



## FOOD AND FEEDING HABIT OF *MACROBRACHIUM FELICINUM* AND *MACROBRACHIUM VOLLENHOVENII*, AT THE AMASSOMA AXIS OF IGBEDI CREEK, BAYELSA STATE

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### ABSTRACT

Food as a nutritious substance is necessary for the survival of any organism including *Macrobrachium felicinum* and *Macrobrachium vollehovenii*. The investigation of the food and feeding habit of these species in Amassoma Axis of Igbedi Creek, Bayelsa State which was carried out for 12 calendar month in the year 2020 indicates that *Ulothrix* is the most consumed phytoplankton species for *M. felicinum* with (56.25%) and *Aphanochaete* (14.53%) for *M. vollehovenii*. Plant materials consumed by *M. felicinum* constituting (62.5%), while *M. vollehovenii* consumed (18.86%). The most consumed zooplanktons is the Copepod *M. felicinum* (31.25%); *M. vollehovenii* (9.45%). The index of relative importance of each food item showed that plant material has the highest significance in *M. felicinum* (18.12%) and (21.22%) for *M. vollehovenii* respectively. The knowledge of the diet of a species in nature is important for the establishment of its nutritional needs and shows its interaction with other organisms. The both species are omnivorous species with preference to plankton, plant materials and crustaceans. Based on the result of this study, culture of these species to support the aquaculture industry in the study area is recommended.

**Keywords:** *Macrobrachium*, edible-material, Creek,

### INTRODUCTION

Food is simply referred to as any edible material that can be digested, assimilated and utilized for energy production (Deekae *et al.*, 2016). Food is important for the survival, well-being, migration and growth of living organisms (Akuna and Amachree, 2019). Stomach or gut content analysis had been recognized as one certain way to determine the food of any animal. Information from such analysis serves as key element in the protection of species and ecosystems. The food of a species can be whole or and must be of flora and fauna sources as these influences the Feeding behaviour. Environmental changes can also influenced feeding behaviour such as temperature changes (Wang *et al.*, 2016). Food studies is crucial as it helps to understand the nutrition of species for culture purposes (Ayisi *et al.* 2017).

Many species take in microscopic food and after being digested are reduced to fragments and are so mixed up that identification of individual food types and quantity becomes very difficult. So far, the foregut is the only means of observing the natural diet in many aquatic organisms because the food type they consumed are very difficult to identify from field observation (Deekae *et al.*, 2016). *Macrobrachium* species have been investigated by several author to determine its food in the aquatic environment.

The species *Macrobrachium macrobrachion* have been described as an omnivore preferring algae (Deekae *et al.*, 2016). The genus *Macrobrachium* like other palaemonid species and shrimps are omnivores and showed preference for algae (Bakhtiyar *et al.*, 2014). Jimoh *et al.* (2015) reported *Macrobrachium vollehovenii* to be considered as an omnivorous detritivore as they take their food from the bottom of their habitats or from the fauna associated with submerged and shore vegetation in the water bodies, which they migrate through. *M. carcinus* is considered omnivorous species, but with a vital carnivorous component, similar to that found in other *Macrobrachium* species (Lima *et al.*, 2014). This study therefore provides information

on the food and feeding habits of two African prawns, *Macrobrachium felicinum* and *Macrobrachium vollenhovenii*.

## MATERIALS AND METHODS

### The Study Area

The study was carried out at Amassoma axis of Igbedi Creek which is a tributary in Bayelsa State. Bayelsa State is the southernmost part of Nigeria. Bayelsa State lies at latitude 4° 39' 50" North and longitude 6° 2' 13.15" East. The Igbedi Creek was purposively selected because the species are caught by fishers in the Amassoma axis. Amassoma is located within latitude 4° 58' 15" N and longitude 6° 06' 32.94" E along Igbedi Creek. It lies within the flood plains of the western flanks of the Wilberforce Island in Southern Ijaw Local Government Area of Bayelsa State (Figure 1).

### Collection of Shrimp Samples

Fresh live specimens of *Macrobrachium felicinum* and *Macrobrachium vollenhovenii* were obtained from fishers for twelve calendar months' biweekly at Amassoma. Specimens were kept and preserved in 10% formalin and taken to the Department of Fisheries Wet Laboratory at the Niger Delta University

### Stomach Content Analysis

The food of the species were analysed by examining the gut or stomachs of *Macrobrachium felicinum* and *Macrobrachium vollenhovenii*. Each gut content was exposed using dissecting sets by removing the carapace, and the gut was separated with dissecting needle.

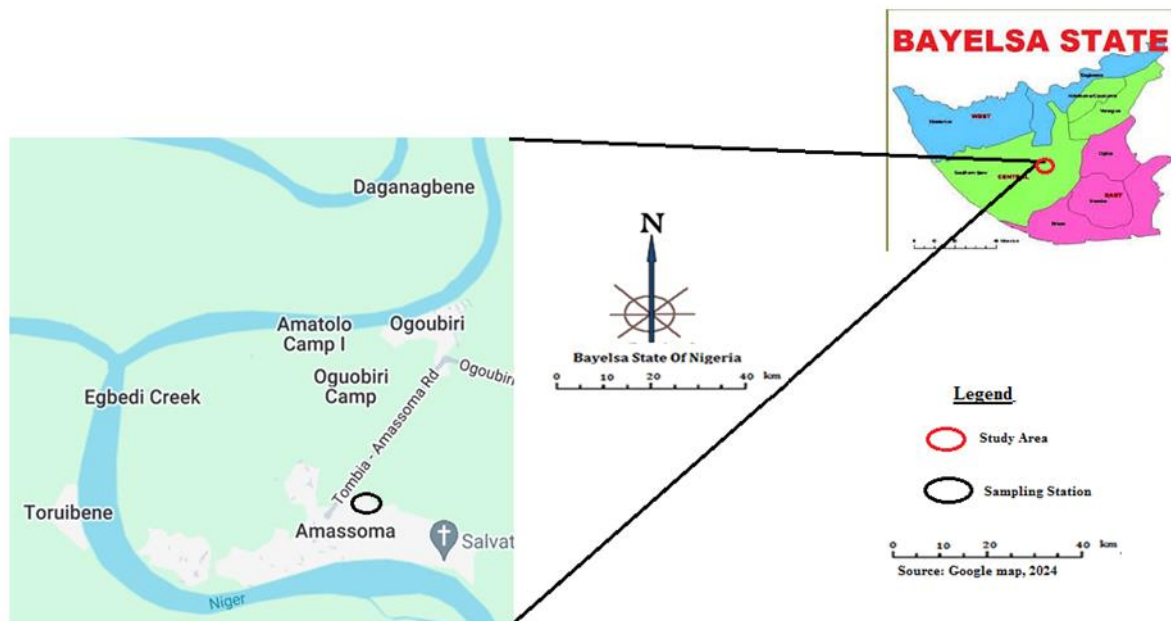


Figure 1. Map of Amassoma, Bayelsa State

The gut was then slit open using blade and the entire contents placed on a slide to which a drop of distilled water was added. The slide was viewed under the binocular microscope Olympus model CX31 Binocular Microscope. The slide was viewed under (4-40x) magnification. Organisms were identified with appropriate field guides (Mekong River Commission, 2015) and field guides utilized by Deekae *et al.* (2016). The frequency of occurrence and point methods were utilised for analysing the food items.

### Frequency of occurrence method

This method of food analysis involves counting the number of times a food item occur in the gut. And it is expressed in percentage. Empty stomach is not included.



$$\text{Frequency of occurrence (FO)} = \frac{\text{Total number of stomachs with the particular food item}}{\text{Total number of stomachs with food}} \times 100$$

.....equation (1)

**Point Method**

This involve assigning points to different food items with consideration of their numbers and sizes as one large organism may be equivalent to many small items. It also expressed in percentage.

$$\text{Percentage points of a food item} = \frac{\text{Number of points of the particular food item}}{\text{Total number of stomachs with food}} \times 100$$

.....equation (2)

Each methods of food analysis emphasises the importance of different categories of food items. This is achieved using the Index of relative importance (IR) which is the measure of the distinct parts of the food item and it is based on the Absolute importance index (AI) (Deekae *et al.*, 2016). This is because Absolute importance index takes into consideration the methods of analysis that reflect numbers, occurrence and bulk of food. Index relative importance (IR) was calculated using the formular below:

$$RI = \frac{100AI}{\sum_i^n AI} \dots\dots\dots \text{equation (3)}$$

AI = Absolute importance index (i.e. % occurrence +% point) of food item

AI = %F+%P .....Equation (3.14)

%F = the percentage frequency of occurrence of a food item.

%P = the percentage point of the food item.

N= number of the different food items.

$$\sum_i^n AI = \frac{AI_1 + AI_2 \dots\dots AI_n}{\sum N} \dots\dots\dots \text{equation (4)}$$

N = number of the different food items.

**RESULT AND DISCUSSION**

**Gut Content Analysis**

The stomach of *M. felicinum* and *M. vollenhovenii*, showed that plankton and plant materials are the major food items which dominated the preferred food items in the two species (Table 1 and 2).

**Table 1:** Stomach content analysis, indicating the frequency of occurrence and point methods of both species at Amassoma

S/No.	FOOD ITEM	No of stomach of each species		Frequency of occurrence method (%)		Point method (%)		
		MF	MV	MF	MV	MF	MV	
Xantophyta	<i>Tribonema</i>	3	317	18.75	10.66	0.43	0.59	
Diatom	<i>Melosira</i>	4	201	25	6.76	8.57	8.24	
	<i>Nitzschia</i>	0	121	0	4.07	0.71	1.03	
	<i>Achnanthes</i>	2	139	12.5	4.67	1.43	1.18	
	<i>Gomphonema</i>	5	333	31.25	11.20	0.86	0.74	
	<i>Synedra</i>	1	55	6.25	1.85	1.14	0.88	
	<i>Pinnularia</i>	6	126	37.5	4.24	0.57	1.03	
	<i>Epithemia</i>	0	54	0	1.82	0.86	0.15	
Chlorophyta	<i>Ulothrix</i>	9	351	56.25	11.80	1.29	0.74	
	<i>Oedogonium</i>	1	226	6.25	7.60	5.00	5.88	
	<i>Stigeoclonium</i>	4	311	25	10.46	3.57	2.35	
	<i>Cloniophora</i>	6	341	37.5	11.47	4.29	4.71	
	<i>Pteromonas</i>	2	333	12.5	11.20	1.00	1.32	
	<i>Mougeotia</i>	1	431	6.25	14.49	0.43	0.15	
	<i>Zygmema</i>	1	303	6.25	10.19	0.57	1.62	
	<i>Prasiola</i>	1	228	6.25	7.67	1.86	1.03	
	<i>Rhizoclonium</i>	1	320	6.25	10.76	0.57	1.32	
	<i>Aphanochaete</i>	3	432	18.75	14.53	1.71	0.74	
	<i>Trentepohlia</i>	6	201	37.5	6.76	0.86	1.32	
	Cyanophyta	<i>Aphanizomenon</i>	1	185	6.25	6.22	0.71	0.29
		<i>Microcoleus</i>	2	126	12.5	4.24	1.14	1.47
<i>Tolypothrix</i>		4	316	25	10.63	0.29	0.59	
<i>Nostoc</i>		0	127	0	4.27	2.29	2.50	
<i>Anabaena</i>		0	101	0	3.40	4.29	3.97	

*M. v*: *Macrobrachium vollenhovenii*, *M.f*: *Macrobrachium felicinum*

Source: Field survey (2020)

Plant materials were the most occurring food items, *M. felicinum* constituting (62.5%), and (18.86%) for *M. vollenhovenii*. The phytoplankton found in the stomach of both species are shown on table 1 and 2, of which Chlorophyta are more preferred, having eleven species identified and the species *Ulothrix* is the most frequently occurring species found in the gut of *M. felicinum* (56.25%) while *Aphanochaete* is the most frequently occurring species (14.53%) in the gut of *M. vollenhovenii*.

Plant materials scored the highest point as large sized food items for both species; *M. felicinum* (8.00%) and *M. vollenhovenii* (9.56%). The phytoplankton *Melosira* score the highest point (8.57%) and (8.24%) respectively. The flora component of the food items are the most sorted food items for both species as presented on (table 1).

The fauna materials examined include Amphipod, Nematode, Rotifer, Insect parts and parts of crustaceans. Unidentified organisms and sand grains were also encountered. Copepod was (31.25%) and (9.45%) respectively in terms of occurrence while Cladocera had the highest score of (6.43%) and (7.35%) (table 1). Rotifer is the least consumed zooplankton for *M. felicinum* (25.00%) while Mosquito larva (0.03%) is the least occurring food item for *M. vollenhovenii*.

The index of relative importance of each food item showed that, plant materials has the highest significance in *M. felicinum* (18.12%) and *M. vollenhovenii* (21.22%) respectively (Figure 2). The knowledge of the diet of a species in nature is important for the establishment of its nutritional needs and shows its interaction with other organisms.

The analysis of the gut contents of *M. felicinum* and *M. vollenhovenii* indicate that the prawns feeds on microscopic organisms and large food items (flora and fauna components), which includes Phytoplankton, Plant parts, Zooplankton and Nematode. This indicates that both species feed on a variety of organisms which made them omnivorous species. The result showed that the species *M. felicinum* and *M. vollenhovenii* consume similar diet as both species were caught together in the same gear. This is in agreement with the findings of Deekae *et al.* (2016), which reported that crustaceans are omnivores. Jimoh *et al.* (2015), described *Macrobrachium vollenhovenii*, as an omnivorous detritivore. Lima *et al.* (2014) described *M. carcinus* as omnivores species which is the feeding behaviour of most prawns and shrimps (Bakhtiyar *et al.*, 2014). The occurrence of sand grains is not because it is a preferred food item but because of the species opportunistic behaviour as indicated by Deekae *et al.* (2016).

**Table 2.** Continuation of stomach content analysis, indicating the frequency of occurrence and point methods of both species at Amassoma

S/No.	FOOD ITEM	No of stomach of each species		Frequency of occurrence method (%)		Point method(%)	
		MF	MV	MF	MV	MF	MV
Euglenphyta	<i>Euglena</i>	0	243	0	8.17	2.86	2.50
	Plant parts	10	561	62.5	18.86	8.00	9.56
Insects	Chironomid larva	0	2	0	0.07	0.43	1.32
	Mosquito pupa	0	1	0	0.03	3.00	1.76
	Larva's of insects	5	41	31.25	1.38	4.71	4.41
	Amphipod ( <i>Gammarus pulex</i> )	5	67	31.25	2.25	0.86	1.03
Copeode	Part of Copepod	5	281	31.25	9.45	7.14	6.03

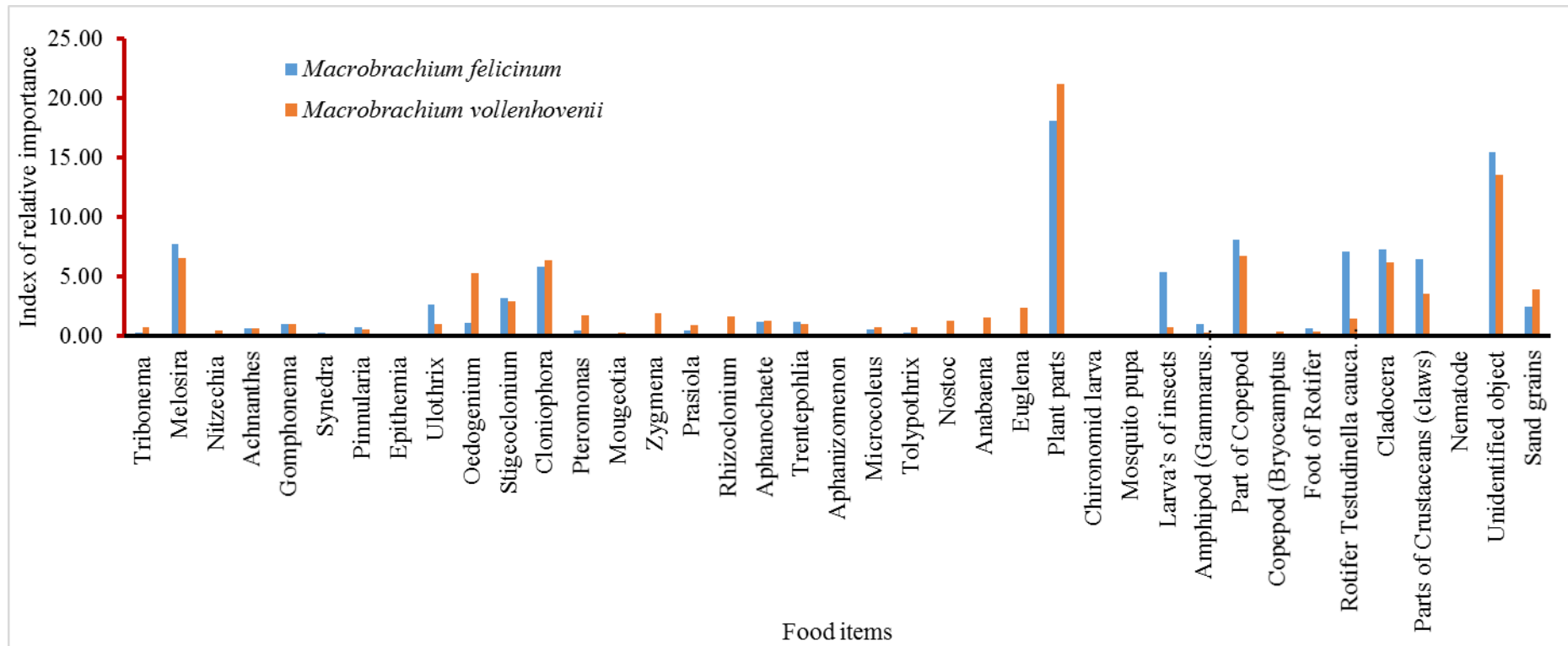




	Copepod	0	84	0	2.82	0.71	1.18
	<i>(Bryocamptus</i>						
Rotifer	Foot of Rotifer	5	87	31.25	2.93	0.57	1.03
	Rotifer	4	55	25	1.85	7.86	6.91
	<i>Testudinella</i>						
	<i>cauca</i> (Parsons, 1892)						
	Cladocera	5	213	31.25	7.16	6.43	7.35
	Parts of	10	319	62.5	10.73	2.86	2.79
	Crustaceans						
	(claws)						
	Nematode	0	15	0	0.50	0.86	1.32
	Unidentified	12	531	75	17.85	5.71	6.47
	object						
	Sand grains	3	400	18.75	13.45	3.57	2.50
	Total stomach	16	2974	100	100	100	100
	with food						
	Empty stomach	6	710				
	TOTAL	22	3684				
	SPECIMEN						

*M. v: Macrobrachium vollenhovenii, M.f: Macrobrachium felicinum*

Source: Field survey (2020)



**Figure 2:** Index of relative importance of *M. v*: *Macrobrachium vollenhovenii*, and *M.f*: *Macrobrachium felicinum*



## CONCLUSIONS AND RECOMMENDATION

Qualitative analysis of the stomach contents using the frequency of occurrence and point methods to determine the feeding behaviours of *M. felicinum* and *M. vollenhovenii* at Igbedi Creek indicates that both species are omnivorous, with preference to plankton and plant materials with opportunistic feeding behaviour which indicates species that can adapt to feed abundance or scarcity. This feeding behaviour is an important factor for the culture of species. Further research on the biology and feeding behaviour of these species should be investigated.

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