

Food strategies of females and males of catfish *Schilbe mandibularis* (Günther, 1867) in the Bia River (West Africa, Côte d'Ivoire)

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Abstract— The diet of 161 specimens of *Schilbe mandibularis* distributed between the female sex (95 specimens) and male (66 individuals) in Bia River has been studied during two years of sampling.

The Lauzanne food index allowed characterizing the diet of males and females specimens. Regarding the general diet, both sexes have the same food trend. As for the seasons, the female specimens collected in the dry season behaved differently. Compared to the size of individuals, juveniles and adults had a similar feeding behavior. Relative to the longitudinal gradient that is the valley station of the dam that diet sexes varies.

The general profiles of the two sexes, on the whole, watch that *Schilbe mandibularis* has an eclectic diet.

Index Terms— Côte d'Ivoire, Bia River, Diet, *Schilbe mandibularis*, female, male.

I. INTRODUCTION

For any animal, food is the only source of energy acquisition it will then use for various purposes [1] According to these authors, so the search for food is an essential activity for the fish, which devotes a significant portion of his time, or even most of its activity. For this purpose, the knowledge of the fish in the wild food is an essential step to understanding their biology and ecology [2]. In Côte d'Ivoire, the diet of *Schilbe mandibularis* was studied partially by [3] and [4]. Because of its important contribution to the catches in the Bia River, which is home to the oldest hydroelectric dam Ivory Coast [5]; [6]; [7], the knowledge of its supply with sex samples caught our attention. To this end, after the presentation of the general diet of the species by gender, we analyze those specimens of both sexes with the seasons and size class based on the stage of sexual.

II. MATERIELS AND METHODES

Sampling area

Fig. 1 shows the location of the sampling stations on Bia River (Bianouan, Lake Ayamé, Aboisso). Bia River originates in Ghana and flows into the Aby lagoon southeast

of Côte d'Ivoire. It has a catchment area of 9300 km², a length of 300 km and an average width of 150 m [8]; [9]. The presence of dams Ayamé I and II remote from one another four kilometers to distinguish three ecological zones: upstream (Bianouan), Lake (Ayamé) and downstream (Aboisso). Note that the selection of study sites was preceded by a survey of six months.

Sampling

Fisheries were conducted for 24 months stations defined on the Bia River. During monthly outings, two batteries mesh nets: 10, 12, 15, 20, 30, 35, 40 and 50 mm were installed at 17h, visited the next day at 7 am and surveys to 13h. The fish caught were identified according to [10] and [11].

They were measured and dissected. Their stomachs were removed, weighed and stored in bottles containing a 5% formalin solution. After the counting of all stomachs collected for the purposes of this study, we were interested only specimens that gender and stage of gonadal maturation were determined.

Size classes were defined on the basis of sexual maturity stages determined by Ouattara (2000). Indeed, specimens of stages 1 and 2 identified by this author in the study of the reproduction of *S. mandibularis* in Bia and Agnébi rivers were considered juveniles. Individuals stages 3 and 4 have been made for adults.

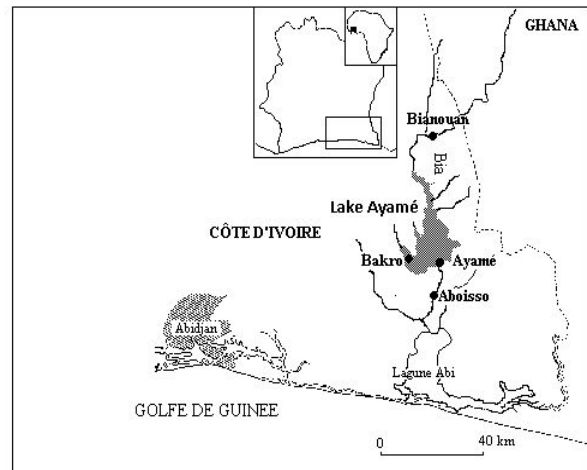


Fig. 1: Location of sampling stations on the Bia River (based on [13]).

Analysis of stomach contents

For the analysis, strictly speaking, stomach contents, each stomach was drained on absorbent paper, weighed and carefully opened under the microscope. A first selection under a dissecting microscope has eliminated the stomach contents too degraded by digestive juices. The different

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fractions of stomach contents retained after this sort were identified, counted and weighed after spin on blotting paper.

Data expressions

The data were presented as percentage of occurrence and species abundance whose calculation formulas are: percentage of occurrence [14]

$$F = \frac{N_{ie}}{N_{et}} * 100$$

Weight percentage (W) [14]

$$W = \frac{w_i}{WT} * 100$$

Where w_i represents the total weight of prey I and WT the total weight of all prey.

Alimentary index (AI) [15]

$$AI = \frac{\% OC X \% V}{100}$$

Where we substitute volumetric percentage by weight percentage.

Schooner's index: [16]

$$C_{xy} = 1 - 0.5(\sum |pxi - pyi|)$$

Where px_i and py_i are the proportions by weight of prey i in the diets of species x and y . The index ranges from 0 which indicate no dietary overlap to a maximum overlap of 1 when all prey items are found in equal proportions.

The Spearman rank correlation coefficient (Statistica 7.1 program) was applied to the percentages of occurrence and abundance of specific individuals of both sexes following factors are taken into account the general scheme, seasonal, depending on the size and longitudinal gradient.

III. RESULTS

General diet

A total of 161 stomachs of *Schilbe mandibularis* from the Bia River and containing food were retained.

The female specimens (95 individuals) and males (66 individuals) of *Schilbe mandibularis* have a diet composed of two major fractions of prey. Animal fraction consists of insects (with the Family: Coleoptera, Diptera, Hymenoptera, Orthoptera, Dermaptera, Hemiptera, Isoptera, Lepidoptera, Odonata, Plecoptera and Tricoptera), others invertebrates (consisting arachnids, crustaceans, molluscs and myriapoda), fishes and other prey animals that are debris. Plant fraction represented by macrophytes comprises mainly fruits and plants debris.

The diet of both sexes is dominated by insects with 50.76% AI respectively for females and 70.62% AI for males. Other prey come in supplements as preferred prey 21.53% AI respectively for females and 20.18% AI in males (Table I).

Table I: Comparison of the diet of females and males of *Schilbe mandibularis* from the Bia River.

Prey	Female (n=95)	Male (n=66)
Insects orders		
Coleoptera	20.65	21.94
Diptera	6.67	13.97
Ephemeroptera	3.47	0.81
Hymenoptera	14.57	7.27
Orthoptera	53.62	35.2
Others insects	1.03	52.49
INSECTS	50.76	70.62
OTHERS		
INVERTEBRATES	4.59	0.09
FISHES	3.55	0.43
MACROPHYTE	19.56	8.67
OTHERS PREY	21.53	20.18

Seasonal diet

In rainy season the females have a diet dominated by insects (61.55% AI), while in males this place is other prey (54.86 % AI) (Table II). In terms of the dry season, it has a power dominated by macrophytes in females and insects in males (Table II).

Table II : Seasonal diet of females and males of *Schilbe mandibularis* from the Bia River.

Prey	Saison des pluies		Saison sèches	
	Female (n=69)	Male (n=51)	Female (n=26)	Male (n=15)
Insects orders				
Coleoptera	20,29	50,17	5,27	5,86
Diptera	5,10	23,82	26,29	3,96
Ephemeroptera	4,20	1,97	0,00	0,07
Hymenoptera	10,83	21,16	68,43	0,37
Orthoptera	58,34	1,12	0,01	14,49
Others insects	1,24	1,77		75,25
INSECTS	61,55	54,86	5,00	81,74
OTHERS INVERTEBRATES	7,05	0,24	0,00	0,00
FISHES	2,16	0,00	9,58	2,61
MACROPHYTE	11,87	3,81	52,63	13,82
OTHERS PREY	17,38	41,09	32,80	1,82

Diet depending on the size class of the specimens

Les juvéniles femelles sont insectivores (45,11 % IA) et les autres proies constituent les proies préférentielles de second ordre (39,61 % IA). Les males ont une alimentation dominée par les autres proies (73,45 % IA) (Table III).

Female juveniles are insectivores (45.11% AI) and others prey are the preferred prey of the second order (39.61% AI). Others preys (73.45% AI) have dominated males diet (Table III).

Table III: Diet of juvenile and adult *Schilbe mandibularis* female gender and males from the Bia River

Prey	Juvenile		Adult	
	Female (n=26)	Male (n=23)	Female (n=69)	Male (n=43)
Insects orders				
Coleoptera	1,39	17,33	19,64	19,21
Diptera	0,14	0,01	8,17	17,67
Ephemeroptera	0,27	0	2,77	1,21
Hymenoptera	97,23	65,65	2,70	3,45
Orthoptera	0,00	16,23	65,90	2,46
Others insects	0,96	0,78	0,82	56,00
INSECTS	39,61	26,32	50,63	76,07
OTHERS INVERTEBRATES	8,56	0,10	4,33	0,09
FISHES	15,83	0,00	2,27	0,76
MACROPHYTE	0,52	0,14	22,13	11,88
OTHERS PREY	35,48	73,45	20,64	11,20

The Spearman rank correlation coefficient does not detect statistically significant differences in diet between juvenile and adult.

Diet in the longitudinal gradient

Upstream of the Bia River, females have a diet dominated by insects (38.79% AI), which are followed by macrophytes (34.42% IA), while males are primarily insectivorous (75.89% AI) (Table IV). At the lake Ayamé, females have a diet dominated by insects (65.87% IA) and others prey (33.14% AI), while males are insectivores (62.69% AI). At the bottom station (Aboisso), males diet is dominated by macrophytes (78.35% AI). Females diet is composed of insects (44.25% AI) and others prey (36.61% AI) as the preferred prey.

Table IV: Diet of females and males of *Schilbe mandibularis* at the three sampling stations on the Bia River.

Prey	Upstream		Lake Ayamé		Downstream	
	Female (n=53)	Male (n=41)	Female (n=31)	Male (n=12)	Female (n=11)	Male (n=13)
Insects orders						
Coleoptera	15.48	18.06	26.29	33.79	12.87	5.83
Diptera	1.41	1.74	4.22	0.13	48.93	84.52
Ephemeroptera	0.09	1.07	31.01			
Hymenoptera	32.42	8.92	0.02	1.41		
Orthoptera	63.66	0.44	33.46	64.68	38.19	9.65
Others insects	0.32	69.76	5.00			
INSECTS	38.79	75.89	65.87	37.31	44.25	20.96
OTHERS INVERTEBRATES	9.79	0.17	0.00		0.05	
FISHES	6.15	0.81	0.98			
MACROPHYTE	34.42	1.38	0.00		19.09	78.35
OTHERS PREY	10.85	21.74	33.14	62.69	36.61	0.69

Overall the rank correlation Spearman coefficients obtained indicate no diet difference between specimens of both sexes at the three study sites.

DISCUSSION

Analysis of *Schilbe mandibularis*'s general diet (161 full stomachs) in the Bia River reveals an eclectic tendency in specimens of both sexes with a specialization in insects and other prey or macrophytes. Thus, our results confirm the observation made by [3]. According to this author, *E. mentalis* (synonym *S. mandibularis*) would have a diet consisting of insects, arachnids, fish and plants. Similarly, this

trend was observed by [3] in a study based on a sample of *S. mandibularis* captured at Lake Koussou

As for the seasons, the food trend of variation is confirmed in the dry season in both sexes with fish as food items specialization in some females and males individuals. However, during the rainy season, some of the female sex predators have a specialization piscivory. This seasonal diet variation profile is consistent with the eclectic trend of the species mentioned above. Indeed, it comes from the availability of prey and because of the food opportunism *Schilbe mandibularis*.

Relative to the size of the specimens, with the exception of adult males tendency to specialization piscivory occurred in other specimens. Contrary to the literature, which mentions that the small *Schilbe* specimens are mostly insectivores [17], our results seem rather to reveal that sex will not impact on food preferences

Thus, as [18], have shown, the size of the mouth is certainly a factor which should contribute to the limitation of the fish feed. Which could induce consumption small prey by young predators. To this end, our observations partially confirm these findings.

Moreover [4], demonstrates the piscivory adult specimens of *S. mandibularis*. This trend appeared only in adult specimens from the resorts on Lake Ayamé-and Pont-auto route [7]. According to the latter author, the clarity of the lake water may have contributed to facilitating capture prey fish by adult specimens of *Schilbe mandibularis*. Moreover, the similarities between diets of juveniles and adults could be explained by the overlap of size classes as shown by [19].

In terms of diet in the longitudinal gradient, only specimens of both sexes caught in the headwaters of the Bia River at Bianouan station, have a diet that does not seem very affected by gender. To Lake Ayamé and lower reaches of the Bia, the Aboisso station, trends of specialization vary from one sex to the other. Overall, other prey insects occupy a position of specialization foods of certain specimens of both sexes. In the lower reaches (Aboisso: downstream of the dam Ayamé) insects move from a position of dominance in male than in female secondary while macrophytes occupy the same position in both sexes.

Food trends according to the study basins, the size of the specimens and the stations were confirmed by [20] and [21]. The first cited authors found intestinal coefficients means (average ratio of the length of the intestine on standard length) of *S. mandibularis* of the order of 1.46 is below 3. This places the species studied in the category of general fish-defined by [21] and which include omnivores.

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