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REGIONAL FISH TRADE IN EASTERN AND SOUTHERN AFRICA

Products and Markets
A Fish Traders Guide

Prepared by
Caroline T. Kirema-Mukasa (Fisheries Research Consultant)

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**REGIONAL FISH TRADE IN EASTERN
AND SOUTHERN AFRICA**

PRODUCTS AND MARKETS

A Fish Traders Guide

Figure 1: MAP SHOWING REGIONAL TRADE MOVEMENT OF FRESHWATER FISHERY PRODUCTS WITHIN EAST AND SOUTHERN AFRICA

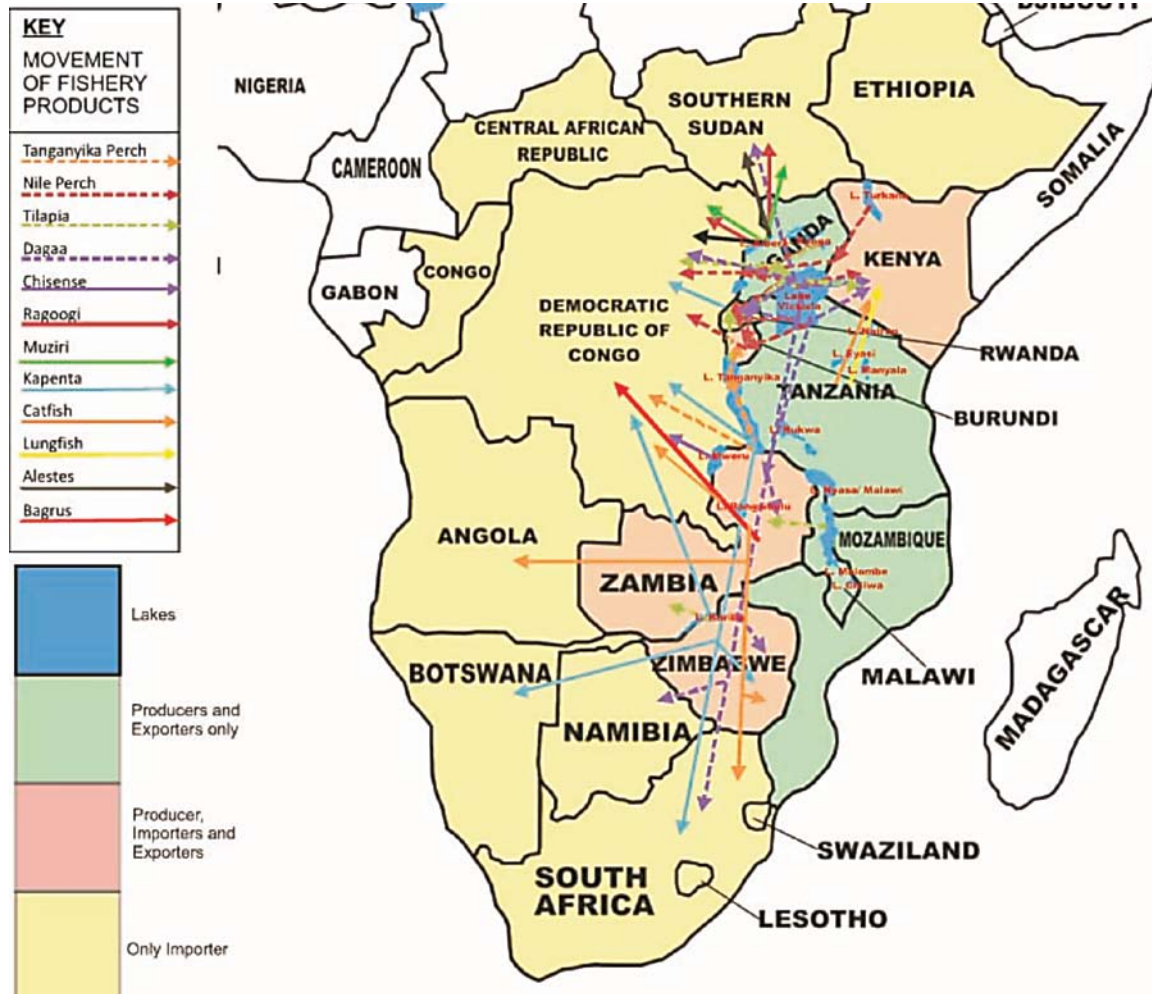


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The information has been gathered from various documents provided by the people consulted and websites, especially that of FAO. The document was subjected to peer-review to iron out any inconsistency and make the Guide more user-friendly.

Special thanks go to Mr. Chris Short Trade Expert of the SmartFish project at IOC for the technical guidance and coordination and Ms. Caroline T. Kirema-Mukasa for preparing this document, which is basically meant to target the Fish Traders, with the objective of encouraging them to improve their trading business.

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Abbreviations and Acronyms

DR Congo/ DRC	–	Democratic Republic of Congo
COMESA	–	Common Market for Eastern and Southern Africa
EA	–	East Africa
EAC	–	East African Community
ESA	–	Eastern and Southern Africa
FAO	–	Food and Agriculture Organization
HACCP	–	Hazard Analysis Critical Control Points
IOC	–	Indian Ocean Commission
LTA	–	Lake Tanganyika Authority
LVFO	–	Lake Victoria Fisheries Organization
NaFFIRI	–	National Fisheries Freshwater Research Institute
SADC	–	Southern African Development Community
TL	–	Total Length
USA	–	United States of America
WHO	–	World Health Organization
WTO	–	World Trade Organization

Foreword

Fish Trade is a major commodity exchange that makes fish to be the cheapest source of animal protein in Eastern and Southern Africa, particularly within the Great Lakes Region. The countries within the Eastern and Southern Africa and Indian Ocean (ESA-IO) Region agreed to a common strategy to increase the level of social, economic and environmental development and deepen regional integration through the sustainable exploitation of fisheries resources. The Program for Implementation of a Regional Fisheries Strategy (IRFS Program) for ESA-IO was launched in February 2011 with Regional Fisheries Trade as one of the five components. The other four components are Fisheries governance, Fisheries management, Monitoring, Control and Surveillance and Food Security. IRFS Program is coordinated by the Indian Ocean Commission (IOC) on behalf of the Member States within the ESA-IO region.

Fish trade across borders or frontiers is an old profession in Africa, which was done to facilitate distant communities to access fish, which was mainly in smoked and sundried/salted form. Trade in East and Southern Africa has increased to cover countries within and outside the region, providing the population with access to fish preserved and processed through industrial and artisanal methods. The range of products has also expanded to include chilled, frozen, and canned fishery products in addition to fresh, salted, sundried, smoked and deep-fried products. The market outlets have also grown from the solitary fish monger to specialised agents, specialised fish shops, retail stores and supermarkets, restaurants and hotels.

The consumers' demand for better quality products brings on board the quality and safety issue prompting the countries to establish Sanitary and Phytosanitary standards for fish and fishery products. Harmonising trade measures provides a freer market for Fish Traders within the same trade or economic bloc. It also provides opportunities for bilateral arrangements between neighbouring countries in dissimilar trade blocs. The conditions under which the regional fish trade operates vary from countries with moderate infrastructure, established measures, well packaged and labelled consignments to those with rudimentary facilities, inadequate measures, and poorly transacted business with high Illegal, Unreported and Unregulated fish trade.

The Fish Traders Guide primarily focuses on freshwater fishes from the Great Lakes region. It provides information on the various aspects of the different fish types or species, fishery products and markets to enable the fish trader to plan and make informed decision. The guide encourages the trader to conduct legal trade and seek technical advice from relevant authorities. It also provides tips on qualities of a successful fish trader and successful business. The guide is neither a legal document nor an instruction material. However, it is a sensitisation instrument to promote responsible fish trading practices.

It is IOC aim to promote wise-use of the fisheries resources, increase in per capita fish consumption and increased accessibility of fish and fishery products by the population within the ESA-IO region. Responsible fish trading practices adhere to the FAO Code of Conduct for Responsible Fisheries, which is central to the sustainability of fisheries resources. Good trading practices discourage illegal fishing methods and promote optimal utilisation of the catches through value addition, improved processing and reduction of post-harvest losses.

USERS OF THIS FISH TRADERS GUIDE

The fish traders guide is intended to provide vital trade information on freshwater fishery products and markets within the Eastern and Southern Africa region.

The guide provides an outline of the major commercial species in the region, with some background about the species and information on the types of product forms, processing methods and nutritive values. The guide also indicates existing and potential markets where the products can be sold.

It also provides information about the structure of fish trade and fish trade regulations in the region, with some pointers on how to be a trader and what makes a successful trader. It is intended to be a useful background for those already trading in fish and for those interested in its potential.

The guide is expected to promote better understanding, increased active participation and improved business decisions, resulting in increased fish supply, incomes, food security, fish consumption, nutrition and livelihoods. The countries selected for this guide are within the Great Lakes region, where there are major fisheries resources and also high demand for freshwater fish and fishery products.

This Fish Traders Guide is divided into five sections:

Section 1 – is the background which provides information on fisheries contribution to trade, consumption and nutrition as well as regional objectives of the Trade blocs.

Section 2 – specifies the major commercial species and the major water bodies that supply fish to regional trade. The profiles of each type of fish are covered under this section, providing information on the characteristics of the fish, fishing methods, processing, nutritional value and markets.

Section 3 – provides information on fish trade, the principles guiding trade and the fisheries regulations of the specified countries.

Section 4 – looks at the critical marketing aspects for regional trade, summarised information on the various products and markets, qualities of a successful regional fish trader, and requirements of a good fish trade business.

Section 5 – the last section specify what the impact would be, if the guide is used as reference material by the traders.

1 Background

Fish is a major source of animal protein, livelihood and plays a critical role in the diet of the low-income groups of people in Eastern and Southern Africa (ESA)¹. Fish trade within the ESA countries is a major food commodity exchange based on fresh fish and traditionally processed fishery products.

The ESA region has many freshwater bodies including the major Great Lakes of Africa, which are endowed with a variety of fishes. The region also has a potentially big market for fish, which comprise the following trade blocs: the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Southern African Development Community (SADC)

The main objectives of COMESA, EAC and SADC for the fisheries sector include increased fish production for self-sufficiency and promotion of fish trade within and outside the regions. FAO/WHO (2011) experts recognize the nutritive value of fish and conclude that “Consumption of fish provides energy, protein and a range of other important nutrients, including the long-chain n-3 polyunsaturated fatty acids (LCn3PUFAs). Consumption of fish, particularly fatty fish, lowers the risk of dying from coronary heart disease and lowers the risk of women giving birth to children with suboptimal neurodevelopment.” In East Africa, small pelagic fishes are used in the production of weaning foods for children and also, commonly used for the prevention and treatment of measles and malnutrition conditions in children.

Africa’s consumption levels are the lowest (*Table 1*), despite the rise in the world per capita food fish consumption from an average of 16.5 kg between 2001-2007 to 17.6 kg in 2010 (*FAO, 2012*)².

Table 1 gives the status of available fish for consumption against the population for each country. The average per capita fish consumption for the selected countries in the ESA region is 5kg per annum, with the lowest consumption of 1.2 in Zimbabwe and the highest consumption of 12.6 kg in Uganda. The low consumption levels are attributed to inequitable distribution of fishery products due to poor infrastructure and the declining fish catches as a result of overfishing and use of destructive fishing gears. The decline in capture fisheries has prompted the promotion of commercial aquaculture to bridge the gap between supply and the growing population in the region. FAO estimated that for 2011, aquaculture would contribute 49% to the total fish supply for direct human consumption (*The FishSite, 2007*)³.

¹ IOC 2011

² FAO (2012)

³ The FishSite (2007)

Table 1: Per Capita Fish Consumption in Selected ESA countries – 2008

Country	Annual Fish Production	Fish for Non food uses	Fish Imports	Fish Exports	Fish Supply for human consumption	Population	Per capita fish Supply/ consumption
Area	tonnes in live weight					('000)	Kg/yr
Burundi	14,200	0	98	11	14,287	7,606	1.9
D.R. Congo	239,078	0	96,474	3	335,851	60,800	5.5
Kenya	148,017	237	26,967	32,211	142,644	36,781	3.9
Malawi	66,794	1	3,002	313	69,483	14,045	4.9
Rwanda	10,025	0	3,310	74	13,285	9,219	1.4
Sudan	62,220	0	2,455	1,229	63,855	39,558	1.6
Tanzania	346,455	8,487	3,744	103,021	238,691	40,133	6
Uganda	459,392	0	682	84,529	375,554	29,663	12.6
Zambia	70,125	0	8,572	1,251	77,447	12,024	6.5
Zimbabwe	12,924	1	3,462	1,513	14,873	12,461	1.2
Total	1,429,230	8,726	148,766	224,155	1,345,970	262,290	5.1

Source: FAO Yearbook of Fishery and Aquaculture Statistics - Commodities Summary Tables (PDF) 2009

Regional and bilateral arrangements are made to streamline regional trade and increase availability and peoples' access to fish and fishery products within and outside the region. The East African Community is improving roads and market infrastructure and harmonised Sanitary and Phytosanitary Standards to facilitate crossborder trade. COMESA introduced a Simplified Trade Regime in 2000 to facilitate small-scale traders, where if a consignment value is \$1000 or less, the trader may use a simplified Customs Declaration form or a common list of eligible goods bilaterally agreed between two neighbouring countries (COMESA, 2012)⁴.

2 Major Commercial Species

Commercial fisheries in Eastern and Southern African region are based on the Great Lakes and minor water bodies, endowed with varied fishes (**Table 2**) as well as from aquaculture. Most types of fish are edible and their relative importance is based on their integration into the monetary economy and contribution to the national incomes. The types of fish, which

⁴ COMESA (2012):

are of major commercial importance to regional trade include: the Small pelagic fishes, Tilapiine, the Perch, the Catfish, *Alestes* spp., Lungfish. Other freshwater species include the Shrimps and Crayfish. Simplified information on the features and other characteristics of each type of fish is given for the trader to be able to identify the type of fish he is dealing in, sources of supply and the common names used in various countries. Table 2 shows the distribution of species in the major waterbodies and the estimated production.

Table 2: Fish production from various Lakes in the ESA Region

Lakes	Coverage (km ²)/Countries	Production in tons	Main Species	Remarks
Victoria	68,800 km ² Kenya, Tanzania and Uganda	900,000 (in 2010)	<i>Lates niloticus</i> (Nile perch) <i>Rastrineobola argentea</i> (Daaga), <i>Oreochromis niloticus</i> (Tilapia), <i>Haplochromis</i> , <i>Bagrus</i> , <i>Clarias</i> , <i>Synodontis</i> , <i>Protopterus</i> .	Dagaa (60%), Lates (30%, and <i>Oreochromis</i> , (7%). 194,172 fishers and 65,758 fishing crafts (2010.)
Tanganyika	32900 km ² Burundi, DR Congo (45%), Tanzania (41%), Zambia	200,000 (in 2011)	<i>Stolothrissa tanganicae</i> and <i>Limnothrissa</i> <i>moidon</i> (Kapenta) <i>Lates stappersii</i> (Bukabuka/Mukeke), <i>Lates angustifrons</i> (Capitaine), <i>Lates</i> <i>Marie</i> (Ngonzi, Sangala), <i>Lates microlepis</i> (Nonzi/Nyunvi), Tilapiine	About 94,800 active fishers (2011). Kapenta contributes 60% to total catch and <i>Lates</i> <i>stappersii</i> 30%.
Malawi/ Nyasa	29600 km ² Malawi, Tanzania and Mozambique	50,600 (in 2007)	<i>Haplochromis</i> spp. (Mbuna), <i>Copadichromis</i> spp. (Utaka), <i>Preochromis</i> spp. (Chambo), <i>Rhamphochromis</i> spp. (Ncheni), <i>Engraulicypris sardella</i> (Usipa), <i>Barbus paludinosus</i> (Matemba), <i>Bagrus</i> <i>meridionalis</i> (Kapango) and <i>Clarias</i> <i>gariepinus</i> (Mlamba)	About 50,000 fishers and over 350000 fish processors, traders etc. in Malawi.
Turkana (Rudolf)	7200 (7570) km ² Kenya and Ethiopia	2,493 (in 2005)	Nile perch, Tilapia, Labeo, <i>Bagrus</i> , <i>Barbus</i> , <i>Citharinus</i> , <i>Distichodus</i> , <i>Clarias</i> , <i>Synodontis</i> , <i>Hydrocynus forskalii</i>	New supplier to regional trade for DR Congo.
Albert	5270 km ² DR Congo 46% and Uganda 54%	More than 150,000 (in 2010)	<i>Alestes baremose</i> , (Ngara), <i>Hydrocynus</i> <i>forskahli</i> (Ngasia), <i>Lates niloticus</i> , <i>L.</i> <i>macrophthalmus</i> , <i>Brycinus nurse</i> (53%), <i>Neobola bredoi</i> (22%), <i>Bagrus bayad</i>	The small pelagic (Ragoogi) and Muziri) catch is over 60% of the Lake in Uganda. <i>Production data is for</i> <i>Uganda only.</i>
Mweru-Luapula	4580 km ² Zambia58% and DR Congo 42%	2,2000	<i>Poecilothrissa mweruensis</i> and <i>Bangweluensis</i> (Chisense), <i>Oreochromis macrochir</i> (Tilapia), <i>Hydrocynus vitattus</i> (Tiger fish).	About 25 000 fishers in Zambian waters
Edward	2325 km ² Uganda29% and DR Congo 71%	10,000 in (2010)	Tilapia, <i>Bagrus</i> , <i>Barbus</i> , <i>Protopterus</i> , <i>Clarias</i> , <i>Haplochromis</i> .	516 fishers (No. of fishers, boats and fishing gears are controlled/set in Uganda)
Kariba	5400 km ² Zambabwe & Zambia	23,226 (in 2001)	<i>Limnothrissa miodon</i> <i>Oreochromis</i> spp. <i>Tilapia rendalli</i> , <i>Labeo</i> <i>Hydrocynus</i> <i>vitattus</i> , <i>Mormyrids</i> , <i>Clarias gariepinus</i>	Lake Kariba is famous for Cage fish farming. Kapenta
Kivu	2370 km ² Rwanda 42% and DR Congo 58%	7,000 (1991)	<i>Oreochromis niloticus</i> , (Ingenge), <i>Stolothrissa tanganicae</i> and <i>Limnothrissa</i> <i>moidon</i> (Kapenta) <i>Barbus</i> spp., <i>Clarias</i> spp., <i>Haplochromis</i> spp.	About 6500 fishers. Kapenta (<i>Limnothrissa</i>) contributes over 80% of the total catch

Source: Country Reports of Selected Countries.

2.1 SMALL PELAGIC FISHES

Small-pelagic fishes are emerging as important commercial fisheries in Africa, contributing substantially to the catches of the major water bodies. The major small pelagic fishes include: *Rastrineobola argentea* (Dagaa/Omena/Mukene), *Stolothrissa tanganyicae* and *Limnothrissa moidon* (Kapenta), *Poecilothrissa mweruensis* and *Bangweluensis* (*Engraulicypris moeruensis*) (Chisense) *Neobola bredoi* (Muziri) and *Brycinus nurse* (Ragoogi). Originally, the major market destination for small pelagic fishes was the animal feeds industry. Their role in regional trade intensified due to the products being affordable with long shelf-life and highly resistant to decomposition.

The Dagaa fishery contributes 60% to the catch from Lake Victoria; Kapenta fishery contributes 60% of the catch from Lake Tanganyika; the Chisense fishery contributes 67% of the catches from Lake Mweru-Luapula; and the Muziri and Ragoogi fisheries contribute over 80% to the catches from Lake Albert.

The contribution of small pelagic fishes to regional trade is increasing due to increased awareness on nutrition value of small fishes, the declining catches of table fishes and the increase in population. Crossborder trade in small pelagic fishes is generally, informal and the increase in numbers of traders and big consignments shows the need to regularise this trade.

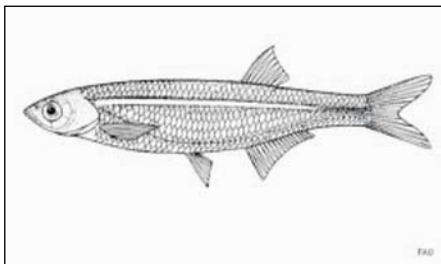
The adoption of value-addition, through improved fish handling and processing, has led to reduction of post harvest losses for small fishes and changed the human consumption to animal feeds ratio from 1:5 to 5:1.

A manual on improved processing and trading in small pelagic species, based on Dagaa, has been developed through collaboration of LVFO and IOC SmartFish program.

Simplified information is provided below on each of the small pelagic fishes identified in the regional trade of the selected ESA countries.

2.1.1 Dagaa

Figure 2 - *Rastrineobola argentea* (Silver fish) by (FAO) and Fresh Dagaa (Photo by NaFIRRI)



1). Common names

Rastrineobola argentea is the scientific name for Silver fish, Silver cyprinid (English); Dagua (EA); Omena (Kenya), Dagua (Tanzania) and Mukene (Uganda).

2). Characteristics of Dagua:

- Dagua is intensively silver with an overall shine and colourless caudal fins. The body is strongly compressed and covered with moderately large scales. It has a lateral line situated low on the body and running along the lower part of the caudal peduncle. After death a fairly distinct dark mid-lateral stripe appears on the body. It can grow to 9 cm TL (Tail Length).
- Dagua spawns in the lake and produces floating eggs. It has a fecundity of 1,000 eggs and it does not provide parental protection to the eggs or juveniles.
- Dagua feeds mainly on small animals (zooplankton) and insects. Dagua is heavily preyed upon by birds and predatory fishes, which include the Haplochromines (Fulu/Furu/Mukene)
- Dagua lives in inshore and coastal waters and some are found on the surface waters of great depth. The adults stay near the bottom during the day and come to the surface at night.
- Dagua is found in the Lake Victoria (Kenya, Tanzania and Uganda), Lake Kyoga complex and Lake Nabugabo and the Victoria Nile in Uganda.

3). Fishing

- Dagua is caught by light fishing using hurricane pressure lamps to aggregate fish then it is encircled by seine or scoop nets and scooped into the canoe.
- Dagua is one of the three major commercial species in Lake Victoria and leads with 60% in the catches (LVFO, 2008).
- Dagua fishing gear measure agreed by the Partner States is minimum 10mm small seine net mesh size with a condition to fish 2 km away from the shore line on Lake Victoria. This measure also applies to other sources of Dagua in Uganda, like L. Kyoga.
- Kenya has a closed fishing season for Dagua on Lake Victoria from April to end of June annually and this includes closure to Dagua imports affecting crossborder trade, mainly with Uganda and Tanzania.

4). Processing

- Dagua processing methods include Sun-drying, deep frying and hot smoking. Salt is added to fresh Dagua as a means of preservation before it is sundried, deep fried or smoked. Milling Dagua into fish powder and using it as an ingredient of health foods is on the increase.
- Dagua is an important nutritive sauce to the staple starch foods of the low-income groups and a component of the weaning foods in the region.
- A Manual on improved processing methods for processing small pelagic fishes was based on Dagua.

Figure 3: Dagaa Drying (L), Deepfrying Dagaa (M), Hot Smoking Dagaa (R)



- Sundrying is the main and widely used method in small pelagic fisheries in Africa. Hot smoking adds flavour to Dagaa products. Deep-frying is a recent method and produces 'crispy' Dagaa products ready for eating.
- Dagaa is rich in unsaturated fat, protein, iron, Zinc, calcium and Sodium as shown in the following Table.

Table 3: Nutritive values of Dagaa

<i>Dagaa</i> (<i>Rastrineobola Argentea</i>): Nutrients per 100 g dry matter of edible portions ⁵							
Processing method ^b	%Moisture content	% Crude fat	%Crude protein	Iron(mg)	Zinc (mg)	Calcium (mg)	Sodium (g)
Fresh, boiled	81	81	0.17	15.6	2.6	4.1	866.5
Market, dried boiled	66	66	0.78	29.2	8.2	10.1	1669.4

5). Markets

- Dagaa has a specialised wholesale market, Kirumba Market, situated on Lake Victoria, in Mwanza, Tanzania, the biggest Dagaa wholesale in Eastern and Southern Africa. Tanzania is the biggest exporter of Dagaa in the Region, followed by Uganda.
- Sundried Dagaa products are exported to Kenya, DR Congo, Malawi, Mozambique, Sudan, Rwanda, Zambia, Zimbabwe, and South Africa.
- The main products are sundried, salted, smoked, deepfried, and milled/powdered Dagaa.

2.1.2 Kapenta

There are two types of major commercial small fishes, native of Lake Tanganyika locally known as Kapenta. Scientifically, the smaller one is called *Stolothrissa tanganyicae* and the bigger one *Limnothrissa moidon*. They contribute over 60% to the catches of Lake Tanganyika. Since they are caught together, they are generally called Kapenta.

⁵ Kabahenda, M, et.al (2011)

Figure 4: *Stolothrissa tanganicae* (L), Smoked *Stolothrissa* (M), *Limnothrissa moidon* (R).



1) Common names

- i) *Stolothrissa tanganicae* is the scientific name for Lake Tanganyika sprat (English). The local names are: Chilwe, Kapenta, Nsembe (Zambia); Ndagala (Burundi); Dagua, Ndagala, Ndakala (Tanzania); Ndagala (DR Congo).
- ii) *Limnothrissa moidon* is the scientific name for Lake Tanganyika Sardine (English). The local names are: Nsembe, Chisamba, Lumbo (Zambia); Lumpu, (Burundi), Lumbo (Tanzania); Lumbo (DR Congo).

2) Characteristics of the two types of Kapenta:

- Tanganyika Sprat or Ndagala has a small silvery and streamlined body with distinct silver stripes on its sides and a highly forked tail.
- Tanganyika Sardine or Lumbo closely resembles Ndagala but is larger, with a silvery but a deeper body, more distinct silver linings on the sides and a highly forked tail end. It can grow to 17 cm TL.
- Ndagala is a pelagic spawner and breeding is during the cold and rainy season and can spawn up to 35000 eggs.
- Lumbo is a littoral spawner able to spawn 55000 eggs, prefers sandy bottoms and breeding is during the cold and rainy season,
- Ndagala feeds on shrimps and copepods, while the juveniles feed on phytoplankton, particularly the diatoms.
- Lumbo feeds on shrimps, copepods and young Ndagala, while the juveniles feed on phytoplankton.
- Major predators of both Kapenta are the Perches in Lake Tanganyika and the *Hydrocynus vittatus* (Tiger Fish) in Lake Kariba.
- Kapenta is mostly found in the pelagic zone or inshore area.
- Kapenta is distributed in Southern Africa water bodies, mainly Lake Tanganyika, Lake Kariba, Lake Itzhitezhi, and Lake Kivu, within Tanzania, Zambia, DR Congo, Burundi and Rwanda.

3) Fishing

- Fishing methods include: (i) Lusenga net fishing using a scoop net and light from pressure lamp to attract fish and (ii) Industrial Ring Net or Purse seine net fishing. Fishing gears include lift-net, purse seine, dip-net, lamparo, and gillnet.

- Kapenta contributes over 60% of the catch from Lake Tanganyika. It provides employment and revenue to a great number of people residing in the lakes basins, most of them being women.
- The fishery is regulated through licensing. The countries sharing Lake Tanganyika are redrafting and harmonising their standards and regulations through the Lake Tanganyika Authority (LTA).

4) Processing

- Kapenta is artisanally processed by sundrying, salting and smoking and deep-frying. The best Kapenta dried products are sundried on raised racks and cement slabs. Industrially, Kapenta is canned and frozen into value-packs for distant markets.
- Dried Kapenta is a good source of calcium, iron, zinc, vitamin B12, membrane lipids, taurine and nucleic acids all essential for body development.

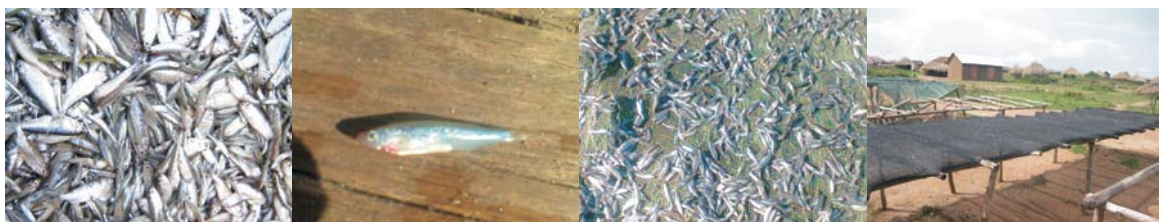
5) Markets

- Canned Kapenta products and frozen Kapenta value packs target both local and export markets. The sundried, smoked and salted products are sold in local and neighbouring countries. Tanzania is a major exporter, whereas the other countries sharing Lake Tanganyika, namely, Burundi, DRC and Zambia are net importers. Zambia exports Lake Kariba Kapenta to Zimbabwe, Botswana, Namibia and South Africa and as well as Rwanda from Lake Tanganyika and imports Kapenta from Mozambique.
- Kapenta is widely consumed within the region, particularly amongst the low-income earners.
- The main products are fresh, frozen value-packs, sundried, smoked, and salted Kapenta.

2.1.3 Neobola

Neobola (Muziri) is a small type of fish that resembles Dagaa and is found mostly in East Africa. Muziri is a new commercial fishery that emerged in Lake Albert in 2000⁶. Initially, it was lumped together with Dagaa mainly for selling to the animal feeds industry. With a different brand name, it is likely to succeed as a good fishery product in the regional trade.

Figure 5: Fresh Muziri mixed with Ragoogi (L), Fresh Muziri (M), Dried Muziri & Drying Rack(R).



⁶ Nambooze, A. (2008)

1) Common names

Neobola bredoi is the scientific name for Neobola (English); and Muziri (Uganda and DR Congo)

2) Characteristics of Muziri

- Muziri is intensely silver, with a darker head surface. A dark mid-lateral stripe appears after death. The size at maturity is 28 mm for female and 30 mm for male. It grows up to 45 mm TL.
- *Muziri* spawns in the lake and produces floating eggs.
- Muziri feeds mainly on small animals (zooplankton) and insects.
- The habitat is imperfectly known, but probably restricted to the surface zone of inshore waters.
- Muziri is endemic to Lake Albert, which is shared by DR Congo and Uganda and is also found in Ethiopia.

3) Fishing

- Muziri is caught at night using light from hurricane pressure lamps to aggregate fish and seines or scoop nets are then used to encircle and scoop the fish into the canoe. It is caught mixed with Ragoogi.
- There is no slot size or gear selectivity measure for Muziri however policy and management framework are being developed.
- Muziri is the second dominant fishery in Lake Albert contributing 19% to all fish catches.

4) Processing

- Muziri is processed by Sundrying, salting and deep frying.
- Muziri fishery provides major employment for women.
- Muziri is very important in nutrition as sauce to the staple starch food of the low income bracket group.
- Muziri is rich in protein, fat, and phosphorus as shown in Table 4 below

Table 4: Average nutrient composition *Neobola bredoi* (Muziri)

Product description	Average nutrient composition					
	Protein (%)	Fat (%)	Gross energy (Kcal/100g)	Ash (%)	Dry matter (%)	Phosphorus (%)
Muziri fresh	68.23	13.01	4593	9.89	93.28	1.78
Muziri washed sun-dried	70.45	10.02	4732	12.46	94.45	2.04
Muziri blanched for 4 minutes	69.55	9.51	4560	14.35	91.96	1.83
Muziri fresh-salted and smoked	51.40	8.78	6339	10.01	96.36	1.43
Muziri salted and sun-dried	50.34	9.51	6180	13.04	91.74	1.42
Muziri salted drip-dried & smoked	47.15	8.67	6209	9.93	95.39	1.34
Unsalted and sundried Muziri	69.6	10.30	4769	13.99	93.34	2.14

Source: Masette, 2012.

5) Markets

- Muziri markets include: DR Congo and Southern Sudan, which take the bulk of the deep fried and sundried products. The domestic consumers and the animal feeds industry mainly take sundried products.
- The main products are sundried and deepfried Muziri.

2.1.4 *Brycinus nurse*

Ragoogi fishery is one of the types of fish driving an emerging commercial fisheries on Lake Albert in Uganda and dominant in the catches. It contributes 64% to catches from Lake Albert.

Figure 6: Ragoogi (L& R); Fried Processed Ragoogi (M)



1) Common names

Brycinus nurse is the scientific name for Ragoogi, Ndolo (Uganda). *Brycinus nurse* in some documents is referred to as *Alestes nurse*⁷. *Alestes jacksonii* (Nsonga) is sometimes referred to as *Brycinus jacksonii* (Nsonga).

2) Characteristics of Ragoogi

- Ragoogi (*Brycinus nurse*) is a sardine coloured silver bluish grey to blue dorsally. The fish has a black blotch on the caudal peduncle, with narrow extension onto the caudal fin; a round black spot behind the head, often faint or invisible in life but intensified after death. The dorsal, pelvic and anal fins are tinged with vermilion. The adult fishes are between 15-23 cm long and occasionally as large as 27cm.
- Ragoogi feeds mainly on plant fragments, zooplankton and aquatic insects.
- Ragoogi are preyed upon by *Bagrus bayad*, *Hydrocynus forskahli* and *Clarias gariepinus* in Lake Albert
- Ragoogi is a pelagic species found in inshore waters.

3) Fishing

- In daylight Ragoogi is caught with seines and perforated basins containing dregs of local brew and at night light from pressured lamps is used to attract the fish.
- Estimated annual Ragoogi catches are 116,702 tons (64%)⁸ of all catches from Lake Albert and provides major employment for women.

⁷ CLOFFA 1

⁸ Department of Fisheries Resources, Uganda, 2011.

- The fishery is regulated through licensing, however, policy and management framework for small fishes are being developed.

4) Processing

- Ragoogi is processed by sundrying, salting and deep-frying. Efforts are being made to improve fish handling and processing practices.
- Nutritionally, *Brycinus nurse* is particularly fatty fish with high iodine values and rich in protein. The fats in *Brycinus* are necessary for the structure of some cell membranes and also more effective in lowering the level of serum cholesterol (Saliu. J.K. 2001) : Some of the nutrients are shown in the table below.

Table 5: Nutritive values of Ragoogi (*Brycinus nurse*)

Product description	Average nutrient composition					
	Protein (%)	Fat (%)	Gross energy (Kcal/100g)	Ash (%)	Dry matter (%)	Phosphorus (%)
Ragoogi fresh	62.85	20.58	5177	11.36	96.17	1.80
Ragoogi sun-dried whole	66.95	14.55	4834	11.82	90.07	1.70
Ragoogi smoked	65.47	13.89	5232	11.45	91.46	1.64

Source: Masette. 2012

5) Markets

- Sundried and deep-fried Ragoogi products are sold on the domestic market of Uganda, DR Congo and Southern Sudan.
- Sundried products are also sold to the animal feeds industry in Uganda
- The main products are fresh, sundried and deepfried Ragoogi.

2.1.5 Chisense

There are two specific types of Chisense *Poecilothrissa mweruensis* which is dominant in Lake Mweru-Luapula and *Engraulicypris moeruensis* dominant in Lake Bangwelu. The Chisense fishery emerged as a commercial fishery in the early 1980s through technical support and promotion.

Figure 7: Dried Chisense¹⁰ (by worldfish)



⁹ Saliu. J.K.: (2001) pg 9-17.

¹⁰ Worldfishcentre web.

1) Common names

- i) *Poecilothrissa mweruensis* is the scientific name for Sardine (English). The local names are Chisense (Zambia, DR Congo); Kasepa (Zambia)
- ii) *Bangweluensis* (*Engraulicypris moeruensis*) is the scientific name for White bull (English). The local name is Chisense (Zambia, DR Congo).

2) Characteristics of Chisense

- The Sardine/ Chisense (*Poecilothrissa*) is a silvery fish with a flat but deep body. Adult is 45 – 47 mm TL.
- The White bull/ Chisense (*Engraulicypris*) has a transparent streamlined body, marked with a stripe on each side, a bright silvery skin covering the belly, a long forked tail as well as a large mouth and eyes . The adult fish is 45 - 47 mm TL.
- The Sardine is a shoaling spawner, which breeds twice a year in March, April and August – September, with more abundance in September. Mature fish can produce up to 1140 eggs.
- The White bull is a shoaling pelagic spawner and breeds during the rainy season especially in December.
- The Sardine feeds on small animals (zooplankton), mainly on insects.
- The white bull is a planktivore and feeds mainly on the algae and diatoms.
- Both types of Chisense live mainly in the inshore waters. The Sardine is more abundant in Lake Mweru-Luapula. The White bull is also found in Lake Mweru-Luapula but more significant in Lake Bangweulu. Lake Mweru-Luapula is shared between DR Congo and Zambia.

3) Fishing

- Fishing of Chisense is undertaken during the day and also at night using light from pressure lamps to attract the fish. The fishing gears include a beach draw net, mid-water seine net, lift net and scoop net, made from very small or mosquito mesh size nets or meshless cloth.
- Chisense contributes about 25% of the total annual catch from capture fisheries in Zambia ranking second to the Tilapiine (Bream). Over 60% of the catch on Lake Mweru-Luapula is composed of the Sardine and only 7% is the White bull, whereas on Lake Bangweulu, White bull dominates.
- The Zambian legislation and fish standards are being revised. Licensing is the major instrument used to manage regional fish trade.

4) Processing

- Sundrying is the major method applied on Chisense and is dried on earthen or concrete slabs, canvas sheets and/ or sandy beaches.
- A Solar drier with a battery was being introduced in Zambia to reduce the post-harvest losses and shorten drying time of Chisense, especially, during wet weather.
- Chisense is rich in proteins, lipids, Vitamins and minerals.

5) Markets

- Trade in sundried Chisense products is conducted by local and crossborder wholesalers who supply local markets and regional markets, respectively. Fresh fish trade is dominated by men while trade in dried products is controlled by women.
- The export trade in Chisense has spurred improvement in fish handling and processing arising from market demand for better quality products.
- Zambia exports Chisense from Lake Mweru-Luapula to DR Congo and other markets along the railway lines in Lusaka, the Copper-belt and Central province.
- The main product is sundried Chisense.

2.2 Perch Fishes

There are two distinct groups of perches in the region, the Nile perch which are found mainly in East Africa and the Tanganyika Perches which are found in Lake Tanganyika. Both are major fisheries contributing 30% to the catches of Lake Victoria and 33% to Lake Tanganyika, respectively.

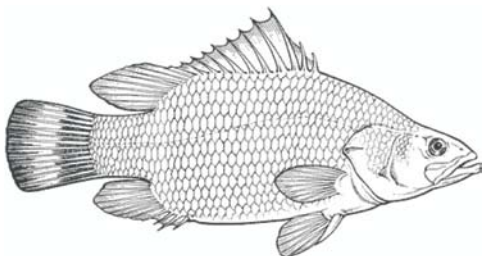
2.2.1 Nile perch

The Nile perch has two recognized species, namely, *Lates niloticus* and *L. macrophthalmus*.

Nile perch is a freshwater fish widely distributed in many tropical African Lakes and rivers such as: Lake Albert, L. Victoria, L. Kyoga, Lake Turkana (Rudolf), and River Nile, Congo River, Lake Chad and Lake Volta. *L. macrophthalmus* is only found in Lake Albert. Nile perch was stocked in Lake Victoria and Kyoga in August 1954 from Lake Albert¹¹.

The Giant Nile perch in the middle picture below was caught from Lake Kyoga, in Uganda in January 2012 and weighed 210 kg (NaFFIRI, 2012). Lake Kyoga has been a major source of sundried Tilapia and Nile perch products to regional markets

Figure 8: Nile perch



¹¹ Pleun Cornelis Goudswaard 1950.

1) Common names

Lates niloticus and *L. macrophthalmus* are the scientific names for the two Nile perch. The trade name is Victoria Perch (East Africa); Mbuta (Kenya), Sangara (Tanzania), and Mputa (Uganda), Captaine (DR Congo, Burundi).

2) Characteristics of Nile perch

- *L. niloticus* is a scaled fish, silver coloured with a blue tint, it has distinct dark eyes with a bright yellow outer ring. It can grow to a maximum total length (TL) of 200 cm and to about 200kg. (NaFIRRI report 2012).
- *L. macrophthalmus* is slender and with a long caudal fin like the sleet lates of Lake Tanganyika (Taabu. A 2012),
- The Nile perch is an open-water spawner, which, can breed up to 14 million eggs at once but does not look after its eggs or the juveniles so the survival rate is lower.
- The Nile perch is an aggressive predator fish, which feeds on fish including its own, crustaceans and insects and the juveniles feed on very small animals called zooplankton.
- The adult Nile perch can live anywhere in the water body, provided there is sufficient oxygen, while the juveniles live in shallow and inshore waters.

3) Fishing Methods

- Common fishing gears include gillnets and longlines (hooks), mounted from canoes propelled by paddle, sail or outboard engine by small-scale fishers.
- The slot size measure on Lake Victoria for catching, processing and trading in Nile perch is between 50 – 85 cm and gear selectivity measures are 7 inches (18 cm) minimum gillnet mesh size and 9 – 4 hook sizes for longline fishing.

4) Processing

- Fresh fish is transported through a cold chain, from the fishing ground to the fish processing factories.
- Un-gutted Nile perch iced after 3 – 4 hours has a shelf life of 22 days, whereas the one iced on board of fishing vessel, immediately, has a shelf life of 28 days¹².
- Nile perch is industrially processed into chilled and frozen fillets, head and gutted, and fish-maws products. 35 Nile perch fish processing plants were established on Lake Victoria. Artisanally, Nile perch by-products, chunks and whole-gutted are processed by salting, sundrying, smoking and deep-frying.

¹² Okeyo GO, et al, 2009

- Nile perch fats are industrially extracted to produce oil used in production of health supplements and local extraction of oil is also done for deep-frying of fish and in cooking food.
- Nile perch products from Lake Victoria – Bukoba, Tanzania are ecolabelled with Naturland certification fetching a prime price in the global market. Efforts to ecolabel Nile perch fishery products from entire lake are on-going.
- Nile perch is rich in Omega-3 fatty acids, polyunsaturated Fatty acids, Potassium, Vitamin A, Thiamine, Riboflavin, Calcium and Iron, which are important nutrients for human health.

Figure 9: Salted Nile perch from Tanzania (L), Fillets (M) & Factory processing Nile perch.



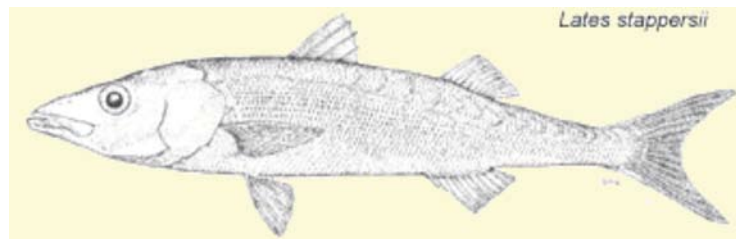
5) Markets

- The regional trade in Nile perch is becoming significant, with entry of chilled and frozen products, trade in fish factory-by-products of Nile perch, increasing trade in undersized Nile perch and entry of sundried products from new exploited sources, such as, Lake Turkana.
- The marketed products are currently dominated by the *Lates niloticus*.
- Sundried, Salted and smoked products are exported to DR Congo Sudan, Rwanda and Burundi including the domestic markets of the exporting countries of Tanzania, Uganda and Kenya.
- Chilled and frozen fillets, head and gutted fish are exported to DR Congo, Rwanda, Burundi, Sudan and Egypt, although, the major trade in these products is with Europe, Middle East, Asia, USA and Australia.
- Trade in undersized Nile perch of below 50 cm is illegal and is a major concern to the producing countries sharing Lake Victoria
- Nile perch oils extracted from fats for local use and in production of health products.
- The main products are fresh whole fish, chilled and frozen fillets, head and gutted; frozen and dried fish maws; salted/sundried, smoked, deep-fried fish and by-products of Nile perch.

2.2.2 Tanganyika Perches

There are four types of Perch found in Lake Tanganyika commonly referred to as Tanganyika perch.

Figure 10: - *Lates stappersii* (Source: FAO)



1) Common names

- i) *Lates stappersii* is the scientific name for Sleek Lates (English). The local names include: Mukeke, Ndagala, Nyamunyamu (Burundi); Mikeke, Nvolo, Ndakala (DR Congo); Mikeke, Mikebuka, Mvolo, Nchebuka, Ndakala, Nionvi, Migebuga (Tanzania); Involo, Bukabuka (Zambia); Ndagala (Rwanda).
- ii) *Lates angustifrons* is the scientific name for Tanganyika Lates (English). The local names include: Sangala (Burundi); Capitaine (DR Congo); Pamba, Sangala, Sangara (Tanzania); Pamba sikiti, Chimizi, Chisoso, Gomba, Kachechi, Katala wa Kamongo, Mpamba, Pamba (Zambia).
- iii) *Lates mariae* is the scientific name for Bigeye Lates, Golden Perch (English). The local names include: Sangala (Burundi); Sangala, Sangara (Tanzania); Pamba ngozi; Chisosa, Kalomolomu, Ngonzi, Pamba (Zambia).
- iv) *Lates microlepis* scientific name for Forktail Lates (English). The local names include: Nonzi (Burundi, DR Congo and Tanzania); Keke, Sangara (Tanzania); Nyunvi, Nyambi, Nyumvi (Zambia).

Figure 11: - Lake Tanganyika Perches



Sleek Lates

Bigeye Lates



Forktail Lates

Tanganyika Lates

Source: Author 2012

2) Characteristics of Tanganyika Perch

- The Tanganyika perch is a native of Lake Tanganyika, which is shared by Burundi, DR Congo, Tanzania and Zambia.
- The Tanganyika perch is dark grey to black on top, tempering to light grey and silver on the sides. The female perch tends to be relatively larger and live longer than the male. The Perch can grow up to about 45 kg except the Tanganyika Lates (Captaine), where the biggest can reach 100 kg.
- Sleek Lates has a mackerel –like body form and an extensive lower jaw and is the smallest of the four endemic species. Length at first maturity is 23.6 cm and can grow up to 45 cm TL.
- Bigeye Lates has exceptionally large eyes, humped dorsal and flattened ventral profiles. Length at first maturity is 45.5 cm and can grow up to 80 cm TL.
- Forktail Lates has features of a typical pelagic predator, streamlined profile, powerful musculature and forked caudal fin. Length at first maturity is 51 cm and it can grow up to 93 cm TL.
- Tanganyika Lates has small eyes with less well-developed features compared to Bigeye Lates and resembles Nile perch in size. The caudal fin is rounded and spotted in juveniles and just rounded in adults. Length at first maturity is 56.5 cm and can grow up to 200 cm TL.
- The peak spawning seasons are in February – March and August – September. The Sleek Lates produces between 100,000 and 1million eggs annually.
- Sleek Lates matures at around 28 months, Bigeye Lates 3 years, Forktail Lates and Tanganyika Lates 3 or 4 years.
- The adult Perch generally feeds on Kapenta (the sardines), shrimps and fish and the young perch feeds on minute animals (zooplankton) and shrimps.
- Juvenile perch up to about 18 cm long live in the shallow area. The adult perch live in deep water, except the Sleek Lates which remain in the pelagic zone and the Tanganyika Lates which lives inshore in the pelagic or benthic zones. Bigeye Lates lives in the deepest waters of the Lake.

3) Fishing Methods

- The Main fishing methods include: (i) Industrial Ring Net or Purse seine net fishing, which mainly targets Sleek Lates; (ii) Gill net fishing, whereby, good catches of Bigeye Lates are obtained and (iii) Lusenga net fishing which uses a paraffin pressure lamp to attract fish and a mosquito (scoop) net, whereby the perch is caught as a by-catch of the Kapenta fishery.
- Sleek Lates is the most prominent in the catches and contributes 30% of the total catches from Lake Tanganyika.

4) Processing

- Fresh fish is transported through a cold chain to the fish processing factories and the wholesale markets.
- Industrial processing includes canning and preserving fresh fish and fillets by chilling and freezing. Artisanal processing includes sundrying, smoking and deep-frying.
- Tanganyika perch nutrition value are more or less similar to that of Nile perch and includes Omega 3, protein, minerals and vitamins essential for the human body.

Figure 12: Canned Buka Buka (L), By-products of Forktail Lates (M), and Smoked Mukeke (R).



Source: Author 2012

5) Markets

- The perch markets include the domestic markets of the riparian countries of DRC Congo, Burundi, Tanzania and Zambia and with regional exports from Tanzania and Zambia to DR Congo and Burundi
- The main products are fresh, chilled and frozen whole fish and fillets, value-packs, canned and smoked Lates.

2.3 Tilapia

Tilapia is the common name for over a hundred types of Tilapiine, which are widespread in African freshwater bodies. The types of tilapia mentioned in this booklet are the most common in trade and aquaculture. Tilapia is the most accepted fish in ESA region and is accessed by all groups of people.

Figure 13: Tilapia (*Oreochromis niloticus* (L) *Oreochromis tanganicae* (M) and *Oreochromis macrochir* (R)



1) Common names

Tilapia, Bream (English).

- i) *Oreochromis niloticus* is the scientific name for Nile Tilapia (English). The local names include: Ngege (East Africa); Baringo, Nyamani, (Kenya); Perege, Sato, (Tanzania); Ihere, Matole, Kihorno, Mahele, Nsogora, Oro, Nzogogo, (Uganda); Ighonda, Ingege, y'nyamagero, Isoke (Rwanda).

- ii) *Oreochromis andersonii* is the scientific name for the Three-spotted Tilapia (English). The local names include: Kafue Bream, Njinji (Zambia); Njinji (Zimbabwe).
- iii) *Oreochromis macrochir* is the scientific name for Longfin Tilapia, Greenheaded Bream, Greenheaded Tilapia (English); Nkamba, Pale, Congo Bream, Mu, (Zambia); Igihwati, Ingege, y'inyafurunzo, (Rwanda).
- iv) *Oreochromis mortimeri*, Kariba Tilapia (English), Kurper Bream (South Africa).
- v) *Oreochromis mossambicus* is the scientific name for Mozambique Tilapia, Common Tilapia, Mozambique mouthbrooder, African mouthbrooder, Java Tilapia, Largemouth Kruper (English); Mphende (Malawi).
- vi) *Tilapia rendalli* is the scientific name for –, Congo Tilapia, Redbreast Tilapia, Redbreasted Tilapia, Redbreasted Bream
- vii) *Tilapia zillii* is the scientific name for Redbelly (English); Ngege, Erihere, Isiswe (Uganda); Kido, Kokine, Loroto (Kenya); Peregere, Sato, (Tanzania); Kudo (Sudan).
- viii) *Oreochromis esculentus* is the scientific name for Graham's Tilapia, Singida Tilapia (English); Ngenge (EA), Dwela, Osamo (Kenya); Perege, Sasala, Sato, Satu (Tanzania); Anagu, Binage, Mnuge (Uganda)

2) Characteristics of Tilapia

- The body form of Tilapia varies; it is covered with scales with the exception of the head, which is not fully covered.
- *Oreochromis niloticus* the Nile tilapia has distinctive regular vertical stripes extending as far down the body as the bottom edge of the caudal fin, with variable coloration. Adults grow up to 60 cm TL and weight of 4.3 kg.
- *The female Mozambique Tilapia* (Mphende) and non-breeding male are silver in colour with 2 – 5 blotches along the midline and the dorsal fin. The breeding male is dark grey to black with white – yellow patches over the gill covers and red margins on the dorsal and caudal fins. The male also has larger and more prominent jaws. The adults can grow up to 40 cm TL and weigh up to 1.13 kg.
- The Redbreast Tilapia or Redbreasted Bream has a dark olive-green head and a body which tends to pale at the sides, with vertical bars and white to grey dark oblique spots. The dorsal fin is olive-green with a thin red margin. The caudal fin is spotted on the dorsal half and yellow or red on the vertical half. The adult can reach up to 45 cm and weigh up to 2.5kg.
- The Redbelly is coloured dark olive on top and light-olive to yellow brown on sides with a shining blue sheen, red lips and pinkish chest. The spawning Redbelly is shiny dark green on top and sides, and red and black on the throat and belly, with vertical bands on the sides. Adults can grow to 30 – 40 cm TL and weigh up to 300 gm.
- The Tilapiine are mouth brooding fish, where the female fish keeps egg, larvae and fry protected inside her mouth until the fry is large enough to be released. Tilapiine reproduce in fresh and brackish waters.
- The Redbreast Tilapia is a substrate spawner (the only type of Tilapiine in Lake Malawi), which lays the eggs on a rock or crater and both parents guard them until the juveniles are old enough to fend for themselves.

- Tilapia feeds on plants, small animals and algae and they have been introduced in various places to control aquatic weeds and mosquitoes.
- The Tilapiine can tolerate a wide range of water conditions including salinity and brackish waters and temperatures between 8 and 42°C.
- The Nile Tilapia is a relatively large cichlid fish, which is native and widespread in Africa from Egypt to East, Central, and West Africa. It is also native to Israel, and has been introduced to many countries outside its natural range.
- The Redbreast Tilapia is a native of Southern and Central Africa water bodies, such as, L. Tanganyika, L. Malawi, L. Chulwa, Chuita and Shire River. It has been introduced in East Africa in Kagera system, L. Jipe, Athi River, dams and water systems.

3) Fishing

- Tilapia is caught using gillnets, handlines, baskets, cast nets and beach seines (beach seines are prohibited in EA).
- In East Africa, the recommended gillnet mesh sizes range between 10 cm – 12 cm (4” – 5”) depending on the water body. The allowed minimum size for harvesting tilapia and processing is 28 cm (11 inches) TL for Lake Victoria. Most of the fish is caught using open small boats in nearshore waters.

4) Aquaculture

- Farmed fish comprise a variety of Tilapiine types and their hybrids and the most common types used in Aquaculture in the region include:
 - o Nile tilapia (*Oreochromis niloticus*),
 - o Three-spotted Tilapia/Njinji, (*Oreochromis andersonii*)
 - o Longfin Tilapia/Greenheaded Bream, (*Oreochromis macrochir*)
 - o Mozambique Tilapia/ Mphende, (*Oreochromis mossambicus*)
 - o Redbreast Tilapia/Redbreasted Bream, (*Tilapia rendalli*)
 - o Kariba Tilapia/ Kurper Bream (*Oreochromis mortimeri*),
 - o Singida Tilapia (*Oreochromis esculentus*)and
 - o Redbelly/ Ngege/ Kido/Sato (*Tilapia zillii*)
- Tilapia family is of great economic importance in most East, Central and Southern Africa countries, as a major source of animal protein, employment and revenue.
- Tilapia is important in fish trade, aquaculture, aquarium trade, sport fishing, weed control and mosquito control.
- The major aquaculture concerns are on seeds, feeds, cost of production, the market, quality and safety of the product, and ecolabelling.

5) Processing

- Tilapia is artisanally processed by hot smoking, sundrying, salting and deep-frying. Fresh tilapia is industrially processed into chilled and frozen whole gutted Tilapia and fillets.
- Tilapia is rich in high-quality protein, vitamins and minerals essential for human health. It is an excellent source of Phosphorus, Niacin, Selenium, and Vitamin B12 and Potassium. Tilapia is low in saturated fat, calories, carbohydrates and sodium.

6) Markets

- Tilapia is widely traded in domestic and regional markets. Net importers of Tilapia include DR Congo, Zambia, Rwanda, Southern Sudan and Kenya. Some countries restrict the export of Tilapia and reserve it for domestic consumption.
- The main products are fresh, chilled and frozen fillets, gutted-whole, sundried, smoked, salted and deepfried Tilapia.

2.4 Alestes

The types of fish scientifically known as *Alestes* are mainly found in Africa, and have been playing an important role in regional trade of the East Africa countries with their neighbours. The types of *Alestes* whose products frequently appear in regional trade are shown below.

Figure 14: *Alestes baremose* (Joannis, 1835) (L)



Alestes dentex (web.v2,boldsystem.org)(R)



1) Common species

- Alestes baremose* is the scientific name for Silverfish, Pebbly Fish (English). The local names are: Ngara, (Uganda); Dorobela, Delete, Lelete, Nyere (Kenya); Alerio, Cin, Cien, Basongorino, Kodo, Kawara baladi (Sudan).
- Alestes dentex* is the scientific name for Characin, Nile robber, Pebbly Fish (English) Alerio, Cin, Cien, Bsongirino (Sudan), Dorobela, Delete, Juse, Lelete, Nyere (Kenya) Ngara (Uganda).
- Alestes macrolepidotus* is the scientific name for True Bigscale Tetra, Characin, Silverside (English); Waraga, Gowa, Owaro (Uganda).
- The types of fish known as *A. nurse* and *A. Jacksonii* are now called *Brycinus nurse* and *Brcyinus jacksonii*.

2) Characteristics of Alestes

- The Alestes species has a slender Body (3-5 times longer than deep), cycloid scales, short snout, small and non- extended mouth, firmly fixed teeth with nostrils close to the eye, separated by a flap of skin. The dorsal fin is situated above or behind the pelvic fins.
- Silversides or Ngara (*Alestes. baremose*) is Silver coloured with blue-grey black on top and with a white belly, greyish dorsal fins with orange colours on the lower lobe of the caudal fin. Adult fishes can grow up to 55 cm TL with an average weight of 500 gm. Alestes can grow to more than one kg.
- **Alestes dentex**: It is Silver blue on top with grey dorsal fin, red lower caudal lobe . The posterior margin of both lobes is outlined in black. In adult fishes, the pelvic and anal fins have orange flush. The adult fishes can grow to 55 cm TL and weigh about 500 gm. Very similar to Alestes baremose but with a difference in the gill rakers.
- True-bigscale Tetra or Waraga (*Alestes macrolepidotus*) is an elongated and slender fish with large scales down the body. The body is silver coloured with green tint with irregular black spots at the base of the caudal fin and behind the gills. In mature fish there is an orange lateral stripe down the body from the opercula to the base of the caudal fin. The adult fish can grow to 55 cm TL and weigh about 500 gm.
- The spawning sites and season for the fish species are unknown.
- The fish feeds on small crustacean, insects and, less frequently, fish predominating.
- The fish habitat are imperfectly known, but probably restricted to the inshore waters. In Uganda the species occur in Lake Albert, the Albert Nile, Murchison Nile and Aswa River.

3) Fishing

- Gill netting is major fishing method
- “Ngara” is a very important fishery on Lake Albert and fresh fish is an important food item for the local people.
- The fishery is regulated through Fish licensing

4) Processing

- Main method used is dry salting in combination with sun drying. Small qualities are smoked.
- Processing of “Ngara” for the domestic and regional markets provides employment for the women
- The products are fatty with a lot of oil (omega-3), therefore, very good for the heart. Other nutrients include essential fatty acid, linolenic acid and minerals such as Iodine, Selenium, Phosphorous, Potassium, Iron, Calcium as well as vitamin A and D.

5) Markets

- The bulk of the dry salted sundried products are exported regionally to DR Congo and Southern Sudan. They are highly valued in the rural area and urban centres of the riparian countries where they are considered a delicacy.
- The main products are fresh, dry-salted and sundried Ngara.

2.5 African Catfishes

The African Catfish is becoming prominent in regional trade, aquaculture and the bait fishery. It is found in most water bodies including rivers and swamps within the region.

Figure 15: Photos of *Clarias gariepinus*, (L) Hot smoking *Clarias* in Tanzania (M),
Lake Albert *Clarias*



1) Common names

Clarias mossambicus is another scientific name used for *Clarias gariepinus*.

Clarias gariepinus is the scientific name for African Sharptooth catfish, Common fish, Mudfish, (English). The local names are: Locate, Dera, Ongala, Macharufu, Kambali, Kopito, Obito, Nisu, Singre, Singri, Sombi (Kenya); Mumi, Kambale, Kambali, Mlamba, (Tanzania) Mali, Nyaki, Twang, Male, Nsonzi (Uganda), Bombe, Bomu, Mlamba, Chibomu (Malawi); Mulonge, Muta, Ndombe (Zambia), Inkube, Ishonzi, Isomba, Uninenzi, Kabambare, Kamongo, (Rwanda).

2) Characteristics of the African Catfish:

- The African Catfish has a scaleless, elongated body with a bony, broad and flattened head, a long dorsal fin without a spine and a long anal fin extending almost to the caudal fin, four pairs of unbranched circum-oral barbels. It is usually dark grey or black on the back, fading to a white belly with a large, accessory *breathing organ* composed of modified gill arches. The average adult length is around 58 cm and can grow to 170 cm TL and a weight of 29 kg.
- The African Catfish is omnivorous, feeding on small fishes (particularly Haplochromis) insect larvae, mollusks and plants, including living and dead animal matter.
- The African Catfish is widely distributed, but more common in shallow, inshore freshwater swamps, lakes and rivers, human-made habitats, such as oxidation ponds or urban sewage system. It is a bottom dweller and can survive at low levels of oxygen and in shallow mud for long periods of time, between rainy seasons.

- The African Catfishes are found throughout Africa and the Middle East.
- The African Catfish breeds after the rainy season, in mass spawning, which mostly takes place at night in the shallow submerged areas of the rivers, lakes and streams. The eggs are laid on vegetation and hatch within 25 – 40 hours after fertilisation. There is no parental care for the eggs and the juveniles.

3) Fishing

- The African catfishes are caught mainly using longlines, basket traps and spears.
- There are used as bait in the Nile perch fishery of East Africa
- No specific regulation for the catfishes, except licensing.

4) Aquaculture

- The rearing of the African sharptooth catfish in Africa started in the early 1970's in Central and Western Africa on realising that it was suitable for aquaculture and introduced all over the world in the early 1980s, as:
 - It grows and matures fast, relatively easy to reproduce in captivity and can feed on a variety of farm by-products.
 - It is hardy, tolerant of adverse water quality conditions and can be raised in high densities resulting into high yields.
 - The catfish can fetch higher prices than tilapia as it is a delicacy in some markets and can also be sold live in the market.
 - It is being cultured as bait for the longline fisheries and is used to control populations in Tilapia aquaculture ponds

5) Processing

- The African Catfish is artisanally processed using a smoking method of hot smoke. It can also be steaked, filleted, headed, gutted and skinned. New industrial products include fish sausages.
- The nutritional composition of 100g of the African Sharptooth Catfish is: Protein content 19.64%; Lipid 1.15%, moisture 76.71% and Ash 1.23% (Journal 44)¹³.

6) Markets

- There are special lucrative market niches for African Catfish in most countries within the region, such as Western Province in Kenya which gets supplies from Lake Kiteka in Singinda in Tanzania, and a wider market in DR Congo, Sudan, Central and West Africa. Zambia exports smoked Clarias to DR Congo, South Africa (mainly for West African community), and Angola
- The regional consumers prefer it hot smoked

¹³ Osibona A.O. et al (2006)

- The African Sharptooth Catfish (*Clarias gariepinus*) is rich a good source of high protein low-lipid contents as well as omega-3 polyunsaturated fatty acids (PUFA), particularly EPA and DHA. The African Sharptooth Catfish is an ideal dietetic food and its consumption would help prevent nutritional deficiencies.
- It can be sold live, fresh or processed into various products, such as, smoked, salted/dried, fillet, sausages, steaks, chilled and frozen.

2.6 Lungfish

The Lungfish is rarely seen in the markets but is found in most countries within the region and share habitat with the Catfish.



1) Common names

Protopterus aethiopicus is the scientific name for Lung fish, Marbled Lungfish (English); Kamongo (Kenya and Tanzania); Mamba (Tanzania, Uganda and Rwanda); Kambale (Tanzania and Uganda); Monye, (Kenya) Lut, Ehondwe, (Uganda). Sombe, Mbamba, Sombo, Sompá (DR Congo), Luth, Namomu, Samak el tin(Sudan).

2) The characteristics of Lungfish

- The Lungfish/ Kamongo/Mamba has elongated sub-cylindrical body with a pointed tail joined with long dorsal and anal fins; a marble-like or leopard coloration over the body and fins. The body is darker along the top and lighter below, covered with thin and deeply embedded scales. It has no specific teeth but are shaped like sharp cutting ridges. It can grow up to 200 cm TL and weigh over 25 lbs.
- The Lungfish are omnivorous, feeding on fish, insects, crustaceans, worms, molluscs, amphibians, plant, sand grains and detrital matter, storing quantities of fat for sustenance during hibernation.
- The Lungfish breed during the rainy season and lay its eggs in a long tunnel at the bottom of a swamp. The eggs and the larvae are guarded by the male.
- The African lungfish live in rivers and lake fringes, swamps, and flood plains and the juveniles live in the shallows under matted roots.
- The lungfish are capable of surviving seasonal drying out of their habitats by burrowing into mud and aestivating throughout the dry season.
- The lungfish is widely distributed in lakes and major rivers, the Nile, Lake Tanganyika, Katanga, Lake No, Stanley Pool (DR Congo) ; Sudan, Kenya, Tanzania, Zambia and Malawi.

3) Fishing

- The fishing gears include longlines, gillnets, baskets and traps. It is believed that the lungfish populations are threatened by overfishing.
- In some countries in Africa, people dig up lungfishes, burrow it in the mud and store it for later use when they want fresh fish to eat.
- The fishery is regulated through licensing.

4) Processing

- The lungfish is split into pieces for immediate sale as fresh fish, hot smoking and deep-frying. It can be processed into fillets, steaks, and sausages.
- Information on nutritional value of this species shows that it a good source of Omega 3 polyunsaturated fatty acids, particularly DHA and DPA. The production of fish oil from lungfish is encouraged for it can be used to provide omega-3 supplements¹⁴.

Figure 16: Smoked and fresh gutted Clarias



5) Markets

- Most of the Lungfish is sold locally either in fresh, smoked or fried form. Uganda exports smoked products to DR Congo and Tanzania exports smoked products to Kenya where there is a specialty market in Western Kenya in the Kisumu area.
- In East Africa, Lungfish is considered a delicacy in some tribes while in others, older females do not eat the lungfish because they consider it a “sister fish,” and it is associated with manhood. The Lungfish has a strong taste, which can be either highly appreciated or strongly disliked.
- Lungfish provides biological control against bilharzias or schistosomiasis
- The Lungfish has potential market in DR Congo, Central and West African countries and special market niches in East Africa.
- The main products are fresh, fillets, smoked and deepfried Lungfish.

¹⁴ Masa Justus et al. (2011)

2.7 Trout

The Trout has been introduced to many countries and almost all continents for food and sport. They are natives of the Pacific Ocean tributaries in Asia and North America. The Rainbow trout was stocked in Eastern African streams, rivers and lakes within the mountain ranges where the climate is cold and hence suitable for trout, such as Mt. Kenya and Mt. Elgon.

Figure 17: Rainbow Trout (Source: Wikipedia 2012)



1) Common Names

Oncorhynchus mykiss is the scientific name for Rainbow Trout and the sea-run trout called Steelhead. Both are the same species and often called the salmon trout.

2) Characteristics of Rainbow Trout

- The Rainbow Trout has elongated firm body covered with irregular shaped spots. Its colours range from blue to olive green above a red/pink lateral line and silver below the line. The colours vary with the habitat, size, sexual condition and diet. Stream trout are darker than lake trout which tends to be lighter. The Trout has white tips on the pectoral, pelvic and anal fin. It can grow up to 120 cm and weigh 24 kg. The market size is around 500 gm and can be reached within 9 months.
- The Rainbow Trout spawn once a year and mainly in spring and the female is able to produce up to 2000 eggs. However, those in aquaculture hatcheries can spawn up to 3 times annually.
- The Rainbow Trout is a predator and feeds on insects, molluscs, crustaceans, fish eggs, but freshwater shrimp is its most important food.

3) Fishing

- The Rainbow Trout is caught by hook and line, favourably with live bait and others include gillnets and other angling methods.

4) Aquaculture

Trout farming started over a hundred years ago, with knowledge and skills accumulated from well-established systems. Trout farming is carried out in colder areas of the countries within the ESA region and major producers are Kenya and South Africa.

- The Rainbow Trout is easy to spawn, fast growing, and tolerant to a wide range of environment and handling conditions. The juveniles can easily be weaned on artificial diet. It is mostly harvested at 30 – 45 cm weighing about 500 gm.
- It is easy to crossbreed, increase growth rates, resistant to diseases and prolificacy (cannot breed in natural aquaculture systems but artificially breed in specialised hatcheries) and has good meat quality and taste
- Trout farming is statutory regulated since they are invasive.

5) Processing

- The Trout can be smoked, filleted, canned, chilled and frozen. It can be processed on farm or in established processing plants. It is usually sold whole fresh due to its small size.
- Rainbow Trout is high in niacin, high in phosphorus, high in selenium, high in Vitamin B6, very high in vitamin B12, low in sodium and has no sugars.

Table: Nutritive Value of Rainbow Trout (raw edible parts - (100 g)

Nutrient	Protein	Unsaturated fatty acids	Saturated fatty acids	Calcium	Iron	Magnesium	Phosphorus	Potassium	Sodium	Zinc	Niacin	Vitamin B6	Vitamin B12
Value	17.6g	1.5 g	0.5g	60 mg	0.9 mg	30 mg	230 mg	290 mg	60 mg	1.7 mg	1.5 mg	0.2 mg	3.4 ug

Source: USDA: National Nutrient Database for Standard Reference, Nutrient Data Laboratory.

6) Market

- The major markets, within the ESA region, are Kenya, Zimbabwe and South Africa, mainly due to the lucrative tourist trade.
- Specialised markets elsewhere include international hotels and restaurants, supermarkets, tourists, and expatriates.
- Trout products include fresh, chilled, frozen, whole, filleted, canned, and smoked. Others include live fish for restocking of rivers and lakes for recreational purposes; and eggs and juveniles from hatcheries sold to other farms.

2.8 Freshwater Shrimp

Caridina nilotica is a native of Africa from River Nile in Egypt to Lake Sibaya in South Africa and it is the only freshwater shrimp in Lake Victoria.

Figure 18: *Caridina nilotica* (L), Dried Lake Victoria *Caridina nilotica* in Kenya (M) & Lake Albert *Caradina*(R)



1) Common names

Caridina nilotica is the scientific name for the freshwater shrimp known as the Common shrimp. There are a number of sub types within the Common Shrimp.

2) Characteristics of the Freshwater Shrimp

- Freshwater shrimp (*Caridina nilotica*) are little creatures with curved body, brown-yellow in colour and the adults are about 11 mm total length. They swim on their side by wagging their legs. The female are smaller than the male
- Freshwater shrimps live in streams, lakes and ponds, especially at the water's edge, need a lot of oxygen and hide under stones and at bases of plant stems.
- During the breeding time, the females and males swim together. The female carries her eggs within her body in a brood pouch and the female releases live young shrimps after hatching.
- Freshwater shrimps eat small particles of food from the water. The shrimps are filter feeders and filter the water for food. They are food for fish, birds and insects and insect larvae.
- Restricted to River Nile catchment area – Burundi, DR Congo, Kenya, Tanzania, Uganda, Rwanda, Sudan, Egypt, Eritrea and Ethiopia. Other countries include South Africa, Swaziland, Mozambique, Namibia, Angola, Lesotho and Botswana.

3) Fishing

- The Freshwater Shrimp is caught as a by-catch of the Dagua fishery on Lake Victoria and of Kapenta fishery on Lake Tanganyika. It is fished at night using light from hurricane lamps to attract the fish, which, is scooped into the boat.
- The sustainability of the fisheries of Lake Victoria depends among others on the abundance and availability of the common shrimp.
- It is also emerging as an important fishery, caught as a by-product of the Dagua fishery and end up in the animal feeds industry.

4) Aquaculture

- Freshwater shrimp farming was introduced in a number of countries within the ESA region such as Malawi, Mozambique, Zimbabwe, South Africa, Kenya, Tanzania and Uganda, from 1980s onwards but production slackened and by 2007 most had failed due to inappropriate water conditions, the intricacies of marketing live products and lack of appropriate on-farm processing facilities.

Figure 19: *Macrobrachium rosenbergii*. Source: maivietbio.com.vn (2008)



- *Macrobrachium rosenbergii*, the giant freshwater shrimp (prawn) is also found in some water bodies in Tanzania.
- The Food and Agriculture Organization of the United Nations (FAO) produced a manual on farming of *Macrobrachium rosenbergii*, which is applicable to other types of freshwater shrimp or prawn.
- There is a potential market for farmed products in South Africa and market niches in other countries.

5) Processing

- Chilled-killed, processed and tail frozen in water. If a frozen tail is kept at -40F or colder it can last for 6 months without losing its quality.
- Sundrying, particularly for shrimp, which is caught as by-catch of Dagaa and by-catch of Kapenta.
- Shrimp is mainly sold live for; its body decomposes very fast.

6) Markets

- International and tourist hotels and restaurants, expatriates, and animal feeds industry
- Shrimp can be sold live on-farm or chilled, frozen or processed and frozen tails should be handled with care as not to lose the quality.
- There is little demand amongst the local population within the ESA region, such that what is caught as by-catch end up in the animal feeds industry.
- Dried freshwater shrimp may be sold with or separate from Kapenta or Dagaa.
- The main products are live, chilled and frozen, and sundried shrimp.

2.9 Crayfish

Crayfish are found throughout the world and native to all continents except Africa. There are over 500 species worldwide of which about 350 species are in North America. Crayfish is a popular food in the southern United States.

The Louisiana crayfish is a native of Mexico and United States and was introduced for commercial food production to many countries which include, among others Kenya, where it was cultured in Lake Naivasha and Uganda, where it was cultured in Lake Bunyonyi and at Kajansi Aquaculture Research Centre.

Figure 20: *Procambarus clarkii* - Louisiana crayfish Prepared Lake Bunyonyi Crayfish (R)



Source: discoveryonsafari.blogspot.com

1) Common names

Procambarus clarkii is the scientific name for Louisiana crayfish, Red swamp crayfish (English). Common Name: Crayfish (Crawfish, Crawdad, Freshwater Lobster, etc.).

2) Characteristics of Louisiana Crayfish

- The Louisiana crayfish resemble small lobsters and has a cylindrical body and the adult is dark red or brownish with a black stripe on the abdomen, and the juveniles are usually grey, sometimes with dark uneven lines. The crayfish has two pairs of antennae, a rigid shell, pincer-like claws, and four pairs of legs and a hard outer shell.
- Colour and size varies with species, diet, and age. Most are red; some are green, brown, tan, or blue with black or orange markings in various combinations. The juveniles have a light tan colour that deepens to red as an adult. The coloration depends in part on their diet, and changes with a diet changes. Adult size is 2" to 6" but some varieties can be much larger.
- They grow by molting, that is, by shedding their shell when they outgrow it, and form a new hard shell. Adults may only molt a couple of times a year, and only under the right conditions.
- Mating and spawning takes place in open water and the burrow provides protection to the eggs and offspring, which are attached to the abdomen. Burrowing activity for reproduction can occur at any time of the year. Standing water is necessary for spawning and the number of eggs laid varies with size and condition of the female and will usually range from 200 to 500 eggs but some types can spawn up to 1000 eggs. The crayfish can grow up to 80 mm TL in 3 months.

- The **Louisiana Crayfish** is omnivorous and, feeds on insects, larvae, detritus, etc., with a preference for animal matter. The crayfish burrows during periods of drought or cold.
- *Louisiana Crayfish* may live in a wide variety of freshwater habitats including rivers, lakes, ponds, streams, canals, and seasonally flooded swamps and marshes, but it does prefer hard water. It is adaptable to a wide range of aquatic conditions, such as moderate salinity, low oxygen levels, extreme temperatures, and pollution.
- The Louisiana red swamp crayfish is well documented as an invasive species worldwide.

3) Fishing

- The Crayfish is caught with baited wood or steel traps. A wire-mesh, 3-sided 'pyramid-shaped' trap is designed for use in shallow water and is effective and efficient to operate.
- The size and shape of the mesh wire used to construct the trap governs the size of crayfish retained by the trap.
- Two categories of bait are used to attract crawfish to the trap - natural baits of fish, and manufactured baits of proprietary formulations.

4) Aquaculture

- Commercial crayfish farming is done in South Africa, Zimbabwe and Zambia. Species farmed are the maroon (*Cherax tenuimanus*) most suitable for South Africa, the yabbie (*Cherax destructor*) and *Cherax quadricarinatus*. They are farmed under licence. The maroon weighing 140 gm can yield meat of 75 gm. The Louisiana crayfish was stocked in the East African minor lakes, L. Naivasha in Kenya and L. Bunyonyi in Uganda. There is little farming activity in the ESA region although the prices in the specialised markets are higher than \$10 per kg.

5) Processing

- Live crayfish are transported and stored in open-mesh plastic sacks that hold approximately 18 kg of crawfish. This method is preferred over more rigid containers because less damage is inflicted on one another with their claws. Crayfish in good health can be stored at moist temperatures of 4-8 °C for up to 6 or 7 days. Smaller crayfish are processed for the abdominal meat.
- Crayfish can be served steamed, fried or baked.
- Crayfish, like other shellfish such as lobster, crab and shrimp, have nutrients that stimulate mental energy. They are rich in protein and Omega-3 Fatty Acids. Vitamin D and A, calcium, potassium, copper, zinc and iodine.

Table 6: The nutrition value of frozen crayfish tail meat¹⁵ :

Fat	Protein	Vitamin A	Calcium	Vitamin	Iron	Cholesterol	Others
2%	15%	10%	6%	10%	15%	40%	2%

Source: Louisiana Crawfish Promotion and Research Board, 1994

This analysis was done to develop a nutritional label that can be used by the entire industry in Louisiana, USA.

6) Markets

- Most crayfish are sold live to wholesale buyers, restaurants and retail customers. Consumer preferences are for crayfish larger than 20 grams. Grading by size has become a routine practice in some markets. The smaller ones are processed for the abdominal meat or blended with larger individuals for large volume sales.
- The regional lucrative market is South Africa and Zimbabwe where there is high market value.
- In the domestic market crayfish is sold to international hotels and restaurants, expatriates and on special orders. There is little demand among the local population in the region.
- Crayfish is also used as fish bait and as an ingredient of animal feeds.

2.10 Others

There are a number of species that are not covered in this booklet which are traded regionally, although in smaller amounts and not so regularly. These include the *Bagrus* spp., *Haplochromis* spp.; *Barbus* spp., and the *Hydrocynus* spp. Some are important as food and others are important in ornamental trade or aquaculture.

Figure 21: *Bagrus* spp. (Left); *Haplochromis* spp. (middle); *Matacembelidae* spp & other spp (right).



Source: Author, 2012

The Fish Traders role is to make sure that fish, in whatever wholesome form, reaches the people who need it, as it is a major source of essential nutrients for the people in Eastern and Southern Africa.

¹⁵ The Louisiana Crawfish Promotion and Research Board 1994.

3 Fish Trade

Trade in fish and fishery products is guided by international agreements and conventions, such as that of the World Trade Organization (WTO), a body that controls global trade; the Trade blocks (such as COMESA, EAC and SADC); the regional fisheries bodies (such as LVFO, LTA); the bilateral arrangements between neighbouring countries and the national regulations of respective countries.

It is to the benefit of the Regional and International Trader to know the major aspects of these agreements and regulations, because they contain provisions that are beneficial to his business. In addition, flouting or breaking some rules may lead to huge losses.

Trade principles and practices¹⁶ include:

- 1) Trade without discrimination – Regional Fish traders should be treated equally, such that customs duty rates should be the same for all members within the same trading bloc. For example, if Rwanda lowers the custom duties for Burundi, this should also apply to other members of the EAC, that is, Kenya, Tanzania and Uganda. If there is discrimination, a Regional trader is advised to seek guidance from his/her respective country on the issue.
- 2) National treatment – Regional and national traders should be treated equally, such that, after the foreign goods have entered the market, the imported goods and locally produced goods should be treated the same. This applies after the trader has paid or fulfilled the customs requirements of the imported fish and fishery products and entered the market.
- 3) Free trade – Sometimes, countries may impose restrictions on trade in regard to customs duties, quotas, import bans, and hence, lowering these restrictions or trade barriers encourages more trade. This opens new markets and opportunities for the regional trader to expand his business. Freeing trade requires a lot of negotiations between countries and it is upon the regional trader to contribute information to his respective country to support negotiations for better terms.
- 4) Predictable – Countries may try to provide an attractive business environment to foreign investors, companies and importers by promising not to raise a trade barrier. In addition, the countries, transparently, may publicise their rules and policies, to facilitate trade. This provides the business a clearer view of future opportunities for investment. The Regional Trader can use this opportunity to plan for growth and expansion of his business because of the stability and ability to predict (foresee) the future.

¹⁶ WTO –2012

- 5) Competitiveness – The rules on equal treatment of regional traders from member countries and equal treatment of imported and locally produced goods provide opportunity for fair competition and discourage dumping of imports (sale below cost) and subsidies for local goods to increase market share. This condition provides opportunity for the regional trader to compete fairly on product attributes and logistical aspects, such as product quality, safety, usage, convenience and timely delivery.
- 6) Comparative advantages – ability to compete well may arise from market changes or new technologies that may give an advantage to the trader to access better and cheaper products. The demand for high quality Dagaa or Kapenta may provide an opportunity to the Regional Fish Trader dealing in good quality to expand his market. The decline in Nile perch catches provides an opportunity for the industry to process farmed tilapia or African catfish and sell them to the regional markets.
- 7) Trade Liberalisation - Adapting the principles and practices to Regional Fish Trade enables the developing countries to gradually adjust to liberalized trade with flexibility and special privileges. The Regional Trader is a major beneficiary of the liberalised trade and is advised to share trade and market information with the relevant authorities to facilitate the negotiation and adjustment processes.

Developing countries' adjustment programmes supported by developed countries has benefited fish trade in the ESA region, through training of fish inspectors; establishment of fish quality and safety standards, adoption of HACCP by fish factories, product development, equipped laboratories, and improved fish landing and market infrastructure.

3.1 Fisheries Regulations

Fisheries regulations focus on sustainable exploitation of fisheries resources and providing wholesome fish food for human consumption. The rules and regulations are embedded into the Fish (Fisheries) Act of each country. Fish trade may be provided for within the specific fisheries regulation or provided as an annex or through a specific Statutory Instrument.

The License is the major statutory instrument used to regulate fish trade by the countries within the region. Some countries use gear selectivity measures and some add on the slot size measures to regulate fish production and control trade in undersized fish. Some fisheries regulations are not specific on trade aspects but generally imply under fishing areas. A few of the countries have detailed specific trade requirements included in the fish quality and safety rules.

The fisheries regulations of the selected countries are at different levels. Some are outdated and hence, with many subsidiary statutory instruments, others are being updated and some are new.

Table 7: Fisheries Regulations

Country	Fisheries Legislation
1. Burundi	Decree of October 4, 1937,
2. D.R. Congo	1937 Decree on Fishing and Hunting (as amended by a decree of 17 January 1957, a legislative ordinance No. 52/273 of 24 June 1958 and a decree of 27 June 1960).
3. Kenya	Fisheries (Safety of fish, fishery products and fish feed) regulations 2007.
4. Malawi	Fisheries Act (Laws of Malawi of 1977 , Cap. 66:05). Amended in 1979, 1984 and 1996.
5. Rwanda	2008 Bill on the legislative framework for fishing and aquaculture
6. Sudan	Freshwater Fisheries Act 1954
7. Tanzania	Fisheries Act 2003 (No. 22 of 2003)
8. Uganda	Fish Act CAP 197 of 2000. Fish Quality Assurance Rules 2008
9. Zambia	Fisheries Act of 1974 amended in 2007
10. Zimbabwe	Parks and Wildlife Act (Chapter 20:14 of 1996) Part XIV.

Source: FAO: Country Profiles.

3.2 Documents for Regional Trade

The major documents required by the Regional Trader include:

- 1) A valid Fish Traders License,
- 2) A Fish Import/Export Permit/Licence,
- 3) A Fish and Fishery Product Health Certificate.
- 4) A visa for a non-resident/ non-national (accompanying the consignment across the borders).

There are other varied documents, such as the Fish Trader Registration Card and Fish movement Permit, but it depends on a country. A non-resident/non-national requires a Visa to trade in a foreign country.

The Regional Fish Trader should consult the Fisheries Department on the requirements needed to engage in “formal” Regional Trade. Some traders engage in regional fish trade without proper documents and end up losing a lot of money when the consignment is impounded.

4 Marketing

The most common types of information required by the regional fish traders are the number of customers in destination market, the quantity and type of fish of available at source and in the destination markets and the fish prices at the source and in the markets¹⁷.

4.1 Fishery Products

The fish and fishery products entering the regional market are varied, ranging from the sundried, salted, smoked and deep-fried products (mainly from artisanal processors), to chilled and frozen fillets, headed and gutted fish, sausages and canned products from industrial processing. There is also potential for trade in pre-cooked packs, oil extracted from unsaturated fats of Nile perch and *Protopterus* spp. among others, as well as, trading in types of fish that seldom appear in trade and aquaculture products. Trade in crustaceans is also attractive due to exclusive markets that offer lucrative prices. This guide is not an instruction but a simple tool to assist the Fish trader to move forward and search for more opportunity even beyond the regional boundaries.

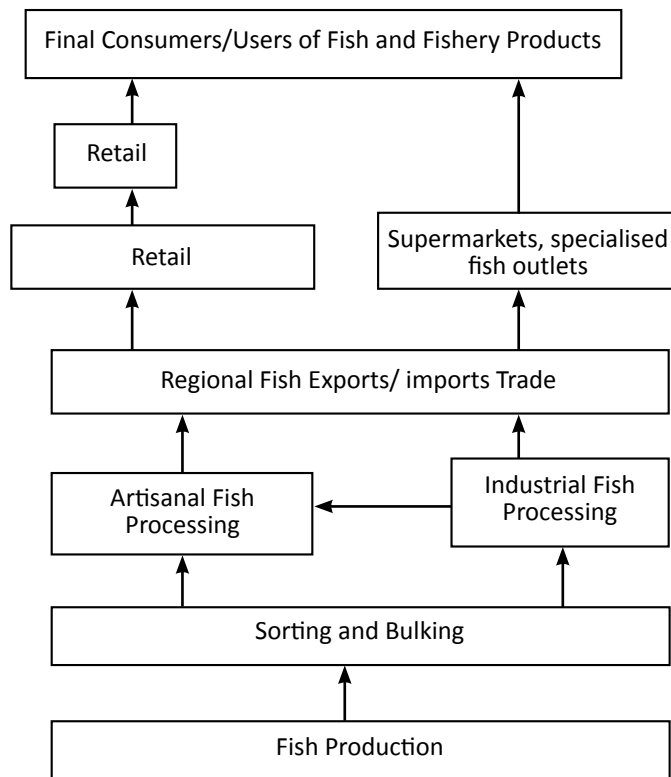
4.2 Markets

The major markets are DR Congo, which take the bulk of the regional trade; other net importers include Zambia, Kenya, Rwanda and Burundi. There are preferences in consumption with Zambia, Kenya and Rwanda importing tilapia and Burundi importing Tanganyika perch (Mukeke) from Tanzania and Nile perch from Uganda. Chilled and frozen perches and Tilapia are sold in most big supermarkets in the capitals of the selected countries.

The small pelagic fishes have a wider market in the region from Southern Sudan to South Africa. The Catfish products have specialized market niches throughout the region. Trout, Shrimp and Crayfish products have good markets in tourist –destination countries, such as, Kenya, South Africa, Zambia, and Zimbabwe. In each fish profile the major markets are indicated. Refer to *Figure 1: Map showing the Movement of Fishery Products in the ESA Region*.

¹⁷ Odongkara K. (2008)

Figure 22: Regional Fish Trade - Flow Chart



Market prices fluctuate and depend on negotiations, especially for chilled and fatty smoked fishery products, which have a short shelf life. In some markets and for some products price is not based on weight (kg) but on volume (bag, tin or cup), particularly for small pelagic fishes. In some countries, the fish traders have formed associations and this helps in stabilising prices. The fish trader needs to support the authorities to provide market information regularly by sharing his information on market trends and performance parameters.

Figure 23: Fish Prices for Chilled and Frozen Fishery Products in Central Market, Bujumbura, Burundi.

TARIF	
- FILET CAPITAIN	10000
- FILET SANGALA	10000
- MUKEKE TRAITÉ	7000
- MUKEKE SOUS GLACE	7000
- MUKEKE CONGÈLE	7000
- SANGALA ENTIER SOUS GLACE	6000
- SANGALA ENTIER CONGÈLE	6000
- SANGALA CAPITAIN	6000
- SANGALA ENTIER BURUNDI	6000
- CAPITAINE BURUNDI	6000
- NONZI KIRANDI	6000
- TILAPIA CONGÈLE	5500/kg
- TILAPIA SOUS GLACE	5500/kg
- NDAGALA FUMÉ	1800
- NDAGALA FRAIS	1200/kg
- NDAGALA SEIGÉ	1200/kg
- POULE	6500
- KUHÉ	1200/kg
- BICHWA	1200/kg
- TILAPIA BURUNDI	6000
- SANGALA BURUNDI	6000
- FILET CAPITAIN BURUNDI	10000

Transport is the most costly item for the Regional Fish Trader, hence small-scale fish traders with few or small consignments usually share transport costs by hiring joint-transport or they use public means.

4.3 Marketing Basics

The Regional Trader has to consider the following marketing aspects for trade in fishery product:

- 1) The product should be of good quality and safe for the consumers. The Regional Trader can influence the processor to adopt improved fish handling and processing methods to improve the quality of small fishes, such as, Dagaa and Kapenta and the fishery by-products from factories destined for regional trade.
- 2) The product should be suitably packaged to control spoilage and contamination. The package should be well labeled with information on shelf life, quantities, nutrition values and usage. The package should be attractive to the customers to give the trader a competitive edge over other similar products.
- 3) The placement of fish and fishery products in the market should consider accessibility and visibility of the product by the customer, as well as timely delivery by the Fish Trader. In some local markets fresh fish is placed at the peripheral in offensive places and in some supermarkets Dagaa is placed in shelves with spices. The Regional Trader can negotiate for better placement of his fishery products or change the location.
- 4) Positioning the product and the trader in the minds of the customers is associated with reputation and therefore, very important. How the product is perceived by the market and customers depends on the general behavior, custom care and appearances of the trader, his/her employees and agents.
- 5) Promotion is done to enhance sales and expand markets for the products. The Regional Fish Trader may verbally present the product and/ or use print and electronic media. It may be costly and the trader has to be prudent. The traders may join hands and advertise as a group or may do corporate promotion by encouraging the public to eat fish. The trader may use information on the nutritive values to promote his product as a health food.
- 6) Prices need to be reviewed regularly to ensure that the selling price covers the costs. Prices of fish change more frequently than those of other foodstuffs. The Regional Trader should set a price that covers all the business costs including his salary. He should also look at the competitors prices. The Trader may lose some of his customers if he raises the price, but this is offset, if the product continues to earn profits. It is important to always ensure that $\text{Total Revenue} - \text{Total cost} = \text{Profit}$.
- 7) People such as employees and agents should be regularly assessed in terms of efficiency, effectiveness and timeliness because their actions can make or break the Fish trader's business.

4.4 Qualities of a successful Regional Fish Trader

A good Regional Fish Trader should:

- 1) Be able to visualize with zeal to follow-up his vision with good planning and business management.
- 2) Be confident with self-assurance of achieving his goals and ability to face challenges and take risks.
- 3) Be a good communicator with ability to negotiate and influence decision to his advantage
- 4) Be a leader with ability to influence others to listen, believe and follow his instructions and also work as a team.
- 5) Be a good listener with ability to discern, learn, appreciate, and recognize the good qualities in others that he can use to advance himself and his business
- 6) Be flexible with willingness to accept defeat, adjust, accommodate other people's progressive ideas and seek for skills where personal and technical skills are lacking or inadequate.
- 7) Be of good character with approachable attitude, presentable, trustworthy, inspire confidence and has good interpersonal skills and ready to associate for mutual benefit of trade.
- 8) Be time conscious with ability to plan and manage time properly for his personal life and business.
- 9) Be astute (shrewd) with money, strictly observing the finance and accounting rules and separating personal money from business funds.
- 10) Take opportunities and appreciate success with gratitude, observe the code of practices in conducting his business and consider social responsibility as part of his business goodwill.

4.5 Requirements of a Good business

A good fish trading business requires skills, proper plans and budgets, good record keeping, adequate funds, enough time and up-to-date information.

1) Skills

- a) Personal skills are important for steering and providing direction to the business, such as personal presentation, negotiation skills, public relations skills: and communication skills.
- b) Technical Skills provide the power to move the business forward. These can be gained from learning and/or hired and these include:
 - Record keeping skills
 - Money saving methods

- Management of finances to ensure profitable business
- Marketing skills

2) Planning and budgeting

The Regional Fish Trader should be able to determine how much money has been gained compared to how much has been spent. The Trader must plan, budget, implement, monitor and control his business and finances.

3) Costing and pricing

The Fish Traders is encouraged to record all the expenditures incurred and diligently cost his labour input for each product made or procured. This helps the trader to determine the price basing on the total cost incurred. The price set for a kilogram of the product to be sold should be above the unit cost of producing or procuring one kilogram of that product, in order to earn a profit. Profit is the positive difference between total revenue and total cost. If it is a negative difference between the revenue and cost it is a loss and adjustment have to be made either in the costs or in the price.

4) Time management

Time management is very important for the success of any business. The Fish Trader has to manage his time properly to ensure that the customer is able to get the right fishery product at the right time, place, amount and price and that it is always available whenever he needs it.

5) Information sharing

Effective trade thrives on reliable information and the Trader should collect information from the market and share it with the processor to enable him to make adjustments on the products to meet market demand. The trader may use the information to promote his products.

6) Associate with other Traders

The Trader should encourage the establishment of an association that would enable him to participate in activities that enhance their trade or address issues that affect their businesses as a group.

5 Conclusion

The impact of this guide may be reflected by the progress of the users' business and the increase in traded products, markets and market information as well as general trade performance. The Fish Trader is requested to promote the guide as reference material and contribute information that can be used to update this guide.

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Blue Tower, 5th floor, Institute Road,
Ebene, Mauritius
Tel: (+230) 402 61 00
Fax: (+230) 466 01 60
www.coi-ioc.org