National Fisheries Resources Research Institute (NaFIRRI)

National Agricultural Research Organization (NARO)

IMPLEMENTATION OF A FISHERIES MANAGEMENT PLAN (IFMP) PROJECT FOR LAKE VICTORIA

A REPORT OF THE FISHERIES CATCH ASSESSMENT SURVEY IN THE UGANDAN WATERS OF LAKE VICTORIA FOR THE AUGUST 2006 SURVEY

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CATCH ASSESSMENT SURVEYS ARE JOINTLY CONDUCTED BY THE NATIONAL FISHERIES RESOURCES RESEARCH INSTITUTE (NAFIRRI), THE DEPARTMENT OF FISHERIES RESOURCES (DFR), AND THE DISTRICTS OF BUSIA, BUGIRI, MAYUGE, JINJA, MUKONO, WAKISO, KAMPALA, MPIGI, MASAKA, KALANGALA AND RAKAI.

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1 FOREWORD

The fisheries of Lake Victoria have been characterised by shifts in abundance of different fish species and changes in fishing effort in the recent past. In this dynamic state, monitoring of the fish stocks as well as the magnitude, distribution and trends of fishing effort and fish catches is necessary for sound fisheries resources management. One of the avenues to collect information to support the above process is through conducting regular Catch Assessment Surveys (CASs).

The EU funded Implementation of a Fisheries Management Plan (IFMP) project for Lake Victoria through the Lake Victoria Fisheries Organisation (LVFO) is supporting the implementation of regionally harmonised CASs in Lake Victoria. The CASs under IFMP are following a statistical design laid down in Standard Operating Procedures (SOPs) agreed around the whole lake. In the Ugandan part of the lake, the CASs are carried out at 54 fish landing sites selected in the eleven riparian districts sharing the lake. They are jointly conducted by the National Fisheries Resources Research Institute (NAFIRRI), Jinja; the Department of Fisheries Resources (DFR), Entebbe; and the Districts of Busia, Bugiri, Mayuge, Jinja, Mukono, Wakiso, Kampala, Mpigi, Masaka, Kalangala and Rakai. The CAS enumerators are recruited from the fishing communities and work under direct supervision of subcounty Fisheries Officers. It is planned to involve the recently formed Beach Management Units (BMUs) in fisheries data collection when modalities for their roles have been streamlined.

This report presents findings of the CAS conducted in the Ugandan waters of Lake Victoria in August 2006. The results of the previous five CASs conducted under the same programme in July, August, September, and November 2005, and March 2006 are included to show the emerging trends. The results of the preceding CASs, which were hitherto estimated using raising factors from the 2004 Frame survey data, are updated in this report using raising factors based on the 2006 Frame survey data.

Through regular CASs, information is building up to show the new picture of fish production in the Ugandan waters of the lake which is based on field observations. Similar surveys are simultaneously conducted in the Kenyan and Tanzanian parts of the lake which provide the lake wide perspective of fisheries production. The continued support for the CAS programme will certainly remove uncertainties about the fish production levels of the lake and provide good basis for planning and management of the fishery. It is planned to start engaging the grass root co-management institutions, especially the Beach Management Institutions (BMUs) in the process of institutionalising fisheries data collection in order to sustain CAS data collection beyond the life of the IFMP project.

J.S. Balirwa
Director

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6 SUMMARY

Between July2005 and August 2006, six Catch Assessment Surveys (CASs) have been conducted at 54 pre-selected fish landing sites in the Ugandan part of Lake Victoria. These comprised approximately 10% of all landing sites in each of the 11 districts sharing the lake. The CASs were conducted following regionally harmonised Standard Operating Procedures (SOPs). This report covers the CAS conducted in August 2006 and puts into context the trends generated from the results of the previous surveys.

The Nile perch catch rates in gillnetting boats with motor/sail, which operate in distant waters continued to drop from the record high of 31.0 ± 1.9 kg boat^{-1} day^{-1} in November 2005 to 24.1 ± 1.7 kg boat^{-1} day^{-1} in March 2006 and to 21.6 ± 1.3 kg boat^{-1} day^{-1}in August 2006. Conversely there was noticeable improvement in the Nile perch catch rates of gillnetting boats using paddles from <10 kg boat^{-1} day^{-1} in earlier surveys to 12.3 ± 1.1 kg boat^{-1} day^{-1} in August 2006. Seasonal changes in the distribution of Nile perch and impact of enforcement and BMUs in discouraging bad fishing practices may have contributed to the above observation. As in earlier surveys, the Nile perch catch rates of long lining boats were higher than of gillnetting boats for similar crafts.

In the tilapia fishery the catch rates of parachute boats, the main craft used were similar to earlier surveys. (17.4 ± 4.9.kg boat^{-1} day^{-1}) for cast nets and 10.1 ± 0.9 kg boat^{-1} day^{-1} for gillnets. The tilapia catch rates of paddled Sesse boats, 6.3 ± 0.8 kg boat^{-1} day^{-1} for gillnets were slightly lower than earlier surveys but the catch rates of cast nets in this category of boats showed an improvement from 6.7 ± 1.4 kg boat^{-1} day^{-1}in March 2006 to 10.7 ± 1.6 kg boat^{-1} day^{-1}in August 2006. Generally, the Tilapia fishery shows stability of catch rates and total catches from the beginning of CAS surveys in July 2005 to August 2006, but with an overall gradual decreasing trend which may be a consequence of the decreasing water levels in the lake.

The mukene catch rates of boats using small seines were 188.7 ± 25.8 kg boat^{-1} day^{-1} and scoop nets 176.1 ± 32.2 kg boat^{-1} day^{-1}in August 2006. These catch rates were in the same range as those observed in March 2006.

In August 2006, the Nile perch contributed 40 % of the overall catches (7,367.7 t) and commanded the highest value at the beaches, i.e. shs 14,192.2 million comprising 78% of the overall gross value of all fish species landed. The tilapia fishery contributed 12% of the total catches (2,206.2 t) in August 2006 worth 12% (shs 2,131.2 million) of the gross value of all fish landed. Mukene contributed 47% of the total catches (8,587.0 t) in August 2006 which was worth only shs 1,674.5 million, 9% of the gross value of all fish landings. Mukene has potential to contribute more with access to open waters improvement of processing methods to enhance its value. The contribution of other fish species was insignificant, i.e. <1% of both weight and value. The annual total fish catches in the Ugandan part of Lake Victoria were estimated at 215,943.6 t worth a gross beach value of shs 221.8 billion for the period October 2005 to September 2006. The estimated annual catches were composed of: Nile perch (91,039.1 t), Tilapias (27, 061.4 t), Mukene (95,734.1 t) and other species (2,109.0 t)

7 INTRODUCTION

Lake Victoria, with a surface area of 68,800 km^2, is the second largest freshwater body in the World. The largest part of the lake, i.e. 35,088 km^2 (51%) is in Tanzania, followed by the Ugandan part 29,584 km^2 (43%), and the Kenyan part 4,128 km^2 (6%). The lake has a shoreline length of 3,450 km: 1,150 km (33%) in Tanzania, 1,750 km (51%) in Uganda and 550 km (16%) in Kenya. The lakes' fisheries support a vibrant fish export industry, which is one of the major foreign exchange earners of the Partner States sharing the lake In addition to the fish exports, the lake is a very important source of high protein food, and employment for the peoples of the Partner States of the East African Community (EAC).

For a long time, there have been information gaps on trends of fishing effort and fish catches. Recent efforts have harmonised fisheries data collection around the lake which include fisheries Catch Assessment Surveys (CASs) through which the Partner States are monitoring exploitation of the fisheries resources. The data generated by CAS provide Catch per unit effort (CPUE), which, together with information obtained from regular Frame surveys data is used as a raising factor to estimate total catches. Data from CAS also is a rough index of stock size. The total catches in this report are estimated using the 2006 Frame survey data. The earlier estimates made from CAS data collected between July 2005 and March 2006 using the 2004 Frame survey data, have been revised. The 2006 Frame survey data have been preferred because they are recent and were processed more efficiently compared with the 2004 Frame survey data whose processing encountered many problems.

This CAS report provides the estimates of the quantities of fish landed in the riparian districts sharing the Ugandan waters of Lake Victoria; the monetary value of the fish catches; the contribution of different fish species to the total catches; and the trends of fish catch rates, total fish catches since the beginning of the current CAS activities, i.e. July 2005 to August 2006. The total annual catch and beach value are also estimated for the period October 2005 to September 2006.

8 METHODOLOGY

8.1 The Catch Assessment Survey Design

The CASs conducted in the Ugandan waters of Lake Victoria follow a design laid out in the approved Standard Operating Procedures for Catch Assessment Surveys for Lake Victoria (LVFO, 2005a). This is a two-stage stratified sampling design whereby: within each district, a sample of primary sampling units (PSUs) i.e. the fish landing sites were first selected, and then, at each PSU, stratified samples of Secondary Sampling Units (SSUs) i.e. the Vessel gear type, are randomly selected by the field enumerator for sampling.

8.2 Sampling Units

Landing sites are the primary sampling unit (PSU) and the vessel-gear (VG) types landing at each site are the secondary sampling unit (SSU). Within each of the eleven districts sharing the Ugandan part of the lake, 10% of all landing sites (PSUs) were selected for sampling. A total of 54 PSUs (Appendix 1)

were selected for sampling in the Ugandan waters of Lake Victoria. The landing sites were selected randomly with Probability Proportional to Size (PPS), where size refers to the total number of vessels landing at the site.

During the sampling period, the enumerators identify the numbers of all Vessel-Gear (VG) types at each landing site that land or are expected to land during the sampling day and allocate sampling effort among the SSUs and VG types in proportion to the number of vessels to be sampled. The maximum sample per day was set at 20 vessels. Sampling is done in four days in the month, staggered to two consecutive days in the first and third weeks of the month.

8.3 Data capture

Regionally harmonised data forms were used to record field data. The enumerators were trained and provided with a *Field Guide* containing the data recording instructions to ensure effective data capture. Provision for close supervision of enumerators by the Sub-county Fisheries Officers and spot checks by District Fisheries Officers and Officers from DFR and NaFIRRI were made to ensure that data collection was according to the laid down procedures.

8.4 Estimation of CAS-based Indicators

Data were stored and analysed using Microsoft Excel. The fishing crafts were segregated into effort groups (Vessel-gear combinations) and the CAS indicators estimated for each effort group.

(i) The mean fish catch rates (kg boat^{-1} day-^{1}) were estimated for each effort group by species.

(ii) The total fish catches were estimated using the mean fish catch rates and the 2006 Frame survey data. For each effort group, the Boat activity coefficient (*B),* i.e. the probability that a fishing vessel of each vessel-gear type *g* would be active on any day during the month. This was estimated as the mean number of days boats in each effort group fished in a week divided by the number of days in a week. The total catch (*C)* of each effort group was then estimated.

(iii) The beach value of the catch, i.e. the gross income to the fishers, was estimated by raising the estimated total catch in each effort group by the mean unit price of each fish species landed.

9 RESULTS

Details of the results, i.e. fish catch rates and the estimated total fish catches are in Appendices 2&3.

9.1 Fish catch rates

9.1.1 Nile perch catch rates

Sesse boats propelled by paddles or motor/sail using gillnets or long lines are the most important fishing units in the Nile perch fishery, i.e. four main vessel gear combinations target the species.

Gillnetting boats

The Nile perch catch rates of paddled Sesse gillnetting boats increased from 9.7 ± 1.7 kg boat^{-1} day^{-1} in March 2006 to 12.3 ± 1.12 kg boat^{-1} day^{-1} in August 2006. This record compared with below 9 kg boat^{-1} day^{-1} in the previous four surveys in July – November 2005 indicated continued improvement in catch rates amongst paddled Sesse boats using gillnets (Figure 1). The catch rates of boats with motor/sail which had increased significantly to a record high of 31.0 ± 1.9 kg boat^{-1} day^{-1} in November 2005 continued to show a downward trend, decreasing from 24.1 ± 1.7 kg boat^{-1} day^{-1} in March 2005 to 21.6 ± 1.3 kg boat^{-1} day^{-1}in August 2006. These observations indicate noticeable improvement of Nile perch catch rates in near shore waters plied by paddled boats against a moderate decrease of catch rates in offshore waters plied by motorised/sailed gillnetting boats.

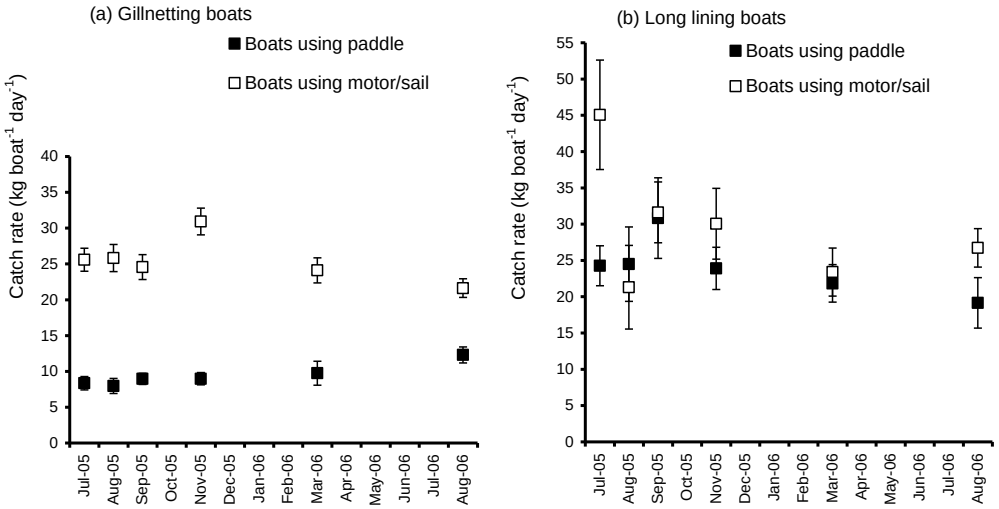


Figure 1. Trends of Nile perch catch rates of the main effort groups targeting the species in the Ugandan part of Lake Victoria between July 2005 and August 2006 (error bars = 95%CL).

Long lining boats

In August 2006, the Nile perch catch rates of long lining boats were 19.2 ± 3.5 kg boat^{-1} day^{-1} for paddle boats and 26.7 ± 2.7 kg boat^{-1} day^{-1} for motorised/sailed boats. As in earlier surveys, the Nile perch catch rates of long lining boats, irrespective of mode of propulsion were generally as high as those of motorised/sailed boats using gillnets (>19 kg boat^{-1} day^{-}1) compared with <13 kg boat^{-1} day^{-1} in gillnetting paddle boats.

9.1.2 Tilapia catch rates

The parachute boats (*bawo tatu*) are the main craft in the tilapia fishery in the Ugandan waters of Lake Victoria. Paddled Sesse boats, to some extent also operate in the Tilapia fishery of the lake. Gillnets and cast nets are the most common gears used to target tilapia. The other gears used in the tilapia fishery that are less common include basket traps and hand line hooks. In August 2006, the tilapia catch rates of parachute boats using cast nets at 17.4 ± 4.9 kg boat^{-1} day^{-1} continued to be higher than those of boats using gillnets which landed 10.1 ± 0.9 kg boat^{-1} day^{-1} (Figure 2). The tilapia catch rates of paddle sesse boats using gillnets (6.3 ± 0.8 kg boat^{-1} day^{-1} were lowest in August 2006 compared with previous surveys and were significantly lower generally than those of cast netting boats (10.7 ± 1.6 kg boat^{-1} day^{-1}).

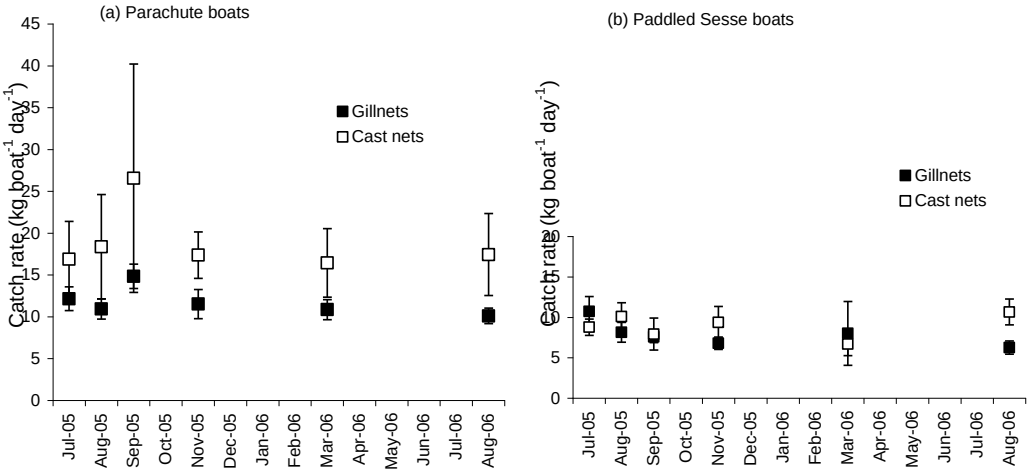


Figure 2. Trends of Tilapia catch rates of the main effort groups targeting the tilapia in the Ugandan part of Lake Victoria between July 2005 and August 2006 (error bars = 95%CL).

9.1.3 Mukene/Dagaa catch rates

The mukene fishery is dominated by paddled Sesse boats using either small seines (Lampala) or scoop nets. The catch rates of boats using small seines were statistically similar to those of scoop nets in August 2006, like in the previous surveys in November 2005 and March 2006 (Figure 3). The catch rates of boats using small seines and scoop nets were 188.7 ± 25.8 and 176.1 ± 32.2 kg boat^{-1} day^{-1}, respectively in August 2006.

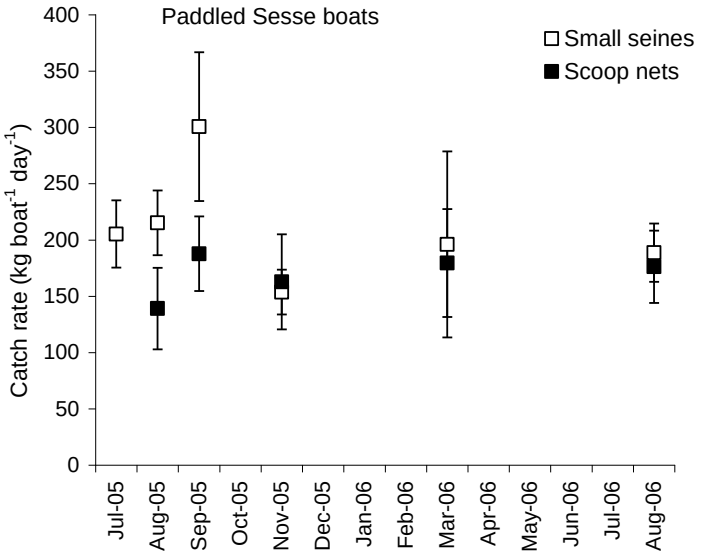


Figure 3. Trends of Mukene/Dagaa catch rates of the main effort groups targeting the species in the Ugandan part of Lake Victoria between July 2005 and August 2006 (error bars = 95%CL).

9.2 National Estimates of total fish catches of the main commercial species

The trends of estimated national total monthly catch for the sampled months between July 2005 and August 2006 are summarised in Table 1 and shown in Figure 4. Details for each month presented by district and species are in Appendices 4-9.

Table 1. Estimated total monthly fish catches in the Ugandan part of Lake Victoria between July 2005 and August 2006.

	Jul-05	±	Aug-05	±	Sep-05	±	Nov-05	±	Mar-06	±	Aug-06	±
Nile perch	8031.2	1242.4	6633.9	1268.9	8322.8	1268.0	8,646.3	1,100.8	7,099.1	1,098.3	7,367.7	1,058.7
Tilapia	2828.9	526.7	2346.0	469.0	2401.9	586.9	2,214.4	425.1	2,331.2	921.4	2,206.2	512.9
Mukene	9445.0	3239.0	8142.6	1252.5	11494.2	2450.2	6,384.7	1,087.4	8,430.8	3,311.3	8,587.0	1,275.2
Other spp	2300.3	752.3	102.1	134.9	101.1	96. 9	101.6	98.1	224.6	204.3	176.4	162.8
Total	**22605.4**	**5760.4**	**17224.6**	**3125.3**	**22320.0**	**4401.9**	**17347.0**	**2711.4**	**18085.7**	**5535.3**	**18337.3**	**3009.6**

9.2.1 Nile perch

The estimated Nile perch total catches in August 2006 (7,367.7 ± 1,058.7 t); were apparently higher than the estimate for the same month in 2005 (6633 ± 1,268.9 t). However, the Nile perch total catch estimates were not statistically different between months, between July 2005 and August 2006 and could be said to have been stable.

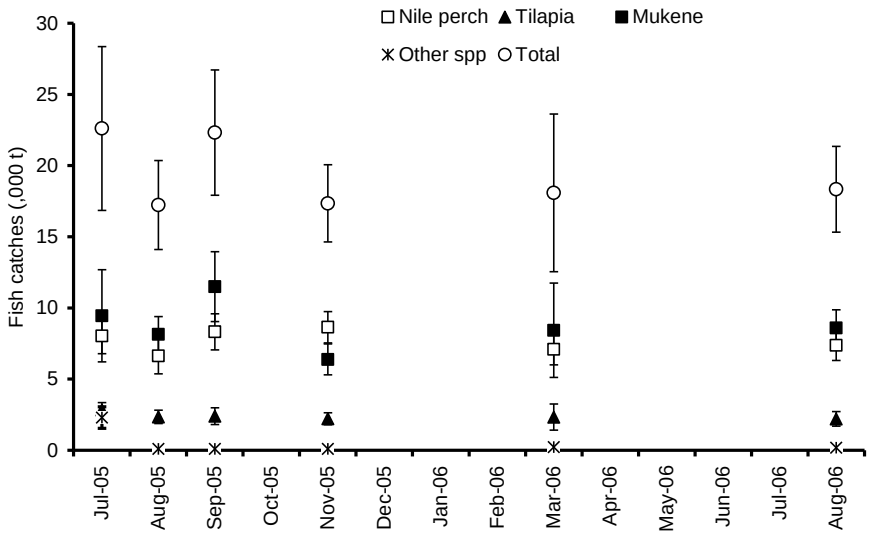


Figure 4. Trends of total monthly catches of the main fish species in the Ugandan part of Lake Victoria between July 2005 and August 2006 (error bars = 95%CL).

9.2.2 Tilapia

There have been an apparent gradual decrease of the Tilapia total catches from highest in July 2005 (2828.9 ± 526.7 t) to the lowest in August 2006 (2,206.2 ± 512.9 t). However, like Nile perch, the tilapia total catches were not statistically different between months and could be considered to have been stable.

9.2.3 Mukene/Dagaa

The Mukene total catch estimate for August 2006 (8,587.0 ± 1,275.2 t) was in the same range as August 2005 (8,142.6 ± 1,252.5 t) and March 2006 (8,430.8 ± 3,311.3 t). The lowest catch estimates were in November 2005 (6,384.7 ± 1,087.4 t) and the highest in September 2005 (11,494.2 ± 2,450.2 t). The Mukene total catch estimates surpassed all species in all month except November 2005 when the Nile perch catch estimates were higher.

9.2.4 Other fish species

Apart from July 2005 when large quantities of haplochromines (2,049.1 ± 528.1 t) were recorded in the catches, probably by error since this was the first survey, leading to the total catch estimate of 2,300.3 ± 752.3 t. The contribution of fishes other than Nile perch, tilapiines and Mukene was insignificant in other months, ranging between 101.1 and 224.6 t. The total catch estimate for other fish species was 176.4 ± 162.8 t for August 2006. These estimates had very large confidence intervals due to infrequent occurrence of these fish species in the catches.

9.2.5 All fish species

The total catch estimates for all fish species 18,337.3 ± 3,009.6 t for August 2006. Throughout the sampled months between July 2005 and August 2006, the lowest estimated total catches of all fish species (17,224.6 ± 3,125.3 t)

was August 2005; and the highest (22,605.4) in July 2005. However, the total catches were not statistically different between the different monthly estimates.

9.3 District Estimates of monthly total fish catches and beach value of the main commercial species

The distribution of the number of fishing crafts in the riparian districts (Table 1) determines the proportional distribution of the total catch estimates for the districts. Further to the number of crafts, the finer details of the craft-gear characteristics, determine the differences in the estimates for each fish species among the districts. Thus, Mukono district with 36% of all fishing crafts in the Ugandan part of the lake (Frame survey 2006 data) had the largest share of the total fish catch estimates for all species, followed by Kalangala, Bugiri, and Mayuge and the least in Busia and Kampala districts district (Tables 3-7). Likewise, the estimate of the gross income from the sale of fish catches at the beach, i.e. the beach value of the catches is unevenly distributed in the riparian districts.

Table 2. Distribution of fishing crafts in the riparian districts of the Ugandan part of Lake Victoria (Frame survey 2006 data

District	No. fishing crafts	%ge
Kampala	142	0.6
Busia	153	0.6
Jinja	246	1.0
Rakai	469	1.9
Mpigi	802	3.3
Masaka	1182	4.9
Wakiso	2022	8.4
Mayuge	2211	9.2
Bugiri	3389	14.0
Kalangala	4797	19.9
Mukono	8735	36.2
Total	24148	100.0

Table 3. Estimated monthly total catches and beach value of Nile perch in the Ugandan part of Lake Victoria presented by district between July 2005 and August 2006.

	July 2005		August 2005		September 2005		November 2005		March 2006		August 2006	
DISTRICT	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)
Busia	29.0	55.9	17.4	33.5	28.3	54.5	24.8	47.8	23.5	45.3	48.0	92.4
Bugiri	1589.0	3060.9	1102.7	2124.1	1392.0	2681.4	1589.3	3061.5	1204.5	2320.3	1217.3	2344.9
Mayuge	757.1	1458.4	572.3	1102.3	748.1	1441.1	792.4	1526.3	642.6	1237.8	639.3	1231.6
Jinja	48.2	92.8	41.2	79.3	54.3	104.6	50.8	97.8	44.2	85.1	50.6	97.4
Mukono	3074.4	5922.2	2633.2	5072.3	3362.7	6477.5	3348.6	6450.4	2810.2	5413.2	2924.7	5633.7
Kampala	47.4	91.2	42.3	81.4	63.3	122.0	51.1	98.4	49.0	94.4	57.6	110.9
Wakiso	546.8	1053.3	467.2	900.0	593.5	1143.3	576.0	1109.5	488.3	940.7	527.2	1015.6
Mpigi	160.2	308.6	143.4	276.2	161.7	311.5	170.2	327.8	152.5	293.7	168.3	324.3
Masaka	200.8	386.9	174.6	336.3	216.8	417.6	221.0	425.7	186.2	358.7	197.0	379.4
Kalangala	1390.3	2678.2	1269.1	2444.7	1516.9	2922.1	1599.3	3080.7	1323.7	2549.9	1368.5	2636.0
Rakai	187.9	361.9	170.7	328.9	185.2	356.7	222.9	429.3	174.3	335.8	169.3	326.1
Total	**8031.2**	**15470.4**	**6633.9**	**12778.9**	**8322.8**	**16032.2**	**8646.3**	**16655.3**	**7099.1**	**13674.8**	**7367.7**	**14192.2**

Table 4. Estimated total catches and beach value of Tilapia in the Ugandan part of Lake Victoria presented by district between July 2005 and August 2006.

	July 2005		August 2005		September 2005		November 2005		March 2006		August 2006	
DISTRICT	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)
Busia	19.4	18.7	22.6	21.7	12.3	11.9	13.3	12.8	16.6	16.0	11.7	11.3
Bugiri	272.1	262.8	193.1	184.8	238.3	230.2	217.4	210.0	247.4	239.0	231.6	223.7
Mayuge	269.9	260.7	359.3	343.9	226.9	219.2	219.4	211.9	233.1	225.2	241.7	233.4
Jinja	39.1	37.8	57.7	55.2	31.2	30.2	32.0	30.9	30.9	29.8	31.2	30.2
Mukono	869.0	839.5	787.0	753.2	696.7	673.0	664.5	641.9	732.4	707.5	667.0	644.3
Kampala	20.2	19.5	25.8	24.7	14.9	14.4	16.6	16.1	17.5	16.9	17.0	16.4
Wakiso	300.5	290.3	180.7	172.9	259.6	250.8	240.9	232.7	234.5	226.6	232.8	224.9
Mpigi	167.5	161.8	135.1	129.3	148.3	143.3	129.5	125.1	131.4	127.0	123.7	119.5
Masaka	246.3	238.0	203.7	194.9	234.7	226.7	205.4	198.4	192.7	186.1	191.6	185.1
Kalangala	572.0	552.6	361.9	346.3	492.4	475.7	434.3	419.5	453.1	437.7	420.7	406.4
Rakai	52.9	51.1	32.8	31.4	46.4	44.8	41.3	39.9	41.6	40.2	37.2	36.0
Total	**2828.9**	**2732.8**	**2359.8**	**2258.3**	**2401.9**	**2320.2**	**2214.4**	**2139.1**	**2331.2**	**2251.9**	**2206.2**	**2131.2**

Table 5. Estimated total catches and beach value of Mukene in the Ugandan part of Lake Victoria presented by district between July 2005 and August 2006.

	July 2005		August 2005		September 2005		November 2005		March 2006		August 2006	
DISTRICT	Total catch (tonnes)	Beach Value (Mill. shs)	Total catch (tonnes)	Beach Value (Mill. shs)	Total catch (tonnes)	Beach Value (Mill. shs)	Total catch (tonnes)	Beach Value (Mill. shs)	Total catch (tonnes)	Beach Value (Mill. shs)	Total catch (tonnes)	Beach Value (Mill. shs)
Busia	19.0	3.7	21.0	4.1	29.3	5.7	14.4	2.8	19.7	3.8	19.6	3.8
Bugiri	744.2	145.1	822.0	160.3	1148.9	224.0	561.4	109.5	792.1	154.5	766.4	149.5
Mayuge	570.6	111.3	621.6	121.2	869.5	169.5	427.8	83.4	590.0	115.1	583.3	113.7
Jinja	6.2	1.2	2.5	0.5	4.1	0.8	3.6	0.7	3.9	0.8	4.2	0.8
Mukono	3436.5	670.1	3436.9	670.2	4821.1	940.1	2477.0	483.0	3349.1	653.1	3360.6	655.3
Kampala	7.6	1.5	8.4	1.6	11.7	2.3	5.9	1.2	7.9	1.5	7.8	1.5
Wakiso	446.1	87.0	461.8	90.0	648.5	126.5	327.3	63.8	444.3	86.6	444.0	86.6
Mpigi	30.4	5.9	33.6	6.5	47.2	9.2	24.2	4.7	32.2	6.3	31.3	6.1
Masaka	450.2	87.8	479.5	93.5	670.9	130.8	332.9	64.9	454.2	88.6	454.8	88.7
Kalangala	3722.8	725.9	2242.8	437.4	3225.3	628.9	2201.4	429.3	2722.6	530.9	2903.1	566.1
Rakai	11.4	2.2	12.6	2.5	17.7	3.5	9.0	1.7	14.9	2.9	11.7	2.3
Total	**9445.0**	**1841.8**	**8142.6**	**1587.8**	**11494.2**	**2241.4**	**6384.7**	**1245.0**	**8430.8**	**1644.0**	**8587.0**	**1674.5**

Table 6. Estimated total catches and beach value of other fish species (Haplochromines, *Bagrus*, *Protopterus*, *Clarias* and others) in the Ugandan part of Lake Victoria presented by district between July 2005 and August 2006.

	July 2005		August 2005		September 2005		November 2005		March 2006		August 2006	
DISTRICT	Total catch (tonnes)	Beach Value (Mill. shs)	Total catch (tonnes)	Beach Value (Mill. shs)	Total catch (tonnes)	Beach Value (Mill. shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)
Busia	7.6	7.9	10.5	8.9	2.3	1.9	0.4	0.3	3.1	1.9	0.6	0.5
Bugiri	278.8	300.5	8.2	6.4	13.8	10.9	12.1	9.2	21.8	15.2	16.0	13.1
Mayuge	201.3	221.7	7.1	5.7	10.5	8.3	9.2	7.1	19.9	14.3	13.6	11.3
Jinja	2.2	1.3	0.9	0.7	1.9	1.5	1.0	0.7	2.2	1.6	1.5	1.2
Mukono	1061.2	1160.6	37.6	26.7	36.2	27.5	32.7	23.2	91.6	65.5	64.4	53.2
Kampala	4.1	3.8	0.7	0.5	0.9	0.7	0.9	0.6	2.0	1.4	1.4	1.1
Wakiso	151.7	163.7	9.1	7.2	11.0	8.9	11.3	8.7	22.0	16.5	16.8	14.1
Mpigi	21.0	18.2	5.2	3.9	4.2	3.3	6.2	4.7	9.5	6.9	7.7	6.5
Masaka	147.7	165.4	4.3	3.2	4.0	3.2	5.6	4.5	8.1	5.8	6.7	5.7
Kalangala	413.5	442.4	16.9	12.7	14.8	11.4	20.0	14.8	41.2	29.5	45.3	42.1
Rakai	11.3	8.4	1.6	1.2	1.5	1.2	2.2	1.7	3.2	2.1	2.4	1.9
Total	**2300.3**	**2493.9**	**102.1**	**77.0**	**101.1**	**78.8**	**101.6**	**75.6**	**224.6**	**160.6**	**176.4**	**150.8**

Table 7. Estimated total catches and beach value of all fish species pooled in the Ugandan part of Lake Victoria presented by district in between July 2005 and August 2006.

	5-Jul		5-Aug		5-Sep		5-Nov		6-Mar		6-Aug	
DISTRICT	Total catch (tonnes)	Beach Value (Mill. shs)	Total catch (tonnes)	Beach Value (Mill. shs)	Total catch (tonnes)	Beach Value (Mill. shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)
Busia	75.0	86.3	71.5	68.2	72.2	74.0	52.9	63.7	62.9	67.0	79.8	107.9
Bugiri	2884.0	3769.3	2126.0	2475.5	2793.0	3146.6	2380.2	3390.2	2265.8	2729.0	2231.3	2731.2
Mayuge	1798.9	2052.1	1560.3	1573.1	1855.0	1838.1	1448.7	1828.8	1485.6	1592.3	1477.9	1590.0
Jinja	95.8	133.1	102.2	135.6	91.5	137.1	87.4	130.1	81.2	117.3	87.5	129.6
Mukono	8441.2	8592.4	6894.7	6522.4	8916.7	8118.2	6522.8	7598.5	6983.3	6839.2	7016.7	6986.6
Kampala	79.3	116.0	77.2	108.3	90.9	139.3	74.5	116.2	76.3	114.2	83.8	130.0
Wakiso	1445.2	1594.3	1118.8	1170.2	1512.7	1529.4	1155.4	1414.7	1189.1	1270.3	1220.8	1341.2
Mpigi	379.0	494.5	317.3	416.0	361.4	467.2	330.1	462.4	325.6	433.8	331.0	456.3
Masaka	1045.1	878.0	862.1	627.9	1126.4	778.4	764.9	693.6	841.2	639.2	850.1	658.9
Kalangala	6098.6	4399.1	3890.7	3241.0	5249.5	4038.1	4254.9	3944.3	4540.7	3548.0	4737.6	3650.7
Rakai	263.4	423.7	217.7	363.9	250.8	406.2	275.3	472.6	234.0	381.0	220.6	366.3
Total	**22605.4**	**22538.8**	**17238.4**	**16702.1**	**22320.0**	**20672.6**	**17347.0**	**20115.0**	**18085.6**	**17731.3**	**18337.2**	**18148.7**

9.4 Relative contribution of the main fish species to the monthly total catches and the beach value.

In August 2006, Nile perch contributed 40% of the total catches in the Ugandan part of the lake, but this accounted for 78% of the estimated gross income of the fishers. Mukene contributed 47% of the total catches but only 9% of the estimated income of fishers (Figure 5). The tilapia catches shared 12% of the total catches and 12% of the gross income to fishers.

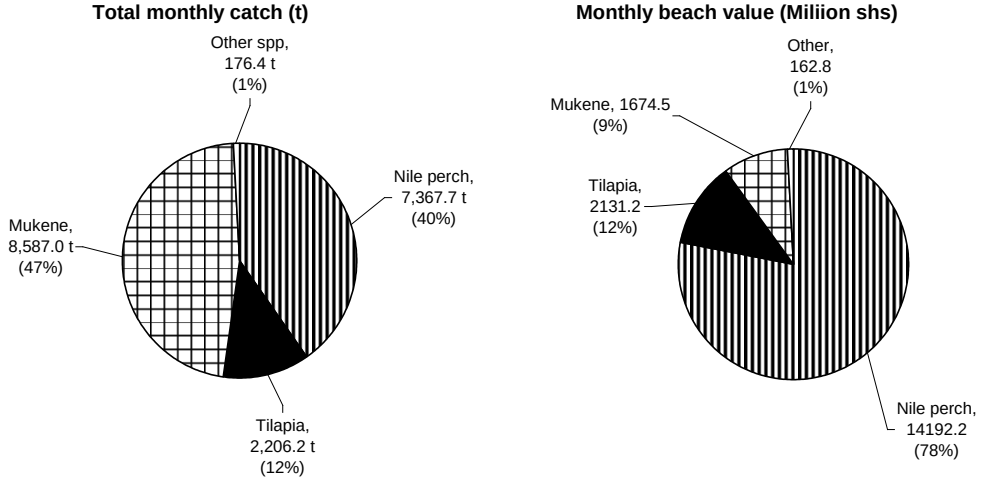


Figure 5. Relative contribution to the total monthly catches and beach value of the main fish species in the Ugandan part of Lake Victoria in August 2006**.**

9.5 Estimated Annual Total Fish Catches and Beach Value

The annual fish catch estimates based on the quarterly monthly estimates of November 2005, March 2006 and August 2006 are in Table 8. The Estimated

overall total annual catches of Nile perch in the Ugandan part of the lake are 91,039.1 t with a beach value of 175.4 billion shillings. The bulk of Nile perch 39% being landed in Mukono district followed by Kalangala (19%), Bugiri (17%), Mayuge 9% and Wakiso 7%. The remaining six districts (Busia, Jinja, Kampala, Mpigi, Masaka and Rakai) shared 9% of the total Nile perch catches.

The overall annual catches of tilapia were estimated at 27,061.4 t with a beach value of 26.1 billion shillings distributed in the district waters as follows: Mukono (31%), Kalangala (19%); Bugiri, Mayuge and Wakiso (10% each) and and Masaka (9%) The remaining five districts (Busia, Jinja, Kampala, Mpigi and Rakai shared 11% of the total tilapia catches.

The annual catches of Mukene are estimated at 95,734.1 t with a very low beach value of 18.7 billion shillings. Approximately 99% of Mukene catches were contributed by only five districts, i.e. Mukono (39.3%%), Kalangala (33.3%) Bugiri (9.1%), Mayuge (6.9%) and Wakiso (5.2%).

Table 8. Estimated Annual total fish catches (tonnes) and the beach value of the catches in the Ugandan part of Lake Victoria presented by district and species

	Nile perch		Tilapia		Mukene		Other spp		**Total**	
DISTRICT	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	Total catch (tonnes)	Beach Value (Mill.shs)	**Total catch (tonnes)**	**Beach Value (Mill.shs)**
Busia	396.0	762.7	166.8	161.1	219.7	42.8	18.2	11.4	**800.6**	**978.1**
Bugiri	15,666.4	30,178.0	2,807.6	2,712.1	8,697.5	1,696.0	206.1	155.1	**27,377.6**	**34,741.3**
Mayuge	8,145.8	15,691.1	2,794.6	2,699.6	6,563.0	1,279.8	178.1	136.3	**17,681.5**	**19,806.8**
Jinja	578.8	1,114.9	375.3	362.5	47.2	9.2	19.7	14.6	**1,021.0**	**1,501.2**
Mukono	35,852.5	69,062.3	8,290.7	8,008.8	37,624.8	7,336.8	800.3	604.0	**82,568.3**	**85,011.9**
Kampala	632.9	1,219.1	205.0	198.0	88.4	17.2	17.9	13.3	**944.1**	**1,447.6**
Wakiso	6,297.8	12,131.3	2,825.7	2,729.6	4,979.2	970.9	208.4	163.9	**14,311.0**	**15,995.8**
Mpigi	1,954.1	3,764.2	1,536.5	1,484.3	358.3	69.9	96.0	74.4	**3,945.0**	**5,392.8**
Masaka	2,387.3	4,598.7	2,345.6	2,265.8	5,089.5	992.4	83.4	65.1	**9,905.8**	**7,922.0**
Kalangala	16,912.7	32,578.8	5,235.2	5,057.2	31,920.0	6,224.4	449.2	366.5	**54,517.2**	**44,226.9**
Rakai	2,214.9	4,266.5	478.5	462.2	146.5	28.6	31.7	23.3	**2,871.6**	**4,780.6**
Total	**91,039.1**	**175,367.7**	**27,061.4**	**26,141.3**	**95,734.1**	**18,668.1**	**2,109.0**	**1,627.9**	**215,943.6**	**221,805.1**

9.6 Relative contribution of the main fish species to the annual total catches and the beach value.

For the period October 2005 to September 2006, the Nile perch contributed 42% of the total annual catches in the Ugandan part of the lake, and this accounted for 79% of the estimated gross income of the fishers. Mukene contributed 44% of the total annual catches but only 8% of the estimated gross income of fishers (Figure 6). The tilapia catches shared 13% of the total annual catches and 12% of the gross income to fishers. The contribution of other fish species was quite insignificant at 1% of catch and beach value.

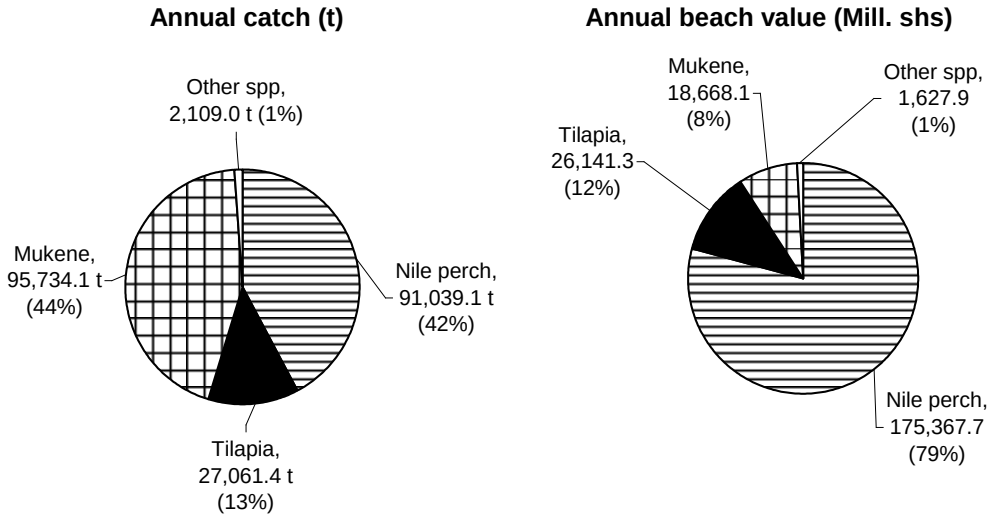


Figure 6. Relative contribution to the annual catches and beach value of the main fish species in the Ugandan part of Lake Victoria Oct. 2005-Sep. 2006.

10 DISCUSSION

The August 2006 catch assessment survey data showed a significant improvement in the Nile perch catch rates of paddled Sesse boats using gillnets from an earlier average of 8-9 kg boat^{-1} day^{-1} to 12.3 ± 1.1 kg boat^{-1} day^{-1}. This was indicative of improvement in the Nile perch fishery in the near shore waters. This was either a seasonal phenomenon or the result of the impact of the ongoing Monitoring Control and Surveillance (MCS) efforts, which are targeting bad fishing practices like the use of beach seines and the influence of the recently formed Beach Management Units (BMUs), which might have discouraged bad fishing practices. However, the impact of MCS and BMUs cannot be easily verified because the data show continued presence of beach seines that crop predominantly immature Nile perch.

The August 2006 data indicated a significant drop in the catch rates of Nile perch in Sesse boats with motor or sail using gillnets from approximately 24 kg boat^{-1} day^{-1} in March 2006 to 21 kg boat^{-1} day^{-1}. The current catch rates of Nile perch of Sesse boats with motor or sail using gillnets have remained very low compared with 53.6 ± 4.7 kg boat^{-1} day^{-1} recorded in 2000 in the same category of boats (Muhoozi, 2002). August is a month when Lake Victoria is completely mixed and this phenomenon probably affects the Nile perch distribution in the water column which may influence the catch in deep offshore waters where these boats operate. Similar lower catches of Nile perch were recorded in August 2005. The change of the sampling frequency from monthly in July – September 2005 to quarterly surveys in November 2005, March 2006, and August 2006 eliminated the chance of building good data sets to analyse the seasonal patterns of catch rates. This was worsened by the missing of sampling in the quarter April-June 2006, which makes it difficult to contemplate on the actual cause of the drop in Nile perch catch rates amongst Sesse boats with motor or sail using gillnets in August 2006.

The Nile perch continued to command a high beach value to the extent that although its catches comprised 40% of the total catches in August 2006, it contributed 78% of the overall gross value of all fish species landed. In view of the high beach value of the Nile perch fishery; it is desirable to increase productivity of this fishery. This could be achieved by allowing fish to grow to the recommended minimum size for harvest of 50 cm total length through elimination of illegal destructive fishing gears like beach seines and undersized gillnets in the short term and control of overall fishing effort in the long term.

The Tilapia fishery shows general stability of catch rates and total catch estimates since the beginning of CAS surveys in July 2005 but with a slight gradual decreasing trend. The small continuous decrease in the catches of Tilapia may be associated with the continuously decreasing water level, which affects the preferred tilapia habitats in the shallow near shore areas of the lake rather than being a factor of fishing effort. This fishery contributed 12% of the total catches in August 2006, compared with 13% in March 2006.

The Mukene/Dagaa fishery in the Ugandan waters of Lake Victoria remained a near shore fishery in which paddle sesse boats were the dominant craft. In spite of this, Mukene contributed 47% of the total catches in August 2006. The mukene fishery is underdeveloped in the deep offshore waters in Uganda and its potential there should be explored in order to expand. At present the few fishers who venture into open waters for Mukene use scoop nets, a very inefficient gear, but their catch rates compare well with those of small seines, which are operated in shallow protected bays. Efficient fishing methods in open waters may therefore be able to yield good catches of Mukene. Another setback in the Mukene fishery is the low value per unit weight compared with other fish species. Efforts should be made to improve the processing methods of this low value fish to enhance its contribution to the direct income of the fishers.

It was estimated that the Ugandan part of Lake Victoria produced 215,943.6 t of fish worth a gross value of shs 221.8 billion at the beach. This was composed of: Nile perch (91,039.1 t), Tilapias (27, 061.4 t), Mukene (95,734.1 t) and other species (2,109.0 t). This estimate is much higher than the earlier prediction of 163,235.7 t predicted worth shs 150 billion in the November 2005 CAS report (Muhoozi *et.al.* 2005). The inconsistency mainly derives from the Frame surveys data used as raising factor. The current estimate is believed to be more accurate because the raising factors were derived from the 2006 Frame survey data which were more efficiently analysed as compared with the 2004 Frame survey data used for the earlier estimates, where many constraints were faced during data handling.

The sale of either part or whole catch at sea in some parts of the lake is becoming common. This practice threatens the reliability of the information collected in CAS and could lead to grave underestimation of the total catches. The BMUs should as one of their bylaws enforce a ban against the practice. Large quantities of CAS data continue to be analyzed manually in a

spreadsheet thus being prone to error. Efforts should be made to complete the Database module for catch assessment surveys to ease data handling.

11 REFERENCES

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12 APPENDICES

Appendix 1. List of fish landing sites selected and sampled in Catch Assessment surveys in the Ugandan waters of Lake Victoria

District	Laning site
Bugiri	Golofa
	Bumeru A
	Butanila B
	Mwango
	Maruba
	Hama 'B'
Busia	Madwa
Jinja	Owen Falls Dam
	Wanyange
Kampala	Luzira Port Bell
Masaka	Nakigga
	Makonzi
Mayuge	Khaaza
	Maganda
	Malindi
	Nakirimira
	Ntinkalu
Rakai	Kasensero
Wakiso	Kinywante
	Kagulube
	Nsonga-Kava
	Nakiwogo
	Kitubulu
Mukono	Buwagajjo
	Namugambe
	Bukaali
	Kibulwe-Ziiru

District	Laning site
Mukono	Nantwalantya
	Kawunguli-Bulago
	Malija-Wabuziba
	Maala
	Kiruguma
	Lufu
	Kisu
	Gunda
	Kinaggaba
	Kawafu
	Zinga
	Kachanga-Bulago
	Luwero
	Kaziru
	Nambula
	Namugombe
	Kalega
	Nyenda
	Kiyindi
Mpigi	Katebo Lwazi
	Nakaziba
Kalangala	Banda
	Kakyanga
	Kasenyi
	Luku-Nabisukiro
	Mweena
	Kyagalanyi
Total	**54**

Appendix 2. Fish catch rates (kg boat^{-1} day^{-1}) in the Ugandan part of of Lake Victoria presented by effort group (Vessel-gear type) and species for August 2006

	VG type	BOAT DAYS	NP Wt.	CL	TL Wt.	CL	DA Wt.	CL	HA Wt.	CL	BD Wt.	CL	PA Wt.	CL	CG Wt.	CL	OT Wt.	CL
Parachute																		
	PA-GN	485	1.10	0.44	10.10	0.92	0.00	0.00	0.01	0.02	0.00	0.00	0.08	0.07	0.01	0.01	0.00	0.00
	PA-LL	14	11.21	12.24	0.39	0.85	0.00	0.00	0.43	0.63	0.00	0.00	3.07	2.64	0.00	0.00	0.00	0.00
	PA-HL	150	5.37	1.63	4.16	1.03	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.02	0.04
	PA-CN	30	0.02	0.03	17.43	4.90	0.00	0.00	0.00	0.00	0.07	0.14	0.00	0.00	0.00	0.00	0.00	0.00
	PA-TR	9	0.00	0.00	4.76	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	1.31	0.00	0.00
	PA-BS	3	6.67	10.04	19.00	43.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	PA-OT	42	0.40	0.57	21.02	6.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sesse Paddle																		
	SP-GN	859	12.30	1.12	6.25	0.82	0.00	0.00	0.03	0.04	0.06	0.04	0.16	0.09	0.07	0.05	0.10	0.05
	SP-LL	263	19.16	3.48	0.02	0.02	0.00	0.00	0.01	0.02	0.03	0.04	0.57	0.45	0.04	0.08	0.00	0.01
	SP-SS	80	0.23	0.38	0.00	0.00	188.67	25.82	0.07	0.07	0.00	0.00	0.19	0.37	0.00	0.00	0.00	0.00
	SP-SN	51	0.00	0.00	0.00	0.00	176.14	32.18	1.47	1.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SP-HL	151	6.94	3.11	4.01	0.93	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.04	0.00	0.00	0.05	0.06
	SP-CN	77	0.16	0.20	10.66	1.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.01
	SP-TR	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SP-BS	328	40.75	5.17	7.62	1.58	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.20	0.03	0.04	0.17	0.09
	SP-OT	27	23.00	9.93	7.83	4.51	0.00	0.00	0.00	0.00	0.74	1.11	0.00	0.00	0.00	0.00	0.19	0.27
Sesse motor/sail																		
	SMS-GN	825	21.62	1.30	0.41	0.16	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.01	0.00	0.00	0.03	0.03
	SMS-LL	265	26.73	2.65	0.18	0.17	0.00	0.00	0.00	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.00
	SMS-HL	11	49.91	36.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SMS-OT	7	20.57	12.34	0.79	1.30	0.00	0.00	0.00	0.00	1.64	1.43	0.00	0.00	0.00	0.00	1.14	1.55
Other craft																		
	OT-GN	10	0.35	0.79	2.15	2.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.38
	OT-LL	5	25.00	7.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	OT-HL	18	0.00	0.00	4.39	2.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	OT-TR	4	0.00	0.00	2.50	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.18	0.00	0.00

Appendix 3. Estimated total fish landed (tonnes) in the Ugandan part of of Lake Victoria presented by effort group (Vessel-gear type) and species for August 2006

VG type	NP	±	TL	±	DA	±	HA	±	BD	±	PA	±	CA	±	OT	±	**TOTAL**	±
Parachute																		
PA-GN	81.0	32.2	741.2	67.4	0.0	0.0	0.9	1.8	0.0	0.0	6.0	5.2	0.4	0.6	0.1	0.1	**829.5**	**107.3**
PA-LL	90.9	99.2	3.2	6.9	0.0	0.0	3.5	5.1	0.0	0.0	24.9	21.4	0.0	0.0	0.0	0.0	**122.5**	**132.5**
PA-HL	104.0	31.6	80.7	20.0	0.0	0.0	0.0	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.4	0.8	**185.3**	**52.8**
PA-CN	0.1	0.3	130.4	36.7	0.0	0.0	0.0	0.0	0.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0	**131.0**	**37.9**
PA-TR	0.0	0.0	2.3	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.0	0.0	**2.6**	**2.1**
PA-BS	24.9	37.6	71.1	162.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**96.0**	**199.7**
PA-OT	0.2	0.3	11.6	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**11.9**	**4.0**
SUB-TOTAL	**301.2**	**201.1**	**1,040.5**	**298.2**	**0.0**	**0.0**	**4.4**	**6.9**	**0.7**	**1.4**	**30.9**	**26.6**	**0.7**	**1.2**	**0.5**	**0.9**	**1,378.8**	**536.3**
Sesse padle																		
SP-GN	1,408.2	127.8	716.0	94.1	0.0	0.0	3.9	4.4	7.1	4.1	18.0	10.4	7.8	6.0	11.7	5.4	**2,172.5**	**252.2**
SP-LL	1,081.4	196.4	0.9	1.3	0.0	0.0	0.4	0.8	1.4	2.2	32.0	25.3	2.4	4.7	0.2	0.4	**1,118.7**	**231.1**
SP-SS	7.8	12.7	0.0	0.0	6,405.2	876.5	2.3	2.5	0.0	0.0	6.4	12.7	0.0	0.0	0.0	0.0	**6,421.7**	**904.5**
SP-SN	0.0	0.0	0.0	0.0	2,181.8	398.6	18.2	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**2,200.0**	**420.7**
SP-HL	171.5	77.0	99.2	23.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	1.0	0.0	0.0	1.3	1.5	**273.0**	**103.0**
SP-CN	0.8	1.0	52.0	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	**52.9**	**8.8**
SP-TR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
SP-BS	1,186.1	150.5	221.9	46.1	0.0	0.0	0.0	0.0	0.0	0.0	8.7	5.8	0.9	1.0	4.9	2.6	**1,422.4**	**206.0**
SP-OT	17.8	7.7	6.1	3.5	0.0	0.0	0.0	0.0	0.6	0.9	0.0	0.0	0.0	0.0	0.1	0.2	**24.5**	**12.2**
SUB-TOTAL	**3,873.5**	**573.1**	**1,096.0**	**175.8**	**8,587.0**	**1,275.2**	**24.8**	**29.8**	**9.5**	**7.6**	**65.5**	**55.2**	**11.1**	**11.8**	**18.2**	**10.2**	**13,685.7**	**2,138.5**
Sesse motor/sail																		
SMS-GN	2,126.4	127.8	40.8	16.2	0.0	0.0	0.0	0.0	1.4	1.5	0.4	0.7	0.0	0.0	3.1	2.6	**2,172.0**	**148.9**
SMS-LL	966.1	95.7	6.3	6.3	0.0	0.0	0.0	0.0	1.8	2.1	0.0	0.0	0.0	0.0	0.0	0.0	**974.2**	**104.1**
SMS-HL	60.3	44.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**60.3**	**44.5**
SMS-OT	8.9	5.3	0.3	0.6	0.0	0.0	0.0	0.0	0.7	0.6	0.0	0.0	0.0	0.0	0.5	0.7	**10.4**	**7.2**
SUB-TOTAL	**3,161.6**	**273.4**	**47.5**	**23.1**	**0.0**	**0.0**	**0.0**	**0.0**	**3.9**	**4.3**	**0.4**	**0.7**	**0.0**	**0.0**	**3.6**	**3.3**	**3,216.9**	**304.7**
Other crafts																		
OT-GN	1.2	2.6	7.2	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	1.3	**10.0**	**11.4**
OT-LL	30.1	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**30.1**	**8.5**
OT-HL	0.0	0.0	13.7	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**13.7**	**7.5**
OT-TR	0.0	0.0	1.5	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.9	0.0	0.0	**2.0**	**2.7**
SUB-TOTAL	**31.3**	**11.2**	**22.3**	**15.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.6**	**1.9**	**1.7**	**1.3**	**55.9**	**30.1**
GRAND TOTAL	**7,367.7**	**1,058.7**	**2,206.2**	**512.9**	**8,587.0**	**1,275.2**	**29.2**	**36.7**	**14.1**	**13.2**	**96.8**	**82.5**	**12.4**	**14.9**	**23.9**	**15.6**	**18,337.2**	**3,009.6**

Appendix 4. Estimated total fish landed (tonnes) in the Ugandan part of Lake Victoria presented by district and species for July 2005

DISTRICT	NP	±	TL	±	DA	±	HA	±	BD	±	PA	±	CA	±	OT	±	**TOTAL**	±
Busia	29.0	9.9	19.4	6.2	19.0	2.8	6.3	1.6	0.1	0.1	0.1	0.2	0.0	0.0	1.1	1.0	**75.0**	**21.8**
Bugiri	1,589.0	243.6	272.1	59.1	744.2	111.4	245.2	63.2	1.4	1.9	4.4	5.7	0.5	0.7	27.2	24.6	**2,884.0**	**510.2**
Mayuge	757.1	136.3	269.9	75.8	570.6	92.5	183.9	47.5	1.0	1.2	4.2	5.6	0.5	0.7	11.7	9.8	**1,798.9**	**369.4**
Jinja	48.2	9.6	39.1	6.6	6.2	4.5	0.0	0.0	0.1	0.1	0.3	0.5	0.1	0.1	1.7	1.2	**95.8**	**22.6**
Mukono	3,074.4	451.3	869.0	165.4	3,436.5	800.5	965.3	248.3	5.4	6.5	7.2	7.8	1.5	1.8	81.8	67.1	**8,441.2**	**1,748.8**
Kampala	47.4	8.4	20.2	4.1	7.6	1.1	2.5	0.7	0.1	0.1	0.3	0.3	0.0	0.0	1.2	0.8	**79.3**	**15.6**
Wakiso	546.8	95.4	300.5	44.7	446.1	91.5	132.8	34.4	0.9	1.1	4.0	4.1	0.4	0.6	13.6	10.6	**1,445.2**	**282.4**
Mpigi	160.2	32.6	167.5	24.2	30.4	4.5	10.1	2.8	0.3	0.3	2.5	2.4	0.3	0.3	7.8	5.7	**379.0**	**72.9**
Masaka	200.8	45.9	246.3	34.0	450.2	81.5	140.1	36.1	0.6	0.8	1.6	1.6	0.2	0.4	5.1	4.6	**1,045.1**	**205.0**
Kalangala	1,390.3	188.6	572.0	97.9	3,722.8	2,046.8	359.1	92.6	2.4	2.9	5.4	5.0	0.8	1.0	45.8	37.8	**6,098.6**	**2,472.7**
Rakai	187.9	20.9	52.9	8.5	11.4	1.7	3.8	1.0	0.2	0.2	0.6	0.5	0.1	0.1	6.6	6.0	**263.4**	**39.0**
TOTAL	**8,031.2**	**1,242.4**	**2,828.9**	**526.7**	**9,445.0**	**3,239.0**	**2,049.1**	**528.1**	**12.5**	**15.3**	**30.6**	**33.8**	**4.4**	**5.8**	**203.8**	**169.3**	**22,605.4**	**5,760.4**

Abbreviations: NP= Nile perch, TL=Tilapiines, DA= Mukene/Dagaa, HA=Haplochromines, BD=Bagrus, PA= Protopterus, CA= Clarias, OT=Other spp

Appendix 5. Estimated total fish landed (tonnes) in the Ugandan part of Lake Victoria presented by district and species for August 2005.

	NP	95%CL	TL	95%CL	DA	95%CL	HA	95%CL	BD	95%CL	PA	95%CL	CA	95%CL	OT	95%CL	**TOTAL**	**95%CL**
Busia	17.4	3.9	11.9	2.6	21.0	2.8	0.0	0.0	0.0	0.0	6.2	17.4	3.5	17.4	0.8	1.1	**60.8**	**45.3**
Bugiri	1,102.7	203.7	233.2	55.8	822.0	110.3	0.4	0.5	1.0	1.3	3.5	3.7	1.1	1.5	2.2	1.6	**2,166.1**	**378.3**
Mayuge	572.3	135.1	226.5	52.3	621.6	84.3	0.3	0.5	0.8	1.0	3.3	3.6	1.1	1.5	1.6	1.2	**1,427.4**	**279.5**
Jinja	41.2	10.2	34.9	7.4	2.5	0.6	0.0	0.0	0.1	0.1	0.3	0.4	0.1	0.1	0.3	0.2	**79.4**	**19.2**
Mukono	2,633.2	476.8	757.2	162.0	3,436.9	485.9	0.6	1.0	5.1	6.6	10.1	11.9	5.4	7.9	16.4	16.1	**6,864.8**	**1,168.3**
Kampala	42.3	10.3	20.0	4.5	8.4	1.2	0.0	0.0	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.1	**71.4**	**16.7**
Wakiso	467.2	106.2	241.1	43.3	461.8	64.1	0.5	0.7	0.9	1.3	4.3	4.4	1.3	1.6	2.1	1.5	**1,179.2**	**223.1**
Mpigi	143.4	35.3	130.9	19.8	33.6	4.6	0.3	0.4	0.3	0.3	2.3	2.1	0.6	0.7	1.8	1.5	**313.1**	**64.7**
Masaka	174.6	49.9	190.9	29.7	479.5	65.5	0.3	0.5	0.2	0.3	1.7	1.8	0.5	0.6	1.7	2.0	**849.2**	**150.2**
Kalangala	1,269.1	216.3	458.4	83.7	2,242.8	431.6	0.6	0.9	2.1	2.6	5.8	5.5	2.6	3.0	5.8	4.1	**3,987.2**	**747.7**
Rakai	170.7	21.2	41.1	7.9	12.6	1.7	0.1	0.1	0.2	0.2	0.7	0.8	0.2	0.2	0.5	0.3	**226.0**	**32.3**
TOTAL	**6,633.9**	**1,268.9**	**2,346.0**	**469.0**	**8,142.6**	**1,252.5**	**3.0**	**4.7**	**10.8**	**13.9**	**38.4**	**51.9**	**16.5**	**34.7**	**33.4**	**29.7**	**17,224.6**	**3,125.2**

Abbreviations: NP= Nile perch, TL=Tilapiines, DA= Mukene/Dagaa, HA=Haplochromines, BD=Bagrus, PA= Protopterus, CA= Clarias, OT=Other spp

Appendix 6. Estimated total fish landed (tonnes) in the Ugandan part of Lake Victoria presented by district and species for September 2005

District	NP	95%CL	TL	95%CL	DA	95%CL	HA	95%CL	BD	95%CL	PA	95%CL	CA	95%CL	OT	95%CL	**TOTAL**	**95%CL**
Busia	28.3	6.2	12.3	3.2	29.3	6.4	0.1	0.1	0.0	0.0	1.8	1.2	0.1	0.1	0.3	0.3	**72.2**	**17.7**
Bugiri	1,392.0	209.3	238.3	105.2	1,148.9	253.1	0.2	0.2	4.8	5.3	6.2	6.2	0.7	1.0	1.9	1.7	**2,793.0**	**581.9**
Mayuge	748.1	126.0	226.9	64.3	869.5	191.6	0.1	0.2	1.6	1.8	5.8	5.9	0.9	1.1	2.1	3.2	**1,855.0**	**394.1**
Jinja	54.3	9.5	31.2	6.4	4.1	1.1	0.0	0.0	0.1	0.1	1.1	1.0	0.3	0.4	0.4	0.2	**91.5**	**18.7**
Mukono	3,362.7	504.5	696.7	180.1	4,821.1	1,048.6	0.3	0.3	4.3	4.6	20.2	18.5	1.8	2.4	9.6	6.4	**8,916.7**	**1,765.4**
Kampala	63.3	10.7	14.9	2.7	11.7	2.6	0.0	0.0	0.0	0.0	0.6	0.5	0.0	0.0	0.2	0.1	**90.9**	**16.8**
Wakiso	593.5	101.8	259.6	53.6	648.5	143.1	0.2	0.2	0.6	0.7	6.6	5.9	1.7	2.1	1.9	1.8	**1,512.7**	**309.2**
Mpigi	161.7	22.9	148.3	18.2	47.2	10.6	0.1	0.1	0.2	0.2	2.4	2.4	0.5	0.6	1.0	0.7	**361.4**	**55.6**
Masaka	216.8	41.2	234.7	41.1	670.9	146.9	0.0	0.1	0.2	0.2	2.9	3.6	0.3	0.4	0.6	0.4	**1,126.4**	**233.9**
Kalangala	1,516.9	215.6	492.4	100.4	3,225.3	641.9	0.2	0.2	1.6	1.5	8.7	8.3	0.7	1.0	3.6	2.1	**5,249.5**	**971.1**
Rakai	185.2	20.3	46.4	11.7	17.7	4.0	0.0	0.0	0.3	0.3	0.8	0.8	0.2	0.2	0.3	0.2	**250.8**	**37.5**
TOTAL	**8,322.8**	**1,268.0**	**2,401.9**	**586.9**	**11,494.2**	**2,450.2**	**1.2**	**1.5**	**13.7**	**14.6**	**57.0**	**54.3**	**7.3**	**9.4**	**21.8**	**17.1**	**22,320.0**	**4,401.9**

Abbreviations: NP= Nile perch, TL=Tilapiines, DA= Mukene/Dagaa, HA=Haplochromines, BD=Bagrus, PA= Protopterus, CA= Clarias, OT=Other spp

Appendix 7. Estimated total fish landed (tonnes) in the Ugandan part of Lake Victoria presented by district and species for November 2005

District	NP	95%CL	TL	95%CL	DA	95%CL	HA	95%CL	BD	95%CL	PA	95%CL	CA	95%CL	OT	95%CL	**TOTAL**	**95%CL**
Busia	24.8	3.8	13.3	3.7	14.4	2.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.1	**52.9**	**9.8**
Bugiri	1,589.3	202.3	217.4	50.9	561.4	76.7	0.3	0.5	1.4	1.9	6.4	6.5	0.6	1.3	3.5	3.1	**2,380.2**	**343.3**
Mayuge	792.4	123.7	219.4	48.1	427.8	60.2	0.3	0.5	0.7	0.9	5.3	4.8	0.6	1.7	2.4	1.9	**1,448.7**	**241.6**
Jinja	50.8	8.8	32.0	5.9	3.6	1.8	0.0	0.0	0.0	0.1	0.3	0.3	0.0	0.5	0.6	0.4	**87.4**	**17.7**
Mukono	3,348.6	403.1	664.5	129.0	2,477.0	371.4	0.4	0.7	3.2	3.9	13.4	12.7	1.9	4.1	13.8	9.4	**6,522.8**	**934.3**
Kampala	51.1	8.4	16.6	3.2	5.9	1.1	0.0	0.0	0.0	0.0	0.4	0.3	0.0	0.1	0.4	0.2	**74.5**	**13.4**
Wakiso	576.0	85.6	240.9	44.6	327.3	50.4	0.4	0.7	0.6	0.7	6.5	5.1	0.8	2.9	3.1	2.2	**1,155.4**	**192.3**
Mpigi	170.2	26.6	129.5	19.8	24.2	5.4	0.2	0.4	0.2	0.2	3.6	2.6	0.4	0.9	1.7	1.1	**330.1**	**57.1**
Masaka	221.0	36.1	205.4	34.8	332.9	45.3	0.4	0.7	0.2	0.2	3.3	2.6	0.6	0.9	1.1	1.0	**764.9**	**121.6**
Kalangala	1,599.3	182.9	434.3	76.8	2,201.4	471.2	0.6	1.0	1.4	1.7	9.7	7.8	1.3	2.0	7.0	5.0	**4,254.9**	**748.4**
Rakai	222.9	19.4	41.3	8.5	9.0	1.9	0.1	0.1	0.2	0.2	1.2	1.1	0.1	0.3	0.7	0.6	**275.3**	**32.1**
TOTAL	**8,646.3**	**1,100.8**	**2,214.4**	**425.1**	**6,384.7**	**1,087.4**	**2.5**	**4.6**	**7.9**	**9.9**	**50.3**	**43.8**	**6.4**	**14.7**	**34.5**	**25.1**	**17,347.0**	**2,711.5**

Abbreviations: NP= Nile perch, TL=Tilapiines, DA= Mukene/Dagaa, HA=Haplochromines, BD=Bagrus, PA= Protopterus, CA= Clarias, OT=Other spp

Appendix 8. Estimated total fish landed (tonnes) in the Ugandan part of Lake Victoria presented by district and species for March 2006

District	NP	±	TL	±	DA	±	HA	±	BD	±	PA	±	CA	±	OT	±	**TOTAL**	**±**
Busia	23.5	9.4	16.6	9.4	19.7	8.4	0.0	0.0	0.1	0.1	0.2	0.2	0.5	0.6	2.4	3.7	**62.9**	**31.8**
Bugiri	1,204.5	177.0	247.4	96.8	792.1	347.2	0.2	0.4	1.6	2.2	6.8	6.2	2.9	2.9	10.2	9.3	**2,265.8**	**642.0**
Mayuge	642.6	121.1	233.1	91.2	590.0	251.5	0.2	0.4	1.2	1.6	6.9	6.2	3.1	3.2	8.5	8.5	**1,485.6**	**483.8**
Jinja	44.2	9.5	30.9	10.5	3.9	1.1	0.0	0.0	0.2	0.2	0.6	0.4	0.5	0.4	1.0	0.5	**81.2**	**22.8**
Mukono	2,810.2	438.9	732.4	349.4	3,349.1	1,384.8	1.1	1.6	5.6	5.4	26.1	20.5	18.1	16.0	40.7	35.2	**6,983.3**	**2,251.9**
Kampala	49.0	7.8	17.5	9.4	7.9	3.4	0.0	0.0	0.1	0.1	0.6	0.5	0.3	0.3	0.9	0.5	**76.3**	**22.1**
Wakiso	488.3	74.8	234.5	79.2	444.3	186.0	0.3	0.5	1.6	2.1	9.0	8.2	3.7	3.6	7.4	5.5	**1,189.1**	**360.0**
Mpigi	152.5	28.5	131.4	42.6	32.2	14.5	0.1	0.2	0.7	1.1	3.8	3.8	1.1	1.3	3.8	2.9	**325.6**	**94.8**
Masaka	186.2	34.1	192.7	46.6	454.2	190.4	0.1	0.1	0.4	0.6	3.6	3.4	0.6	0.8	3.5	4.6	**841.2**	**280.6**
Kalangala	1,323.7	178.1	453.1	171.1	2,722.6	915.1	0.5	0.8	2.8	3.2	13.4	11.8	6.6	6.4	17.8	13.2	**4,540.7**	**1,299.6**
Rakai	174.3	18.9	41.6	15.2	14.9	8.9	0.0	0.1	0.3	0.3	0.9	0.9	0.2	0.3	1.8	1.3	**234.0**	**46.0**
TOTAL	**7,099.1**	**1,098.3**	**2,331.2**	**921.4**	**8,430.8**	**3,311.3**	**2.6**	**4.1**	**14.6**	**17.0**	**71.8**	**62.1**	**37.7**	**35.8**	**97.8**	**85.3**	**18,085.6**	**5,535.3**

Abbreviations: NP= Nile perch, TL=Tilapiines, DA= Mukene/Dagaa, HA=Haplochromines, BD=Bagrus, PA= Protopterus, CA= Clarias, OT=Other spp

Appendix 9. Estimated total fish landed (tonnes) in the Ugandan part of Lake Victoria presented by district and species for August 2006

District	NP	±	TL	±	DA	±	HA	±	BD	±	PA	±	CA	±	OT	±	**TOTAL**	**±**
Busia	48.0	11.5	11.7	2.6	19.6	2.7	0.0	0.1	0.1	0.1	0.3	0.2	0.0	0.0	0.2	0.2	**79.8**	**17.4**
Bugiri	1,217.3	165.6	231.6	98.7	766.4	104.9	1.2	1.6	2.3	2.5	9.3	8.3	0.9	1.0	2.3	1.7	**2,231.3**	**384.4**
Mayuge	639.3	120.8	241.7	111.2	583.3	80.2	1.1	1.5	1.2	1.4	8.7	7.6	0.8	1.0	1.7	1.2	**1,477.9**	**324.8**
Jinja	50.6	11.0	31.2	5.4	4.2	0.8	0.1	0.1	0.2	0.2	0.8	0.6	0.1	0.2	0.3	0.2	**87.5**	**18.5**
Mukono	2,924.7	397.1	667.0	134.8	3,360.6	475.6	6.4	7.9	5.6	5.1	36.5	31.1	5.4	6.5	10.5	6.7	**7,016.7**	**1,064.8**
Kampala	57.6	9.2	17.0	3.1	7.8	1.1	0.1	0.1	0.1	0.1	0.8	0.6	0.1	0.1	0.3	0.2	**83.8**	**14.5**
Wakiso	527.2	89.4	232.8	35.5	444.0	62.1	1.5	2.1	1.0	0.9	11.3	9.5	1.1	1.3	1.9	1.2	**1,220.8**	**202.0**
Mpigi	168.3	30.9	123.7	23.2	31.3	4.3	0.7	1.0	0.5	0.4	5.0	4.0	0.6	0.6	0.9	0.5	**331.0**	**64.9**
Masaka	197.0	33.4	191.6	28.6	454.8	63.0	0.8	1.1	0.3	0.3	4.3	4.0	0.6	1.0	0.8	0.5	**850.1**	**131.9**
Kalangala	1,368.5	173.3	420.7	64.0	2,903.1	479.0	17.1	21.0	2.5	2.1	18.5	15.5	2.5	2.7	4.7	2.9	**4,737.6**	**760.4**
Rakai	169.3	16.5	37.2	5.6	11.7	1.6	0.2	0.3	0.3	0.2	1.3	1.0	0.3	0.3	0.4	0.3	**220.6**	**25.8**
TOTAL	**7,367.7**	**1,058.7**	**2,206.2**	**512.9**	**8,587.0**	**1,275.2**	**29.2**	**36.7**	**14.1**	**13.2**	**96.8**	**82.5**	**12.4**	**14.9**	**23.9**	**15.6**	**18,337.2**	**3,009.6**

Abbreviations: NP= Nile perch, TL=Tilapiines, DA= Mukene/Dagaa, HA=Haplochromines, BD=Bagrus, PA= Protopterus, CA= Clarias, OT=Other spp