

C.S.C.35

MINISTRY OF NATURAL RESOURCES AND LOCAL GOVERNMENT



Annual Report
of the
Department
of
Game, Fish and Tsetse Control
for the
Year ended 31st December
1961

PRICE 4s-0d

1962

PRINTED AND PUBLISHED BY THE GOVERNMENT PRINTER
ZOMBA, NYASALAND

G.F.T. 9208/360/9.62

.....
begs to acknowledge with thanks receipt of the *A/R. G F T C*

.....for the year 1961 and requests that a copy
of the ~~R~~eport for the following year be provided in due course.



Annual Report of the Department of Game, Fish and Tsetse Control for the Year 1961

(a) Staff and General

Mr. Iles, Fishery Research Officer, resigned to take up an appointment in England during March but was rapidly replaced by Mr. R. B. Williamson, who joined the research staff in April. Mr. A. A. Hyde joined as Technical Officer to the Fishery Research unit in September, so that the Senior Division research establishment was brought up to strength with the exception of one Research Officer. Mrs. Williamson also joined the research staff in a temporary capacity.

2. The Senior Division establishment in other branches was also brought up to strength with the recruitment of Mr. B. W. Morris, as Fish Ranger, Lake Chilwa, in October and the posting of Mr. C. M. Chisala to the Nchenachena Fish Farm, in training for the substantive post of Fish Breeder, in May.

3. The year was, however, not without its difficulties and tragedies with respect to staff. The Senior Ranger, in charge of game matters in the Southern Province, became seriously ill in July and was out of action for nearly all the rest of the year and the Department was much shocked and set back by the sudden death from diphtheria of Mr. Maliro, a Junior Division officer who had just been promoted to Senior Tsetse Scout. The first meant that almost no real progress could be made in game matters in the Southern Province. The second caused considerable difficulties with the tsetse programme since it had been planned that Mr. Maliro should take major charge of the Tsetse Scouts in the absence of the Tsetse Botanist on leave. The Department also lost the very valuable services of Mr. C. H. Rickman, who transferred to the Provincial and District Administration on return from leave.

4. Dr. Steele, Tsetse Botanist, went on leave in January and returned in July; Mr. Howard, Fish Ranger, went on leave in September; and Mr. Carey, Game Ranger, at the beginning of December.

5. All Senior Division Officers with the exception of the Fisheries Officer and the Director were seconded for Election Registration duties in February and most of them, together with some Junior Division officers, were again seconded at the time of the actual Elections.

6. In the absence of the Senior Ranger little could be done about game in the Southern Province other than try to attend to routine matters but the Senior Ranger was able to get two electric fences in action, one before and one after his illness. In the Northern Province the most important step forward was a concerted and organized attempt at a burning programme on the Nyika designed to protect the grazing as well as the forest patches, which have previously been the sole object of protective burning.

7. There was steady progress in fisheries work in general, with the opening of the Nchenachena Fish Farm and the organization of a fishermen's information room at Fort Johnston as the more obvious advances. Fish and fishing also formed a major part of the exhibition in the Nyasaland Pavilion at the Central African Trade Fair, the Department being intimately concerned with preparation of the exhibit.

8. Three important visits took place during the year. In July Dr. P. Glasgow spent two weeks in Nyasaland as part of an enquiry into the tsetse research problems of the Rhodesias and Nyasaland on behalf of the Agricultural Research Council. He has made suggestions which, for Nyasaland, mainly involve a study of the reasons for

the decline in tsetse populations in recent years. In November, Dr. M. A. Vaucel, Director General of the Overseas Pasteur Institutes, paid a short visit to Nyasaland on behalf of the World Health Organization, to which he is to submit a report on the trypanosomiasis situation in Africa. In October Dr. Gulland of the Fisheries Laboratory, Lowestoft, England, paid a visit to advise on the collection of fishery statistics.

(b) Game

CROP PROTECTION

9. Operations in control of marauding animals proceeded as usual, though somewhat disjointedly in the second half of the year as far as the Southern Province was concerned owing to the absence of the Ranger on sick leave. For the most part the emphasis was again on crop-raiding elephant and hippo, some sixty-seven of the former and seventy-three of the latter being killed.

10. The killing of so many hippo is regretted on aesthetic, scientific and even economic grounds, in view of the undoubtedly beneficial effect they have on fish production through their influence on the fertility of the water. It is hoped that the waterside cultivators will give active co-operation in the matter of electric fences. These could be most effective against hippo and if used would give far better protection of the crops than armed hunters, who obviously can only cover a limited area at any one time, and would avoid the necessity of so much haphazard killing. Hippo could then be cropped in an organized and conservative manner, with resulting benefits to the fishing industry, sporting hunting and meat supply.

11. The Department continued its efforts to get these fences introduced and, as a demonstration, two were erected during the year in the Southern Province round part of fields cultivated by African staff of the Agricultural Department. They appeared to give good protection against pig and, for a time, against baboon though these latter, as was to be expected, fairly quickly learned to leap over them. A high level strand was added late in the year in the effort to prevent this but it is doubtful if this will defeat the baboons for long. It seems probable that fences would find their best use in protecting dimba gardens and rice paddies from hippo as such cultivation tends to be more concentrated than ordinary gardens and since it is necessarily on damp soil there is an excellent contact when a raiding animal touches the wire.

12. The bounty system against pigs and baboons was continued, but with rather mediocre results compared with previous years. Reports received from Districts operating the scheme appear to indicate that there has been some relaxation of interest.

13. During the year much publicity was given to the savaging, and even in some cases killing, of human beings by hyaenas in Mlanje District. This, though unusual, is by no means an unknown propensity of hyaenas, particularly when people sleep in the open as they tend to do in Mlanje District in the very hot weather just before the onset of the rains. Hunters were sent to try to deal with the animals but in spite of prolonged and patient night patrolling, trapping, etc., did not succeed in destroying any large numbers.

14. There is no doubt that the proper answer to this problem is for the numerous private firearm owners to supplement the activities of the comparatively few Government hunters and for the people of the threatened locality to erect small stockades if they wish to sleep outside during the hot weather.

15. Table I in Appendix II gives the kills under the crop protection scheme in 1961.

CROCODILE HUNTING

16. Increasing numbers of Africans began to interest themselves in the trade. By an amendment to the Crocodile Ordinance enacted in July it was made obligatory for all persons engaging in crocodile hunting, irrespective of race, to be licensed. This was in protection both of the established licensees and those Africans who had pioneered African participation in the trade. By the end of the year there were thirteen licensees of which two were somewhat inactive.

17. Returns submitted by licensees, plus export certificates issued to Africans before licensing was applied to them, indicate a total of 1,270 reptiles killed, a rise of 65 per cent. on the 1960 figures. Size distribution showed about 49 per cent. immature specimens, but the catch included six specimens quoted at 16 feet in length in the returns.

GAME CONSERVATION

18. The situation in the Game Reserves as revealed by the records of observations by the Game Reserve Guards, shown at Tables 1A to 1G in Appendix III, was somewhat variable.

19. In the Southern Province Game Reserves of Mwabvi and Majete the game population appeared to decline during the year with respect to all the major species, while that in the Lengwe Reserve remained static. Nevertheless there is no doubt there was an increase of poaching and it is only too probable that there was a real drop in the game population as a result.

20. On the other hand observations in the Kasungu and Kota Kota Game Reserves in the Central Province, which were much more closely supervised, suggest an increase in some species. For example, taking the year as a whole the average number of elephant seen per 10 days patrol in Kota Kota Reserve was 23 as against 19 in 1961, while similar comparisons for zebra, buffalo, eland and hartebeeste showed ratios of approximately 8:5, 20:10, 11:9, and 6:3 respectively. Ratios on the same basis for Kasungu were 40:24 for elephant, 8:6 for zebra, 17:13 for buffalo, 7:6 for eland and 7:6 for hartebeeste. The differences are, of course, very small in some cases, but at least on the right side.

21. In the Northern Province most of the larger species on the Nyika grasslands showed a perceptible drop but it is not believed that there was any great increase in poaching. It seems more probable that the drop was due either to the better protection accorded to the animals in the Vwaza Marsh or to the burning policy on the Nyika in 1961, or possibly a combination of both.

22. With regard to the first the Vwaza Marsh Controlled Area is one end of a migration route of which the Nyika grasslands represent the other. The herds, particularly of eland and roan, have in the past been accustomed to leave the Nyika at the beginning of the cold weather and move down into the Vwaza Marsh, returning again in late August when burning and hunting begin on the lower levels. In 1961, however, the cumulative effect of prohibition of hunting in the Vwaza Marsh area which has been going on for the last few years appears to have built up considerably and the herds certainly stayed there much later in the season than before. A compensating drop in the numbers observed on the Nyika is thus not unexpected.

23. In respect of burning the policy has for long been to make firebreaks round the relic forest patches and early burn in further protection of them. Unfortunately shortage of staff and transport has often resulted in the burning programme dragging on into August and September, by which time the grass has been so dry that virtually all the area has burned and by late September the hillsides have been completely bare.

What was intended to be an early patchwork burn degenerated into a mid dry-season complete burn, and this, on general principles of pasture management, seemed to be a bad thing. Indeed a perceptible invasion of bracken could be noticed apparently as a result of the overall late burn. In 1961, therefore, a planned and concerted effort was made by both Forestry and Game Department staff to get all protective burning and construction of firebreaks completed really early on in the dry season, so that fires could be controlled and not allowed to run over the entire grassland. The attempt was fairly successful and up to late in November there were considerable areas of unburned grasslands as a result.

24. A detailed chart is being kept of the areas burned and unburned in 1961 and it is hoped to follow a pattern of alternating burning and resting over successive years, with the object of encouraging the less fire resistant and more palatable grasses.

25. In addition to what may be termed the generalized trial, definite experimental plots have been laid down in various parts of the Nyika, well protected by firebreaks. These will be subjected to a variety of early burning policies, annual early burning, annual late burning, two or three rest years followed by burning, etc., in the hope of getting more precise information on the changes in grass species composition actually brought about by the various policies, instead of relying simply on general principles.

26. The attempt to restrict annual burning made during 1961 may be, and according to standard practice apparently is, the correct policy for improving grazing in the long run but the immediate, short term effect was to reduce the acreage of newly sprouted grass in the last five months of the year, when game populations on the Nyika are usually at their height. The change in burning policy referred to in paragraph 23 may therefore be partly responsible for the drop in observed numbers of game animals during 1961 and this theory is supported by the fact that the biggest drop from 1960 figures occurred in the last two quarters of the year.

27. Game populations continued to improve in the Vwaza Marsh area. Impala were seen there for the first time during February, 1961, though admittedly in extremely small numbers. In August simultaneous three-hour patrols in fairly widely separated localities made by ten distinct parties consisting of the Game Ranger, Game Guards and Messrs. S. Hayes and G. Knighton as volunteer observers, produced a total of 343 animals, or an average of 34 per 3 hours per party. Species included elephant, hippopotamus, zebra, roan, sable, kudu, eland, hartebeeste, buffalo and lion. In August a Game Reserve Guard was stationed in the area and regular patrols and observations begun. Sighting for 10 patrol days over the last few months of the year compare favourably with the Game Reserves in respect of several species.

28. No further information has yet come to light concerning the origin of the chimpanzee which suddenly appeared in Nkata Bay District towards the end of 1959. Further enquiries only served to make it all the more certain that the animal has not escaped or been released from captivity in Nyasaland, wherever else it may have been in captivity. On the other hand its increasing tameness and apparent predilection for human society suggest strongly that it has been in captivity somewhere at some time.

29. Further attempts were made to acquaint the general public with the purpose and value of Game Reserves and other game conservation measures, though these attempts could not be very extensive in view of the staff position. The Game Ranger, Northern Province, gave talks and slide shows to the students of the Mzuzu Secondary School and a number of village audiences; the Game Ranger, Central Province, conducted three parties of students from the Dedza Secondary School, the Bishop Mackenzie School and the Colby School respectively on week-end visits to the Kasungu Reserve. All parties expressed themselves as well pleased by their visits and by what they saw.

30. Game licences taken out during 1961 were a little below those taken out in 1960 as far as residents' licences were concerned, but there was very little difference in total value of all licences issued under the Game Ordinance.

31. During the year the provisions of the Wild Birds Protection Ordinance relating to the declaration of Controlled Areas for wild-fowling were brought into force and areas were declared in respect of duck and geese in Port Herald District, Lakes Chilwa and Chiuta, Upper Bua, Lower Bua, Rusa, Kaombe and Lake Kazuni. Some 57 licences had been taken out between the opening of the season and the end of the year, mostly in respect of Port Herald.

(c) Fishery

THE STATE OF THE FISH STOCKS

32. There appeared to be some slight recovery in the *Tilapia* stocks of the south-east arm during the year. The number of ring net hauls was the lowest since 1956, being down to 5,995 as against 12,412 in 1959 and 9,007 in 1960, yet the ring net catch was 306,788 dozens against 302,264 in 1960 and 423,604 in 1959. In other words although the 1961 effort was only 66 per cent. of the 1960 and 48 per cent. of the 1959 efforts the 1961 catch was slightly larger than that in 1960 and 72 per cent. of the catch in 1959.

33. Length frequency records collected from ring net catches in 1961 seem to confirm the general impression that *Tilapia* stocks are recovering. They show that the main part of the catch was mature *T. lidole* of the three year age group and that fish older than three years were regularly available. This is an improvement on 1960 when the majority of *T. lidole* caught in the ring nets were just below breeding size.

34. It may be that the reduction in fishing effort since 1959 has made it possible for a higher percentage of *T. lidole* to reach maturity. It is, however, possible that there was exceptionally heavy or successful spawning in 1958, giving a high crop of three-year-old fish in 1961. However one inclines to the belief that the major part of the recovery is due to the relaxation of the fishing effort, allowing recruits to the fishable stock to accumulate a little before being caught. If the whole effect were due to successful spawning in 1958 one would have expected a higher yield in 1960, for two-year-old fish are certainly within the range of catch of the ring nets. One might also expect the catch of 12 cm. fish in the small meshed seines of 1959 to have been higher.

35. Whatever the cause of the apparent recovery the reward per unit of effort during 1961 was certainly bigger than it has been for some years. Probably a small increase in effort up to the 6,000 or 7,000 pulls level would now increase total yield without bringing the yield per effort undesirably low.

36. *Labeo* catches dropped by almost a third in the large-scale fishery, with a drop in gill net effort of about 47 per cent. In this case, however, the drop in effort reflects the drop in catch rather than the reverse. Gill nets were not set in such numbers because the catch was poor. African *Labeo* catches were also indifferent during 1961 in the minor fisheries and generally speaking it seems to have been a bad year for this species.

37. It was noted in June that the peak in catches usually seen at that time was far below that of previous years and the relatively low catches at the end of the year, when the highest take is normally made, confirmed the general impression of poor recruitment to catchable sized *Labeo* stocks during the year. Judging by the preliminary analysis of normal mortality rates due to fishing which has been made by the Research Organization, it seems unlikely that biological overfishing could have been the cause and the situation suggests a poor spawning year in the past, probably about 1958.

38. In this connection it is interesting to compare the rainfall records for the period December to the following April over the period 1954-55 to 1959-60, at the ten stations in the Lake Nyasa catchment area for which continuous records exist. This comparison shows that 1957-58 had the lowest total rainfall at the recording stations over five months and almost the lowest rainfall in January and February, which are peak months for breeding.

The figures (from Reports of the Meteorological Service) are:

1954-55 Jan. and Feb. 229.33 in.	..	Total Dec.-Apr.	438.69 in.
1955-56 Jan. and Feb. 233.15 in.	..	.. Dec.-Apr.	511.08 in.
1956-57 Jan. and Feb. 241.17 in.	..	.. Dec.-Apr.	461.74 in.
1957-58 Jan. and Feb. 182.58 in.	..	.. Dec.-Apr.	348.30 in.
1958-59 Jan. and Feb. 197.90 in.	..	.. Dec.-Apr.	362.93 in.
1959-60 Jan. and Feb. 170.96 in.	..	.. Dec.-Apr.	392.22 in.

39. Since *Labeo* are accustomed to enter rivers in flood for spawning purposes the coincidence of what looks poor spawning and comparatively low rainfall is not unexpected. The incidence of heavy individual falls causing floods is probably of more importance than actual total rainfall as far as the breeding of *Labeo* is concerned, but when the total rainfall is higher it is at least likely that individual heavy falls were rather more common. However, growth rate estimates for *Labeo* are still very tentative and one cannot be sure that it is the 1958 year class which should have come to crop in 1961. The rainfall figures can scarcely be regarded as indicating more than an interesting coincidence at present.

LARGE-SCALE FISHERY UNDER LICENCE

40. As stated above the effort declined rather sharply during the year as far as south-east arm fishing was concerned. This was mainly due to a change of ownership of one of the three firms in June, the new owners deciding to suspend fishing operations until the beginning of 1962 to permit of reorganization, receipt of new gear, etc.

41. Total landings of all species by all methods by the three firms fishing in the south-east arm were 2,654 short tons against 3,391 short tons in 1960, the shortfall being in the landings from gill nets.

42. In July the old owners of the south-east arm business which changed hands set up a new gill net effort in the south-west arm but yields were poor and only 29 short tons were landed up to the end of the year.

43. An ice-making plant was installed by one of the south-east arm firms, the last of the three to do so, but there were no other major developments in the installation of equipment.

44. Data from this section of the fishery are shown in Appendix IV.

SMALL-SCALE FISHERY NOT SUBJECT TO LICENSING

45. The continuous increase in effort which has been a feature of the past few years slowed down to a more conservative pace and in some cases there was even a decrease in effort, especially in relation to gill nets, though it remained above 1959 averages. Only Kota Kota and Mpemba showed an increase in gill net settings, the increase in the latter area being largely due to an influx of gill net fishermen from Malombe where catches were poor and damage from crocodiles rather severe. In the main such increased effort as was made was in the use of large meshed seines for *Tilapia*, though small meshed nets increased markedly at Mtundu and Mpemba. There was also a marked increase in chilimila effort.

46. There were more *Tilapia* in observed catches than in 1960 at Mpemba, Shire River and Mtundu, though the records at the latter station are not comparable since it was not regularly recorded prior to 1961. Immature *Tilapia* occurred in some numbers at Malindi, where they are not usually conspicuous, though in a ratio with *utaka* and other small *Haplochromis* of no more than 1:6. A number were also caught at Demira Bay but the ratio was still only 1:7.

47. The catches of small *Haplochromis* increased considerably at all beaches and most spectacularly at Mpemba.

48. During 1961 efforts were made to make some more considered estimates of total catch from this section of the industry, the area chosen being the south-east arm—Upper Shire—Lake Malombe. The estimate was based on the records of catches, gear in possession, and frequency of use at recording stations, coupled with a survey of gear in possession at neighbouring beaches. Each recording beach was assumed to be typical of the other beaches in the locality. The catch per unit effort and amount of effort per item of gear possessed being known at the recording beach some approximation could then be made for the catch from the area as a whole.

49. This somewhat crude method appeared to be the best that could be devised in the difficult circumstances of the non-licensed section of the fishery. It was, in fact, later approved in principle by Mr. Gulland, the statistical expert from the Lowestoft Fisheries Laboratory who visited the territory in October to advise on collection of statistics. His amendments to it chiefly consisted of recommending the inclusion of more beaches in the regular recording programme of each Fisheries Assistant and rather less concentration on one single beach by each man, as has been the practice in the past.

50. The results of calculations based on such data cannot, of course, be used to indicate much more than the order of the catch in each particular area but do nevertheless provide some logical guide to the position.

51. The calculations in 1961 indicate a catch of as much as 3,000–4,000 short tons in the south-east arm—Upper Shire—Lake Malombe area, which is far higher than had previously been thought probable. In the coming year attempts will be made to make similar calculations in other areas of heavy fishing effort and it seems likely they will lead to considerable revision of estimates of the overall African catch.

52. Landings by would-be full time commercial fishermen of whom some 15 were in action, on the average, throughout the year, amounted to about 240 short tons. The situation with respect to these men, many of whom have received loans from the African Loans Board, appeared rather disappointing. In a good many cases the acquisition of a loan and the opportunity to increase the scale of operations has led not to the expansion of a business but to its collapse. Thus in Fort Johnston District out of fifteen recipients of loans three have already failed, two appear on the verge of failure, eight show some promise of success but only two can be said to have really established themselves.

53. As reported in 1960 too often the cause of failure is mismanagement. In general the lesson is still to be learned that the keys to success are personal attention to the detail of fishing operations by the owner of the business; the setting aside, in periods of affluence, of money to provide for the eventual replacement of worn gear; and contentment with modest profits on individual sales so long as those sales are quick and repeated. Much more explanation and closer contact between the field staff and the fishermen and much more willingness on the part of the fishermen to listen to advice are necessary if these points are to be fully appreciated.

THE FISH TRADE

54. Fish exports to Southern Rhodesia were approximately 173 short tons fresh fish, 108 short tons dried or smoked fish and 133 short tons salted fish, corresponding to a total of about 765 short tons landed weight. Virtually all exports were by the large firms though several small-scale fishermen possessed export licences.

55. The drop in exports compared with 1960 figures was due to the change in ownership of one of the three firms. As reported above the new owners ceased fishing temporarily and therefore had none of their own product to export and they also ceased, it is hoped temporarily, the purchase of fish from small-scale operators which provided much of their smoked fish export in 1960.

56. The closing of this channel for the small-scale section of the fishery is to be regretted but does not seem to have had any immediate effect on the fishermen.

57. There was little change in the general structure of minor fish trading. Small turnover by multitudes of small traders with high mark-up between the Lake-side and the township markets continued to be the common procedure and fish selling at 2d each on the Lake-shore were 8d or 10d on Limbe market. There was not much sign of adoption of the principle of small profits and quick returns which could do so much for this section of the industry.

58. Some 28,710 lb. of ice were sold from the Departmental ice-making plant at Fort Johnston, only very little more than double the July to December figure of 1960. Nevertheless customers increased from 59 in 1960 to 96 in 1961 so the idea of using ice appears to be gaining ground, if slowly.

DEVELOPMENTAL WORK

59. A rather tentative effort was made to set up a demonstration unit to give practical demonstration of methods and techniques developed in the course of experimental work. There were, however, difficulties in selecting suitable personnel to run the unit, and up to the end of the year the attempt had scarcely been pressed home.

60. Boat building continued and a total of 18 boats were completed against 12 in 1960 and 6 in 1959. The demand for boats dropped rather suddenly in the middle of the year, however, and though the financial position of the unit, which runs as a quasi-commercial organization, remained fairly sound there were four unsold boats on hand at the end of the year.

61. The decrease in demand was no doubt influenced by a temporary pause in the granting of fishing loans and also by the fact that there are now about six private African carpenters who occasionally build boats for sale. One carpenter at Nkata Bay, originally an employee of the Department, completed three boats, has five more on order and seems well established.

62. The stimulation of private enterprise by demonstrating the need for reasonably good fishing craft was, of course, the ultimate object of setting up the Departmental unit and it looks as if it may be on the verge of achievement. The unit has, since its inception, built and distributed some sixty or seventy of these craft and as a voyage round Lake Nyasa on the Lake steamer will show, they are now well scattered up and down the Lake. One hopes that the idea of using boats instead of wasteful dug-out canoes will spread naturally from now on, as far as Lake Nyasa is concerned.

63. During the year efforts were made to interest Lake Chilwa fishermen and carpenters in these simple boats. Mixed parties of fishermen and carpenters were invited down to Fort Johnston to see the unit in action and inspect the type of boats

and it appeared to be generally agreed that they would be very suitable for Chilwa. Subsequently a carpenter from Chilwa came to Fort Johnston for training but absconded for some unknown reason after a very few days. Nevertheless just after the turn of the year there were orders for boats from Lake Chilwa fishermen so the effort to introduce them may yet be successful.

64. Further efforts were made to get fishermen to paint their nets as a means of identification and deterrent to net thieves but this has not as yet proved popular. Trials were also made with a delayed release mechanism for net marker buoys suggested by the Director of the East African Freshwater Fisheries Organization, but were not quite completed by the end of the year.

TRAINING AND PROPAGANDA

65. The Fishermen's Training Courses were continued at Nkata Bay under the Fish Ranger up to his departure on leave in September. Attendance was, however, severely curtailed by the fact that the Lake steamer passenger service from the south was suspended for three months and during this period eight applicants failed to attend. There was also probably still some feeling that attendance at the course might make one unpopular with one's fellows.

66. During the year a very attractive fishermen's information room was established by the Fisheries Officer at Fort Johnston, with a number of aquaria, an outside open water tank and a room equipped with diagrams, models, photographs, etc., illustrating various aspects of Department activities, dangers to the fishery of undesirable practices and suggested new techniques. It was opened to the public in May and was seen by 230 people up to the end of the year. It forms a very interesting exhibit and is now a regular item on the programme for important official visitors to Fort Johnston.

67. A number of posters and pamphlets were distributed during the year explaining the advisability of not catching undersized *Tilapia*. The apparent recruitment position does not suggest that the catching of immature fish has had any real influence on the fishable *Tilapia* stocks to date but it clearly might have if not kept in reasonable check. Reaction to the propaganda was not unfavourable and it is thought that the position is appreciated by the fishermen, though few if any acted on the suggestions made. Nevertheless it was considered worthwhile to implant the idea of protection of immature fish before the situation gets out of hand. At present the catching of young *Tilapia* is only incidental to the catching of *Haplochromis* of the *utaka* species flock and provided it remains at that level there is probably little danger.

68. Lectures illustrated with coloured slides on this and other aspects of fishery control and development were given to some 1,200 people in a number of villages along the Lake-shore, projection being by means of a projector worked from a 12 volt car battery. After some initial difficulties the shows became very successful and a number of villages which have not yet seen them have asked for a visit. It is hoped to expand this programme in the coming year.

69. The Fisheries Section of the Department played a prominent part in the Natural Resources exhibit in the Nyasaland Pavilion at the Central African Trade Fair. A collection of the more important lake fish was made for Mr. Hanney, Curator of the Nyasaland Museum, who converted them into a series of realistically coloured casts for exhibition, while the Nkata Bay Research unit carried down and established in aquarium tanks an interesting collection of rock fish which attracted considerable interest. The Department is indebted to the Director and staff of the Bulawayo Museum who kindly took care of the fish while the exhibition tanks were being set up.

EXPERIMENTAL WORK

70. The series of comparative gill net settings was continued with further trials of mended 3-ply nets, monofilament platyl net and unmended 6-ply net fished against a mended 6-ply net as a single standard of comparison, all being of 4-inch mesh and equal depth.

71. The trial of 3-ply versus 6-ply was a repetition of previous trials in 1959 and 1960 (Annual Reports 1959 and 1960, pages 12 and 11). The experiment was repeated because, contrary to expectations, the 6-ply appeared the more effective in the 1959 and 1960 trials and indeed in the 1961 series the order was reversed. Nevertheless taking the 1959 (1), 1960 (2) and 1961 (3) series together the 6-ply retained its lead, the results being given below:

Series	No. fish 6-ply net			Total No. all sets	Percentage of total catch of both nets %	No. fish 3-ply net			Total No. all sets	Percentage of total catch of both nets %
	1	2	3			1	2	3		
No. sets in series	38	96	141	275		38	96	141	275	
Genera of fish										
<i>Tilapia</i> spp.	126	782	593	1,501	54.5	107	518	649	1,274	45.5
<i>Haplochromis</i> spp.	—	24	8	32	52.3	4	17	10	31	47.7
<i>Labeo</i> ..	54	228	66	348	58.8	45	153	104	302	41.2
<i>Bagrus</i> ..	24	84	47	155	71.0	31	30	3	64	29.0
<i>Clarias</i> ..	42	36	37	115	54.7	16	25	55	96	45.3
<i>Barbus</i> ..	—	1	9	10	13.5	6	3	68	77	87.5
<i>Mormyridae</i>	—	3	1	4	62.5	—	—	3	3	37.5
Others ..	4	2	6	12	43.9	1	1	11	13	54.1
	250	1,160	767	2,177	55.2	210	747	903	1,860	44.8

72. It would seem therefore that, as concluded from the 1959-60 experiments, the 6-ply net catches slightly more fish but as the 3-ply net is not much more than 50 per cent. of its price the latter would seem to be the more economic.

73. The experiment with the platyl net was carried out with a 0/20 mm. filament net fished against the standard net of ordinary 6-ply nylon thread, and served to confirm previous findings that, unlike the 0/30 mm. monofilament, this net offers no advantage over ordinary nylon under local conditions. It seems that the thinner monofilament not only is less durable but catches less fish.

74. In the experiment in which a 6-ply net which was merely "cobbled" between sets (referred to as unmended) was compared with the standard 6-ply net which was carefully mended the unmended net caught more fish; thus confirming previous tentative findings. During the series thirty-six hours were spent repairing the "mended" net as against seventeen and a quarter on the "unmended" net.

75. Catches of the 0/02 mm. platyl net, of the "unmended" 6-ply net and of the "mended" 6-ply net which served as the standard are given below. They represent the results of 125 settings for the platyl net and 141 for each of the others:

Genera of fish	Standard 6-ply catch	Unmended 6-ply catch	0,02mm. catch
<i>Tilapia</i> spp.	..	..	..
<i>Haplochromis</i> spp.	..	..	..
<i>Labeo</i> ..	..	..	..
<i>Bagrus</i> ..	..	..	..
<i>Clarias</i> spp.	..	..	..
<i>Barbus</i> ..	..	..	..
<i>Mormyridae</i>	..	..	..
Others ..	..	..	..
	593	658	463
	8	9	18
	66	57	46
	47	59	67
	37	40	62
	9	2	10
	1	1	7
	6	3	20
	767	829	693

76. It is interesting to compare the rates of deterioration of the standard 6-ply nylon, the unmended 6-ply nylon, the 0/02 mm. platyl and the 3-ply nylon (1961 series). To this end the catch of successive groups of 20 settings each are set out below:

	Catch by genera							Total
	<i>Tilapia</i>	<i>Haplochromis</i>	<i>Labco</i>	<i>Bagrus</i>	<i>Clarias</i>	<i>Barbus</i>	<i>Others</i>	
<i>Sets 1-20</i>								
Standard 6-ply ..	40	2	3	17	13	6	—	81
Unmended 6-ply ..	48	1	1	23	8	—	—	81
3-ply ..	40	—	4	13	22	3	5	87
0/02 mm. platyl ..	56	4	4	26	25	4	11	130
<i>Sets 21-40</i>								
Standard 6-ply ..	112	—	11	4	1	1	1	130
Unmended 6-ply ..	144	1	8	3	5	—	1	162
3-ply ..	147	—	17	8	8	—	—	180
0/02 mm. platyl ..	126	3	21	12	3	5	4	174
<i>Sets 41-60</i>								
Standard 6-ply ..	48	—	1	6	10	2	1	68
Unmended 6-ply ..	50	—	—	9	7	1	1	68
3-ply ..	49	4	4	8	6	—	1	72
0/02 mm. platyl ..	64	3	1	6	15	1	5	95
<i>Sets 61-80</i>								
Standard 6-ply ..	56	1	2	4	4	—	—	67
Unmended 6-ply ..	58	3	2	11	5	1	—	80
3-ply ..	93	2	4	10	2	—	2	113
0/02 mm. platyl ..	88	1	1	8	7	—	2	107
<i>Sets 81-100</i>								
Standard 6-ply ..	16	2	40	8	3	—	2	71
Unmended 6-ply ..	14	2	28	7	9	—	1	61
3-ply ..	21	4	63	22	2	—	3	115
0/02 mm. platyl ..	9	5	19	9	11	—	3	56
<i>Sets 101-120</i>								
Standard 6-ply ..	156	1	—	3	1	—	1	162
Unmended 6-ply ..	142	1	—	2	2	—	1	148
3-ply ..	162	—	—	3	2	—	2	169
0/02 mm. platyl ..	77	2	—	6	1	—	2	88
<i>Sets 121-140</i>								
Standard 6-ply ..	161	2	9	5	5	—	1	183
Unmended 6-ply ..	196	1	15	4	3	—	1	219
3-ply ..	137	—	12	4	13	—	1	167
0/02 mm. platyl ..	*43	—	—	—	—	—	—	43

*Five settings only in this group.

77. It is to be noted that the 3-ply catches did not drop below those of the standard 6-ply until after 120 settings, that the drop in efficiency of the unmended 6-ply net was no more rapid than in the carefully mended net and that the efficiency of the 0/02 mm. monofilament net declined rapidly after 80 settings.

78. In contrast to the trial with 0/02 mm. monofilament platyl a comparison of a net with 0/03 mm. filament with a 3-ply nylon net carried out by the Research Unit in the south-east arm confirmed the 1960 findings of the value of the thicker monofilament (Annual Report 1960, p. 11). The results of the comparison over 22 sets were as follows:

<i>Fish by genera</i>	<i>Number in 0/03 mm. platyl net</i>	<i>Number in 3-ply nylon net</i>
<i>Tilapia</i> spp.	91	12
<i>Labeo</i>	58	13
<i>Bagrus</i>	52	6
<i>Clarias</i>	19	—
Others	45	12
<i>Total No.</i> ..	265	43
<i>Total wt.</i> ..	307 lb.	45 lb.

79. A series of trials to attempt to determine the period of the night when most fish actually entered gill nets was begun in November with the arrival of the Fish Ranger. The information gained from them might have considerable bearing on the economics of gill netting. If it were found that most fish were caught during some comparatively limited portion of the dark hours it might pay to set during that period only, lying to the nets instead of returning to shore and going out to pick up again next morning. The reduction in fuel costs, risk of net thefts and the better condition of fish on landing might offset a small reduction in catch due to loss of those comparatively few extra fish which might be expected to enter if the nets were left down for the whole night.

80. In this experiment three fleets of two nets are being set. One fleet is set at dusk and hauled at daylight in the normal way, one fleet is set at dark and hauled at midnight and one is set at midnight and hauled at dawn.

81. Up to the end of the year only six settings had been made and it will, of course, be necessary to continue the experiment with sets at other seasons and during other moon phases. The results of these first six sets are given below. Four of these were on the first quarter of the moon (14th to 17th November) and two on the last quarter (29th to 30th December).

<i>Fish by genera</i>	<i>Numbers of Fish</i>		
	<i>Set from 1700 hrs.— 2400 hrs.</i>	<i>Set from 0000 hrs.— 0600 hrs.</i>	<i>Set from 1700 hrs.— 0600 hrs.</i>
<i>Tilapia</i> spp.	18	13	42
<i>Labeo</i>	15	5	8
<i>Bagrus</i>	5	6	3
<i>Clarias</i>	1	—	—
Others	—	2	—
	39	26	53

82. The results are naturally indeterminate at this stage but do not so far indicate any great variation in fish movement throughout the night. It is, however, odd to note that the total of the two fleets each set for half the night exceeds the total for the fleet which remained undisturbed for the whole night.

83. In December trials were begun on the effect of various numbers of floats per unit length of head rope. In this experiment five nets are used, identical in all respects except that the floats are spaced at intervals of four, six, eight, ten and twelve feet respectively.

84. Only a few sets were made up to the end of the year so nothing can yet be determined from the results but catches so far are as follows:

Float Distances	..	..	..	4 ft.	6 ft.	8 ft.	10 ft.	12 ft.
Total No. fish	..	..	..	49	34	78	52	94

85. A single attempt, carried out on Lake Malombe, to drive fish into gill nets during the day-time produced discouraging results but further attempts to give a proper test of this method, or modifications of it, will be made when opportunity offers. It appears likely, however, that it is only successful when nets are set in relation to previously located shoals.

86. An activity which attracted a good deal of interest and rather premature publicity was a series of preliminary trials in canning of some local species. These were carried out by the Fish Ranger, Nkata Bay, after undergoing a short course in the principles of fish canning very kindly given by the Research Division of the Metal Box Company of South Africa.

87. For these preliminary trials very simple apparatus was used consisting of a small hand operated can-closing machine designed for canning on a domestic scale with pressure cookers for exhausting and cooking.

88. The species used were *Labeo mesops*, *Bagrus meridionalis* and *Haplochromis* of the "utaka" species flock. A variety of packs were used, brine applied in various ways, a proprietary brand of cooking oil, brine plus cooking oil, etc., but apart from brine no strongly flavoured substances were used.

89. Samples were examined by the Research Division of the Metal Box Company of South Africa, the Fishing Industry Research Institute of South Africa and the Tropical Products Institute in England.

90. The results did not suggest any probability of an export market for these fish, the general flavour being considered somewhat tasteless, the flesh having a tendency to assume a mushy texture and the bones requiring an unusual amount of cooking to soften. However, though the general tenure of the reports was somewhat discouraging they did point the way to the possibility of further trials and the lines on which these should be made, and success by world standard could scarcely be expected at the first attempt. Several possible improvements in the processing can be suggested in the light of the reports, and there are, of course, other species of fish to be tested. The product of a pack suitable for local consumption at least remains a possibility if not perhaps a very strong one.

91. Also in the field of fish processing a beginning was made at a new attempt to produce fish meal for fertilizer or stock feed from waste fish. Early experiments were made in 1956 and showed some promise but had to be abandoned when the Fisheries Officer resigned soon afterwards and was not replaced.

92. The Senior Agricultural Chemist of the Department of Agriculture very kindly analysed the result of the new trials and reported it to be of a not unreasonable composition, though at the low end of the range normal for fish meals. Unfortunately however, it was heavily contaminated with siliceous matter to an extent which made it quite unsuitable for feed.

93. This contamination was obviously introduced in the grinding process, which entailed the use of stones in a wooden barrel, and it may be that the difficulty can be overcome with the use of harder stones, or reduction in grinding time, or a combination of both. Obviously altogether more elaborate equipment would produce a better result but what is aimed at is a process suited to the small-scale fisherman, who could employ it to use up damaged fish, fish offal, etc. For this purpose modern plant is obviously out of the question.

FISHERIES RESEARCH ORGANIZATION

94. The work of the organization is reported in detail in the Annual Report published jointly by the Nyasaland and Northern Rhodesian Units in the name of the Joint Fishery Research Organization. There is therefore no need to report in detail here, nor do many of the projects, being of a long term research nature, really lend themselves to annual reporting.

95. In general work consisted of a continuation of studies of the population dynamics of *Labeo mesops*, age determination of this species and the more important *Tilapia* species, together with routine and extended hydrographic work. A start was also made on the identification and listing of the main groups of phytoplankton, a subject which has not previously received any attention.

96. Good progress was made with the erection of the new Research Base at Monkey Bay and it is expected that this will be brought into action about the middle of 1962.

TROUT FISHING

97. Licences for the season ending in March, 1961, were only 59 in respect of Mlunguzi, worth £44, 6 for Mlanje mountain streams, worth £3-10s, and 4 for the Northern Province streams valued at £2-15s.

98. Data on fishing were therefore very scant and were made scantier by the fact that a number of licensees failed to render returns. Such data as are available are listed at Appendix VI but only in respect of the Mlunguzi are they sufficiently extensive to be worth comment.

99. On this stream there seems to have been some increase in average size of fish landed from 9.8 inches in 1959-60 to 11 inches in 1960-61; and the figures include one 15 inch fish against a maximum of 14 inches in 1959-60. This may well be a result of the feeding and rearing exercise carried out in 1960 and early 1961 without, this time, interference by loss of fish from unheralded draining of the reservoir. Reports on the current (1961-62) season so far suggest that the increased size average will apply to it also.

100. During 1961 trout were observed in the grassland section of the Chelinda stream on the Nyika with some regularity and in some number, and appeared to be displaying breeding behaviour. Occasional fish have been observed in previous years but never before in numbers which suggest they had really established themselves. If they have, it will be the result of a very small stocking made in 1957. The apparent success of this is in sharp contrast to the results on the lower reaches of this river which were heavily and repeatedly stocked between 1953 and 1955 without any visible result whatever. Late in the 1960-61 season a 19 $\frac{3}{4}$ -inch fish was landed from this grassland water.

FISH FARMING

101. Three further ponds were completed at Domasi farm during the year and one two-acre pond was nearly completed and would have been finished by the end of the year but for adverse weather conditions towards the close. Apart from the two-acre pond under construction the banks of all ponds are now well covered with Seychelles grass which appears to be admirable for the consolidation and holding of

pond banks. Water supply to the site is proving very adequate but a good deal of maintenance work has been necessary on the furrow and its inlet due to silting, blockage by vegetation and holing by rats and crabs.

102. Good progress was made with buildings. The office and garage for the station Land-Rover were completed together with two small houses for station labourers, and station buildings are now complete.

103. The ponds are now well supplied with fingerling fish and some 1,600 were sent away for stocking other dams in the Southern Province during the year, 350 going to private ponds and the remainder to Government dams.

104. Trials of various types have been started. These include attempts to discern the effect of running a mixed population of local predator (*Serranochromis robusta*) and local forage fish (*T. melanopleura* and *T. shirana*) on the tendency of the latter to "stunt" in unmixed populations of forage fish, studies of the growth and reproduction of a mixed population of *T. shirana* and *T. melanopleura* compared with those of pure populations of both species, attempts to find optimum stocking rates for *T. melanopleura*, trials of *T. melanopleura* in rice paddies and investigations on the possibilities of *Clarias mossambicus* as a pond fish. None of these have yet proceeded far enough to permit discussion of results.

105. Cormorants visited the ponds fairly frequently but, as in 1960, only during the dry season. 73 visits were recorded starting on 11th June and ending on 10th December.

106. The Nchenachena station, which had been on a care and maintenance basis since early 1959, was re-opened in April.

107. The initial programme consisted of a general stock-taking to see what fish had survived the long period when the farm was not under resident supervision. All ponds which had been in action during this period were half emptied and netted. Reasonable sized fish were sorted to a central pond to form a marketing stock and fry were returned to selected ponds to form a reserve ready for subsequent distribution to privately owned ponds in the vicinity, or for growth and marketing.

108. This programme having been successfully completed, plans were laid for its repetition at intervals, the market pond being used for production of fish for sale and its population kept up by transfer from some of the fry ponds. The rest of the fry ponds were to form the stock breeding ponds to be netted as required for supply of stock to new farms.

109. The Nchenachena ponds having been put onto a systematic basis the officer proceeded to contact erstwhile fish farmers in the Northern Province and to try to revive their interest. The response in the Nchenachena locality has so far been verbal rather than active but one or two pond owners have been persuaded to clean up their old ponds, two new ponds of small size have been constructed and stocked and there has been a very limited amount of cropping. Response in the Chikwina area of Nkata Bay District has been more active; indeed the people here did not let their interest lapse as did those at Nchenachena, and their ponds are kept clean and well cared for.

110. Cropping is clearly something of a problem on these privately owned ponds, many of which are small and therefore not obviously justifying the expense of a large net. Some owners do a certain amount of cropping with hook and line but it seems probable that this will prove too slow a method to keep up with the exceptionally rapid reproduction and that the ponds will eventually become overstocked with undersized fish. However one of the Nchenachena ponds is being cropped in this way to study the effect of relying on this method over a long period.

111. In an effort to get regular cropping under way in the Nchenachena area a spare net has been sent up to Nchenachena for loan to surrounding farmers. The principle of a free loan is scarcely a sound one and it is being made clear that this is a temporary measure only. The idea is to get people to realize the real potential of their ponds in the hope that private or perhaps group action will be taken to acquire nets, once their value is appreciated.

112. The "market" pond at Nchenachena was netted on two or three occasions and the fish sold. It is, however, taking some time to accustom people to the idea of fish being available, and on some occasions fish were netted without anyone appearing to buy in spite of advance notice while on others people appeared to buy when there was no netting going on. The obvious solution is to net regularly, despite possible paucity of buyers, and to dry any surplus fish against casual opportunities to sell between the regular netting days. This will be resorted to in future as far as weather permits.

Tsetse Control

SURVEYS

113. Surveys of the latest position in a number of areas were carried out as usual. Among these were the Macnear area in Ncheu District, the site of a new settlement scheme, for which recommendations on anti-trypanosomiasis measures were made. An outbreak of trypanosomiasis at N.A. Symon was investigated, but no immediate source of tsetse flies could be found to account for the disease.

114. In both the Liwonde and Chiuzi Dambo areas, which have been the subject of recent more intensive patrolling, there were sharp declines in *G. morsitans* catches, as is evidenced by the fall in catches at Kasupe and Fort Johnston fly posts respectively. The cause of these declines has not yet been studied, but the necessity for action to reduce fly numbers has fallen away, at least temporarily.

115. Detailed studies of the Lower River area were continued, particularly in relation to two small outbreaks of trypanosomiasis in Port Herald District, the first recorded since the Department of Veterinary Services antrycide campaign in 1959. *G. morsitans* continues to be found in fair numbers in the Mwabvi area and carriage of occasional flies may account for one of the outbreaks. Carried tsetse on trains are still a potential source of disease in this District. Investigation of both sources of flies is continuing.

KARONGA RECLAMATION SCHEME

116. Routine patrols for *G. brevipalpis* were maintained throughout the year. No new action was taken on any large scale. In October a single application of 4 per cent. dieldrin emulsion was made with Motoblo machines to six sectors of the thicket and Silhoa patrols and sections 9 and 10 of the Lisantha patrol (Katumbi's graveyard). This was intended as an experimental attack on persistent fly pockets, occasional flies having been recorded at irregular intervals in these sectors until September. From October to December, however, fly catches were nil over the whole of the area of the observed part of the belt and the results in the sprayed areas can only be assessed if there is a general recovery of fly populations in the rest of the belt in early 1962.

117. Cultivation of the former centre of *G. brevipalpis* infestation in and around Yembe Hill continues at an encouraging rate and doubtless contributes much to the present maintenance of an exceedingly low fly density. A large scale campaign for complete eradication in concert with Tanganyika did not prove possible but it now appears unlikely that this will be necessary as far as Nyasaland is concerned as that portion of the belt immediately threatening the main cattle areas has been dealt with.

TSETSE CONTROL POSTS

118. Six posts continued to operate as in previous years. The by-passing of the Kasupe post by large numbers of motorists and the inconvenience of subsequent prosecutions were at last ended by the erection of a movable barrier. Details of traffic and fly catches for all posts in 1961 and a comparison of fly catches in recent years are shown in Appendix VII.

119. The general trend fly catches as compared with previous years is again of interest, although no explanation of the reasons for the changes can be offered with certainty. Kasupe has again declined, probably in relation to increased occupation along the Liwonde-Kasupe road and general "urbanization" of the vicinity of the Liwonde ferry. Fort Johnston shows a dramatic decline. Observations on the source of flies in the Chiuzi Dambo which contributes most flies to the Fort Johnston catch have not been made recently but occupation and cultivation are clearly not sufficient to cause the reduction. Three of the four posts in Kota Kota District show a small unexplained decrease. Numbers at the small Chota post, although small, have more than doubled and indicate some danger of a resurgence of *G. morsitans* in the Chia Lagoon area. This has not yet been investigated.

OTHER INVESTIGATIONS

120. In September, a trial was made of the protection of the Tongole Rest Camp in the Kota Kota Game Reserve from the nuisance of the surrounding heavy *G. morsitans* concentrations by spraying tree trunks with dieldrin emulsion. After preliminary standardized observations on fly numbers in the camp and surroundings all tree trunks within 50 yards of the camp were sprayed to run off point with 4 per cent. dieldrin to a height of 10 feet.

121. In the six days after spraying was completed there was a reduction to one third (13.3) in the average daily catch by various methods in the camp, as compared with the seven days before catching (39.4). Unfortunately it was not possible to make further long-term observations of any cumulative effect of the insecticide or its persistence, but the radius of 50 yards for treatment is smaller than was originally intended and is probably too low for preventing any flies from reaching the camp. It is hoped to continue the investigation in 1962, since apart from local interest the question of the efficiency of insecticidal barriers is of widespread concern at present.

APPENDIX I

Senior Staff as at 31st December, 1961

Director .. ..	..	..	..	..	H. J. H. BORLEY, M.A.
Tsetse Botanist .. ..	..	..	..	..	B. STEELE, B.SC., PH.D
Fisheries Officer .. ..	..	..	..	..	E. C. L. BIRKENMEIER, D.PHIL.
Senior Ranger (Game) .. ..	..	..	..	..	E. T. LLEWELLYN
Senior Ranger (Fish) .. ..	..	..	..	..	A. V. GIFKINS
Fish Rangers .. ..	..	..	..	..	K. T. HOWARD
					B. W. MORRIS
Game Rangers .. ..	..	..	..	..	O. J. CAREY
					L. T. KETTLE

FISHERY RESEARCH ORGANIZATION

Fishery Research Officers .. ..	..	..	..	D. H. ECCLES, B.SC.
				R. B. WILLIAMSON, B.SC.
Technical Officer .. ..	..	..	..	A. A. HYDE

APPENDIX II

Table I

Animals killed and staff employed 1st January to 31st December, 1961 (Crop Protection)

	Totals 1960		Northern Province		Central Province		Southern Province		Totals 1961
Average No. Hunters	28	..	6	..	13	..	7	..	26
ANIMALS KILLED:									
Elephants	57	..	11	..	31	..	25	..	67
Hippo	48	..	3	..	52	..	18	..	73
Buffalo	3	..	—	..	—	..	—	..	—
Carnivora	11	..	1	..	10	..	11	..	22
Antelope	—	..	2	..	—	..	—	..	2
Baboon	320	..	175	..	—	..	—	..	175
Pig	14	..	5	..	—	..	—	..	5
*Vermin killed under bounty system									
A.D.W. Finance	24,948	..	5,427	..	3,160	..	1,250	..	9,837
District Council Finance	19,695	..	500	..	4,516	..	4,200	..	9,216

Table II

Revenue accruing from Crop Protection Activities

Value of ivory .. ..	..	..	..	..	..	£1,221
Value of meat and skin sales .. ..	..	..	..	..	..	£210



APPENDIX III
Average Number of Game seen per 10 Patrol Days

Type	TABLE IA MWABVI				TABLE IB LENGWE			
	1st qtr.	2nd qtr.	3rd qtr.	4th qtr.	1st qtr.	2nd qtr.	3rd qtr.	4th qtr.
Elephant	—	—	—	—	—	—	—	—
Rhinoceros .. .. .	.4	—	.9	1.2	—	—	—	—
Hippopotamus	—	—	—	—	—	—	—	—
Zebra	4.4	—	—	1.2	—	—	—	.2
Lion	—	—	—	—	—	—	—	—
Leopard	—	—	—	—	seen	—	—	.1
Buffalo	8.2	7.8	5.5	12.3	—	5.1	1.7	3.2
Sable	32.4	19.3	18.8	20.2	.7	—	—	—
Roan	—	—	—	—	—	—	—	—
Kudu	29.9	16.1	12.9	18.7	4.4	5.3	3.9	2.9
Eland	—	.2	—	—	—	—	—	—
Hartebeeste	—	—	—	—	2.2	3.0	.7	1.0
Waterbuck	1.7	—	—	—	3.0	.8	—	—
Nyala	1.0	.9	1.5	1.1	—	2.9	.9	.9
Impala	26.7	11.8	5.8	18.8	1.4	seen	1.9	3.2
Reedbuck	1.7	.8	—	.6	1.4	.9	1.7	.7
Bushbuck	1.6	—	.5	1.1	1.0	1.1	1.6	1.4
Duiker	4.6	3.3	3.9	3.5	.9	1.9	—	1.7
Klipspringer	3.1	2.8	1.8	4.0	—	—	—	—
Oribi	—	—	—	—	—	—	—	—
L. Suni	—	.2	—	.4	.4	seen	—	.6
S. Steinbuck .. .. .	.3	.1	—	—	.2	—	.1	.1
Pig	9.1	.8	2.0	1.0	2.0	2.5	4.5	2.0
Warthog	19.9	24.7	13.7	14.7	1.1	1.2	1.0	.9
Wild Dog	—	—	—	—	—	—	—	—
TOTAL DAYS PATROL ..	170	160	237	317	193	185	188	162
TOTAL DAYS NO GAME SEEN ..	34	48	41	73	68	62	41	47

APPENDIX III—(Continued)

Type	TABLE IC MAJETE				TABLE ID NYIKA			
	1st qtr.	2nd qtr.	3rd qtr.	4th qtr.	1st qtr.	2nd qtr.	3rd qtr.	4th qtr.
Elephant	6.1	9.1	.8	3.3	—	—	—	—
Rhinoceros	—	—	—	—	—	—	—	—
Hippotamus	—	—	—	—	—	—	—	—
Zebra	5.1	8.3	11.5	5.0	57.2	50.8	47.2	54.1
Lion	1.2	.2	.3	1.3	.2	.4	.4	1.9
Leopard	—	.1	—	.1	.4	.2	.1	—
Buffalo	—	—	—	—	.2	—	—	—
Sable	4.6	6.1	17.0	4.7	—	—	—	4.4
Roan	—	—	—	—	60.3	46.7	39.1	34.6
Kudu	4.4	6.0	5.3	3.8	—	—	—	—
Eland .. .. .	.3	1.7	7.8	1.6	108.1	65.0	51.3	103.1
Hartebeeste	1.1	1.1	1.2	1.4	seen	—	—	—
Waterbuck	—	—	.3	—	—	—	—	—
Nyala	—	—	—	—	—	—	—	—
Impala .. .. .	.6	—	—	—	—	—	—	—
Reedbuck	5.3	9.7	.5	2.2	19.6	18.4	12.8	34.8
Bushbuck	2.5	.5	2.2	1.2	6.8	4.9	2.5	4.5
Duiker	1.5	1.2	2.3	1.1	9.4	6.9	5.9	8.5
Klipspringer .. .. .	.5	1.0	.2	.5	.4	—	—	.1
Oribi	—	—	—	—	—	—	—	—
L. Suni	—	.4	—	—	—	—	—	—
S. Steinbuck .. .. .	.1	.4	.1	—	—	—	—	—
Pig	1.7	5.2	.3	3.8	12.4	8.8	6.3	10.4
Warthog	2.1	3.0	—	2.2	5.2	5.7	4.2	3.7
Wild Dog	—	—	—	.7	—	—	—	—
TOTAL PATROL DAYS ..	157	147	109	82	370	375	320	300
TOTAL DAYS NO GAME SEEN ..	50	51	27	36	Nil	Nil	Nil	Nil

APPENDIX III—(Continued)

Type	TABLE IE KOTA KOTA				TABLE IF KASUNGU			
	1st qtr.	2nd qtr.	3rd qtr.	4th qtr.	1st qtr.	2nd qtr.	3rd qtr.	4th qtr.
Elephant	22.3	23.9	21.9	25.2	40.6	41.5	40.0	40.8
Rhinoceros	seen	seen	seen	.7	.7	.9	.7	.8
Hippopotamus	—	—	—	—	seen	—	—	—
Zebra	8.3	8.9	9.3	7.5	8.6	8.3	7.3	7.8
Lion	seen	seen	.4	.1	seen	seen	.2	.2
Leopard	—	—	—	—	seen	—	—	—
Buffalo	19.8	23.9	18.4	20.5	22.3	15.4	11.7	17.9
Sable	3.9	6.0	6.3	5.6	3.9	6.0	6.7	9.4
Roan	3.8	4.8	5.9	4.9	7.6	5.7	6.3	9.6
Kudu	3.5	4.5	4.6	3.9	3.3	2.9	4.2	5.2
Eland	10.5	10.9	9.6	15.3	7.0	8.7	4.9	8.4
Hartebeest	6.4	7.3	7.3	5.1	7.1	6.4	9.2	6.8
Waterbuck	5.9	6.1	5.8	6.2	2.2	2.9	1.6	2.3
Nyala	—	—	—	—	—	—	—	—
Impala	—	—	—	—	—	—	—	—
Reedbuck .. .. .	.1	.1	.4	.6	1.6	1.4	2.5	2.7
Bushbuck	—	—	.1	.2	—	—	.1	.3
Duiker	—	—	—	—	—	—	.2	.2
Klipspringer	—	—	—	—	—	—	—	—
Oribi	—	—	—	—	seen	.3	.9	.8
L. Suni	—	—	—	—	—	—	—	—
S. Steinbuck	—	—	—	—	seen	—	—	—
Pig .. .. .	.3	.3	.3	2.0	1.1	.4	1.3	.6
Warthog	—	—	—	2.5	.71	2.2	2.6	2.2
Wild Dog .. .. .	.2	.3	.2	—	—	—	—	—
Red Duiker	—	—	—	—	—	—	—	—
Jackals	—	—	—	—	—	—	—	—
TOTAL PATROL DAYS ..	740	720	674	605	777	750	644	673
TOTAL DAYS NO GAME SEEN	283	228	200	97	160	146	144	112

APPENDIX III—(Continued)

Type	TABLE IG VWAZA MARSH			
	1st qrt.	2nd qrt.	3rd qrt.	4th qrt.
Elephant	—	—	13.0	27.9
Rhinoceros			—	—
Hippopotamus .. .. .			.9	1.2
Zebra .. .. .			.6	.4
Lion			—	—
Leopard			—	—
Buffalo			4.2	17.6
Sable			2.1	4.9
Roan			30.3	34.1
Kudu			—	—
Eland			60.0	25.6
Hartebeest			12.5	5.5
Waterbuck			—	—
Nyala			—	—
Impala	No Record	No Record	—	—
Reedbuck	No Record	No Record	—	—
Bushbuck			12.0	11.2
Duiker			4.1	2.2
Klipspringer			11.0	7.6
Oribi			—	—
L. Suni			—	—
S. Steinbuck			—	—
Pig			11.0	5.2
Warthog .. .. .			.2	3.5
Wild Dog			3.1	1.3
Red Duiker			—	—
Jackals			—	—
TOTAL PATROL DAYS	—	—	180	258
TOTAL DAYS NO GAME SEEN	—	—	Nil	Nil

APPENDIX III—(Continued)

Table II. Game and Wild Birds Licences Issued during 1961

	No. Issued	Value £
Residents	1,973	1,973
Protectorate Full	130	650
Protectorate Temporary	16	16
Visitors Full	3	30
Visitors Temporary	3	9
Elephant	16	160
Wild Birds Licences	57	28
Licences for sale of Game meat	15	45
		<u>£2,911</u>

APPENDIX IV

Large Scale Fishery under Licence

Table I. Total hauls of each type per annum in S.E. Arm

Type of Net	1957	1958	1959	1960	1961
Ring Net	6,803	9,325	12,412	9,007	5,995
Gill-Net	Presenta- tion Method not com- parable	3,271,760 Yards	3,040,220 Yards	3,792,400 Yards	1,788,000

Table II. Average catch per single haul of ring-net in S.E. Arm
(Numbers represent dozens)

Net	Fish	1957	1958	1959	1960	1961
No. 1 Ring Net	<i>Tilapia</i>	127	59	42	36	59
No. 2 Ring Net	<i>Tilapia</i>	51	55	22	27	45
No. 3 Ring Net	<i>Tilapia</i>	41	38	42	38	43

Table III. Total catches of more important species
(Numbers represent dozens. Weight estimated in short tons)

Year	<i>Tilapia</i>	<i>Tilapia</i> (immature)	<i>Labeo</i> and <i>Clarias</i>			<i>Others</i>	Weight
			<i>Labeo</i>	<i>Clarias</i>	<i>Others</i>		
S.E. Arm							
1957	304,600	—	16,148	6,742	126	3,984	
1958	479,675	—	41,229	10,654	1,226	4,311	
1959	482,730	—	35,207	8,886	659	3,953	
1960	383,519	—	34,012	6,160	283	3,391	
1961	321,252	—	12,062	3,093	31	2,654	
			<i>Bagrus</i> and <i>Clarias</i>				
Year	<i>Tilapia</i>	<i>Tilapia</i> (immature)	<i>Labeo</i>	<i>Clarias</i>	<i>Others</i>	Weight	
S.W. Arm							
1957	3,725	—	22,757	10,135	3,705	421	
1958	4,730	—	10,836	5,568	10,034	297	
1959	12,155	—	2,357	555	2,101	145	
1960	—	—	—	—	—	—	
1961	283	—	9	16	2	29	

APPENDIX IV—(Continued)

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

Type of net	Number	Fees paid
Ring net	5	£50
Gill net	9,000	£90

Table VI. Fish Exports

Month	Weight fresh fish (lb.)	Weight smoked fish (lb.)	Weight salted fish (lb.)
January	45,086	44,797	24,382
February	4,717	15,890	39,143
March	41,350	47,148	34,295
April	35,120	4,818	20,792
May	74,503	24,888	25,882
June	21,148	4,330	25,767
July	35,072	5,752	31,102
August	19,345	19,904	16,690
September	22,617	8,345	22,106
October	34,501	11,730	7,200
November	5,824	24,299	13,840
December	7,844	4,770	5,516
TOTALS	<u>347,127</u>	<u>216,671</u>	<u>266,715</u>
Estimated landed weight	347,127	650,013	533,430
Combined landed weight	765 short tons		

APPENDIX V

Small-Scale Fishery not subject to licensing

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

Station	Large meshed seines		Small meshed seines		Gill-nets		Chilimila	
	1960	1961	1960	1961	1960	1961	1960	1961
Malindi	—	—	749	1,738	686,540	255,554	—	—
Matewera	351	681	142	93	278,251	171,249	—	—
Shire River	1,824	2,808	—	171	31,050	16,847	—	—
Mpemba	—	—	117	338	37,807	143,180	324	673
Monkey Bay	—	4	—	—	46,700	29,300	269	730
Kota Kota	23	—	75	—	275,437	443,904	—	—
Salima	175	215	50	99	399,235	332,410	—	—
Domira Bay	98	32	183	129	188,570	141,080	—	—
Chia Lagoon	10	—	—	4	779,788	939,145	—	—
Lake Chilwa	—	—	—	—	214,403	190,956	—	—
Lake Malombe	108	148	—	—	138,740	112,100	—	—
Mtundu	87	561	11	256	—	198,950	—	—
Nkata Bay	—	—	—	—	102,330	118,860	—	76

Table II. Average catch per single haul at Recording Stations

(Figures represent actual numbers of fish)

A. Large meshed seines

Station	Period	Tilapia (Adult)	Tilapia (immature)	Labeo	Catfish	Haplochromis
Matewera	1960 ..	45.28 ..	— ..	0.18 ..	0.08 ..	—
	1961 ..	57.73 ..	— ..	1.81 ..	0.05 ..	—
Shire River	1960 ..	86.53 ..	— ..	0.71 ..	1.35 ..	—
	1961 ..	142.60 ..	— ..	8.36 ..	0.14 ..	—
Salima	1960 ..	57.51 ..	— ..	12.49 ..	2.59 ..	—
	1961 ..	34.50 ..	— ..	6.07 ..	4.11 ..	—
Domira Bay	1960 ..	97.23 ..	25 ..	50.02 ..	8.54 ..	—
	1961 ..	69.00 ..	4 ..	17.65 ..	9.96 ..	—
Lake Malombe	1960 ..	287.64 ..	— ..	3.02 ..	3.17 ..	—
	1961 ..	892.33 ..	— ..	1.53 ..	2.05 ..	—
Mtundu	1960 ..	250.02 ..	— ..	27.13 ..	4.46 ..	—
	1961 ..	214.96 ..	— ..	1.28 ..	0.19 ..	—

B. Small meshed seines

Malindi	1960 ..	0.25 ..	— ..	0.16 ..	0.59 ..	333
	1961 ..	0.14 ..	75 ..	0.01 ..	0.04 ..	452
Matewera	1960 ..	40.93 ..	— ..	0.04 ..	0.12 ..	9
	1961 ..	84.40 ..	— ..	4.55 ..	0.16 ..	109
Shire River	1960 ..	— ..	— ..	No hauls observed		—
	1961 ..	8.02 ..	— ..	0.09 ..	0.05 ..	1,955
Mpemba	1960 ..	0.50 ..	63 ..	0.008 ..	0.03 ..	497
	1961 ..	0.10 ..	— ..	0.005 ..	0.002 ..	606

APPENDIX V—(Continued)

Station	Period	<i>Tilapia</i> (Adult)	<i>Tilapia</i> (immature)	<i>Labeo</i>	<i>Catfish</i>	<i>Haplo-</i> <i>chromis</i>
Salima	1960	12.22	—	3.68	1.26	480
	1961	5.26	—	1.56	0.74	1,674
Domira Bay	1960	32.81	60	36.66	3.45	860
	1961	54.97	190	60.28	9.56	1,422
Chia Lagoon	1960	14.00	—	—	3.40	—
	1961	124.25	—	31.25	11.00	—
Mtundu	1960	6.45	—	7.63	105.90	225
	1961	—	—	0.66	—	630
<i>C. Chilimila</i>						
Mpemba	1960	0.59	—	0.30	0.22	387
	1961	0.01	—	—	—	3,054
Monkey Bay	1960	—	—	2.60	—	2,292
	1961	—	—	—	—	1,217
Nkata Bay	1960	—	—	No hauls observed		—
	1961	—	—	0.01	—	1,795

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

Station	<i>Tilapia</i> (Adult)	<i>Tilapia</i> (Immature)	<i>Labeo</i>	<i>Catfish</i>	<i>Haplo-</i> <i>chromis</i>
Malindi	14,222	13,050	784	1,738	786,150
Matewere	57,854	—	22,903	1,919	10,200
Shire River	403,056	—	23,512	2,928	334,375
Mpemba	16,075	—	7,439	4,580	2,259,975
Monkey Bay	1,484	—	977	1,349	888,750
Kota Kota	11,934	—	44,218	7,438	—
Salima	8,486	—	24,100	9,058	165,750
Domira Bay	11,982	24,750	36,251	4,406	153,175
Chia Lagoon	136,581	—	27,170	30,946	—
Lake Chilwa	23,812	—	—	2,864	—
Lake Malombe	153,942	—	1,496	3,797	—
Mtundu	183,369	—	968	1,456	161,505
Nkata Bay	9	—	41	2,655	136,415

APPENDIX VI

Trout Fishing

<i>Stream</i>					<i>Mlunguzi</i>		<i>Mlanje stream</i>
No. rod days	..	..	..	..	87	..	9
No. fish killed	..	..	..	..	45	..	38
Average size	..	..	..	..	11"	..	8½"
No. fish at 8"	..	..	..	..	1	..	16
8½"	..	..	..	..	—	..	4
9"	..	..	..	..	10	..	6
9½"	..	..	..	..	6	..	1
10"	..	..	..	..	19	..	—
10½"	..	..	..	..	1	..	—
11"	..	..	..	..	5	..	—
11½"	..	..	..	..	—	..	—
12"	..	..	..	..	1	..	2
12½"	..	..	..	..	1	..	—
13"	..	..	..	..	—	..	—
13½"	..	..	..	..	—	..	—
14"	..	..	..	..	—	..	—
14½"	..	..	..	..	—	..	—
15"	..	..	..	..	1	..	—
15½"	..	..	..	..	—	..	—
16"	..	..	..	..	—	..	1
No. fish returned undersized	..	..	..	..	190	..	42
No. licences	..	..	..	..	59	..	6

APPENDIX VII

Summary of Traffic and Flies (*G. morsitans*) caught at Decontamination Posts, 1961

Post	Position	Number of Motor Vehicles	Flies caught	Number of Cycles	Flies caught	Number of Pedestrians	Flies caught	Total flies
Kota Kota	Outskirts Kota Kota Township (N) ..	6,259	128	16,906	5	30,535	2	135
Chota	Outskirts Kota Kota Township (S) ..	—	—	26,598	11	42,110	12	23
Mbobo	Approach to C.P. Highlands, Ko'a Kota road ..	3,001	223	1,414	17	3,101	25	265
Fort Johnston	East of Ferry crossing, Fort Johnston Township ..	6,586	2	78,875	33	231,534	12	47
Kasupe	Approach to Zomba highlands, Zomba/Liwonde road ..	20,375	0	33,647	4	36,293	2	6
Fungo	Approach to Malomo area, Kota Kota road ..	656	23	691	38	707	1	62

Long Term Records from Deflying Posts

Post	Total flies (<i>G. morsitans</i>)										
	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Kota Kota	113	47	34	16	28	105	181	136	113	194	135
Chota	34	12	16	12	7	5	10	13	12	10	23
Mbobo	179	26	45	24	50	205	266	164	203	358	265
Fort Johnston	14,521	7,557	11,750	9,591	2,652	1,589	3,736	3,849	1,787	812	47
Kasupe	207	84	88	96	46	63	104	22	26	18	6
Fungo	—	—	—	—	—	—	—	29	34	91	62