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## An inventory of fish species at the urban markets of Lubumbashi, Democratic Republic of Congo.

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Translation by Prof. A. Ngosa

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*Fisheries and HIV/AIDS in Africa: Investing in Sustainable Solutions*



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## **Introduction**

Several studies have been conducted in the world focused on finding ways and means of fighting HIV/AIDS. All research areas have proved to be important, notably medicine, psychology, sociology... and nutrition. AIDS is the major cause of mortality in the 20 – 49 year olds, which is the productive age. AIDS destroys the economy and development of communities by causing services and companies to decrease productivity through the loss of human resources. Thus, AIDS in our country has led to various social phenomena, such as the appearance of child-headed households, and the disease has been the root cause of serious demographic and cultural disturbances (1). The epidemiological chart of AIDS and HIV infections in the Democratic Republic of Congo (DRC) is a matter of concern and the HIV prevalence rate was 4.5% in 2007 (2).

All these facts have prompted us to seek a way to try and improve the living conditions of people living with HIV/AIDS. Studies conducted on demography have shown that there will be a discrepancy between population growth and the forecast of food production in the coming years, pointing to the conclusion that the world's land will not be able to feed the world's population. Resorting to the seas, oceans, rivers and other water sources might be the needed to respond to the needs of the world population (3). With this in mind, we pose ourselves the following question: Can a diet of local products with low value fish as the main source of protein improve the nutritional status of people living with HIV/AIDS?

If we are all aware of the fact that HIV/AIDS decreases the absorption of nutritive substances by the body, spoils appetite and disturbs metabolism, tears muscles and destroys body organs, leaving the body increasingly vulnerable to external aggression (4), we should then understand that nutrition is a crucial factor in fighting HIV/AIDS. That is why many documents have been produced on nutrition and HIV/AIDS. Among others, we can mention: « A healthy diet to ensure a better nutritional balance for people living with HIV/AIDS » (5), « Nutrition and HIV » (6), and « AIDS and Nutrition » (7). From these documents, we have learned that a healthy diet will not cure AIDS nor prevent HIV infection, but may contribute to improving the nutritional status of patients and slow the progression of HIV/AIDS-related diseases. According to the manual on the nutritional care and support for people living with HIV/AIDS, provision of an adequate diet improves the quality of life for those living with HIV (8).

It is, therefore, of the utmost importance that nutritional care and support be provided to patients in the early stages of the infection to prevent the development of nutritional deficiencies. A good diet will supplement and enhance the effects of the prescribed drugs (9). As part of this study, we first conducted a literature review.

We found out that the sea, oceans and other water sources had sufficient resources to respond to the needs of a growing population (1). In addition, fish are a source of protein with the same protein content as meat. It is a source of income and employment; fish supports households and can provide a springboard for development (11). We also learned that the fish distribution channel was a driver of HIV/AIDS in the community (12). From a nutrition point of view, fish is a rich source of proteins and minerals (11).

This study, which aims at analyzing the nutritional value of fish products sold on the fish markets of Lubumbashi, has been conducted by the World Fish center as part of its regional programme « *Fisheries and HIV/AIDS in Africa : investing in sustainable solutions* ». The key issue arising from this study conducted in the DRC was concerned with providing an answer to the following question:

*What are the various categories of fish products (for the poor and the rich) found in Lubumbashi?*

To answer this question, we first conducted a field investigation to define and describe fish markets of Lubumbashi. This report contains a map of fish markets of Lubumbashi with analyses of fish species found at these markets, and information about the most common fish species. In addition, we compiled a photographic guide of the various types of fish and fish products in their order of importance, depending on the amounts that are available on Lubumbashi markets.

## **1. Overview of Lubumbashi and description of markets.**

Lubumbashi is the provincial capital of the copper-producing province of Katanga. It is located in the south of the DRC. Covering an area of seven hundred and forty-seven (747) square kilometers and with a population amounting to about 2 million inhabitants (14), the city of Lubumbashi is subdivided into 7 administrative communes. This study covers all the communes which include Lubumbashi, Kamalondo, Kenya, Katuba, Kampemba, Rwashi and Annex. There are thirty markets including large markets (f.i. Zando) and small ones (f.i. WENZE). The most important market for fish is Ndjandja.

The objectives of this part of our study were:

- Identifying fish markets
- Locating their position in the city of Lubumbashi
- Identifying the main market for fish

### **Methodology**

We conducted field visits in all the communes of Lubumbashi, visiting all places where people are trading in foodstuffs and holding discussions on fish with the team of market administrators. The survey team travelled by public transport and used forms (questionnaires) to interview market administrators.

### **Methods**

- Structured interviews (open-ended and closed-ended questions) enabled us to collect all the data on the market situation.
- Participatory observation, which allowed us to have a better understanding of some of the facts in the field during the data collection period.
- Review of documents and records (by consulting records, we were able to trace the history of the market, its capacity in the beginning and its development).

## Findings

The city of Lubumbashi has 8 fish markets which are located in 5 communes. These include:

Commune :	Market :
Kenya commune	Commune Market
	Central Market
	Mwimbila Market
Kapemba commune	Ndjandja Market
	Rail Market
Lubumbashi commune	Mzee Market
	Psaromatis Supermarket
Annex commune	Luwowoshi Market
Katuba commune	Mimbulu Market

### Commune Market

The area that this market covers is unknown but it is the mainstay of the town's economy. All kinds of foodstuffs are sold there. It specializes in wholesale and retail prices. This market has four food sections with three hundred and fifty (350) stalls, 25 of which sell fish. There are three hundred and fifty traders, 25 of whom are selling fish and a total of 391 people involved in administration and handling activities. Fish mainly comes from Ndjandja Market, Kapolowe, and Shinagwe (Lake Tshangalele). Traders as well as buyers come from all communes of Lubumbashi, and from towns and villages located in the surrounding areas such as Kipushi, Likasi, and Kapolowe.

### Central Market

With an area of two hundred (200) square meters, this market has about four thousand (4000) stalls and three thousand (3000) traders, one hundred and sixty-two (162) of whom sell fish. This market has a total number of three thousand and eighty-one (3081) people working there. Everything is sold here including food, clothes, shoes, drugs, spare parts, and machines, electrical appliances, etc. This market is renowned for haggling and low-priced items. It receives a massive influx of customers from everywhere, even foreign tourists from Europe.

Fish in this market comes from Ndjandja Market, cold rooms of Lubumbashi commune or directly from Zambia or from another area of the province. Traders and buyers come from all the communes of Lubumbashi but also from other towns and villages of the country and also from Zambia. From this market, people can buy smoked, dried, salted and fresh fish.

### Mwimbila Market

Mwimbila Market is one hundred and ten (110) square meters. It has five hundred and seventy (570) stalls. The total number of traders amounts to seven hundred and fifty (750), and there are twenty-two (22) stalls for fish and 22 people selling fish. The total number of people who work in this market amounts to seven hundred and sixty-eight (768).

This market serves people in the poor areas of Kenya commune (Brondo) and those of the neighbouring commune of Katuba. Traders and buyers come from nearby and from the surrounding areas of Lubumbashi; Sambwa mission and Kanakanga (haut Katanga). This market specializes in the selling of foodstuffs at

retail prices. The most common fish is small fry (Kashikisha, Mapapa, Kashombwe, Sardines). Fresh fish is scarce due to perishability; there are no cold rooms.

### **Ndjandja Market**

With its forty five (45) food depots, this market is the main source of fish supply (smoked, dried, salted fish) in the city of Lubumbashi. Fish mostly come from Kasenga (Lake Moéro) and are also imported from Zambia, Tanzania, Zimbabwe, Malawi and Mozambique.

It is a wholesale food market but retailing is also operational. Traders whose number amounts to six hundred (600) come from all the communes of Lubumbashi, from Kasenga (Lake Moero) and from the above-mentioned countries. They are Congolese nationals and sometimes foreigners who work in partnership with Congolese nationals. The market's fame attracts buyers from all over the country and from abroad, notably from Belgium and South Africa.

### **Rail Market**

This market has been relocated but it is still operating locally in some of the yards of people because a good location for the market has not been found yet. This market is vitally important to this newly developed area as the town is getting bigger and no markets have been constructed in these new quarters. This market serves part of Lubumbashi commune, Kampemba commune, as well as villages along Kasenga and Likasi roads.

This market is renowned for its low-priced items. It specializes in the selling of foodstuffs, particularly fresh farm and fish products. Other items include second hand clothes and some spares for bicycles. In total, there are eighty (80) stalls, sixty of which sell fish. Two hundred and eighty four (284) people work at this market. There are two hundred and eighty traders, sixty (60) of whom sell fish. Fresh, smoked, dried, and salted fish, coming from Ndjandja Market and from villages along the above-mentioned roads. Due to perishability (lack of cold rooms), fresh fish must be sold within the same day, thus its price varies as time goes by.

### **Mzee Market**

This market is located in the town centre. It is a modern-type market that sells almost all items: food, clothes, drugs, electrical appliances, scholastic materials, plumbing fittings, construction materials, electric fittings, meals and drinks, etc. The market also sells all kinds of fish which are within everybody's price range. The fish varies in size (from small to large), quantity and price. Together with the Central Market of Kenya commune, this market is a major attraction of the town.

Traders and buyers come from all communes and from neighboring towns of the province, country and from abroad. Traders get their supply of fresh, smoked, dried and salted fish from Ndjandja Market and from cold rooms which are located in the town of Lubumbashi (fresh fish). Even though there are no cold rooms in the vicinity of the market, traders manage to store their fish in food depots where they can rent freezers against a weekly fee.

There is a wide range of fish which is displayed at the fish stalls. Every day, there is an increase in the number of people who visit this market because of its good location. Almost 95% of public transport buses terminate in the vicinity of this market and 90% of salaried employees work in the urban commune of Lubumbashi.

### **Psaromatis Supermarket**

This is a quality supermarket for people on an average income and for the rich. It is a well-known supermarket which sells almost everything including food, household

cleaning materials, body lotions and creams. The supermarket does not sell clothes, shoes, electrical appliances, spares, or drugs.

Here, fresh fish is sold by the kilogram, unlike at the markets where fish is sold in piles or by using a measuring plastic container. There is a cold room and fish is displayed in glass-fronted freezers that meet all standards of hygiene. It should be noted that it is Psaro Supermarket that supplies the town as well as other cold rooms in town with imported fresh fish.

#### **Luwohoshi (Zambia) Market**

Luwohoshi Market (also known as Zambia Market) supplies the town with fresh vegetables and it is renowned for its low prices of vegetables and fish. People who directly benefit from this market are those living in Rwashu commune, and dwellers of all quarters, Annex commune, and particularly those from Luwovoshi quarters. This market has been renovated and two large sheds, each having an area of 900 square meters, have been built as an extension to the market. This market sells almost everything, but mainly vegetables.

Fish which is sold here mainly comes from Ndjanja Market and villages along Kasenga road. There are neither cold rooms nor food depots with freezers. Fish traders must struggle to sell out of their fresh fish within the same day. Thus, the price goes down as the sun sets.

“Kapolowe” from Lake Tshangalele is the most common fish which is sold in this market. There is a total number of nine hundred and seventy (970) traders, two hundred (200) of whom sell fish. These traders come from all the communes of Lubumbashi. Out of one thousand nine hundred and eighty (1980) stalls, two hundred and forty (240) sell fish. The number of other market staff is sixteen. Fish at this market mainly comes from Ndjanja Market and from Kapolowe.

#### **Mimbulu Market**

This small market, whose surface area is unknown, has a large number of traders who are selling a wide range of goods. Fish in this market mainly comes from Ndjanja Market and from cold rooms located in the city of Lubumbashi. This market serves some quarters of Katuba and the southern surrounding areas of the city of Lubumbashi.

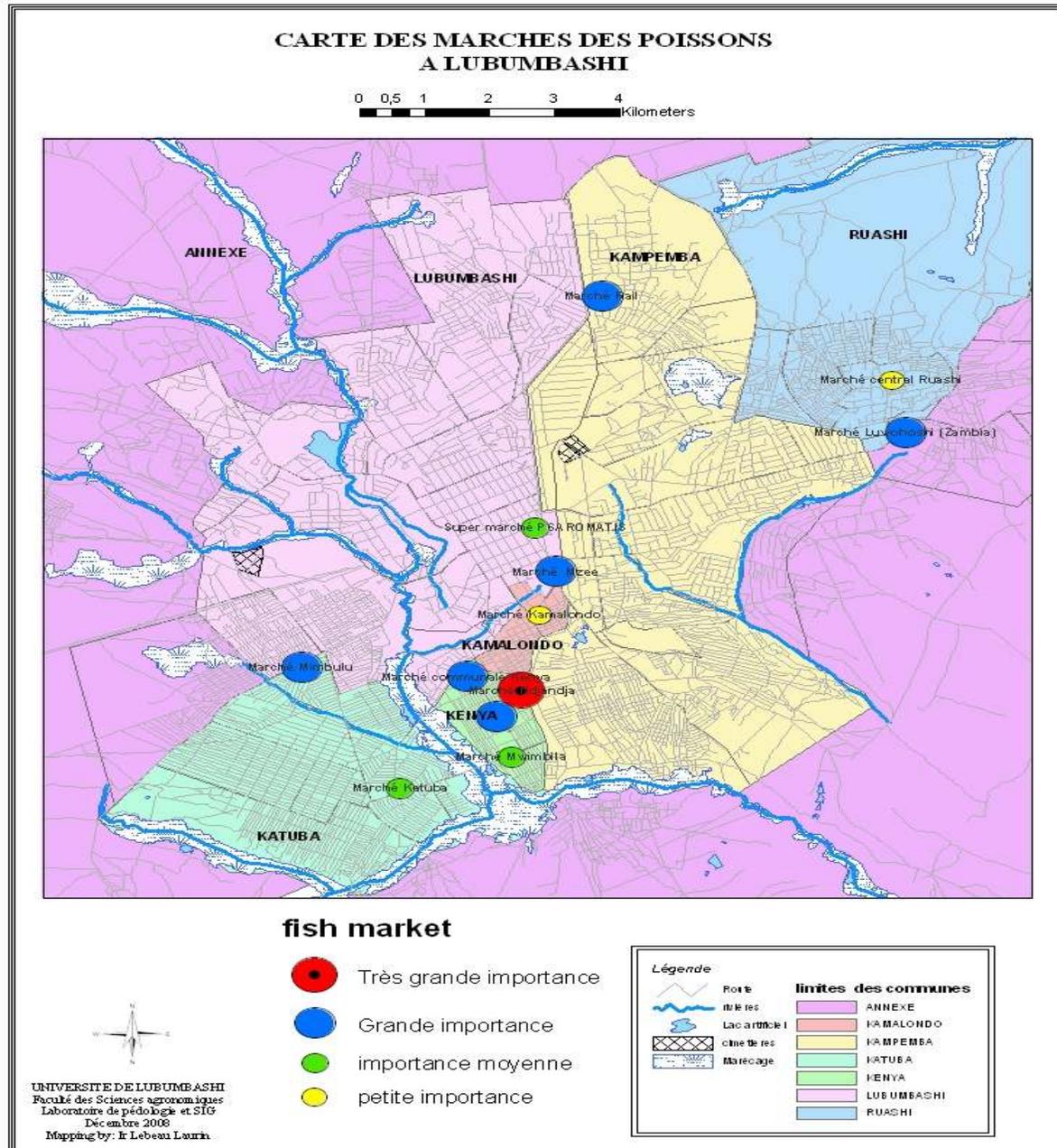
It is well-known for its ideal geographical location. It is located on Kasumbalesa road, more particularly by the junction of Kasumbalesa road and Kipushi road. It provides a focal point for villagers who live along these two roads and is a suitable place for trade transactions. This market specializes in the selling of charcoal and firewood.

Fish sold in this market comes from Ndjanja Market, which is the case for most other markets too. There is a small amount of fresh fish which comes from cold rooms located in the city of Lubumbashi. The total number of stalls is five hundred and twenty (520), more than twenty (20) of which sell fish. There are five hundred and eighty (580) traders, more than twenty (20) of whom are fish traders.

In brief, Ndjanja Market is the main market for fish by virtue of its surface area, its uniqueness as a market that sells only fish and its many food depots (45) that have several fish stalls. Fish that vary in type and condition are sold here at wholesale and retail prices. Traders in this market come from all communes of Lubumbashi and from other neighbouring provinces and countries in the region, such as Zambia. Buyers come from all over the country, from South Africa, Ivory Coast, and Benin and even from Europe; from Belgium and the UK.

## 2. Map of Lubumbashi showing market sites

Based on information which was collected in the field, a research team from the school of agronomy made the following digitized map of Lubumbashi showing market sites:



On the above map, markets are concentrated in the south-eastern part of the town while the northern, north-eastern parts have no notable markets. Places where basic commodities are sold in the above-mentioned areas are not proportional to the size of the population. They cannot compare in terms of the goods to be supplied, the space and the infrastructure, which is likely to impact on the nutritional status of urban populations.

### **3. Nutritional Survey**

To answer the question “*What are the various categories of fish products (for the poor and the rich) found in Lubumbashi?*”, we conducted a nutritional survey at the various markets of Lubumbashi.

Before conducting this survey, we carried out a pre- test which enabled us to analyze responses to our questionnaire and check whether these responses met our expectations. The objectives of the survey included:

- Compiling a list of fish found and sold in Lubumbashi;
- Listing the fish in ascending order of economic value (low value);
- Classifying the fish in descending order of consumption and availability (fish that is most common, most sold and most consumed);
- Listing fish in order of importance according to the quantities available at the markets;

#### **Methodology**

We proceeded by doing observations and conducting interviews, using a questionnaire to gather the following information on each type of fish:

- Distribution channel,
- Value according to popular opinion (for the poor and for the rich ),
- Consumption level as compared to other animal products,
- Place in the diets of Lubumbashi city dwellers,
- Role in professionalizing the work of fish traders,
- Economic impact: if the head of household meets the needs of the family by selling fish,
- Within the fish classification, why are there species of fish that are sold most and those that sold least?
- Why do people prefer one type of fish to another?

Survey questionnaires were completed by 326 people, 279 of whom were women and 47 men in 8 markets of Lubumbashi city.

#### **Criteria for selecting markets to be surveyed**

We used two criteria for selecting markets:

- The market must have at least 15 stalls of fish and 15 traders,
- The market must receive a large influx of buyers (renowned for good prices which are within everyone’s reach),

Kamalondo and Ruashi communes which have a significant number of markets according to the selection criteria were used during the pre-test, while the five other communes which passed the selection criteria were used in the final study.

## **Methods**

Structured interviews: to collect all the data on fish and any details related to its distribution channel up to the consumer, we used open-ended and closed-ended questions.

Document review: the literature review enabled us to have a better understanding of fish, including the scientific names which are related to the common names of fish found in the area.

Participatory observations: enabled us to understand the maze of fish trade in the city of Lubumbashi.

Field work teams: There were two teams, each consisting of two people who surveyed all the markets and there was one supervisor. Teams were given training in the most important questions of the survey, identity, the wearing of appropriate clothing, use of appropriate language, the way of asking, understanding and answering questions.

A pre-test was then administered to assess the feasibility of the questions and potential outcomes of the study. Interviewers held an academic qualification in the medical field: there were 3 people with a diploma in nutrition and one with a degree in nursing. They were tasked to interview fish traders in the targeted markets and to record responses on forms. The supervisor was responsible for preparing and reproducing the questionnaire, overseeing the beginning, implementation and end of the survey, collecting survey forms, and providing forms when they were out of stock, getting in contact with people before field visits, approaching various government services to obtain paperwork, etc. In short; the focal person.

Our work in the field was easily conducted thanks to a job order issued by the provincial minister of Agriculture, fisheries and animal husbandry, and a written authorization from each commune administration.

## **Limitations**

We were faced with the following problems:

- The strike which occurred in Mzee Market caused some disruption to our time-frame.
- Bureaucracy at all levels, before and during the survey itself, slowed down the work.

### **3.1. Findings from the analysis of fish being sold**

Table 1 below shows which fish is found and sold in the eight surveyed markets of Lubumbashi. We mentioned the scientific as well as the local name of each identified fish and assessed the condition in which the fish is sold. Interviews with fish traders provided insights into the origins of the fish.

Our study showed that most fish comes from Lake Moero and is mostly sold smoked or salted because most markets do not have cold rooms or freezers.

**Table 1: List of fish found and sold at markets of Lubumbashi**

N <sup>o</sup>	Scientific name	Local name	Condition of fish at the market	Origin
1	<i>Stolotrissa tanganyicae</i>	Misumari	Salted	Kalemie
2	<i>Pellanolva miodon</i>	Malawi	Salted	Malawi
3	<i>Pellanolva miodon</i>	Ya tshuvi	Salted	Zambia
4	<i>Pellanolva miodon</i>	Mapapa	Salted	Moero
5	<i>Pellanolva miodon</i>	Kashobwe	Salted	Moero
6	<i>Pellicotrisa</i>	kashikisha	Salted	Zambia
7	<i>Pellicotrisa</i> or <i>Pellanulacuneria</i>	Kisense	Salted	Moero
8	<i>Limnotrisa miodon</i>	Ndakala (lumbu)	Fresh, salted	Mwadingusha, Zambia
9	<i>Tilapia macrochir</i>	Pale	Salted	Moero
10	<i>Tylochromis</i>	Tembwa	Salted	Moero
11	<i>Tilapia sparmannii</i>	Tukenge	Salted	Moero
12	<i>Gadus morhua</i>	Morue	Salted	
13	<i>Clarias gariepinus</i>	Kabambale	Smoked, fresh, salted	Moero
14	<i>Clariallabes</i>	Milonge	Smoked, fresh,	Moero
15	<i>Clariallabes</i>	Milonge ya kumitshi	Smoked	Moero
16	<i>Ophiocephalus</i>	Milonge (Mfutu)	Smoked	Moero
17	<i>Genyomyrus mormyrus</i>	Ndomondomo	Smoked	Moero
18	<i>Oreochromis niloticus</i>	Makoki	Smoked	Moero
19	-----	Petit fumé	Smoked	Zimbabwe
20	<i>Serranochromis</i>	Makobo	Salted, smoked	Moero
22	<i>Parachana S.P.</i>	Mungusu	Smoked	Moero
23	<i>Pellanula miodon</i>	Sardine	Salted	Moero
24	<i>Trachurus trachurus</i>	Thomson	Fresh	Zimbabwe, RSA
25	<i>Scorporena Porcus</i>	Rouget	Fresh	RSA
26	<i>Scorporena Scrofa</i>	Jack (rouget)	Fresh	RSA
27	<i>Tilapia melanopleura</i>	Tilapia	Fresh, smoked	Zambia
28	<i>Luciolates stapperssi</i>	Mikebuka	Fresh, salted	Kalemie
29	<i>Gadidaemerlueciidae</i>	Hake	Fresh	RSA
30	<i>Solea solea</i>	Soles	Fresh	RSA
31	<i>Salmon solar</i>	Saumon (Filet)	Fresh	RSA
32	.....	King klip	Fresh	RSA
33	<i>Lates niloticus</i>	Capitaines	Fresh	Kalemie
34	<i>Mormyrops</i>	Mulobe	Salted	Moero
35		Kasangala	Fresh	Kalemie
36	<i>Chrysichthys</i>	Kibonde	Fresh	Lac Tanganyika
37	<i>Gnathonemus</i>	Lusa	Fresh	Lac Tanganyika
38	<i>Tilapia macrochir</i>	Kapolowe		Lac Changalele

Table 2 below shows the fish which was identified in the eight markets listed in ascending order from the cheapest (fish which was identified as « low value ») to the most expensive, not easily accessible to poor people.

**Table 2: List of fish in ascending order (from the cheapest to the most expensive)**

N°	Scientific name	Local name
1	<i>Pellicotrisa</i>	Kashikisha
2	<i>Pellanolva miodon</i>	Mapapa
3	<i>Pellanolva miodon</i>	Malawi
4	<i>Pellanolva miodon</i>	Kashobwe
5	<i>Pellicotrisa ou Pellanulacuneria</i>	Kisense
6	<i>Pellanula miodon</i>	Sardine
7	<i>Tilapia sparmannii</i>	Tukenge
8	<i>Tilapia macrochir</i>	Kapolowe (frais)
9	<i>Ophiocephalus</i>	Milonge (Mfutu)
10	<i>Pellanolva miodon</i>	Ya tshuvi
11	<i>Stolotrisa tanganyicae</i>	Misumari
12	<i>Serranochromis</i>	Makobo
13	<i>Tylochromis</i>	tebwa

### Analysis

Fish is classified in terms of their value as can be seen in the two tables above. This list is not exhaustive as the survey was conducted in a period during which some fish species were not available, such as Mormyrops, commonly known as Mulobe.

We found that any fish that is reduced in size or small is considered to be « low value ». Fish is sold packed in bundles of 30, 40, 60 fish at FC 3,000, FC 4,000 and FC 5,000 respectively. *Tilapia sparmannii* (*Tukenge*), *Serranochromis* (*Makobo*), and *Tylochromis* (*Tembwa*) have not enough flesh, which is their characteristic feature. There is also fish which is rather big but classified as « low value » fish, such as *Ophiocephalus* (*Milonge Mfutu*), a fish which has a bitter taste and which is not liked by most Lubumbashi dwellers. On the other hand, the so-called “high value” fish is sold packed in bundles of 4 - 6 fish or simply sold per piece at FC 8,000, FC 10,000 or FC 30,000. These include *Tilapia macrochir* (*Pale*), *Clarias gariepinus* (*Kabambale*), and *Chrysichthys* (*Kibonde*).

It has been noted that the size of the fish plays an important role in how the fish is valued and priced. Taste is also an important criterion. Fry (*fretins*) are particularly classified as “low value” due to taste.

Furthermore, it has been noted that some fish which are small in size are expensive. They mainly owe it to their taste and to the intrinsic value that consumers put towards these fish, for example *Clariallabes* (*Milonge ya kumiti*).

It has also been noted that the fish known as Thomson in its 12<sup>+</sup>, 14<sup>+</sup> and 16<sup>+</sup> sizes is considered to be «low value» and sold at a lower price on the market, even though the butcher’s shop charges the same prices for this fish in these sizes and in its 20<sup>+</sup>, 25<sup>+</sup> sizes and it is sold by the kilogram. Thus the size of the fish and its condition influence the buyers’ perception of fish.

At the same time, *Kapolowe* from lake Changalele is considered « low value » fish as compared to Thomson in its 20<sup>+</sup>, 25<sup>+</sup> sizes and not compared to Thomson in its 12<sup>+</sup>, 14<sup>+</sup>, 16<sup>+</sup> sizes.

It has also been noted that besides « low value » fish, there is also fish for rich people, which is sold at prices ranging between FC 18,000 and FC 26,000 per kilogram.

Table 3 below shows fish in descending order from the most common, sold and consumed fish to the least common fish. Results from this table show that fry are available on the markets in considerable quantities because they sell well, which helps to foster trade.

**Table 3: List of fish in descending order (from the most to the least common fish)**

<b>Scientific name :</b>	<b>Local name :</b>
Pellanovlla miodon	<i>Malawi</i>
Pellanovlla miodon	<i>Ya tshuvi</i>
Pellanovlla miodon	<i>Mapapa</i>
Pellanovlla miodon	<i>Kashobwe</i>
Pellicotrissa	<i>Kashikisha</i>
Pellicotrissa or Pellanulacuneria	<i>Kisense</i>
Pellanula miodon	<i>Sardine</i>
Tylochromis	<i>Tembwa</i>
Tilapia sparmannii	<i>Tukenge</i>
Ophiocephalus	<i>Milonge (mfutu)</i>
Trachurus trachurus	<i>Thomson (chinchard)</i>
Tilapia macrochir	<i>Kapolowe</i>
Serranochromis	<i>Makobo</i>
Tilapia macrochir	<i>Pale</i>
Clarias gariepinus	<i>Kabambale</i>
Stolotrissa tanganicae	<i>Misumari</i>

When analyzing the fish listed above in order of importance according to the amount of fish that is available on the surveyed markets, we find that salted fish is dominant at the markets. Results from the survey also show that there is a substantial amount of fry at the markets:

- Salted fish: 401,750 kg.
- Fry: 186,355 kg.
- Fresh fish (Thomson, Kapolowe): data unavailable.
- Smoked fish and dried fish: 107,663 kg.

### **3.2. Findings from the nutritional survey**

This paragraph describes findings of the nutritional survey which are shown in text or graph form and it also provides our brief analysis of these findings.

### Distribution of surveyed markets

As part of the present study, a survey was carried out at eight markets, including:

- Mzée Market in Lubumbashi commune (43 respondents ),
- Municipal Market (Kenya) (42 respondents ),
- Central Market of Kenya: the biggest market in the city of Lubumbashi in terms of its surface area and its annexes, and also its wide range of goods and its large influx of buyers (62 respondents),
- Mwimbila Market: small market located on the outskirts of Kenya commune (16 respondents),
- Ndjandja Market: the most important market because it has an abundance of fish coming from everywhere (from surrounding villages, Lubumbashi, villages on the Kasenga road section, from Tanganyika, Tanzania, Zambia, Zimbabwe, Namibia and Malawi) and a major trade centre that is distributing fish products to other markets of Lubumbashi, province and even to other towns of the country. This market has food depots with an average number of 14 traders per food depot (66 respondents),
- Rail Market: located in Kampemba commune, very busy market, renowned for its low prices of vegetables and fish which come from surrounding areas of Lubumbashi such as Kapolowe (31 respondents),
- Luwohoshi Market nicknamed Zambia Market, is located in Annex commune: It also a busy market and renowned for its low prices of basic commodities like vegetables, fish and other goods (38 respondents).
- Mimbulu Market is located in Katuba commune: small market in terms of its surface area but very busy because it is located on the outskirts of the town of Lubumbashi and it serves poor areas (25 respondents).

### Distribution of respondents by gender and marital status

Fish traders are predominantly women, accounting for about 85.6% (279 women) and 14.4% are men (47), which gives us a sex ratio of 17 males to 100 females. Survey respondents included 282 married people against 44 unmarried people, and an average number of five children per person.

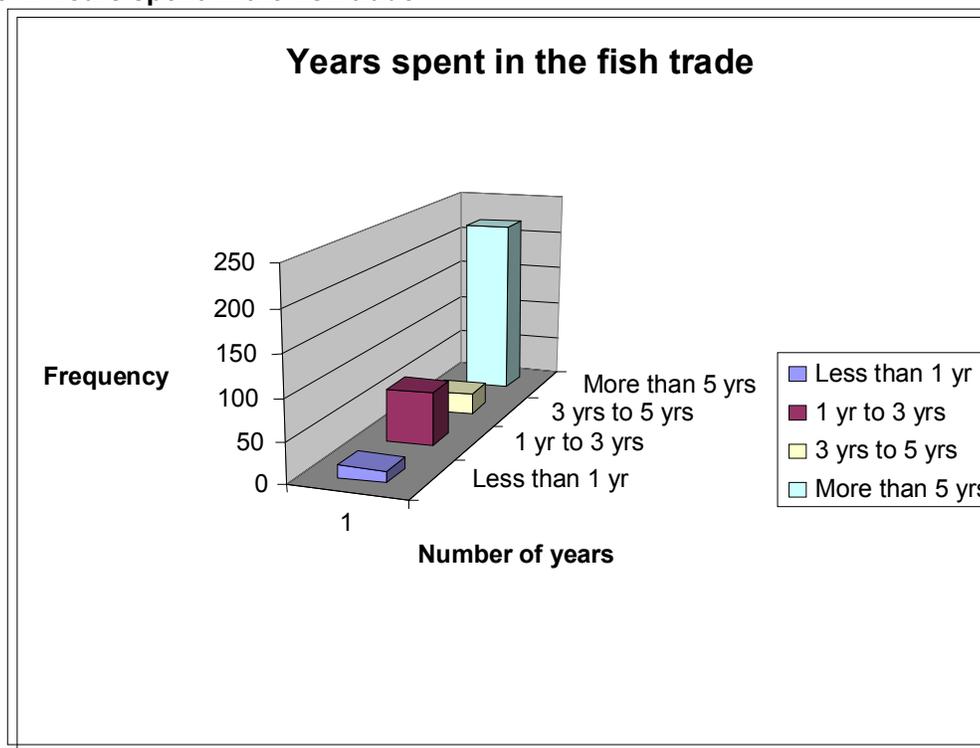
### Distribution of respondents by category and years spent in the fish trade

The study took a sample of 99.4% (that is 324) fish traders and 99.1% (that is 323) of retailers. Of these, only 0.6% (2 people) and 0.9% (3 people) represent traders of a diverse range of goods and wholesalers.

### Years spent in the fish trade

Figure 1 below shows that there is a large number of fish traders and that fish trade is like any other job that can strengthen the economy of the population and the country. Most survey respondents (200) have been in the fish trade for more than five years.

**Figure 1: Years spent in the fish trade**



Distribution of fish by origin

Table 4 below shows the main places of origin for the fish which is sold in Lubumbashi. Results from our analysis have confirmed that most fish in this study comes from Ndjanja Market. The findings shown in this table all point to the conclusion that our country has fish-poor water resources and has been experiencing a flight of capital to other foreign countries (Mozambique, Tanzania, Zimbabwe), particularly to Zambia which provides most of the foreign fish .

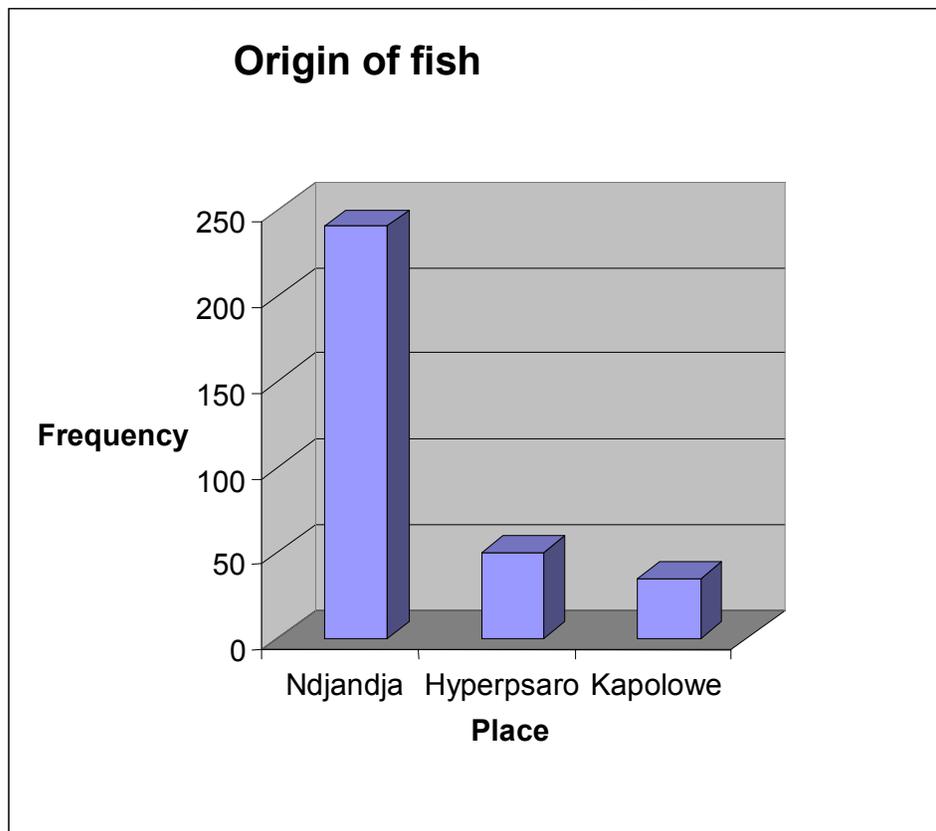
**Table 4: Place of origin of fish sold at the markets of Lubumbashi**

Origin :	Frequency :
South Africa	14
Kenya commune	2
Frigomoero	2
Hyperpsaro	34
Kalemie	8
Kapolowe	33
Kasenga	30
Kashobwe	2
Kilwa	4
Kiubo	4

Mozambique	1
Ndjandja Market	151
Dhinangwa	10
Tanzania	7
Zambia	23
Zimbabwe	1
<b>Total</b>	<b>326</b>

Figure 2 below indisputably shows that Ndjanja Market is the main supplier of fish that is sold and purchased.

**Figure 2: Main places where fish is sold and bought**



Distribution of the most sold fish.

Survey results have shown that the main animal product consumed by families is fish and there is no taboo on fish consumption. Our analysis, as shown in table 5 below, indicates that the most sold fish is salted fish, followed by fry (such as Pellanovlla miodon, Pellicotrisa, Pellanula miodon, Stolotrisa tanganicae, Limnotrisa miodon, and Pellanulacuneria), Thomson (Trachurus trachurus), Kapolowe (Tilapia

macrochir ), Kabambale (*Clarias gariepinus*), and Mikebuka (*Luciolates stapperssi*). The table also indicates that most survey respondents live on meager incomes.

**Table 5: Distribution of the most sold fish**

Most sold fish	Frequency
Bitoyo /salted	71
Fry	55
Kabambale	31
Kapolowe	45
Makoki	3
Mikebuka	25
Milonge	30
Mungusu	1
Ndomondomo	4
Gold fish	1
Thomson	54
Tilapia	6
<b>Total</b>	<b>326</b>

Distribution of fish species consumed per week

Our sample indicates that fry are the fish products mostly consumed by households per week. This is due to the fact that people buy fry at lower prices, which makes fry more accessible than other fish. The number of meals of fish dishes per week is 5,17 on average, with a standard deviation of about 1,63.

**Table 6: Distribution of fish species consumed per week**

Type of fish	Frequency
Other	1
Bitoyo	41
Diverse	5
Fry	109
Kabambale	14
Kapolowe	45
Makoki	3
Mikebuka	8
Milonge	25
Thomson	73
Tilapia	2
<b>Total</b>	<b>326</b>

### Distribution of the number of meals of fish dishes per week

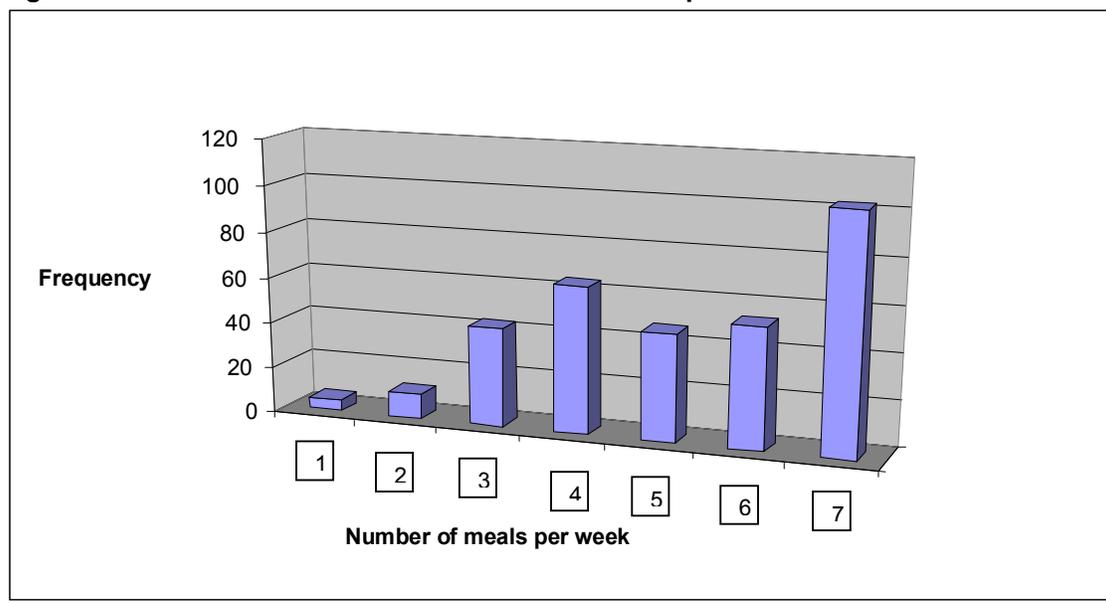
Of all the animal food products, fish are the most consumed by the target population per week.

**Table 7: Distribution of the number of meals of fish per week**

Number	Frequency	%
1	5	1.5%
2	11	3.4%
3	43	13.2%
4	64	19.6%
5	47	14.4%
6	53	16.3%
7	103	31.6%
<b>Total</b>	<b>326</b>	<b>100%</b>

Figure 3 below shows that people in Lubumbashi mainly live on a diet of fish. Most respondents have a meal of fish more than seven times a week.

**Figure 3: Distribution of the number of meals of fish per week**



### Distribution of fish species that are mostly preferred by respondents .

Table 8 below shows that most respondents (76) prefer Thomson, while 73 prefer Kapolowe. The preference for one or another type of fish is dictated by taste. Sometimes, low price and accessibility are cited as the reason why people prefer one type of fish to others.

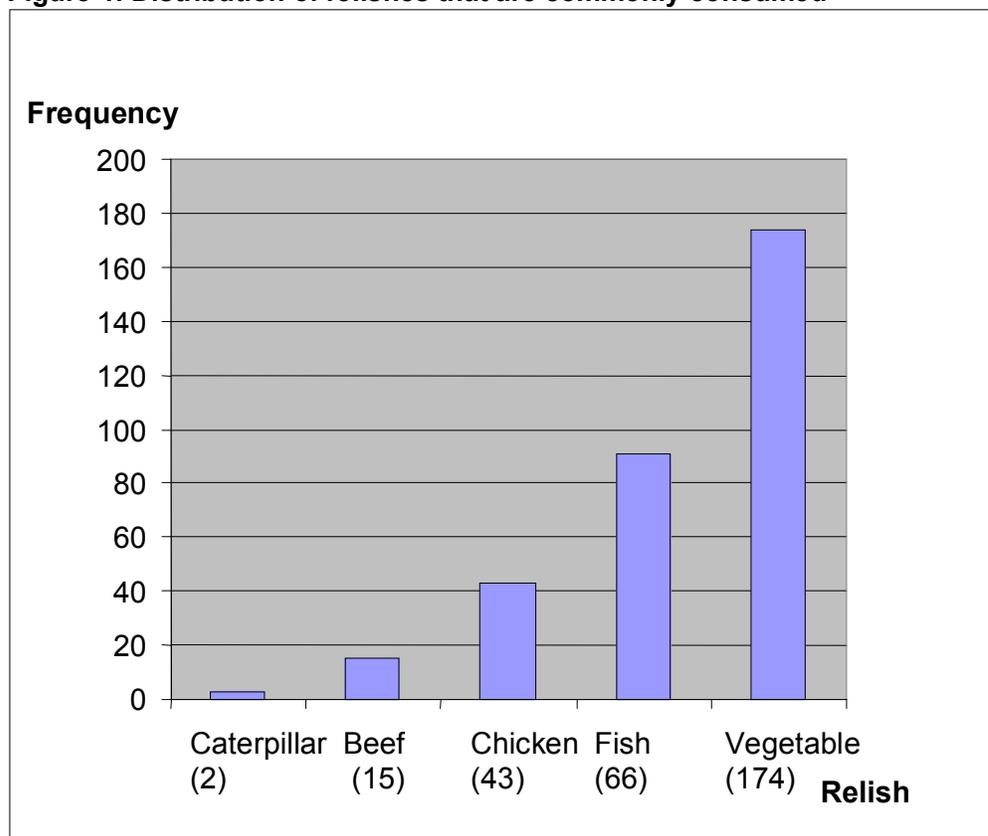
**Table 8: Distribution of fish species that are mostly preferred by respondents**

Type of fish that are mostly preferred	Frequency
Tilapia	56
Bitoyo	18
Fry	12
Kabambale	38
Kapolowe	73
Makoki	8
Mikebuka	13
Milonge	22
Gold fish	1
Thomson	76
Diverse	1
Other	5
No preference	3
<b>Total</b>	<b>326</b>

Distribution of relish commonly consumed by households

Relish that is most commonly consumed by households of respondents are vegetables (174), followed by fish (66) and chicken (43), as has been shown in Figure 4 below.

**Figure 4: Distribution of relishes that are commonly consumed**



## 4. Conclusion

Results from the survey show that Lubumbashi dwellers live mainly on a diet of fish because the average fish consumption rate is five times per week and there is no taboo on fish consumption. Most people involved in fish trade practice it as a job, which helps many families to respond to their needs during the current period of severe economic crisis in the country.

Fish which is mostly consumed is « low value » fish such as fry, Bitoyo (salted) and other small sized fish. The so-called low value fish sells well because traders are able to sell a considerable amount of such fish to consumers. Thus, this type of fish is mostly consumed by lower classes who are in the majority and who live one day at a time. Visits and investigations carried out at 30 markets, 10 of which had been targeted in the context of this study in Lubumbashi, have shown that there are more than 40 different fish species and types which are sold and consumed in the town of Lubumbashi. Fish trade is the main source of livelihood for more than 4,000 households in the town of Lubumbashi.

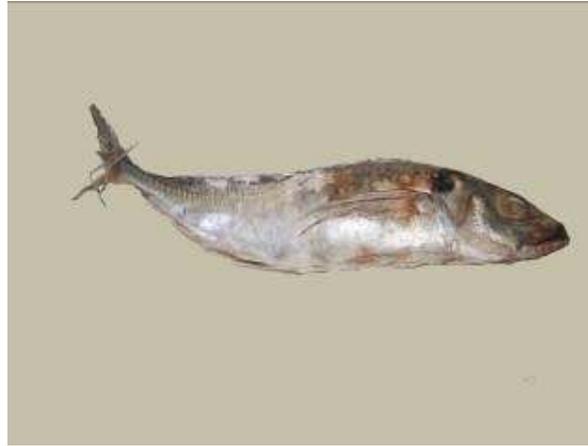
Survey questionnaires were administered to 326 fish traders, 279 of whom were women. Results from the survey have shown that fish comes from various places. Fishing sites which are located in Katanga province from Lake Moero up to Lake Tanganyika, as well as the inland water sources provide 50 % of the fish which is processed through salting and smoking, while 30 % is processed through freezing. Southern African countries such as Zambia, Mozambique, Zimbabwe, Malawi and South Africa provide 70% of the fresh fish and 30% of smoked and salted fish.

During our visits, we noticed that people had kept a stock of local fish. In fact ,this was due to the fact that fish in rivers of Katanga province have been allowed to breed again as government has enforced a fish ban during the fish breeding period.



## 5. Photographic guide of different types of fish

This chapter provides a photo guide (in alphabetic order) to different types of fish which are commonly found and sold on the markets of Lubumbashi.



**Chinchard**



**Chinchard (*trachurustrachurus*) - Thomson (fresh fish, from Zimbabwe/ South Africa)**



**Chrysichthys – Kibonde (Fresh fish, from Lake Tanganyika)**



**Clariallabes – *Milonge ya kumitshi* (smoked fish, from lake Moero)**



**Clarias – *Kabambale* (fresh)**



**Clarias – *Kabambale* (smoked, from Lake Moero)**



**Clarias – Kabambale (dried, from Lake Moero)**



**Fry (measuring container, plastic container (quaker), or bucket)**



**Gadidaemerlueciidae – Hake (fresh)**



**Gadus morhua – Cod (fresh)**



**Pellanovlla miodon – *Malawi* (dried, from Malawi)**



**Pellanovlla miodon – *Mapapa* (dried, from Moero)**



**Pellanovlla miodon - *Ya tshivi* (dried, from Zambia)**



**Oreochromis niloticus – *Makoki* (smoked, from Moero)**



**Parachana S.P. – *Mungusu* (smoked, from Moero)**



**Pellanovlla miodon – *Kashobwe* (dried, from Moero)**



**Luciolates stapperssi – *Mikebuka* (salted, from Kalemie)**



**Ophicephalus - *Milonga / Mfutu* (smoked, from Moero)**



**Limnotrissa miodon – *Ndakala lumbu***  
(Fresh, from Mwadingsha in the DRC or from Zambia)



**Lucilates stapperssi – *Mikebuka*** (salted, from Kalemie)



**Luciolates stapperssi – *Mikebuka*** (fresh, from Kalemie)



**Genyomyrus mormyrus – Ndomondomo (smoked, from Moero)**



**Gnathonemus – Lusa (fresh, from Lake Tanganyika)**



**King klip (fresh)**



**Pellanula miodon – sardine (dried, from Lake Moero)**



**Pellicotrisa pellanulacuneria – Kisense (dried, from Lake Moero)**



**Pellicotrisa – Kashikisha (dried, from Zambia)**



**Petit fumé (from Zimbabwe)**



**Salmon solar – *Salmon* (fillet, fresh)**



**Salmon (fillet)**

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