



Government of Malawi
Department of Fisheries

Analysis of Catch and Effort Data for the Fisheries of Domira Bay, Lake Malawi, 1976-1999.

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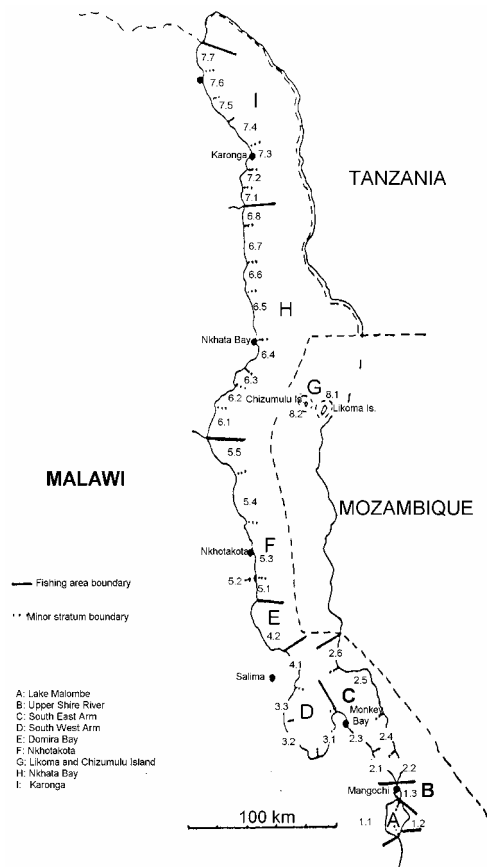


Figure 1. Map of statistical strata in Lake Malawi, the Upper Shire River and Lake Malombe.

Summary

There has been a general decline in the catches of the Domira bay fishery, from almost 3000 tons in the late 1970s to less than 500 t in the late 1990s. In the late 1970s and 1980s the other bigger species groups such as chambo and catfishes contributed significantly to the catches. However these species groups declined to very low levels by the 1990s and the fishery became dominated by utaka. The most important gear in the area is the chilimira net and ownership of this gear in the late 1990s appears stable at around 80 gears. The disappearance of the larger species groups and the declining trend in the catches from previous years indicates that the fishery may be overexploited.

Introduction

Domira Bay is situated on the western coast of Lake Malawi south of Nkotakota in stratum E (Figure 1). The bay is about 40 km wide and its shoreline consists of many reedy areas as well as marshes and lagoons. Mbenji Island, which is well known for its closed season to fishing, is situated in the middle of the Bay where chilimira fishing occurs. Domira Bay is relatively shallow, comprising of a wide shelf of shallow water. It has a 50 m contour of about 10 km offshore and a 100m contour 20 km out (Tweddle *et al*, 1994).

Catch statistics for the fisheries in Domira Bay have been collected since 1977 (Tweddle *et al*, 1994). The last published report on the Domira Bay fisheries was an analysis of catch and effort data for the period 1977-1989 (Tweddle *et al*, 1994). The purpose of this report is to update the catch and effort data available for Domira Bay up to the year 1999.

Methods of data collection

Statistical data on the traditional fisheries in all minor strata have been collected and analysed using Catch Assessment Survey (CAS) since 1976. The CAS was developed by Bazigos (1972) and implemented by Walker (1974; 1976). The CAS methods and the problems associated with it are documented elsewhere (Bazigos 1972, Walker 1974,1976, Alimoso 1988, Weyl & Manase 1999). The total catch and fishing effort in each area were estimated by combining data obtained in monthly CAS and data from the annual frame surveys. In this report the data are presented in gear and species group. Names of fishing gear used in this report are standard and the gear is described in Weyl *et al*. 2000.

Data analysis

Total catch

There were large fluctuations in the estimated total catch for Domira Bay (Figure 2). In the late 1970s to the early 1980s, the estimated catch ranged from between 1700 to nearly 3000 tons. In 1985 and 1986, the catch decreased to less than 1000 tons but it increased again to 2800 tons in 1989 where after the total catch declined to less than 500 tons in 1999.

The main contributors to the total catch were chilimira nets (59%), gillnets (28%) and kambuzi seines (10%). The 'other gear' group consisted of the longlines and mosquito nets. The contribution of the gill net has changed over time. Its greatest contribution to the total catch was in the early 1980s. By 1990s, chilimira net contributed the most (79%) to the total catch (1990 to 1999). The dominant species in the fishery were utaka (54%), kampango (14%), chambo (7%) and kambuzi (6%) (Figure 3).

Analysis by gear

Gear ownership

Temporal trends in the number of fishing gears is shown in Figure 4. In the chilimira fishery, there was a general increase in the 1980s, 90 nets were recorded in 1989. The numbers of chilimira gears in the area stabilised in the 1990s and in 1999, 79 chilimira nets were recorded at Domira Bay. During the 23 year period, the number of gill nets have fluctuated without showing any pattern, 329 gill nets were recorded in 1999. Similarly, the number of kambuzi seines have fluctuated, reaching a peak of 25 nets recorded in 1997. However in 1999, only 6 nets were recorded. Longline use has shown some fluctuations with a sudden peak in 1996 to 147 gears, however the numbers decreased reaching 43 longlines in 1999.

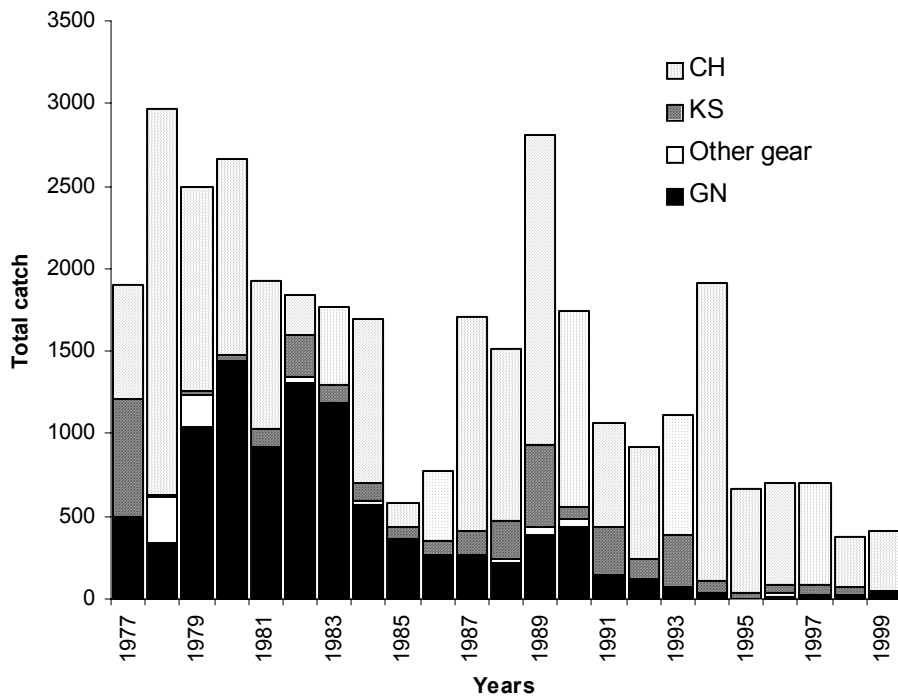


Figure 2. Annual catch by gear in Domira Bay from 1977-1999.

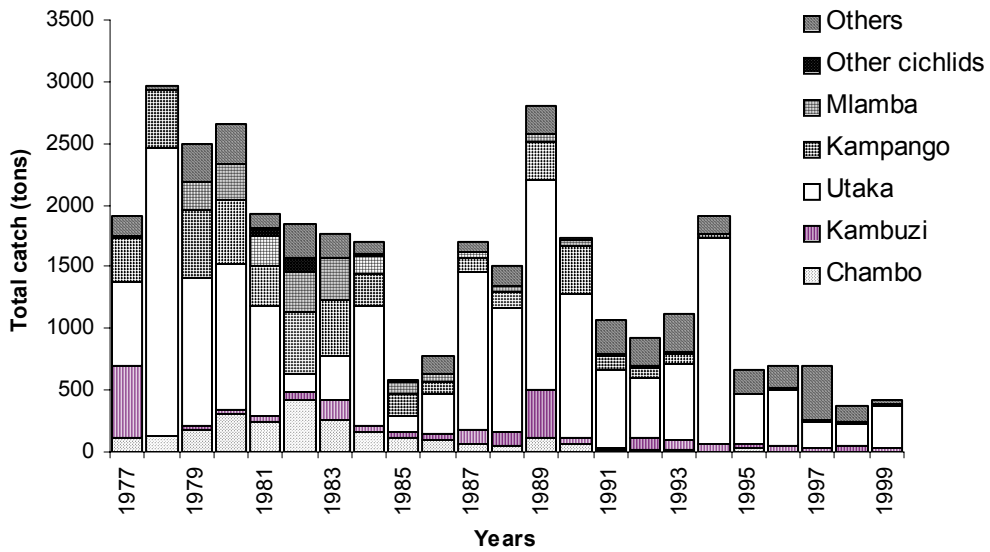
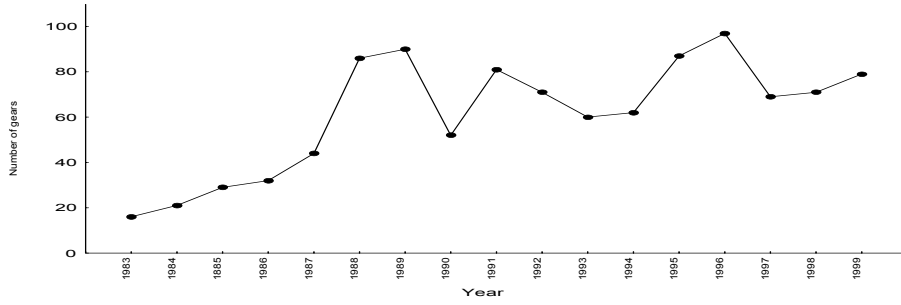
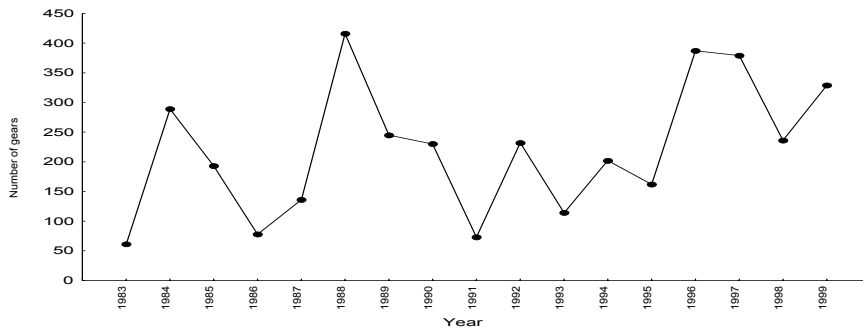


Figure 3. Annual catch by species for all gears combined in Domira Bay from 1977 to 1999.

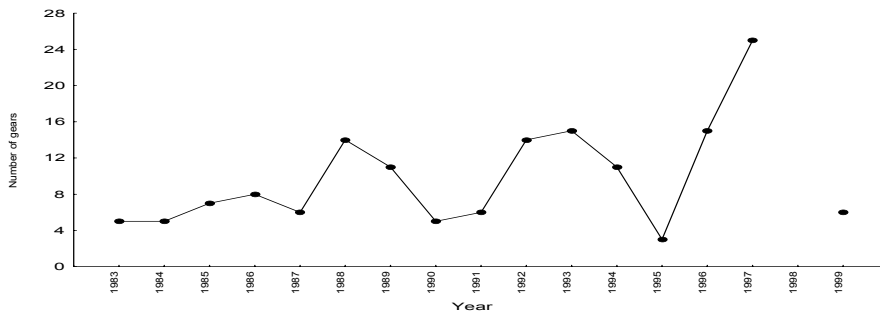
a) Chilimira nets



b) Gill nets



c) Kambuzi seines



d) Longlines

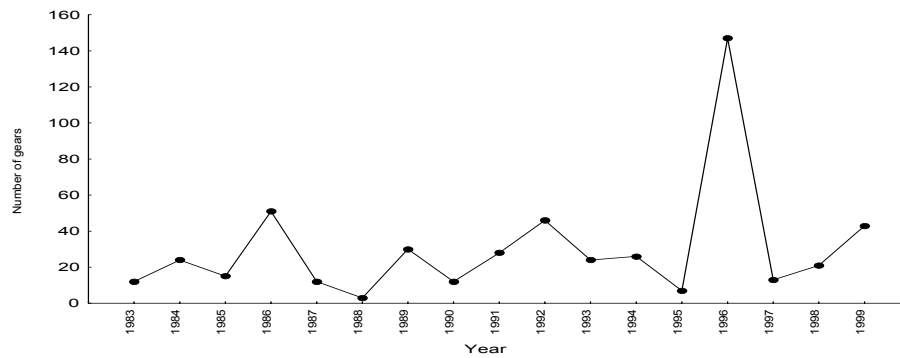


Figure 4. Temporal trends in the number of major fishing gear in Domira Bay 1983-1999.

Gillnets

Annual estimates for effort, CPUE and catch composition for the gill net fishery are shown in Figures 5, 6 and 7, respectively. Effort increased in the late 1980s but declined in the 1990s (Figure 5). Estimates of CPUE of the gill net fishery show an increase in the early 1980s but from 1983 there was a drastic decline till the 1990s (Figure 6). Total catch for the gill net fishery showed high catches from 1979 to 1983 averaging 1182 tons, after which catches started to decline to very low levels of less than 50 tons in the late 1990s (Figure 7).

Chambo, kampango and mlamba dominated the catch in the species composition of the gill net fishery (Figure 7). Chambo was a major component in the catch in the 1970s and 1980s. However, by the mid 1980s, chambo catches declined to 15 tons in 1991 after which the species was only a minor contributor to the total catch (Figure 7). In the 1990s, the catfishes dominated the catch composition of this fishery (Figure 7).

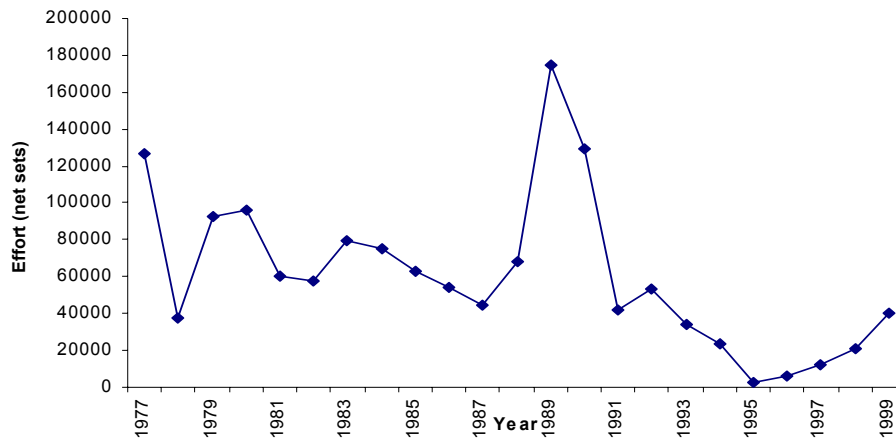


Figure 5. Gill net effort (91m gill net sets) in Domira bay from 1977 to 1999.

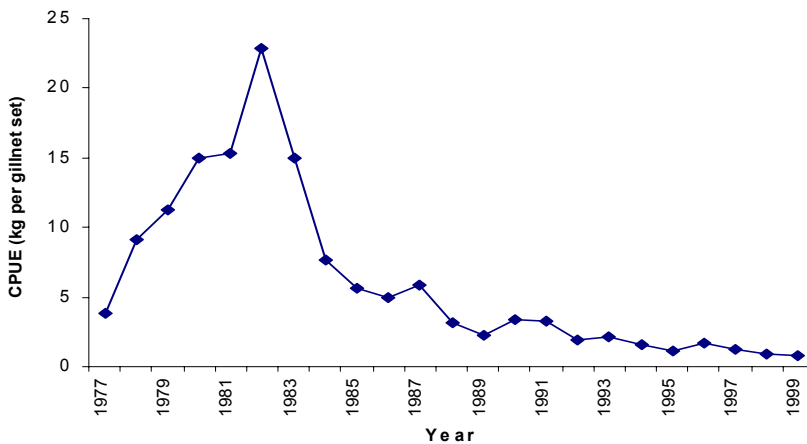


Figure 6. Gill net CPUE (kg per gill net set) in Domira Bay from 1977 to 1999.

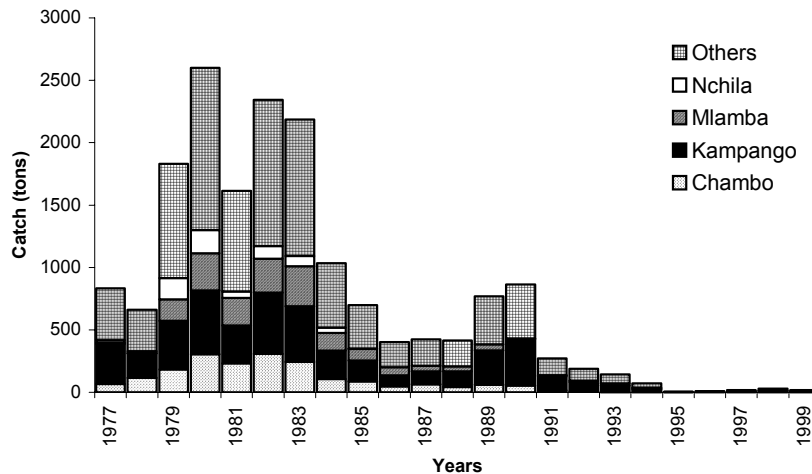


Figure 7. Total catch and species composition in the gill net fishery of Domira Bay from 1977 to 1999.

Chilimira nets

Annual estimates for effort, CPUE and catch composition for the chilimira fishery are shown in Figures 8, 9 and 10 respectively. Effort in this fishery fluctuated widely, however there was a general increase in effort in the late 1980s reaching very high levels in 1989 of 100 000 hauls (Note: this high Figure should be viewed with caution, Tweddle *et al* 1994). In the 1990s effort declined reaching over 32 000 hauls in 1999 (Figure 8). Estimates of the CPUE of the chilimira fishery also showed a fluctuating pattern with the highest CPUE (96 kg per haul) being recorded in 1981. From 1988 through to the 1990s, CPUE remained at less than 35 kg per haul (Figure 9). Total catch for the chilimira fishery was erratic, with some years yielding catches of more than 1700 tons (i.e. 1978, 1989 & 1994). Apart from the unusually high catch recorded in 1994, the 1990s yielded rather low catches averaging at 572 tons (Figure 10).

Utaka dominated the catch of the chilimira fishery throughout the 23 year period, comprising 90% of the catch for the whole period (Figure 10). Usipa was also recorded in some years in substantial amounts, the highest being 380 tons in 1997 (Figure 10).

Kambuzi seines

Annual estimates for effort, CPUE and catch composition for the kambuzi seine fishery are shown in Figures 11, 12 and 13 respectively. Effort throughout the 23-year period has fluctuated. Apart from unusual years when estimated effort was extremely high (1977 & 1989) the recorded effort for the rest of the years has not exceeded 11 000 hauls (Figure 11). Estimates of the CPUE of the kambuzi seine fishery also showed a fluctuating pattern (Figure 12). However there was a general decline in CPUE in the late 1990s to less than 20 kg per haul (Figure 12).

Total catch for the kambuzi fishery shows an unusually high catch estimate in 1977 followed by very low catches in the next proceeding years (Figure 13). In the late 1980s the catch started to increase reaching another high level in 1989 of 505 tons. In the 1990s there was a general decline in the catches to a very low level in 1999 of 15 tons (Figure 13). Kambuzi contributed 55% of the catches of the kambuzi seines during the 23 years. Usipa contributed 25% of the catches during the same period. Usipa started being recorded in substantial amounts in the late 1980s and 1990s, sometimes dominating the catch in some years (i.e. 1991 & 1993) (Figure 13).

Chambo was mainly recorded in the 1970s and 1980s catches and during the 23 years, it contributed only 7% of the catches. The 'others' group contributed in substantially in the 1970s and early 1980s catches altogether contributing 13% of the catches in the 23 years (Figure 14). This group consists of species groups such as utaka, kampango, other tilapia, nchila and mlamba.

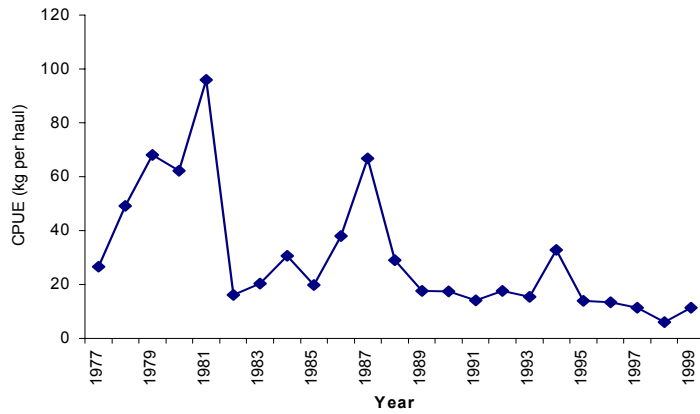


Figure 8. Chilimira effort (hauls per year) in Domira bay from 1977 to 1999.

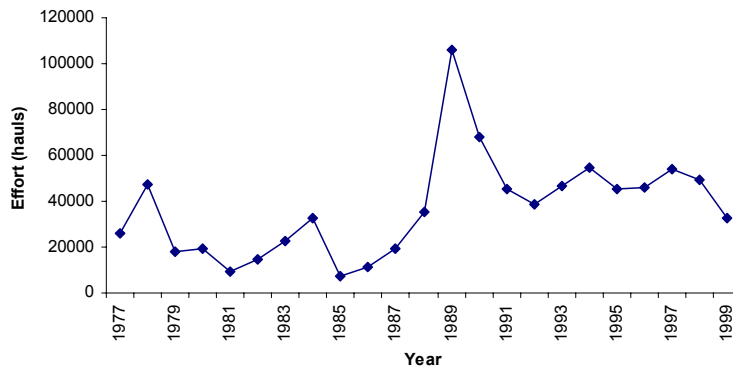


Figure 9. Chilimira CPUE (kg per haul) in Domira bay from 1977 to 1995.

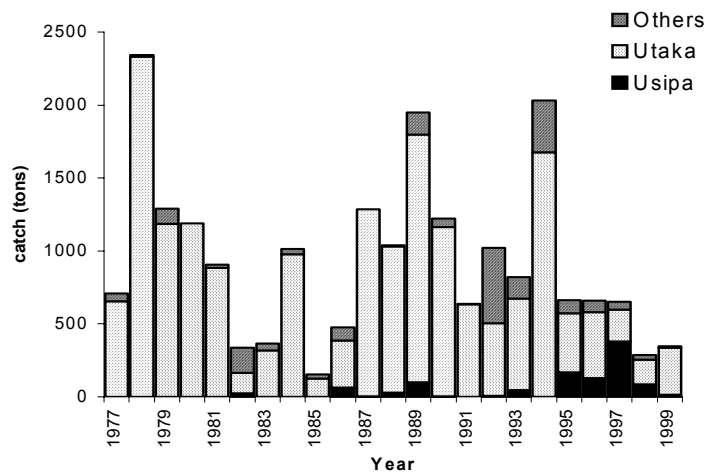


Figure 10. Total catch and species composition in the chilimira fishery of Domira Bay from 1977 to 1999.

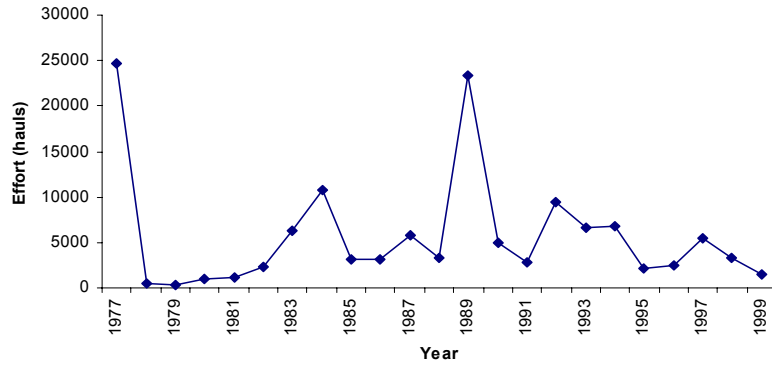


Figure 11. Kambuzi seine effort (hauls per year) in Domira bay from 1977 to 1999.

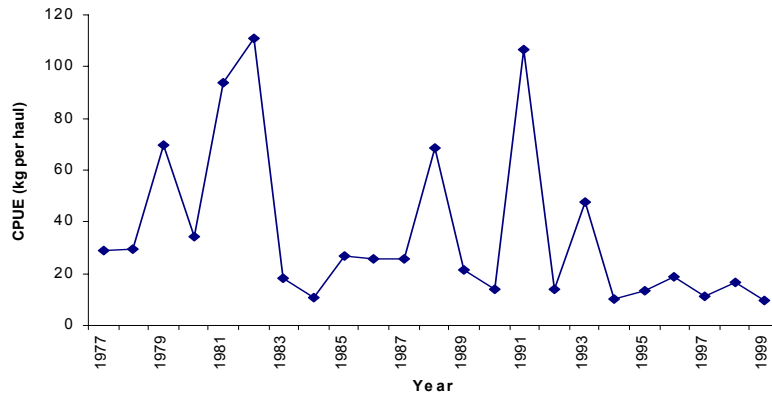


Figure 12. Kambuzi seine CPUE (kg per haul) in Domira bay from 1977 to 1999.

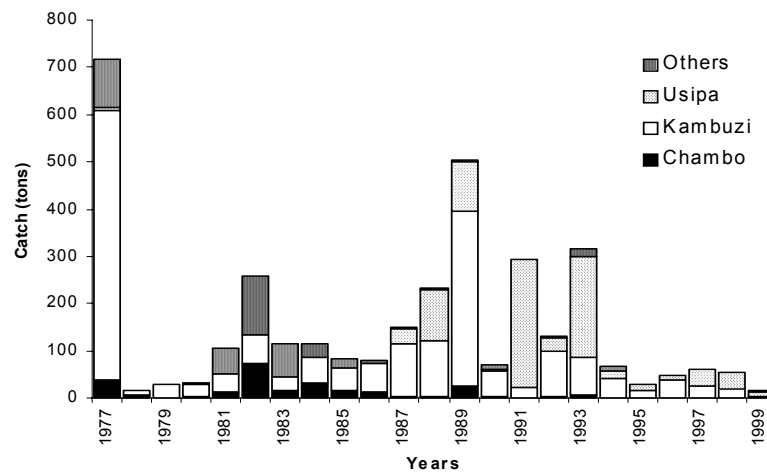


Figure 13. Total catch and species composition in the kambuzi seine fishery of Domira Bay from 1977 to 1999.

Analysis by species

Chambo

The main gear used for catching chambo in Domira Bay was the gill net which contributed 81% of the total chambo catch from 1977 to 1999 (Figure 14). There was a general increase in the chambo catches from the late 1970s to 1982 where 425 tons were recorded (Figure 14). In the late 1980s, there was a decline in the catches to very low levels in the 1990s, reaching less than 5 tons in the late 1990s (Figure 14). This decline in the catch is correlated to the decline in CPUE of the gill net fishery, which was the main fishery harvesting the chambo (Figure 15).

It is clear that the chambo stocks in Domira Bay have declined to very low levels in the late 1990s indicating that the stock has collapsed (Figure 14). Chambo contributed 7% of the total catch during the 23 years and it started to decline in the late 1980s at the same period when there were very high effort levels in the fishery. It is expected that chambo will continue to be caught at very low levels in this area.

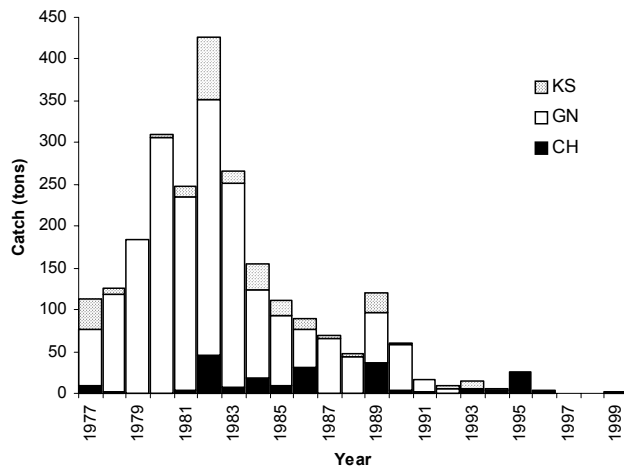


Figure 14. Total chambo catch by main contributing gear in Domira Bay from 1977 to 1999.

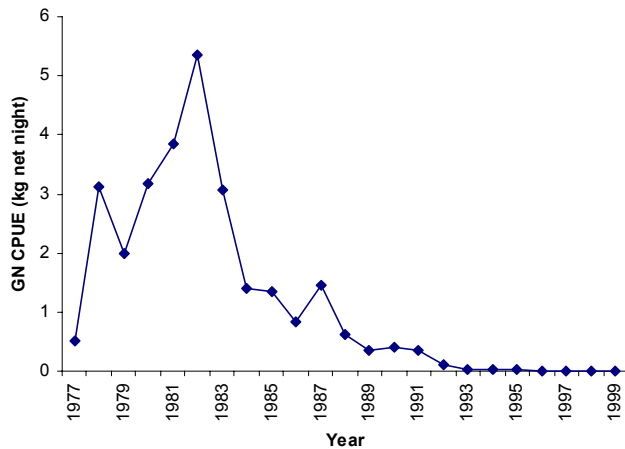


Figure 15. Chambo CPUE (kg net night) in the gill net fishery in Domira Bay for the period 1977 to 1999.

Utaka

The main harvesting gear for the utaka was the chilimira net, which contributed 99% of the total utaka catch for the 23-year period (Figure 16). The catches have fluctuated over the years with some very low catches recorded in the early 1980s as well as the late 1990s (average of 795 tons a year) (Figure 16). The high catches in the late 1980s are due to high effort levels in the chilimira fishery during this period. CPUE for the utaka in the chilimira fishery showed a general decline in the late 1980s, stabilising in the 1990s at low levels, averaging at 12 kg per haul (Figure 17).

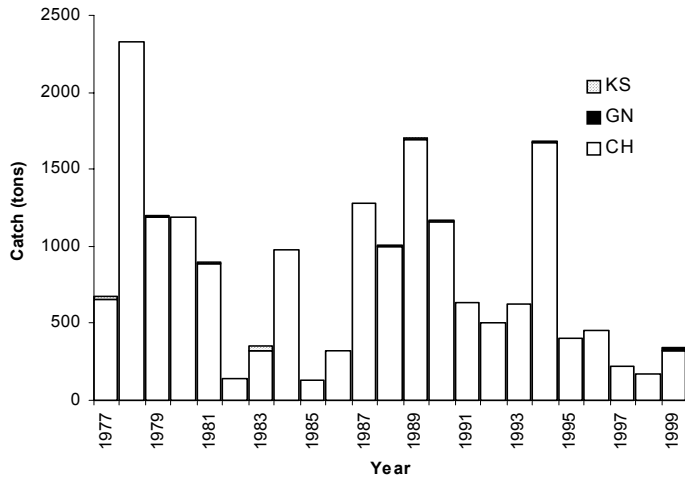


Figure 16. Total utaka catch by main contributing gear in Domira Bay from 1977 to 1999.

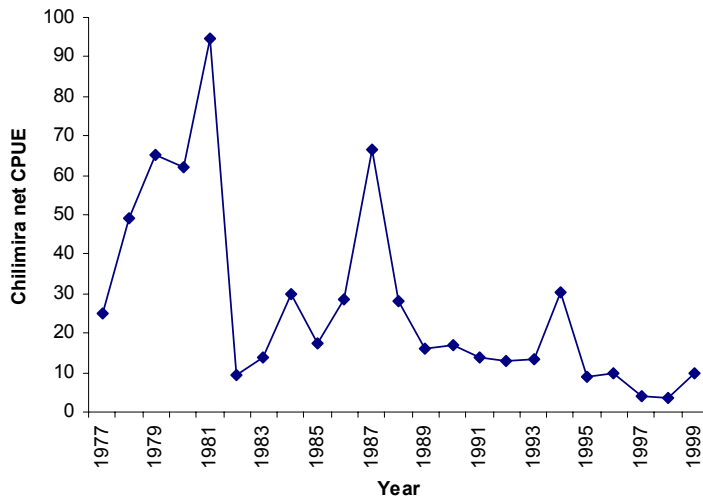


Figure 17. Utaka CPUE (kg per haul) in the chilimira fishery of Domira bay for the period 1977 to 1999.

Kampango

The main gear harvesting kampango was the gill net, which contributed 88% of the total kampango catch for all the years (Figure 19). High catches were recorded in the late 1970s to early 1980s. In the 1990s, there was a general decline of the catches to extremely low levels of less than 15 tons in the late 1990s (Figure 18). CPUE for the kampango in the gill net fishery was high in the early 1980s reaching its peak in 1984 at 8.5kg net night. However

CPUE started to decline in the late 1980s reaching very low levels in the late 1990s at less than 1kg net night (Figure 19).

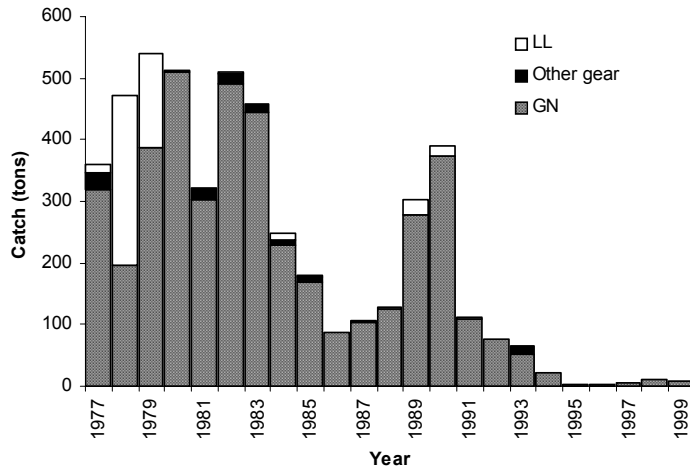


Figure 18. Total kampango catch by main contributing gear in Domira Bay from 1977 to 1999.

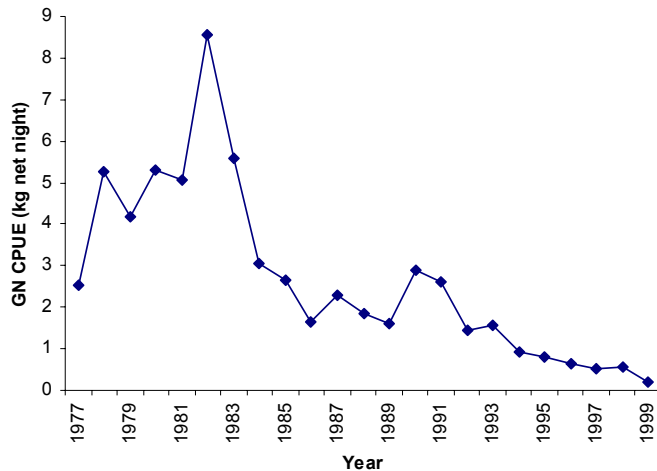


Figure 19. Kampango CPUE (kg net night) in the gill net fishery in Domira bay for the period 1977 to 1999.

Mlamba

88% of the total catch for the mlamba during the 23 year period was caught from gill nets and 6% from longlines. The data for the mlamba showed a similar trend to that of kampango, with very high catches in the early 1980s (reaching a peak of 337 tons). These high catches were followed by a steady decline in the late 1980s to less than 100 tons, eventually reaching less than 5 tons in the late 1990s. The CPUE of the mlamba group also showed a similar trend to the kampango with the highest CPUE in the early 1980s (with a peak of 5kg net night) and thereafter declining drastically to very low levels in the late 1990s of less than 1kg net night.

Discussion

Throughout the 23 year period, the Domira Bay fishery has been dominated by using chilimira nets targeting utaka. During the late 1990s, it is observed that there has been a decline in the overall catches in the fishery including chilimira net catches and the ownership of this gear shows that this fishery has stopped expanding. The gear ownership for the gill nets has not shown any negative trend towards the ownership of the gear despite the poor catches recorded for this gear especially in the late 1990s. The catches for the chambo and catfish groups have shown a drastic decline during the 23 year period correlating with the declining gill net catches in the area, since these species groups were mainly caught in the gill nets.

A declining trend can be observed in the overall catches in Domira bay, reaching very low levels in the late 1990s. As in Tweddle et al 1994, concern is also expressed concerning the absence of data from smaller gears (i.e. handlines and fishtraps) which are recorded in the annual frame surveys. This unrecorded data for the catches thus leads to an underestimation of the total catches in the area.

From the data, it can be recommended that there should be no further expansion of the chilimira fishery due to the fact that at present effort levels, the catches have reached extremely low levels. The chambo and catfish fisheries at the moment can be considered to have collapsed in this area. Reducing the number of gill nets operating in the area should be an option to consider in order to give the chambo and catfish stocks an opportunity to rebuild.

Acknowledgements

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Appendix 1 : Catch and effort data tables for Domira bay, 1977-1999.

(CPUE = Catch Per Unit Effort expressed as kg per unit effort; Catch and Total Catch are in tons; CH = Chilimira net, effort in hauls; GN = Gill net, effort in 91 m net sets; KS = Kambuzi seine, effort in hauls; LL = Longline, effort in 100 hook sets; MN = Mosquito net, effort in hauls)

Year	Gear	Statistic	Chambo	Other Tilapia	Kambuzi	Utaka	Chisawasawa	Kampango	Mlamba	Usipa	Nchila	Others	TOTAL
1977	CH	Catch	9.62	0	11.23	654.48	0.99	13.81	0	0	1.62	1.21	692.96
1977	CH	CPUE	0.368	0.000	0.430	25.049	0.038	0.529	0.000	0.000	0.062	0.046	26.522
1977	CH	Effort	26128	26128	26128	26128	26128	26128	26128	26128	26128	26128	26128
1977	GN	Catch	65.99	0	0	0	0	319.85	11.22	0	20	64.37	481.43
1977	GN	CPUE	0.523	0.000	0.000	0.000	0.000	2.534	0.089	0.000	0.158	0.510	3.814
1977	GN	Effort	126242	126242	126242	126242	126242	126242	126242	126242	126242	126242	126242
1977	KS	Catch	36.99	0	573.05	25.01	0	13.04	4.48	3.88	0.86	59.23	716.54
1977	KS	CPUE	1.498	0.000	23.202	1.013	0.000	0.528	0.181	0.157	0.035	2.398	29.012
1977	KS	Effort	24698	24698	24698	24698	24698	24698	24698	24698	24698	24698	24698
1977	LL	Catch	0	0	0	0	0	14.49	0	0	0	0	14.49
1977	LL	CPUE	0.000	0.000	0.000	0.000	0.000	7.249	0.000	0.000	0.000	0.000	7.249
1977	LL	Effort	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999
1977		Total catch	112.6	0	584.28	679.49	0.99	361.19	15.7	3.88	22.48	124.81	1905.42
1978	CH	Catch	2.33	0	0	2331.38	0	0	0	0	0	1.87	2335.58
1978	CH	CPUE	0.049	0.000	0.000	49.098	0.000	0.000	0.000	0.000	0.000	0.039	49.187
1978	CH	Effort	47484	47484	47484	47484	47484	47484	47484	47484	47484	47484	47484
1978	GN	Catch	115.93	0	0	0	0	195.17	3.64	0	15.71	9.35	339.8
1978	GN	CPUE	3.122	0.000	0.000	0.000	0.000	5.255	0.098	0.000	0.423	0.252	9.150
1978	GN	Effort	37138	37138	37138	37138	37138	37138	37138	37138	37138	37138	37138
1978	KS	Catch	6.54	0	8.93	0	0	0	0	0	0	0	15.47
1978	KS	CPUE	12.457	0.000	17.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	29.467
1978	KS	Effort	525	525	525	525	525	525	525	525	525	525	525
1978	LL	Catch	0	0	0	0	0	276.26	0	0	0	1.46	277.72
1978	LL	CPUE	0.000	0.000	0.000	0.000	0.000	28.058	0.000	0.000	0.000	0.148	28.206
1978	LL	Effort	9846	9846	9846	9846	9846	9846	9846	9846	9846	9846	9846
1978		Total catch	124.8	0	8.93	2331.38	0	471.43	3.64	0	15.71	12.68	2968.57
1979	CH	Catch	0	0	0	1185.15	0	0	52.27	0	0	0	1237.42
1979	CH	CPUE	0.000	0.000	0.000	65.122	0.000	0.000	2.872	0.000	0.000	0.000	67.994
1979	CH	Effort	18199	18199	18199	18199	18199	18199	18199	18199	18199	18199	18199
1979	GN	Catch	184.48	0.88	0	16.1	0	388	173.64	0	169.16	114.78	1047.04
1979	GN	CPUE	1.985	0.009	0.000	0.173	0.000	4.175	1.868	0.000	1.820	1.235	11.267
1979	GN	Effort	92932	92932	92932	92932	92932	92932	92932	92932	92932	92932	92932
1979	KS	Catch	0.3	0	27.5	0	0	0	0	0	0	0	27.8
1979	KS	CPUE	0.750	0.000	68.750	0.000	0.000	0.000	0.000	0.000	0.000	0.000	69.500
1979	KS	Effort	400	400	400	400	400	400	400	400	400	400	400
1979	LL	Catch	0	0	0	0	0	151.3	2.25	0	0	32.47	186.02
1979	LL	CPUE	0.000	0.000	0.000	0.000	0.000	16.678	0.248	0.000	0.000	3.579	20.505
1979	LL	Effort	9072	9072	9072	9072	9072	9072	9072	9072	9072	9072	9072
1979		Total catch	184.78	0.88	27.5	1201.25	0	539.3	228.16	0	169.16	147.25	2498.28

Year	Gear	Statistic	Chambo	Other Tilapia	Kambuzi	Utaka	Chisawasawa	Kampango	Mlamba	Usipa	Nchila	Others	TOTAL
1980	CH	Catch	0	0	0	1188.11	0	0	0	0	0	0.06	1188.17
1980	CH	CPUE	0.000	0.000	0.000	62.201	0.000	0.000	0.000	0.000	0.000	0.003	62.205
1980	CH	Effort	19101	19101	19101	19101	19101	19101	19101	19101	19101	19101	19101
1980	GN	Catch	305.77	6.11	0	0	0	510.65	296.93	0	186.54	138.4	1444.4
1980	GN	CPUE	3.171	0.063	0.000	0.000	0.000	5.296	3.079	0.000	1.934	1.435	14.979
1980	GN	Effort	96430	96430	96430	96430	96430	96430	96430	96430	96430	96430	96430
1980	KS	Catch	3.05	0	25.49	0	0	1.04	0.41	0	1.2	1.12	32.31
1980	KS	CPUE	3.234	0.000	27.031	0.000	0.000	1.103	0.435	0.000	1.273	1.188	34.263
1980	KS	Effort	943	943	943	943	943	943	943	943	943	943	943
1980		Total catch	308.82	6.11	25.49	1188.11	0	511.69	297.34	0	187.74	139.58	2664.88
1981	CH	Catch	3.79	0.47	0	883.17	0	1.53	3.4	0	0	1.14	893.5
1981	CH	CPUE	0.407	0.050	0.000	94.863	0.000	0.164	0.365	0.000	0.000	0.122	95.972
1981	CH	Effort	9310	9310	9310	9310	9310	9310	9310	9310	9310	9310	9310
1981	GN	Catch	231.1	59.15	0	0	0	303.26	220.65	0	52.12	52.35	918.63
1981	GN	CPUE	3.856	0.987	0.000	0.000	0.000	5.060	3.682	0.000	0.870	0.874	15.328
1981	GN	Effort	59930	59930	59930	59930	59930	59930	59930	59930	59930	59930	59930
1981	KS	Catch	12.76	1.92	38.8	16.56	0	15.96	9.53	0	3.72	6.05	105.3
1981	KS	CPUE	11.383	1.713	34.612	14.773	0.000	14.237	8.501	0.000	3.318	5.397	93.934
1981	KS	Effort	1121	1121	1121	1121	1121	1121	1121	1121	1121	1121	1121
1981	LL	Catch	0	0	0	0	0	0.69	4.87	0	0	0	5.56
1981	LL	CPUE	0.000	0.000	0.000	0.000	0.000	1.364	9.625	0.000	0.000	0.000	10.988
1981	LL	Effort	506	506	506	506	506	506	506	506	506	506	506
1981	MN	Catch	0.4	0	0	0	0	0	0.47	0	0	0	0.87
1981	MN	CPUE	2.532	0.000	0.000	0.000	0.000	0.000	2.975	0.000	0.000	0.000	5.506
1981	MN	Effort	158	158	158	158	158	158	158	158	158	158	158
1981		Total catch	248.05	61.54	38.8	899.73	0	321.44	238.92	0	55.84	59.54	1923.86
1982	CH	Catch	44.97	2.33	0.22	139.13	0	0.27	0	24.9	0	25.38	237.2
1982	CH	CPUE	3.052	0.158	0.015	9.442	0.000	0.018	0.000	1.690	0.000	1.722	16.097
1982	CH	Effort	14736	14736	14736	14736	14736	14736	14736	14736	14736	14736	14736
1982	GN	Catch	307.26	44.7	0	0	0	490.76	271.74	0	102.04	94.73	1311.23
1982	GN	CPUE	5.356	0.779	0.000	0.000	0.000	8.555	4.737	0.000	1.779	1.651	22.858
1982	GN	Effort	57365	57365	57365	57365	57365	57365	57365	57365	57365	57365	57365
1982	KS	Catch	73.75	69.94	60.26	0	0	17.07	17.78	0	8.24	9.9	256.94
1982	KS	CPUE	31.775	30.134	25.963	0.000	0.000	7.355	7.660	0.000	3.550	4.265	110.702
1982	KS	Effort	2321	2321	2321	2321	2321	2321	2321	2321	2321	2321	2321
1982	LL	Catch	0	0	0	0	0	2.03	32.96	0	0	0	34.99
1982	LL	CPUE	0.000	0.000	0.000	0.000	0.000	1.065	17.293	0.000	0.000	0.000	18.358
1982	LL	Effort	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906
1982		Total catch	425.98	116.97	60.48	139.13	0	510.13	322.48	24.9	110.28	130.01	1840.36

Year	Gear	Statistic	Chambo	Other Tilapia	Kambuzi	Utaka	Chisawasawa	Kampango	Mlamba	Usipa	Nchila	Others	TOTAL
1983	CH	Catch	7.53	0	124.32	317.89	0	3	1.75	0	0	7.5	461.99
1983	CH	CPUE	0.332	0.000	5.489	14.037	0.000	0.132	0.077	0.000	0.000	0.331	20.400
1983	CH	Effort	22647	22647	22647	22647	22647	22647	22647	22647	22647	22647	22647
1983	GN	Catch	244.24	0	1.05	0	0	444.83	321.47	0	82.48	93.32	1187.39
1983	GN	CPUE	3.075	0.000	0.013	0.000	0.000	5.601	4.048	0.000	1.039	1.175	14.951
1983	GN	Effort	79419	79419	79419	79419	79419	79419	79419	79419	79419	79419	79419
1983	KS	Catch	14.66	0	30.74	39.6	0	9.26	13.4	0	1.19	5.6	114.45
1983	KS	CPUE	2.324	0.000	4.872	6.277	0.000	1.468	2.124	0.000	0.189	0.888	18.141
1983	KS	Effort	6309	6309	6309	6309	6309	6309	6309	6309	6309	6309	6309
1983		Total catch	266.43	0	156.11	357.49	0	457.09	336.62	0	83.67	106.42	1763.83
1984	CH	Catch	17.57	0	0	977.59	0	0	0	0	0	0.33	995.49
1984	CH	CPUE	0.540	0.000	0.000	30.067	0.000	0.000	0.000	0.000	0.000	0.010	30.617
1984	CH	Effort	32514	32514	32514	32514	32514	32514	32514	32514	32514	32514	32514
1984	GN	Catch	105.56	3.69	0	0	0	228.95	140.69	0	41.84	53.79	574.52
1984	GN	CPUE	1.404	0.049	0.000	0.000	0.000	3.046	1.872	0.000	0.557	0.716	7.643
1984	GN	Effort	75165	75165	75165	75165	75165	75165	75165	75165	75165	75165	75165
1984	KS	Catch	30.85	3.56	56.18	0	0	9.62	8.66	0	2.8	3.23	114.9
1984	KS	CPUE	2.860	0.330	5.209	0.000	0.000	0.892	0.803	0.000	0.260	0.299	10.653
1984	KS	Effort	10786	10786	10786	10786	10786	10786	10786	10786	10786	10786	10786
1984	LL	Catch	0.45	0	0	0	0	8.8	5.3	0	0	0	14.55
1984	LL	CPUE	0.150	0.000	0.000	0.000	0.000	2.933	1.767	0.000	0.000	0.000	4.850
1984	LL	Effort	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
1984		Total catch	154.43	7.25	56.18	977.59	0	247.37	154.65	0	44.64	57.35	1699.46
1985	CH	Catch	8.23	0.42	3.22	126.71	0	0	0	0	0	3.9	142.48
1985	CH	CPUE	1.140	0.058	0.446	17.550	0.000	0.000	0.000	0.000	0.000	0.540	19.734
1985	CH	Effort	7220	7220	7220	7220	7220	7220	7220	7220	7220	7220	7220
1985	GN	Catch	85.47	0.5	0	0	0	167.75	93.12	0	2.69	5.6	355.13
1985	GN	CPUE	1.353	0.008	0.000	0.000	0.000	2.655	1.474	0.000	0.043	0.089	5.622
1985	GN	Effort	63171	63171	63171	63171	63171	63171	63171	63171	63171	63171	63171
1985	KS	Catch	17.05	0	47.32	0	0	10.12	8.73	0	0	0.63	83.85
1985	KS	CPUE	5.423	0.000	15.051	0.000	0.000	3.219	2.777	0.000	0.000	0.200	26.670
1985	KS	Effort	3144	3144	3144	3144	3144	3144	3144	3144	3144	3144	3144
1985	LL	Catch	0	0	0	0	0	0.84	1.53	0	0	0	2.37
1985	LL	CPUE	0.000	0.000	0.000	0.000	0.000	1.277	2.325	0.000	0.000	0.000	3.602
1985	LL	Effort	658	658	658	658	658	658	658	658	658	658	658
1985		Total catch	110.75	0.92	50.54	126.71	0	178.71	103.38	0	2.69	10.13	583.83

Year	Gear	Statistic	Chambo	Other Tilapia	Kambuzi	Utaka	Chisawasawa	Kampango	Mlamba	Usipa	Nchila	Others	TOTAL
1986	CH	Catch	31.02	0	0	321.64	0	0	0	64.4	0	9.55	426.61
1986	CH	CPUE	2.765	0.000	0.000	28.672	0.000	0.000	0.000	5.741	0.000	0.851	38.029
1986	CH	Effort	11218	11218	11218	11218	11218	11218	11218	11218	11218	11218	11218
1986	GN	Catch	45.84	0	0	0	0	88.29	66.58	0	0.06	66.49	267.26
1986	GN	CPUE	0.847	0.000	0.000	0.000	0.000	1.632	1.231	0.000	0.001	1.229	4.939
1986	GN	Effort	54108	54108	54108	54108	54108	54108	54108	54108	54108	54108	54108
1986	KS	Catch	13.12	1.2	60.96	0	0	0	1.49	0	0	3.22	79.99
1986	KS	CPUE	4.261	0.390	19.799	0.000	0.000	0.000	0.484	0.000	0.000	1.046	25.979
1986	KS	Effort	3079	3079	3079	3079	3079	3079	3079	3079	3079	3079	3079
1986	LL	Catch	0	0	0	0	0	0	2.73	0	0	0	2.73
1986	LL	CPUE	0.000	0.000	0.000	0.000	0.000	0.000	1.193	0.000	0.000	0.000	1.193
1986	LL	Effort	2289	2289	2289	2289	2289	2289	2289	2289	2289	2289	2289
1986		Total catch	89.98	1.2	60.96	321.64	0	88.29	70.8	64.4	0.06	79.26	776.59
1987	CH	Catch	0.32	0	1.67	1283.15	0	0	0	2.08	0	0	1287.22
1987	CH	CPUE	0.017	0.000	0.087	66.623	0.000	0.000	0.000	0.108	0.000	0.000	66.834
1987	CH	Effort	19260	19260	19260	19260	19260	19260	19260	19260	19260	19260	19260
1987	GN	Catch	64.8	3.69	0	0	0	102.62	44.66	0	0	48.77	264.54
1987	GN	CPUE	1.446	0.082	0.000	0.000	0.000	2.290	0.997	0.000	0.000	1.088	5.903
1987	GN	Effort	44815	44815	44815	44815	44815	44815	44815	44815	44815	44815	44815
1987	KS	Catch	3.43	0	112.03	0.72	0	2.43	0	31.04	0	0	149.65
1987	KS	CPUE	0.595	0.000	19.423	0.125	0.000	0.421	0.000	5.381	0.000	0.000	25.945
1987	KS	Effort	5768	5768	5768	5768	5768	5768	5768	5768	5768	5768	5768
1987	LL	Catch	0	0	0	0	0	0	1.03	0	0	0	1.03
1987	LL	CPUE	0.000	0.000	0.000	0.000	0.000	0.000	3.977	0.000	0.000	0.000	3.977
1987	LL	Effort	259	259	259	259	259	259	259	259	259	259	259
1987		Total catch	68.55	3.69	113.7	1283.87	0	105.05	45.69	33.12	0	48.77	1702.44
1988	CH	Catch	0.58	0.33	0	1002.99	0	0	0	30.08	0	1.47	1035.45
1988	CH	CPUE	0.016	0.009	0.000	28.151	0.000	0.000	0.000	0.844	0.000	0.041	29.062
1988	CH	Effort	35629	35629	35629	35629	35629	35629	35629	35629	35629	35629	35629
1988	GN	Catch	42.9	0	0	0	0	124.8	39.18	0	0.39	9.07	216.34
1988	GN	CPUE	0.629	0.000	0.000	0.000	0.000	1.829	0.574	0.000	0.006	0.133	3.170
1988	GN	Effort	68239	68239	68239	68239	68239	68239	68239	68239	68239	68239	68239
1988	KS	Catch	3.99	0	115.66	1.24	0	0.94	0	109.76	0	0	231.59
1988	KS	CPUE	1.179	0.000	34.178	0.366	0.000	0.278	0.000	32.435	0.000	0.000	68.437
1988	KS	Effort	3384	3384	3384	3384	3384	3384	3384	3384	3384	3384	3384
1988	LL	Catch	0	0	0	0	0	2.3	2.89	0	0	0	5.19
1988	LL	CPUE	0.000	0.000	0.000	0.000	0.000	13.372	16.802	0.000	0.000	0.000	30.174
1988	LL	Effort	172	172	172	172	172	172	172	172	172	172	172
1988	MN	Catch	0	0	0	0	0	0	0	21.8	0	0	21.8
1988	MN	CPUE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	134.568	0.000	0.000	134.568
1988	MN	Effort	162	162	162	162	162	162	162	162	162	162	162
1988		Total catch	47.47	0.33	115.66	1004.23	0	128.04	42.07	161.64	0.39	10.54	1510.37

Year	Gear	Statistic	Chambo	Other Tilapia	Kambuzi	Utaka	Chisawasawa	Kampango	Mlamba	Usipa	Nchila	Others	TOTAL
1989	CH	Catch	37.25	0	9.24	1697.15	0	0	0	99.65	0	25.84	1869.13
1989	CH	CPUE	0.350	0.000	0.087	15.967	0.000	0.000	0.000	0.938	0.000	0.243	17.585
1989	CH	Effort	106290	106290	106290	106290	106290	106290	106290	106290	106290	106290	106290
1989	GN	Catch	58.98	0	0	0	0	277.92	47.66	0	0.41	2.75	387.72
1989	GN	CPUE	0.338	0.000	0.000	0.000	0.000	1.594	0.273	0.000	0.002	0.016	2.224
1989	GN	Effort	174333	174333	174333	174333	174333	174333	174333	174333	174333	174333	174333
1989	KS	Catch	24.82	0	371.84	4.12	0	0	1.17	103	0	0	504.95
1989	KS	CPUE	1.064	0.000	15.937	0.177	0.000	0.000	0.050	4.415	0.000	0.000	21.642
1989	KS	Effort	23332	23332	23332	23332	23332	23332	23332	23332	23332	23332	23332
1989	LL	Catch	0	0	0	0	0	25.29	16.98	0	0	0	42.27
1989	LL	CPUE	0.000	0.000	0.000	0.000	0.000	2.013	1.351	0.000	0.000	0.000	3.364
1989	LL	Effort	12566	12566	12566	12566	12566	12566	12566	12566	12566	12566	12566
1989		Total catch	121.05	0	381.08	1701.27	0	303.21	65.81	202.65	0.41	28.59	2804.07
1990	CH	Catch	4.41	0	2	1160.95	0	0	0	2.28	0	15.84	1185.48
1990	CH	CPUE	0.065	0.000	0.029	17.084	0.000	0.000	0.000	0.034	0.000	0.233	17.445
1990	CH	Effort	67956	67956	67956	67956	67956	67956	67956	67956	67956	67956	67956
1990	GN	Catch	53.24	0	0	0	0	373.21	5.55	0	0	1.53	433.53
1990	GN	CPUE	0.411	0.000	0.000	0.000	0.000	2.882	0.043	0.000	0.000	0.012	3.347
1990	GN	Effort	129509	129509	129509	129509	129509	129509	129509	129509	129509	129509	129509
1990	KS	Catch	3.36	0	54.6	8.24	0	0	0	3.44	0	0	69.64
1990	KS	CPUE	0.671	0.000	10.898	1.645	0.000	0.000	0.000	0.687	0.000	0.000	13.900
1990	KS	Effort	5010	5010	5010	5010	5010	5010	5010	5010	5010	5010	5010
1990	LL	Catch	0	0	0	0	0	15.81	33.82	0	0	0	49.63
1990	LL	CPUE	0.000	0.000	0.000	0.000	0.000	1.500	3.209	0.000	0.000	0.000	4.709
1990	LL	Effort	10540	10540	10540	10540	10540	10540	10540	10540	10540	10540	10540
1990		Total catch	61.01	0	56.6	1169.19	0	389.02	39.37	5.72	0	17.37	1738.28
1991	CH	Catch	1	0	0	633.65	0	0	0.5	0	0	0	635.15
1991	CH	CPUE	0.022	0.000	0.000	14.062	0.000	0.000	0.011	0.000	0.000	0.000	14.095
1991	CH	Effort	45062	45062	45062	45062	45062	45062	45062	45062	45062	45062	45062
1991	GN	Catch	15.11	0	0	0	0	109.84	10.85	0	0.17	0.6	136.57
1991	GN	CPUE	0.361	0.000	0.000	0.000	0.000	2.624	0.259	0.000	0.004	0.014	3.263
1991	GN	Effort	41858	41858	41858	41858	41858	41858	41858	41858	41858	41858	41858
1991	KS	Catch	0	0	22.24	0.16	0	0	0	270.72	0	0	293.12
1991	KS	CPUE	0.000	0.000	8.084	0.058	0.000	0.000	0.000	98.408	0.000	0.000	106.550
1991	KS	Effort	2751	2751	2751	2751	2751	2751	2751	2751	2751	2751	2751
1991	LL	Catch	0	0	0	0	0	1.13	3.15	0	0	0	4.28
1991	LL	CPUE	0.000	0.000	0.000	0.000	0.000	0.296	0.826	0.000	0.000	0.000	1.122
1991	LL	Effort	3814	3814	3814	3814	3814	3814	3814	3814	3814	3814	3814
1991		Total catch	16.11	0	22.24	633.81	0	110.97	14.5	270.72	0.17	0.6	1069.12

Year	Gear	Statistic	Chambo	Other Tilapia	Kambuzi	Utaka	Chisawasawa	Kampango	Mlamba	Usipa	Nchila	Others	TOTAL
1992	CH	Catch	0	0	1.65	500.17	0	0	0	5.58	0	171.29	678.69
1992	CH	CPUE	0.000	0.000	0.043	12.948	0.000	0.000	0.000	0.144	0.000	4.434	17.570
1992	CH	Effort	38628	38628	38628	38628	38628	38628	38628	38628	38628	38628	38628
1992	GN	Catch	5.67	0	0	0	0	75.92	12.17	0	0.08	10.3	104.14
1992	GN	CPUE	0.107	0.000	0.000	0.000	0.000	1.431	0.229	0.000	0.002	0.194	1.963
1992	GN	Effort	53042	53042	53042	53042	53042	53042	53042	53042	53042	53042	53042
1992	KS	Catch	3.87	0	94.29	0	0	0.39	1.73	28.92	0	0	129.2
1992	KS	CPUE	0.411	0.000	10.016	0.000	0.000	0.041	0.184	3.072	0.000	0.000	13.724
1992	KS	Effort	9414	9414	9414	9414	9414	9414	9414	9414	9414	9414	9414
1992	LL	Catch	0	0	0	0	0	0	4.1	0	0	0	4.1
1992	LL	CPUE	0.000	0.000	0.000	0.000	0.000	0.000	3.108	0.000	0.000	0.000	3.108
1992	LL	Effort	1319	1319	1319	1319	1319	1319	1319	1319	1319	1319	1319
1992	MN	Catch	0	0	0	0	0	0	0	3.59	0	4.87	8.46
1992	MN	CPUE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.973	0.000	8.103	14.077
1992	MN	Effort	601	601	601	601	601	601	601	601	601	601	601
1992		Total catch	9.54	0	95.94	500.17	0	76.31	18	38.09	0.08	186.46	924.59
1993	CH	Catch	5.23	0	0	626.7	0	0.05	0	48.33	0	44.79	725.1
1993	CH	CPUE	0.111	0.000	0.000	13.357	0.000	0.001	0.000	1.030	0.000	0.955	15.454
1993	CH	Effort	46920	46920	46920	46920	46920	46920	46920	46920	46920	46920	46920
1993	GN	Catch	1.04	0	0	1.5	0	52.68	17.59	0	0	0.66	73.47
1993	GN	CPUE	0.031	0.000	0.000	0.044	0.000	1.559	0.521	0.000	0.000	0.020	2.174
1993	GN	Effort	33789	33789	33789	33789	33789	33789	33789	33789	33789	33789	33789
1993	KS	Catch	7.73	0	78.47	0	0	12.89	4.05	213.2	0	0	316.34
1993	KS	CPUE	1.163	0.000	11.802	0.000	0.000	1.939	0.609	32.065	0.000	0.000	47.577
1993	KS	Effort	6649	6649	6649	6649	6649	6649	6649	6649	6649	6649	6649
1993		Total catch	14	0	78.47	628.2	0	65.62	21.64	261.53	0	45.45	1114.91
1994	CH	Catch	3.44	0	13.54	1677.63	0	0	0.24	0	0	114.95	1809.8
1994	CH	CPUE	0.063	0.000	0.246	30.518	0.000	0.000	0.004	0.000	0.000	2.091	32.922
1994	CH	Effort	54972	54972	54972	54972	54972	54972	54972	54972	54972	54972	54972
1994	GN	Catch	0.75	0	0	0	0	21.71	9.77	0	2.78	2.3	37.31
1994	GN	CPUE	0.032	0.000	0.000	0.000	0.000	0.920	0.414	0.000	0.118	0.097	1.581
1994	GN	Effort	23595	23595	23595	23595	23595	23595	23595	23595	23595	23595	23595
1994	KS	Catch	0.9	0	39.49	5.89	0	0.79	0	17.76	0	2.45	67.28
1994	KS	CPUE	0.134	0.000	5.864	0.875	0.000	0.117	0.000	2.637	0.000	0.364	9.991
1994	KS	Effort	6734	6734	6734	6734	6734	6734	6734	6734	6734	6734	6734
1994	LL	Catch	0	0	0	0	0	0	0.31	0	0	0	0.31
1994	LL	CPUE	0.000	0.000	0.000	0.000	0.000	0.000	0.143	0.000	0.000	0.000	0.143
1994	LL	Effort	2170	2170	2170	2170	2170	2170	2170	2170	2170	2170	2170
1994		Total catch	5.09	0	53.03	1683.52	0	22.5	10.01	17.76	2.78	119.7	1914.39

Year	Gear	Statistic	Chambo	Other Tilapia	Kambuzi	Utaka	Chisawasawa	Kampango	Mlamba	Usipa	Nchila	Others	TOTAL
1995	CH	Catch	24.82	0	17.5	404.34	5.25	0	0	167.04	0	13.44	632.39
1995	CH	CPUE	0.545	0.000	0.384	8.879	0.115	0.000	0.000	3.668	0.000	0.295	13.887
1995	CH	Effort	45537	45537	45537	45537	45537	45537	45537	45537	45537	45537	45537
1995	GN	Catch	0.1	0	0	0.14	0	2.24	0.17	0	0	0.49	3.14
1995	GN	CPUE	0.036	0.000	0.000	0.050	0.000	0.800	0.061	0.000	0.000	0.175	1.121
1995	GN	Effort	2801	2801	2801	2801	2801	2801	2801	2801	2801	2801	2801
1995	KS	Catch	0.16	0	15.15	0	0	0	0	14.26	0	0	29.57
1995	KS	CPUE	0.072	0.000	6.852	0.000	0.000	0.000	0.000	6.450	0.000	0.000	13.374
1995	KS	Effort	2211	2211	2211	2211	2211	2211	2211	2211	2211	2211	2211
1995	LL	Catch	0	0	0	0	0	0.13	0.67	0	0	0	0.8
1995	LL	CPUE	0.000	0.000	0.000	0.000	0.000	0.531	2.735	0.000	0.000	0.000	3.265
1995	LL	Effort	245	245	245	245	245	245	245	245	245	245	245
1995		Total catch	25.08	0	32.65	404.48	5.25	2.37	0.84	181.3	0	13.93	665.9
1996	CH	Catch	4.26	0	6.88	452.49	0	0	0	128.67	0	22.82	615.12
1996	CH	CPUE	0.093	0.000	0.150	9.892	0.000	0.000	0.000	2.813	0.000	0.499	13.447
1996	CH	Effort	45743	45743	45743	45743	45743	45743	45743	45743	45743	45743	45743
1996	GN	Catch	0	0	0.53	4.89	0	3.72	0.49	0	0	0.58	10.21
1996	GN	CPUE	0.000	0.000	0.090	0.830	0.000	0.631	0.083	0.000	0.000	0.098	1.733
1996	GN	Effort	5891	5891	5891	5891	5891	5891	5891	5891	5891	5891	5891
1996	KS	Catch	0	0	39.79	0	0	0	0	7.15	0	0	46.94
1996	KS	CPUE	0.000	0.000	15.696	0.000	0.000	0.000	0.000	2.821	0.000	0.000	18.517
1996	KS	Effort	2535	2535	2535	2535	2535	2535	2535	2535	2535	2535	2535
1996	LL	Catch	0	0	0	0	0	0	0.48	0	0	0	0.48
1996	LL	CPUE	0.000	0.000	0.000	0.000	0.000	0.000	0.873	0.000	0.000	0.000	0.873
1996	LL	Effort	550	550	550	550	550	550	550	550	550	550	550
1996	MN	Catch	0	0	0	0	0	0	0	26.28	0	0	26.28
1996	MN	CPUE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	17.626	0.000	0.000	17.626
1996	MN	Effort	1491	1491	1491	1491	1491	1491	1491	1491	1491	1491	1491
1996		Total catch	4.26	0	47.2	457.38	0	3.72	0.97	162.1	0	23.4	699.03
1997	CH	Catch	0.34	0	3.03	217.83	0	0	0	380.7	0	17.98	619.88
1997	CH	CPUE	0.006	0.000	0.056	4.016	0.000	0.000	0.000	7.020	0.000	0.332	11.430
1997	CH	Effort	54234	54234	54234	54234	54234	54234	54234	54234	54234	54234	54234
1997	GN	Catch	0	0.52	0	0.84	0	6.5	1.69	0	1.03	4.63	15.21
1997	GN	CPUE	0.000	0.041	0.000	0.067	0.000	0.515	0.134	0.000	0.082	0.367	1.206
1997	GN	Effort	12615	12615	12615	12615	12615	12615	12615	12615	12615	12615	12615
1997	KS	Catch	0	0	25.81	0	0	0	0	34.15	0	1.5	61.46
1997	KS	CPUE	0.000	0.000	4.665	0.000	0.000	0.000	0.000	6.172	0.000	0.271	11.108
1997	KS	Effort	5533	5533	5533	5533	5533	5533	5533	5533	5533	5533	5533
1997	MN	Catch	0	0	0	0	0	0	0	5.67	0	0	5.67
1997	MN	CPUE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.501	0.000	0.000	8.501
1997	MN	Effort	667	667	667	667	667	667	667	667	667	667	667
1997		Total catch	0.34	0.52	28.84	218.67	0	6.5	1.69	420.52	1.03	24.11	702.22

Year	Gear	Statistic	Chambo	Other Tilapia	Kambuzi	Utaka	Chisawasawa	Kampango	Mlamba	Usipa	Nchila	Others	TOTAL
1998	CH	Catch	0	0	33.22	168.36	2.84	0.66	0.26	84.93	0	10.72	300.99
1998	CH	CPUE	0.000	0.000	0.671	3.398	0.057	0.013	0.005	1.714	0.000	0.216	6.076
1998	CH	Effort	49541	49541	49541	49541	49541	49541	49541	49541	49541	49541	49541
1998	GN	Catch	0.27	0	0	3.44	0	11.2	2.39	0	0	1.27	18.57
1998	GN	CPUE	0.013	0.000	0.000	0.168	0.000	0.546	0.116	0.000	0.000	0.062	0.905
1998	GN	Effort	20530	20530	20530	20530	20530	20530	20530	20530	20530	20530	20530
1998	KS	Catch	0	0	19.18	0	0	0.26	0	35	0	0	54.44
1998	KS	CPUE	0.000	0.000	5.933	0.000	0.000	0.080	0.000	10.826	0.000	0.000	16.839
1998	KS	Effort	3233	3233	3233	3233	3233	3233	3233	3233	3233	3233	3233
1998	LL	Catch	0	0	0	0	0	0	0.87	0	0	0	0.87
1998	LL	CPUE	0.000	0.000	0.000	0.000	0.000	0.000	0.833	0.000	0.000	0.000	0.833
1998	LL	Effort	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044
1998		Total catch	0.27	0	52.4	171.8	2.84	12.12	3.52	119.93	0	11.99	374.87
1999	CH	Catch	1.73	0	26.1	325.17	0	0	0	13.23	0	1.79	368.02
1999	CH	CPUE	0.053	0.000	0.802	9.991	0.000	0.000	0.000	0.407	0.000	0.055	11.308
1999	CH	Effort	32546	32546	32546	32546	32546	32546	32546	32546	32546	32546	32546
1999	GN	Catch	0	0	2.46	14.43	5.54	7.63	1.36	0	0	1.91	33.33
1999	GN	CPUE	0.000	0.000	0.061	0.360	0.138	0.191	0.034	0.000	0.000	0.048	0.833
1999	GN	Effort	40030	40030	40030	40030	40030	40030	40030	40030	40030	40030	40030
1999	KS	Catch	0	0	4.19	2.81	0	0	0	8.02	0	0	15.02
1999	KS	CPUE	0.000	0.000	2.682	1.799	0.000	0.000	0.000	5.134	0.000	0.000	9.616
1999	KS	Effort	1562	1562	1562	1562	1562	1562	1562	1562	1562	1562	1562
1999		Total catch	1.73	0	32.75	342.41	5.54	7.63	1.36	21.25	0	3.7	416.37