Analysis of the Catch and Effort Data for the Fisheries of Domira Bay 1976 - 1989

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CATCH AND EFFORT DATA FOR THE FISHERIES OF DOMIRA BAY: LAKE MALAWI, 1977-1989

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TRADITIONAL FISHERIES ASSESSMENT PROJECT (MG/ODA)
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PREFACE

This Fisheries Bulletin is one of a series of working papers on the fisheries of Lake Malawi and associated waters produced by the ODA-funded Traditional Fisheries Assessment Project in 1991. They have since been edited after external refereeing but no changes have been made to the findings and recommendations made at that time. These papers include all available data on the fisheries up to 1989 tabulated on an annual basis, and also numerous graphs of the data for various fishing gears to allow Fisheries Officers in the different areas to easily visualise the trends which have occurred in the fisheries in their areas.

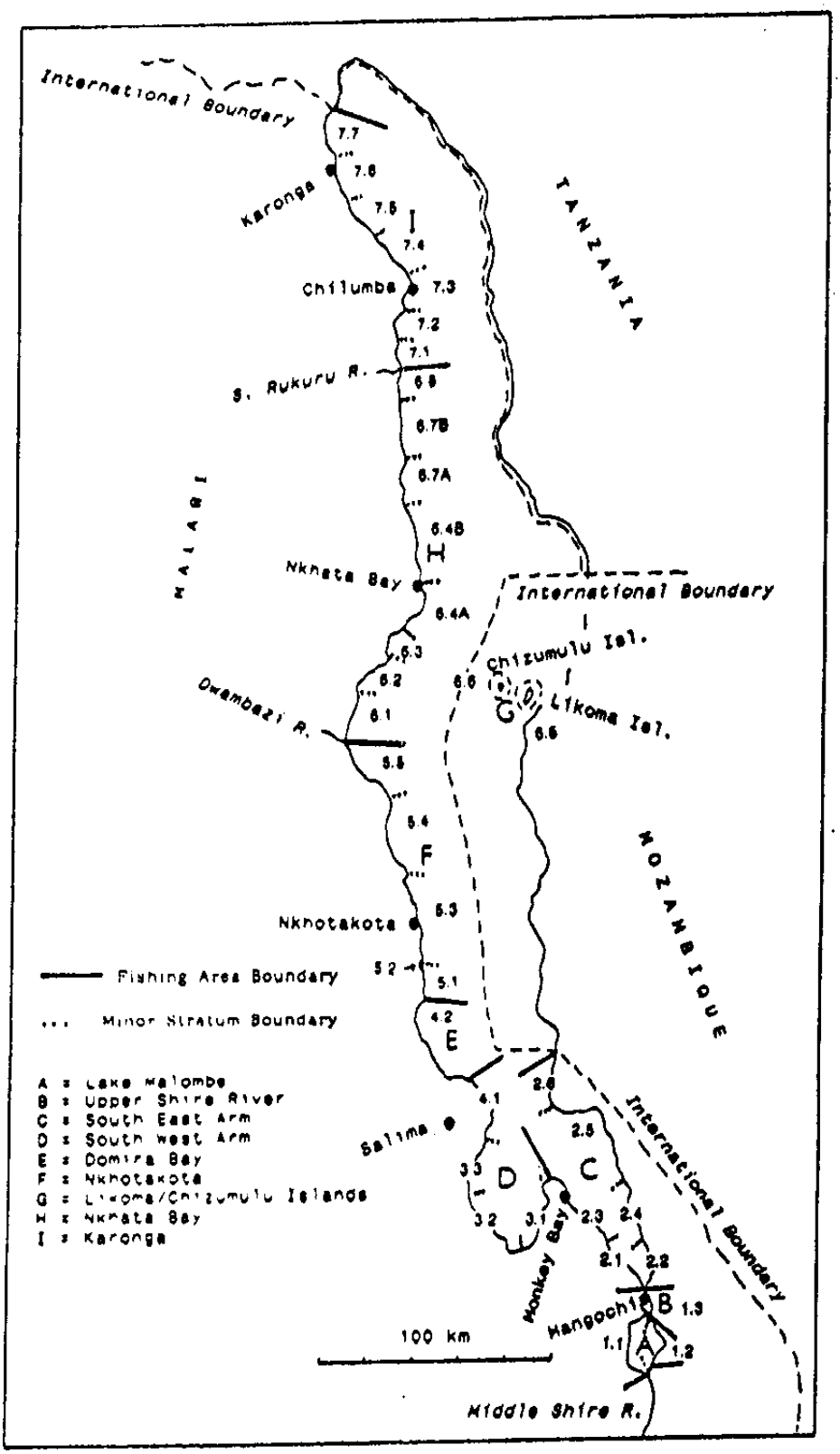

Figure 1. Lakes Malawi, Malombe and the Upper Shire River, showing areas into which the areas have been divided for data analysis

INTRODUCTION

Domira Bay is about 40km wide and faces north east. Most of the shoreline is reedy, backed by extensive marshes and lagoons with a large hippo population. In the middle of the bay, the rocky outcrop of Mbenji Island is the focus of an important chirimila fishery. The bay has a wide shelf of relatively shallow water, with the 50m contour about 10km offshore and the 100m contour 20km out.

METHODS OF DATA COLLECTION

Statistical data on the traditional fisheries are collected and analysed using methods developed by Bazigos (1972) and implemented by Walker (1974; 1976). A description of the methods of collecting data and the associated problems has been presented elsewhere (Alimoso, 1988). Total catch and fishing effort for each area are estimated by combining data obtained in monthly catch assessment surveys (CAS) and in annual frame surveys. The data are presented here by gear and by species group.

DATA ANALYSIS

869 fishermen were recorded fishing in Domira Bay in the 1989 annual frame survey, using 154 canoes and 38 boats, of which 10 had outboard engines. Figure 2 shows the trend in numbers of fishing craft in recent years. The analysis of data in this report covers the period from 1977 to 1989. The 1976 data are missing.

Estimated catches over the 13 year period ranged from 584 to 3,585 tonnes (Fig. 3) with a mean of 1,976 tonnes. Several species groups contributed significantly to the catches, the main species being Utaka (*Copadichromis* spp.) (mean 50% over the 13 years), Kampango (*Bagrus meridionalis*) (17%), Chambo (*Oreochromis* spp.) (9%) and Mlamba (clariid catfishes) (8%) (Fig. 4).

ANALYSIS BY GEAR

Most of the catch came from chirimila nets (52% overall), gillnets (35%) and Kambuzi seines (10%). Longlines contributed 2% (Fig. 5). The only other gears ever recorded were mosquito nets in 1981 and 1988.

Gillnets

The number of gillnets owned by fishermen of Domira Bay ranged from 61 in 1983 to 416 in 1988 according to the results of annual frame surveys (Figure 6). The annual totals are very erratic and clearly unreliable.

Over the 13 year period, Kampango was the main species caught in gillnets (42% of the total catch). Chambo (21%) and Mlamba (20%) were also important (Fig. 7). Figures 8 to 10 show the trends in the gillnet fishery. The data are very difficult to interpret with, apparently, a decline in annual effort until 1987 and then a big increase to 1989 (Fig. 9). There is no correlation between effort and recorded number of gillnets in the fishery. Catch (Fig. 8) and catch per unit effort (cpue) (Fig. 10) showed a sharp increase in the late 1970s and then declined in the mid-1980s. Cpue increased from 4 kg/set in 1977 to a peak of 23 kg/set in 1982 and then declined to a low of 2kg/set by 1989. There are no obvious reasons for these apparent fluctuations. It is possible that there was a trend towards "driving", i.e. frightening the fish into the net at night by beating the water, as used in Lake Malombe (Tweddle *et al.*, 1991a), and that this led to the increase in cpue. A subsequent decline either in the use of the technique or in fish stocks as a result of the increased efficiency of the gear may then have caused the fall in cpue. However, this is speculation and we have no evidence to support or disprove this hypothesis at present. No stock assessment can be attempted on the basis of these data.

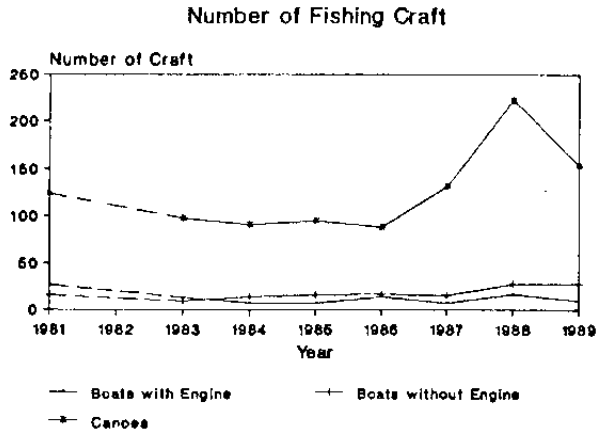

Figure 2

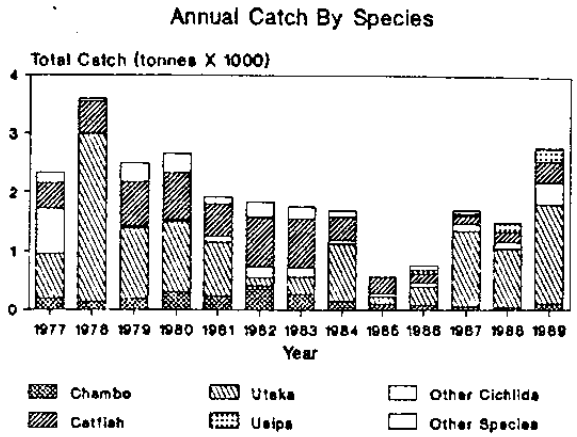

Figure 3

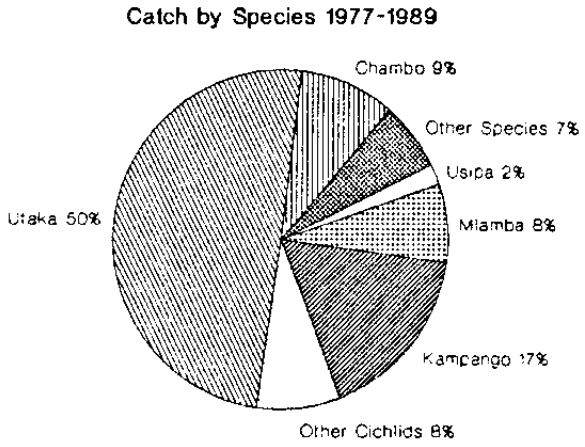

Figure 4

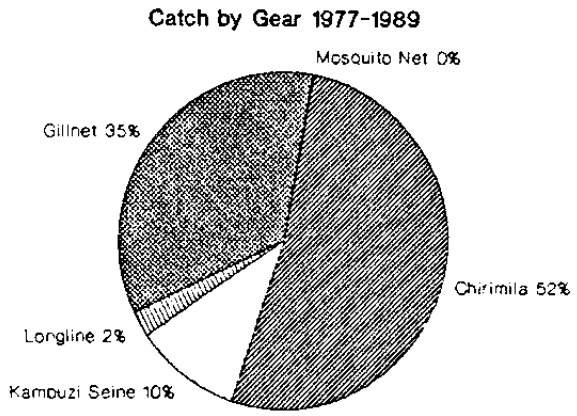

Figure 5

Figure 2. Changes in the number of fishing craft owned by Domira Bay fishermen, based on annual frame surveys.

Figure 3. Annual catches in Domira Bay.

Figure 4. Contribution of the different species groups to the total catch over the 13 year period 1977-1989.

Figure 5. Contribution of the different fishing gears to the total catch over the 13 year period 1977-1989.

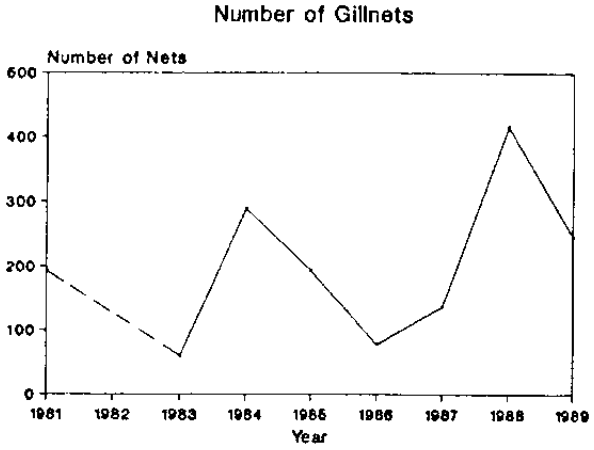

Figure 6

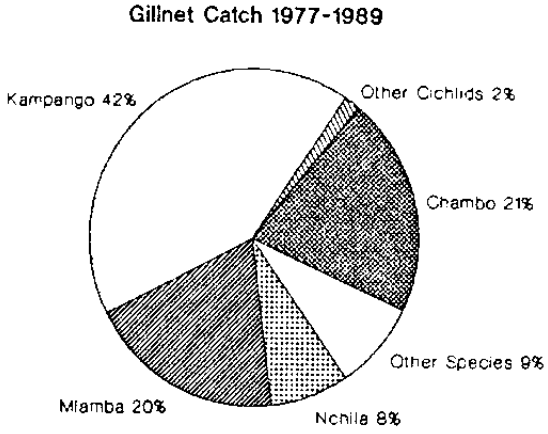

Figure 7

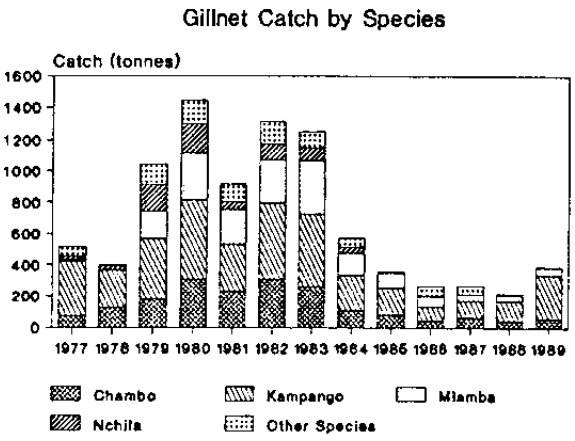

Figure 8

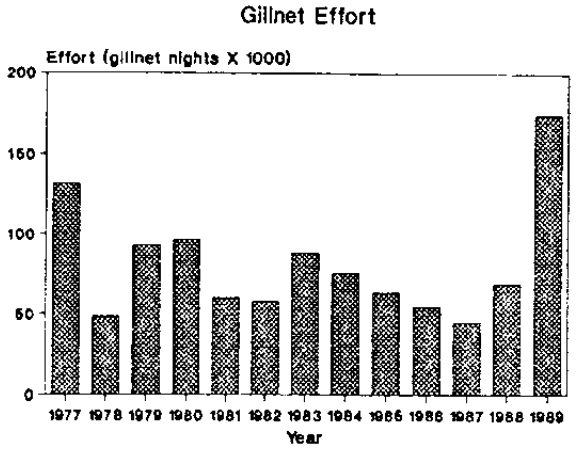

Figure 9

Figure 6. Changes in the number of gillnets owned by Domira Bay fishermen, based on annual frame surveys.

Figure 7. Contribution of the different species groups to the Domira Bay gillnet catches over the 13 year period 1977-1989.

Figure 8. Annual catches made by gillnets by species groups.

Figure 9. Annual effort for gillnets (1gillnet night = 1 x 100yd (91m) stretched length gillnet set for 1night).

Figure 10. Changes in cpue in gillnets from year to year.

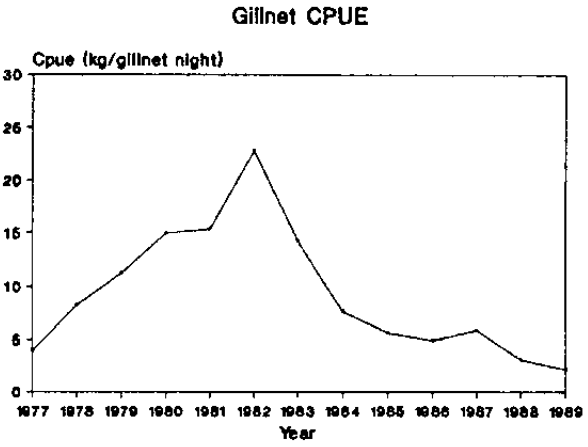

Figure 10

Chirimila net

Numbers of chirimila nets owned by South West Arm fishermen fluctuated between 16 and 90 according to annual frame surveys (Fig. 11). The number shows a more than fivefold increase since 1983. Figures 12 to 14 show the catch and effort data for chirimila nets. Catches in this gear fluctuated erratically from year to year. 95% of recorded catches were Utaka (Fig. 12). Cpue increased from 1977 to 1981, declined sharply to the 1977 level, recovered in 1986 and 1987 and then declined again. Effort in 1989 was abnormally high, though a steady increase in effort is to be expected as a result of the increased number of nets owned.

Kambuzi seine

The number of Kambuzi seines in the fishery fluctuated between 5 and 14 nets according to the annual frame surveys (Fig. 15).

Figures 16 to 18 show the catch and effort data for Kambuzi seines. The data (Fig. 17) show wild fluctuations. The low effort in the late 1970s and gradual improvement until 1984 may reflect the loss of suitable seining beaches with the high lake level followed by re-establishment of the beaches as the lake level fell. However, this does not explain the abnormally high effort of 1977, nor the erratic data since 1984 and in particular the high 1989 effort. Data on number of nets owned are not available before 1981, but the numbers recorded in the 1980s show that the recorded effort figures in 1977 and 1989 were impossibly high. The selection of recorded beaches on an annual basis can lead to anomalies when gear numbers vary greatly from beach to beach, and the selection of important seining beaches in 1977 and 1989 may have led to extreme bias.

Kambuzi (small demersal haplochromines) were the main target species group, but some Chambo were also caught in 1977 and 1982.

Longline

Reported ownership of this gear fluctuated wildly from year to year and is certainly inaccurate (Fig. 19). 83% of the recorded catch was Kampango, 12% Mlamba and 6% other species. As Mlamba dominate in longline catches in all other areas of the lake (Tweddle *et al.*, 1991b; 1991c; 1991d; 1991e; 1991f; 1991g), this catch ratio raises serious questions about the accuracy of the data. The catch data for this gear show wild fluctuations (Appendix 1).

ANALYSIS BY SPECIES

Utaka

Utaka were by far the most important species in the Domira Bay catches, comprising 50% of the overall catch (Fig. 4). Chirimila nets caught over 99% of the total Utaka catch, and Utaka comprised 95% of the overall chirimila catch. A separate analysis for Utaka alone is therefore unnecessary.

Chambo

Chambo comprised 9% of the total catch from Domira Bay (Fig. 4). Gillnets were the main gear used in the fishery for Chambo. For this reason and because gillnets are a passive gear and hence the cpue might be expected to give a reasonably accurate figure of relative abundance, effort for Chambo was standardised in gillnet equivalents, using the formula:

$$\text{Total Effort} = \frac{\text{Total Catch}}{\text{Gillnet Catch}} \times \text{Gillnet Effort}$$

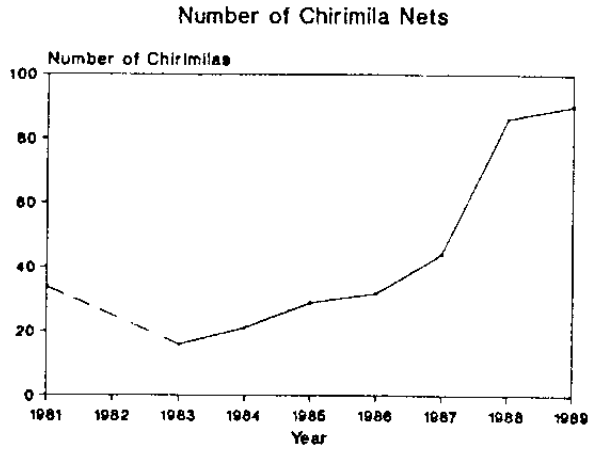

Figure 11

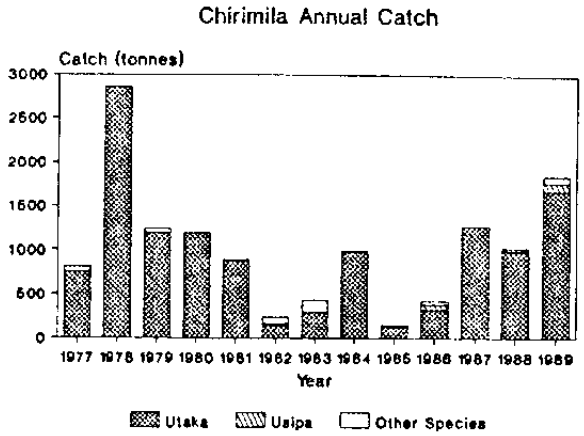

Figure 12

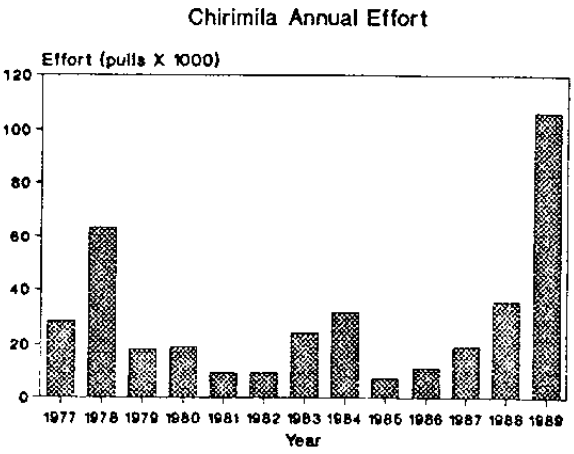

Figure 13

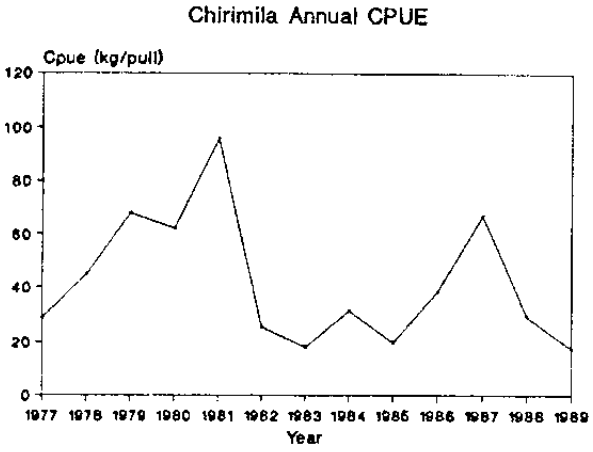

Figure 14

Figure 11. Changes in the number of chirimila nets owned by Domira Bay fishermen, based on annual frame surveys.

Figure 12. Annual catches by species group of chirimila nets.

Figure 13. Annual effort for chirimila nets, expressed in numbers of pulls.

Figure 14. Changes in cpue from year to year in chirimila nets.

Number of Kambuzi Seines

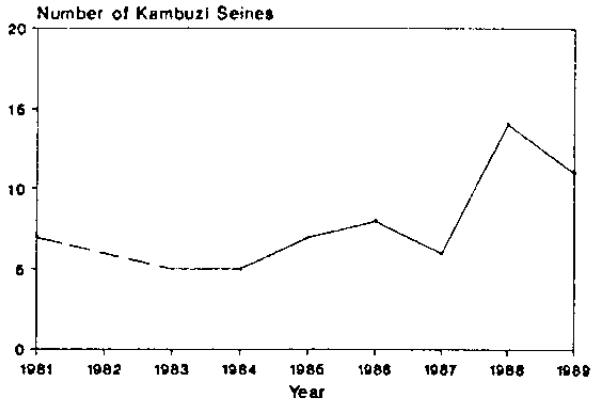

Figure 15

Kambuzi Seine Annual Catch

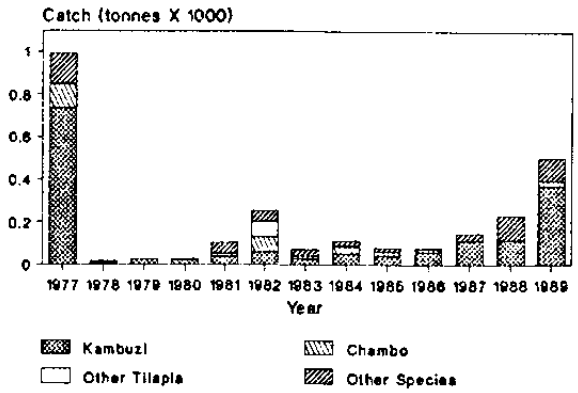

Figure 16

Kambuzi Seine Annual Effort

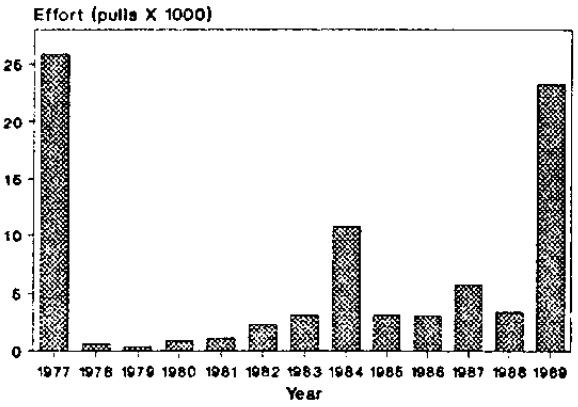

Figure 17

Kambuzi Seine Annual CPUE

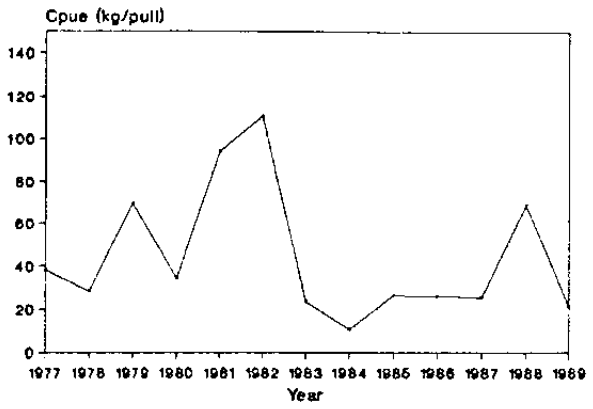

Figure 18

Figure 15. Changes in the number of Kambuzi seines owned by Domira Bay fishermen, based on annual frame surveys.

Figure 16. Annual catches for Kambuzi seines, showing the contributions of the different species groups.

Figure 17. Annual effort for Kambuzi seines, expressed in number of pulls.

Figure 18. Changes in cpue in Kambuzi seines from year to year.

Figure 19. Changes in the number of longlines owned by Domira Bay fishermen, based on annual frame surveys.

Number of Longlines

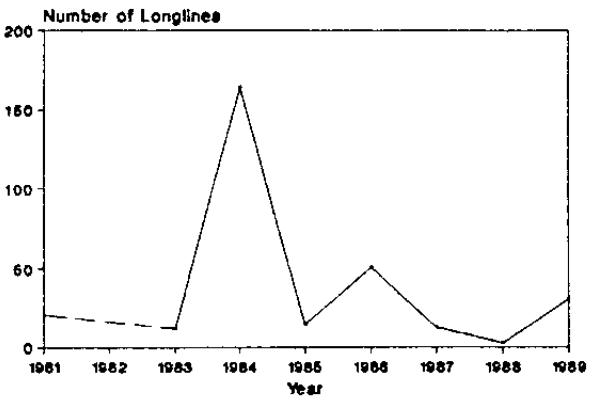

Figure 19

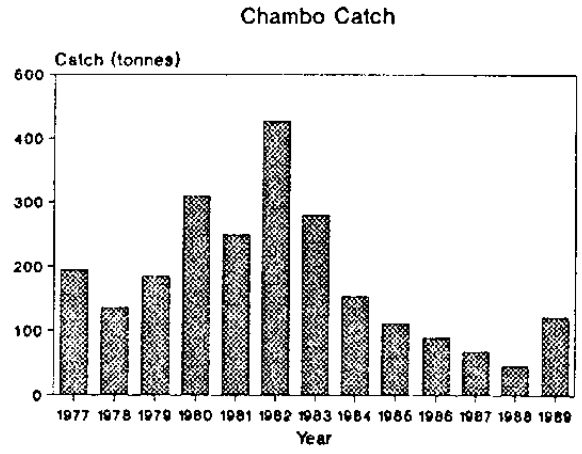

Figure 20

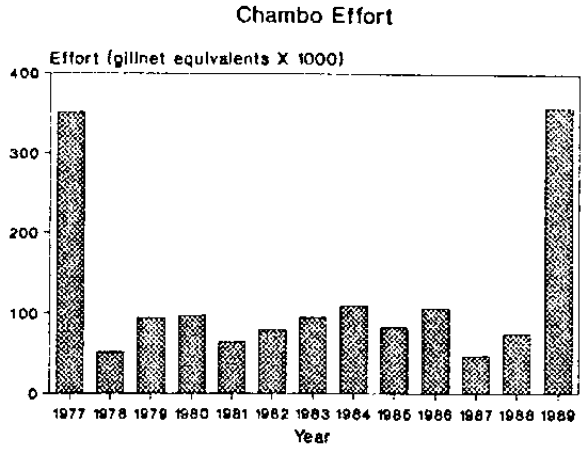

Figure 21

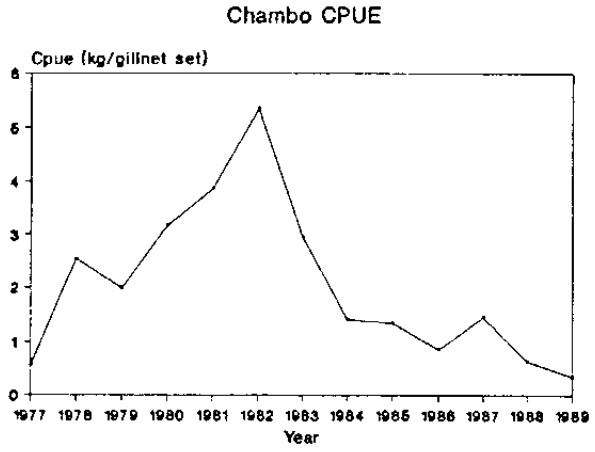

Figure 22

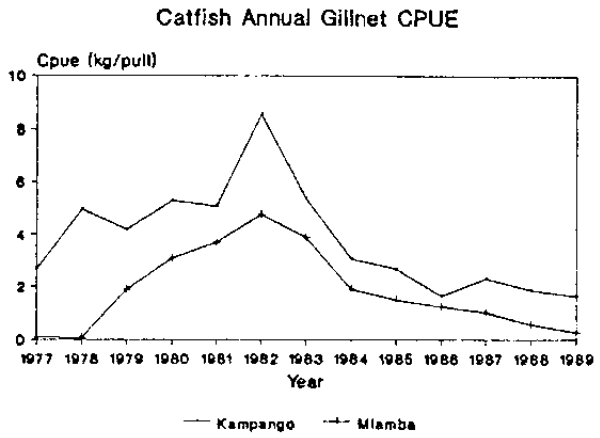

Figure 23

Figure 20. Annual catches of Chambo in all gears in Domira Bay.

Figure 21. Annual effort expended to catch Chambo in Domira Bay, expressed in gillnet night equivalents. For explanation see text.

Figure 22. Changes in cpue for Chambo in gillnets from year to year.

Figure 23. Changes in cpue for the two catfish groups, Kampango and Mlamba, in gillnets in Domira Bay from year to year.

Figure 24. Annual catches of the two catfish groups in all gears in Domira Bay.

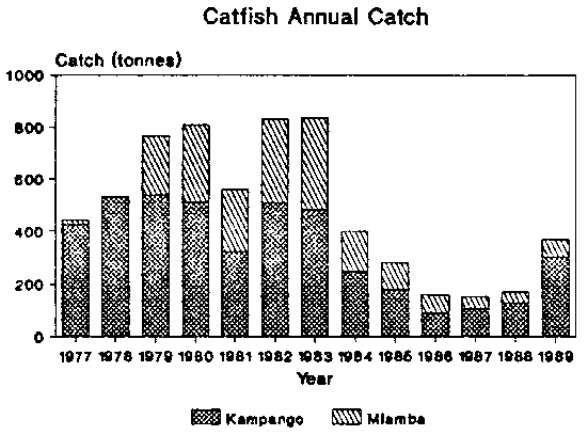

Figure 24

The estimated annual catch ranged from 47 to 426 tonnes (Fig. 20). The effort appeared to be fairly stable with the exception of 1977 and 1989. In 1977, high catches recorded in the Kambuzi seine fishery combined with low gillnet cpue resulted in an artificially inflated and inaccurate apparent effort (Fig. 21). This estimate should be ignored. The 1989 high recorded effort was a result of the very high recorded gillnet effort in that year. The data must be viewed with caution.

In Domira Bay, high cpue was recorded for Chambo from 1980 to 1983 (Fig. 22). In other areas of Lakes Malawi and Malombe, high cpue was recorded in the mid-1980s (Tweddle *et al.*, 1991a; 1991b; 1991c). In Domira Bay the high cpue was associated with identical patterns in other gillnet-caught species such as the catfishes (Fig. 23), hence the apparent rise in Chambo cpue is considered here to be a result of flaws in the recording system or changes in fishing techniques, and is not considered to be correlated with the high Chambo catches of the mid-1980s in other areas of the lake.

Catfish

Figure 24 shows the annual catches of the two catfish groups, Kampango and Mlamba, in all gears. The apparent high catches in the early 1980s have already been discussed under gillnets. The data suggest a decline in catfish catches as a whole but, given the large fluctuations in the data as discussed above, the apparent decline should be treated with suspicion.

DISCUSSION

The Domira Bay fishery is dominated by the use of chirimila nets for Utaka. The data on craft and chirimila ownership suggest this fishery is still expanding, though no trends in catch data are apparent yet. The area around Mbenji Island in particular is an important fishing ground. Fishermen from Likoma Island make a major contribution to the catches, as several chirimila fishermen move to Mbenji for six months in the year. In a survey of the entire Likoma coastline in June 1987, about 50 fishermen with 13 chirimila nets were reported to be at Mbenji. This annual migration leads to bias in the estimates for both areas as raising factors are based on the amount of craft recorded in annual frame surveys. A mass movement of fishermen after a frame survey results in subsequent overestimates in catch for the vacated area and underestimates for the area the fishing craft moved to.

No major policy recommendations for fisheries management are justified on the basis of the data presented in this report. Figure 3 gives an impression of a steady decline in overall catches until 1985 and subsequent recovery, but the gear and species breakdowns show that the apparent decline to 1985 was almost certainly an artefact. In particular, the high recorded catch of 1977 was a result of unacceptably high effort estimates in the Kambuzi seine fishery, while the 1978 high was a result of very high estimates for the chirimila fishery. The low 1985 and 1986 estimates were a result of low recorded effort in the Kambuzi seine and chirimila fisheries. Without these aberrant data, the fisheries appeared to be relatively stable with catch rates equivalent to those when recording started. However, since 1985 there is evidence of increasing effort in all gears, particularly chirimilas. This may be correlated with increased ownership of the gears. However, the sudden very high effort in the three important gears in 1989 must be viewed with suspicion.

There are major doubts about the accuracy of the data, particularly the absence of any of the smaller gears from the records, such as handlines and fishtraps, both of which are common in the area and recorded in the annual frame surveys. The almost total absence of Usipa from recorded catches before 1986 also gives cause for concern, as does the aberrant Kampango/Mlamba longline catch ratio. There can be little doubt that a large percentage of fishing effort in Domira Bay is going completely unrecorded and that actual catches may be higher than those reported here.

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APPENDIX I

DOMIRA BAY, LAKE MALAWI

ANNUAL CATCH AND EFFORT DATA SUMMARIES

1976-1989

NOTES ON MONTHLY AND ANNUAL DATA SUMMARIES

The data in this report are presented by species group and by gear. The species groups listed by column are as follows:-

chambo	=	*Oreochromis* spp., excluding *O. shiranus.*
other tilapia	=	*O. shiranus* and *Tilapia rendalli.*
kambuzi	=	inshore cichlid (haplochromine) species.
utaka	=	*Copadichromis* spp.
chisawasawa	=	offshore, demersal haplochromines.
kampango	=	*Bagrus meridionalis* Günther.
mlamba	=	clariid catfishes.
usipa	=	*Engraulicypris sardella* Günther.
nchila	=	*Labeo mesops* Günther.
others	=	species not included in above categories, including mormyrids and some cyprinid species.

The gears are listed by row, with catch, effort and catch per unit effort (cpue) shown for each gear.

Catch is expressed in metric tonnes in all cases.

Effort is expressed as follows:-

gillnets	:	number of sets of 91 m (stretched length) net.
longlines	:	number of sets of 100 hooks.
chambo seines	:	number of hauls.
kambuzi seines	:	number of hauls.
chirimila nets	:	number of hauls.
mosquito nets	:	number of hauls.
fish traps	:	number of traps set.
handlines	:	number of hauls.
cast nets	:	number of hauls.
scoop nets	:	number of hauls.
nkacha nets	:	number of hauls.

Cpue is expressed in catch (in kg) per unit of effort as defined above.

ADJUSTMENTS FOR MISSING DATA

Where data are not available, either because of sickness of the recorder or because data have been lost over the years, estimates have been made based on catch rates in the area in question before and after the month for which the data are missing. Estimates are based on the mean effort and cpue for each species group and gear category for the month preceding and the month following the data gap. Total catches in the month are then estimated by multiplying mean cpue by mean effort.

Data estimated by taking means of other months are as follows:

1977 August and September.

1978 January, August and October.

1983 August.

ANNUAL SUMMARY FOR THE YEAR 1977

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTA
gill net	catch	73.41	0.00	0.00	0.00	0.00	349.40	12.28	0.00	20.00	65.36	520.4
	effort	131112	131112	131112	131112	131112	131112	131112	131112	131112	131112	1311
	cpue	0.56	0.00	0.00	0.00	0.00	2.66	0.09	0.00	0.15	0.50	3.9
long line	catch	0.00	0.00	0.00	0.00	0.00	14.49	0.00	0.00	0.00	0.00	14.4
	effort	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	199
	cpue	0.00	0.00	0.00	0.00	0.00	7.25	0.00	0.00	0.00	0.00	7.2
kambuzi seine	catch	108.89	0.00	738.25	0.00	0.00	47.93	4.23	3.88	9.83	76.90	989.9
	effort	25832	25832	25832	25832	25832	25832	25832	25832	25832	25832	2583
	cpue	4.22	0.00	28.58	0.00	0.00	1.86	0.16	0.15	0.38	2.98	38.3
chiri' mila	catch	12.51	0.00	18.97	761.19	0.99	13.81	0.00	0.00	1.62	1.21	810.3
	effort	28373	28373	28373	28373	28373	28373	28373	28373	28373	28373	2837
	cpue	0.44	0.00	0.67	26.83	0.03	0.49	0.00	0.00	0.06	0.04	28.5
	TOTAL CATCH	194.81	0.00	757.22	761.19	0.99	425.63	16.51	3.88	31.45	143.47	2335.1

ANNUAL SUMMARY FOR THE YEAR 1978

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTAL
gill net	catch	122.73	0.00	0.00	0.00	0.00	239.70	3.64	0.00	24.30	8.71	399.0
	effort	48356	48356	48356	48356	48356	48356	48356	48356	48356	48356	4835
	cpue	2.54	0.00	0.00	0.00	0.00	4.96	0.08	0.00	0.50	0.18	8.2
long line	catch	0.00	0.00	0.00	0.00	0.00	303.52	0.00	0.00	0.00	4.32	307.8
	effort	11171	11171	11171	11171	11171	11171	11171	11171	11171	11171	1117
	cpue	0.00	0.00	0.00	0.00	0.00	27.17	0.00	0.00	0.00	0.39	27.5
kambuzi seine	catch	7.82	0.00	10.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.1
	effort	638	638	638	638	638	638	638	638	638	638	63
	cpue	12.26	0.00	16.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.5
chiri' mila	catch	4.29	0.00	0.00	2851.39	0.50	0.00	0.00	0.00	0.00	3.62	2859.8
	effort	63623	63623	63623	63623	63623	63623	63623	63623	63623	63623	6362
	cpue	0.07	0.00	0.00	44.82	0.01	0.00	0.00	0.00	0.00	0.06	44.9
	TOTAL CATCH	134.84	0.00	10.36	2851.39	0.50	543.22	3.64	0.00	24.30	16.65	3584.9

ANNUAL SUMMARY FOR THE YEAR 1979

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTAL
gill net	catch	184.48	0.88	0.00	16.10	0.00	388.00	173.64	0.00	169.16	114.78	1047.04
	effort	92932	92932	92932	92932	92932	92932	92932	92932	92932	92932	92932
	cpue	1.99	0.01	0.00	0.17	0.00	4.18	1.87	0.00	1.82	1.24	11.27
long line	catch	0.00	0.00	0.00	0.00	0.00	151.30	2.25	0.00	0.00	32.47	186.02
	effort	9072	9072	9072	9072	9072	9072	9072	9072	9072	9072	9072
	cpue	0.00	0.00	0.00	0.00	0.00	16.68	0.25	0.00	0.00	3.58	20.50
kambuzi seine	catch	0.30	0.00	27.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.80
	effort	400	400	400	400	400	400	400	400	400	400	400
	cpue	0.75	0.00	68.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	69.50
chiri' mila	catch	0.00	0.00	0.00	1185.15	0.00	0.00	52.27	0.00	0.00	0.00	1237.42
	effort	18199	18199	18199	18199	18199	18199	18199	18199	18199	18199	18199
	cpue	0.00	0.00	0.00	65.12	0.00	0.00	2.87	0.00	0.00	0.00	67.99
	TOTAL CATCH	184.78	0.88	27.50	1201.25	0.00	539.30	228.16	0.00	169.16	147.25	2498.28

ANNUAL SUMMARY FOR THE YEAR 1980

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTAL
gill net	catch	305.77	6.11	0.00	0.00	0.00	510.65	296.93	0.00	186.54	138.40	1444.4
	effort	96430	96430	96430	96430	96430	96430	96430	96430	96430	96430	9643
	cpue	3.17	0.06	0.00	0.00	0.00	5.30	3.08	0.00	1.93	1.44	14.9
kambuzi seine	catch	3.05	0.00	25.49	0.00	0.00	1.04	0.41	0.00	1.20	1.12	32.3
	effort	943	943	943	943	943	943	943	943	943	943	94
	cpue	3.23	0.00	27.03	0.00	0.00	1.10	0.43	0.00	1.27	1.19	34.2
chiri' mila	catch	0.00	0.00	0.00	1188.11	0.00	0.00	0.00	0.00	0.00	0.06	1188.1
	effort	19101	19101	19101	19101	19101	19101	19101	19101	19101	19101	1910
	cpue	0.00	0.00	0.00	62.20	0.00	0.00	0.00	0.00	0.00	0.00	62.2
	TOTAL CATCH	308.82	6.11	25.49	1188.11	0.00	511.69	297.34	0.00	187.74	139.58	2664.8

ANNUAL SUMMARY FOR THE YEAR 1981

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTAL
gill net	catch	231.10	59.15	0.00	0.00	0.00	303.26	220.65	0.00	52.12	52.35	918.6
	effort	59930	59930	59930	59930	59930	59930	59930	59930	59930	59930	5993
	cpue	3.86	0.99	0.00	0.00	0.00	5.06	3.68	0.00	0.87	0.87	15.3
long line	catch	0.00	0.00	0.00	0.00	0.00	0.69	4.87	0.00	0.00	0.00	5.5
	effort	506	506	506	506	506	506	506	506	506	506	50
	cpue	0.00	0.00	0.00	0.00	0.00	1.36	9.62	0.00	0.00	0.00	10.9
kambuzi seine	catch	12.76	1.92	38.80	16.56	0.00	15.96	9.53	0.00	3.72	6.05	105.3
	effort	1121	1121	1121	1121	1121	1121	1121	1121	1121	1121	112
	cpue	11.38	1.71	34.61	14.77	0.00	14.24	8.50	0.00	3.32	5.40	93.9
chiri' mila	catch	3.79	0.47	0.00	883.17	0.00	1.53	3.40	0.00	0.00	1.14	893.5
	effort	9310	9310	9310	9310	9310	9310	9310	9310	9310	9310	931
	cpue	0.41	0.05	0.00	94.86	0.00	0.16	0.37	0.00	0.00	0.12	95.9
m'quito net	catch	0.40	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.00	0.00	0.8
	effort	158	158	158	158	158	158	158	158	158	158	15
	cpue	2.53	0.00	0.00	0.00	0.00	0.00	2.97	0.00	0.00	0.00	5.5
	TOTAL CATCH	248.05	61.54	38.80	899.73	0.00	321.44	238.92	0.00	55.84	59.54	1923.8

ANNUAL SUMMARY FOR THE YEAR 1982

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTAL
gill net	catch	307.26	44.70	0.00	0.00	0.00	490.76	271.74	0.00	102.04	94.73	1311.2
	effort	57365	57365	57365	57365	57365	57365	57365	57365	57365	57365	5736
	cpue	5.36	0.78	0.00	0.00	0.00	8.56	4.74	0.00	1.78	1.65	22.8
long line	catch	0.00	0.00	0.00	0.00	0.00	2.03	32.96	0.00	0.00	0.00	34.9
	effort	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	190
	cpue	0.00	0.00	0.00	0.00	0.00	1.07	17.29	0.00	0.00	0.00	18.3
kambuzi seine	catch	73.75	69.94	60.26	0.00	0.00	17.07	17.78	0.00	8.24	9.90	256.9
	effort	2321	2321	2321	2321	2321	2321	2321	2321	2321	2321	232
	cpue	31.78	30.13	25.96	0.00	0.00	7.35	7.66	0.00	3.55	4.27	110.7
chiri' mila	catch	44.97	2.33	0.22	139.13	0.00	0.27	0.00	24.90	0.00	25.38	237.2
	effort	9336	9336	9336	9336	9336	9336	9336	9336	9336	9336	933
	cpue	4.82	0.25	0.02	14.90	0.00	0.03	0.00	2.67	0.00	2.72	25.4
	TOTAL CATCH	425.98	116.97	60.48	139.13	0.00	510.13	322.48	24.90	110.28	130.01	1840.3

ANNUAL SUMMARY FOR THE YEAR 1983

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTA
gill net	catch	258.80	0.00	1.59	0.00	0.00	469.55	338.95	0.00	82.48	101.01	1252.
	effort	87520	87520	87520	87520	87520	87520	87520	87520	87520	87520	875
	cpue	2.96	0.00	0.02	0.00	0.00	5.37	3.87	0.00	0.94	1.15	14.
kambuzi seine	catch	13.17	0.00	30.74	0.00	0.00	9.26	13.40	0.00	1.19	5.60	73.
	effort	3108	3108	3108	3108	3108	3108	3108	3108	3108	3108	31
	cpue	4.24	0.00	9.89	0.00	0.00	2.98	4.31	0.00	0.38	1.80	23.
chiri' mila	catch	8.28	0.00	124.32	293.24	0.00	3.00	1.75	0.00	0.00	7.50	438.
	effort	24248	24248	24248	24248	24248	24248	24248	24248	24248	24248	242
	cpue	0.34	0.00	5.13	12.09	0.00	0.12	0.07	0.00	0.00	0.31	18.
	TOTAL CATCH	280.25	0.00	156.65	293.24	0.00	481.81	354.10	0.00	83.67	114.11	1763.

ANNUAL SUMMARY FOR THE YEAR 1984

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTAL
gill net	catch	106.01	3.69	0.00	0.00	0.00	228.95	140.69	0.00	41.84	53.79	574.9
	effort	75165	75165	75165	75165	75165	75165	75165	75165	75165	75165	7516
	cpue	1.41	0.05	0.00	0.00	0.00	3.05	1.87	0.00	0.56	0.72	7.6
long line	catch	0.00	0.00	0.00	0.00	0.00	8.80	5.30	0.00	0.00	0.00	14.1
	effort	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	300
	cpue	0.00	0.00	0.00	0.00	0.00	2.93	1.77	0.00	0.00	0.00	4.7
kambuzi seine	catch	30.85	3.56	56.18	0.00	0.00	9.62	8.66	0.00	2.80	3.23	114.9
	effort	10786	10786	10786	10786	10786	10786	10786	10786	10786	10786	1078
	cpue	2.86	0.33	5.21	0.00	0.00	0.89	0.80	0.00	0.26	0.30	10.6
chiri' mila	catch	17.57	0.00	0.00	977.59	0.00	0.00	0.00	0.00	0.00	0.33	995.4
	effort	31704	31704	31704	31704	31704	31704	31704	31704	31704	31704	3170
	cpue	0.55	0.00	0.00	30.83	0.00	0.00	0.00	0.00	0.00	0.01	31.4
	TOTAL CATCH	154.43	7.25	56.18	977.59	0.00	247.37	154.65	0.00	44.64	57.35	1699.4

ANNUAL SUMMARY FOR THE YEAR 1985

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTAL
gill net	catch	85.47	0.50	0.00	0.00	0.00	167.75	93.12	0.00	2.69	5.60	355.1
	effort	63171	63171	63171	63171	63171	63171	63171	63171	63171	63171	6317
	cpue	1.35	0.01	0.00	0.00	0.00	2.66	1.47	0.00	0.04	0.09	5.6
long line	catch	0.00	0.00	0.00	0.00	0.00	0.84	1.53	0.00	0.00	0.00	2.3
	effort	658	658	658	658	658	658	658	658	658	658	65
	cpue	0.00	0.00	0.00	0.00	0.00	1.28	2.33	0.00	0.00	0.00	3.6
kambuzi seine	catch	17.05	0.00	47.32	0.00	0.00	10.12	8.73	0.00	0.00	0.63	83.8
	effort	3144	3144	3144	3144	3144	3144	3144	3144	3144	3144	314
	cpue	5.42	0.00	15.05	0.00	0.00	3.22	2.78	0.00	0.00	0.20	26.6
chiri' mila	catch	8.23	0.42	3.22	126.71	0.00	0.00	0.00	0.00	0.00	3.90	142.4
	effort	7220	7220	7220	7220	7220	7220	7220	7220	7220	7220	722
	cpue	1.14	0.06	0.45	17.55	0.00	0.00	0.00	0.00	0.00	0.54	19.7
	TOTAL CATCH	110.75	0.92	50.54	126.71	0.00	178.71	103.38	0.00	2.69	10.13	583.8

ANNUAL SUMMARY FOR THE YEAR 1986

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTA
gill net	catch	45.84	0.00	0.00	0.00	0.00	88.29	66.58	0.00	0.06	66.49	267.2
	effort	54108	54108	54108	54108	54108	54108	54108	54108	54108	54108	5410
	cpue	0.85	0.00	0.00	0.00	0.00	1.63	1.23	0.00	0.00	1.23	4.9
long line	catch	0.00	0.00	0.00	0.00	0.00	0.00	2.73	0.00	0.00	0.00	2.7
	effort	2289	2289	2289	2289	2289	2289	2289	2289	2289	2289	228
	cpue	0.00	0.00	0.00	0.00	0.00	0.00	1.19	0.00	0.00	0.00	1.1
kambuzi seine	catch	13.12	1.20	60.96	0.00	0.00	0.00	1.49	0.00	0.00	3.22	79.9
	effort	3079	3079	3079	3079	3079	3079	3079	3079	3079	3079	307
	cpue	4.26	0.39	19.80	0.00	0.00	0.00	0.48	0.00	0.00	1.05	25.9
chiri' mila	catch	31.02	0.00	0.00	321.64	0.00	0.00	0.00	64.40	0.00	9.55	426.6
	effort	11218	11218	11218	11218	11218	11218	11218	11218	11218	11218	1121
	cpue	2.77	0.00	0.00	28.67	0.00	0.00	0.00	5.74	0.00	0.85	38.0
	TOTAL CATCH	89.98	1.20	60.96	321.64	0.00	88.29	70.80	64.40	0.06	79.26	776.5

ANNUAL SUMMARY FOR THE YEAR 1987

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTAL
gill net	catch	64.80	3.69	0.00	0.00	0.00	102.62	44.66	0.00	0.00	48.77	264.5
	effort	44815	44815	44815	44815	44815	44815	44815	44815	44815	44815	4481
	cpue	1.45	0.08	0.00	0.00	0.00	2.29	1.00	0.00	0.00	1.09	5.9
long line	catch	0.00	0.00	0.00	0.00	0.00	0.00	1.03	0.00	0.00	0.00	1.0
	effort	259	259	259	259	259	259	259	259	259	259	25
	cpue	0.00	0.00	0.00	0.00	0.00	0.00	3.98	0.00	0.00	0.00	3.9
kambuzi seine	catch	3.43	0.00	112.03	0.72	0.00	2.43	0.00	31.04	0.00	0.00	149.6
	effort	5768	5768	5768	5768	5768	5768	5768	5768	5768	5768	576
	cpue	0.59	0.00	19.42	0.12	0.00	0.42	0.00	5.38	0.00	0.00	25.9
chiri' mila	catch	0.32	0.00	1.67	1283.15	0.00	0.00	0.00	2.08	0.00	0.00	1287.2
	effort	19260	19260	19260	19260	19260	19260	19260	19260	19260	19260	1926
	cpue	0.02	0.00	0.09	66.62	0.00	0.00	0.00	0.11	0.00	0.00	66.8
	TOTAL CATCH	68.55	3.69	113.70	1283.87	0.00	105.05	45.69	33.12	0.00	48.77	1702.4

ANNUAL SUMMARY FOR THE YEAR 1988

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTAL
gill net	catch	42.90	0.00	0.00	0.00	0.00	124.80	39.18	0.00	0.39	9.07	216.3
	effort	68239	68239	68239	68239	68239	68239	68239	68239	68239	68239	6823
	cpue	0.63	0.00	0.00	0.00	0.00	1.83	0.57	0.00	0.01	0.13	3.1
long line	catch	0.00	0.00	0.00	0.00	0.00	2.30	2.89	0.00	0.00	0.00	5.1
	effort	172	172	172	172	172	172	172	172	172	172	172
	cpue	0.00	0.00	0.00	0.00	0.00	13.37	16.80	0.00	0.00	0.00	30.1
kambuzi seine	catch	3.99	0.00	115.66	1.24	0.00	0.94	0.00	109.76	0.00	0.00	231.5
	effort	3384	3384	3384	3384	3384	3384	3384	3384	3384	3384	3384
	cpue	1.18	0.00	34.18	0.37	0.00	0.28	0.00	32.43	0.00	0.00	68.4
chiri' mila	catch	0.58	0.33	0.00	1002.99	0.00	0.00	0.00	30.08	0.00	1.47	1035.4
	effort	35629	35629	35629	35629	35629	35629	35629	35629	35629	35629	3562
	cpue	0.02	0.01	0.00	28.15	0.00	0.00	0.00	0.84	0.00	0.04	29.0
m'quito net	catch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.80	0.00	0.00	21.8
	effort	162	162	162	162	162	162	162	162	162	162	162
	cpue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	134.57	0.00	0.00	134.57
	TOTAL CATCH	47.47	0.33	115.66	1004.23	0.00	128.04	42.07	161.64	0.39	10.54	1510.37

ANNUAL SUMMARY FOR THE YEAR 1989

Gear		chambo	other tilapia	kambuzi	utaka	ch'sawa	k'pango	mlamba	usipa	nchila	others	TOTAL
gill net	catch	58.98	0.00	0.00	0.00	0.00	277.92	47.66	0.00	0.41	2.75	387.7
	effort	174333	174333	174333	174333	174333	174333	174333	174333	174333	174333	17433
	cpue	0.34	0.00	0.00	0.00	0.00	1.59	0.27	0.00	0.00	0.02	2.2
long line	catch	0.00	0.00	0.00	0.00	0.00	25.29	16.98	0.00	0.00	0.00	42.2
	effort	12566	12566	12566	12566	12566	12566	12566	12566	12566	12566	1256
	cpue	0.00	0.00	0.00	0.00	0.00	2.01	1.35	0.00	0.00	0.00	3.3
kambuzi seine	catch	24.82	0.00	371.84	4.12	0.00	0.00	1.17	103.00	0.00	0.00	504.9
	effort	23332	23332	23332	23332	23332	23332	23332	23332	23332	23332	2333
	cpue	1.06	0.00	15.94	0.18	0.00	0.00	0.05	4.41	0.00	0.00	21.6
chiri' mila	catch	37.25	0.00	9.24	1697.15	0.00	0.00	0.00	99.65	0.00	25.84	1869.1
	effort	106290	106290	106290	106290	106290	106290	106290	106290	106290	106290	10629
	cpue	0.35	0.00	0.09	15.97	0.00	0.00	0.00	0.94	0.00	0.24	17.5
	TOTAL CATCH	121.05	0.00	381.08	1701.27	0.00	303.21	65.81	202.65	0.41	28.59	2804.0