Food and Feeding Habit of Two Mugilidae from Lagoon of Grand-Lahou (Côte d’Ivoire) : *Liza dumerili* (Steindachner, 1870) and *Liza falcipinnis* (Valenciennes, 1836)

Irène Kessia Fokouo KOUAKOU1, Tiéhoua KONE1, Fulgence KOUATO1, Konan N’DA2

1Unité de formation et de Recherche des Sciences Biologiques, Département de Biologie Animale, Université Péléforo Gon Coulibaly de Korhogo BP 1328 Korhogo, Côte d’Ivoire

2Unité de formation et de Recherche des Sciences de la Nature, Université Nangui Abrogoua, Laboratoire de Biologie et Cytologie Animale, 02 BP 801 Abidjan 02, Côte d’Ivoire

*Corresponding author’s email : fokouoirene [AT] gmail.com

ABSTRACT---- Study of the diet and feeding habits of 104 specimens of *Liza dumerili* (Steindachner, 1870) and 113 specimens of *Liza falcipinnis* (Valenciennes, 1836) coming from the artisanal fishing of the Grand-Lahou lagoon was carried out over the period from September 2008 to August 2009. Analysis of stomach contents revealed that these two species of fish feed mainly on diatoms and detritus. It appears that these species are phytoplanktonophagous and detritivores. The diet of *Liza falcipinnis* does not vary according to the size of the individuals. These two species specialize in the consumption of diatoms, particularly pennate diatoms.

Keywords---- Artisanal fishing, Stomach contents, Feeding, Phytoplanktonophagus, Côte d’Ivoire

1. INTRODUCTION

Mugilidae are coastal fish of tropical and temperate seas. Brackish, estuarine and lagoon environments are their favorite domain [1]. In Côte d’Ivoire, investigations focused on systematics [2], reproduction [2, 3, 4, 5] and ecology [2]. These fish, which are caught year round, are well represented in the fishery landings from the Grand-Lahou lagoon, although no statistics relating to this are available [4]. However, *Liza dumerili* (Steindachner, 1836) and *Liza falcipinnis* (Valenciennes, 1870), two species of this family of fish, are frequently encountered in the catches of the artisanal fishery of this lagoon. In addition, these species of fish are highly appreciated by the population for the quality of their flesh and are highly prized. Finally, their fishing plays an important socio-economic role [4]. To this end, it appears necessary to conduct a study on the food ecology of these fish species with a view to cultivating them for better management of stocks and meeting the fish needs of human populations.

1. MATERIAL AND METHODS

2.1. Study environment

The Grand-Lahou lagoon is located between 5 ° 07 and 5 ° 14 North latitude and between 4 ° and 5 ° 25 West longitude [6]. It is a lagoon system that runs from east to west over a length of 50 km [7]. This lagoon system includes the Tagba (57 km²), Mackey (28 km²), Tadio (90 km²) and Niouzoumou (15 km²) lagoons. It communicates with the sea through the Grand-Lahou pass at the level of the Tagba lagoon (Figure 1).
2.2. Sampling and data analysis

The fish were harvested from artisanal commercial fishing during the period from September 2008 to August 2009 in the lagoon of Grand-Lahou. The boats used for fishing are small canoes. They are three to four meters in length with 0.5 m wide. The fishing gears consist of gill nets and cast nets. The gill nets used have a length between 25 and 100 m, a height of 2 to 3 m and meshes between 25 and 45mm. The cast nets are 50 to 200 m long, 0.5 to 2 m high and 20 to 25 mm mesh size. After identification of the fish species according to [1], the specimens were weighed to the nearest gram and measured to the nearest millimeter (fork length). The fish were dissected and each stomach was removed and stored in a pill box containing 5% formalin. In the laboratory, the stomach is taken out of the pill organizer and weighed after being rinsed with copious amounts of water, then wrung out on blotting paper. After incision and recovery of the stomach contents, a volumetric dilution was performed to facilitate the separation of the different foods at a rate of 10 to 30 ml of water depending on the size of the stomach. Next, the planktonic prey was observed using solutions of stomach contents mounted between slide and lamella. The identification of phytoplankton was made using the keys of [9, 10, 11]. Their count was carried out under a binocular microscope using a Bürker cell. Zooplankton was identified using the keys of [12, 13, 14], then counted under the microscope under the using a Dolfuss tank. The specimens were grouped into two size classes in Liza falcipinnis according [2]. The first class includes individuals smaller than 18 cm (juveniles) and the second class includes individuals having reached the size of first maturity (size ≥ 18 cm). The size class regrouping at Liza dumerili was not carried out due to insufficient number of full stomachs.

The coefficient of emptiness (Cv) which expresses the percentage of empty stomachs was calculated by the formula:

\[ Cv = \frac{N_v}{N_t} \times 100 \]

where, \( N_v \) is the number of empty stomachs and \( N_t \) is the total number of stomachs examined.

The corrected percentage of occurrence making it possible to determine the food preferences of a given species, \( F_c = \frac{F_i}{\sum F_i} \times 100 \), where \( F_i = \) frequency of occurrence with \( F_i = \frac{N_e}{N_t} \) where \( N_e \) is the number of stomachs containing a category of prey and \( N_t \) is the total number of stomachs containing at least one prey [15, 16].

The percentage by number [17, 18] which represents the proportion of a prey category \( i \) in the total stomach contents was calculated. It is obtained by the equation: \( N = \frac{N_i}{N_t} \times 100 \) where \( N_i \) is the total number of a prey category \( i \) and \( N_t \) is the total number of all prey.

The specific abundance index which is calculated on the basis of knowledge of the number, volume or weight of prey and expressing the proportion of each category of prey, only in the stomachs where it is encountered [19] is determined according to the equation: \( S_i = \frac{a_i}{a_t} \) with \( a_i \), total abundance of prey \( i \) and \( a_t \), total abundance of all prey only in all stomachs containing prey \( i \).

Comparisons of diet between maturity stages were made using the Schoener index [20]. It was used to assess the degree of similarity between the stages.

\[ \alpha = 1 - 0.5 \left( \sum_{i=1}^{n} \left| p_{ai} - p_{yi} \right| \right) \]
Pxi = proportion of prey i consumed by a stage of maturity or individuals of a season (x),
Pyi = proportion of a prey i consumed by a maturity stage individuals of a season (y).
Diets are considered significantly similar when the α value is greater than 0.6 [21]

2.3. Ethologie alimentaire

2.3.1. Feeding ethology

The graphic method of [22], modified by [19] is chosen to describe variations in diet by plotting the specific abundance of prey versus frequency of occurrence in a two-dimensional graph. This method relates the diet of a given species to its feeding strategy. It allows us to analyze the importance of prey, their contribution to the extent of the trophic niche and their feeding strategy.

2.3.2. Statistical analysis

The Costello diagram, modified by [19] is carried out using the STATISTICA 7.1 program [23].

2. RESULTS

3.1. General profile of the diet of Liza dumerili

A total of 104 stomachs were examined, 13 full stomachs were counted, for an emptiness percentage of 87.5%. The stomach contents consist of planktonic prey (phytoplankton and zooplankton), detritus, grains of sand and indeterminate elements (Table 1). The preys (phytoplankton and zooplankton) are divided into 6 groups. Phytoplankton is made up of cyanobacteria (chroococcaceae and oscillatoriaceae) and diatoms (centric and pennate). As for zooplankton, it includes copepods, rotifers, foraminifera, nematodes. Numerically, the most abundant foods are diatoms (67.89%) with a dominance of pennate diatoms (57.56%). They are followed by cyanobacteria (13.71%) then foraminifera (10.43%). The classification of foods based on the percentages of occurrence indicates that diatoms (25.5%), cyanobacteria (21.3%) are important, followed by detritus (16%). Among the diatoms, pennate diatoms (18.1%) are the most consumed prey, as well as chroococcaceae (16.9%) from the cyanobacteria group.
Table 1: Composition of the general diet of *Liza dumerili*; N: percentage by number, Fc: corrected percentage of occurrence, S: specific abundance.

| FOOD ITEMS         | N (%) | Fc (%) | S (%) |
|--------------------|-------|--------|-------|
| PHYTOPLANKTON      | 81.6  | 46.8   | 78.1  |
| CYANOBACTERIES      | 13.71 | 21.3   | 15.58 |
| Chroococcaceae     | 8.74  | 16.9   | 8.28  |
| Chroococcus        | 2.1   | 4      | 7.94  |
| Gomphosphaeria     | 0.76  | 1.1    | 3.82  |
| Merismopedia       | 2.53  | 4      | 4.91  |
| Microcystis        | 2.3   | 4.3    | 3.59  |
| Myxosarcina        | 1.05  | 3.5    | 2.08  |
| Oscillatoriaeae    | 4.97  | 4.4    | 8.51  |
| Oscillatoria       | 1.91  | 1.1    | 10.41 |
| Phormidium         | 3.06  | 3.3    | 16.66 |
| DIATOMS            | 67.89 | 25.5   |       |
| Centric Diatoms    | 10.33 | 7.4    | 26.85 |
| Actinoptychus      | 6.6   | 3.7    | 20.56 |
| Terpsinoe          | 3.73  | 3.7    | 9.37  |
| Pennate Diatoms    | 57.56 | 18.1   | 71.02 |
| Amphora            | 15.6  | 7.4    | 18.88 |
| Cymbella           | 0.19  | 1.1    | 2.94  |
| Gyrosigma          | 5.4   | 2.4    | 19.34 |
| Navicula           | 35.22 | 6.1    | 3.68  |
| Nitzschia          | 1.15  | 1.1    | 5.74  |
| ZOOPLANKTON        | 15.9  | 18.7   |       |
| COPEPODS           | 3.56  | 8.4    | 4.9   |
| FORAMINIFERA       | 10.43 | 8.1    | 15.58 |
| ROTIFERS           | 1.15  | 1.11   | 2.47  |
| NEMATODES          | 0.76  | 1.09   | 1.11  |
| UNDETERMINED       | 2.5   | 2.5    | 2.6   |
| DETRITUS           | -     | 16     |       |

3.2. Feeding ethology of *Liza dumerili*

Analysis of the Costello diagram reveals that *Liza dumerili* has a general diet (Figure 2). The percent occurrence and specific abundance values for centric diatoms, oscillatoriaeae, copepods, rotifers, foraminifera and nematodes are low. As for pennate diatoms, their specific abundance is high (71.02%) while their percentage of occurrence is low (18.1%).
3.3. General diet profile of *Liza falcipinnis*

113 fish stomachs were examined. 38 had full stomachs and 75 had empty stomachs, for an emptiness percentage of 66.4%. Two categories of prey (phytoplankton and zooplankton) divided into 6 groups have been identified. Phytoplankton includes cyanobacteria (14.49%) (chroococcaceae and oscillatoriaceae) and diatoms (83.18%) (centric diatoms and pennate diatoms). Among the diatoms, pennate diatoms (72.76%) are the most abundant. Zooplankton are made up of copepods (0.30%), rotifers (0.6%), foraminifera (0.99%) and nematodes (0.07%). Detritus, grains of sand and an undetermined component are noted (Table 2). Regarding the percentages of occurrence, diatoms are the most important with 42.11%, followed by cyanobacteria (32.84%). Diatoms are dominated by pennate diatoms with 33.33%.
Table 2: Composition of the general diet of *Liza falcipinnis*; N: percentage by number, Fc: corrected percentage of occurrence, S: specific abundance.

| FOOD ITEMS | N (%) | Fc (%) | S(%) |
|------------|-------|--------|------|
| **PHYTOPLANKTON** | | | |
| 97.67 | 74.95 | |
| **CYANOBACTERIES** | 14.49 | 32.84 | |
| Chroococcaceae | 5.45 | 23.35 | 7.33 |
| Chroococcus | 2.14 | 4.1 | 5.39 |
| Gomphosphaeria | 0.11 | 0.49 | 0.81 |
| Merismopedia | 0.8 | 5.1 | 1.6 |
| Microcystis | 0.8 | 4.1 | 1.48 |
| Microcrocis | 0.3 | 1.46 | 1.12 |
| Myxosarcina | 0.76 | 4.3 | 1.11 |
| Synechocystis | 0.6 | 3.8 | 1.43 |
| **Oxillatoriaceae** | 9.04 | 9.49 | 11 |
| Lyngbya | 0.13 | 0.49 | 1.16 |
| Oscillatoria | 3.1 | 3.3 | 5.36 |
| Phormidium | 0.46 | 1.14 | 1.74 |
| Planctothrix | 4.38 | 2.04 | 7.93 |
| Pseudanabaena | 0.97 | 2.52 | 1.81 |
| **DIATOMS** | 83.18 | 42.11 | |
| Centric diatoms | 10.42 | 8.78 | 8.09 |
| Actinoptychus | 4.85 | 4.9 | 7.32 |
| Terpsinoe | 5.46 | 3.5 | 8.12 |
| Melosira | 0.04 | 0.19 | 11.42 |
| Odontella | 0.07 | 0.19 | 1.16 |
| Pennate diatoms | 72.76 | 33.33 | 78 |
| Amphora | 21.6 | 7.6 | 23.77 |
| Cymbella | 0.76 | 1.18 | 3.82 |
| Eunotia | 5.74 | 4.9 | 8.33 |
| Gyrosigma | 13.5 | 6.2 | 14.55 |
| Navicula | 19.15 | 7.4 | 20.92 |
| Nitzschia | 2.71 | 1.45 | 20.87 |
| Pinnularia | 9.3 | 4.6 | 13.78 |
| **ZOOPLANKTON** | 1.96 | 4.91 | |
| COPEPODS | 0.30 | 0.98 | 1.13 |
| FORAMINIFERA | 0.99 | 2.06 | 6.05 |
| ROTIFERS | 0.6 | 1.7 | 2.82 |
| NEMATODES | 0.07 | 0.17 | 3.04 |
| INDETERMINETED | 0.37 | 1.25 | 1.78 |
| **DETRITUS** | | | - |

3.4. Feeding ethlogy of *Liza falcipinnis*

The Costello diagram shows that the species *Liza falcipinnis* has a generalist diet (Figure 3). The frequency of occurrence and specific abundance values of centric diatoms, chroococcaceae, oscillatoriaceae, foraminifera, copepods, rotifers and nematodes are low. Pennate diatoms show a high specific abundance (78%) compared to the percentage of occurrence (33.33%).
3.5. *Liza falcipinnis* diet according to size

Based on the numerical percentage, diatoms with 83.18% are the most abundant prey in small individuals (<18 cm). Among these diatoms, pennate are the most abundant preys (80.18%). They are followed by cyanobacteria (13.12%), detritus (12.86%). In large individuals (> 18 cm), diatoms with 77.25% numerical percentage are the most important preys. They are dominated by pennate diatoms (69.08%). Cyanobacteria (17.13%) come second. Based on the occurrence, diatoms are the most important prey in both size classes with 43.83% for small individuals and 46.15% for large individuals. Then come the cyanobacteria with 23.99% for small sizes and 32.84% for large sizes (table 3). Regarding the feeding strategy, the analysis of the Costello diagram of each size class shows that the fish are generalists (Figure 4). Apart from the pennate diatoms which have a low percentage of occurrence and a high specific abundance, the values of percentage of occurrence and specific abundance of other prey (centric diatoms, chroococcaceae, oscillatoriaceae, foraminifera, copepods, nematodes and rotifers) are weak.

Figure 3: Costello diagram describing the feeding strategy of *Liza falcipinnis*.

Pe: Pennate diatoms; Ce: centric diatoms; Ch: Chroococcaceae; Os: Oscillatoriaceae; Fo: Foraminifera; Co: Copepods; Ne: Nematodes; Ro: Rotifers.
Table 3: Composition of the diet of *Liza falcipinnis* according to the size.

Fc: corrected percentage of occurrence, N: numerical percentage, S: specific abundance

| FOOD ITEMS       | Small size (size < 18 cm) | Large size (size ≥ 18 cm) |
|------------------|---------------------------|---------------------------|
|                  | N (%)  | Fc (%) | S (%)  | N (%)  | Fc (%) | S (%)  |
| PHYTOPLANKTON    | 96.3   | 67.82  |        | 94.38  | 78.99  |        |
| CYANOBACTERIES   | 13.12  | 23.99  |        | 17.13  | 32.84  |        |
| Chroococcaceae   | 4.9    | 13.52  | 5.94   | 18.19  |        |        |
| Chroococcus      | 0.73   | 1.42   | 8.83   | 2.8    | 0.99   | 15.33  |
| Gloeotheca       | -      | -      | 8.63   | 0.18   | 0.32   | 14.4   |
| Merismopedia     | 1.71   | 2.84   | -      | 0.75   | 3.16   | 1.79   |
| Microcystis      | 1.9    | 5.6    | 3.05   | 0.64   | 4.26   | 1.33   |
| Micrococcus      | -      | -      | 2.88   | 0.09   | 1.5    | 5.08   |
| Myxosarcina      | 0.46   | 2.24   | -      | 0.51   | 3.7    | 0.83   |
| Synechocystis    | 0.1    | 1.42   | 1.28   | 0.97   | 4.26   | 6.33   |
| Oscillatoriaeae  | 8.22   | 10.47  | 11.19  | 11.51  |        |        |
| Lyngbya          | 0.2    | 1.42   | 8.51   | 0.18   | 0.45   | 8.04   |
| Oscillatoria     | 5.22   | 4.27   | 0.66   | 3.86   | 2.63   | 1.14   |
| Phormidium       | -      | -      | 7.1    | 0.1    | 1.54   | 0.04   |
| Planctothrix     | 2.5    | 1.94   | -      | 5.38   | 2.63   | 11.4   |
| Pseudanabaena    | 0.3    | 2.84   | 5.25   | 1.67   | 4.26   | 2.33   |
| DIATOMS          | 83.18  | 43.83  |        | 77.25  | 46.15  |        |
| Centric diatoms  | 2.46   | 7.1    | 26.85  | 8.17   | 10.62  | 19.01  |
| Actinocyclus     | 0.2    | 2.84   | 1.9    | 3.83   | 4.26   | 6.03   |
| Terpsinoe        | 2.22   | 284    | 18.14  | 4.16   | 5.61   | 6.84   |
| Melosira         | -      | -      | 7.1    | 0.1    | 1.54   | 0.08   |
| Odontella        | 0.4    | 1.42   | 11.42  | 0.13   | 0.45   | 1.16   |
| Pennate diatoms  | 80.18  | 36.73  | 71.02  | 69.08  | 35.53  |        |
| Amphora           | 30.05  | 11.4   | 38.17  | 17.42  | 6.29   | 71.10  |
| Cymbella          | 1.03   | 1.42   | 2.14   | 1      | 1.54   | 32.7   |
| Eunotia           | 3.4    | 2.84   | 55.4   | 6.36   | 5.8    | 3.68   |
| Gyrotrocha       | 8.3    | 5.6    | 9.57   | 12.4   | 6.35   | 34.84  |
| Navicula          | 16     | 5.6    | 41.01  | 19.3   | 8.01   | 19.2   |
| Nitzschia         | 16.1   | 4.27   | 43.27  | 4.45   | 0.99   | 22.04  |
| Pinnularia        | 5.3    | 5.6    | 4.84   | 8.09   | 5.26   | 6.88   |
| ZOOPLANKTON      | 2.5    | 5.44   | 5.37   | 7.3    |        |        |
| COPEPODS         | -      | -      | -      | 0.58   | 1.54   | 1.13   |
| FORAMINIFERA     | 1.75   | 3.02   | 6.44   | 3.06   | 2.08   | 6.05   |
| CEPHALOCHAETES   | 0.75   | 2.42   | 0.7    | 1.6    | 3.16   | 3.04   |
| NEMATODES        | -      | -      | -      | 0.13   | 0.52   | 2.82   |
| INDETERMINED     | 1.2    | 1.02   | 4.4    | 0.25   | 0.45   | 1.78   |
| DETRITUS         | -      | 12.86  | -      | -      | 7.9    | -      |
3.5. Dietary overlap of the two species

The value of the food overlap index of the two species is: $\alpha = 0.75$.

3.6. Dietary overlap of *Liza falcipinnis* according to size

The food overlap index according to the size of *L. falcipinnis* is as follows: $\alpha = 0.84$

3. DISCUSSION

The analysis of the diet of *Liza dumerili* from the Grand-Lahou lagoon shows that this species feeds on diatoms (67.89%) (pennate diatoms and centric diatoms), cyanobacteria (13.71%) (chroococcaceae and oscillatoriaceae), foraminifera (10.43%), copepods (3.56%), rotifers (1.15%) and nematodes (0.76%). These preys are planktonic. Phytoplankton, in particular diatoms, are the most abundant. Among the diatoms, the pennate diatoms are the most consumed preys. This species has a phytoplanktonophagous diet. The presence of detritus and grains of sand was observed in all stomachs. This indicates that this fish has a preference for diatoms, detritus and sand. It is also a detritivore. These results are consistent with those issued by [24] in the Sine Saloum estuary in Senegal and by [25] in the Pra and Volta estuaries in Ghana. [26-27] reports the presence of foraminifera in the South African estuary; which is consistent with this present study. On the other hand, [28] in Lagos Lagoon in Nigeria underline the absence of foraminifera in these fish. This absence could be due to his living environment. The presence of the sand particles in all the stomachs indicates that they could contribute to the digestion of the prey of these individuals. This hypothesis agrees with that put forward by [29] and [30] who assert that these particles of sand help the stomach to mechanically crush the diatoms. In addition, some authors have observed that *L. dumerili* has the particularity of ingesting larger grains of sand than do other Mugilidae species ([27, 31, 32, 25]. The presence of sand particles in all stomachs would indicate the presence of benthic life of *L. dumerili*. This would explain the food preference of pennate diatoms. The pennate diatoms are mainly benthic diatoms [33].

Moreover, the general diet profile of *Liza falcipinnis* from the Grand-Lahou lagoon shows that this fish consumes the same types of prey as *L. dumerili*. This species is therefore phytoplanktonophagous.

Indeed, the most abundant preys are the diatoms (83.18%) more particularly the pennate diatoms (72.76%). In addition to diatoms [34] in Nigeria in his work reports the presence of other algae (slime, rhodophyceae, chlorophyceae and dinophyceae) which was not observed in this study. This could be due to the unavailability of these algae in the Grand-Lahou lagoon. According to [8], the phytoplankton densities of this lagoon are seasonal. They are greater during the short dry season and the long rainy season, low in the long dry season and low in the short rainy season.
This present study shows that diatoms and detritus constitute the bulk of the prey consumed by this species. This fish is a detritivore. Also, our results corroborate those of [28] and those of [31] in Sierra Leone; [25] in Ghana.

Studies carried out by [2], in the Ebrié lagoon in the Ivory Coast have presented results similar to ours. These authors indicate that in the Ebrié lagoon L. falcipinnis seems to be distinguished from the other species of mullet studied by a more opportunistic diet.

It has the possibility of including elements of zooplankton and macro-invertebrates in its diet and especially that of ingesting more and better assimilating cyanobacteria [2]. In the present study, the individuals examined did not consume macroinvertebrates. This could be due to the fishing area. Indeed, these authors attest that macro-invertebrates were observed in L. falcipinnis individuals from lagoon areas under strong marine influence. The Grand-Lahou lagoon communicates partially with the marine environment [36] while the Ebrié lagoon is permanently [37].

In the diet of L. falcipinnis, diatoms are the most important prey regardless of the size of this fish. However, small individuals did not consume copepods and nematodes. The diet according to the size of L. falcipinnis does not vary. This assertion is the same as that made by [25] in Ghana.

*Liza dumerili* and *Liza falcipinnis* are mainly phytoplankton and scavengers. [38] qualify them as limnivorous, that is to say that they swallow the mud and sift it through a gill apparatus developed to extract organic particles. Moreover, in our study, the coefficient of vacuité of the two studied species is high especially that of *L. Dumerili*. This could be due to the time of day fishing. [39] (2002) In [38] justify this situation by the fact that mules graze seagrass during the day, and at night, suck clay from mudflats to cleanse their stomachs. Which would explain the high number of empty stomachs. [25] state that in the Volta estuary mullets do not feed at night, which is not the case in the lagoons of Elmina and Cape cost in Ghana [32-40].

Regarding the feeding strategy of these two species, the Costello diagram of each species indicates that they are on a generalist diet. However, the majority of the population of each species specializes in the consumption of diatoms, especially pennate diatoms. This is explained by the fact that their specific abundance is high (71.02% for *L. dumerili* and 78% for *L. falcipinnis*) compared to their percentage of occurrence (18.1% for *L. dumerili* and 33.33% for *L. falcipinnis*). Centric diatoms, oscillatoriaceae, copepods, rotifers, foraminifera, and nematodes show low values for specific abundance and percent occurrence in both species. These low values indicate that these prey are rare in the diet of these fish. This means that they are eaten by a small percentage of predators. In this case, the ecological niche of these species is said to be restricted [19]. Therefore, their position in the food web of the ecosystem is interesting in that they are the main primary consumers within the fish fauna. This could be beneficial for aquaculture. [25] support this assertion by the fact that their low trophic level is an asset for aquaculture because the establishment of these foods requires little means.

*L. dumerili* and *L. falcipinnis* have a high dietary overlap index (α = 0.75) and greater than 0.6. This index shows that these two species have a similar diet. This similarity could lead to food competition between them if the availability of resources were to decrease [41].

Regarding the dietary overlap of *L. falcipinnis* according to size, the overlap index (α = 0.84) of the two size classes exceeds the cut-off value. This could mean that there is food competition between individuals of the two size classes.

4. **CONCLUSION**

The stomach contents of *Liza dumerili* and *Liza falcipinnis* from the Grand-Lahou lagoon consist mainly of diatoms, detritus and sand particles. These fish are phytoplanktonophagous and detritivores. The diet of *Liza falcipinnis* does not vary with height. These two species specialize in the consumption of diatoms, particularly pennate diatoms.

6. **REFERENCES**

[1] Albaret JJ, Mugilidae. In : Poissons d’eaux douces et saumâtres de l’Afrique de l’ouest ; Paugy D., Lévêque C. et Teugels G G, (Eds) : Edition IRD, Tome II, pp. 602-611, 2003.

[2] Albaret J J, Legendre M, Biologie et écologie des mugilidés en lagune Ebrié (Côte d’Ivoire). Intérêt potentiel pour l’aquaculture lagunaire. Centre de recherche oceanographique, Rev. Hydrobiol. Trop., vol 18 n°4, pp. 281-303, 1985.

[3] Djadji E L G, Atsé B C, Sylla S, Konan K J, Kouassi N J, Reproduction du Mugilidae *Mugil cephalus* Linné, 1758 dans deux complexes lagunaires (lagunes Ébrié et de Grand-Lahou) de la Côte d’Ivoire. Int. J. Biol. Chem. Sci. vol 7 n°4, pp. 1701-1716, 2013.

[4] Diaby M, Distribution spatio-temporelle, pêche et dynamique de la population de Mugilidae (poisson, teléostéens) de la lagune de Grand-Lahou (Côte d’Ivoire). Thèse de Doctorat de l’Université Nangui Abrogoua, Abidjan, 2014.
[5] Alla E Y GH, Adepo-Gourène A B, Stratégies de reproduction de trois espèces de Mugilidae, Liza dumerili (Steindachner, 1870), L. grandisquamis (Valenciennes, 1836) et L. falcipinnis (Valenciennes, 1836) dans la lagune Ebrié, Sud, Côte d’Ivoire. Afri. Scienc. vol 16 n°1, pp. 279-299, 2020.

[6] Durand J R, Skubich M, Recherche sur les lagunes ivoiriennes. Doc. C.R.O., Abidjan, 1979.

[7] Lae R, Premières observations sur la pêche en lagune de Grand-Lahou. D.E.A. Océanographie tropicale, Université de Brest, 1982.

[8] Komoé, K Da K P, Kouassi A M, Aka N M, Kamanzi A K, Adingra A A, Seasonal distribution of phytoplankton in Grand-Lahou lagoon, Côte d’Ivoire. Eur. J. Sci. Res., vol 26 n°3, pp 329-341, 2009.

[9] Desikachary T V, Cyanophyta. Indian council of Agriculture research, New Delhi, 1959.

[10] Compère P, Algues de la région du lac Tchad. IV. Diatomophycées. Cahier de l’ORSTOM, S. Hydrobiol., vol 9 n°4, pp 203-290, 1975.

[11] Komarek J, Anagnostidis K, Cyanoprokaryota - 1. Teil: Oscillatoriales. In : Ettlh., Gärtnert., Heying, H. & Mollenhawer. D. (Eds.): Süßwasserflora von Mitteleuropa 19/1, Gustav Fisher, Jena / Stuttgart /Lübeck, 1998.

[12] Dussart B H, Les copépodes. In: Flores et faunes aquatiques de l’afrique sahelo-soudanaise. Tome I ; Durant, J. R., et Lévêque, C., (Eds.), ORSTOM, Paris, vol 1; pp 333-356 1980.

[13] Pourriot R, Les rotifères. In Flore et faune aquatiques de l’Afrique Sahélo-Soudanienne ; Durant, J. R. et Lévêque, C., (Edit.), ORSTOM, Paris : pp 219-244, 1980.

[14] Sandacz S, Kubo E., Copépode (Calanoïda e Cyclopoïda) de reservatorios do estado de Sao Paulo. B. Inst. Pesca. 9(único) : pp 51-89, 1982.

[15] Paugy D, Lévêque C, Régimes alimentaires et réseaux trophiques. In : Lévêque, C., et Paugy, D., (Eds.), les poissons des eaux continentales africaines : Diversité, écologie et utilisation par l’homme. Editions IRD, Paris, pp 167-190, 1999.

[16] Gray A E, Mulligan T J, Hannah R W, Food habits, occurrence and population structure of the bat ray, Myliobatis californica, in Humboldt Bay. California. Envir. Biol. Fish., vol 49, pp 227-238, 1997.

[17] Lauzanne L, Régime alimentaire d’Hydrocyon forskalii (Pisces. Characidae) dans le lac Tchad et ses tributaires. Cah. ORSTOM. Sér. Hydrobiol., vol 9, pp 105-121, 1975.

[18] Hyslop E J, Stomach contents analysis, a review of methods and their application. J. Fish Biol., vol 17, pp 411-429, 1980.

[19] Amundsen P A, Gabler H M, Staldvik F J, A new approach to graphical analysis of feeding strategy from stomach contents data-Modification of the Costello (1990) method. J. Fish Biol., 48 : 607-614, 1996.

[20] Schoener T W, Non-synchronous spatial of lizards in patchy habitats. Ecology, vol 51 : pp 408-418, 1970.

[21] Wallace R K, An assessment of diet overlap indexes. Transactions of American Fisheries Society., vol 110, pp 72-76, 1981.

[22] Costello M J., Predator feeding strategy and prey importance: A new graphical analysis. J. Fish Biol., vol 36, pp 261-263, 1990.

[23] Stat-Soft France, STATISTICA (logiciel d’analyse de données), version 7.1. www.statsoft.fr, 2006.

[24] Ngouda S, Contribution à l’étude qualitative du régime alimentaire de quelques poissons dans l’estuaire du Sine Saloum (Sénégal). Document scientifique du centre de recherches océanographiques de Dakar-Thiaroye. N°142, 1997.

[25] Dankwa H R, Blay Jr J, Yankson K, Food and feeding habits of Grey Mullets (Pisces: Mugilidae) in two estuaries in Ghana A. J. O. L. vol 8 n°1, 2005.

[26] Blaber S J M, The food and feeding ecology of Mugilidae in the St Lucia lake system. Biol. J. Limn. Soc., vol 8, pp 267-277, 1976.

[27] Blaber S J M, The feeding ecology and relative abundance of mullet (Mugilidae) in Natal and Pondland estuaries. Biol. J. Limn. Soc., vol 9, pp 259-275, 1977.
[28] Fagade S O, Olaniyan C I O, The food and feeding interrelationship of the fishes in the Lagos lagoon. J. Fish. Biol., vol 5, pp 205-225, 1973.

[29] Marais J F, Aspect of food intake, food selection and alimentary canal morphology of Mugil cephalus Linne, Liza tricuspidens Smith, L. richardsoni Smith and L. dumerili Steindachner. J.exp. mar. Biol. Ecol., vol 44, pp 193-210, 1980.

[30] Asif A K, Masroor F, Feeding Ecology of the Grey Mullet, Rhinnomugil corsula (Hamilton) from the River Yamuna, North Asia. Fish. Scienc., vol 7, pp 259-266, 1994.

[31] Payne A, The relative abundance and feeding habit of the grey mullet species occurring in an estuaries in Sierra Leone, West Africa. Mar. Biol., vol 35, pp 277-286, 1976.

[32] Blay J, Food and feeding habits of four species of juvenile mullet (Mugilidae) in a tidal lagoon in Ghana. J. Fish Biol., vol 46, pp 134-141, 1995a.

[33] Bussard A, Capacités d’acclimatation des diatomées aux contraintes environnementales. Thèse de doctorat Museum national d’histoire naturelle, 2015.

[34] King R P, Observations on Liza falcipinnis (Valenciennes, 1836) in Bonny River, Nigeria. Rev. Hydrobiol. Trop., vol 21 n°1, pp 63-70, 1988.

[35] Payne A, Gut pH and digestive strategies in estuarine grey mullet (Mugilidae) and tilapia (Cichlidae). J. Fish. Biol., vol 13, pp 627-629, 1978.

[36] Abé J, Bakayoko S, Bamba S B, Koffi K P, Morphologie et hydrodynamique à l’embouchure du fleuve bandama. ur. Ivoir. Océanol. Limnol. Abidjan., vol 2, pp 9-24, 1993.

[37] Dufour P, Production primaire d’une lagune tropicale (Ebrié, Côte d’Ivoire). Facteurs naturels et anthropiques. Thèse université Pierre et Marie-Curie, paris, 1984.

[38] Bernadon, M, Vall M O M, Le Mulet en Mauritanie : biologie, écologie, pêche et aménagement. Projet PRCM, 2005.

[39] Worms J, Mouloud A O E, les savoirs traditionnels des Imraguen liés à la pêche. Projet CONSDEV, 2002.

[40] Blay J, Food habits and diel feeding periodicity of juvenile sicklefin mullet, Liza falcipinnis (Pices: Mugilidae) in a closed tropical lagoon. Arch. Hydrobiol, vol 135, n°2, pp 271-281, 1995b.

[41] Pusey, B J Bradshaw S D, Diet and dietary overlap in fishes of temporary waters of southwestern Australia. Ecol. Freshwater. Fish, 5, pp 183-194, 1996.