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DEPARTMENT OF NATIONAL PARKS AND WILDLIFE MANAGEMENT



**1996 FISHERIES STATISTICS
LAKE KARIBA - ZIMBABWE SHORE**

PROJECT REPORT NO. 89

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BOX 75
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LANDINGS SUMMARY

1. The Pelagic Fishery (Kapenta)

Basin	1995	1996
Sanyati	7713	8183
Bumi / Chalala	3568	3516
Sengwa	1825	1839
Binga & Mlibizi	2174	1885
Total	15280	15423

2. The Inshore Fishery

Area	Catch in tonnes	
	1995	1996
C1	50.65	36.85
C2	114.20	88.20
C3	8.60	17.71
C4	157.34	116.54
C5	92.13	69.47
C6	combined with C7	1.68
C7	29.55	<i>not recorded</i>
Total enumerated	393.20	289.34
Total estimate	1 175	957.89

Grand total for Zimbabwe

15 423 (Kapenta) + 957.89 (inshore) + 6.40 (tigerfish bycatch) = **16 387.29** tonnes

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THE PELAGIC (KAPENTA) FISHERY

Introduction

This section of the report covers Kapenta catch records from the Zimbabwean part of Lake Kariba. Data are compiled from returns which the Kapenta fishing companies submit to Lake Kariba Fisheries Research Institute every month. Tiger fish landings are not accurate because the fishermen rarely submit all their catches to their employers. However, the recorded landings give a general trend.


Kapenta usually constitute about 90% of the total catch from Lake Kariba. However, within the last few years there has been a substantial increase in the incidence of theft and illegal sales from rigs. The scale of such illegal activities is difficult to quantify but we estimate that at least 20% of the total Kapenta catch is illegally sold before landing and thus not recorded. The figures of the Kapenta landings presented in the report must therefore be viewed as an underestimate of the total catch.

Kapenta fishing operations are based at 11 sites (Figure 1b). Of the 306 rigs registered to 73 companies in 1996, returns were received from 279 rigs which are assumed to have been operating. For statistical purposes, catches are recorded for the 5 hydrological basins namely Mlibizi, Binga, Sengwa, Bumi and Kariba (also known as Sanyati). The catches from Binga and Mlibizi are combined as the operators in these regions share common fishing grounds. Bumi and Chalala also use the same fishing grounds.

Operators are restricted to fishing in areas where water depth is greater than 20 metres and 3 km from developed areas along the shoreline. Fishing is not allowed in Leisure Bay, Charara Bay, Masango Bay, Gache Gache Bay and also in river mouths (Figure 1a).

There is a need for Kapenta operators to step up control and management of their employees in order to limit the scale of illegal sales and theft from rigs. Since the Kapenta operators, are fully responsible for their employees, they should consider coming together to form an independent Kapenta guard unit which operates at night to prevent thefts. The Department of National Parks and Wildlife Management could provide assistance to such a unit.

Figure 1a : Kapenta Fishing Zones (basins) on Lake Kariba

- B1 & B2 - Binga / Mlibizi :- from Mlibizi to Chete Gorge
 - B3 - Sengwa :- from Chete Gorge to Sibilobilo Narrows
 - B4 - Bumi / Chalala :- from Sibilobilo Narrows to a straight line joining Forthergill & Msambakaruma Islands
 - B5 - Sanyati :- from a straight line joining Forthergill & Msambakaruma Islands to the Dam Wall
-  No fishing areas

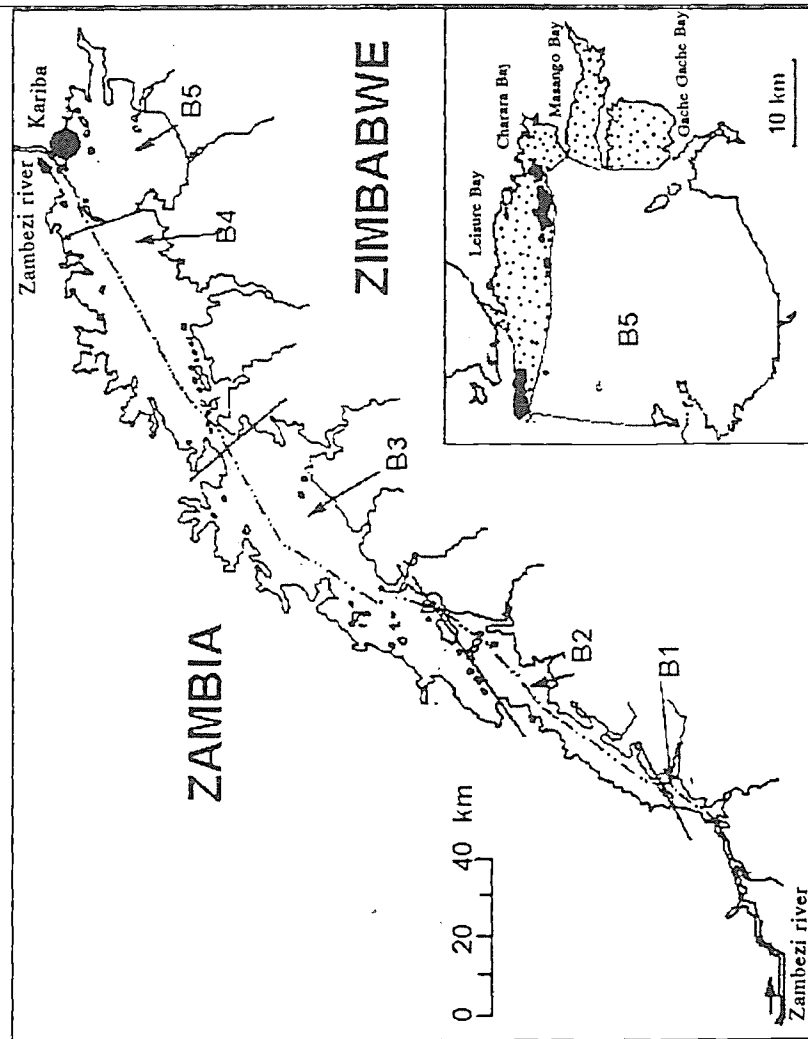


Figure 1b : Location of Kapenta fishing bases on Lake Kariba

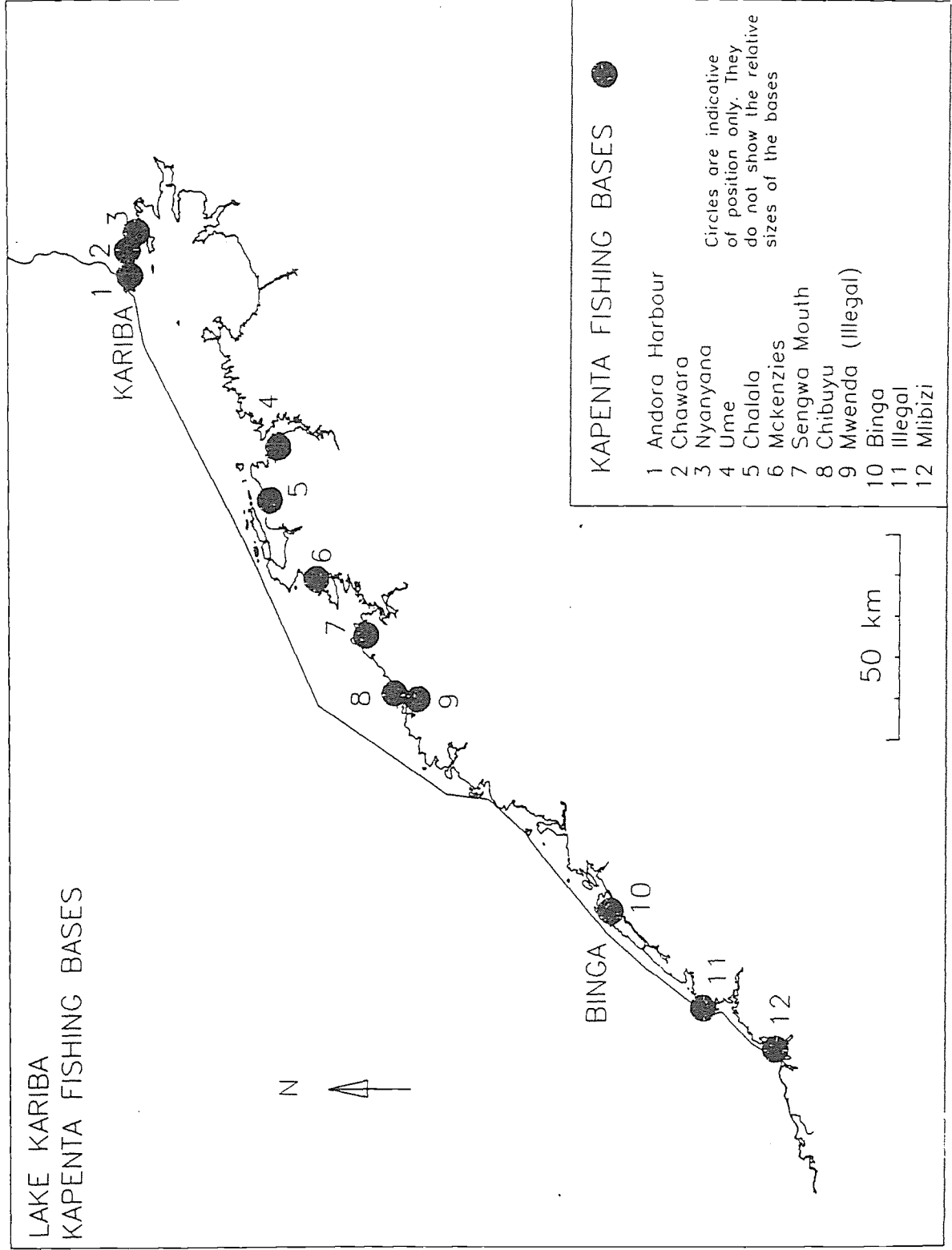


Figure 2a : Percentage of total Kapenta landings for each basin, 1996

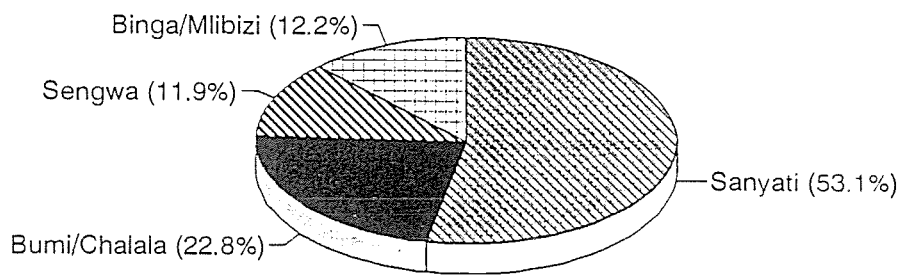


Figure 2b : Percentage of total number of rigs that fished per basin, 1996

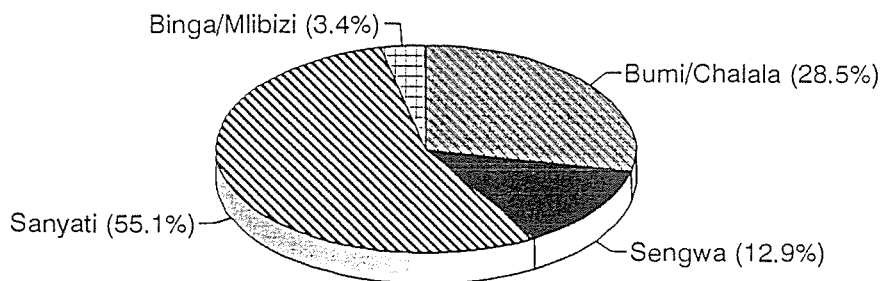


Figure 3 : Trends in the Kapenta fishery, 1974 - 1996 (CPUE; Catch; Effort)

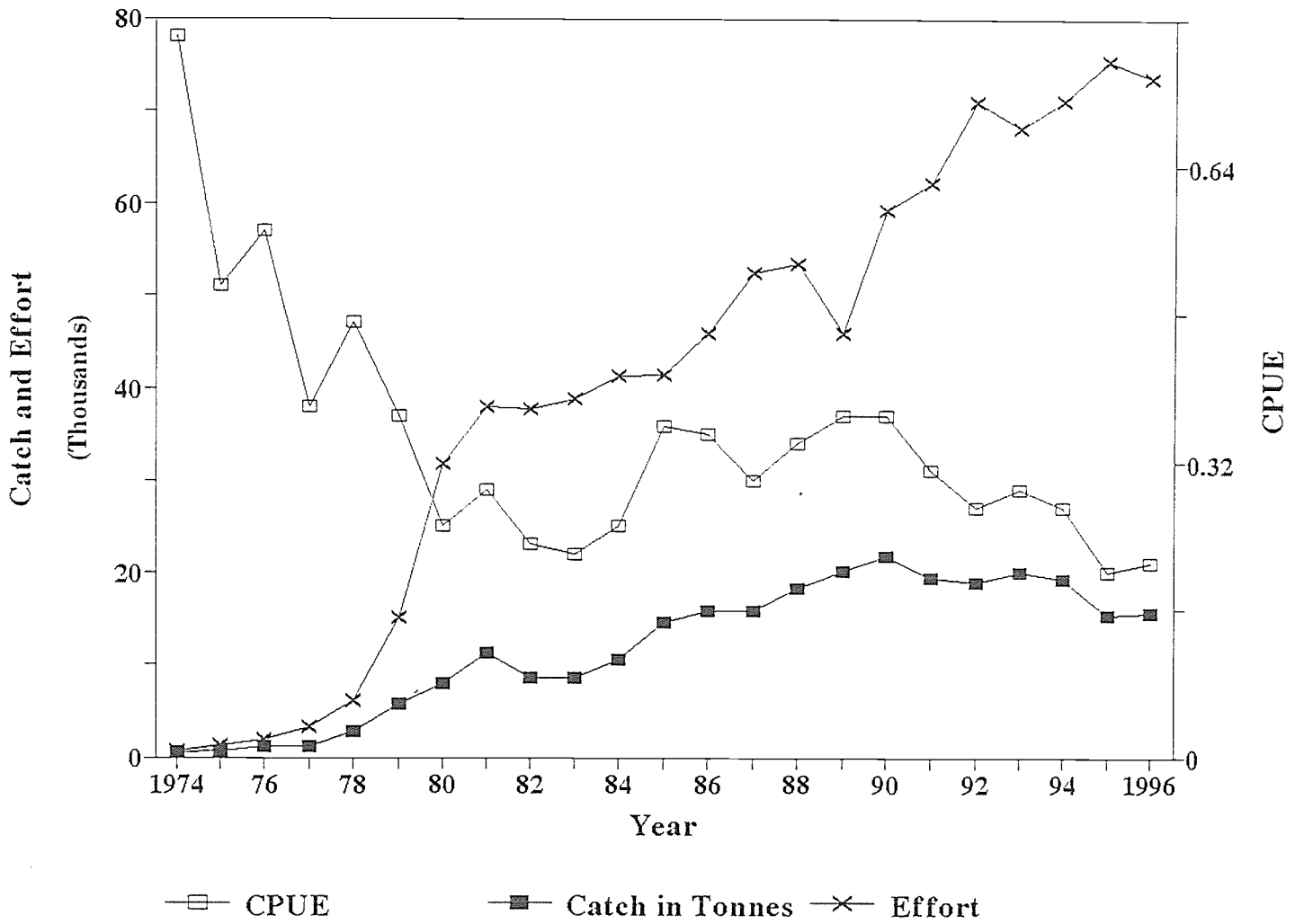


Table 1 : Landings (tonnes) of Kapenta, 1974 - 1996

YEAR	AREA					TOTAL
	Sanyati	Bumi	Chalala	Sengwa	Binga / Mlibizi	
1974	488					488
1975	656					656
1976	1050					1050
1977	1172					1172
1978	2770			35		2805
1979	5475	78	8	75	96	5732
1980	5938	173	1261	115	465	7952
1981	7408	285	2879	175	390	11137
1982	5249	234	2544	113	310	8450
1983	5590	170	2516	96	176	8548
1984	6286	305	3417	74	312	10394
1985	9179	338	4658	105	306	14586
1986	9077	369	4912	944	445	15747
1987	8194	288	4847	1832	662	15823
1988	8799	186	5975	2513	893	18366
1989	10199	146	6036	2438	1293	20112
1990	11143	194	5977	2692	1752	21758
1991	9867	92	4893	2714	1740	19306
1992	10371	4620		2279	1660	18937
1993	10690	5330		2139	1794	19958
1994	10216	4961		2295	1760	19232
1995	7713	3568		1825	2174	15280
1996	8183	3516		1839	1885	15423

Figure 4 : Trends in the Kapenta fishery by basin, 1979 to 1996

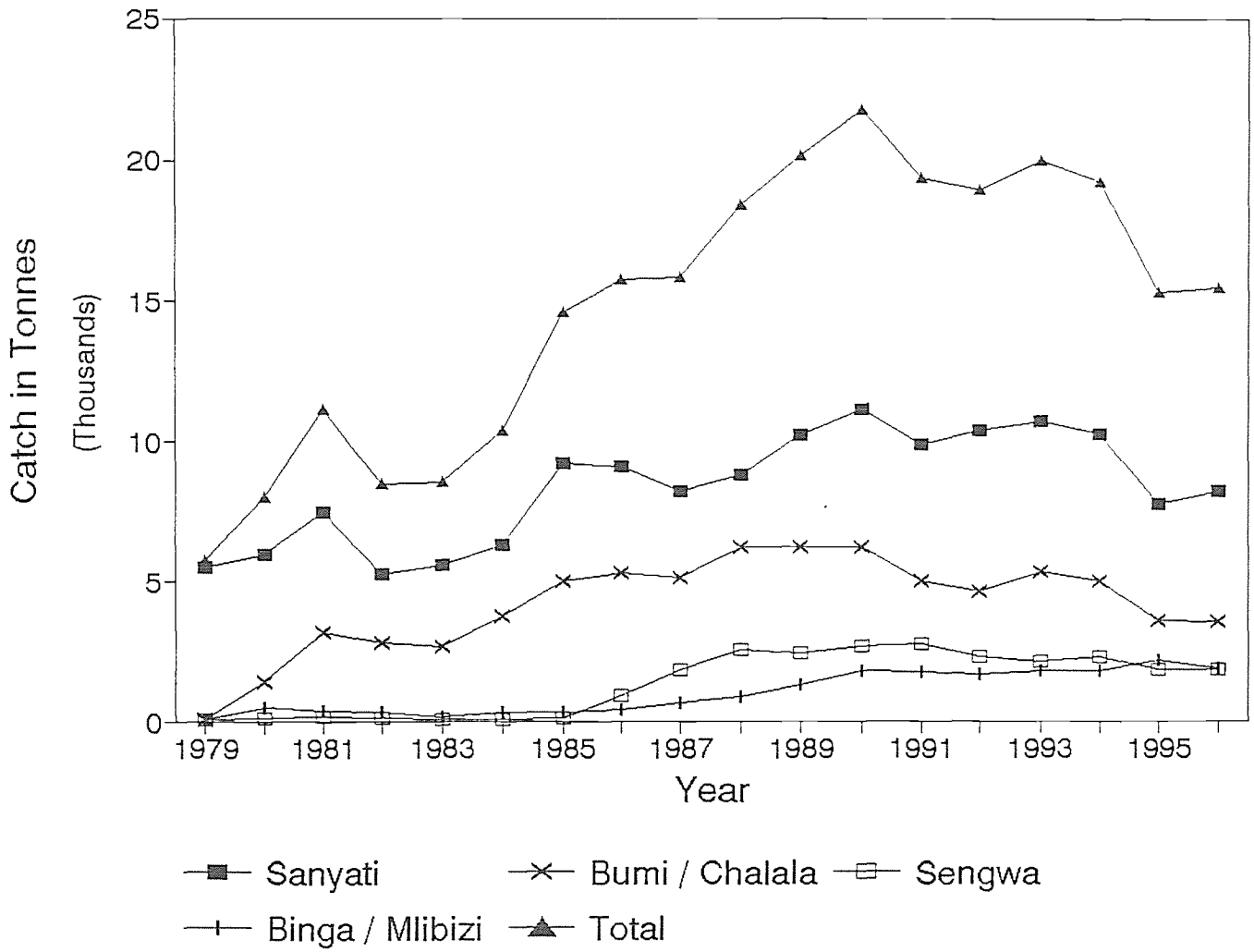


Table 2 : Total effort (unit night) in the Kapenta fishery, 1974 - 1996

YEAR	AREA					TOTAL
	Sanyati	Bumi	Chalala	Sengwa	Binga / Mlibizi	
1974	616					616
1975	1298					1298
1976	1833					1833
1977	3114					3114
1978	5877			96		5973
1979	14003	195	43	324	543	15108
1980	22775	789	6046	586	1551	31747
1981	24393	1770	9953	668	1188	37972
1982	23816	1467	10560	539	1394	37776
1983	24481	1036	11643	642	1063	38865
1984	25112	1077	13253	499	1293	41234
1985	24245	1155	14319	449	1235	41403
1986	26153	1245	15140	1688	1564	45790
1987	29702	1410	15966	3544	1792	52414
1988	29501	1002	16120	4356	2424	53403
1989	28670	887	16716	4957	3689	45919
1990	31160	952	16854	5396	4831	59193
1991	33133	666	17255	6314	4840	62208
1992	37544	20053		7359	6109	71066
1993	37533	18883		5880	5859	68155
1994	36926	20395		8308	5620	71249
1995	37613	18678		9114	10038	75443
1996	38079	16536		8441	10468	73524

Table 3 : Monthly Kapenta catches (tonnes), 1996

YEAR	AREA				TOTAL
	Sanyati	Bumi / Chalala	Sengwa	Binga / Mlibizi	
January	318	142	78	151	753
February	538	158	113	144	953
March	587	174	126	130	1017
April	547	148	112	97	904
May	505	280	204	105	1095
June	470	353	163	157	1142
July	619	373	197	150	1340
August	1113	540	250	211	2114
September	1208	587	278	333	2406
October	907	293	127	190	1517
November	837	215	90	93	1236
December	470	251	100	124	945
Total	8183	3516	1839	1885	15423

Figure 5 : Monthly trends in Kapenta catches, 1996

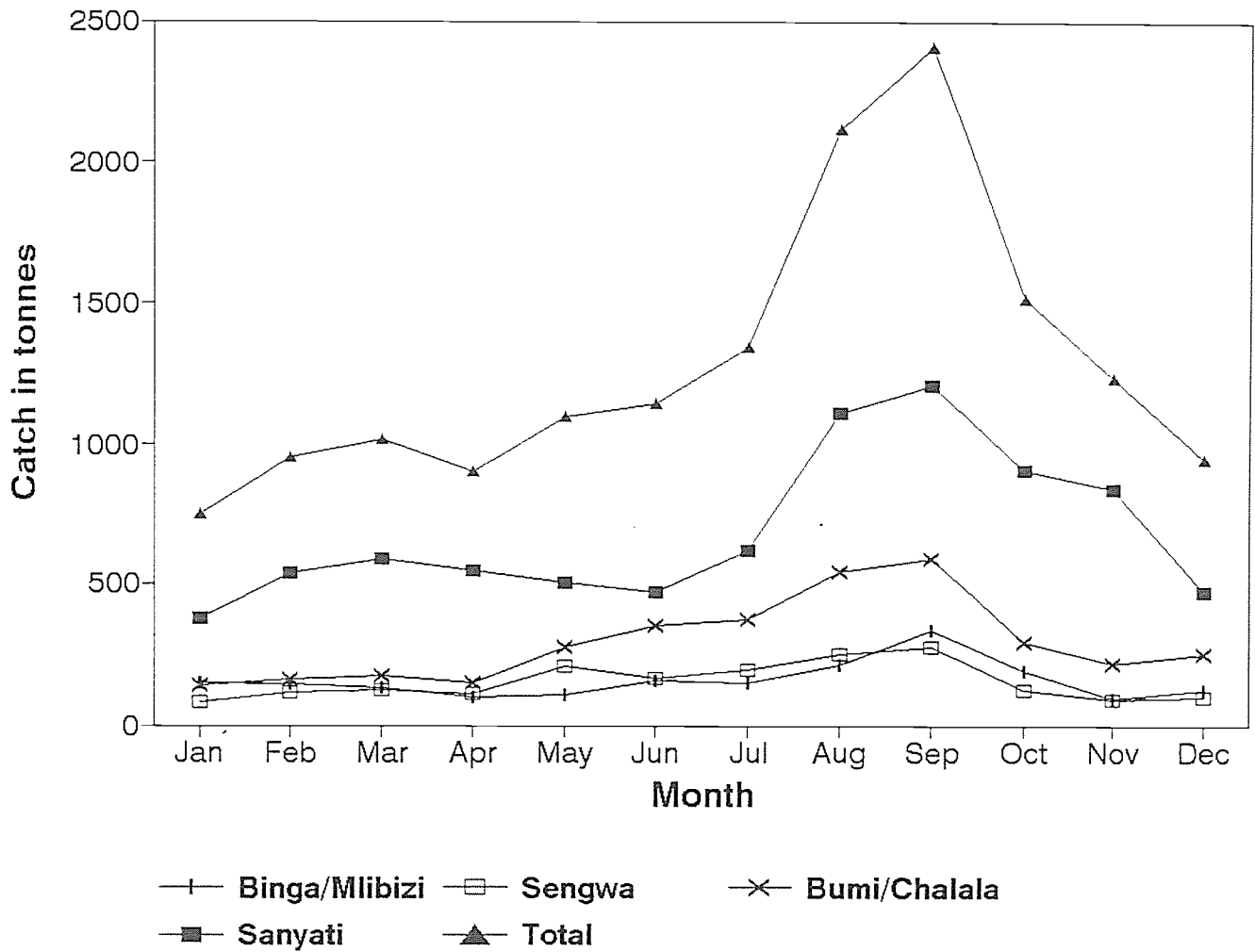


Table 4 : Mean catch per unit effort (tonnes/boat/night) of Kapenta, 1974 -1996

YEAR	AREA					TOTAL
	Sanyati	Bumi	Chalala	Sengwa	Binga / Mlibizi	
1974	0.78					0.78
1975	0.51					0.51
1976	0.57					0.57
1977	0.38					0.38
1978	0.47				0.36	0.47
1979	0.34	0.40	0.19	0.26	0.18	0.37
1980	0.26	0.22	0.21	0.20	0.31	0.25
1981	0.30	0.17	0.29	0.26	0.23	0.29
1982	0.22	0.16	0.25	0.21	0.24	0.23
1983	0.23	0.16	0.22	0.18	0.17	0.22
1984	0.25	0.28	0.26	0.17	0.24	0.25
1985	0.40	0.36	0.30	0.23	0.27	0.36
1986	0.35	0.26	0.36	0.53	0.30	0.35
1987	0.26	0.15	0.30	0.50	0.36	0.30
1988	0.29	0.19	0.37	0.58	0.37	0.34
1989	0.36	0.16	0.36	0.49	0.35	0.37
1990	0.36	0.20	0.35	0.50	0.36	0.37
1991	0.29	0.13	0.28	0.43	0.35	0.31
1992	0.27		0.23	0.36	0.27	0.27
1993	0.28		0.28	0.36	0.30	0.29
1994	0.28		0.24	0.28	0.31	0.27
1995	0.22		0.19	0.2	0.22	0.2
1996	0.21		0.11	0.22	0.34	0.21

Table 5 : Monthly fishing effort (boat night) for Kapenta, 1996

MONTH	AREA					TOTAL
	Mlibizi	Binga	Sengwa	Bumi / Chalala	Sanyati	
January	114	693	721	1317	2777	5622
February	145	663	815	1535	3038	6196
March	169	716	723	1516	3367	6491
April	163	662	606	1282	3099	5812
May	166	716	644	1410	3159	6095
June	163	726	678	1474	3228	6269
July	164	692	658	1356	3290	6160
August	155	766	770	1486	3338	6515
September	150	745	691	1440	3264	6290
October	158	788	715	1416	3387	6464
November	150	742	750	1093	3371	6106
December	132	730	670	1211	2761	5504
Total	1829	8639	8441	16536	38079	73524

Table 6 : Monthly tigerfish by-catch in kilograms (from Kapenta rigs), 1996

MONTH	AREA				TOTAL
	Sanyati	Bumi / Chalala	Sengwa	Binga / Mlibizi	
January	159	1	11	95	265
February	161	2	14	77	253
March	255	3	18	124	399
April	187	14	16	548	764
May	136	4	31	652	822
June	93	8	54	879	1035
July	73	9	44	419	544
August	121	12	68	386	586
September	64	5	98	176	343
October	273	2	37	143	455
November	341	76	66	171	654
December	77	9	21	212	319
Total	1939	143	476	3882	6440

Figure 6 : Monthly trends in tigerfish by-catch, 1996

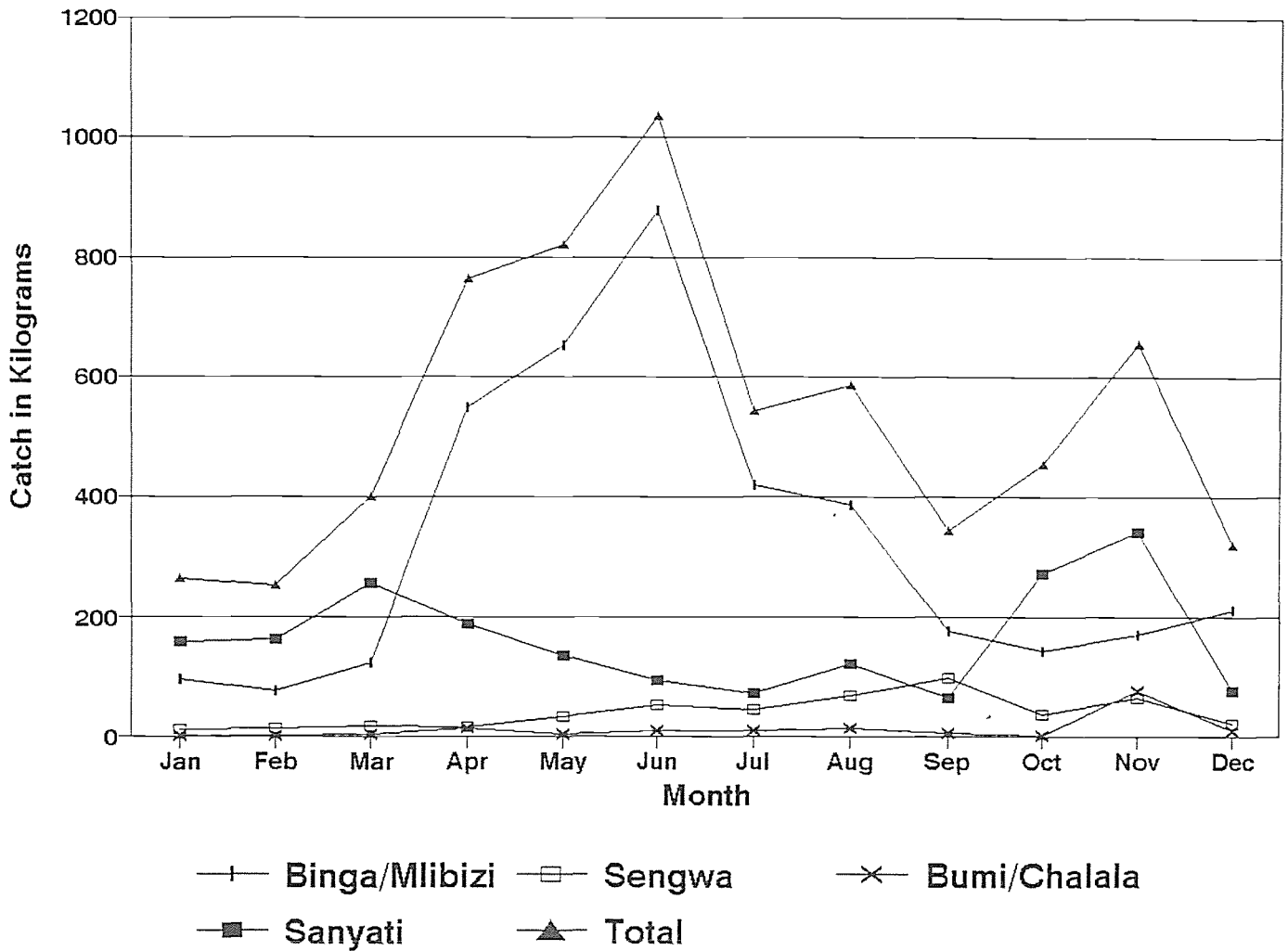


Table 7 : Tigerfish by-catch (tonnes), 1974 - 1996

YEAR	AREA					TOTAL
	Sanyati	Bumi	Chalala	Sengwa	Binga / Mlibizi	
1974	18					18
1975	81					81
1976	91					91
1977	138					138
1978	129			1		130
1979	64	1		3	2	70
1980	41	1		2	5	49
1981	54	6	2	1	2	65
1982	44	3	1	1	1	50
1983	45	4	3	1	1	54
1984	22	2	2	-	1	27
1985	22	1	2	1	-	26
1986	40	2	19	3	3	67
1987	31	2	6	3	2	44
1988	8	1	3	1	2	15
1989	11	0.5	4	1	3	19.5
1990	14	0.5	4	3	5	26.5
1991	8	0	2	1	1	12
1992	8	1.4	1.1	1.1	2.8	13.7
1993	4.8	1.2		1.3	3	10.3
1994	12.1	3.2		2.1	1.8	19.2
1995	4	0.3		0.6	2.9	7.8
1996	1.9	0.1		0.5	3.9	6.4

THE INSHORE FISHERY

Sampling in the Inshore Fishery

The sampling system in use has been designed to provide a statistically valid catch estimation for the whole of the Zimbabwe inshore fishery on Lake Kariba. Whereas the Kapenta data represent total actual landed catches, data from the artisanal fishery are from sampled catches. Thus all figures presented for the artisanal fishery are estimates. The exceptions are the data from Nyaodza, Gache Gache and Luyando co-operatives which submit returns for the whole year reflecting the actual total landings. The fishing areas are divided into 7 zones, C1 to C7 (Figure 7) thus all areas and all basins are represented. The fishing activities are simplified because there is only one type of gear (gill-nets) used throughout the whole inshore fishery of Zimbabwe.

The Kapenta, which occupy the open pelagic waters of the lake represent a unit stock which is harvested by both Zimbabwe and Zambia; whereas the artisanal fishery exploits inshore species which, in general, occupy water less than 10m deep along the shoreline. The Zambian and Zimbabwean inshore fisheries may therefore be considered to be exploiting two separate stocks. The inshore fishery of Zambia therefore has no influence upon the inshore fishery of Zimbabwe and vice versa.

As it is not possible to sample all villages nor the total landings for any particular village for the whole year, 10 representative villages are enumerated for 10 days every month. The sampled catch is raised to an estimate of the total catch per village by multiplying by the ratio between total number of days sampled and days in the year. To estimate the total catch for the Zimbabwean side of the lake, the ratio between the number of fishermen in the villages sampled and the total number of fishermen on the Zimbabwean side of the lake is used.

The above calculations make the assumption that fishing takes place on 360 days and that the catchability of the species is the same throughout the whole lake. It is also assumed that the number of active fishermen per village is approximately the same throughout the year.

National Parks regulations state that each fisherman is allowed a maximum of 5 gill-nets with a minimum mesh size of 100mm, and conformation to this regulation is assumed for catch effort calculations.

The main species in the inshore fishery are the breams *Oreochromis mortimeri*, *Sargochromis codringtonii*, *Tilapia rendalli*; the cyprinid *Labeo altivelis*; the tigerfish *Hydrocynus vittatus*; the mormyrid *Mormyrus longirostris*; the barbel *Clarius gariepinus* and the squeaker *Synodontis zambezensis*.

Figure 7 : Location of Artisanal fishing villages on Lake Kariba

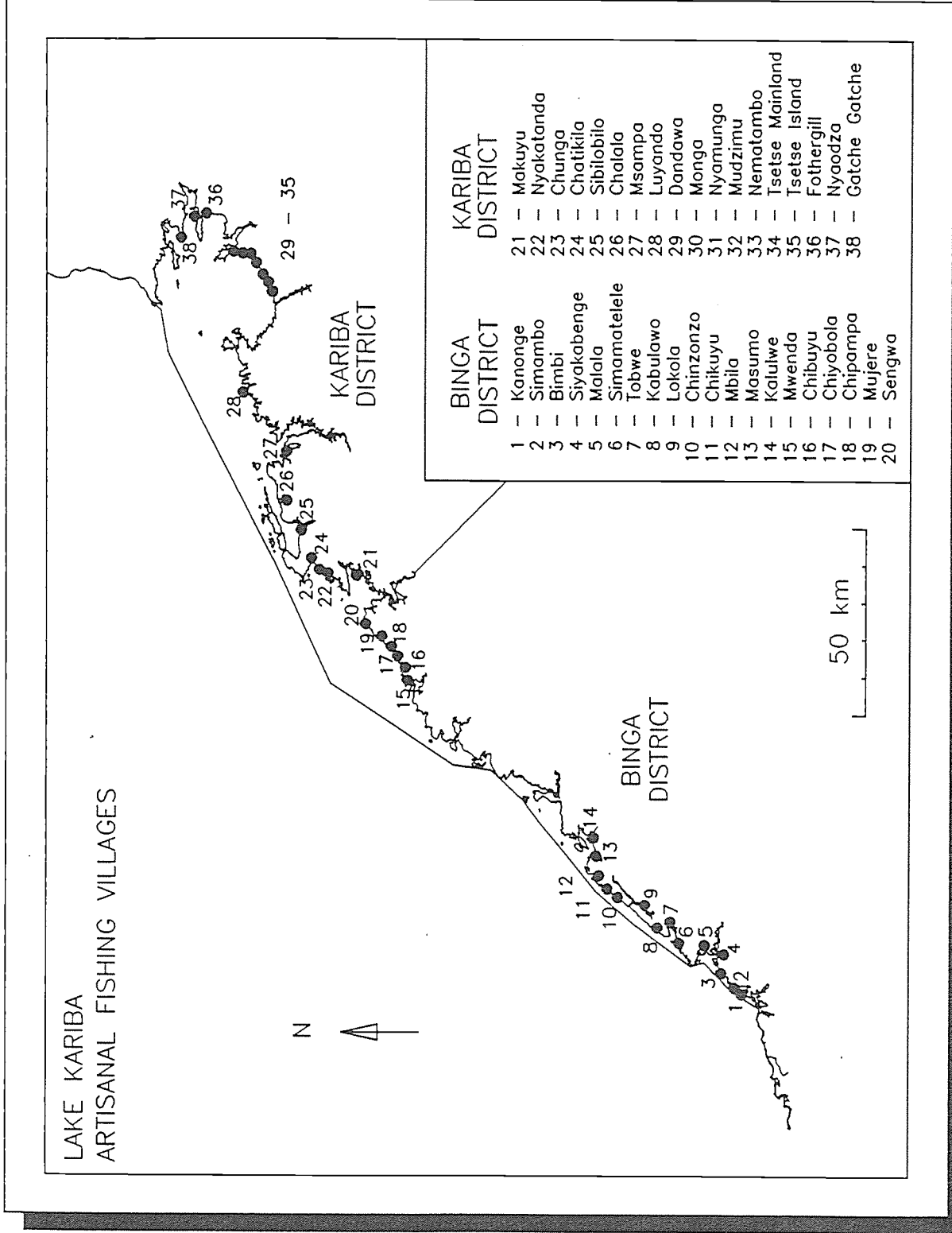


Table 8: Illustration of estimation of data in enumerated villages in Inshore Fishery

AREA	CAMP CODE	CAMP NAME	TOTAL SAMPLED CATCH in tonnes	TOTAL SAMPLED EFFORT (no. of nets x 45m)	CPUE for sample (c/d) kg/100m	TOTAL FISHERMEN (FROM FRAME SURVEY 1993)	TOTAL SAMPLED DAYS	ESTIMATED TOTAL CATCH (C X 360) / G	ESTIMATED TOTAL EFFORT (D X 360) / G
A	B	C	D	E	F	G			
C2	6	Nematombo	4.63	84 150	5.5	38	80	20.85	378 675
	7	Mudzimu	4.07	69 795	5.8	11	70	20.93	358 946
	10	Dandawa	12.89	457 065	2.8	79	100	46.41	1 645 434
C4	12	Musamba	23.89	228 240	10.5	68	100	85.99	821 664
	14	Sibilobilo	6.79	200 880	3.4	55	80	30.55	903 960
C5	19	Makuyu	10.32	249 975	4.1	31	100	37.14	899 910
	22	Mujere	8.98	170 190	5.3	58	100	32.33	612 684
C6	43	Kalulwe	1.68	56 790	3.0	38	40	15.13	511 110
C7	39	Simambo	-	-	-	-	-	-	-
TOTAL			73.25	1 517 085	4.8	378	670	289.34	6 132 383

The actual total catch for co-op returns in area C1 & C3 is 72.26t and estimated total catch for enumerated villages is 289.34 tonnes. The total estimate for the whole lake is $289.34 \times \text{Total fishermen for the whole lake} + (\text{co-op Catches}) = 289.34 \times 1157 + 72.26 = 957.89\text{t}$
 Number of fishermern in the above villages 378

Table 9 : Estimated Catch and effort summary for enumerated villages, 1996

Village	Effort (metres)	Catch (tonnes)	CPUE (KG/100M)
Gache Gache co-op	295 200	8.73	2.96
Nyaodza co-op	521 055	28.11	5.39
Nematombo	378 675	20.85	5.51
Mudzimu	358 946	20.93	5.83
Dandawa	1 645 434	46.41	2.82
Luyando co-op	325 125	17.71	5.45
Musamba	821 664	85.99	10.47
Sibilobilo	903 960	30.55	3.38
Makuyu	899 910	37.14	4.13
Mujere	612 684	32.33	5.28
Kalulwe	511 110	15.13	2.96
Simambo	-	-	-
Total	7 273 763	343.90	4.73

All co-operatives in the above table are showing the actual sampled catch and effort data.

Table 10 : Estimated catch composition for 1996 based on enumerated villages

Species Name	Percentage %	Estimated catch in tonnes
<i>O. mortimeri</i>	13.4	38.80
<i>H. vittatus</i>	34.1	98.62
<i>C. gariepenus</i>	4.9	14.32
<i>M. longirostris</i>	12.3	35.48
<i>S. codringtonii</i>	10.1	29.19
<i>T. rendalli</i>	4.4	12.71
<i>L. altivelis</i>	7.4	21.60
<i>S. macrocephalus</i>	1	2.84
<i>M. anguilloides</i>	7.1	20.40
Others	5.3	15.38
Total	100	289.34

Figure 8a : Percentage catch per area of total landings in the Inshore Fishery, 1996

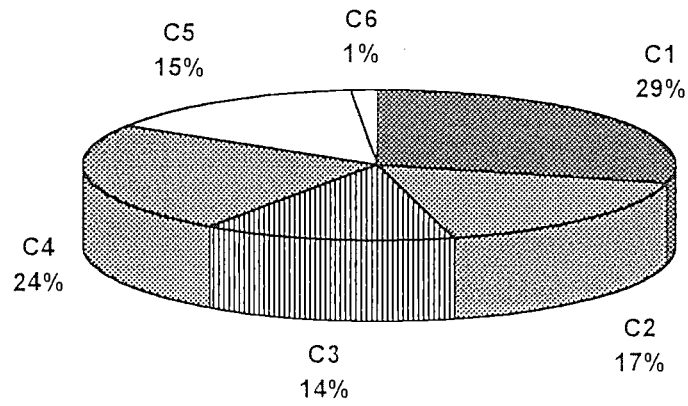


Figure 8b : Catch proportions of different species caught in the Inshore area

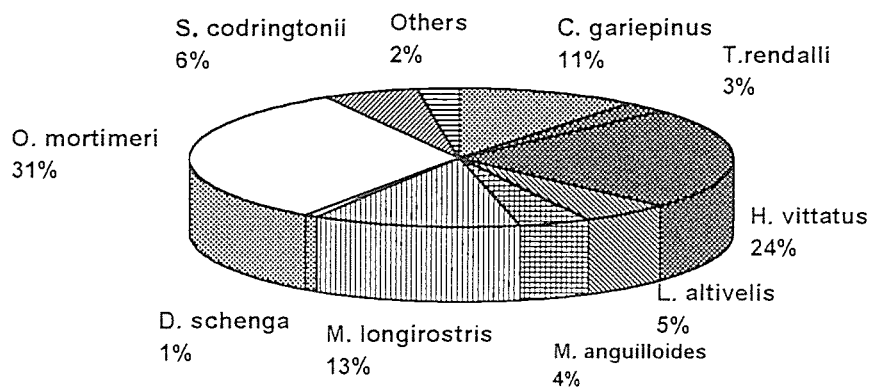


Figure 9 : Species composition of Inshore landings (%kg) by area

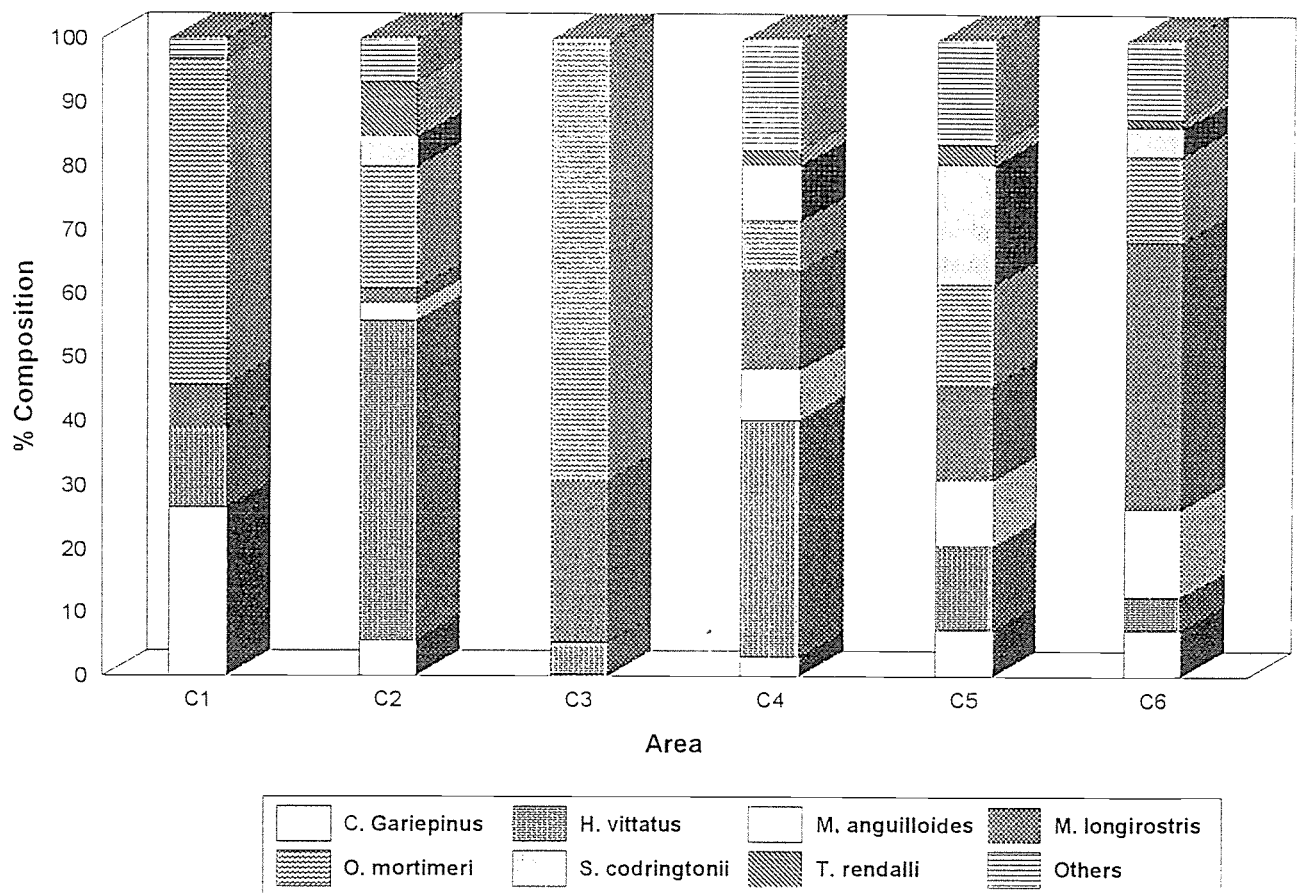


Table 11 : Catch and Effort for Gache Gache Co-operative Society, 1985-1996

Year	Total catch (tonnes)	Effort (metres)	CPUE (kg/100m)
1985	71.70	2591639	2.76
1986	69.46	1636286	4.24
1987	66.68	3884326	1.71
1988	56.41	1526070	3.69
1989	63.74	125206	5.09
1990	57.63	973573	5.91
1991	38.15	1143188	3.33
1992	27.37	821730	3.33
1993	37.56	669150	5.61
1994	26.82	852480	3.15
1995	43.97	665820	6.60
1996*	8.73	295 200	2.96

* Recorded up to May only.

Table 12 : Catch and Effort for Nyaodza Co-operative Society, 1987 to 1996

Year	Total catch (tonnes)	Effort (metres)	CPUE (kg/100m)
1987	44.31	2198277	2.01
1988	16.88	4312950	3.91
1989	21.21	591000	3.58
1990	28.92	449587	6.43
1991	31.19	393120	7.93
1992	16.77	594559	2.82
1993	14.29	609820	2.34
1994	21.28	505575	4.21
1995*	6.69	299700	2.23
1996	28.11	521 055	5.39

* Recorded up to May only.

Table 13 : Catch and Effort for Area C1, 1973 to 1996

Year	Effort (metres)	Total catch (tonnes)	CPUE (kg/100m)
1973	4245514	87.77	2.07
1974	4067000	171.12	4.21
1975	5823454	216.14	3.71
1976	4693325	184.89	3.94
1977	2585583	100.17	3.87
1978	4232470	178.57	4.22
1979	3604010	168.15	4.67
1980	3435068	97.37	2.83
1981	2919457	72.17	2.47
1982	2614889	86.99	3.33
1983	3553053	77.73	2.19
1984	4459223	51.55	1.16
1985	2690008	29.9	1.11
1986	1730367	26.11	1.51
1987	2005549	129.15	6.44
1988	2420193	143.35	5.92
1989	2236510	112.77	5.04
1990	1890355	112.55	5.95
1991	1958094	96.91	4.95
1992	1723204	62.91	3.65
1993	1278970	51.85	4.05
1994	1358055	48.1	3.54
1995	965520	50.65	5.25
1996	816255	36.85	4.51

Table 14 : Catch and Effort for Area C2, 1973 to 1996

Year	Effort (metres)	Total catch (tonnes)	CPUE (kg/100m)
1973	6054815	199.04	3.29
1974	8699007	277.67	3.19
1975	9012427	311.97	3.46
1976	6745253	20.79	3.42
1977	8235006	234.84	2.85
1978	9856397	340.51	3.45
1979	no records	no records	no records
1980	5433118	187.98	3.46
1981	6050384	168.6	2.79
1982	5436199	164.06	3.02
1983	2540788	170.18	6.7
1984	4703577	417.03	8.87
1985	3321195	226.01	6.81
1986	2671602	255.45	9.56
1987	323340	274.01	8.5
1988	2443409	242.02	9.91
1989	2691484	257.55	9.57
1990	1545481	244.46	15.82
1991	1794358	203.81	11.36
1992	1265580	87.64	6.92
1993	1760936	124.9	7.09
1994	1104300	73.22	6.63
1995	1798701	114.20	6.35
1996	2383055	88.20	3.70

Table 15 : Catch and Effort for Area C3, 1973 to 1996

Year	Effort (metres)	Total catch (tonnes)	CPUE (kg/100m)
1973	3456725	97.18	2.81
1974	3473470	124.48	3.58
1975	3389575	78.13	2.3
1976	3079440	80.2	2.6
1977	2489851	75.35	3.03
1978	2616114	120	4.59
1979	2000135	119.73	5.99
1980	2452951	101.11	4.12
1981	2091404	66.77	3.19
1982	1642321	50.4	3.06
1983	1530166	37.43	2.44
1984	11503152	21.85	0.19
1985	13333335	16.3	1.22
1986	1180508	22.73	1.93
1987	599099	26.39	4.41
1988	2256450	193.08	8.56
1989	384749	34.93	9.07
1990	510048	30.63	6.01
1991	444296	35.35	7.73
1992	475476	31.83	6.69
1993	332317	20.74	6.24
1994	533475	14.5	2.69
1995*	271575	8.60	3.17
1996	325125	17.71	5.45

* Recorded up to July only.

1996 - landings recorded up to August only.

Table 16 : Catch and Effort for Area C4, 1973 to 1996

Year	Effort (metres)	Total catch (tonnes)	CPUE (kg/100m)
1973	1551514	77.15	4.97
1974	1535458	84.21	5.48
1975	736212	58.29	7.92
1976	429982	31.92	7.42
1977	no records	no records	no records
1978	1291114	63.86	4.95
1979	no records	no records	no records
1980	1090772	66.59	6.1
1981	2063793	99.72	4.83
1982	1928563	78.58	4.07
1983	1001906	71.48	7.13
1984	1058426	54.03	5.1
1985	701275	110.01	15.69
1986	619018	709.28	17.65
1987	958678	143.52	14.97
1988	2256450	193.09	8.56
1989	1587782	198.33	12.49
1990	1108323	159.83	14.42
1991	1690667	152.98	9.04
1992	1594995	139.59	8.75
1993	1399595	159	11.36
1994	1768961	124.1	7.02
1995	1743201	157.34	9.03
1996	1725624	116.54	6.75

Table 17 : Catch and Effort for Area C5, 1973 to 1996

Year	Effort (metres)	Total catch (tonnes)	CPUE (kg/100m)
1973	3840473	94	2.45
1974	3961230	107	2.7
1975	no records	no records	no records
1976	1094730	70	6.39
1977	no records	no records	no records
1978	no records	no records	no records
1979	no records	no records	no records
1980	574756	100	17.4
1981	21224842	177	8.33
1982	2131082	106	4.97
1983	3078396	83	2.7
1984	7385335	75	1.02
1985	2572756	80	3.11
1986	3985620	94	2.36
1987	1006188	41	4.07
1988	135117	42	3.12
1989	3078394	112	3.64
1990	718900	88	12.24
1991	1112908	78	7.01
1992	2285092	140.98	6.17
1993	935972	96.9	10.35
1994	1512998	91.73	6.06
1995	3299535	92.13	2.79
1996	1512594	69.47	4.50

Table 18 : Catch and Effort for Area C6 and C7, 1973 to 1996

Year	Effort (metres)	Total catch (tonnes)	CPUE (kg/100m)
1989	176021	25.54	14.51
1990	no records	no records	no records
1991	219490	22.71	10.35
1992	306604	18.99	6.19
1993	953951	42.1	4.41
1994	1170612	36.75	3.14
1995	1431247	29.56	2.07
1996*	511110	15.13	3.00

* Area C6 was recorded & C7 was not enumerated.

