Floodplain Fishery of the Lower Sondu-Miriu River with Emphasis on the Nile Perch (*Lates niloticus*) (Linnaeus)

Manyala, J.O.
Kenya Marine and Fisheries Research Institute
Sangoro Riverine Laboratory
P.O. Box 136, PAP-ONDITI VIA AHERO

Abstract

Experimental beach seine surveys in 1990 in the lower Sondu-Miriu river indicate a potential catch rate of up to 59.8 Kg ha^{-1} hr^{-1}. *Lates niloticus* (Linnaeus) dominated the catches in the lower reaches (37.5%), while catches in the upper reaches were dominated by *Labeo victorianus* (Boulenger), *Schilbe mystus* (Linnaeus) and *Barbus altianalis* (Boulenger). *Labeo victorianus* contributed up to 84.8% of the catch in the upper reaches by weight. Catches in the floodplain were dominated by *Oreochromis niloticus* (Linnaeus), *O. variabilis* (Boulenger) and *Clarias gariepinus* (Burchell), which contributed more than 50% by weight. The size frequency distribution of *L. niloticus* suggests that larger specimens occur in the river as compared to the floodplain.

Key Words: Sondu-Miriu, catch rates, floodplain, river fishery.

Introduction

The Sondu-Miriu river draining into the Winam Gulf of Lake Victoria covers a major catchment area of about 3,470 Km^2. Apart from river fisheries and irrigation water, the river is a source of power for water mills and provides both navigation and recreational opportunities. Manyala & Ochumba (1990) reported more than 28 fish species occurring in the river, of which *Labeo victorianus* and *Barbus* spp. still form important subsistence and commercial fisheries. Continued decline of the fishery over the last 30 years has been reported by Whitehead (1958), Van Someren (1959), Cadwalladr (1965a), Benda (1979), Marten (1979a) and Ogutu-Ohwayo (1990). The annual catch of 2500 metric tonnes (Whitehead 1959a) from the

Nyanza rivers is no longer possible. Decline in fish population in the river can be attributed to three factors: Overfishing (Whitehead 1958, Van Someren 1959), papyrus encroachment (Balirwa & Bugenyi 1980) and habitat degradation by pollutants and eutrophication (Ochumba 1984). Studies on riverine fishes include those of Okedi (1969, 1970, 1971), Welcomme (1969), Balirwa (1979) and Manyala & Ochumba (1990) on their biology and economic importance. Upstream migration of individual species (Whitehead 1958, 1959, Fryer & Whitehead 1958, Cadwalladr 1965b) are governed by the annual flooding pattern.

Few studies have been conducted on the riverine fishery in the Kenyan portion of the Lake Victoria catchment area, since the collapse of East African Community, apart from those by Manyala & Ochumba (1990) and Ochumba & Manyala (in press). The present study estimated the catch rates of major fish species before the construction of a proposed hydroelectric dam and discusses the possible ecological impact of *L. niloticus* invasion in the river.

Materials and Methods

2.1 *Study Area*

The Sondu-Miriu river basin (latitude 0°17"S, 0°22"S and longitude 34°04"E, 34°49"E) is shown in Fig.1. It forms the fourth largest basin of Kenyan rivers which into Lake Victoria, covering an estimated area of 3,470 Km^2. A detailed description of the area can be found in Manyala & Ochumba (1990) and Ochumba & Manyala (in press).

2.2 *Sampling and Data Analysis*

The sampling stations were visited fortnightly from January to December 1990. A beach seine of 117.0m x 2.8m and 28mm stretched mesh size was used in all sampling operations. A standard haul was considered to sweep an area of opportunity of 5,000 m^2 after drifting the beach seine for about 15 minutes in the river and 10 minutes in the floodplain. Identification of all landed specimens was based on Greenwood (1966). The landed specimens were sorted out into species and the total weight of each species taken to the nearest 1g using a spring balance. This data was used to calculate the catch rate of each species in kg ha^{-1} hr^{-1}. For *L. niloticus*, the total length (TL) of each specimen was recorded to the nearest 0.1cm and the data used to construct length-frequency distribution for each sampling station.

Results

Numerical abundance of the major species from the lower Sondu-Miriu river is shown in Table 1, while the catch rates in Kg ha^{-1} hr^{-1} are shown in Table 2 for the river and Table 3 for the floodplain. The fishery of *S. mystus* and *L. victorianus* were more prominent in the river and away from the lake, contributing some 5.6–88.3% and 22.4–84.8% to the total catch respectively. The fishery of *B. altianalis* was relatively low in the floodplain but far much higher in the upper reaches of the river (0.13–2.56%). *Lates niloticus* became less prominent away from the lake constituting only 0.6–3.9% of the catch by weight as compared to 37.5% near the lake. In the floodplain, the fishery of *L. niloticus* was less prominent (8.3–11.8%) as compared to *O. niloticus* (10.6–25.6%), *O. variabilis* (15.4–27.7%) and *C. gariepinus* (13.1–28.9%). A mean catch rate of 20.0Kg ha^{-1} hr^{-1} was calculated

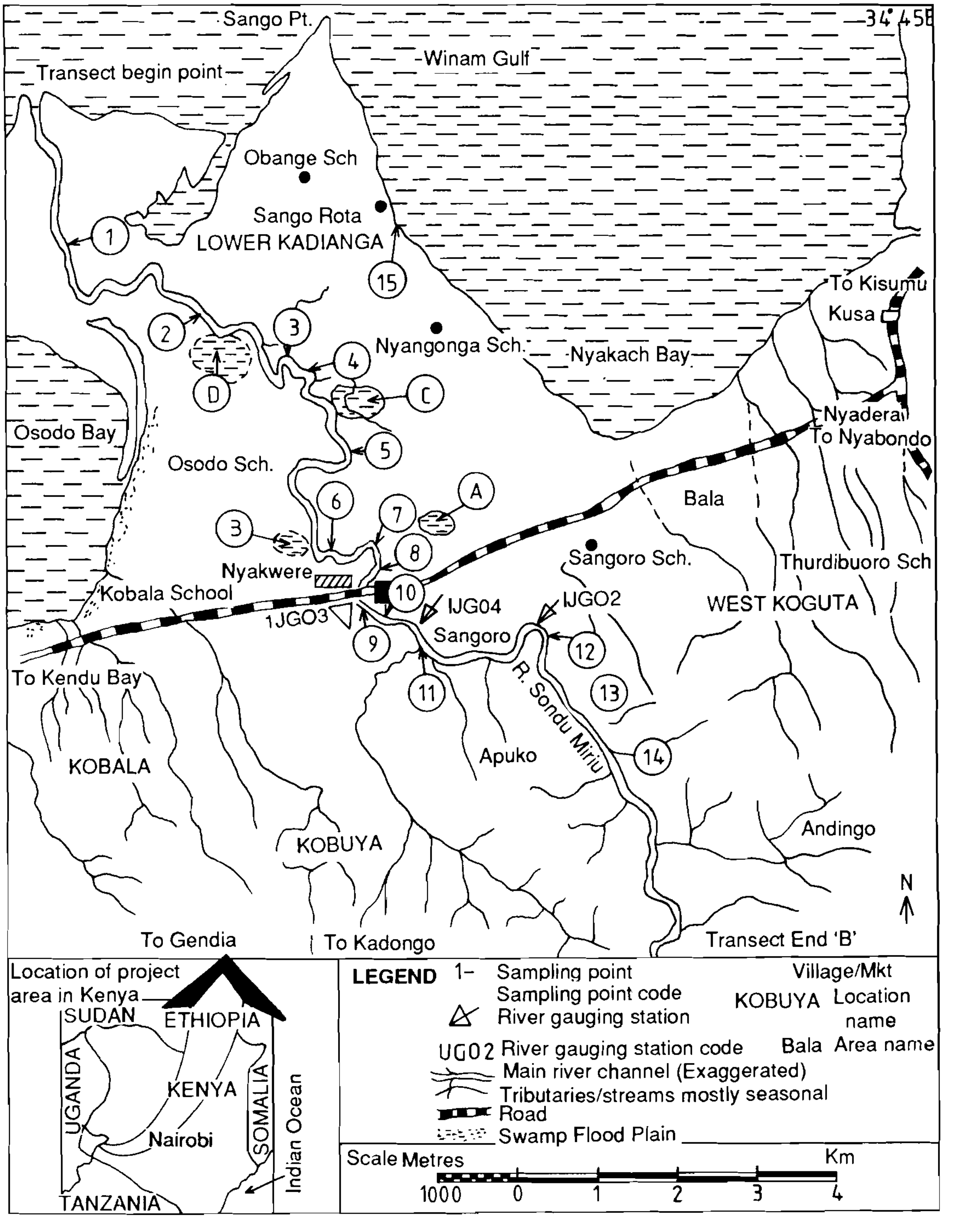

Fig. 1. The lower Sondu-Miriu River catchment (with sampling points shown)

Table 1: Mean numerical abundance of fish species from the lower Sondu-Miriu river on monthly basis from January to December 1990

	J	F	N	H	M	J	J	A	S	O	N	D
L. victoria	14	13	28	20	4			18	32	11	2	
B. neglectus			4	10	2	5			6			
B. altiana	2	4	12	14	6				4	8	3	1
L. niloticus	4	2	20	33	24	40	16	6	10	2	3	
S. victoriae		6	14	20	21	14		4	22	17		4
S. afrofis			7	11	4	2			8	2		2
A. jacksonii		3	4	4	15	9	1		2	4	1	
O. niloticus				4	10	17	4	22	5	2	8	12
O. variabilis	4	5	13	16	7		2	6	23		7	13
S. mystus	40	23	74	114	67	31	20	4	48	51	17	28
O. gariepin			6	8	11	1	4	2				
O. leucost				10	17	6	3	19		7	4	1
O. zillii					7	8	4		4	3		
M. kannume			6	4	7	2			8	2		2
Haploch. spp.		12	7	3	8	2			2	4	2	2
Xenocl. sp.					4	2		3				
P. aethiop												
M. salmoides				2	3				3	1		
C. muriei												
B. docmac			2	4	1							

Table 2: Mean catches of fishes from the lower Sondu-Miriu river (Kg ha^{-1} hr^{-1})

	Sampling station							
	6	7	9	10	11	12	13	14
L. victorianus	0.27	1.65	4.80	1.41		3.22	4.17	4.52
B. neglectus			0.74	2.88			1.80	0.04
B. altiamalis		2.56		2.88		1.97	1.88	0.13
L. niloticus	0.30	6.49	18.75	5.37	0.07	0.56		
S. victoriae	0.02	3.41	3.02	6.48	0.96	0.72	0.17	0.38
S. afrofischeri	0.03	1.73				0.42		
A. jacksonii		2.16		0.78	0.03	0.53		
O. niloticus						0.76		
O. variabilis	0.18	1.77	3.22	1.72	0.09		0.12	
S. mystus		10.58	31.03	6.54	9.58	3.24	0.49	
C. gariepinus						1.96		
O. leucostictus			2.22		0.10			
T. zilii							0.57	
M. kannume	0.01							
Haplochromis sp.		3.00				0.33		
Xenoclarias sp.							0.08	
M. salmoides			0.01		0.02			
B. docmac			1.06					
Total	0.81	33.35	64.85	28.06	10.85	14.36	8.63	5.07
L. niloticus (%)	37.5	19.5	23	19.6	0.6	3.9		
S. mystus (%)		31.7	51.8	23.9	88.9	22.6	5.6	
L. victorianus (%)						22.4	47.9	85.0

Table 3: Mean catches of fishes from the lower Sondu-Miriu floodplain (kg ha^{-1} hr^{-1})

	Sampling station			
	A	B	C	D
L. victorianus	1.90	–	4.71	0.64
B. neglectus	–	0.19	4.59	0.75
L. niloticus	3.09	2.32	–	4.10
S. victoriae	0.92	–	–	2.18
A. jacksonii	0.15	–	1.10	1.20
O. niloticus	0.71	4.64	4.02	5.30
O. variabilis	4.02	6.91	6.48	9.33
S. mystus	2.29	–	2.84	5.75
C. gariepinus	3.43	7.22	4.55	10.56
O. leucostictus	0.11	1.76	1.58	4.14
T. zilli	–	0.88	–	2.01
M. kannume	0.57	–	–	–
Haplochromis spp.	0.90	0.96	2.18	0.22
Xenoclarias spp.	0.80	–	0.1	3.00
P. aethiopicus	0.60	0.02	0.06	0.20
C. muriei	0.10	0.08	–	–
B. docmac	0.59	–	–	–
Total	26.18	24.98	32.23	49.28
O. niloticus (%)	25.18	18.60	12.50	10.60
O. variabilis (%)	15.40	27.70	20.50	18.60
O. gariepinus	13.10	28.90	14.10	21.40
L. niloticus	11.80	9.30	–	8.30

based on all species from all sampling stations.

The size-frequency distribution of *L. niloticus* from different sampling stations are shown in Figs. 2 & 3. Progressively larger specimens were found to have colonized longer distances from the river mouth than relatively smaller sized specimens. In the floodplain, there were no significant differences in the size of specimens landed from the beach seine survey. The maximum size of *L. niloticus* recorded in the river was 56 cm TL, while that from the floodplain was only 38 cm TL.

Discussion and Conclusion

The mean catch rate (20 Kg ha^{-1} hr^{-1}) observed in this study is similar to those reported per fisherman for the same river (0–20 kg day^{-1}) by Manyala & Ochumba (1990). Considering the fact that the local fishermen use a variety of fishing gear (beach seines, gill nets of various mesh sizes; basket traps, cage traps and several sizes of hooks) during different times of the year, it is evident that a beach seine is more efficient in the river as compared to the other gears. Welcomme (1985) reported catches of up to 143.53 kg ha^{-1} yr^{-1} for 17 fully exploited African floodplain fisheries. It is possible that the beach seine could have overestimated the nominal catch per fisherman per day, but indicates that the yield from the river could be higher than the current levels when more efficient gears are used. It would therefore be most appropriate to control the fishery by control and licensing of gears along the river and its floodplain.

On the basis of extensive work already available on Nile perch (*L. niloticus*) from Lake Victoria (Okemwa 1984, Asila &

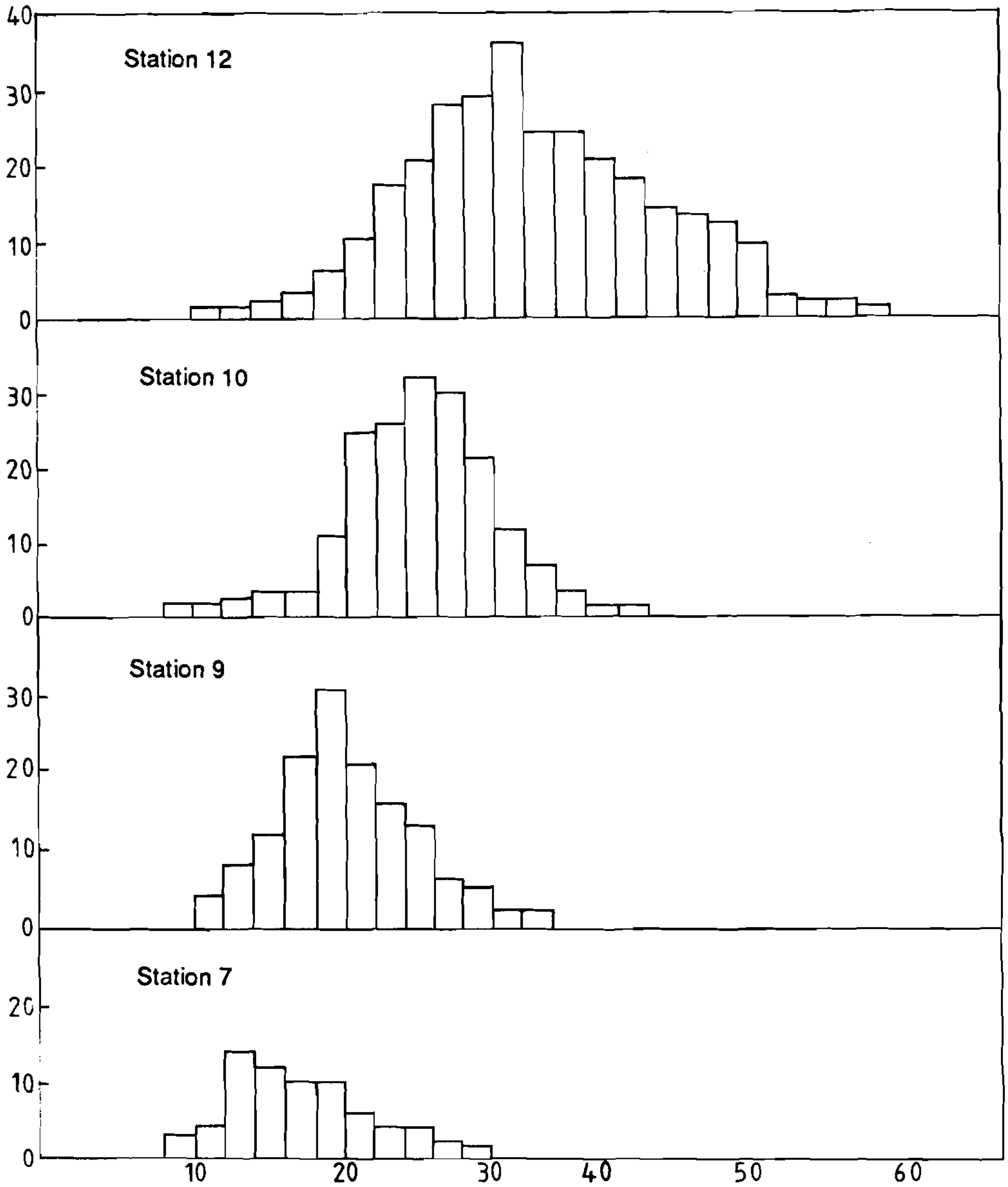

Fig. 2. Length-frequency distribution of *L. niloticus* in the main channel of river Sondu-Miriu

Ogari 1988, Ogari & Dadzie 1988, Ogutu-Ohwayo 1990), it is logical to expect the same ecological impact in the major affluent rivers of Lake Victoria after establishment of *L. niloticus*. Such an unstable condition could have a devastating effect on the riverine fish species, which are already in danger from overfishing and environmental degradation. The current fishery status, combined with the proposed hydraulic development in the river which could interfere with the annual flood regime, calls for a more rigorous planning of this fishery and those of similar rivers in the Lake Victoria catchment area.

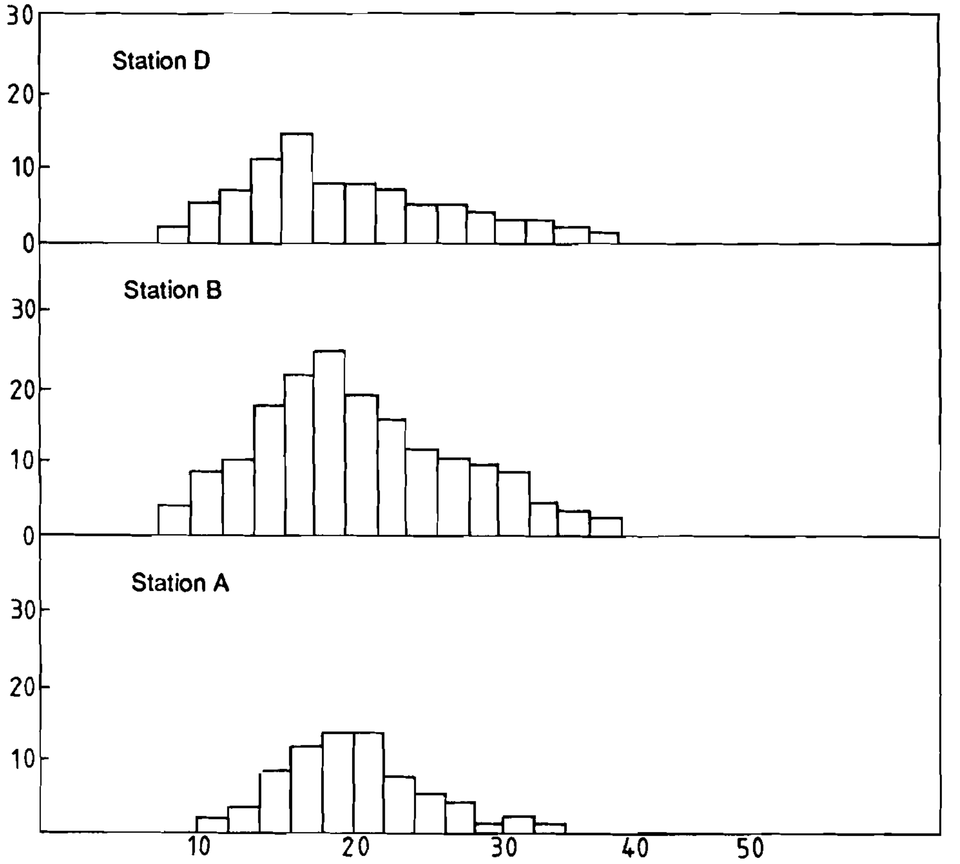

Fig. 3. Length-frequency distribution of *L. niloticus* in the river Sondu-Miriu floodplain

It is possible that there could be an already established predator-prey relationship in the river system. This could suppress further the already endangered riverine fish species. There is thus a latent danger to the recovery of the riverine fishery. The large percentage of Nile perch (*L. niloticus*) observed in the river, could point to a similar behaviour of the riverine fishes in terms of reproductive strategy or to prey abundance response. The reproductive strategy is most unlikely since most of the Nile perch specimens caught have not reached the threshold size of sexual maturity (Asila & Ogari 1988). The presence of Nile perch in the affluent rivers or subsequent establishment of *Micropterus salmoides* (Lacepede), as apex predators at the end of a long food chain, would render other herbivores and insectivores incapable of sustaining heavy harvest by both man and the large predators. This aspect of predator-prey relationship has been discussed in detail by Marten (1979b) for the case of Lake Victoria.

Apart from the Sondu-Miriu system, other affluent rivers such as Nzoia, Yala, Kibos, Awach, Nyando, Kuja and Migori in the Kenyan sector of Lake Victoria require immediate investigations.

References

Asila, A.A. & J. Ogari. 1988. Growth and mortality of Nile perch (*Lates niloticus*) estimated from length-frequency data in the Nyanza Gulf (Lake Victoria). FAO Fisheries Report 389: 272–287.

Balirwa, J.S. 1979. A contribution to the study of the food of six cyprinid fishes in three areas of the Lake Victoria basin, East Africa. *Hydrobiologia* 66: 65–72.

Balirwa, J.S. & F. W. B. Bugenyi. 1980. Notes on the fisheries of the River Nzoia, Kenya. *Biological Conservation* 18: 53–58.

Benda, R.S. 1979. Analysis of catch data from 1968–1976 from nine fish landing beaches in the Kenyan waters of Lake Victoria. *Journal of Fish Biology* 15: 385–387.

Cadwalladr, D.A. 1965a. The decline in *Labeo victorianus* (Boulenger), (Pisces: Cyprinidae) fishery of Lake Victoria and associated deterioration in some indigenous fishing methods in the Nzoia river, Kenya. *East African Agriculture Journal* 30: 249–256.

Cadwalldr, D.A. 1965b. Notes on the breeding biology and ecology of *Labeo victorianus* (Boulemger), (Pisces: Cyprinidae) of Lake Victoria *Rev. Zool. Bot. Afr.* 72: 109–134.

Fryer, G. & P. J. Whitehead. 1959. The breeding habits, embryology and larval development of *Labeo victorianus* (Boulenger) (Pisces: Cyprinidae). *Rev. Zool. Bot. Afr.* 59: 33–49.

Greenwood, P.H. 1966. The Fishes of Uganda. 2nd revised edition. The Uganda Society, Kampala. 131p.

Manyala, J. O. & P. B. O. Ochumba. 1990. Small scale fishery of the lower Sondu-Miriu river. pp. 101–110. In. Proceedings of the symposium on socio-economic aspects of Lake Victoria fisheries. Vol. I. UNDP/FAO Regional Project for Inland Fisheries Planning. 25-27 April 1990. Kisumu, Kenya.

Marten, G.G. 1979a. Impact of fishing on the inshore fishery of Lake Victoria (East Africa). *Journal of the Fisheries Research Board of Canada* 36: 891–900.

Marten, G.G. 1979b. Predator removal: effect on fisheries yield in Lake Victoria (East Africa). *Science Vol.* 203: 646–648.

Ochumba, P.E.O. 1984. The status of Lake Victoria environment in Kenya, Lake Victoria. pp. 86–89. In Proceedings of the Shiga conference 1984 on conservation and management of world lake environment. Shiga prefectural Government, Otsu, Japan.

Ochumba, P.B.O. & J. O. Manyala. (in press). The distribution of fishes along the Sondu-Miriu river of Lake Victoria with special reference to upstream migration, biology and yield. *Aquaculture and Fisheries Management*.

Ogari, J. & S. Dadzie. 1988. The food of Nile perch, *Lates niloticus* (L) after the disappearance of the haplochromine cichlids in the Nyanza Gulf of Lake Victoria. *Journal of Fish Biology*. 32: 571–577.

Ogutu-Ohwayo, R. 1990. The decline of the native fishes of Lake Victoria and Kyoga (East Africa) and the impact of introduced species, especially the Nile perch, *Lates niloticus* and the Nile tilapia, *Oreochromis niloticus*. *Environmental Biology and Fisheries*, 27: 31–96.

Okedi, J. 1969. Observations on the breeding and growth of certain mormyrid fishes in the Lake Victoria basi (Pisces: mormyridae). *Rev. Zool. Bot. Afr.* 79: 34–64. J. Okedi. 1970. A studyon the fecundity of some mormyrid fishes from Lake Victoria. *East African Agriculture and Forestry Journal*. 436–442.

Okedi, J. 1971. The food and feeding habits of the small mormyrid fishes of Lake Victoria, East Africa. *African Journal of Tropical Hydrobiology and Fisheries* 1: 1–12.

Okemwa, E.N. 1984. Potential fishery of Nile perch, *Lates niloticus* (Linne) (Pisces: Centropomidae) in the Nyanza Gulf of Lake Victoria, East Africa. *Hydrobiologia* 108: 121–126.

Van Someren, V.D. 1959. A study of small basket-trap river fishery in Kenya. *East African Agriculture and Forestry Journal* 24: 257–267.

Welcomme, R.L. 1969. The biology and ecology of a small biological stream. *Journal of Zoology*, London 158: 485–523.

Welcomme, R.L. 1985. River fisheries. FAO Fisheries Technical Paper 262: 330pp.

Whitehead, P.J.P. 1958. Indigenous river fishing methods in Kenya. *East African Agriculture Journal* 24: 111–117.

Whitehead, P.J.P. 1959. The river fisheries of Kenya. Nyanza Province. *East African Agriculture Journal* 24: 274–278.