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Food and feeding habit of *Mormyrus rume* (Valenciennes, 1846) in Lake Geriyo, Adamawa, Nigeria

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Abstract
Mormyrus, a prominent fish within the Mormyridae family in Lake Geriyo and are commercially found in fresh, smoked, fried and roasted forms across the diverse markets of Adamawa, Nigeria. The feeding habit of elephant snout fish from Lake Geriyo was studied during the period of dry season between October, 2022 to March, 2023. A total of 134 samples of fish species were sampled monthly from commercial fishers' catches at exactly 6:00am at the landing site. The major fishing methods employed by fisher folks for collecting the specimens were cast netting and set netting. The stomach contents were analysed using numerical and frequency of occurrence approaches. The results from this study indicated out of the 134 specimens collected during the study period, 69 were males, and 65 were females. Stomachs of 65 and 64 individuals were found to have recognizable food items. The higher percentage of identified food items by number were benthic insects and detritus which accounted for 69.713% and 64.155% respectively, while the higher percentage frequency of occurrence were detritus and chlorophytes accounted for 100% and 98.462% respectively. This revealed that *M. rume* is a bottom feeder, since benthic insects and detritus were the dominant food components. Diatoms, crustaceans, rotifers and protozoans had relatively lower contributions. The numerical analysis revealed insectivorous behaviour, the frequency of occurrence indicated detritivorous behaviour, and the relative contribution index demonstrated a preference for insects over detritus. Variation in stomach fullness revealed that 45.522% of the total stomachs examined were at a half-full capacity and females consistently showcase higher foraging intensity than males. The most influential factor affecting the foraging activity of *M. rume* was the cold phase of the dry season.

Keywords: Food, feeding habit, stomach content, *Mormyrus rume,* Lake Geriyo

Introduction

Members of the family of Mormyridae are among the important commercial fishes found in Lake Geriyo, Adamawa State, Nigeria.

Elephant snout fish *(Mormyrus rume)* also known as 'Bani Aron Baki' in Hausa language, is a type of fish categorized within the family Mormyridae, in the order Osteoglossiformes (Jibrin and Shu'aibu, 2023) [27]. The members (Elephantfishes) of the family Mormyridae inhabit freshwater environments in tropical Africa (Greenwood *et al.* 1966), and are equipped with weak electric organs (Ladich and Tanja, 2016) [35]. These fish have distinctive appearances, with significant variations in head shape and the size of their unpaired fins.

Generally, every fish needs energy for growth, reproduction, and migration, and this energy is derived from its food sources. "Food refers to any substance consumed, typically derived from plants or animals, and it contains the necessary nutrients". These nutrients can be broken down by the fish, assimilated by the fish cells, and utilized for energy production to sustain life or promote growth. On the other hand, "feeding constitutes the primary activity throughout the entire lifespan of fish (Royce 1972) [43]". According to Gerking (1994) [16], feeding behavior of fish involves the pursuit and consumption of food, whereas food habits and diet refer to the substances that fish consistently consume. The dietary preferences and feeding behaviors of various fish species frequently exhibit significant variations. Moreover, the same fish may display varying food preferences as it matures or with changing seasons (Maar *et al.,* 1983) [36].

However, numerous studies have been undertaken on the stomach contents of various tropical fish species to better understand their natural feeding habits and how they interact with their environments (Ugwumba *et al.*, 1990; Nadeem *et al.*, 2019) [46, 39]. Information on interactions of fish within aquatic systems are derived from an understanding of the dietary preferences and feeding behaviors of fish (Bayhan *et al.*, 2013;) [6]. This knowledge is pivotal for selecting suitable fish species for aquaculture (Azadi *et al.*, 2009; Manon and Hossain, 2013) [2, 38]. Fish feeding activities are influenced by various factors, including composition of available food organisms (Manon and Hossain, 2013;) [38]. Analyzing stomach contents provides valuable information on fish food consumption and assimilation rates (Azadi *et al.*, 2009; Bayhan *et al.*, 2013) [2, 6]. Furthermore, information regarding diet composition, relative gut length (*RGL*), index of fulness (*IF*), index of relative importance (*IRI*) and foraging intensity are crucial for fish farming practices (Gumus *et al.*, 2002; Bakhoum and Fatas, 2003; Manon and Hossain, 2013) [19, 5, 38]. These parameters help to evaluate environmental variations (Bonato *et al.*, 2012) [8], and serves as a biological indicator for assessing fish foraging intensity (Bocholtz *et al.*, 2009) [9]. Fawole (2002) [14] reported that the main food items in stomach of *M. rume* in Lekki Lagoon (Nigeria) were detritus and plants. According to Babatunde and Raji (2004) [3], *M. rume* were bottom-dweller that predominantly fed on insect larvae. In contrast, Ipinjolu *et al.* (2005) [24] reported that *M. rume* in River Rima and Goronyo reservoir (Nigeria) consumed both plant and animal-derived items. Moreover, Odedeyi and Fagbenro (2010) [48] documented that *M. rume* in River Ose (Nigeria) relied primarily on benthic insects and crustaceans as their main source of food.

Irrespective of its significance in the local economy, there has been no prior research conducted on the dietary and feeding behaviors of *M. rume* in Lake Geriyo. Therefore, there is a critical need for a study to investigate these aspects of this fish species. Understanding the food preferences and feeding patterns of *M. rume* will provide essential information on how nutrients move through aquatic ecosystems (Fatema *et al.*, 2013; Rahman *et al.*, 2020) [13, 42]. As this will aid in effective species management for optimal yield in aquaculture because a fish success in its environment is closely tied to its dietary choices, and offers valuable insights into its natural history (Kim *et al.*, 2019; Khanom *et al.*, 2020) [32, 31].

Therefore, the current study aimed to examine the food and feeding habit, occurrence, distribution, periods of active foraging and level of intensity in *M. rume* in the Lake. The data obtained will contribute to both academic knowledge and practical applications.

Materials and Methods

Study Area

The study was conducted in Lake Geriyo, Yola North Local Government Area of Adamawa State. Lake Geriyo is positioned at coordinates 09º 18' 11"N and 12º 25' 36"E (Figure 1) and occupies natural depression close to the upper Benue River in the north-eastern part of Nigeria (UBRBDA, 1985). Based on the information provided by the leader of the local fisher folk, Lake Geriyo was naturally formed when the River Benue became blocked due to significant silt accumulation approximately 60 years ago. This blockage created a small gully, which eventually filled with water from rainfall and the flooding of the River Benue. The Lake is relatively shallow, with an average depth of around 2 meters. During the rainy season from May to September, the River Benue causes the lake to become flooded. The aquatic vegetation in the Lake consists of various types of floating weeds, including water hyacinth, typha grass, water lilies, and wild guinea corn. These plants tend to drift across the surface of the Lake due to prevailing winds (Ekundayo *et al.*, 2014) [11]. The primary commercially important fish species in the Lake are Clarias and Tilapia (UBRBDA, 1985) as cited by Kefas and Abubakar (2022) [30].

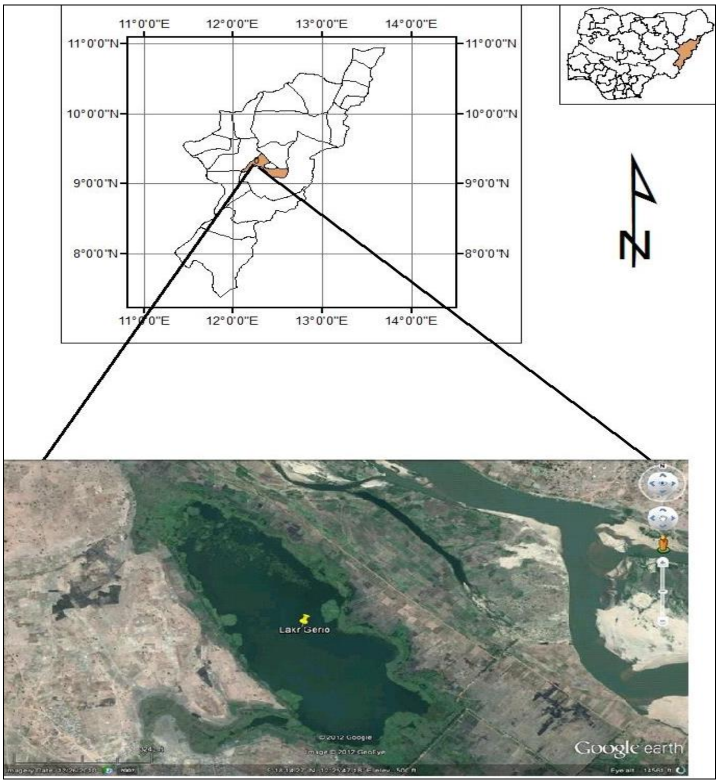

Fig 1: Map indicating the geographical position of the research area within Adamawa State

Sample collection

Specimens were consistently obtained at 6:00 am from commercial fisherfolks operating at Lake Geriyo's landings each month during dry seasons spanning from October 2022 to March 2023, covering a period of six-month. The major fishing gears employed for harvesting the entire set of 134 specimens were cast and set nets, and they were identified using keys for identification authored by Olaosebikan and Raji (2013). Fish specimens (see Plate I) collected were meticulously stored in an ice-chest container with ice-block to inhibit deterioration before being transported to the laboratory for further examinations.

Plate 1: Specimen *(M. rume)*

Laboratory procedures

In the laboratory, the species were categorised as males and females by examining the shapes of their genital papillae and genital openings using a handheld magnifying lens. Total lengths (TL) and standard length (SL) were measured to the nearest 0.1 cm from the scale whereas Body weight (BW) and stomach weight (SW) were taken with Digital Electric weighing balance (Adam AFP 4100L) and recorded to the nearest 0.1g.

Examination of gut contents

The state of fullness of each stomach was determined visually based on the distension of the stomachs before dissection; recorded and categorised as empty (⁰/₄), one-quarter full (¼), Half-full (²/₄), Three-quarter full (¾), and Full stomach (⁴/₄).

Gut content analysis

The specimens were dissected and the stomach contents were preserved in 5% formalin solution for subsequent examination. The stomach contents were mixed with 2.0 mL distilled water in a sterile petri dish. Visible large food items were easily identified with the naked eye and also with the aid of handheld magnifying lens, while microscopic ones were carefully dispersed on a cleaned slide and observed under a microscope. All food items were identified using identification keys and taxonomic work (Jeje and Fernando, 1986; Kolb, 1986; Kadiri, 2002) [25, 33, 20]. The gut contents identified, were subjected to analysis using numerical and frequency of occurrence methods and food analysis index to assess the foraging intensity of *M. rume* and the prominence of each food item, thus;

Numerical method (Hynes, 1980; Hyslop, 1980; Mahesh *et al.* 2019) [22, 23, 37].

$$\% \, Ni = \frac{Ni}{N_t} \, X \, 100$$

Where:

% Ni is the percentage of food item i

Ni is the number of particular food item i

N_t is the total number of food (gut content) items

Frequency of Occurrence (Hyslop, 1980; Baker *et al.*, 2014; Mahesh *et al.* 2019) [23, 4, 37].

$$\% \, Oi = \frac{Ni}{N} \, X \, 100$$

Where:

% Oi is the frequency of occurrence of given food i

Ni is the number of stomachs containing prey i

N is the total number of stomachs with some food

Index of fullness Mahesh *et al.*, (2019) [37]

$$\text{ISF} = \frac{W_g}{W_f} \, X \, 1000$$

Where:

ISF = Index of Stomach Fullness

% Wg = weight of the stomach contents (g),

Wf = fish body weight,

Index of Relative importance (George and Hadley, 1979; Hyslop, 1980) [15, 23]

$$\text{RI} = \frac{100AI}{\begin{matrix} n \\ \Sigma AI \\ i \end{matrix}}$$

Where:

RI = Relative Importance

AI = Absolute Importance Index (% Number + % Occurrence + % Volume) of food items,

ni = Number of different food items,

Statistical analysis

Data regarding the Total length measured in centimetres, along with Body and Gut weight recorded in grams, were further analysed in terms of mean, standard error and deviation using SPSS v.25.

Results

The total length for the 134 specimens ranged from 5.50 to 65.50 cm with a mean value of 26.205±1.339; 15.50 (Mean ± SE; SD.); Body weight ranged from 7.80 to 98.60 g with a mean value of 44.216±2.299; 26.623 (Mean ± SE; SD) and Gut weight ranged from 0.10 to 0.99 g with a mean value of 0.452±0.024; 0.282 (Mean ± SE; SD). On the other hand, the total length for the 69 male specimens ranged from 5.50 to 55.50 cm with a mean value of 18.551±1.628; 13.521 (Mean ± SE; SD); Body weight ranged from 7.80 to 96.50 g with a mean value of 35.255±2.869; 23.839 (Mean ± SE; SD) and Gut weight ranged from 0.10 to 0.95 g with a mean value of 0.351±0.029; 0.242 (Mean ± SE; SD) while, the total length for the 65 female specimens ranged from 5.50 to 65.50 cm with a mean value of 28.146±1.988; 16.028 (Mean ± SE; SD); Body weight ranged from 8.50 to 98.60 g with a mean value of 53.728±3.259; 26.281 (Mean ± SE; SD) and Gut weight ranged from 0.10 to 0.99 g with a mean value of 0.558±0.035; 0.285 (Mean ± SE; SD) (Table 1). Table 2 displays stomach fullness values for specimens across various months. At the end of February, 2.239% of full guts were observed and sharply increased to 12.687% in March. Three-quarter full stomachs were present in October, February, and March, accounting for 5.223%, 4.478%, and 5.070%, respectively. Half-full stomachs were consistently observed throughout all the months, with the highest percentage occurring in October at 25.373%. One-quarter full stomachs were identified in November, December and January, with the highest percentage in December at 11.194%. Empty stomachs were exclusively found in January, representing 2.985%. The highest indices of stomach fullness were recorded in October and March with values of 10.246% and 10.656% respectively. Table 3 indicates active foraging behaviours in March, characterized by warm temperature, with stomach fullness ranging from three-quarter to full, with values of 4.348% to 5.797% for males and 7.692% to 20.00% for females respectively. In contrast, passive feeding was observed during November, December and January, characterized by cold temperature, with stomach fullness ranging from one-quarter to half-full, varying between 2.899% to 31.884% for males and 1.538% to 18.462% for females respectively. Analysing the stomach contents of 134 *M. rume* unveiled the identification of 12 food items, encompasses protozoans (23.636%), fish eggs (24.303%), crustaceans (34.068%), insects (68.713%), algae (41.789%), rotifers (38.562%), nematodes (29.341), annelids (25.296%), detritus (64.155%), sand particles (28.733%), cnidarians (39.773%), plants parts (24.528%), diatoms (29.899%), and fragments of unidentified origin (26.500%) (Table 4). In terms numerical representation, insects and detritus comprised the greatest percentages, with values of 68.713% and 64.155% respectively, whereas detritus occurred in 100% of the stomachs of sampled specimens (Table 4). Notwithstanding, insects and detritus formed the predominant dietary components, with index relative contribution values, 3.235% and 3.003% respectively (Table 5).

Table 1: Descriptive statistics of body morphometric of *M. rume* examined from Lake Geriyo

Sex	Variables	Minimum	Maximum	Mean ± SE; SD
♂♀	TL	5.500	65.500	26.205±1.339; 15.500
	BW	7.800	98.600	44.216±2.299; 26.623
	GW	0.100	0.990	0.452±0.024; 0.282
♂	TL	5.500	55.500	18.551±1.628; 13.521
	BW	7.800	96.500	35.255±2.869; 23.839
	GW	0.100	0.950	0.351±0.029; 0.242
♀	TL	5.500	65.500	28.146±1.988; 16.028
	BW	8.500	98.600	53.728±3.259; 26.281
	GW	0.100	0.990	0.558±0.035; 0.285

TL = Total length (cm), BW = Body weight (g), GW = Gut weight (g), SE = Standard error, SD = Standard deviation, ♂ = Male, ♀ = Female

Table 2: Gut status for combined sexes of *M. rume* (n=134) examined in Lake Geriyo during dry season between October, 2022 to March, 2023.

Degree of stomach fullness											
Month	**(⁰/₄)**	**%**	**(¼)**	**%**	**(²/₄)**	**%**	**(¾)**	**%**	**(⁴/₄)**	**%**	**IF**
October	-	-	-	-	34	25.373	7	5.223	-	-	10.656
November	-	-	10	7.462	10	7.462	-	-	-	-	8.432
December	-	-	15	11.194	3	2.239	-	-	-	-	7.053
January	4	2.985	3	2.239	10	7.462	-	-	-	-	5.211
February	-	-	-	-	2	1.493	6	4.478	3	2.239	9.341
March	-	-	-	-	2	1.493	8	5.970	17	12.687	10.246

Key: (⁰/₄) = Empty stomach, (¼) = One quarter full stomach, (²/₄) = Half full stomach, (¾) = Three quarter full stomach, (⁴/₄) = Full stomach, and (IF) = Index of fullness

Table 3: Active and passive foraging periods of *M. rume* (n=134) examined from Lake Geriyo during dry season between October, 2022 to March, 2023.

(♂ = 69) **Months**	**(⁰/₄)**	**%**	**(¼)**	**%**	**(²/₄)**	**%**	**(¾)**	**%**	**(⁴/₄)**	**%**	**Total**
October	-	-	-	-	22	31.884	1	1.449	-	-	23 (33.333)
November	-	-	7	10.145	6	8.696	-	-	-	-	13 (18.841)
December	-	-	9	13.043	2	2.899	-	-	-	-	11 (15.942)
January	3	4.348	2	2.899	6	8.695	-	-	-	-	11 (15.942)
February	-	-	-	-	1	1.449	-	-	2	2.899	3 (4.348)
March	-	-	-	-	1	1.449	3	4.348	4	5.797	8 (11.593)
(♀ = 65) Months											
October	-	-	-	-	12	18.462	6	9.231	-	-	18 (27.693)
November	-	-	3	4.615	4	6.154	-	-	-	-	7 (10.769)
December	-	-	6	9.231	1	1.538	-	-	-	-	7 (10.769)
January	1	1.538	1	1.538	4	6.154	-	-	-	-	6 (9.231)
February	-	-	-	-	1	1.538	6	9.231	1	1.538	8 (12.307)
March	-	-	-	-	1	1.538	5	7.692	13	20.000	19 (29.231)

Table 4: Numerical Distribution (%) and Occurrence Frequency (%) of various food items in the diet of *M. rume* (n=130) examined from Lake Geriyo during dry season between October, 2022 to March, 2023.

	Numerical	**Distribution**	**Frequency of**	**Occurrence**
Food items	**Numerical**	**Percent**	**Frequency**	**Percent**
Protozoa	39	23.636	27	20.769
Fish eggs	61	24.303	37	28.462
Crustacea	170	34.068	93	71.538
Insecta	285	68.713	63	48.462
Chlorophyta	235	41.789	128	98.462
Rotifera	59	38.562	24	18.462

Nematoda	49	29.341	23	17.692
Annelida	64	25.296	47	36.154
Detritus	562	64.155	130	100
Sand particles	152	28.733	93	71.538
Cnidaria	70	39.773	34	26.154
Plant parts	78	24.528	94	72.308
Ochrophyta	148	29.899	91	70.000
Unidentified fragments	53	26.500	32	24.615

Table 5: Relative contribution and importance index (%) of different food items in the diet of Males (n=66) and Females (n=64) *M. rume* examined from Lake Geriyo during dry season between October, 2022 to March, 2023.

	Numerical Distribution (%)		**Frequency Of Occurrence (%)**		**RI**		**Total**
Food items	**Males**	**Females**	**Males**	**Female**	**M**	**F**	**RI**
Protozoa	24.242	23.232	21.212	20.313	0.115	0.302	0.417
Fish eggs	24.706	24.096	18.182	39.063	1.176	0.602	1.778
Crustacea	32.601	35.841	77.273	65.625	0.366	0.442	0.808
Insecta	65.441	70.874	37.879	59.375	0.735	2.500	3.235
Chlorophyta	40.483	43.019	98.485	98.438	1.010	1.515	2.525
Rotifera	36.538	42.857	24.242	12.500	0.224	0.233	0.457
Nematoda	30.952	27.711	16.667	18.750	1.190	1.205	2.395
Annelida	27.273	24.026	31.818	40.625	1.010	0.649	1.659
Detritus	62.238	65.996	100	100	0.962	2.041	3.003
Sand particles	27.426	29.795	66.667	76.563	0.422	0.342	0.764
Cnidaria	32.500	41.912	15.625	37.500	0.485	0.735	1.220
Plant parts	20.710	28.859	50.000	53.125	0.592	0.671	1.263
Ochrophyta	29.565	30.189	66.667	73.438	0.435	0.377	0.812
Unidentified fragments	25.641	27.711	27.273	15.625	0.855	1.205	2.060

Discussion

In this current study, the minimum size of available specimens in the catches was 5.50 cm while the maximum was 65.50 cm, smaller and bigger than the size (15.0 to 50.0 cm) utilized by Odedeyi and Fagbenro (2010) [48]. The study revealed a greater prevalence of males in the catches compared to females, suggesting a potential decrease in reproductive efficiency. However, the prevalent presence of half-full stomachs ($^{2}/_{4}$) with values of (45.522%) and the infrequent occurrence of full stomachs ($^{4}/_{4}$) with values of (14.926%) imply a low level of feeding intensity in *M. rume*. This observed outcome may be due to prey encounter rate in the Lake. On the other hand, a great proportion of full stomachs were observed in March, the warmer phase of dry season in the study area. This suggests an increased abundance of food items in the habitat. Comparable findings were reported by Jewel *et al.* (2019) [26], who noted increased richness of food items during the summer season in Padma River (Bangladesh). This result is incomparable with the findings of Ipinjolu *et al.*, (2005) [24], who reported that (48.1%) of *M. rume* specimens captured in River Rima and Goronyo Dam (Nigeria) had empty stomachs and no sample with full stomach. According to Vinson and Angrandi (2011) [47], the empty stomachs in fish may be attributed to autecological factors such as variations in gastric evacuation rates, diet, feeding habits, gut clearance rate, presence of non-feeding life stages, as well as individual fish health. Environmental conditions, such as prey encounter rate and temperature, and sampling arti-facts like regurgitated or digested contents upon capture, also play a role. Additionally, species-specific fish behaviour may impact the occurrence of empty stomachs, with certain species being more vulnerable to specific gears when exhibiting increased activity or a higher likelihood of taking baited hooks. The findings also showed a decreased in foraging activities of species during the colder periods of dry season, spanning from November to February, followed by an increased in the warmer periods from February through March. This agrees with the findings of Beamish (1978) [7], who noted that lower temperature result in a reduction of metabolic rate in fish, consequently leading to a decreased in the feeding activity of fish species. On the other hand, Jobling (1994) [28] observed that elevated temperature causes an increase in metabolism, subsequently enhancing the feeding activity of a fish species. Additionally, Shafland and Pestrak (1982) [44], reported that fish tend to lose appetite, come to a halt, and ultimately cease ingesting food at temperatures well before reaching the ultimate maximal critical temperature for the species. Helene and Ivar, (2020) [20], also documented that the effects of temperature on feeding differ among species, but generally, voluntary food intake tends to rise with moderate temperature increases, and decline when temperatures fall outside the optimal temperature range for the fish. Moreover, the research demonstrated that females *M. rume* exhibited higher foraging activities compared to their male counterparts. This could be attributed to the territorial defence activities of males, which could lead to a reduced frequency of food consumption of males. This agrees with the findings of Green *et al.* (1984) [17]. They reported that males consume food less frequently compared to females.

Notwithstanding, investigation also revealed that *M. rume* ingested a diverse range of food categories. The predominant items in their diet were benthic insects and detritus. These were consistently present in all stomachs observed with food. These results were partly in line with the discoveries of Ugwumba *et al.* (1990) [46], who observed that Mormyrids in Lekki lagoon (Nigeria) primarily consumed insects and crustaceans; Omotosho (1993) [40], who documented that *M. rume* fed on detritus, algae and macrophytes; Paugy (2002) [41], who reported insectivorous behaviour in *M. rume* from Baoule River (Mali); Fawole (2002) [14], who identified detritus and plant parts as the primary dietary components for *M. rume* in Lekki lagoon; Odedeyi and Fagberon (2010) [48], who observed insects and crustaceans as the major food items for *M. rume* in River Ose (Nigeria); except Abdulaziz *et al.* (2019) [1], who documented *Petrocephalus bane* in Debiram Dam prey mainly on zooplanktons. Reported that these variations could be attributed to differences in food availability across the various habitats. The stomach contents also included chlorophytes, cnidarians, rotifers, crustaceans, and nematodes in moderate percent whereas diatoms, annelids, plant parts, fish eggs, and protozoans were less in abundance as revealed in the study. However, sand particles and fragments of unknow origin were found in almost all the stomachs containing food. These were likely consumed while foraging at the sediment bed of the lake. This observation indicates that *M. rume* is a benthic dweller. This agrees with the findings of several researchers (Omotosho, 1993; Paugy, 2002; Fawole, 2002; Odedeyi and Fagbenro, 2010) [40, 14, 48]. All food items were found in the stomachs of *M. rume* regardless of their size, sex or the season of examination. This corresponds with the findings of Kouamelan *et al.* (1999) [34], who noted no significant variations in the food composition of *M. rume* from River Bia (Cameroon). Similarly, Fawole (2002) [14] observed the presence of food items in the stomachs regardless of size, sex or season in Lekki lagoon (Nigeria). Odedeyi and Fagbenro (2010) [48] also documented no variations in the food composition of *M. rume* from River Ose (Nigeria).

However, it was observed that rainy season ended in October, accompanied by an influx of allochthonous materials, particularly insects, seeds, leaves, and numerous kinds of materials from inundated forests into Lake Geriyo through River Benue basin caused by the water released from Lagdo Dam. These materials settle at the bottom of the lake and underwent decomposition by bacterial and fungal activities. Therefore, the higher percentage occurrence of detritus recorded, coupled with its high index of relative contribution in diet, implies that *M. rume* is a detritivore. The distinctive trunk-like snout and small terminal mouth of *M. rume* further support its detritivorous behaviour. Holden and Reed (1972) [21] reported that this elongated tubular snout is employed for burrowing in pursuit of their food items. However, plankton in the lake is predominantly composed of Chlorophyta, Ochrophyta, and crustacea. Despite the relatively lower occurrence of insects compared to detritus in the benthos of the lake, insects surpassed detritus in prominence in the stomachs of *M. rume*. This indicates a heightened preference for insects over detritus, suggesting that *M. rume* is also an insectivorous.

In the diet of *M. rume* in Lake Geriyo, the result further showed that insects and detritus make up the majority and were considered the most crucial food components. Following closely were chlorophytes and nematodes as the second most significant dietary items. The third tier includes fish eggs, annelids, plant parts, and cnidarians. Diatoms, crustaceans, rotifers, and protozoans constitute the remaining food items, each contributed less than 1% to the diet despite rotifers and crustaceans were ingested in reasonable percentage. Collectively, these items make up (19.572% IRI) and out of this %IRI, the contribution of food items to the diet of females were higher with values of (11.272%) compared to males (8.300%).

Conclusion

The current research presents the food and feeding references of *M. rume* during dry season in Lake Geriyo, Adamawa State, Nigeria. The *M. rume* exhibited a varied diet, incorporating insects, detritus, phytoplankton, zooplankton, macrophytes, and fish eggs. Benthic insects and detritus were the predominant and the most important food items consumed by the specimens. Food of minor importance was crustaceans, rotifers, and protozoans. The study observed an augmentation in both the availability of food and foraging activity during the warm phase of the dry season, accompanied by a corresponding declined during colder periods of dry season. This investigation distinctly characterizes *M. rume* as a benthic dweller, concurrently functioning as an insectivorous and detritivorous. The study also indicated preference for insects over detritus, suggesting that *M. rume* is an insectivore. Additionally, the research identified a higher male population compared to female and was further confirmed that females consistently displayed greater foraging intensity than males throughout the period of dry season. The current discoveries concerning the feeding biology and dietary preferences of *M. rume* have the potential to enhance our understanding for the sustainable management of this species, which is susceptible to exploitation. Furthermore, the findings from this research may aid in formulating suitable techniques for feeding in the aquaculture of *M. rume.*

Additionally, exploring the feeding biology and dietary preferences of this species in the rainy season for comparison with dry season is crucial, along with studying their spawning patterns in Lake Geriyo.

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Conflict of interest

In the context of this research, it is affirmed that there is no conflict of interest to disclose.

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