REPUBLIC OF KENYA

MINISTRY OF AGRICULTURE, LIVESTOCK AND FISHERIES

STATE DEPARTMENT FOR FISHERIES AND THE BLUE ECONOMY

FISHERIES ANNUAL STATISTICAL BULLETIN 2015

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1.0 INTRODUCTION

Fisheries production in Kenya can be classified into three groups namely fresh water capture fisheries, marine capture fisheries and aquaculture. The major sources of capture and aquaculture data (including prices) are Fisher folks dealing with marine and inland fishing such as Beach Management Units (BMUs); Aquaculture farmers, County Directors of Fisheries in the various counties, Kenya Marine and Fisheries Research Institute, Kenya National Bureau of Statistics (KNBS), Association of Fish Processors and Exporters of Kenya (AFIPEK), Government and County fish farms and hatcheries, Fish and fish products markets.

On fisheries data exchange, the State Department for Fisheries and the Blue Economy has active collaborative initiatives with various organizations. Due to the fact that some of the most important fisheries in the country are Tran-boundary, there are strong mechanisms of data sharing with the aim of fostering better management of the shared fisheries resources. The department thus exchanges data with regional bodies such as the Lake Victoria Fisheries Organization (LVFO), the Indian Ocean Tuna Commission (IOTC), the Food and Agricultural Organization (FAO) and the South West Indian Ocean Fisheries Commission (SWIOFC). Data exchange with these organizations is wide ranging encompassing all aspects of fisheries.

LVFO is also involved in setting benchmarks of data collections protocols by issuing standard operating procedures in data collection and analysis so that the data thus collected can be compared across the shared water body regardless of the country. Data exchange with Indian Ocean Tuna commission (IOTC) concerns tuna and tuna like species which are highly migratory. The stocks are shared by the countries bordering the Indian Ocean and for effective management, the member countries share fisheries data to enable species specific stock assessment in the Indian Ocean. The South West Indian Ocean Fisheries Commission mainly deals with demersal species, nearshore pelagics, crustaceans and molluscs which mainly are within a country's water boundaries or are shared with the immediate neighbours. The department also makes submissions to FAO statistical year books as well as for the annual economic survey reports by Kenya National Bureau of Statistics. This report details on the fisheries production data for the years 2015 and compares the results with those of the previous years. The imports and export data are also important for evaluation of the per capita consumption of fish in the country.

2.0 NATIONAL FISH PRODUCTION

Kenya is endowed with both marine and inland water resources. The inland water resources include lakes, dams and rivers of varying sizes. Some of the major lakes include: Lake Turkana (6,405 Km^2), Lake Victoria-Kenyan side (6% of the whole lake =4,128 km^2), Naivasha (210 Km^2), Baringo (129 Km^2), and Lake Jipe (39 Km^2). Major rivers include Tana (700 Km), Athi/Galana/Sabaki (530 Km), Ewaso-Ngiro-North (520 Km), Kerio (350 Km), Suam-Turkwel (350 km), Mara (280 km), Nzoia (240 km), Voi (200 km), Yala (170 km), Ewaso-Ngiro-south (140 km), Sondu (105 km), Malewa (105 km) and Kuja (80 km. Across the country are also dams stocked with fish and in areas like Uasin Gishu and Laikipia, the fish production is quite substantial.

Further to these inland water resources, Kenya also enjoys a vast coastline of 640 km on the Western Indian Ocean, besides a further 200 nautical miles Exclusive Economic Zone (EEZ) under Kenyan jurisdiction. The total area of the territorial waters is 9,700 Km^2 while the Kenyan EEZ is 142,400 Km^2. Kenya also lays claim to extended EEZ reaching 350 km with an extra area of approximately 103,320 Km^2. The total area for exploitation by the country is a massive 255,420 Km2 which is about half of the Kenyan land cover area.

The Kenyan fishery is mainly artisanal with very few commercial/industrial vessels targeting mainly shallow water shrimps, deep water shrimps and lobsters. The country has for a period been having a Kenyan flagged longliner exploiting the EEZ. Other vessels are purse seines and long liners owned by Distant Water Fishing Nations (DWFN) which operate under Kenyan license in our Economic Exclusive Zone (EEZ) targeting Tuna and Tuna like species. The artisanal fishery accounts for most the inland and marine water catches reported in this bulletin and consequently it is currently the most important fishery in the country, even though our EEZ which is predominately for commercial fishing is under exploited with an estimated potential of between 150,000 to 300,000 metric tonnes (Commonwealth secretariat report 2003 by Dr. George Habib).

The fisheries sector plays a significant role in employment and income generation. During the year under review the sector supported a total of 61,311 people directly as fishermen and 73,839 fish farmers with 69,688 stoked fish ponds. The sector supports about 1.2 million people directly and indirectly, working as fishers, traders, processors, suppliers and merchants of fishing accessories and employees and their dependents. Besides being a rich source of protein especially for riparian communities, the sector is also important for the preservation of culture, national heritage, and recreational purposes.

During the year (2015) under review, the total fish production was 164,310 metric tons worth 24,463 million Kenya shillings (Figure 1). The production was 10% decline compared to 182,710 tons worth 25,607 million Kenya shillings in landed in 2014. Most of the production as in the past was from inland capture fisheries amounting to 122,999 metric tons with an ex-vessel value of Kshs.15,584 million. The production from marine and aquaculture was 22,407 and 18,656 metric tons worth Kshs. 3,865 and 5,014 million shillings respectively (Fig 2).

Inland capture fisheries contributed 74.9% of Kenya's total fish production, with the principal fishery being that of Lake Victoria. The lake accounted for 109,902 metric tons or 89.4% of the country's total annual inland fish production in 2015. Lake Turkana, Kenya's largest freshwater body (6,405 km^2) produced 10,605.3 metric tons of fish during the year under review. Other freshwater-bodies of commercial importance included lakes Baringo (176.2 MT), Naivasha (1,072.5 MT), Jipe (123 MT).

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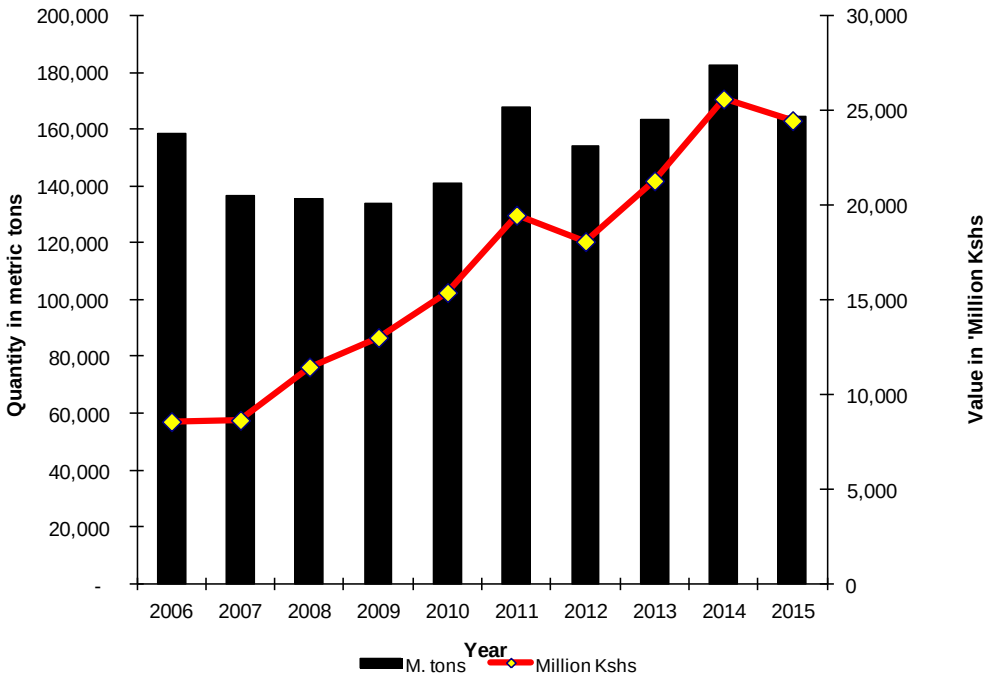

Figure 1: Fish production by quantity and value 2006-2015

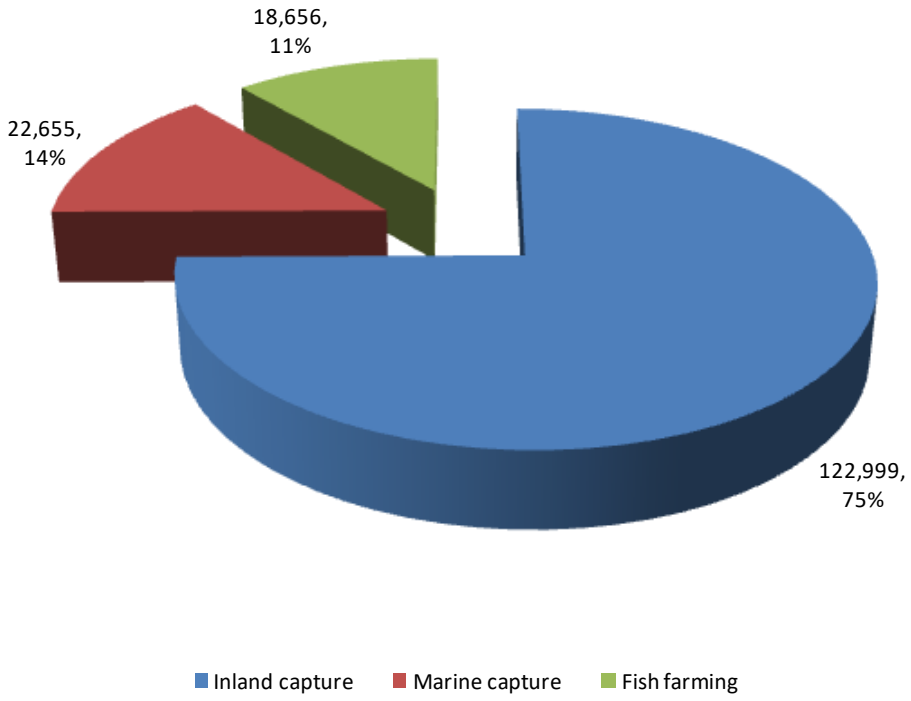

Figure 2: National fish production by Fishery Category 2015

The fish and fish products produced in the country are marketed domestically or exported to the international markets. The main fish and fishery products exported during the year under review included Nile perch products (fillets, maws, headless and gutted whole Nile perch), Octopus, Fish meal and marine shells. Fish and fishery products imported into the country included the following products among others: frozen Mackerels, frozen Tilapia, frozen Tilapia fillets, frozen Sardines, frozen Pangasius fillets and Tuna fish meals among others.

The fisheries production by different water bodies in 2015 is shown in table 1. The table also has number of fishers, fish farmers and production inputs such as crafts and ponds during the year. Table 2 compares the fish production for the past three years (2013 – 2015) while the production by species for the same period is shown in table 3.

Table 1 Fish landings by Weight, Value, Number of Fishers, Ponds and fishing Crafts 2015

Fresh water	**M. tons**	**000 Kshs.**	**Fishers**	**Farmers**	**Crafts**	**Ponds**
Lake Victoria	109,902	14,494,839	40,113		13,402	
Lake Turkana	10,605	735,717	7,000		1650	
Lake Baringo	176	54,859	120		47	
Lake Naivasha	1,072	132,617	150		50	
LakeJipe/Dams	122	21,031	66		46	
Lake Kanyaboli	100	9,874	188		99	
Lake Kenyatta	64	5,085	120		40	
Tana River dams	852	115,020	316		180	
Turkwel dam	28	5,936				
Fish Farming	18,656	5,014,149		73,839		69,688
Tana River delta	54	4,818	299		93	
Riverine	24	4,212				
Total Fresh water	**141,655**	**20,598,157**	**48,372**	**73,839**	**15,607**	**69,688**
Marine Artisanal	22,407	3,795,575	12,915		2,913	
Marine Industrial	248	69,599				
Total Marine	**22,655**	**3,865,174**				
Grand Total	**164,310**	**24,463,331**	**61,287**	**73,839**	**18,520**	**69,688**
	M. tons	**000 Kshs.**	**% Quantity**	**% Value**		
Inland Capture	122,999	15,584,008	74.9	63.7		
Marine Capture	22,655	3,865,174	13.8	15.8		
Aquaculture	18,656	5,014,149	11.4	20.5		
Total	**164,310**	**24,463,331**	**100**	**100**		

Table 2: Quantity and Value of fish landings 2013 – 2015

	2013		2014		2015	
FRESH WATER	**M. tons**	**000 Kshs**	**M. tons**	**000 Kshs**	**M. tons**	**000 Kshs**
L. Victoria	124,643	13,858,682	128,708	14,601,790	109,902	14,494,839
L. Turkana	4,338	438,646	4,166	433,790	10,605	735,717
L. Naivasha	231	17,542	633	68,070	**1,072**	**132,617**
L. Baringo	263	25,008	302	86,595	176	54,859
L. Jipe/Dams	116	16,910	115	19,249	122	21,031
Lake Kanyaboli	194	12,004	134	10,466	100	9,874
Lake Kenyatta	54	3,770	51	3,899	64	5,085
Tana River Dams	705	73,024	1,024	98,311	852	115,020
Fish Farming	23,501	5,522,735	24,096	5,601,722	18,656	5,014,149
Turkwel dam	208	16,009	56	11,547	28	5,936
Tana delta	45	3,204	47	3,574	54	4,818
Riverine			8	1,894	24	4,212
TOTAL	**154,253**	**19,987,534**	**159,340**	**20,940,907**	**141,655**	**20,598,157**
Marine Artisanal	9,136	1,298,173	23,287	4,641,349	22,407	3,795,575
Marine Industrial	46	15,700	83	25,205	248	69,599
Marine Total	**9,182**	**1,313,873**	**23,370**	**4,666,554**	**22,655**	**3,865,174**
GRAND TOTAL	**163,435**	**21,301,407**	**182,710**	**25,607,461**	**164,310**	**24,463,331**

Table 3: Fresh Water and Marine fish catches by Species, Weight and Value 2013- 2015

	2013		2014		2015	
	M. tons	**000 Kshs**	**M. tons**	**000 Kshs**	**M. tons**	**000 Kshs**
Alestes spp.	329	27,359	318	26,871	620	96,600
Bagrus spp.	105	8,550	101	8,398	90	4,965
Barbus spp.	94	8,443	101	10,777	14	2,936
Black bass	1	133	3	461	20	2,164
Clarias spp.	6,918	1,196,823	7,174	1,252,514	5,180	857,874
Rastreonobola argentia	66,717	3,552,513	69,561	4,129,707	61,662	5,457,786
Labeo spp.	659	60,785	622	61,135	684	69,569
Haplochromis spp.	1,126	85,212	929	73,211	2,624	149,035
Lates niloticus	44,319	8,589,887	43,399	8,473,050	31,348	6,823,874
Protopterus spp.	1,318	115,852	1,339	158,834	1,147	156,509
Synodontis spp.	141	11,885	136	11,672	1,407	96,630
Tilapia niloticus	25,071	5,531,254	26,278	5,746,526	29,410	5,847,829
Tilapia others	2,395	253,577	2,612	300,187	19	2,202
Trout	235	140,853	241	142,943	937	467,700
Carps	1,920	182,300	2,083	202,237	1,667	257,897
Eels	-	-	-	-	-	-
Citharinus spp.	120	14,118	116	13,866	224	19,318
Hydrocynus	109	9,826	106	9,650	-	-
Distichodus niloticus	330	34,562	319	33,946	477	37,348
Caradina niloticus	-	-	-	-	2,201	43,258
Schilbe mystes	-	-	-	-	1,602	176,226
Unspecified	2,251	161,488	3,903	284,922	322	28,437
TOTAL	**154,159**	**19,985,420**	**159,340**	**20,940,907**	**141,655**	**20,598,156**
MARINE FISH						
Demersal	2,147	177,666	13,302	2,139,486	10,135	1,493,850
Pelagic	698	66,158	5,834	1,049,390	7,844	1,298,861
Sharks/Rays	2,136	319,831	1,312	181,583	1237	166,826
Mixed species	2,722	380,143	423	48,039	525	58,596
TOTAL	**7,704**	**943,799**	**20,870**	**3,418,498**	**19,741**	**3,018,133**
CRUSTACEA						
Lobster	123	114,952	408	885,657	263	343,600
Prawns	365	77,752	170	39,061	213	60,637
Crabs	274	58,146	135	43,389	145	70,274
TOTAL	**762**	**250,851**	**713**	**968,107**	**621**	**474,512**
MOLLUSCS						
Beche-de-mers	80	37,475	13	2,297	19	2,158
Cuttlefish			45	10,493	47	8,994
Octopus	446	45,899	1,610	233,756	1,832	258,926
Squids	143	20,149	35	8,198	147	32,853
TOTAL	**669**	**103,523**	**1,703**	**254,744**	**2,045**	**302,930**
TOTAL MARINE	**9,135**	**1,298,173**	**23,287**	**4,641,349**	**22,407**	**3,795,575**
GRAND TOTAL	**163,294**	**21,283,593**	**182,627**	**25,582,256**	**164,062**	**24,393,731**

3.0 INLAND CAPTURE FISHERIES

Most of the fish landings from inland capture fisheries in Kenya are from lakes Victoria, Turkana, Naivasha, Baringo, Jipe, Tana River dams, and Tana river delta. The rest are from the dams and rivers. In capture fisheries, gill netting was the most used fishing method during the year. The other methods included use of gears such as long line hooks, hand line, traditional traps, trolling, ring nets, cast nets and small (mosquito) seines for *Rastrineobola argentea* fishing. There are other methods which are used though are prohibited due to their destructive nature. They include; Beach seining, Monofilament gill netting, Trawl netting, Scuba diving, spear gunning and vertical integration of gears.

3.1 LAKE VICTORIA FISHERY

Lake Victoria's contribution to total national annual inland fish production is enormous 109,902, Metric tons of the total inland fisheries production of 122,999 Metric tons which is (89.4% in 2015) even in the face of rapidly declining fish stocks in the lake. Capture fisheries of Lake Victoria are a source of livelihood to many people employed directly as boat owners, fishermen (40,113), fish traders, fish processors, etc and indirectly as fishing gear manufacturers, boat builders, and ice producers among others. Lake Victoria is a multi-species fishery with many of known species, but only *Rastrienobola argentea* (Omena) 61,662 Metric tons, *Lates niloticus* (Nile perch) 31,287 Metric tons and *Oreochromis niloticus* (Nile tilapia) 5,352 Metric tons are of major economic significance which contributed combined catch of 98,301 Metric tons out of the total catches of 109,902 Metric tons from the lake (Kenyan side) which is makes 89.4 % of the catches from the lake during the year under review. This has been the case for a number of years. However, for the last few years there have seen a rapid decline of fish stocks in Lake Victoria thereby creating a wide gap between supply and demand for fish in the country. In response to this undesirable situation, the government has taken concrete steps to promote aquaculture development in the country to bridge the existing supply demand gap. Cage farming in the Lake Victoria has also been supplementing the dwindling catches from the lake.

During the year 2015, fish production from Lake Victoria decreased from 128,708 metric tons to 109,902 metric tons with an ex-vessel value of Kshs 14.49 billion compared to Kshs 14.6 billion, an ex-vessel value of 2014. The landings of this year decreased by 14% compared to 2014 while the 2015 ex-vessel value reduced by 0.7% decreasing from the ex-vessel value of 2014. In terms of species contribution to the total weight of fish landed from the lake, *Rastrienobola argentea* took the lead with 56.1 % this year compared to 54.0% in 2014, *Lates niloticus* 28.5% this year compared to 33.3% in the year 2014, *Oreochromis niloticus*, 4.9% in this year compared 6.2%, in 2014. *Clarias spp 2.2% this year compared to* 1.9% in 2014. *Protopterus aethiopicus* 0.9% in this year, similar to 2014, *Haplochromis spp.* 2.4% this year compared to, 0.7% of the 2014 and the others species combined contributed 5.1% this year compared to 3.0%, of the year 2014 figure 4. While the major species are on a decline, there was an increase in the *Haplochromis spp.* *Caradina niloticus* and *Mystis schilbe* among other species in the lake. As in the previous years, Homa Bay County contributed 60.6% this year compared to 63.2% in 2014 of the total landings, Siaya contributed 26.6% this year compared to 22.1% in 2014, Migori contributed 4.7% compared to 6.1% in 2014, Kisumu contributed 4% this year compared to 4.3% in 2014 and Busia contributed 4.1% this year compared to 4.2% in 2014.

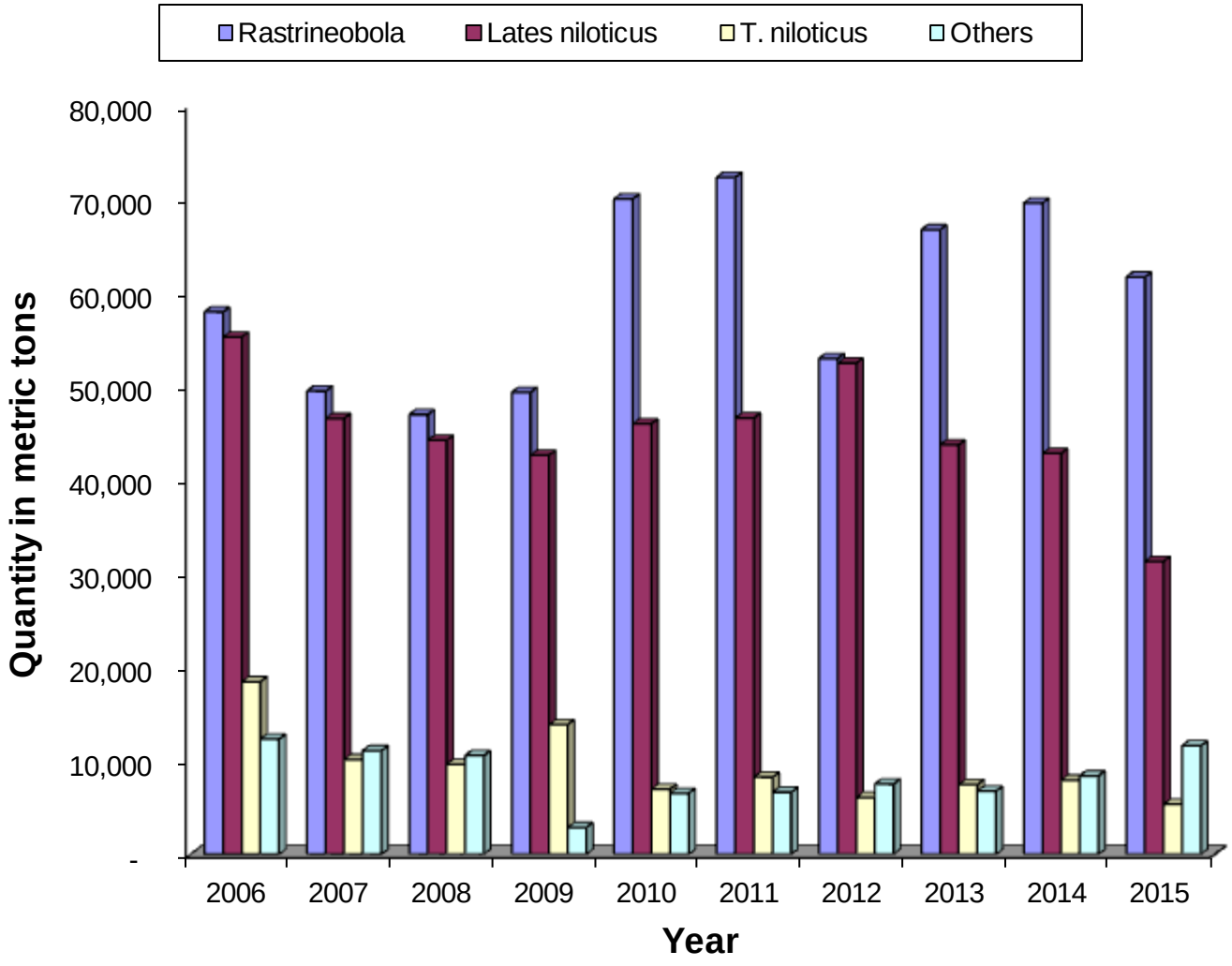

Figure 3: Lake Victoria species catch composition 2006-2015

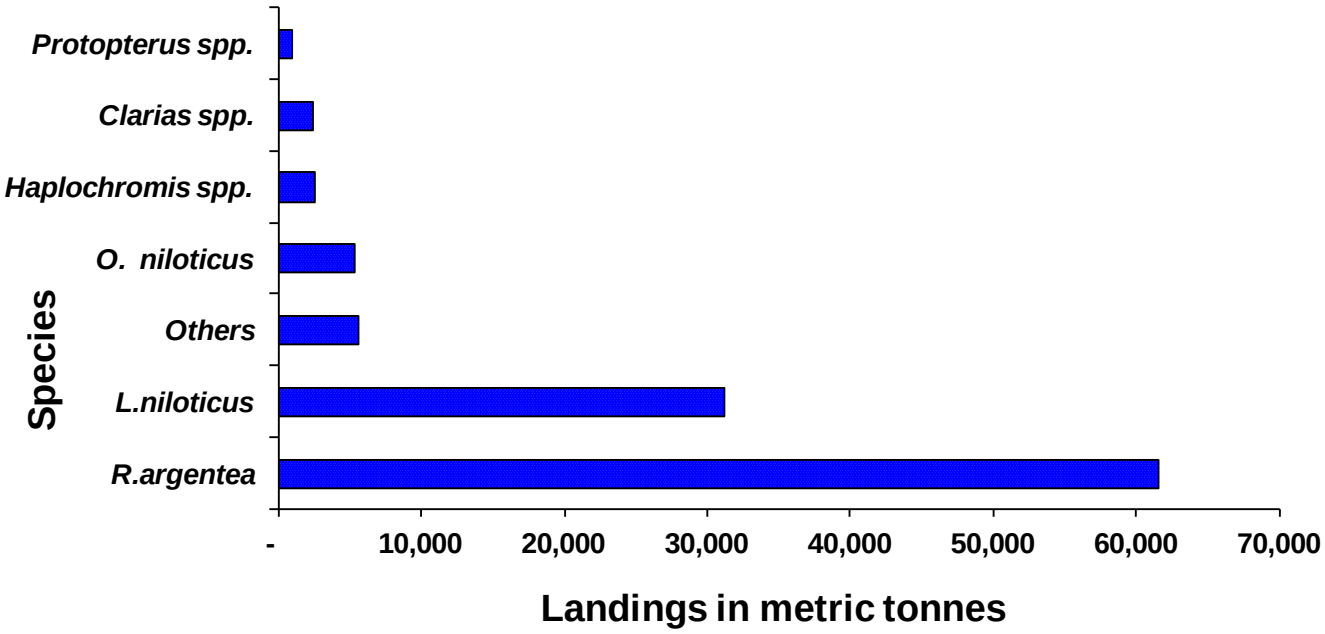

Figure 4: Lake Victoria species catch composition 2015

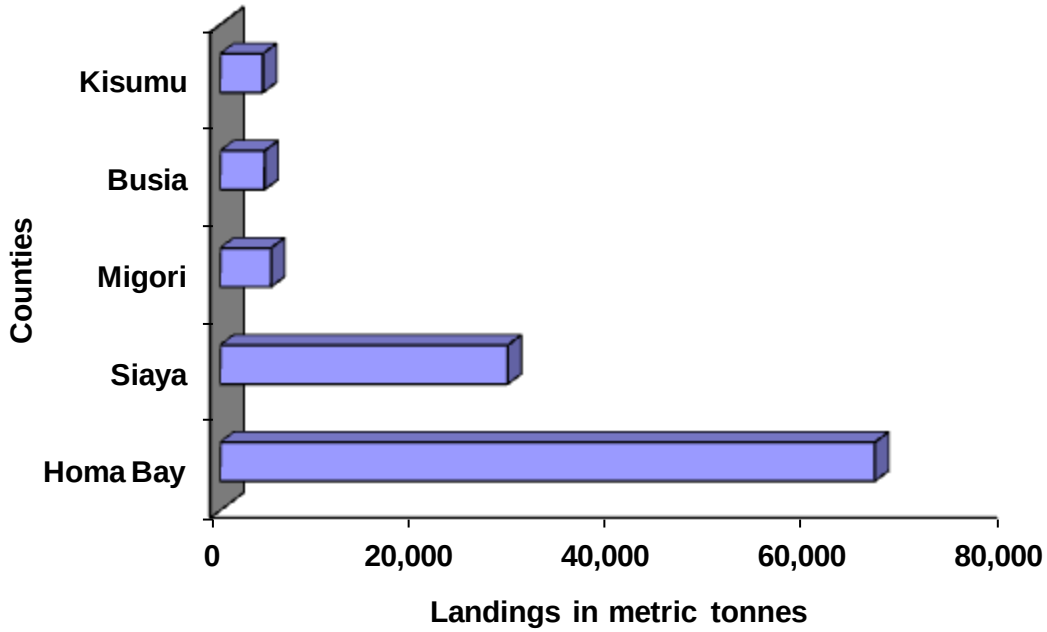

Figure 5: Lake Victoria fish landings by Counties 2015

Challenges facing Lake Victoria fishery:

i. The declining trend in catches of *Lates niloticus*, *Rastrineobola argentea* and *Oreochromis niloticus*, an indicator of reduced fish stocks particularly in Lake Victoria;
ii. Infestation of the lake by aquatic weeds i.e. Water Hyacinth and the Hippo grass;
iii. The major challenge afflicting the fisheries of Lake Victoria is still mainly attributed to over fishing and habitat degradation. These have had adverse impacts to the fishery by changing the species diversity and reduction in total harvestable biomass;
iv. Increase in illegal fishing gears and methods;
v. Lack of appropriate fish handling and preservation facilities that usually lead to post-harvest losses and poor quality of fish and fishery products;
vi. Weak and unfavorable fish marketing systems along the fish landing sites leading to poor prices and therefore resource deterioration;
vii. Inadequate resources (human and funds) to ensure efficient Monitoring, Control and Surveillance for sustainability.

The State Department of Fisheries is concerned about the sustainability of Lake Victoria fisheries. Scientists have advised that the fish stocks are continuously declining and unless this is effectively dealt with, the sustainability of the fishery remains under threat. This will eventually have a negative impact on other businesses and the fishers.

All stakeholders especially fish processors and gear distributors should collaborate with the State Department of Fisheries in order to manage Lake Victoria fisheries resources sustainably. Many illegal gears are still in use and this can only be controlled with the cooperation of all the stake holders.

Table 4: Lake Victoria fish landings by Species, Weight and Value 2013 – 2015

	2013			2014			2015		
Species	**Metric tons**	**Million Kshs**	**% Comp**	**Metric tons**	**Million Kshs**	**% Comp**	**Metric tons**	**Million Kshs**	**% Comp**
L. niloticus	43,736	8,521	35	42,838	8,405	33	31,287	6,815	28
R. argentae	66,717	3,553	54	69,561	4,130	54	61,662	5,458	57
T. niloticus	7,445	1,210	6	7,927	1,332	6	5,352	1,360	5
Clarias spp.	2,329	238	2	2,440	273	2	2,402	252	2
Proptopterus spp.	1,070	93	1	1,122	105	1	975	112	1
Haplochromis spp.	1,112	85	1	919	73	1	2,616	148	2
Others	2,233	160	2	3,901	285	3	5,608	350	5
TOTAL	**124,643**	**13,859**	**100**	**128,708**	**14,602**	**100**	**109,902**	**14,495**	**100**

Table 5: Lake Victoria Monthly fish landings by Species, Weight (M. tonnes) 2015

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
L. niloticus	2,738	3,367	4,170	4,181	4,354	3,466	1,360	1,502	1,521	1,487	1,819	1,322	31,287
R. argentea	6,739	10,239	8,576	6,900	7,027	3,474	3,099	2,256	2,278	2,919	3,857	4,298	61,662
T. niloticus	467	471	1,287	499	407	337	286	365	319	372	265	277	5,352
Clarias spp.	147	153	230	259	201	372	136	74	93	92	525	121	2,402
Protopterus spp.	124	78	85	93	116	116	73	53	58	55	65	58	975
Haplochromis spp.	154	745	95	22	46	27	579	732	67	56	53	41	2,616
Others	253	244	526	755	684	468	364	262	488	565	613	385	5,608
TOTAL	**10,620**	**15,298**	**14,969**	**12,709**	**12,835**	**8,260**	**5,898**	**5,243**	**4,824**	**5,546**	**7,197**	**6,502**	**109,902**

Table 6: Lake Victoria Annual fish landings by Species, Weight, Value and by Counties 2015

County	Busia		Siaya		Kisumu		H/Bay		Migori		Total	
Species	**Metric tonnes**	**000 Kshs**	**Metric tonnes**	**000 Kshs**	**Metric tonnes**	**000 Kshs**	**Metric tonnes**	**000 Kshs**	**Metric tonnes**	**000 Kshs**	**Metric tonnes**	**000 Kshs**
L. niloticus	1,348	305,601	11,351	2,468,866	597	125,021	15,843	#######	2,148	542,211	**31,287**	**6,815,399**
R. argentea	1,992	151,612	11,688	406,408	1,301	163,157	44,110	#######	2,571	228,231	**61,662**	**5,457,786**
O. niloticus	1,140	288,188	1,673	295,753	285	77,681	1,830	567,948	425	130,713	**5,352**	**1,360,283**
Clarias spp.	-	-	421	34,950	845	95,356	1,136	121,420	1	94	**2,402**	**251,820**
Protopterus spp	-	-	332	29,706	371	51,053	265	30,160	6	1,222	**975**	**112,141**
Haplochromis	-	-	1,409	11,280	105	12,457	1,075	121,978	27	2,744	**2,616**	**148,459**
Others	35	2,776	2,384	55,369	849	51,022	2,339	216,666	1	64	**5,608**	**348,952**
Total	**4,515**	**748,178**	**29,257**	**3,302,331**	**4,354**	**575,747**	**66,598**	#######	**5,178**	**905,278**	**109,902**	**14,494,839**

3.2 MARINE CAPTURE FISHERY

3.2.1 MARINE ARTISANAL LANDINGS

The marine capture fishery is composed of coastal and near shore artisanal, semi-industrial and offshore industrial fisheries. Artisanal and semi-industrial fisheries are exploited by the coastal local communities while the industrial fisheries are exploited by foreign fishing companies. During the year under review, the artisanal fishing fleet comprised of 2,913 fishing crafts and 12,915 fishermen (*Marine Artisanal Fisheries Frame Survey 2014 report*) while the semi-industrial fleet had two licensed trawlers. The inshore waters which are fishing grounds for artisanal fishermen are over-exploited and degraded. Great potential exists in the exploitation of the Kenyan EEZ where estimates done in 1975-1980 indicate potential of 100,000 to 150,000 metric tonnes annually (FAO, 1980) and more recent estimates indicate potential of 300,000 metric tonnes (Habib, 2003). This fishery is currently exploited by Distant Water Fishing Nations (DWFN) upon payment of access fees to the State Department of Fisheries. The State Department has limited capacity for Monitoring, Control and Surveillance (MCS) to ensure compliance with the established fisheries management standards, besides it is possible that vessels could be accessing our EEZ resources without payment of access fees. However the challenge at hand is large and needs a comprehensive approach in order to establish and deploy a national fisheries enforcement unit. A well trained and a disciplined law enforcement unit is critical toward the management of every fishery particularly when its operation is based on best scientific information.

The artisanal fishing activities are affected by Kenya's coastal oceanographic conditions which are caused by changes in the monsoon wind system (UNEP, 1998) that results to seasonal reversal process with NE monsoons between November-March and SE monsoons between May-September. These oceanographic processes cause distinct seasonality in the artisanal fishery, with high catches during the NE monsoon than the SE monsoon. These two seasons are referred to as *Kazi kazi* and *Kusi* by the locals. During *Kazi kazi* the sea is calm and there is a lot of fishing activities and fish landings are normally high while during *Kusi* the winds render the sea rough thus unfavorable to fishing trips. During the rough sea season, the exploitation of the near reefs, lagoons and bays is highest leading to degradation of the resource.

Marine artisanal fishery capture over the reporting period has slightly declined compared to 2014 production. In 2015, a total of 22,407 Metric tons with an ex-vessel of Ksh. 3.79 billion was landed. The 2014, marine capture landings from artisanal sources was 23,287 Metric tons with an ex-vessel value of Ksh. 4.6 billion. The catch represented a drop of 3.8% production with a corresponding 18% decline in the ex-vessel value. Over the past 8 years (2006-2013), fish production from the marine artisanal fishery had remained fairly constant between 7,000 and 9,000 metric tons. However this trend changed in 2014 and 2015 when the State Department of Fisheries and Blue Economy introduced new methodology and approaches in the collection of catch data and estimation of fish landings. The collection was undertaken in 22 primary and secondary landing sites which were used for raising catches for the sites not covered using the frame survey data. The results show that there was underreporting in areas especially where the fisheries staff were not accessing previously.

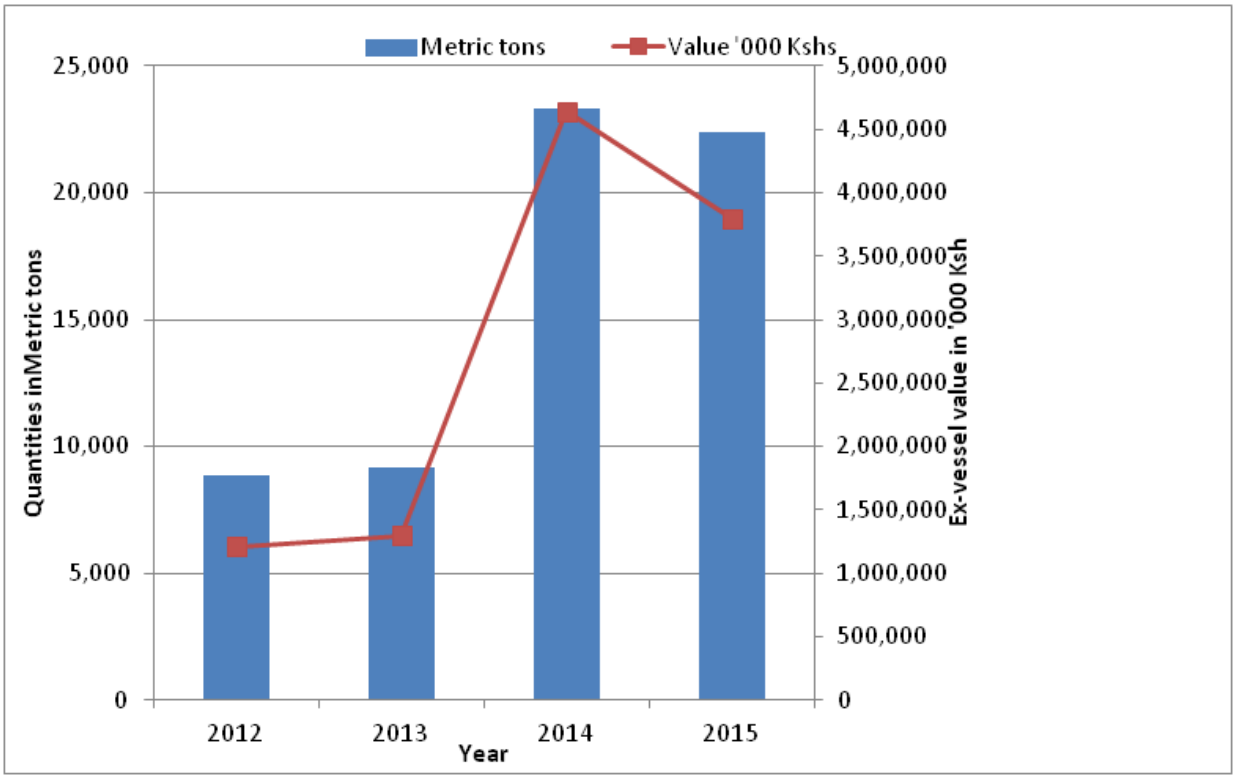

Figure 6: Trends of marine fish production by quantity and value 2012-2015

In 2015, demersals dominated artisanal marine fisheries catch accounting for 45% (10,135) Metric tons) of the total landings. Pelagics contributed 35% (7,843 Metric tons) while Molluscs accounted for 9% (2,044 Metric tons). Sharks, rays and mixed species (NIE) contributed 8% (1,762 Metric tons) and crustaceans 3% (620 Metric tons).

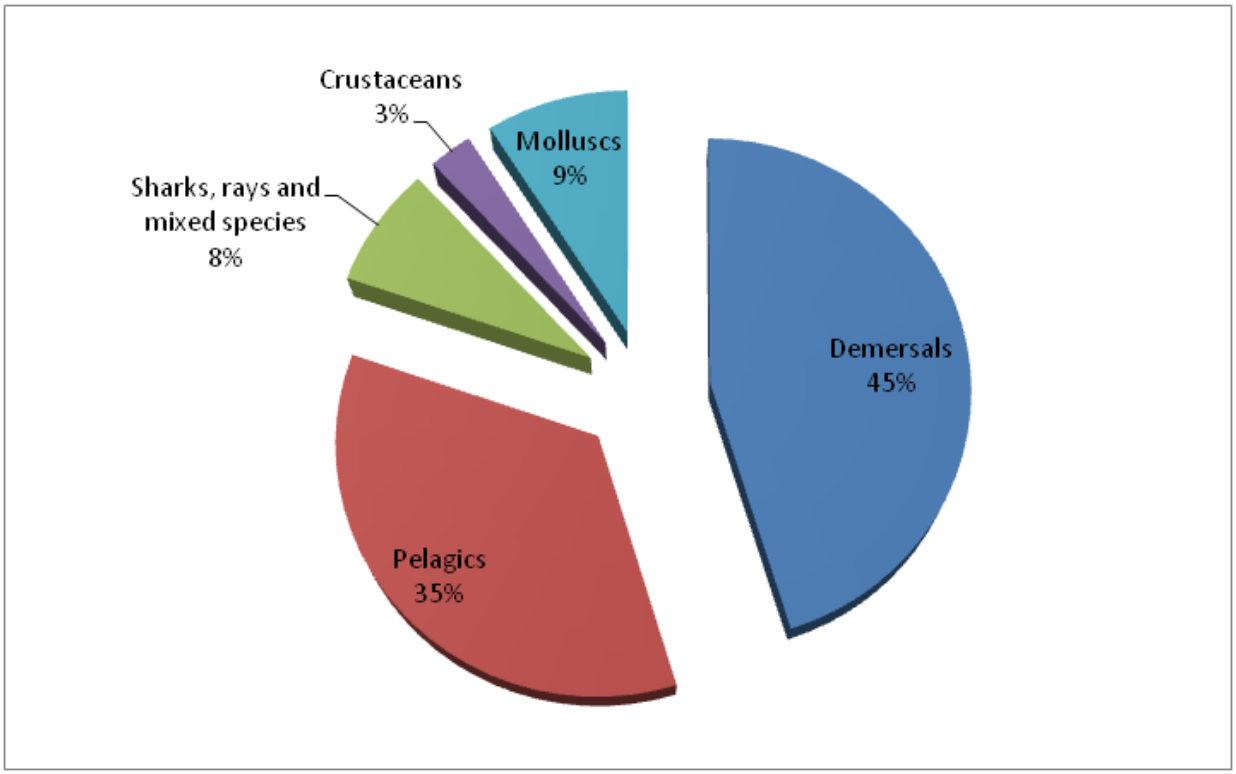

Figure 7: Percentage contribution of marine fish species groups 2015

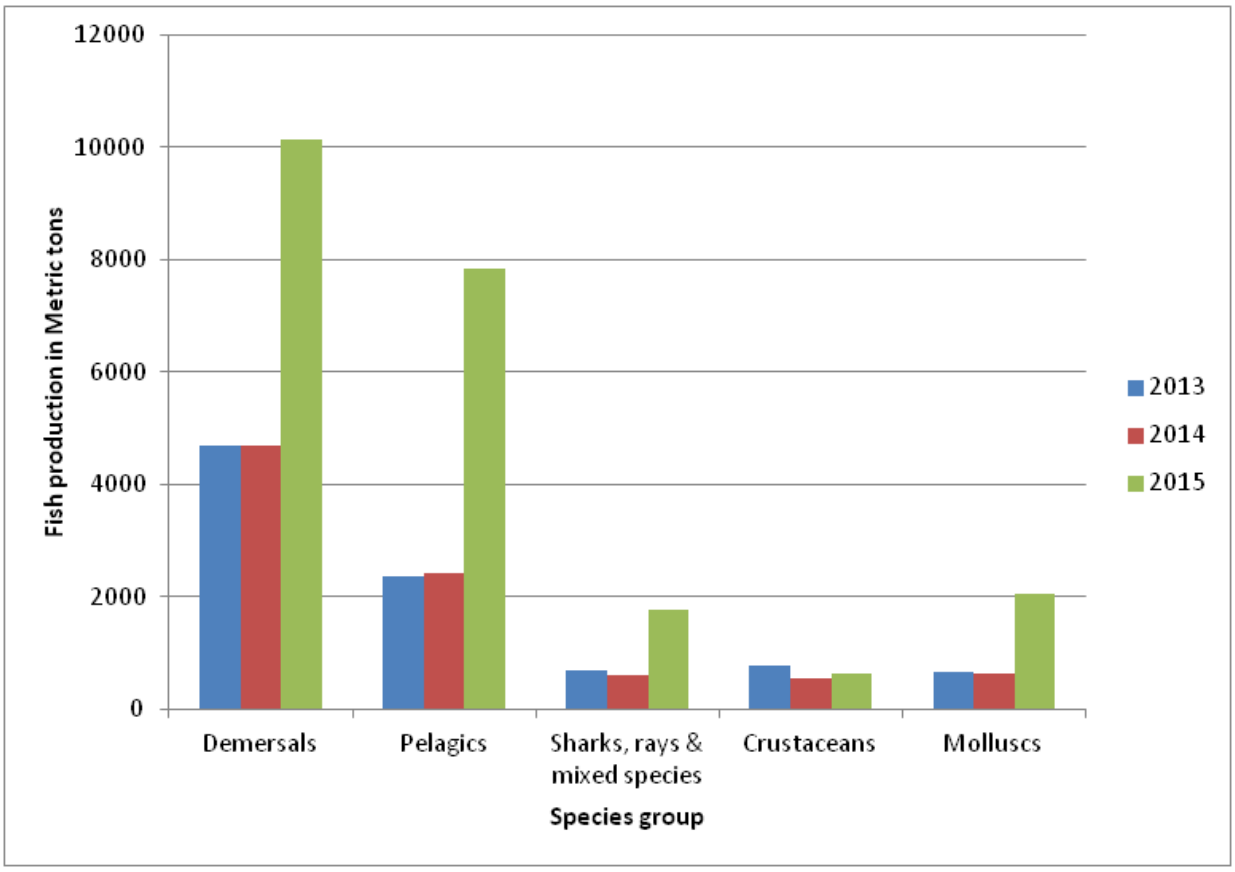

Figure 8: Trends of landings of marine fish species groups 2013-2015

In this reporting period, Kilifi county contributed the highest quantity of marine artisanal landing of 11,444 Mt (51% of the total landings) with an ex-vessel value of Ksh. 1.969 billion (52% of the total ex-vessel value). Kwale county contributed 5,079 Mt (23%) with ex- vessel value of Ksh. 757.169 Million (20%), followed by Lamu county with 3,566 Mt (16%) with ex-vessel value of Ksh. 613.632 (16%). Mombasa contributed 1,743 Mt (8%) with ex-vessel value of Ksh. 356.46 Million (9%) with Tana River county contributing the least, 575 Mt (2%) with ex-vessel value of Ksh. 98.95 Million (3%). See Figure 9 below.

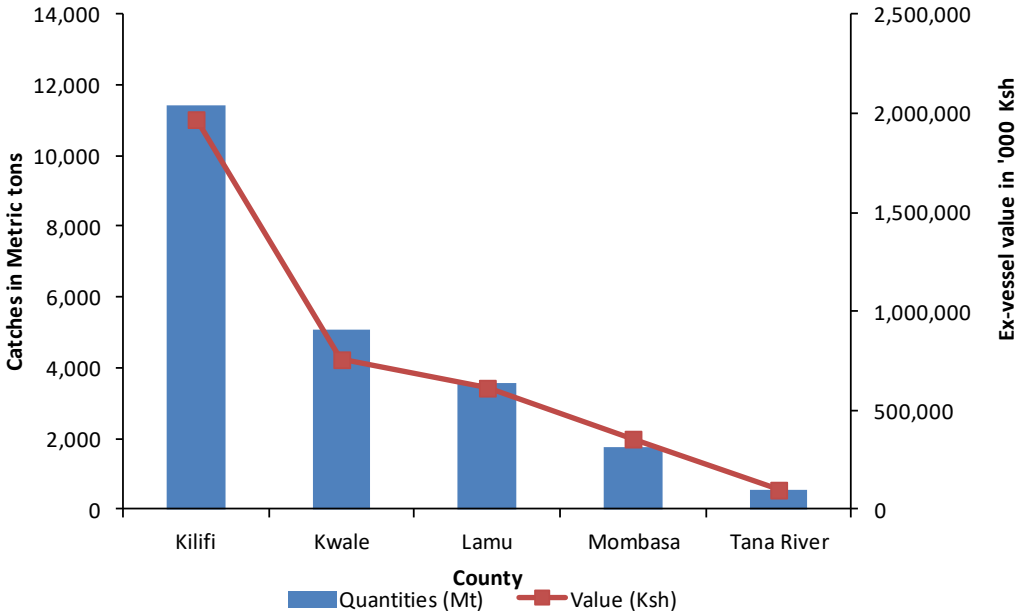

Figure 9: Marine fish production by Quantity, Value and Counties 2015

For the first time, the catches by gear types for marine fishery were reported from the new catch assessment Survey report. There over 20 types of gears used along the coast as per the marine frame survey reports. In 2015, seven of the gears used by coast fishers landed 65% of the total catch. Handlines contributed the most catch (4,372 Mt), followed by gillnets (2,958 Mt), beach seine (1,898 Mt), monofilament (1,801 Mt), ringnet (1,571 Mt), spear gun (1,374 Mt) and longline (516 Mt) while all the other gears combined landed 7,918 Mt, (Figure 10).

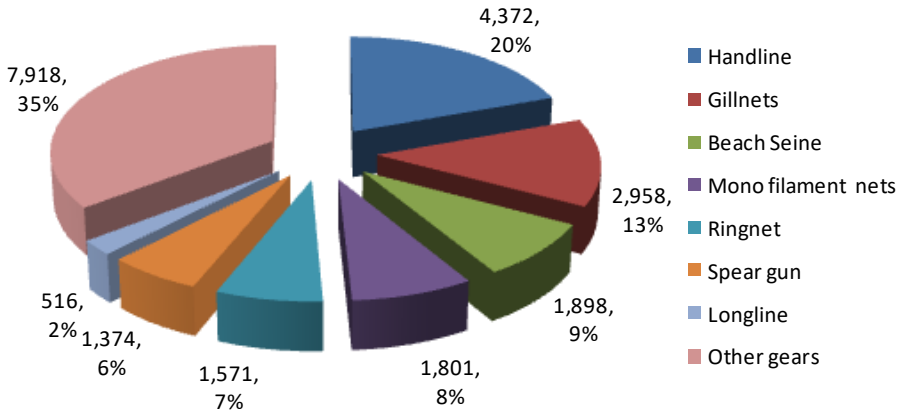

Figure 10: Marine artisanal landings by gear types in 2015

Table 7: Marine Fish Landings by Species, Weight and Value 2013 to 2015

SPECIES		2013		2014		2015	
Demersals	**Demersals**						
Lutjanidae	Snappers	347	49,224	3,358	567,335	1,687	290,809
Siganidae	Rabbitfishes	794	105,666	2,507	410,586	1,488	240,562
Lethrinidae	Scavengers	685	81,641	1,947	316,779	1,247	198,576
Scaridae	Parrotfishes	540	53,973	1,231	167,355	846	103,516
Serranidae	Groupers	199	24,151	573	90,523	694	106,912
Nemipteridae	Threadfin breams			572	81,623	630	72,834
Acanthuridae	Surgeonfishes	248	29,480	295	40,765	510	65,586
Mugilidae	Mullets	220	27,962	320	47,015	454	60,267
Haemulidae	Grunts	336	37,217	597	86,944	399	54,189
Terapontidae	Grunters			188	31,832	341	51,529
Other Demersals		1,334	1,334	1,714	298,730	1,839	249,070
Total Demersals		**4,703**	**410,648**	**13,302**	**2,139,486**	**10,135**	**1,493,850**
Pelagics							
Scombridae	Tunas/Mackerels	788	106,564	1,682	374,967	2,313	447,961
Belonidae	Needlefishes			522	75,995	1,215	174,201
Carangidae	Jacks/Trevallies	466	58,501	767	129,278	795	141,985
Sphyraenidae	Barracudas	317	41,523	534	95,070	729	131,432
Clupeidae	Sardines	217	22,344	457	86,738	649	113,493
Hemiramphidae	Halfbeaks			725	89,350	632	71,619
Istiophoridae	Sailfishes	140	21,743	431	85,403	402	70,207
Engraulidae	Anchovies			48	5,302	285	37,036
Chirocentridae	Wolf Herrings			198	26,388	274	29,709
Coryphaenidae	Dolphinfishes	17	2,219	103	18,550	230	34,775
Other pelagics		414	51,382	368	62,350	320	46,442
Total pelagics		**2,359**	**304,276**	**5,834**	**1,049,390**	**7,844**	**1,298,861**
Others							
Sharks &Rays	Sharks & Rays	314	46,339	1,312	181,583	1237	166,826
mixed fish/Others	mixed fish/Others	377	42,069	423	48,039	525	58,596
Total		**691**	**88,408**	**1,735**	**229,622**	**1763**	**225,422**
Crustaceans							
Palinuridae	Lobsters	123	114,952	408	885,657	263	343,600
Portunidae	Crabs	365	77,752	135	43,389	145	70,274
Penaeidae	Prawns/Shrimps	274	58,146	170	39,061	213	60,637
Total crustaceans		**762**	**250,850**	**713**	**968,107**	**621**	**474,512**
Molluscs							
Octopodidae	Octopus	446	45,899	1,610	233,756	1832	258,926
Loliginidae	Squids	143	20,149	35	8,198	147	32,853
Sepiidae	Cuttlefishes			45	10,493	47	8,994
Holothuridae	Sea cucumber	48	35,296	13	2,297	19	2,158
Total molluscs		**669**	**103,523**	**1,703**	**254,744**	**2,045**	**302,930**
Total Marine		**9,184**	**1,157,705**	**23,287**	**4,641,349**	**22,407**	**3,795,575**

Table 7: Marine monthly fish landing by Species, Weight and Value 2015

	Family	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Demersals														
Lutjanidae	Snappers	296,143	237,330	236,504	99,211	248,028	265,699	50,184	40,159	32,338	45,839	51,818	84,048	1,687,301
Siganidae	Rabbitfishes	137,767	126,596	134,020	142,857	119,827	125,047	123,513	152,628	83,655	100,046	137,336	104,475	1,487,766
Lethrinidae	Scavengers	128,995	108,799	93,666	180,874	78,384	81,052	69,978	120,902	92,218	75,712	116,056	100,746	1,247,381
Scaridae	Parrotfishes	71,457	86,241	68,377	134,379	71,229	46,924	58,938	49,130	68,345	51,444	72,631	66,736	845,832
Serranidae	Groupers	36,843	54,485	73,592	62,852	49,509	197,710	42,692	38,347	40,389	34,290	30,406	32,650	693,765
Nemipteridae	Threadfin breams	124,582	43,094	62,025	94,692	53,504	106,507	47,479	26,353	17,486	17,239	16,137	20,859	629,957
Acanthuridae	Surgeonfishes/Tangs/Unicornfishes	38,115	35,017	73,427	13,358	13,085	24,890	20,133	20,763	34,355	155,906	33,011	47,587	509,647
Mugilidae	Mullets	27,348	15,046	61,211	27,813	49,073	32,852	34,273	39,753	25,289	48,882	58,923	33,273	453,736
Haemulidae	Grunts	23,851	20,360	46,191	34,435	30,305	24,115	56,544	23,250	34,130	31,524	38,520	36,225	399,450
Terapontidae	Grunters	11,656	254,989	5,771	18,199	27,787	3,114	2,264	5,042	1,481	4,054	2,859	4,246	341,464
Other demersals		151,526	148,692	218,775	110,156	191,112	125,272	149,931	155,552	81,008	199,832	151,205	156,071	1,839,132
Total Demersals		**1,048,285**	**1,130,649**	**1,073,559**	**918,825**	**931,844**	**1,033,181**	**655,930**	**671,880**	**510,693**	**764,768**	**708,902**	**686,917**	**10,135,433**
Pelagics														
Scombridae	Tunas/Mackerels/ Wahoos	103,338	327,834	504,896	151,724	91,092	265,533	72,804	99,855	94,287	141,972	240,807	218,989	2,313,132
Belonidae	Needlefishes	53,002	69,469	49,554	58,316	93,635	290,943	205,285	213,391	14,749	11,328	60,612	94,218	1,214,501
Carangidae	Jacks/Trevallies/Queenfishes	40,159	68,460	71,270	89,695	49,031	72,293	43,941	31,198	35,038	53,524	127,855	112,487	794,952
Sphyraenidae	Barracudas	24,769	96,042	59,889	57,389	30,869	70,016	98,469	28,994	39,226	57,266	90,085	75,781	728,794
Clupeidae	Sardines	35,376	62,187	148,779	217,406	24,216	26,590	4,013	18,118	12,249	19,247	44,283	36,993	649,459
Hemiramphidae	Halfbeaks	18,360	18,877	46,518	81,297	69,957	81,509	79,408	57,705	28,994	41,658	67,606	40,285	632,174
Istiophoridae	Sailfishes	8,840	56,119	84,783	8,878	31,284	16,110	19,117	3,512	23,746	47,282	31,980	70,002	401,653
Engraulidae	Anchovies	16,241	9,993	282	1,584	18,227	19,915	34,792	80,630	18,069	42,880	35,077	7,512	285,200
Chirocentridae	Wolf Herrings	13,622	11,508	33,632	42,388	42,374	21,134	21,329	6,432	23,094	37,030	10,235	11,116	273,893
Coryphaenidae	Dolphinfishes	6,631	7,185	40,291	58,703	15,817	19,016	11,553	4,901	12,841	13,752	25,272	13,789	229,750
Other pelagicss		25,493	26,548	41,657	27,079	35,499	12,133	16,309	16,954	21,477	22,726	31,994	42,210	320,079
Total pelagics		**345,830**	**754,221**	**1,081,551**	**794,459**	**502,002**	**895,191**	**607,020**	**561,689**	**323,769**	**488,665**	**765,807**	**723,382**	**7,843,586**

Sharks and Rays, mixed species														
Mixed species		41,115	32,924	32,171	46,674	23,096	48,872	52,223	123,127	76,267	13,998	13,869	21,055	525,392
Dasyatidae	Sting Rays	74,513	78,593	63,813	39,966	24,931	46,175	76,790	48,972	16,413	46,130	54,679	41,886	612,863
Carcharhinidae	Sharks	42,905	51,363	23,513	34,863	57,963	36,643	70,368	21,343	43,345	22,031	19,499	23,670	447,506
Myliobatidae	Manta Rays	12,972	50,306	13,878	19,505	21,768	5,844	7,834	7,651	11,350	7,217	2,946	6,205	167,475
Sphyrnidae	Hammerhead sharks	394	1,227	1,447	492	3,481	-	-	-	126	535	-	-	7,701
Lamnidae	Great white sharks	-	-	-	-	-	-	-	-	926	-	-	-	926
Rhincodontidae	Whale shark	-	-	-	-	-	-	-	-	-	-	682	-	682
Total Sharks & rays		**171,899**	**214,412**	**134,822**	**141,500**	**131,239**	**137,535**	**207,215**	**201,093**	**148,427**	**89,911**	**91,675**	**92,817**	**1,762,545**
Crustaceans														
Palinuridae	Lobsters	14,334	22,558	21,337	20,732	31,750	35,837	20,793	15,266	12,954	28,781	15,032	24,071	263,446
Portunidae	Crabs	57,746	5,163	14,224	8,235	34,961	4,828	3,324	21,207	2,432	9,920	45,660	5,122	212,822
Penaeidae	Prawns/Shrimps	798	1,386	43,065	6,032	22,413	4,124	1,826	3,068	6,435	10,446	17,789	27,303	144,682
Total crustaceans		**72,877**	**29,106**	**78,627**	**34,998**	**89,123**	**44,790**	**25,943**	**39,540**	**21,821**	**49,147**	**78,481**	**56,496**	**620,951**
Molluscs														
Octopodidae	Octopus	151,449	99,652	190,506	114,491	114,046	90,839	94,848	74,399	169,356	303,257	265,011	163,919	1,831,774
Loliginidae	Squids	20,724	27,395	13,788	22,892	25,427	5,236	5,662	3,520	4,188	4,260	5,269	8,977	147,338
Sepiidae	Cuttlefishes	930	1,906	29,705	4,502	2,225	1,607	1,458	737	1,288	874	843	876	46,951
Holothuridae	Sea cucumber	47	1,423	252	14	416	1,804	128	4,615	4,516	1,656	3,658	85	18,614
Total Molluscs		**173,150**	**130,375**	**234,252**	**141,898**	**142,115**	**99,486**	**102,096**	**83,272**	**179,348**	**310,047**	**274,781**	**173,857**	**2,044,677**
Toral Marine		**1,812,041**	**2,258,765**	**2,602,810**	**2,031,681**	**1,796,322**	**2,210,183**	**1,598,204**	**1,557,474**	**1,184,058**	**1,702,539**	**1,919,646**	**1,733,469**	**22,407,192**

Table 8: Marine fish landing by Species, Weight and Value and by Counties 2015

Family	Common Name	Kilifi		Kwale		Lamu		Mombasa		Tana River		Total	
Zoological	English	Catch (Kg)	Value	Catch (Kg)	Value	Catch (Kg)	Value	Catch (Kg)	Value	Catch (Kg)	Value	Catch (Kg)	Value
Demersals													
Lutjanidae	Snappers	1,188	220,786	225	33,167	93	7,780	77	17,296	104	11,780	1,687	290,809
Siganidae	Rabbitfishes	343	67,406	434	73,592	475	43,470	235	56,095	-	-	1,488	240,562
Lethrinidae	Scavengers	329	63,292	335	56,667	377	33,845	203	44,280	4	492	1,247	198,576
Scaridae	Parrotfishes	187	25,673	237	34,739	358	31,228	65	11,876	-	-	846	103,516
Serranidae	Groupers	357	65,505	137	18,425	152	14,057	47	8,880	0	43	694	106,912
Nemipteridae	Threadfin breams	298	35,784	181	23,685	23	1,751	-	-	128	11,614	630	72,834
Acanthuridae	Surgeonfishes	366	44,760	106	13,403	4	321	33	7,101	-	-	510	65,586
Mugilidae	Mullets	205	34,868	48	6,466	166	13,293	20	4,335	13	1,305	454	60,267
Haemulidae	Grunts	92	17,183	77	11,791	175	15,210	48	9,354	8	650	399	54,189
Terapontidae	Grunters	263	43,765	12	1,498	55	4,167	11	2,098	-	-	341	51,529
Other Demersals		870	131,870	455	59,125	261	22,015	134	25,590	119	10,469	1,839	249,070
Total Demersals		**4,499**	**750,893**	**2,246**	**332,560**	**2,140**	**187,137**	**873**	**186,905**	**376**	**36,354**	**10,135**	**1,493,850**
Pelagics		-	-	-	-	-	-	-	-	-	-	-	-
Scombridae	Tunas/Mackerels	1,795	351,204	351	52,438	67	25,695	99	18,520	1	104	2,313	447,961
Belonidae	Needlefishes	957	144,333	147	19,544	101	7,942	9	2,383	-	-	1,215	174,201
Carangidae	Jacks/Trevallies	478	91,802	148	25,469	99	10,184	69	14,419	1	111	795	141,985
Sphyraenidae	Barracudas	416	83,430	265	38,398	16	1,499	32	8,100	0	6	729	131,432
Clupeidae	Sardines	84	9,498	338	64,649	2	146	188	36,808	37	2,392	649	113,493
Hemiramphidae	Halfbeaks	84	13,483	52	6,786	496	51,198	1	152	-	-	632	71,619
Istiophoridae	Sailfishes	375	66,099	22	3,257	-	-	5	852	-	-	402	70,207
Engraulidae	Anchovies	148	23,306	136	13,648	-	-	1	81	-	-	285	37,036
Chirocentridae	Wolf Herrings	154	21,018	4	449	113	7,908	2	272	2	62	274	29,709
Coryphaenidae	Dolphinfishes	208	31,533	22	3,146	-	-	0	96	-	-	230	34,775
Other pelagics		78	12,189	79	10,588	16	1,412	146	22,253	-	-	320	46,442
Total pelagics		**4,777**	**847,895**	**1,565**	**238,371**	**909**	**105,983**	**552**	**103,937**	**41**		**7,844**	**1,298,861**

											2,675		
Mixed species		-	-	-	-	-	-	-	-	-	-	-	-
*Mixed NEI		99	15,772	207	21,280	215	20,838	3	539	2	167	525	58,596
Dasyatidae	Sting Rays	493	65,678	78	8,597	15	4,167	25	3,779	2	176	613	82,397
Carcharhinidae	Sharks	291	39,253	9	1,333	20	1,608	108	18,351	20	2,575	448	63,120
Myliobatidae	Manta Rays	54	6,921	91	10,437	6	461	15	1,980	0	23	167	19,821
Sphyrnidae	Hammerhead sharks	8	1,254	-	-	-	-	0	19	-	-	8	1,272
Lamnidae	Great white sharks	-	-	-	-	-	-	1	130	-	-	1	130
Rhincodontidae	Whale sharks	1	85	-	-	-	-	-	-	-	-	1	85
Total others		**945**	**128,963**	**386**	**41,647**	**256**	**27,074**	**152**	**24,797**	**24**	**2,941**	**1,763**	**225,422**
Crustaceans		-	-	-	-	-	-	-	-	-	-	-	-
Palinuridae	Lobsters	70	66,486	26	16,081	157	253,391	11	7,643	-	-	263	343,600
Portunidae	Crabs	-	32	144	30,494	61	29,008	7	1,103	-	-	213	60,637
Penaeidae	Prawns/Shrimps	6	3,225	0	110	4	6,129	15	5,820	119	54,991	145	70,274
Total crustaceans		**77**	**69,743**	**170**	**46,685**	**222**	**288,528**	**33**	**14,565**	**119**	**54,991**	**621**	**474,512**
Molluscs		-	-	-	-	-	-	-	-	-	-	-	-
Octopodidae	Octopus	1,017	145,137	671	91,754	38	4,910	90	15,132	16	1,993	1,832	258,926
Loliginidae	Squids	98	20,842	13	2,339	-	-	37	9,673	-	-	147	32,853
Sepiidae	Cuttlefishes	31	5,857	10	1,683	-	-	6	1,455	-	-	47	8,994
Holothuridae	Sea cucumber	-	28	19	2,129	-	-	-	-	-	-	19	2,158
Total molluscs		1,145	171,864	712	97,905	38	4,910	133	26,260	16	1,993	2,045	302,930
Total Marine		**11,444**	**1,969,357**	**5,079**	**757,169**	**3,566**	**613,632**	**1,743**	**356,463**	**575**	**98,954**	**22,407**	**3,795,575**

*Mixed NEI. Are marine species Not Elsewhere Included

3.2.2 MARINE INDUSTRIAL LANDINGS

The catches from industrial fishery in 2015 were from the trawlers. During the year under review, two trawlers operated in the shallow water prawn fishery. Shallow water prawn fishing is an important marine fishery in Kenya, providing a high value product mainly targeting the export market. The fishery is composed of a small scale fishery carried out throughout most of the coastline and the semi-industrial trawl fishery. This section covers the industrial trawling fishery. The semi industrial prawn trawling has evolved through various stages driven by economic, social and ecological considerations, during the last four decades. The existence of fishable shallow water shrimp stocks in the bay was established by several surveys conducted during the 1960's and 70's by the Kenya Government during surveys carried out under United Nations Development Programme (UNDP) and FAO fishery development programs.

Since inception, between 4 and 20 commercial bottom shrimp trawlers have operated in the bay with most of the fishing effort concentrated within the mouths of the two main rivers discharging into the bay; namely the Sabaki River around Malindi and the Tana River within the Kipini area. Prawn Fishery Management Plan (PFMP of 2010) is used to regulate the fishery with a closed season from 1st November to 31st March. The annual landings are estimated at 400 t (Mwatha 2002). During the year under review, the semi-industrial fleet had 2 licensed trawlers. A total of 247,045 kg of prawns, assorted fin fish species, others and trash with an estimated ex-vessel value of Kshs. 68,857,000 were landed by the industrial trawlers (Table 9). This production reflected an increase of 193% in total catch and 173% in catch value from last year's (2014) production of 84,210 kg with an ex-vessel value of Kshs. 25,207,200.

Table 9: Monthly catch weights (kg) and total catch value (KSh.) of trawl fisheries in 2015

Months	**Prawns**	**Finfish**	**Lobsters**	**Trash**	**Total catch (kg)**	**Total Value ('000 Kshs)**
April	331	12,150	-	380	12,861	3,203
May	5,683	50,424	-	412	56,519	15,448
June	6,329	19,859	-	512	26,700	8,129
July	4,669	32,378	10	301	37,358	10,437
August	4,627	20,143	-	464	25,234	7,349
September	4,054	31,953	-	349	36,356	10,015
October	5,178	46,747	-	92	52,017	14,276
Total	**30,871**	**213,654**	**10**	**2,510**	**247,045**	**68,857**

3.3 LAKE TURKANA FISHERY

Lake Turkana is Africa's fourth largest lake by volume and Kenya's largest inland lake measuring about 249 km long by 48 km at its widest part, with a delta extending into Ethiopia. It lies in a closed basin 365 meters above sea level. The lake has three volcanic islands namely the north, central and south islands. The central island has three saline crater lakes known for endemic species of tilapias. The islands are listed as UNESCOs world heritage sites.

Over 90% of the annual water discharge by volume is from river Omo originating from the Ethiopian highlands while the rest is from seasonal rivers Kerio and Turkwel. River Omo drains a large portion of the south western highlands of Ethiopia and therefore influences fluctuations in the lake's water level, which in turn affects the amount (or abundance) of fish stocks and hence fish production from the lake. With no surface outlet, the water budget is a balance between river inflow and evaporation which imposes special physical chemical conditions making the lake saline. Therefore any activities dealing with water abstraction or damning that interferes with the natural discharge rates of river Omo has a negative effect on the lake volume levels.

The lake has about 48 species of fish with a dozen supporting a commercial fishery. The species exploited commercially include, Nile perch (*Lates niloticus),* Tilapia *(Oreochromis niloticus),* Catfish *(Clarias gariepinus), synodontis schall, Hydrocynus forskalii, Labeo horie, Bagrus spp, Distichodus niloticus, Citharinus spp, Barbus spp* and *Alestes spp* The fishery is characterized by bust cycles in fish landings associated with fluctuations in lake levels due to the dynamics of the climatic conditions especially precipitation leading to filling and drying up of the Ferguson's gulf. The filling up of the Ferguson's gulf is associated with boom in fish catches especially tilapias. The peripheral communities entirely rely on fishing directly supporting about 7,000 fishers and 6,500 fish traders and transporters.

During the year under review, a total of 10,605.3 metric tons of fish were landed with an ex-vessel value of Kshs. 735,716,614.00 from both sides (Turkana and Marsabit counties) of the lake (Figure 11). This years' production was an increase of 254.6% in quantity coupled with an increase of 169.6 % in ex-vessel value compared to 2014 production of 4,166 metric tons and an ex-vessel value of Kshs 433,790,000. The trends in annual fish catches from Lake Turkana are determined by the lakes' water level and for that the catches have been unpredictable for a long time. But there has been a continuous decline in the catches since 2009 apart from the increase in 2013, and now the 2015 catches.

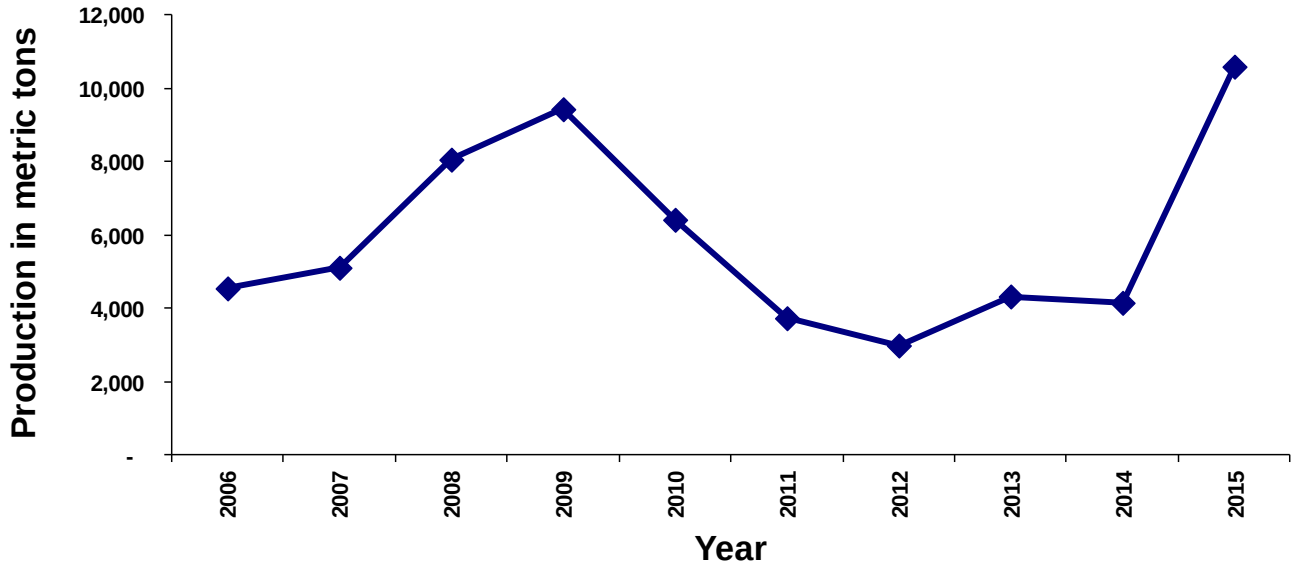

Figure 11: Trends in annual fish landings from Lake Turkana fishery 2006-2015

During the year under review, *Tilapia spp*. dominated the landings by contributing 8,522.9 Metric tons compared to 1,743 metric tons landed in 2014 (or 80.4%) followed by *Labeo spp.* of 680.3 metric tons (6.4%), *Alestes spp*. of 620.5 metric tons (5.9%), *Distichodus spp.* of 477.1 metric tons (4.5%), *Citharinus spp*. of 223.9 metric tons (2.1%) and *Lates niloticus* 61.7 metric tons (0.5%) (Figure 12). These six species combined contributed 99.8% of all the landings of the lake.

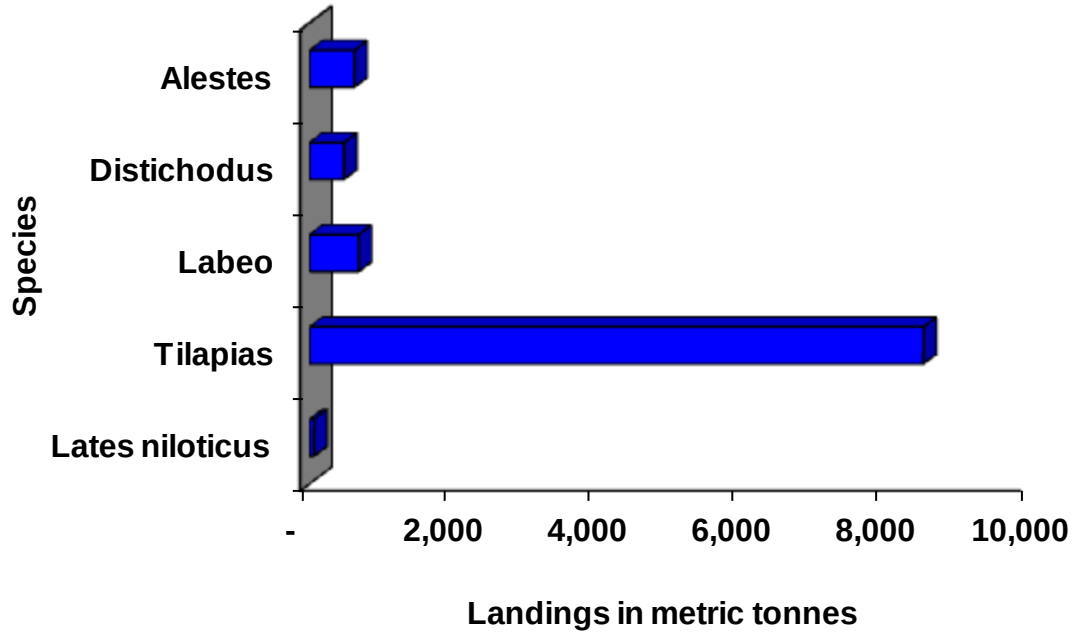

Figure 12: Species composition in catches of Lake Turkana Fishery 2015

Table 10: Lake Turkana monthly fish landings by Species, Weight and Value 2015

	Tilapia		Labeo		Alestes		Others		Total	
MONTH	**Tons**	**'000 Kshs**	**Tons**	**'000 Kshs**	**Tons**	**'000 Kshs**	**Tons**	**'000 Kshs**	**Tons**	**'000 Kshs**
Jan	1,093.5	54,365.7	17.3	1,342.2	24.2	36,030.0	17.4	2,413.9	**1,152.3**	**94,151.8**
Feb	1,690.1	77,343.0	44.3	5,049.8	24.0	971.9	37.6	4,122.8	**1,796.0**	**87,487.5**
Mar	290.8	39,319.6	43.2	7,415.1	16.2	3,232.0	37.8	4,105.2	**387.9**	**54,071.9**
Apr	405.7	8,114.8	20.0	399.4	29.5	590.9	53.9	1,185.6	**509.1**	**10,290.7**
May	754.9	15,097.9	14.5	434.2	16.3	489.0	37.2	3,424.4	**822.8**	**19,445.5**
Jun	622.5	12,450.0	36.9	1,106.4	29.3	243.9	25.3	823.0	**714.0**	**14,623.2**
Jul	495.5	41,176.5	5.4	702.9	2.8	392.0	22.9	3,110.1	**526.6**	**45,381.5**
Aug	614.7	52,930.3	37.1	4,243.9	114.5	13,692.4	16.0	738.9	**782.4**	**71,605.4**
Sep	666.8	52,951.0	94.5	10,994.0	70.9	8,203.0	68.4	4,137.8	**900.5**	**76,285.8**
Oct	677.3	61,239.3	137.9	16,255.3	76.7	9,207.7	210.6	25,322.1	**1,102.5**	**112,024.4**
Nov	585.8	38,857.5	104.0	10,357.7	117.8	11,781.2	81.6	8,150.2	**889.2**	**69,146.6**
Dec	625.3	50,064.7	125.4	11,232.0	98.2	11,766.0	172.9	8,139.5	**1,021.8**	**81,202.3**
TOTAL	**8,522.9**	**503,910.2**	**680.3**	**69,532.9**	**620.5**	**96,600.0**	**781.6**	**65,673.5**	**10,605.3**	**735,716.6**

Table 11: Lake Turkana Monthly fish landings by Weight and Value 2015

Month	M. tons	000 Kshs
January	1,152.3	94,151,760
February	1,796.0	87,487,505
March	387.9	54,071,906
April	509.1	10,290,720
May	822.8	19,445,538
June	714	14,623,239
July	526.6	45,381,457
August	782.4	71,605,434
September	900.5	76,285,840
October	1,102.5	112,024,390
November	889.2	69,146,569
December	1,021.8	81,202,256
TOTAL	**10,605.3**	**735,716,614**

One of the major challenges in the exploitation of the Lake Turkana fishery is lack of cold storage facilities within reach forcing all fishers to sale almost all their catches as dried or smoked products which are inferior products and consequently fetch highly reduced market prices per nominal unit weight.

There is also need to evaluate the data collection system in the region due to the expansiveness of the lake shoreline and build capacity of the local fishers groups and Beach Management Units (BMUs) through training to effectively undertake primary data collection.

Some of the main challenges still facing Lake Turkana fishery which need to be addressed include the following:

- Lack of appropriate fish handling and preservation facilities that usually lead to post-harvest losses and poor quality of fish and fishery products;
- Poor state of landing site access roads, which make marketing impossible at some landing sites such as Todonyang and Namukuse;
- Armed conflicts between the Turkana in Kenya and the Dasenach in Ethiopia over fishing and grazing grounds in the River Omo delta. Many lives have been lost especially on the Kenyan side;
- Weak and unfavorable fish marketing systems along the fish landing sites;
- Rampant insecurity in the lake which make resource Monitoring, Control and Surveillance a risky affair;
- Insufficient funds for training Beach Management Units in data collection

There is an urgent need to develop a sound management plan for Lake Turkana fishery. The State Department of Fisheries should strengthen community participation in Fisheries resource management, utilization and conservation in the entire lake through:

- Capacity building of BMU officials and fishers from both sides of the lake;
- Train fishers on appropriate hygiene and sanitation, fish handling, processing and fish value addition.

3.4 LAKE BARINGO FISHERY

Lake Baringo is one of the Rift valley lakes with a surface area of 130 Km^2 and a mean depth of 5.6 metres. The lakes has rivers El Molo, Perkerra and Ol arabel as the main inlets but with no obvious outlet and the waters are assumed to seep through to the underground bedrock which is believed to be volcanic. The fishery of Lake Baringo is currently based on four species including *Oreochromis niloticus* (Tilapia), *Barbus gregorii*, *Clarias mossambicus* and *Protopterus aethiopicus* which was introduced in the lake.

The fishery was previously based on the tilapiine species, however owing to changes in the lakes biophysical processes such as siltation and species introductions, the fishery is currently dominated by *Protopterus aethiopicus.* During the year under review a total of 176 tons of fish with an ex-vessel value of Kshs. 54.9 million were landed. This was a decrease of 58.4% in quantity and a huge decrease of 63.4% in ex-vessel value compared to last year's production of 302 tons valued at Kshs. 86 million.

The species catch composition was dominated by *Protopterus aethiopicus* having contributed 71% (124 metric tonnes) followed by *Tilapia spp* 16% (29 metric tonnes), *Barbus spp* 7% (13 metric tonnes) and *Clarias spp* with 6% (10 metric tonnes), figure 13 and table 12.

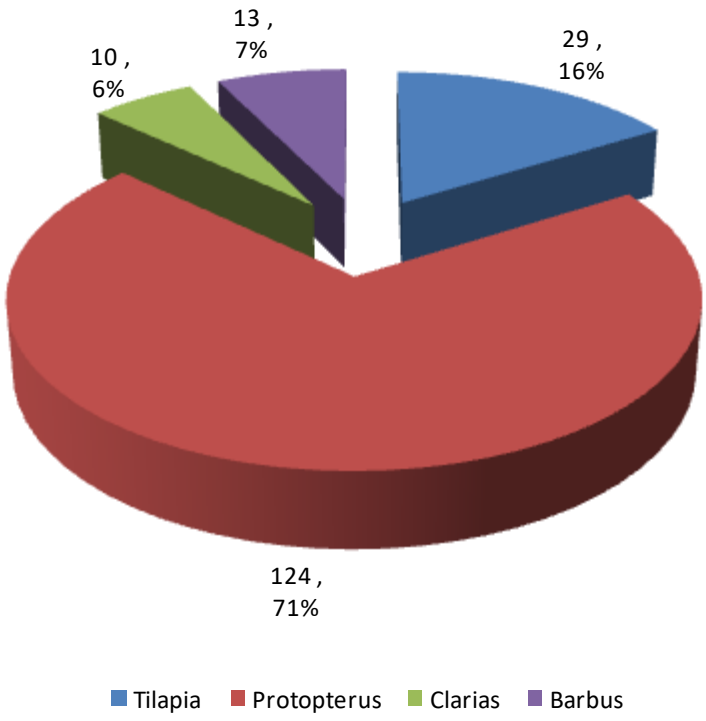

Figure 13: Percentages catch by species composition in Lake Baringo in 2015

Table 12: Lake Baringo Monthly fish landings by Species, Weight and Value 2015

	Tilapia		Protopterus		Clarias		Barbus		Total	
MONTH	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**
Jan	2,485	745,580	15,250	4,575,060	1,307	261,380	1,155	231,000	20,197	5,813,020
Feb	1,547	464,100	7,588	2,276,400	840	168,000	434	86,800	10,409	2,995,300
Mar	2,639	791,700	9,394	2,818,200	314	62,720	337	67,480	12,684	3,740,100
Apr	1,770	530,880	10,714	3,154,200	988	197,680	1,830	365,986	15,302	4,248,746
May	3,220	966,000	8,490	2,546,880	536	107,840	1,735	346,780	13,981	3,967,500
Jun	3,340	1,108,950	9,670	3,151,005	800	154,560	1,850	367,980	15,660	4,782,495
Jul	1,675	670,000	12,345	4,320,750	1,450	362,500	876	219,000	16,346	5,572,250
Aug	1,435	574,000	9,786	3,425,100	843	210,750	640	160,000	12,704	4,369,850
Sep	2,456	982,400	10,435	3,365,225	657	164,250	336	84,000	13,884	4,595,875
Oct	1,770	530,880	10,714	3,154,200	985	246,250	980	245,000	14,449	4,176,330
Nov	2,897	1,158,800	9,657	3,379,950	787	196,750	1,030	257,500	14,371	4,993,000
Dec	3,300	1,320,000	10,453	3,658,550	843	210,750	1,659	414,750	16,255	5,604,050
TOTAL	**28,534**	**9,843,290**	**124,496**	**39,825,520**	**10,350**	**2,343,430**	**12,862**	**2,846,276**	**176,242**	**54,858,516**
	Tilapia		Protopterus		Clarias		Barbus		Total	
	M. tonnes	**000 Kshs**	**M. tonnes**	**000 Kshs**	**M. tonens**	**000 Kshs**	**M. tonnes**	**000 Kshs**	**M. tonnes**	**000 Kshs**
	29	**9,843**	**124**	**39,826**	**10**	**2,343**	**13**	**2,846**	**176**	**54,859**

3.5 LAKE NAIVASHA FISHERY

The present fish population of Lake Naivasha comprises of the introduced species including largemouth bass (*Micropterus salmoides*) which was introduced in 1927, 1951 and 1956 from the United States of America, *Tilapia zilli* introduced from Lake Victoria in 1956. The introduction of *Tilapia zilli* also contained *Oreochromis leucostictus* and other tilapine species which are presently not encountered in the lake. The exotic rainbow trout (*Onchorhynchus mykiss*) occasionally strays into the lake from river Malewa while *Barbus amphigramma* migrates between the lake and river Malewa. The Louisiana red swamp crayfish (*Procambarus clarkii*) was introduced in 1970 as a source of food for the bass. The *Procambarus clarkii* and *Barbus amphigramma* are not under commercial exploitation currently in the lake.

The recent accidental introduction of Common carp (*Cyprinus carpio*) has created a shift in the fish production from the lake. The *Cyprinus carpio* is believed to have come through river Malewa from Nyandarua highlands during the El-Nino period of 1998-1999.

Species composition in the catches from the lake has drastically changed since the year 2002 where total catches were dominated by the *tilapiines*. However over the last thirteen years, *Tilapiines* contribution in catches has declined with the introduced *Cyprinus carpio* assuming greater prominence in the catches.

It is imperative for management and research to understand the implications of the *Cyprinus carpio* on the other fish species in the ecosystem. Besides, it is also important to understand the effects of the feeding habits of the *Cyprinus carpio* on the breeding grounds/nests of the *tilapiines* in the fishery.

During the year under review, a total of 1,072 tons of fish with an ex-vessel value of Kshs. 132.6 million were landed from Lake Naivasha. This was huge increase of 169% and 195% in

quantity value respectively compared to 2014 landings of 633 tons valued at Kshs 68.1 million. Common carp (*Cyprinus carpio*) continued to be the most dominant species accounting for 83.8% (899 tons) of the total catch. The other species contribution were *Oreochromis niloticus* 6.6% (70 tons), Mirror carp accounting for 4.4% (47 tons), Black bass (*Micropterus salmoides*) 1.8% (20 tons), lake 'Naivasha tilapia' (*Oreochromis leucostictus*) 1.8% (19 tons) and *Clarias gariepinus* 1.6% (16 tons), figure 14.

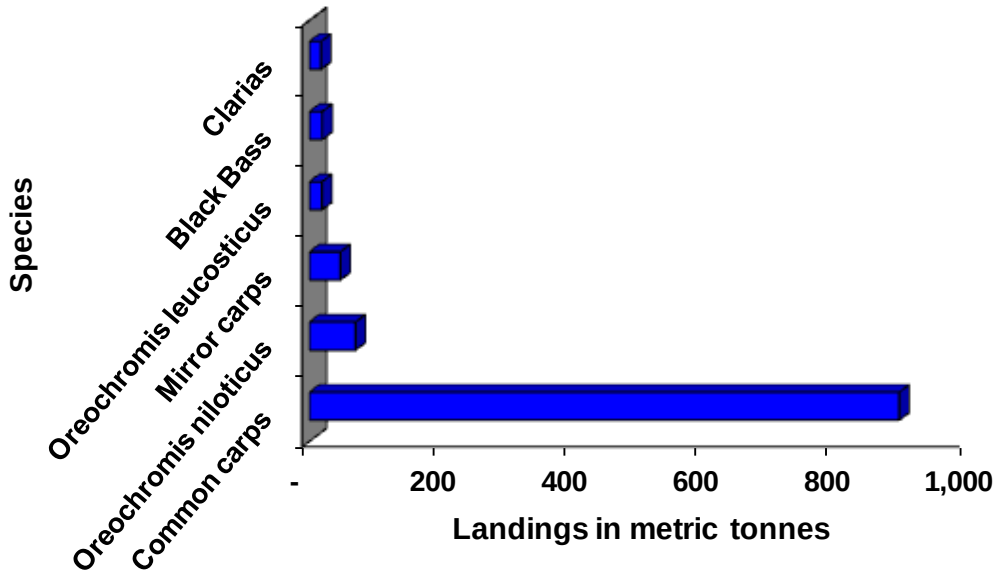

Figure 14: Lake Naivasha species composition landings in metric tonnes 2015

During the year under review, average monthly fish catches was 89.4 metric tonnes with a peak between May and September figure 15 and Table 13. A total of 50 fishing crafts were licensed to operate and these were operated by an average of 150 fishers per month.

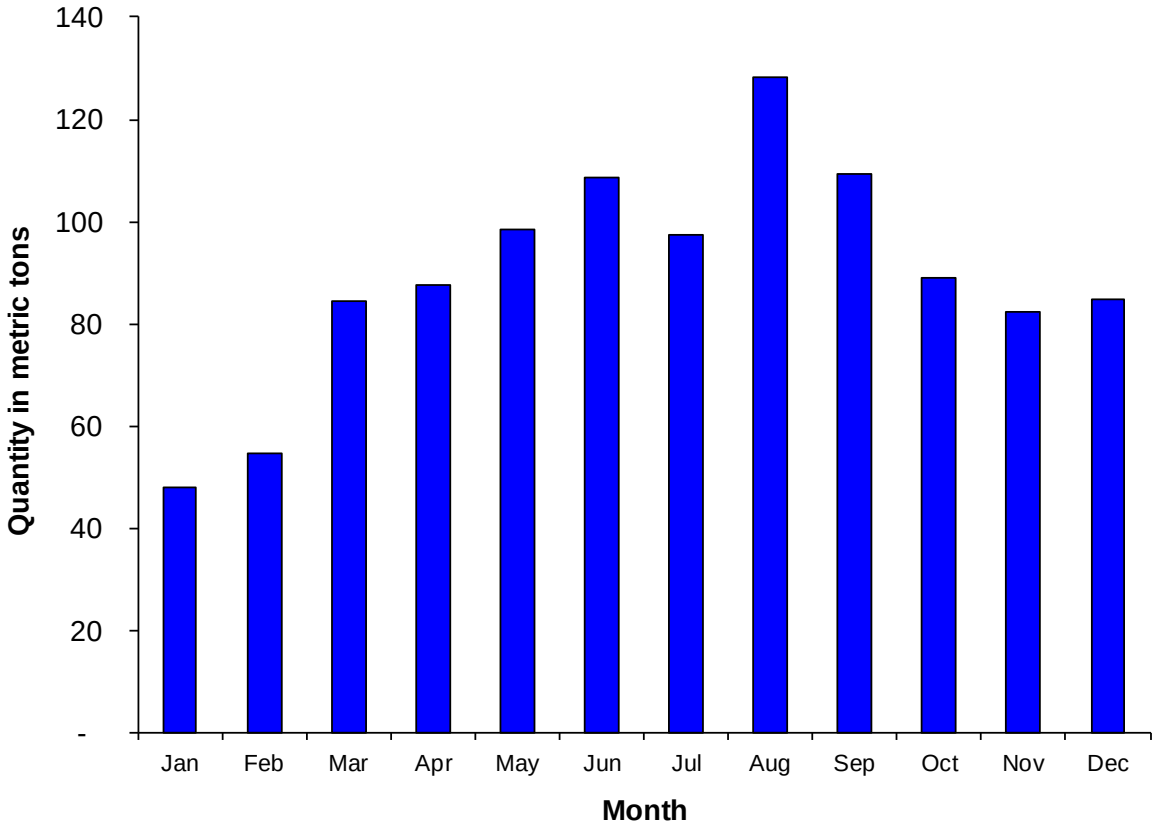

Figure 15: Lake Naivasha monthly catches in metric tonnes 2015

Table 13: Lake Naivasha Monthly fish landings by Species, Weight and Value 2015

	O. niloticus		*O. leucosticus*		*M. salmoides*		*C. gariepinus*		Mirror carp		*Common carp*		Total	
Month	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**
Jan	1,369	183,279	186	40,430	211	22,900	86	4,220	-	-	46,155	7,301,818	48,006	7,552,647
Feb	816	109,371	809	175,445	455	107,640	15	600	-	-	52,603	6,398,478	54,698	6,791,534
Mar	4,782	640,842	2,044	443,037	2,051	434,812	1,877	111,572	-	-	73,681	15,386,658	84,435	17,016,921
Apr	4,827	646,751	1,128	233,776	2,120	449,440	1,043	92,046	-	-	78,335	8,466,718	87,453	9,888,731
May	2,929	392,222	875	189,001	45	9,560	1,902	111,212	-	-	92,625	14,096,873	98,376	14,798,868
Jun	8,221	1,101,324	2,032	439,122	2,053	435,236	1,985	113,482	-	-	94,191	9,832,536	108,482	11,921,700
Jul	6928	748961	783	70628	2048	85959	1890	109967	8461	635993	77397	8414119	97,507	10,065,627
Aug	7885.5	748076	1244.5	206223.5	2159.5	195704.5	1050.5	93543.5	9482	506556	106508.5	10306354	128,331	12,056,458
Sep	8119	1297035	1992.5	70604	2097	100167	1900	106372	7718	655356	87452	9528032	109,279	11,757,566
Oct	3374	463764	3870	102233	2082	95892	1884	112352	7430	3234074	70474	9360607	89,114	13,368,922
Nov	10733	1146346	949	85022	2061	87555	1969	185693	6925	592264	59572	7349710	82,209	9,446,590
Dec	10312	768853	3225	146036	2144	138942	2032	116892	7163	1007978	59698	5772238	84,574	7,950,939
Total	**70,295**	**8,246,824**	**19,137**	**2,201,558**	**19,526**	**2,163,808**	**17,633**	**1,157,952**	**47,179**	**6,632,221**	**898,692**	**112,214,141**	1,072,461	132,616,503
	O.niloticus		O.leucosticus		M.salmoides		C.gariepinus		M. carp		C. carp		Total	
	M. tonnes	**000 Kshs**	**M. tonnes**	**000 Kshs**	**M. tonnes**	**000 Kshs**	**M. tonnes**	**000 Kshs**	**M. tonnes**	**000 Kshs**	**M. tonnes**	**000 Kshs**	**M. tonnes**	**000 Kshs**
TOTAL	**70**	**8,247**	**19**	**2,202**	**20**	**2,164**	**18**	**1,158**	**47**	**6,632**	**899**	**112,214**	**1,072**	**132,617**

3.6 LAKE JIPE FISHERY

During the year 2015, a total of 122 metric tonnes of both Tilapia and Clarias with an ex-vessel value of Kshs 21 million were landed from Lake Jipe. This reflected an increase of 6% in quantity and an increase of 7.7% in ex-vessel value compared to previous year 2014 production of 115 metric tonnes valued at Kshs 19.5 million. The only two species (Tilapia and Clarias) caught in the lake. Tilapia contributed 85% (104 metric tonnes) and Clarias 15% (18 metric tonnes), Table 14, figure 16.

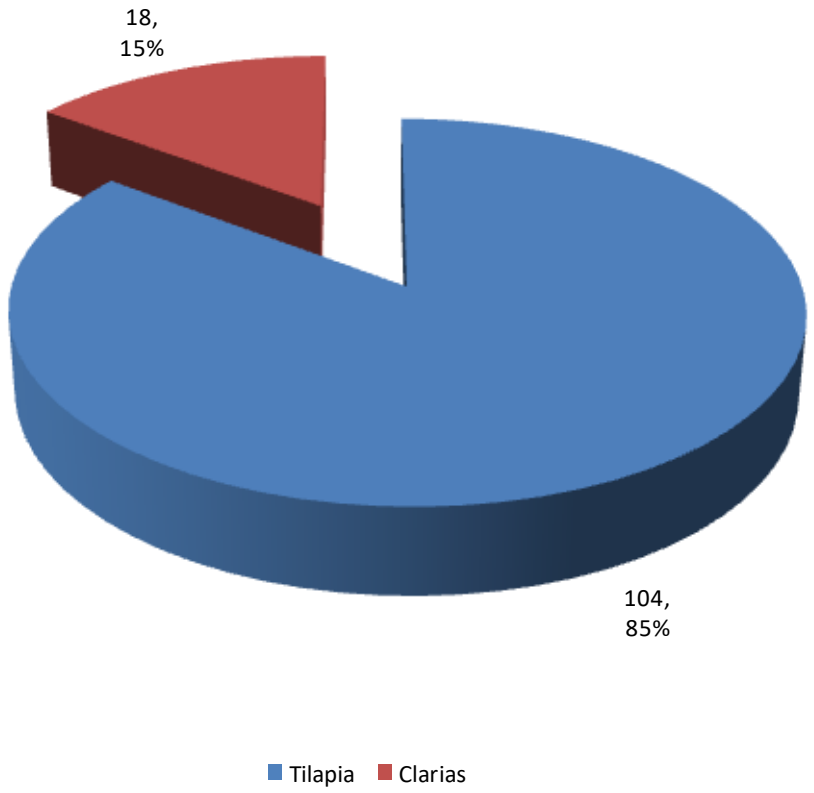

Figure 16: Percentages composition of species catch in Lake Jipe 2015

The challenges which faced capture fisheries in Lake Jipe during the year under review continued to included;

- Floating vegetation continued to stand out as the biggest problem faced by the fishers. The vegetation abstracts fishing crafts motion besides serving as hiding ground for the fish hence impacting substantially on the low production;
- Siltation – there is observable high rate of silt deposition in the lake's bed which is caused by among others sand harvesting activities on the banks of River Lumi and increased agricultural activities along the river course. The siltation has contributed to creation of a shallow inlet point in the lake which eventually brings about diversion of the river course off the lake and the water ends up in Nyumba ya Mungu resercoir in

Mwanga district of Tanzania. The knock on effect accruing from this is and not limited to proliferation of water weeds, increased salinity and receding of the lake shoreline.

Table 14: Lake Jipe Monthly fish landings by Species, Weight and Value 2015

	Tilapia		Clarias		Total	
Month	**Kgs**	**000 Kshs**	**Kgs**	**000 Kshs**	**Kgs**	**000 Kshs**
Jan	9,412	1,672,276	1561.35	221,925	**10,973**	**1,894,201**
Feb	8,979	1,595,415	1,449	205,956	**10,428**	**1,801,372**
Mar	8,638	1,534,785	1,145	162,676	**9,783**	**1,697,461**
Apr	8,335	1,480,871	1,482	210,583	**9,816**	**1,691,454**
May	8,634	1,534,039	1,765	250,879	**10,399**	**1,784,918**
Jun	8,201	1,457,178	1,825	259,386	**10,026**	**1,716,564**
Jul	7,875	1,399,160	1,641	233,268	**9,516**	**1,632,428**
Aug	8,102	1,439,456	1,445	205,359	**9,546**	**1,644,815**
Sep	8,461	1,503,257	1,269	180,436	**9,730**	**1,683,693**
Oct	8,767	1,557,731	1010.1	143,572	**9,777**	**1,701,304**
Nov	8,920	1,584,782	1,738	246,998	**10,657**	**1,831,780**
Dec	9,511	1,689,812	1,835	260,878	**11,346**	**1,950,690**
Total	**103,835**	**18,448,762**	**18,165**	**2,581,916**	**122,000**	**21,030,678**

3.7 TANA RIVER DAMS FISHERY

A total of 852.3 metric tonnes of fish with an ex-vessel value of Kshs 115,020,260 were landed from the main fishery water bodies of the Tana River dams of Masinga, Kamburu, and Kiambere compared to 1,024 metric tonnes of fish with an ex-vessel value of Kshs 98,311,000 landed from the dams in 2014. This production reflected a decrease of 16.8% in quantity and a 70% increase in ex-vessel value compared to 2014 figures (Figure 17).

The most important species in the catches in 2015 were *Cyprinus carpio* (Common carp), *Tilapia spp*, and *Clarias gariepinus.* Landings of *Cyprinus carpio* were the highest at 345,575 kgs (40.5%) followed by *Tilapia* spp 272,792 kgs (or 32.0%) and *Clarias* gariepinus 233,678 Kgs (27.4%). The other species (the Eels, Barbus spp, Labes spp and Mormyrus) combined contributed 271 kgs 0.03%. Tana River dam's fish production is determined by the level of water in the dams and this causes fluctuations of the total annual landing depending on the water level in the dams.

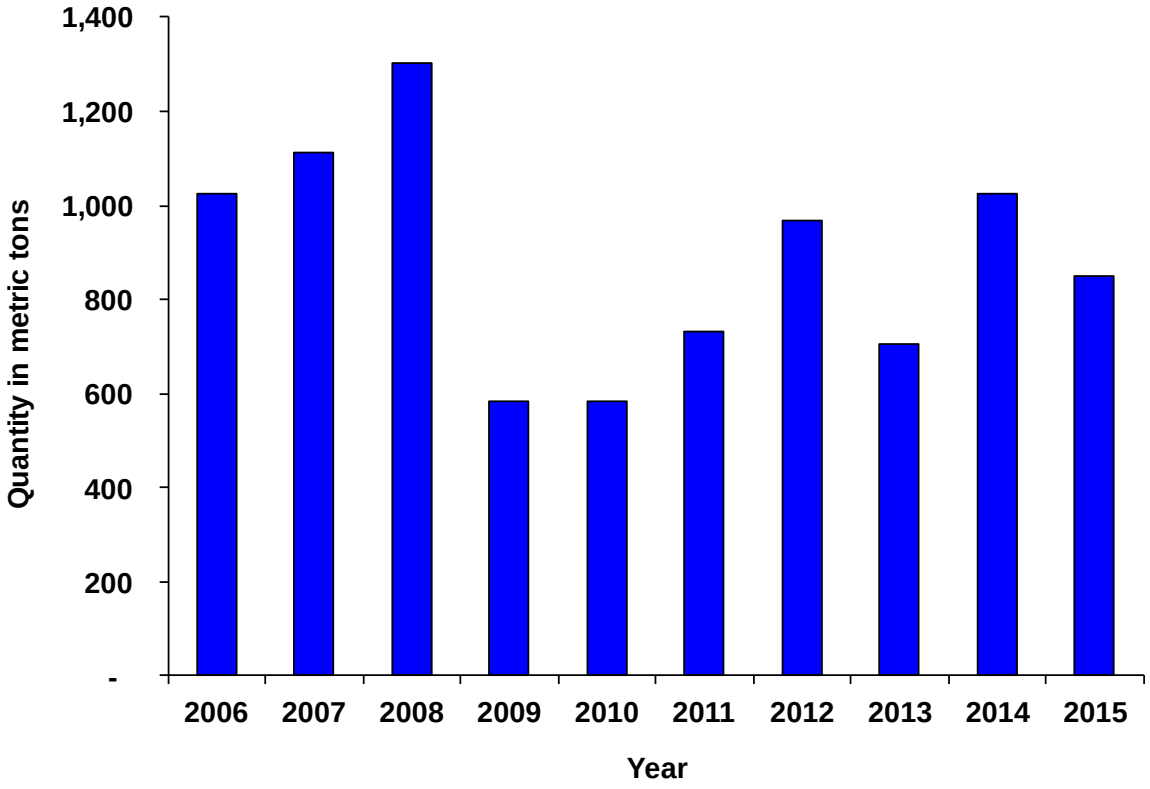

Figure 17: Tana River dams' fish catch trends in metric tonnes 2006 – 2015

Table 15: Tana River dams Monthly fish landings by Species, Weight and Value 2015

	Tilapia		Clarias		Common carp		Others		Total	
Month	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**
Jan	27,483	3,451,703	24,970	3,683,206	37,177	4,747,060	47	5,766	**89,677**	**11,887,735**
Feb	23,248	2,947,554	26,173	3,864,089	26,600	3,434,081	47	5,766	**76,067**	**10,251,490**
Mar	20,077	2,532,959	16,508	2,439,574	25,752	3,317,825	14	1,682	**62,350**	**8,292,039**
Apr	22,864	2,899,325	17,892	2,646,620	26,995	3,503,861	12	1,441	**67,762**	**9,051,247**
May	20,197	2,502,087	15,331	2,271,737	32,462	4,221,578	14	1,682	**68,004**	**8,997,083**
Jun	19,673	2,489,858	13,115	1,945,744	25,793	3,366,475	16	1,922	**58,596**	**7,803,999**
Jul	19,724	2,479,275	14,097	2,086,818	24,961	3,203,779	21	2,823	**58,803**	**7,772,695**
Aug	18,853	2,391,669	13,877	2,050,793	28,562	3,762,175	35	4,757	**61,327**	**8,209,394**
Sep	17,330	2,168,082	14,226	2,103,047	21,232	2,757,206	16	1,922	**52,804**	**7,030,257**
Oct	19,919	2,512,489	19,069	2,787,585	26,395	3,449,072	16	1,922	**65,398**	**8,751,069**
Nov	18,932	2,379,104	19,936	2,920,623	28,075	3,700,420	8	961	**66,952**	**9,001,107**
Dec	44,493	6,276,827	38,485	5,804,439	41,570	5,887,517	27	3,363	**124,575**	**17,972,147**
Total	**272,792**	**35,030,931**	**233,678**	**34,604,275**	**345,575**	**45,351,047**	**271**	**34,007**	**852,315**	**115,020,260**

3.8 LAKE KENYATTA FISHERY

During the year under review a total of 64 tons of fish with an ex-vessel value of Kshs. 5.1 million were landed from Lake Kenyatta in Lamu County of the coast province. This was a 25.5% increase in quantity of the fish landed and a corresponding increase of 30.4% in ex-vessel value compared with 2014 figures of 51 tons with an ex-vessel value of Kshs 3.9 million. The catch composition from this lake comprised of three species namely *Tilapia spp*, *Protopterus spp* and *Clarias spp*. *Tilapia spp* contributed 47% (30,202 Kgs) of the total catch, *Clarias spp*. 27% (17,436 Kgs) and *Protopterus spp* 27% (16,351 Kgs), figure 18 and Table 15. The fishing effort was 120 fishers using 40 fishing crafts. Fishing was mainly passive with gillnetting, long line hooks and hand line hooks being the most common methods of fishing.

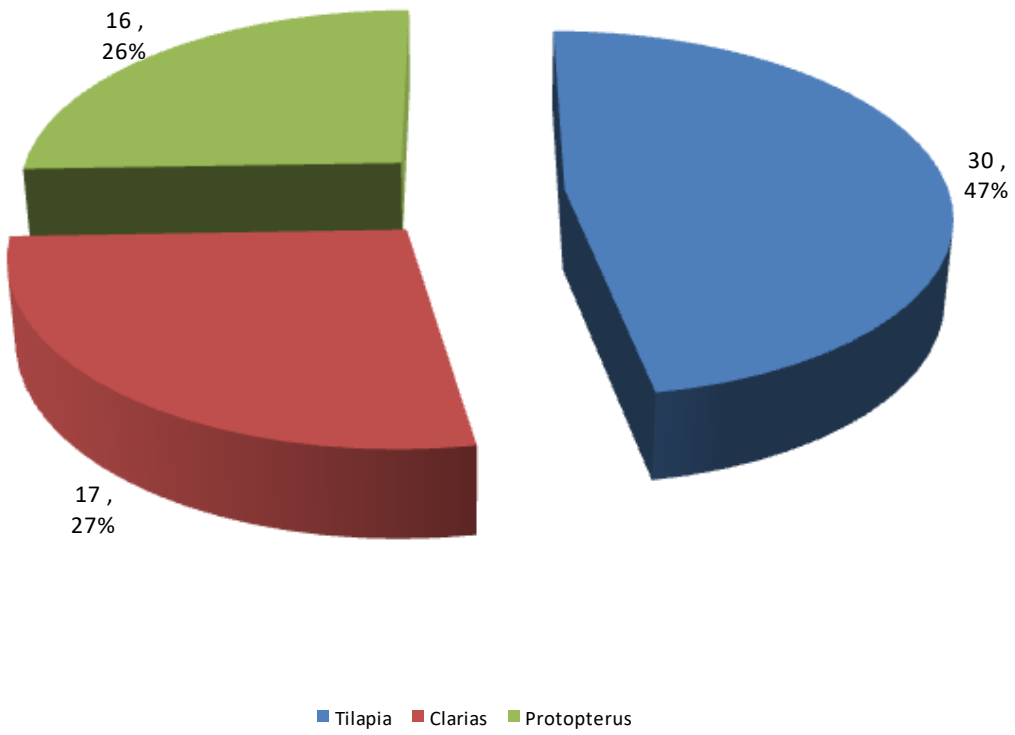

Figure 18: Percentages composition of species catch in Lake Kenyatta 2015

Table 16: Lake Kenyatta Monthly fish landings by Species, Weight and Value 2015

	Tilapia		Clarias		Protopterus		Total	
	Quantity (Kg)	Value (Kshs.)	Quantity (Kg)	Value (Kshs.)	Quantity (Kg)	Value (Kshs.)	Quantity (Kg)	Value (Kshs.)
Jan	2,800	118,257	857	83,105	836	67,967	4,493	269,329
Feb	2,291	96,833	2,472	239,762	1,641	133,393	6,404	469,988
Mar	1,273	53,130	2,849	276,379	1,563	127,041	5,685	456,550

Apr	1,273	55,701	2,849	276,379	2,110	171,506	6,232	503,585
May	3,486	262,222	1,782	172,896	3,369	274,046	8,638	709,164
Jun	2,800	93,406	850	82,468	55	4,446	3,705	180,320
Jul	2,800	125,112	853	82,786	8	635	3,661	208,534
Aug	3,309	320,493	1,024	99,343	70	5,717	4,403	425,553
Sep	1,782	164,531	1,116	108,259	1,594	129,582	4,492	402,372
Oct	3,309	317,065	1,106	107,304	3,048	247,731	7,463	672,100
Nov	4,327	389,048	1,113	107,940	1,462	118,784	6,901	615,772
Dec	764	68,555	565	54,766	594	48,276	1,922	171,597
Total	**30,212**	**2,064,352**	**17,436**	**1,691,386**	**16,351**	**1,329,125**	**64,000**	**5,084,863**
	M. tons	**000 Kshs**	**M. tons**	**000 Kshs**	**M. tons**	**000 Kshs**	**M. tons**	**000 Kshs**
Total	**30**	**2,064**	**17**	**1,691**	**16**	**1,329**	**64**	**5,085**

3.9 LAKE KANYABOLI FISHERY

Lake Kanyaboli is one of the satellite lakes of Lake Victoria and it is located in Siaya County. The fisheries of the lake are comprised of the following fish species: *Oreochromis niloticus*, *Protopterus aethiopicus*, *Haplochromis* and *Clarias spp*. A total of 100 metric tonnes with an ex-vessel value of Kshs 9.9 million were landed from the lake during the year under review. This was a 25% decline in quantity of the fish landed coupled with a 6% decline in ex-vessel value compared with 2013 figures of 144 metric tonnes with a value of Kshs 10.5 million.

The main species in catches were Tilapia which contributed 55% (54.5 metric tonnes) of the total catch followed by Clarias 19% (19.3 metric tonnes), Protopterus 18% (18.5 metric tonnes) and Haplochromis 8% (7.7 metric tonnes), figure 19 and Table 17. The fishing activities were undertaken by 188 fishers operating 99 fishing crafts.

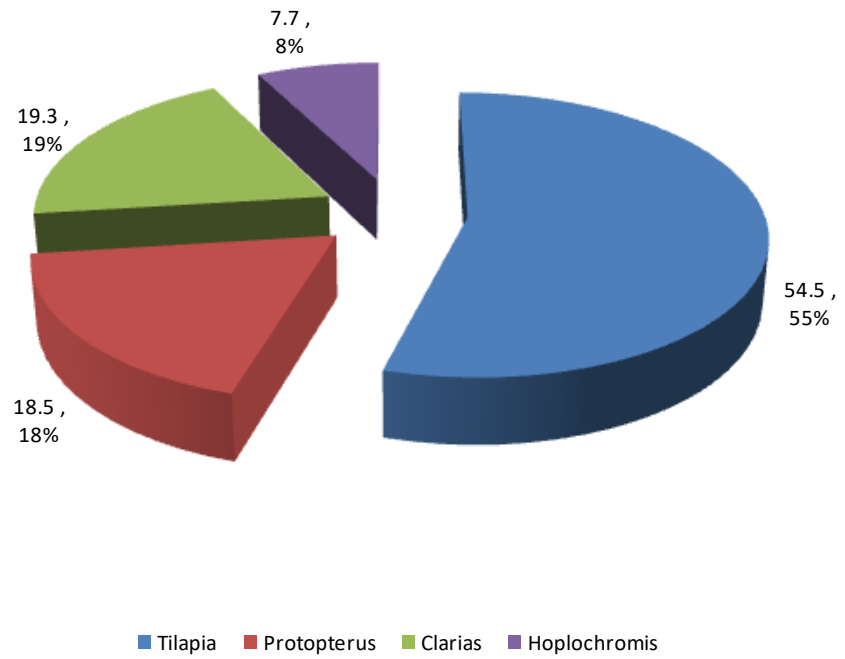

Figure 19: Percentages composition of species catch in Lake Kanyaboli 2015

Table 17: Lake Kanyaboli Monthly fish landings by Species, Weight and Value 2015

	Tilapia		Protopterus		Clarias		Haplochromis		Total	
	Kgs	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**
Jan	3,165	299,321	718	78,702	1,375	150,390	1,075	80,920	6,333	609,333
Feb	7,196	680,617	2,101	230,374	1,785	195,225	765	57,542	11,848	1,163,757
Mar	2,615	247,355	1,070	117,276	2,232	244,031	1,119	84,177	7,035	692,840
Apr	7,378	697,765	2,132	233,678	1,963	214,696	1,070	80,558	12,543	1,226,698
May	3,833	362,523	1,251	137,195	779	85,187	492	37,058	6,356	621,963
Jun	2,766	261,581	1,473	161,485	676	73,914	397	29,893	5,312	526,873
Jul	4,763	450,475	627	68,694	902	98,637	361	27,142	6,652	644,949
Aug	4,043	382,400	1,694	185,679	722	78,910	313	23,523	6,771	670,513
Sep	3,552	335,891	1,932	211,816	2,208	241,469	524	39,447	8,216	828,623
Oct	5,726	541,544	1,838	201,517	2,035	222,510	457	34,380	10,056	999,952
Nov	5,990	566,488	1,892	207,444	2,452	268,114	629	47,336	10,963	1,089,382
Dec	3,498	330,825	1,755	192,383	2,214	242,110	449	33,801	7,916	799,119
Total	**54,525**	**5,156,784**	**18,483**	**2,026,245**	**19,342**	**2,115,193**	**7,651**	**575,779**	100,001	9,874,001
	M. tons	**000 Kshs**	**M. tons**	**000 Kshs**	**M. tons**	**000 Kshs**	**M. tons**	**000 Kshs**	**M. tons**	**000 Kshs**
Total	**55**	**5,157**	**18**	**2,026**	**19**	**2,115**	**8**	**576**	**100**	**9,874**

3.10 TURKWEL DAM

Turkwel Dam is one of the major Hydro Electric Power Station in Kenya. It is situated in North West of Kenya, in the border of Turkana, West Pokot and Pokot North Sub-Counties. The dam was constructed under the control of Kerio Valley Development Authority (KVDA) from 1986 to 1991 and is still under the management of KVDA. The State Department of Fisheries has been working with KVDA and Moi University on the introduction of fish in this Dam for commercial exploitation since 2006. The dam has an area of 66 square Km with a capacity of 1,641 cubic metres. Data of fish landings from the dam were recorded for the first time in 2013.

During 2015 a total of 28 metric tonnes of fish with an ex-vessel value of Kshs 5.9 million were landed from the dam. This was a 50% decline in both quantity and value of the fish landed compared with 2014 figures of 56 metric tonnes with a value of Kshs 11 million. The fisheries of the dam are comprised of two species: Tilapia *(Oreochromis niloticus)* and *Clarias spp*. Tilapia landings contributed 93% (26.5 metric tonnes) while Clarias contributed 7% (3 metric tonnes) during the review period, figure 20. The monthly catches are shown in figure 21 and Table 17 where the lowest catches were recorded in June and July.

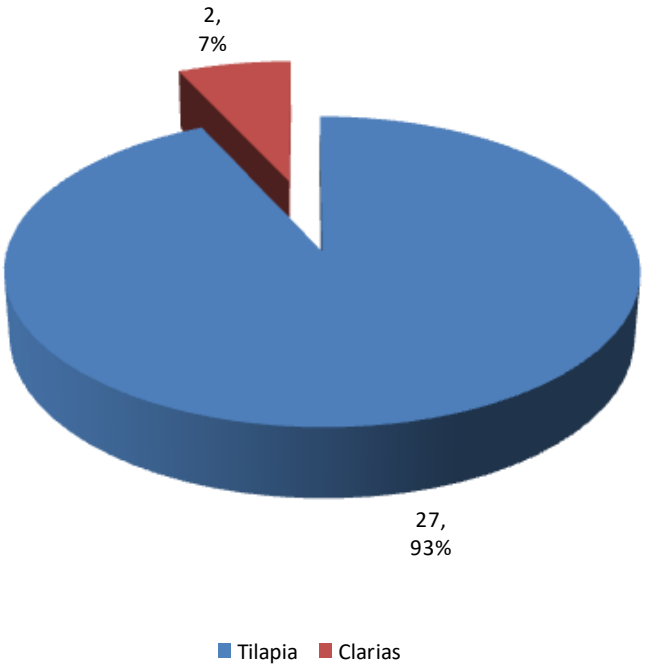

Figure 20: Percentages composition of species catch in Turkwel dam 2015

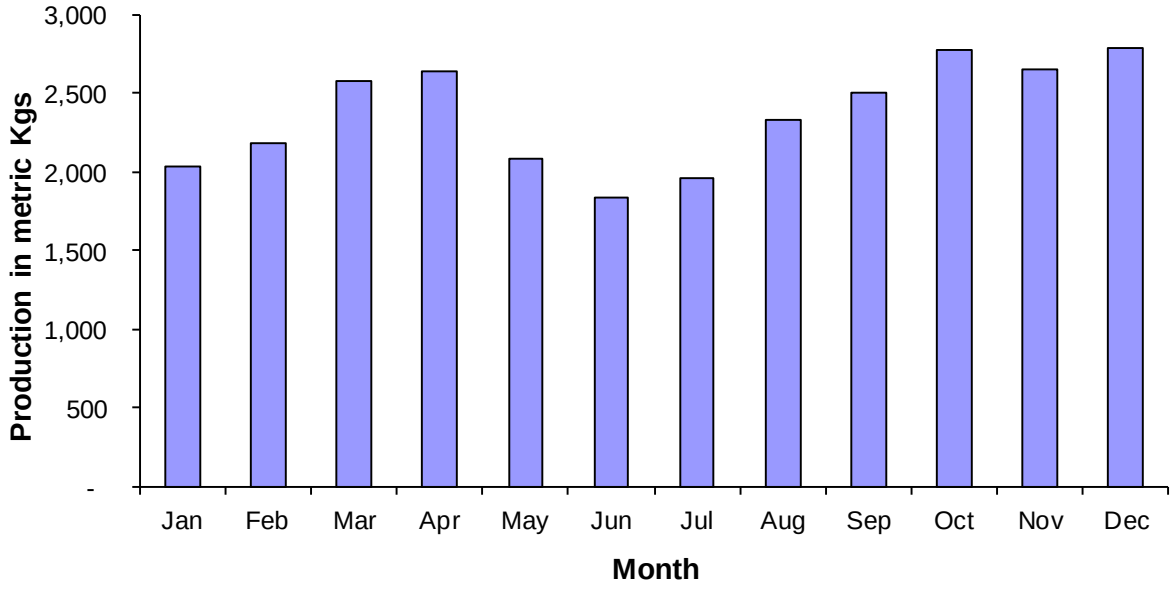

Figure 21: Turkwel dam monthly fish catches in metric tonnes 2015

Table 18: Turkwel dam Monthly fish landings by Species 2015

Month	Tilapia		Clarias		Total	
	Kgs	Kshs	Kgs	Kshs	Kgs	Kshs
Jan	1,840	390,040	191	40,524	2,031	430,564
Feb	2,036	398,487	143	30,393	2,180	428,879
Mar	1,998	390,382	574	121,571	2,572	511,953
Apr	1,957	414,861	679	143,859	2,636	558,720
May	2,008	425,498	76	16,209	2,084	441,708
Jun	1,836	389,027	2	507	1,838	389,534
Jul	1,953	413,848	1	122	1,954	413,969
Aug	2,323	492,362	7	1,520	2,330	93,882
Sep	2,490	527,821	4	810	2,494	528,631
Oct	2,763	585,567	11	2,431	2,774	587,998
Nov	2,630	557,403	14	3,039	2,644	560,442
Dec	2,765	586,073	17	3,647	2,782	589,720
TOTAL	**26,599**	**5,571,368**	**1,721**	**364,632**	**28,320**	**5,936,000**
	M tonnes	000 Kshs	M tonnes	000 Kshs	M tonnes	000 Kshs
Total	**27**	**5,571**	**2**	**365**	**28**	**5,936**

3.11 TANA RIVER DELTA

Fresh water fish landings from Tana River delta in Tana River County during the year under review amounted to 55 tons Kgs with an ex-vessel value of Kshs 4.81 million. This was an increase of 3.3% in quantity of the fish landed coupled with a 11.5% increase in ex-vessel value compared 47 tons with an ex-vessel value of Kshs 3.6 million landed in 2014. The landings comprised of *Clarias spp* 27 tons (50%), *Tilapiines* 14 tons (26%) and *Protopterus spp* 13 tons (24%), figure 22 and Table 19.

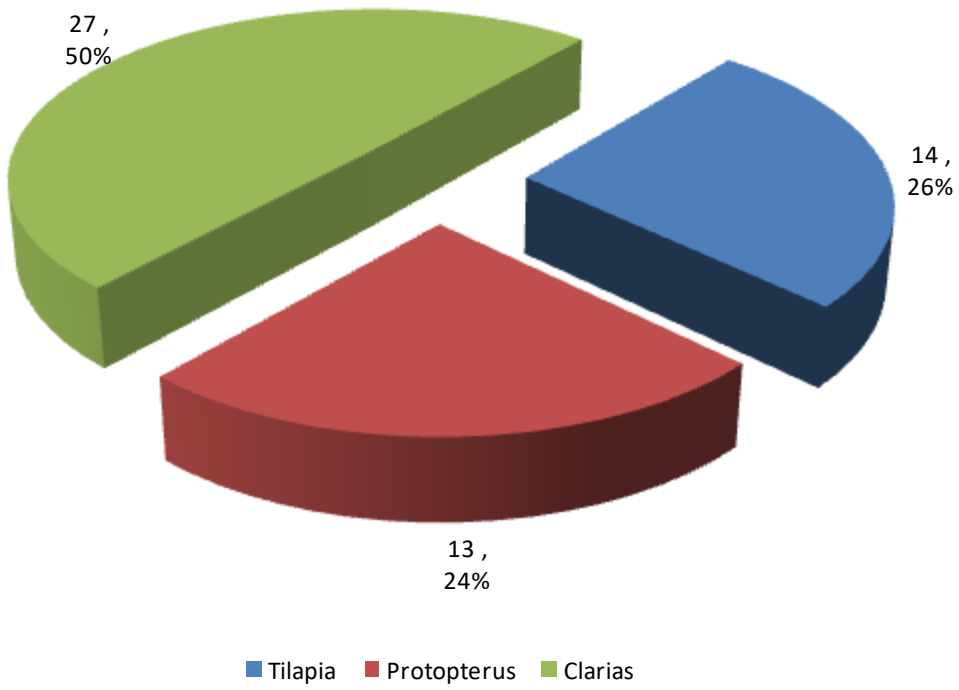

Figure 22: Percentages composition of species catch in Tana river delta 2015

Table 19: Tana River delta freshwater monthly fish landings by Species 2015

	Tilapia		Clarias		Protopterus		Total	
Month	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**	**Kgs**	**Kshs**
January	1,087	87,934	1,926	196,837	588	63,793	3,601	348,564
February	843	77,019	1,832	183,790	802	86,309	3,477	347,118
March	935	79,215	2,412	167,769	883	92,447	4,230	339,432
April	1,100	92,713	2,423	228,133	1,109	95,101	4,632	415,947
May	1,257	100,355	3,291	230,515	1,032	98,073	5,580	428,943
June	1,070	85,829	1,818	204,028	877	93,035	3,766	382,892
July	1,008	81,208	2,535	210,151	788	83,637	4,330	374,996
August	1,349	104,224	2,303	216,487	720	81,037	4,372	401,747
September	1,443	109,651	2,467	275,459	2,499	161,819	6,409	546,929

October	1,665	133,147	2,994	255,077	696	70,429	5,355	458,653
November	864	68,001	2,165	203,895	2,533	172,617	5,562	444,513
December	1,566	117,589	862	121,924	813	89,136	3,241	328,650
Total	**14,186**	**1,136,886**	**27,030**	**2,494,065**	**13,339**	**1,187,432**	**54,555**	**4,818,383**
	M.tons	**000Kshs**	**M.tons**	**000Kshs**	**M.tons**	**000Kshs**	**M.tons**	**000Kshs**
Total	**14**	**1,137**	**27**	**2,494**	**13**	**1,187**	**55**	**4,818**

4.0 AQUACULTURE (FISH FARMING)

Freshwater aquaculture development in Kenya in recent years has been fast growing. Compared to an annual production of about 1,000 MT in 2006, production had increased to an estimated 18,656 MT in 2015. This has been mainly the result of a nationwide fish farming mass campaign as part of the Economic Stimulus Programme launched by the Government of Kenya (GoK) during the period 2009-2013. As a result, the area of fishponds has increased from 220 ha in 2009 to 1,873 ha in 2015 (introducing 7,700 new ponds) and other support has been provided along different aquaculture value chains. The main produced species were Nile tilapia (80%), African catfish (13%), Rainbow trout (5%) and Common carp and Ornamental fish (2%). Mariculture production of seaweeds is being practiced commercially, mainly at Kibuyuni in south coast and is planned for uptake in other areas, as it has demonstrated that seaweed production can succeed in Kenya.

Nevertheless, there is a lack of reliable data as regards aquaculture production at County and National level and estimates from different sources range from 10,000 to about 40,000 MT per year. Aquaculture sector is gaining momentum as production from catch fisheries decreases and demand increases due to population growth. There is already a significant gap (250,000MT in 2015), between the projected demand and production of fish, which is expected to increase and is projected to be 360,000 MT/year by 2025. This lack of supply has resulted in a continuous decline of per capita average consumption, due to rising prices and limited availability. This shows the significant domestic growth potential of the aquaculture sector. The import of frozen fish, predominantly from China, has grown rapidly from 2,664 MT in 2011 to 5,853 MT in 2015 to fill the gap in local supply, since fish catches from the wild are declining and pond farmers are not able to supply consistent quantity and quality. The GoK is looking into ways of promoting aquaculture and using fish products for food relief programmes as a means to enhancing food security and improving health.

In 2009, the Government of Kenya implemented an ambitious aquaculture development programme under Economic Stimulus Programme (ESP) over a four-year period (2009-2013) at a cost of USD 40 million. The programme supported construction of ponds (300 in 160 constituencies), improved infrastructure for fish feeds and seeds, and construction of four fish processing facilities in four regions (Nyeri, Meru, Migori and Kakamega) to serve aquaculture farmers within and the surrounding Counties. Part of the funds was used to map

zones of high aquaculture potential in which viable investments can be promoted. In total, 48,000 fishponds were constructed under the programme. During early stages, it supported as well aquaculture in reservoirs that were constructed by the programme before it was abandoned later due to high investment costs and non-availability of lands for the programme to construct man-made reservoirs to be dedicated for aquaculture. The programme supported the provision of subsidized feeds and seeds for the newly established ponds. It is worth mentioning that farmers contributed land only, while the ESP supported digging of the pond.
After the devolution (2013), fish farming was one of the devolved functions and some of the Counties abandoned the programme as they focused resources in areas which were of priority. At present, several ponds are out of production due to issues with quality of feeds and fingerlings, as well as poor selection of sites for some of the ponds. Some of the fingerlings farms, supported by the programme are getting out of business in certain areas due to low demand. This has consequently led to the observed decline in fish production from aquaculture.

Aquaculture Production

Fish farming production during the year (2015) was 18,656,000 Kgs (18,656 metric tonnes) with a farm gate value of Kshs. 5,014,149,000 compared to 24,095,999 Kgs (24,096 metric tonnes) valued at Kshs. 5,601,721,944 in 2014. This production was from 69,688 ponds with an area of 20,906,400 metres square (2,091 hectares), 161 tanks measuring 23,085 metres square and 124 reservoirs with an area of 744,000 square metres throughout the country. The main species produced in 2015 were tilapia 80% (14,925 tons) and worth Kshs. 3,897 million. The rest of the species were catfish, 13%, trout 5% and carp 2% (Figure 24). Over the last five years, fish production has increased from 19,585 metric tonnes produced in year 2011 to the production of 24,096 metric tonnes in 2014 from which production has declined to the current 18,656, figure 23.

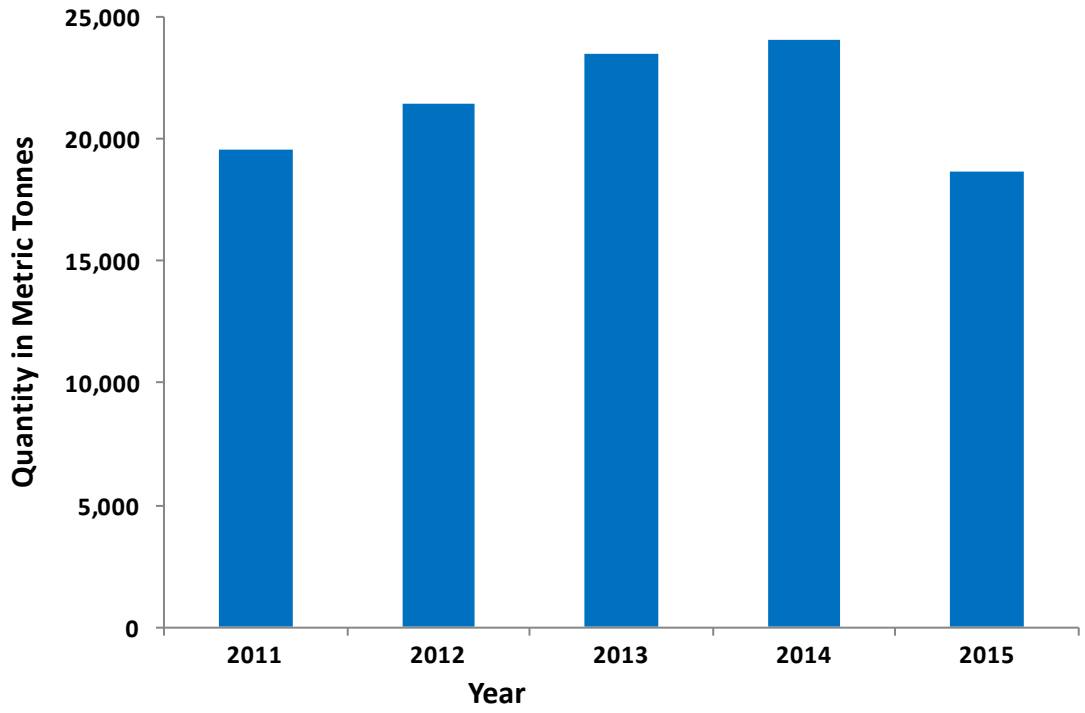

Figure 23: Aquaculture production for last ten years (2011-2015)

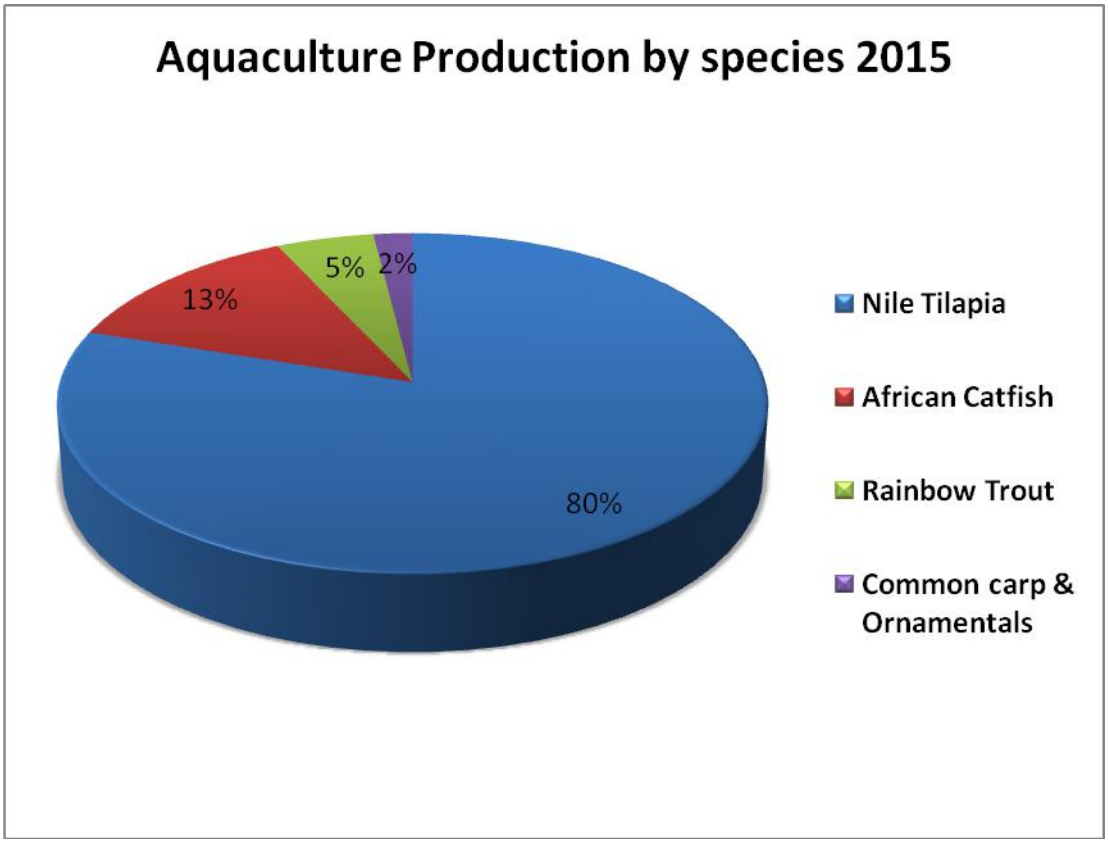

Figure 24: Aquaculture production by species in 2015

The following constraints continued to affect aquaculture activities during the year under review:

- Inadequate readily available and affordable quality fish seed (fingerlings);
- Inadequate good quality and affordable fish feeds;
- Poor adoption of fish husbandry techniques by some farmers even after being trained on basic pond management;
- Water scarcity due to other competing uses – industry, domestic and agriculture;
- Inadequate market information for use by fish farmers;
- Lack of good credit facilities and schemes for fish farmers;
- Security and safety of fish in ponds posed by thieves and predators;
- Poor book keeping and record management leading to inaccurate data from farmers along the aquaculture value chain e.g. input costs, management cost, quantities of fish harvested and value;
- Sub optimal staffing levels especially extension personnel;
- Inadequate facilitation in terms of transport and timely funds towards carrying out of fisheries extension service provision.

5.0 EXPORTS OF FISH AND FISHERY PRODUCTS

During the year under review, a total of 8,241 metric tons of fish and fishery products were exported earning the country Kshs. 3.12 billion in foreign exchange. The main products were Nile perch products and its by-products totaling 4,717 metric tons or 57.2 % of the total exports. This was a decrease of 163 metric tons from the previous year of 4980 metric tons 3%. The main products were frozen fillets 2,090 metric tons, chilled fillets 1,723 metric tons, Headless and gutted 761 metric tons and frozen fish maws 143 metric tons.

In the marine sub-sector 1,915 metric tons of Tuna loins were processed at a labour charge of Kshs. 282,789,246. The cooked frozen tuna loins were trans-shipped through the port of Mombasa. This quantity was a decrease of 65% from the previous year's trans-shipment of 5,602 metric tons. The main markets for the loins were Spain and Italy. During the same period 559 metric tons of frozen Octopus valued at Kshs 203.4m, 52 metric tons of frozen whole marine fish valued at Kshs 4.9m and 10 metric tons of prawns valued at Ksh 8.6 m were exported

The main constraints cited by fish business operators may be summarized as follows:

i. International competition
ii. Insufficient raw materials
iii. High cost of doing business

The main markets for the fisheries exports were Netherlands, China, Israel, Italy and Portugal with the value of each exceeding 200 million Kenya shillings. Within the region, Uganda and Zambia were the main export countries with trade valued at 101 and 43 million Kshs respectively (Figure 25).

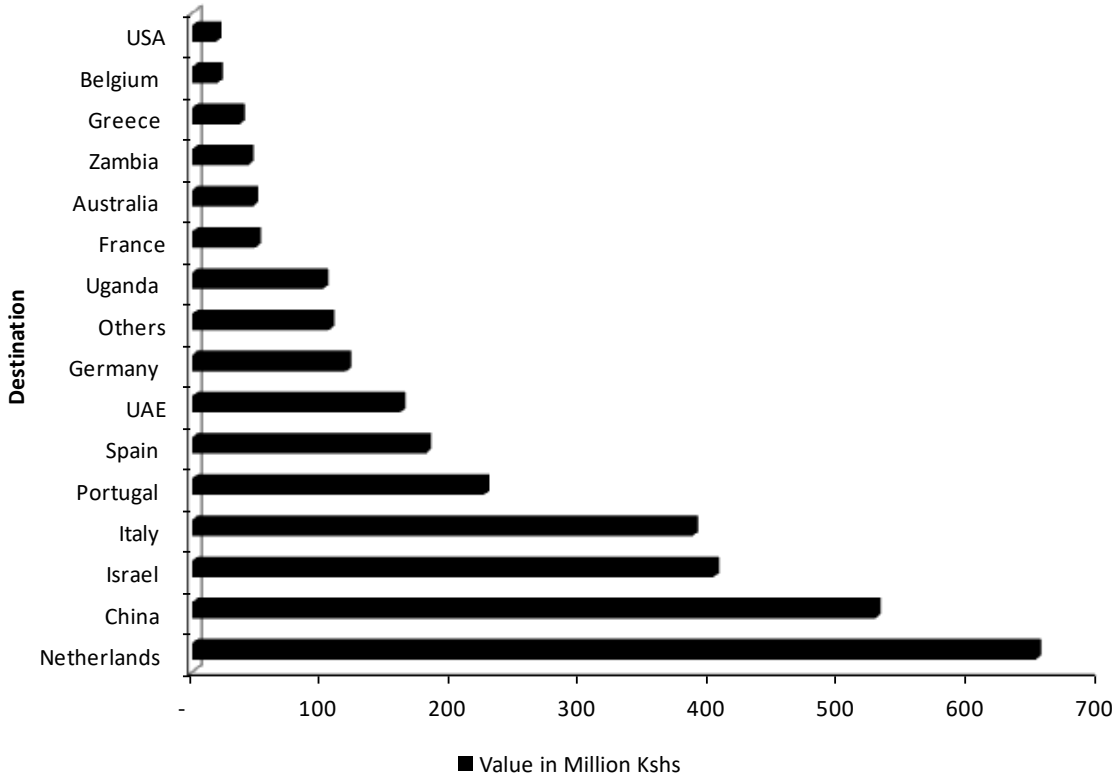

Figure 25: Exports Products by destinations- 2015

By product types, nile perch was the leading export product 1.59 billion Kshs representing 51% of the total export value from Kenya. Fish maws and headed and gutted fish represented 17% and 10% of the export respectively for 2015. Other export products were octopus, yellowfin loins, skipjack loins and lobsters representing 6%, 5%, 3% and 2% of the export values respectively. The rest of the products fetched 6% of the export value (Figure 26).

The main constraints faced by all exporters of fish and fishery products during the year under review were international market competition and insufficient supply of raw materials.

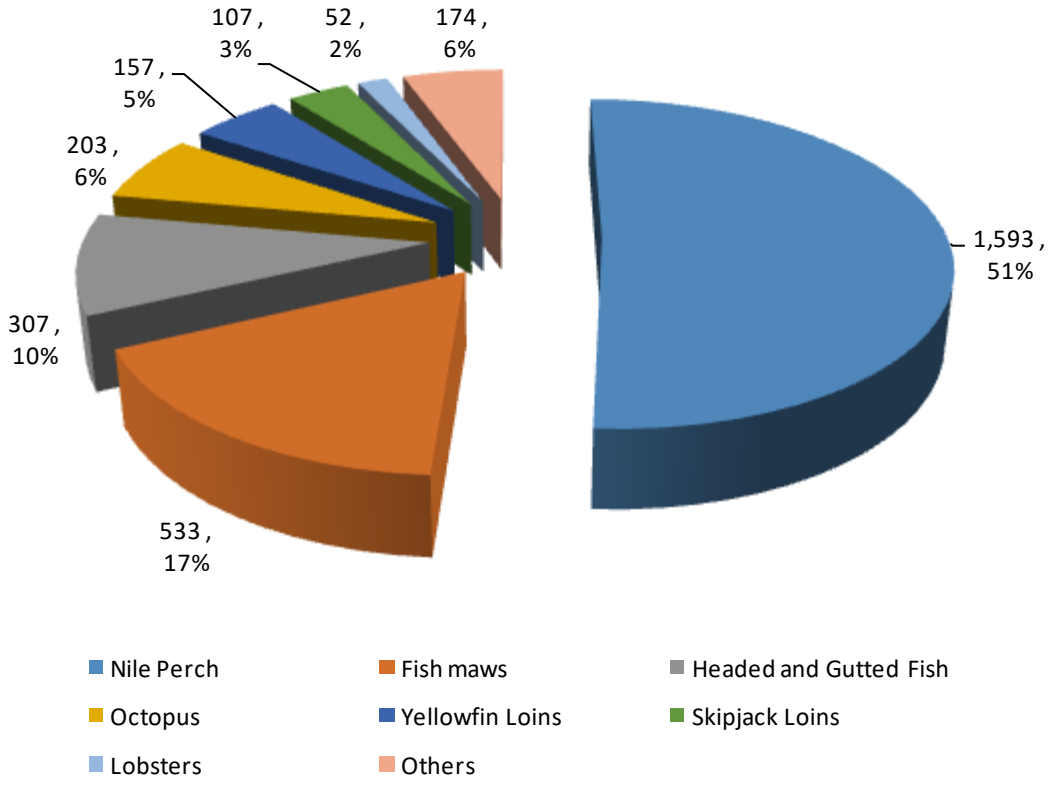

Figure 26: Exports value of fish by product type in millions of Kshs. during 2015

Table 20: Exports of Fish and Fishery Products 2015

Commodity	M. Tons	000Kshs	% Quantity	% Value
Frozen Nile Perch Fillets	2,091	889,261	25.4	28.5
Chilled Nile Perch Fillets	1,723	704,054	20.9	22.6
Fish maws	143	533,341	1.7	17.1
Headed and Gutted Fish	761	303,203	9.2	9.7
Frozen Octopus	559	203,416	6.8	6.5
Cooked Frozen Yellowfin Loins	1,068	157,024	13.0	5.0
Cooked Frozen Skipjack Loins	720	106,818	8.7	3.4
Mixed Species	337	48,960	4.1	1.6
Fish Meal	400	43,125	4.9	1.4
Frozen Whole Lobsters	52	38,143	0.6	1.2
Cooked Frozen Bigeye Loins	127	18,947	1.5	0.6
Frozen Whole Prawns	11	8,623	0.1	0.3
Live Crabs	17	6,988	0.2	0.2
Frozen Spiny Lobsters	4	6,458	0.1	0.2
Frozen Snapper Fillets	17	5,983	0.2	0.2
Frozen Jobfish Fillets	10	5,963	0.1	0.2
Live Lobsters	7	5,707	0.1	0.2
Frozen Jobfish	15	5,563	0.2	0.2
Dried Shark Fins	7	5,115	0.1	0.2
Frozen Whole Fish	25	4,971	0.3	0.2
Marine Shells	89	4,268	1.1	0.1
Dried Sea Cucumbers	7	4,134	0.1	0.1
Frozen Headed and gutted Fish	20	3,889	0.2	0.1
Frozen Slipper Lobsters	1	1,640	0.0	0.1
Others	29	5,473	0.3	0.2
Sub Total	**8,242**	**3,121,066**	**100**	**100**
Live Fish	**Number (Thousands)**	**Value, 000 Kshs.**	**% Quantity**	**% Value**
Marine aquarium fish	230	12,960	70.9	82.9
Marine aquarium invertebrates	94	2,672	29.1	17.1
Total	**325**	**15,632**	**100**	**100**
GRAND TOTAL	**8,567**	**3,136,698**		

Marine Aquarium exports

Aquarium fish

In 2015, 230,465 aquarium fish were exported compared with an average of 280,974 fish exported between 2009 and 2015 (Figure 27). The total number of fish exported in 2015 decreased by 19% from the 284,287 aquarium fish exported in 2014. Twenty species made up 65% of the total exports, with the top 5 species being *Pseudoanthias squamipinnis* (10.2%), *Chromis viridis* (6.3%), *Centropyge acanthops* (5.7%), *Labroides dimidiatus* (4.9%) and *Salarias fasciatus* 4.1% as shown in Annex 1. The dominance of these species in the export market is similar to that of 2014. *Pseudoanthias squamipinnis* dominated the exports throughout the year with two peaks in January and October while exports of *Salarias fasciatus* were relatively constant throughout the year. The lowest exports volumes for the main species was between April and July while the highest exports were recorded between October and November (Fig 28).

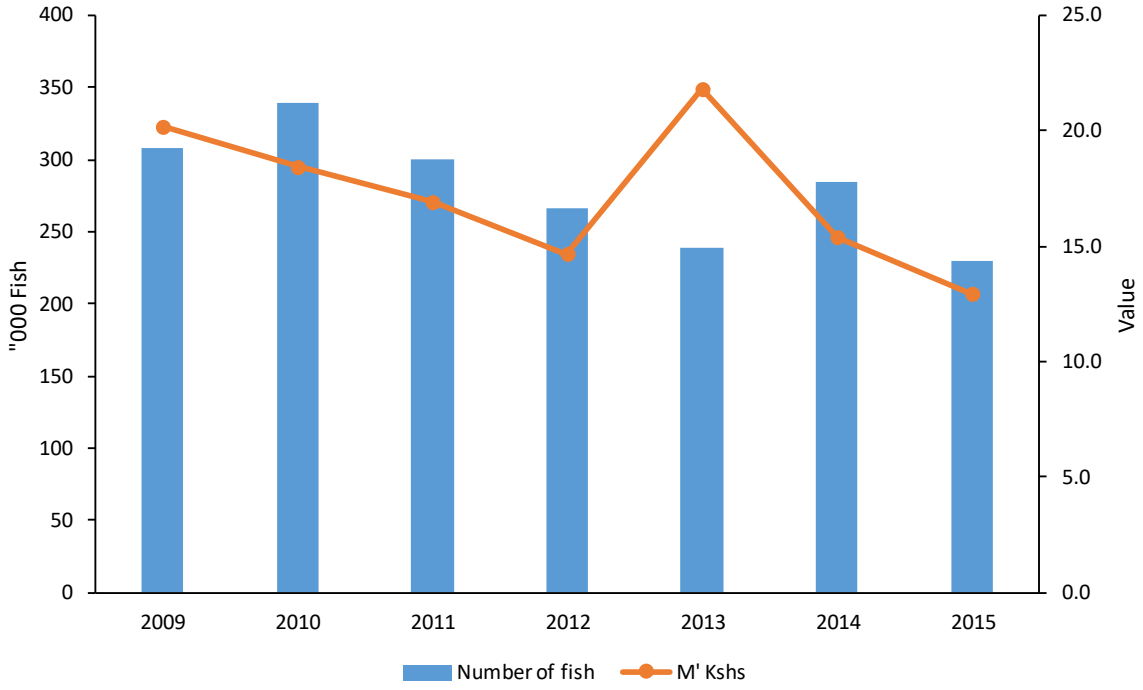

Figure 27: Annual trends of aquarium fish exports in numbers and value in during 2009 - 2015

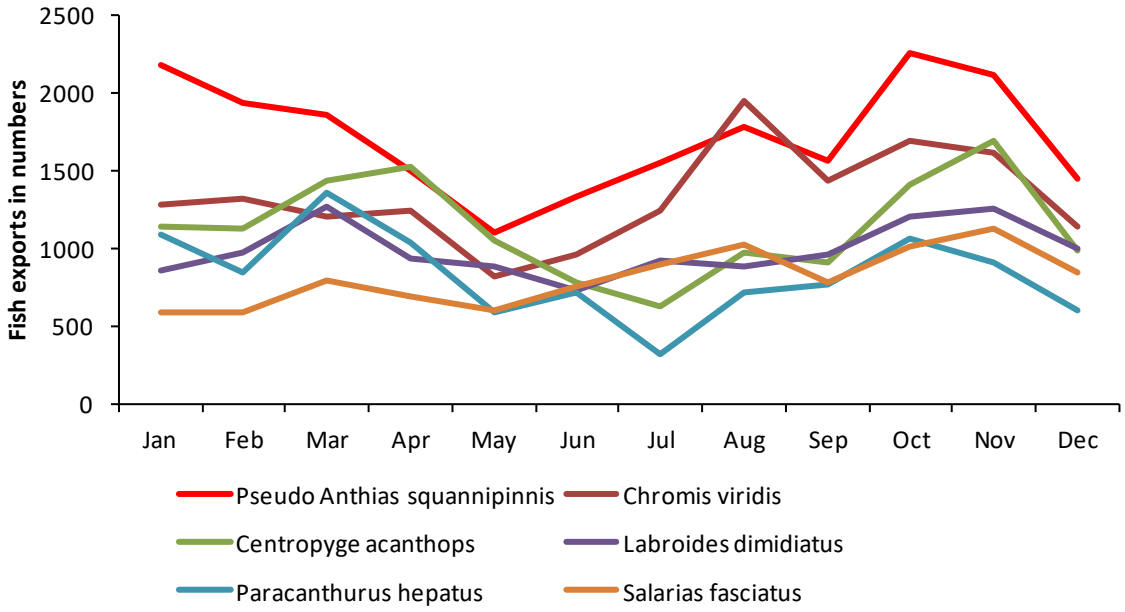

Figure 28: Monthly export trends of top six marine aquarium fish in 2015

Invertebrates

The number of marine invertebrates exported in 2015 was 94,480 which was decline of about 9% from compared to 103,243 invertebrates exported in 2014 (Figure 29). The export value however increased to 2.7 million Kshs. compared to 1.9 million Kshs. in 2014. The figures are however lower than the 2010 exports where approximately 131,000 fish worth 6.4 million Kshs were exported. Twenty species made up 80.5% of the invertebrates exports, with the top 5 species being *Nerita sp*. (10.9 %), *Clibinareus sp*. (10.6%), *Nerita polita* (turbo snail) (10.1), *Calibanarius africanus* (9.2%), *Calcinus laevimanus* (8.3%) (Annex 2).The monthly trends of the exports were similar to those of aquarium fish with the least exports occurring between April and July while October, November and March were the months when most of the invertebrates were exported. The monthly fluctuation in exports for the invertebrates is however more than that of the aquarium fish (Figure 30).

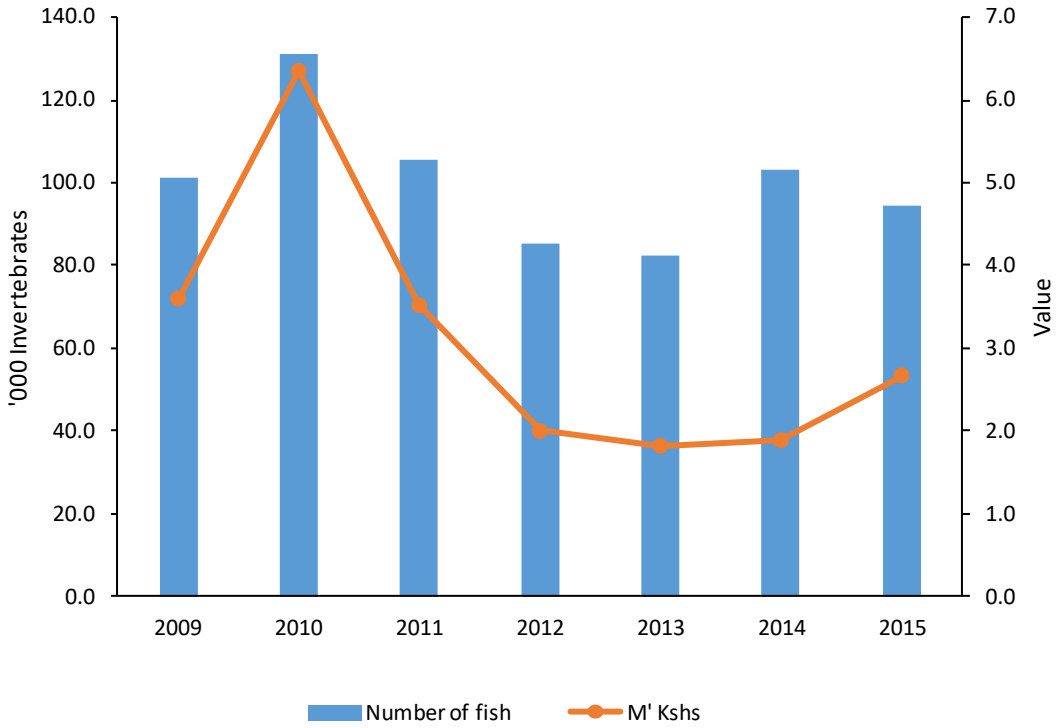

Figure 29: Annual trends in the marine invertebrates exports in numbers and value during 2009 – 2015

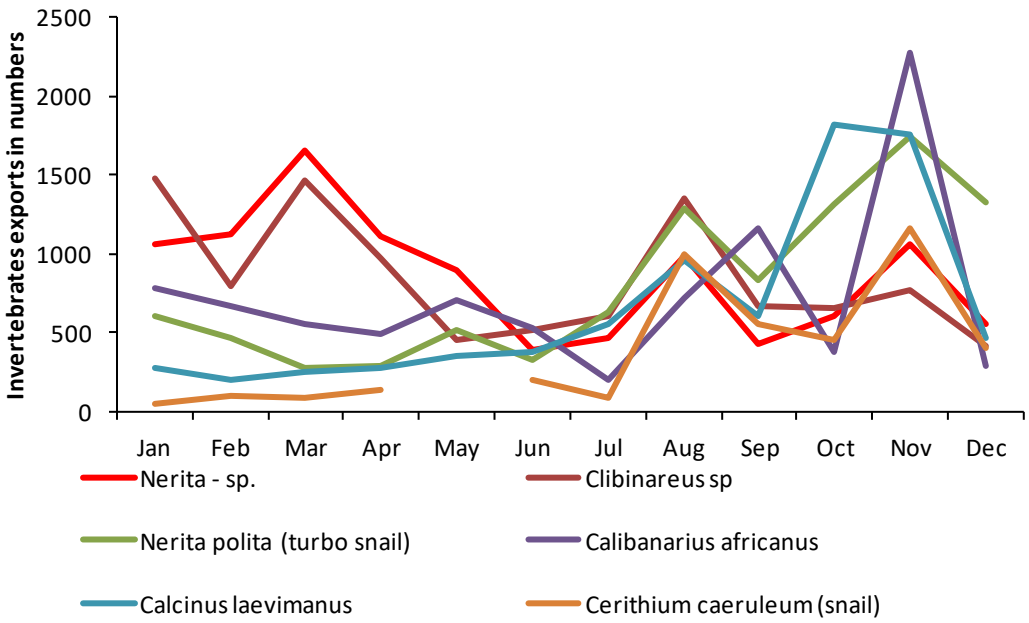

Figure 30: Monthly export trends of top six marine aquarium invertebrates in 2015

6.0 IMPORTS OF FISH AND FISHERY PRODUCTS

In 2015, Kenya imported 9,753 metric tons of fish and fishery products worth Kshs 1.1 billion. The value of imported fish was 2 billion Kenya shillings less than the exported fish although the quantities in terms of weight were close. This means that fish Kenya exported high priced products compared to the low priced imports. The imports were mainly composed of *Tilapia niloticus* 4,182 metric tons (43%) of the total fish and fishery products imported during the year. These were followed by frozen Mackerels with 3,802 metric tons which was 39%, Sardines 573 metric tons (6%), Pangasius 217 metric tons (2%) and tuna fish meal 200 metric tons (2.0%) (Fig. 31). The imports originated largely from Asian countries, notably China, Korea, Yemen, India, Japan and Vietnam but most of the *Tilapia niloticus* was imported from China and some quantities from Uganda and Tanzania (Fig 32).

Some 200,000 Trout ova and 4320 pieces of aquarium fish worth Kshs 647,465 and Kshs 509,824 respectively were also imported during the period under review. Trout ova was mainly imported from South Africa and Scotland

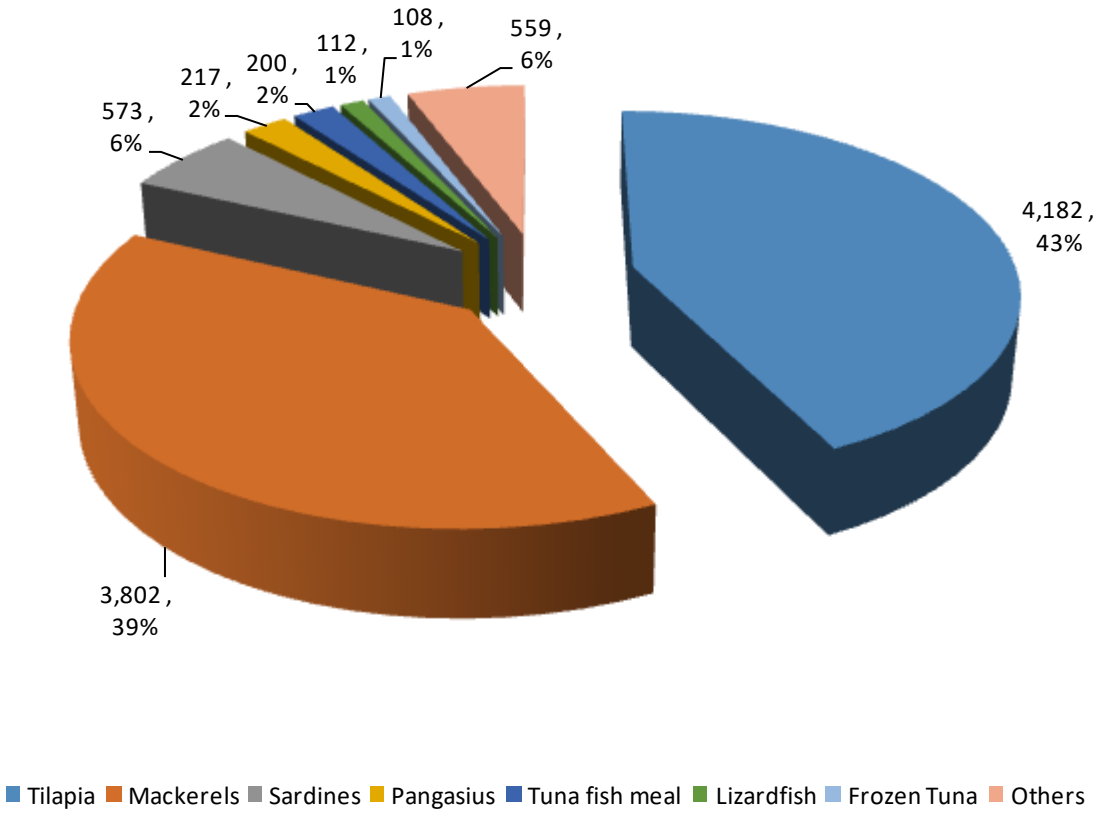

Figure 31: Import of fish and fish products 2015

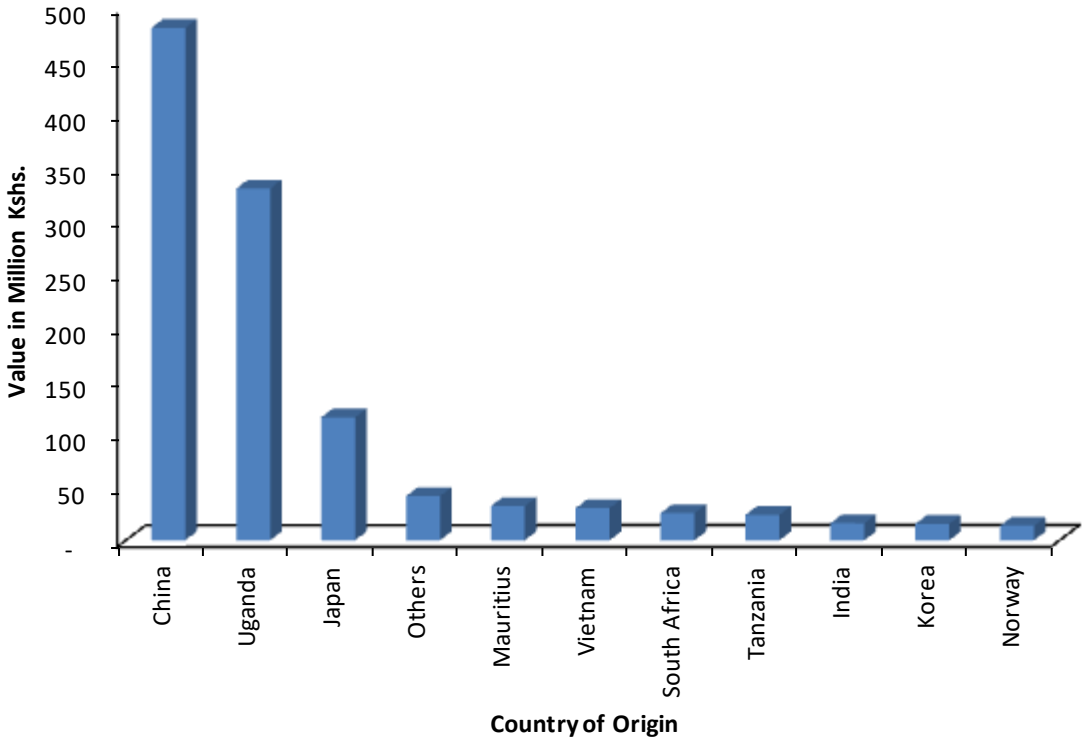

Figure 32: Fish imports by Country of origin

Table 21: Imports of Fish and Fishery Products 2015

Product	Quantity (M. Tons)	Value ('000Kshs)	% Quantity	% Value
Frozen Mackerels	3,802.4	291,833	38.7	25.5
Frozen Whole and Gutted Tilapia	2,657.8	290,920	27.1	25.4
Fresh Tilapia	1,335.5	264,651	13.6	23.1
Frozen Sardines	573.0	47,751	5.8	4.2
Frozen Pangasius Fillets	217.0	16,686	2.2	1.5
Tuna Fish Meal	200.0	19,747	2.0	1.7
Frozen Tilapia Fillets	188.8	51,783	1.9	4.5
Frozen Lizardfish	112.0	7,634	1.1	0.7
Frozen Tuna	107.8	17,546	1.1	1.5
Frozen Mixed Fish	91.9	7,202	0.9	0.6
Omena	90.1	7,328	0.9	0.6
Frozen Herrings	85.8	4,687	0.9	0.4
Frozen Mahimahi	54.0	2,643	0.5	0.2
Canned Sardines	48.1	11,061	0.5	1.0
Fish Feed	40.9	4,658	0.4	0.4
Frozen Prawns	32.0	23,902	0.3	2.1
Mussels/Hake/Prawns	24.1	16,077	0.2	1.4
Frozen Salmon/Trout Fillets	23.2	16,496	0.2	1.4
Others	69.4	20,313	0.7	1.8
Sub Total	**9,754.0**	**1,122,919**	**100**	**100**
Live fish	**Quantity (‘000)**	**Value ('000Kshs)**	**% Quantity**	**% Value**
Aquarium Fish	1	421	0.5	37.8
Garra Rufa	2	45	0.8	4.0
Trout Ova	200	647	98.7	58.2
Total	**203**	**1,113**	**100**	**100**
GRAND TOTAL	**9,957**	**1,124,031**		

ANNEXES

Annex 1. The monthly composition of the top 20 most exported marine aquarium species in 2015

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Grand	%
Pseudoanthias squamipinnis	2,802	2,452	2,799	2,319	1,631	2,102	1,640	2,253	1,905	2,936	2,698	1,791	27,328	10.2
Chromis viridis	1,281	1,262	1,571	1,556	873	1,086	1,317	1,893	1,384	1,802	1,642	1,239	16,906	6.3
Centropyge acanthops	1,285	1,312	1,679	1,614	1,322	900	770	1,019	1,008	1,485	1,846	1,022	15,262	5.7
Labroides dimidiatus	1,013	1,235	1,424	1,055	1,017	865	1,053	933	1,030	1,288	1,338	1,037	13,288	4.9
Salarias fasciatus	698	678	972	848	683	706	1,033	1,143	892	1,180	1,269	918	11,020	4.1
Paracanthurus hepatus	1,033	927	1,373	976	747	645	345	803	814	1,097	1,001	578	10,339	3.8
Nemateleotris magnifica	534	611	1,034	739	486	570	615	630	671	739	858	583	8,070	3.0
Valenciennea strigata	503	587	531	374	276	626	708	1,127	731	863	983	631	7,940	3.0
Amphiprion allardi	589	700	740	744	484	520	499	774	723	708	848	509	7,838	2.9
Halichoeres iridis	521	721	859	768	535	521	586	753	632	613	745	471	7,725	2.9
Ecsenius midas	471	653	731	574	557	464	360	420	325	510	659	398	6,122	2.3
Ostracion cubicus	466	541	624	526	387	444	410	462	511	566	567	458	5,962	2.2
Coris Formosa	496	625	618	555	546	425	402	481	375	483	458	280	5,744	2.1
Pseudocheilinus hexataenia	212	273	347	311	417	432	443	528	417	532	790	396	5,098	1.9
Pterois volitans	399	343	397	382	310	523	364	573	419	473	462	450	5,095	1.9
Acanthurus leucosternon	313	402	545	387	293	267	385	382	371	487	495	452	4,779	1.8
Macropharyngodon bipartitus	281	379	449	346	256	358	414	432	449	342	470	357	4,533	1.7
Amphiprion chrysogaster	278	335	504	405	309	322	269	389	394	342	386	310	4,243	1.6
Cirrhilabrus exquisitus	375	438	526	389	380	326	255	340	276	286	347	215	4,153	1.5
Chromis vanderbilti	217	297	414	273	391	239	187	257	370	484	276	299	3,704	1.4
Others	8,019	9,005	9,817	8,288	6,680	6,544	7,028	8,581	6,814	7,418	8,916	6,826	93,936	34.9

Annex 2. The monthly composition of the top 20 most exported marine invertebrate species in 2015

Species	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Grand**	**%**
Nerita - sp.	1,060	1,125	1,655	1,115	900	390	470	990	430	610	1,060	560	10,36	10.9
Clibinareus sp	1,475	790	1,460	975	455	520	610	1,350	670	655	775	420	10,15	10.6
Nerita polita (turbo snail)	605	460	280	289	510	325	625	1,283	835	1,315	1,742	1,330	9,599	10.1
Calibanarius africanus	788	668	558	491	708	525	205	720	1,156	375	2,271	290	8,755	9.2
Calcinus laevimanus	270	200	250	277	350	375	560	960	610	1,821	1,760	470	7,903	8.3
Cerithium caeruleum (snail)	50	100	85	135		200	85	1,000	550	450	1,160	400	4,215	4.4
Lysmata - grabhanii	665	270	195	385	510	85	35	150	315	620	410	400	4,040	4.2
Dolabella	254	342	374	317	287	283	199	389	269	268	451	300	3,733	3.9
Hymenocera - picta	112	144	211	210	169	179	140	236	200	156	270	140	2,167	2.3
Heteractis Magnifica	227	207	208	208	132	124	98	150	135	200	302	141	2,132	2.2
Protogaster - linckii	113	135	188	120	132	133	135	288	190	266	216	125	2,041	2.1
Diadema Urchin - sp.	100	70	125	215	105	210	205	175	185	155	130	75	1,750	1.8
Petrolisthes - sp.	110	160	140	155	110	120	140	160	125	150	200	75	1,645	1.7
Linkia - lavigata	109	91	83	108	71	105	321	118	66	279	123	94	1,568	1.6
Hippolysmata grabhami	94	70	54	70	52	35	30	102	91	291	178	257	1,324	1.4
Capnella sp.	98	127	132	175	69	138	103	94	73	78	111	84	1,282	1.3
Cerithium caeruleum (snail)	150	120	110	140	60			10	340		95	115	1,140	1.2
Cespitularia sp.	39	107	115	86	69	118	78	112	100	133	93	85	1,135	1.2
Sarcophyton sp.	89	146	136	113	54	68	45	86	44	79	68	84	1,012	1.1
Sabellastarte - sp.	129	102	99	147	57	60	65	60	55	53	65	35	927	1.0
Others	1,549	1,761	1,630	1,822	1,197	1,238	1,256	1,419	1,414	1,307	2,998	1,026	18,61	19.5
Total	8,086	7,195	8,088	7,553	5,997	5,231	5,405	9,852	7,853	9,261	14,4788	6,506	95,50	