

# Assessment of the Nutritional Value of Fresh *Polydactylus quadrifilis* and *Galeoides decadactylus* Sold at the Bonfi Market in the Republic of Guinea

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## Abstract

In order to assess the nutritional value of fish species caught off the Guinean coast, two of the most commonly consumed species, *Polydactylus quadrifilis* and *Galeoide decadactylus*, were analyzed. The Total Volatile Basic Nitrogen (TVBN) values of 23.30 and 27.71 are within the 20 - 30 range for bony fish and below 40% for cartilaginous fish. The trimethylamine (TMA) contents of 19.93 and 13.18 are below the 15% mentioned by Malle (1989). The trimethylamine to total volatile basic nitrogen ratios (TMA/TVBN): 47.37% and 47.56% are also below the 50% standard. The fat contents of 0.37 and 0.35% classify the fish analyzed as lean fish because their fat content is less than 5%. The protein contents are 17.66% and 16.92%. The results of the bacteriological analysis show the absence of sulphite-reducing anaerobes and *Salmonella*, but fecal and total coliforms were found in numbers below the standard.

## Keywords

Fish, Freshness, Nutritional Value

## 1. Introduction

The Guinean continental shelf covers an area of 56,000 km<sup>2</sup> and, together with the adjacent waters, forms an area characterized by a wide diversity of fauna and flora, among which fishery resources have been identified as some of the most abundant on the West African coast. In terms of biomass, these resources are distributed as follows: demersal species 80,000 tons, pelagic species 100,000 tons, cephalopods

30,000 tons, and shrimp 4000 tons [1].

Among these fishery resources, demersal fish play a very important role in the fisheries sector in the coastal countries of the sub-region. This is mainly due to the extremely high commercial value of these species, their volume in exports, the challenges they represent in terms of national and international fishing licenses in national economies, and the prominent place these fish occupy on the plates of European, Asian, American, and even African consumers (despite their price remaining very inaccessible to the latter). All these factors mean that high anthropogenic pressures are still being exerted on demersal fish in the sub-region, to such an extent that some of them are already experiencing significant declines in their initial abundance, while others are considered to be seriously threatened with extinction.

Fishery products make a relatively significant contribution to meeting animal protein requirements in Guinea. According to the Economic Atlas of Guinea, this contribution was estimated at 40% in 2001. Furthermore, the fisheries statistics bulletin published by the National Centre for Fisheries Sciences in Boussoura indicates that Guineans consumed an average of 20 kg of fish in 2003. Annual individual fish consumption prior to 2003 was estimated at 13 kg by the Ministry of Fisheries and Aquaculture (MPA) [2].

In fish, the concept of quality is correlated with the freshness or spoilage index. Spoilage involves a series of microbiological, chemical, and physical processes. Several approaches can be used to assess the level of spoilage or freshness of fish. These are sensory, microbiological, and chemical.

Many factors are taken into consideration when assessing the quality of fish. First and foremost, safety is paramount: any fish that contains toxins or heavy metals in quantities exceeding the standards, or that is contaminated with petroleum or radioactive products, is rejected. Furthermore, the specific nutritional properties of fish, such as their low fat content linked to a high level of polyunsaturated fatty acids, mean that their consumption is often recommended by dietitians.

The oil content of fish varies greatly; it is influenced not only by the type of fish but also by maturity, season, and food availability. Fish oils are characterized by a high content of polyenoic acids with 4 to 6 double bonds, while their tocopherol content is relatively low. Fish fats are important sources of fat-soluble vitamins [3] [4].

Despite this importance, the nutritional value of certain species remains unknown to the general public. This study was therefore undertaken to provide a database on the nutritional value of certain fish species, enabling their characteristics to be better defined.

Specifically, the aim is to determine the nutritional value of fresh *Polydactylus quadrifilis* and *Galeoides decadactylus* sold at the Bonfi market, using selected fish, many of which are consumed by the local population. We will discuss the results for the target fish species in order to assess the quality of our coastline. Our

aim is also to identify future needs in this area of research.

**Study of Selected Species:**

- 1) Big captain, *Polydactylus quadrifilis* (Cuvier, 1829) in **Figure 1**.



**Figure 1.** Big Captain, *Polydactylus quadrifilis* [5].

This is the “true sea captain” (see *Sciaenidae*: otoliths). It can be identified by its pectoral fin with four relatively short, thread-like free rays, shorter than the length of the body. Its grey-brown dorsal colouring lightens on the sides to become white on the belly; the fins are grey or yellowish. It is a coastal species that enters estuaries and lagoons. It can reach 200 cm in length and weigh 80 kg; large individuals are generally caught at sea. It is common on the West African coast, from Senegal to Congo [6].

- 2) Small captains, *Galeoides decadactylus* (Bloch, 1795) in **Figure 2**.



**Figure 2.** Small captains, *Galeoides decadactylus* [7].

In Guinea, the “little captain” or “plexiglass captain” is fished at depths of up to 40 metres, with maximum abundance at depths between 10 and 20 metres. This species is found at greater depths in Congo (up to 50 m) and Côte d’Ivoire (up to 60 m). It is caught on bottoms generally covered with muddy sand. Caverivière even indicates that this species avoids putrid mud bottoms [8]. Domain *et al.* believe that this is probably a behaviour intended to avoid the minimum oxygen

levels caused by oxidation-reduction phenomena linked to the presence of pure mud [9]. Samba also notes that in Congo, during the cold season, *G. decadactylus* migrates perpendicular to the coast, thus fleeing the cold, oxygen-poor waters during this season [10].

## 2. Materials and Methods

### 2.1. Biological Material

*Polydactylus quadrifilis* and *Galeoides decadactylus*.

### 2.2. Equipment and Reagents

Appropriate equipment and reagents are used to perform laboratory analyses.

### 2.3. Methods

The aim is to compare the nutritional value of *Polydactylus quadrifilis* and *Galeoides decadactylus*.

#### 2.3.1. Type and Duration of Study

An analytical and technological study lasting three months, from 15/03/2017 to 15/06/2017.

#### 2.3.2. Inclusion Criteria

All fresh *Polydactylus quadrifilis* and *Galeoides decadactylus* were included in this study.

#### 2.3.3. Exclusion Criteria

The following were not included in our study: non-fresh *Polydactylus quadrifilis* and *Galeoides decadactylus*, as well as other fish species sold at the Bonfi market.

### 2.4. Work Environment

The National Quality Control Office in Matoto served as the setting for our analyses.

The National Quality Control Office (ONCQ) is responsible for monitoring compliance with regulations governing the quality of consumer goods in the Republic of Guinea.

### 2.5. Sampling

We purchased 20 fish of each species from three vendors at the Bonfi market. The fish were placed together, and then three fish of each species were selected according to the sampling plan to determine the freshness of the fish.

#### Sampling Plan for Determining Fish Freshness:

The sampling plan must be carried out according to specific requirements targeting certain issues, and an assessment must be contained in the manual for inspection and quality control of fishery products. The relevance of good sampling is crucial because it allows accurate and representative results to be obtained. The

analysis sample must be representative of quality requirements. The sampling method based on the number of fish is recorded in **Table 1**.

**Table 1.** Sampling based on the number of fish in the batch.

Number of Fish in the Batch (N)	Number of Fish in the Sample (n)	Number of Defects Limit for an Acceptable Batch
2 to 15	2	0
16 to 25	3	0
26 to 90	5	0
91 to 150	8	1
151 to 500	13	1
501 to 1200	20	2
1201 to 10,000	32	3
10,001 to 35,000	50	5
35,001 to 500,000	80	7
500,001 to Above	125	10

The parameters analyzed are as follows.

## 2.6. Sensory Analyses

Colour, taste, smell, and consistency.

## 2.7. Physicochemical Analyses

Moisture: The method is based on weight loss by drying. Total ash: The method is based on total calcination in a muffle furnace at a temperature of 600°C to 700°C. ABVT; TMA: The method is based on deproteinization using 7.5% trichloroacetic acid, followed by steam distillation and neutralization of the distillate with 0.1 N sulphuric acid. Proteins: Using the Kjeldahl method. Lipids: Using the Foch method. Vitamin Identification: Using Color Reactions.

## 2.8. Bacteriological Analyses

Total aerobic mesophilic flora; Fecal coliforms; Total coliforms; Sulphite-reducing anaerobes and *Salmonella*.

## 3. Results and Interpretations

### 3.1. Sensory Analyses

The quality assessment used to rate the quality index on a defect scale is shown in **Table 2**.

The Quality Index Method (QIM) is based on sensory parameters that are sig-

nificant for raw fish. It uses a practical scoring system in which the fish is graded and points corresponding to defects are recorded. The scores for all characteristics are then added together to give an overall sensory rating known as the quality index. A score of 0 is given to very fresh fish. This score increases as the fish deteriorates. Sensory tests on the fresh fish obtained show that all biological and organoleptic characteristics were normal, meaning that the fresh fish selected were of good quality.

**Table 2.** Results of the Quality Index Method (QIM) applied to *Polydactylus quadrifilis* and *Galeoides decadactylus*.

Species	Quality Settings	Character	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>	
<i>Polydactylus quadrifilis</i>	General Appearance	Skin	0	1	0	
		Blood Spots on the Gills	0	1	1	
		Rigidity	0	0	0	
		Belly	0	0	0	
		Smell	0	0	0	
	Eyes	Clarity	0	0	0	
		Form	0	0	0	
	Gills	Color	0	0	0	
		Smell	0	0	0	
	Total Points			0	2	1
	<i>Galeoides decadactylus</i>	General Appearance	Skin	1	0	1
Blood Spots on the Gills			1	0	0	
Rigidity			0	0	0	
Belly			1	0	0	
Smell			0	0	0	
Eyes		Clarity	0	0	0	
		Form	0	0	0	
Gills		Color	0	0	0	
		Smell	0	0	0	
Total Points			3	0	1	

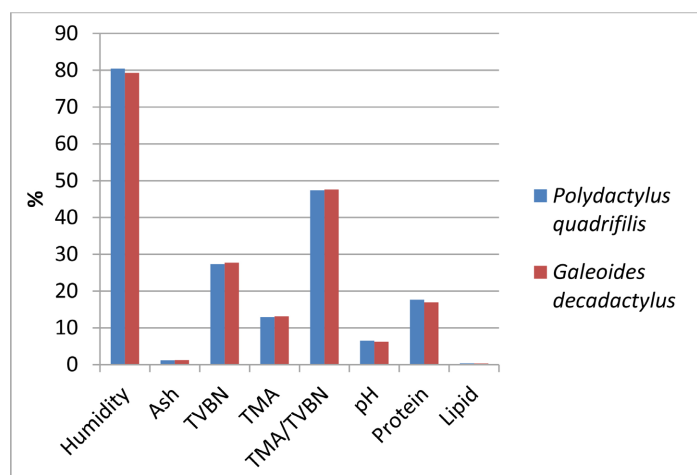
### 3.2. Physicochemical Analyses

The summary of the results of the physical and chemical analyses of *Polydactylus quadrifilis* and *Galeoide decadactylus* in fresh condition, expressed as a percentage, is presented in **Table 3**.

**Table 3.** Average results of the physicochemical parameters of *Polydactylus quadrifilis* and *Galeoide decadactylus* in fresh condition in %.

Parameter	<i>Polydactylus quadrifilis</i>	<i>Galeoides decadactylus</i>
Humidity	80.45	79.25
Ash	1.21	1.27
TVBN	27.3	27.71
TMA	12.93	13.18
TMA/TVBN	47.37	47.56
pH	6.5	6.26
Protein	17.66	16.92
Lipid	0.37	0.35

The results of analyses of *Polydactylus quadrifilis* and *Galeoide decadactylus* in fresh condition, expressed as a percentage, are shown in **Figure 3**.

**Figure 3.** Histogram of the physicochemical parameters of *Polydactylus quadrifilis* and *Galeoide decadactylus* in the fresh state, expressed as a percentage.

### 3.2.1. Moisture Content

Our analysis shows that the moisture content of *Polydactylus quadrifilis* and *Galeoides decadactylus* is 80.45% and 79.25% respectively, which corresponds to dry matter contents of 19.55% and 20.75%. The moisture content levels found show that fish is a perishable commodity and, therefore, difficult to preserve. The moisture content levels found are within the 74% - 80% range mentioned by Sampou *et al.* [11] for most fish; they are also within the 60% - 80% range mentioned by Belitz [3].

The moisture values obtained are within the moisture range for lean fish [12]-[14].

#### Total Volatile Basic Nitrogen (TVBN) and Trimethylamine (TMA):

According to Etienne, total volatile basic nitrogen (TVBN) is an indicator of

spoilage in raw fish flesh from whole fish, steaks, and fillets; it remains constant during the first few days of storage on ice, then changes as a result of microbial growth [15].

The total volatile basic nitrogen (TVBN) contents found in *Polydactylus quadrifilis* and *Galeoides decadactylus*, at 27.30% and 27.71% respectively, are higher than the range (20% - 25%) mentioned by Malle [16]. According to the same author, Total volatile basic nitrogen (TVBN) cannot be used as an indicator of freshness for all fish species because it varies depending on the habitat (pelagic, benthic, demersal) and whether the fish is bony or cartilaginous [17]. The European Union reports that the limit for total volatile basic nitrogen (TVBN) content is

- 25 mg of nitrogen per 100 g of flesh of species *Sebastes* spp, *Helicolenus*, *Dactylopterus*;
- 30 mg of nitrogen per 100 g of flesh of the species *Pleuronectidae*;
- 35 mg of nitrogen per 100 g of flesh of *Salmo salar* species belonging to the *Merlucciidae* family [18].

Thus, the total volatile basic nitrogen (TVBN) found (27.30 and 27.71) classifies the fish analysed in the Extra class of cartilaginous fish for which the total volatile basic nitrogen (TVBN) is less than 40 [16] or class A of bony fish for which the total volatile basic nitrogen (TVBN) is in the range (20 - 30).

As for the trimethylamine (TMA) content (12.93% and 13.18%) for *Polydactylus quadrifilis* and *Galeoides decadactylus*, respectively, these are lower than the 15% mentioned by Malle [16].

The parameters determining the freshness of the fish are generally satisfactory.

The trimethylamine to total volatile basic nitrogen (TMA/TVBN) ratios for the two fish species are 47.37% and 47.56% respectively.

The product may be accepted as long as the trimethylamine to total volatile basic nitrogen (TMA/TVBN) ratio does not exceed 50, as evidenced by the routine method described in Decision 95/149/EC of 8 March 1995. However, there is some disagreement on the issue of TMA and ABVT, as several factors (species, lifestyle, fishing location, handling, packaging method, etc.) can influence their content in fish. In this case, we can say that the increase in total volatile basic nitrogen (TVBN) and trimethylamine (TMA) content may be due, on the one hand, to the packaging of the product before freezing. And on the other hand, to the species, the conditions of capture and uncertainties during analysis.

### 3.2.2. pH

According to Sainclivier, the pH value varies from 6.1 to 6.95; it also varies depending on the flesh: 6.25 for red-fleshed fish and 6.85 for white-fleshed fish [12].

We found a value of 6.26 for *Galeoides decadactylus*, which is comparable to the standard of 6.25, and a pH of 6.50, which is lower than 6.85, for *Polydactylus quadrifilis*. However, all the pH values obtained fall within the range mentioned by Sainclivier [12]. We know that the pH of fish is very unstable, not only depending on glycogen reserves due to the resistance of the fish during capture [3], but also on the fat content of its flesh [19]. Anaerobic glycolysis occurs following the

cessation of respiration, a decrease in O<sub>2</sub> content, and a decrease in oxidation-reduction potential. The result is a decrease in pH following the production of lactic acid. Actin and myosin bind to form actomyosin, a sign of rigor mortis.

### 3.2.3. Ash

The ash content is 1.21% and 1.27% for *Polydactylus quadrifilis* and *Galeoides decadactylus*, respectively. These values are within the 0% - 2% range mentioned by Pokrovsky for fresh fish [20].

### 3.2.4. Protein

We found that *Polydactylus quadrifilis* is slightly richer in protein (17.66%) than *Galeoides decadactylus* (16.92%). However, all these values fall within the range of 15% - 24% accepted by Pokrovsky as the protein content in fresh fish [20].

### 3.2.5. Fat Content

The classification of fish as lean, semi-lean, and fatty depends on the author. We found a fat content of 0.37% for *Polydactylus quadrifilis* and 0.35% for *Galeoides decadactylus*; these values show that the fish analysed are lean fish, for which fat content varies from 0 to 5% according to Nadine [21].

### 3.2.6. Vitamins

The results of the identification of fat-soluble vitamins are shown in **Table 4** below.

**Table 4.** Results of qualitative analysis of fat-soluble vitamins (A, D, E, and K) in fresh fish (*Polydactylus quadrifilis* and *Galeoides decadactylus*).

Designation	Vitamin	Filtered	Reagents Used	Expected Coloring	Coloring Observed	Observations
<i>Polydactylus quadrifilis</i>	A	5 ml	Concentrated Sulphuric acid	Purple red	Purple red	+
	D	2 ml	Acetic anhydride and concentrated acid	Purple red	Purple red	+
	E	5 ml	Ferric chloride	Yellow coloring	Yellow coloring	++
	K	5 ml	Concentrated nitric acid	Red	Red	+++
<i>Galeoides decadactylus</i>	A	5 ml	Concentrated sulphuric acid	Purple red	Purple red	+++
	D	2 ml	Acetic anhydride and concentrated acid	Purple red	Purple red	++
	E	5 ml	Ferric chloride	Yellow coloring	Yellow coloring	++
	K	5 ml	Concentrated nitric acid	Red	Red	+

Qualitative analysis identified all fat-soluble vitamins in the two fish species analyzed.

Based on the intensity of the coloring or the abundance of precipitates observed, vitamin K is more abundant in *Polydactylus quadrifilis*, followed by vitamin E and finally vitamins A and D, whereas in *Galeoides decadactylus*, vitamin A is more

abundant, followed by vitamins D and E and finally vitamin K.

### 3.3. Microbiological analyses

The results of the bacteriological analysis are presented in **Table 5**.

**Table 5.** Results of microbiological analyses of fresh *Polydactylus quadrifilis* and *Galeoides decadactylus*.

N°	Species	Targeted Germs	Standard of Assessment	Analysis Results	Appraisal
I	<i>Polydactylus quadrifilis</i>	FMAT	10 <sup>5</sup> /g	7 × 10 <sup>2</sup>	Good
		CT	-	03	Bad
		CF	10/g	01	Good
		ASR	10/g	00	Good
		<i>Salmonella</i>	Absence in 25 g	00	Good
II	<i>Galeoides decadactylus</i>	FMAT	10 <sup>5</sup> /g	1.2 × 10 <sup>3</sup>	Good
		CT	-	07	Bad
		CF	10/g	06	Bad
		ASR	10/g	00	Good
		<i>Salmonella</i>	Absence in 25 g	00	Good

The results of the bacteriological analysis show that the presence of FMATs in fish is below the criterion; it was found to be lower in *Polydactylus quadrifilis* ( $7 \times 10^2$ ) than in *Galeoides decadactylus* ( $1.2 \times 10^3$ ). Fecal and total coliforms were also found in numbers below the criterion, while ASR and *Salmonella* were not identified in either species. The presence of coliforms could originate from intestinal contents during evisceration, *i.e.*, of intestinal origin, or from microbial contamination of fecal origin. This contamination may be aggravated by poor handling and the use of non-potable water (seawater drawn from the bay, well water from a depth of 2 meters) for processing the products. In short, it is generally poor hygiene that can lead to contamination.

## 4. Conclusions

Analyses of overall composition and physicochemical parameters were carried out on the two fish species *Polydactylus quadrifilis* and *Galeoides decadactylus* in order to establish a database that would enable the characteristics of these two species to be better defined.

The results of the sensory evaluation are consistent with the results of the physical and chemical analyses.

A relative variability in parameters was observed between *Polydactylus quadrifilis* and *Galeoides decadactylus*. For *Polydactylus quadrifilis*, the protein and fat content are 17.66% and 0.37%, respectively, whereas for *Galeoides decadactylus*, they are 16.92% and 0.35%. These values show that the fish analyzed are lean fish with fat contents ranging from 0 to 5%. However, *Polydactylus quadrifilis* is slightly richer in protein than *Galeoides decadactylus*.

As for fat-soluble vitamins, although qualitative analysis revealed their presence in both fish species, the study does not show which species contains higher levels of fat-soluble vitamins and in what proportions. It would be desirable for future research to use quantitative methods to obtain more accurate measurements.

The relative differences in moisture, ash, total volatile basic nitrogen (TVBN) and trimethylamine (TMA) content, fat-soluble vitamins, pH values, and color may affect the shelf life of the fish as well as its sensory properties. It is therefore possible that, due to this variability, the fish may no longer meet consumer expectations.

Joint analysis of organoleptic, microbial, and chemical parameters is a relevant strategy for determining the use-by date of fish. Objective sensory analysis combined with total volatile basic nitrogen (TVBN), trimethylamine (TMA) & FMAT, and biogenic amines (putrescine and cadaverine in particular) are good indicators of the quality of preserved fish. Refrigeration has a protective effect on fish quality and extends its shelf life. Freezing is known to be even more effective, hence the need to store fish under ice. Our results can serve as a scientific basis for legislation and veterinary inspection services to regulate fish sales in local markets better. Consumers must be made aware of the importance of maintaining the cold chain for this fragile foodstuff and must strictly adhere to fish consumption deadlines in order to prevent any food poisoning. Other hazards may be considered to complement this study. Parasites (trematode metacercariae), the impact of persistent pollutants (dioxins and heavy metals), and the presence of possible pesticides may be considered in the future. Chemical risks are more serious than microbiological risks associated with pathogens or indicator bacteria. Microbiological hazards are often controlled by cooking, whereas chemical hazards are known for their cumulative effects in fish. For this reason, it is time for Guinean legislation and the competent authorities to focus on this type of food risk. The presence of coliform bacteria fully justifies strict protocols for fish sellers in order to prevent foodborne illnesses and protect public health by requiring hand washing, clean surfaces, compliance with the cold chain, good personal hygiene (clean clothing, headgear, gloves), and rigorous environmental management (clean equipment, drinking water).

## 5. Recommendations

In light of the above, action must be taken by the competent authorities and professionals in the fishing industry to improve the microbiological quality of fish by ensuring good hygiene practices at landing sites and markets.

Before capture, the hazards are the presence of biotoxins and contamination by chemicals and/or enteric pathogens:

- a. Control measures consist of monitoring the environment (fishing areas) for pollution and the presence of biotoxins.
- b. Critical limits must be established by the government.
- c. Monitoring results must be published periodically.
- d. Corrective action consists of prohibiting fishing in heavily polluted areas.

e. Raise awareness and train processors in good hygiene and manufacturing practices.

**To Professionals:**

Comply with current regulations on the production, handling, and marketing of foodstuffs of animal origin.

Corrective action involves checking fish for periods when temperature control was not maintained, sorting, and discarding poor-quality fish. Identify the reason (s) for the failure to maintain the correct temperature.

**To Researchers:**

Continue research into the microbiological and chemical quality of fresh fish and the best means of preserving it.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## References

- [1] GF/6105-92-74 UNEP/Guinea Conakry (1997) National Monograph on Biological Diversity.
- [2] Ministry of Fisheries and Aquaculture Letter (2009) Review and Strategy.
- [3] Belitz, H.D., Grosch, W. and Schieberle, P. (1986) Food Chemistry. 4th Revised and Extended Edition, Springer.
- [4] Poulter, R.G., Curran, C.A., Rowlands, B. and Disney, J.G. (1982) Comparison of the Biochemistry and Bacteriology of the Tropical and Temperate Water Fish during Preservation and Processing. *Symposium on Harvest and Post-Harvest Technology of the Fish*, Cochin, 24-27 November 1982.
- [5] <https://www.fishbase.se/photos/PicturesSummary.php?&ID=5002&what=species&showAll=yes>
- [6] Séret, B. (1981) Sea Fish of Tropical West Africa Orstom. ORSTOM Editions.
- [7] <https://www.fishbase.se/photos/FamilyPicturesSummary.php?famcode=361>
- [8] Caverivière, A. (1982) Demersal Species of the Ivorian Continental Shelf—Biology and Exploitation. Doctoral Thesis, Aix-Marseille University.
- [9] Domain, F., Keïta, M. and Morize, E. (2000) General Typology of Demersal Resources on the Continental Shelf. In: Domain, F., Chavance, P. and Diallo, A., *Coastal Fishing in Guinea—Resources and Exploitation*, Editions IRD/CNSHB, 53-85.
- [10] Samba, G. (1974) Contribution to the Study of the Biology and Dynamics of a West African Polynemidae *Galeoides decadactylus* (Boch., 1795). Master's Thesis, University of Bordeaux.
- [11] Sampou, K. and N'Diaye, I. (1987) Project for a Fish Meal Production Plant with a Capacity of 1,848 Tonnes per Year in Gamal Abdel Nasser University of Conakry.
- [12] Marcel, S. (1983) Agronomic Science of Rennes “Fisheries Food Industry”. 152-165.
- [13] TDRI (1986) Handling, Preservation and Processing of Fish in the Tropics: Part I. Tropical Development and Research Institute.
- [14] Piclet, G. (1987) Fish as Food: Composition and Nutritional Value. *Cahiers de Nutrition et de Diététique*, **22**, 317-336.
- [15] Etienne, M. (2005) Tracaebility-Project 6.3—Valid Methods for Chemical Quality

- Assessment—Volatile Amines as Criteria for Chemical Quality Assessment. European Project Sea Food Plus. 21 p.
- [16] Malle, P. (1989) Volatile Basic Nitrogen Content in Marine Fish Muscle Tissue. Element for of AB Standardisation VT Determination and Use. *Veterinary Medicine Collection*, **165**, 395-402.
- [17] OFIMER (2006) Practical Guide to Hygiene on Board Fishing Vessels. 117 p.
- [18] European Union (1991) Council Directive 91/493/EEC of 22 July 1991 Laying down the Health Rules Governing the Production and Placing on the Market of Fishery Products. The Official Journal of the European Union, 9-15.
- [19] Linden, G. and Lorient, D. (1994) Agro-Industrial Biochemistry: Food Valorisation of Agricultural Production. Masson, 367.
- [20] Pokrovsky, A.A. (1978) Composition of Food Products. Food Industry Publishing House.
- [21] Nadine, Z. (2005) Quality of Animal Products (Fish and Meat). CIRAD, 165-171.