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Food and feeding habit of some freshwater fishes from Ayeyawady River, Myitkyina Township, Kachin State, Myanmar

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Abstract
The food and feeding habit of seven fish species from Ayeyawady River were exmined during December 2017 to May, 2018. Observation of five species, the relative length of alimentary range in *Mystus bleekeri*, from 0.87 to 0.95; in *Mystus leucophasis*, from 0.94 to 1.23; in *Clarias batrachus*, from 0.91 to 0.98; in *Macrognathus aral*, from 0.55 to 0.95 and in *Macrognathus armatus*, from 0.67 to 0.88 respectively. Their ration ranges is shorter than of each standard length and carnivorous in feeding habitat. In *Puntius sarana*, the relative length of alimentary canal ranged from 1.55 to 2.11. The ratio is 1.5 to 3 times of the standard length and omnivorous. In *Labeo rohita*, the relative length of alimentary canal ranged from 8.44 to 12.6. This ratio is longer the standard length and herbivorous. The information on the feeding habits of fish helps to know about the inter-specific relationship of aquatic fauna and productivity of the water body.

Keywords: Fish, food, feeding habit, stomach content, Ayeyawady River

1. Introduction
Food is one of the important factors regulating or influencing growth, fecundity, migration and abundance of fish stocks. Assessment of the food and feeding habits is important to evaluate the ecological role and position of the fish in the food web of ecosystems [1]. The information on food and feeding habit provides further support to aquatic management and fish production [2].
In general, the growth of a fish is influence by the quality and quantity of food material available and consumed. Thus, any variation in quality and quantity of food materials will affect the growth rate of the fish. The qualitative and quantitative variations of natural food materials in water body are under the influence of several abiotic and biotic factors. These variations could be known by qualitative and quantitative analysis of gut contents of a fish and / or by the estimation of gastrosomalic index [3].
The basic knowledge on the food preference and feeding habits of species are of primary importance for ascertaining its suitability for aquaculture [4]. Diet related studies from natural habitat also help in understanding the autecology, production and ecological role of fish population. So obviously the best method of ascertaining its food is by examination of its gut contents [5]. The dietary habits of fish based on stomach content analysis also widely used in fish ecology as an important means of investigation tropic relationship in aquatic communities [6].
The knowledge of food and feeding habits of a species helps to find out distribution of the species which helps successful management of the fishery. Studies on food and feeding habit are important aspect in biology and management of fishes [7]. The length of the gut of a species of fish or any other animals, reflects its diet and the percentage composition of food items present in the stomach also showed the feeding habits of fish [8].
Myanmar has considered having richest fishery resources in the world. There are many important rivers, streams, creep, lakes, Ins and dams are the treasure resources of Myanmar both in terms of their utility as food and as materials for scientific study. Fish constitutes a major source for animals proteins in the diet of Myanmar people. Ayeyawady is one of the largest river in Myanmar and most important commercial water way. Originating from the confluence of the N' Mai Hka and Mali Hka rivers, its flows relatively straight from North to South before emptying through the Ayeyawady Delta into the Andaman Sea [9]. Thus, the selecting was made to study site to investigate the variation in the food composition and feeding habit of some freshwater fishes in Ayeyawady River, Myitkyina Township.

2. Material and Methods
2.1 Study area and study period
The fish specimens were collected from segment of Ayayawady River, Myitkyina Township. It is located at 25°23 11.02"N and 97°24'33.87"E. The present study was started from December, 2017 to May, 2018.

2.2 Collection and preservation of specimens
Fish samples were collected twice a month. Seven fish species were collected from Ayeyawady River, with the help of local fishermen. An average of ten specimens of each fish species was used in the study. The collected specimens were preserved in 10% formation with fully labels in collection bottles.

2.3 Measurement of specimens
After measuring the total length standard length and body weight, fishes were dissected ventrolaterally with the help of a pair of fine scissors. After that the alimentary canal of

each fish was stretched out and the length was measured.

2.4 Analysis of data

For diet composition, stomach contents of each specimens were examined. The stomachs were removed from the gut. The presence or absence (empty) of food content in the stomach was examined. If the stomach was found with food items, then all contents were transferred into clean petridish. The food substances found in the stomach were identified with the help of compound microscope. Food items were identified at the general level, wherever possible, using information provided by Imms [10], Edmondson [11], Jordan and Verma [12]. The stomach contents were analyzed using frequency of occurrence methods based on Hyslop [13]. Calculation of relative length of alimentary canal (RLA) was done by the Taki [14] method.

3. Results

In this study, determination of food composition and feeding habit of studied species has been made on the basis of occurrence of food items in the stomach contents and relative length of altimetary canal. The total length, standard length and body weight for each studied species were measured and recorded (Table 1). The alimentary canal length and ratio of alimentary canal length to standard length were given in Table 2. The categorizations of stomach fullness of studied species were given in Figure 1. The categorization of the percentage composition of occurrence of food items in the stomach contents of studied species were shown in Figure 2. Summary of food items of studied fish species were shown in Table 3. Determination of feeding habits of studied fish species were shown in Table 4.

3.1 Food composition and feeding habit of studied species

Labeo rohita feed on zooplankton, phytoplankton, algae, plant materials and mud and sand. Of all the food items examined, the highest percentage of phytoplankton (70%) and the lowest of plant materials and mud and sand (10%) were observed. The length of alimentary canal ranged from 152 cm to 370 cm, whereas the relative length of alimentary canal ranged from 8.44 to 12.6 with a mean value of 11.5 (Table 2). This ratio is longer than 3 times of the standard length. Therefore, the feeding habit of *L.rohita* is determined as herbivorous fish.

Puntius sarana feed on phytoplankton, zooplankton, fish, crustaceans, plant materials and mud and sand. Of these food items they consume, the highest percentage of phytoplankton (60%) and the lowest of crustaceans and plant materials (10%) were observed. The length of alimentary canal ranged from 15.8 cm to 29 cm. The relative length of alimentary canal ranged from 1.55 to 2.11, with a mean value of 1.74 (Table 2). The ratio is between 1.5 and 3 times of the standard length. Therefore the feeding habit of *P. sarana* is omnivorous in nature.

Mystus bleekeri feed on fish, insects, molluscs and plant materials. Of these food items, the highest percentage of fish (40%) and the lowest of plant materials (10 %) were observed. The length of alimentary canal ranged from 10.5 cm to 14.6 cm. The relative length of alimentary canal ranged from 0.87 to 0.95, with a mean value of 0.91 (Table 2). This ratio is shorter than 1.5 time of the standard length. Therefore, the feeding habit of *M.bleekeri* is carnivorous in nature.

Mystus leucophasis feed on zooplankton, fishes, insects, crustaceans, molluscs and worm. Of these food items, the highest percentage of fish (30 %) and the lowest of crustaceans, molluscs and worm (10 %) were observed. The length of alimentary canal ranged from 9.6 cm to 21.5 cm. The relative length of alimentary canal ranged from 0.94 to 1.23, with a mean value of 1.05 (Table 2). This ratio is shorter than 1.5 time of the standard length. Therefore, the feeding habit of *M.leucophasis* is carnivorous in nature.

Clarias batrachus feed on fish, insects, crustaceans, molluscs and plant materials. Of these food items, the highest percentage of fish (60%) and the lowest of crustanceans, molluscs and plant materials (10%) were observed. The alimentary canal length ranged from 17.8 cm to 27 cm. The relative length of alimentary canal ranged from 0.91 to 0.98, with a mean value of 0.95 (Table 2). This ratio is shorter than 1.5 times of the standard length. Therefore, the feeding habit of *C.batrachus* is carnivorous in nature.

Macrognathus aral feed on phytoplankton, insects, crustaceans, molluscs, worm and mud and sand. Of these food items, the highest percentage of molluscs (40%) and the lowest of phytoplankton, crustaceans and mud and sand (10%) were observed. The alimentary canal length ranged from 8.2 cm to 2.3 cm. The relative length of alimentary canal ranged from 0.55 to 0.95 with a mean value of 0.7 (Table 2). This ratio is shorter than 1.5 times of the standard length. Therefore, the feeding habit of *M.aral* is carnivorous in nature.

Macrognathus armatus feed on zooplankton, fish, insects, crustanceans and plant materials. Of these food items, the highest percentage of crustaceans (40 %) and the lowest of plant materials (10 %) were observed. The length of alimentary canal ranged from 9.5 cm to 17.6 cm, whereas the relative length of alimentary and ranged from 0.67 to 0.88, with a mean value of 0.77 (Table 2). This ratio is shorter than 1.5 times of the standard length. Therefore, the feeding habit of *M.armatus* is carnivorous in nature.

Table 1: Measurement of body weight, total length and standard length of studied fish species (n =10)

Scientific Name	BW (g)		TL (cm)		SL (cm)	
	Range	mean	Range	Mean	Range	Mean
Labeo rohita	68-750	332.3	20.1-38.5	28.01	18-36	25.86
Puntius sarana	36.2-82.1	55.86	12.3-18.5	15.93	10.2-16.2	13.94
Mystus bleekeri	14-29.5	22.66	12.8-18.5	15.78	11.1-16.8	13.98
Mystus leucophasis	18.2-210.3	110.62	9.8-22.5	16.86	7.8-20	14.83
Clarias batrachus	82-235	15.35	23.8-33.4	27.76	18.4-28.6	22.69
Macrognathus aral	10.2-45.5	29.88	16-25	21.42	14.9-24.2	20.53
Macrognathus armatus	12-47	27.95	11.6-27.3	18.86	10.8-26.2	18.06

BW = Body Weight; TL= Total Length; SL = Standard Length

Table 2: Measurement of alimentary canal and relative length of alimentary canal in the studied fish species (n = 10)

Scientific Name	ACL (cm)		RLA	
	Range	Mean	Range	Mean
Labeo rohita	152-370	291.04	8.44-12.6	11.15
Puntius sarana	15.8-29	24.31	1.55-2.11	1.74
Mystus bleekeri	10.5-14.6	12.67	0.87-0.95	0.91
Mystus leucophasis	9.6-21.5	15.43	0.94-1.23	1.05
Clarias batrachus	17.8-27	21.43	0.91-0.98	0.95
Macrognathus aral	8.2-23	13.87	0.55-0.95	0.7
Macrognathus armatus	9.5-17.6	13.62	0.67-0.88	0.77

ACL = Alimentary Canal Length; RLA = Relative Length of Alimentary Canal

Table 3: Summary of food items of studied fish species

Animal food items	Plant foot items
Fish	**Phytoplankton**
remain of fish body Pieces of bones	Diatom *Pediastrum*
Insect legs, head, larvae	
	Algae
Crustaceans small prawn, parts of prawn	Filamentous algae *Oscillatoria* sp *Spirogyra* sp.
Molluscs	Plant material
Gastropod Bivalvia	submerged plant
Worms	
whole body	
Zoplankton Cladocera Copepods	

Table 4: Determination of feeding habits of studied fish species

Fish species	Feeding habit
Labeo rohita	Herbivore
Puntius sarana	Omnivore
Mystus bleekeri	Carnivore
Mystus leucophasis	Carnivore
Clarias batrachus	Carnivore
Macrognathus aral	Carnivore
Macrognathus armatus	Carnivore

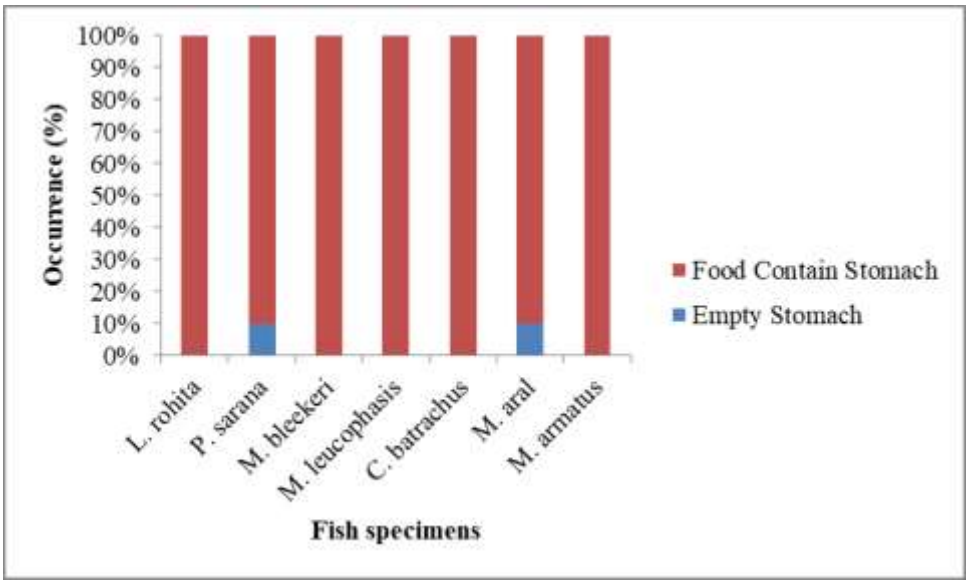

Fig 1: Categorization of stomach fullness of studied fish species

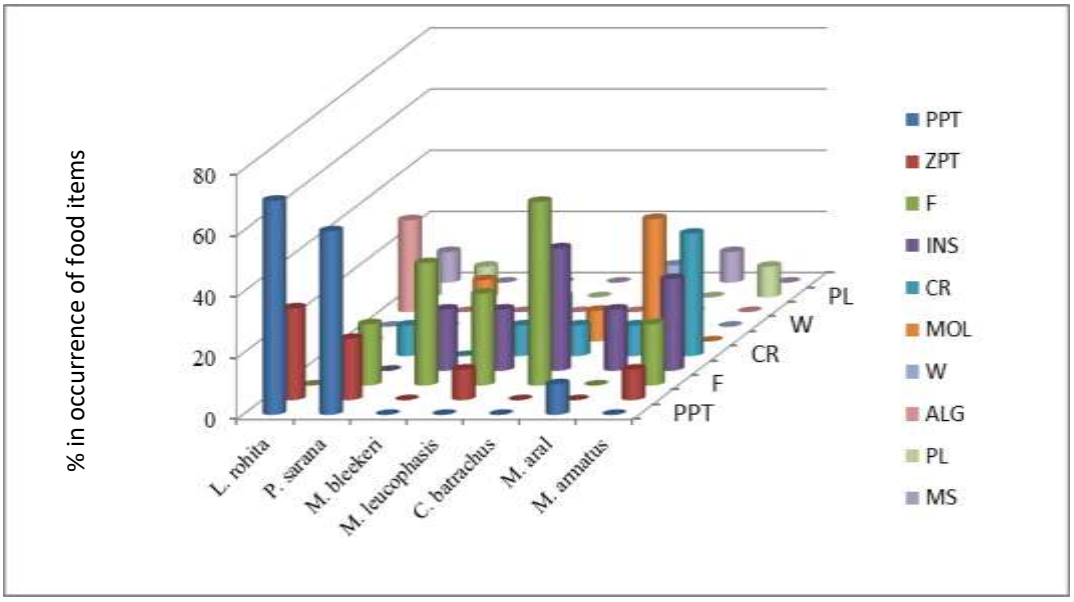

Fig 2: Percent composition in occurrence of food items in the stomach contents of studied fish species

4. Discussion

In the present study, determination of food composition and feeding habits has been made on the basis of percentage composition of the food items in the stomach contents and relative length of alimentary canal. Frequency of occurrence method was used for stomach content analysis. Fish, according to the feed type, there are three types of fishes; carnivores, omnivores, and herbivores. Taki [14] suggested that fish having a relative length of digestive tract shorter than 1.5 times of the standard length were judged to be carnivorous and those with a relative length of digestive tract longer than three times of the standard length were regarded as herbivorous. Tentatively, fish that were intermediate in relative length of digestive tract and showed no other evidence to determine their feeding habit were considered as omnivorous.

In the present observation, five species are carnivorous while one species is omnivorous and another one species is herbivorous fishes according to the results. Of these seven fish species examined, five species were carnivorous fishes include *Mystus bleekeri, Mystus leucophasis, Clarias batrachus, macrognathus aral* and *Macrognathus armatus. Mystus bleekeri* and *M. leucophasis* mainly feed on fish, insects and molluscs and few on crustaceans, worm, zooplankton and plant materials. Khin Than Htwe[15] reported that *M. bleekeri* and *M. leucophasis* as carnivorous; feeding on fish, insect, crustaceans, molluscs and worm. Tin Mar Cho[16] also mentioned that *M. bleekeri* and *M. leucophasis* as carnivores. *Clarias batrachus* mainly feed on fish and insect and few on crustaceans, molluscs and plant materials. Khin Than Htwe [15] indicated that fish, crustaceans, molluscs, worms, zooplankton and mud and sand were observed in the stomach of *C. batrachus*. Sakhare and Chalak [17] and Ramesh and Kiran [18] also recorded that *C. batrachus* as carnivorous fish and preferred fish and insect larvae as major food.

Macrognathus aral mainly feed on insect, molluscs and worm and few on crustaceans and mud and sand whereas *Macrognathus armatus* mainly feed on fish, insects and crustaceans and few on zooplankton and plant materials. Abujam, *et al*., [19] recorded that *M. aral* as carnivorous fish. Similarly, Gupla and Banerjee [20] described *M. armatus* as carnivorous fish. Khin Than Htwe[15] and Khin Myat Maw[21] also desocibed *M. aral* and *M. armatus* as carnivorous fish and found these species mainly feed on fish, crustaceans, molluscs and insect.

The relative length of alimentary canal for carnivorous fish species ranged from 0.7 to 1.05. All relative length of alimentary are shorter than 1.5 times of the standard length. These ratio are 0.91 in *M. bleekeri*, 1.05 in *M. leucophasis*, 0.95 in *C. batrachus*, 0.7 in *M. aral* and 0.77 in *M. armatus*. The longest ratio was found in *M. leucophasis* and the shorted was found in *M.aral*. Hossain, *et al*., [22] and Khin Aye Han [23] also considered *P. sarana* as omnivorous nature of feeding habit. The mean relative length of alimentary for *P. sarana* is 1.74. This ratio is between 1.5 and 3 times of standard length and it follows the character of omnivores given by Taki [14]. In this study agreed with that of observed, the feeding habit of *Puntius sarana* was determined as omnivores. Since *P. sarana* mainly feed on phytoplankton, zooplankton and fish and few on crustacean and plant materials were recorded.

In the present study, herbivorous fish includes *Labeo rohita*. It mainly feed on phytoplankton, zooplankton and algae and few on plant materials and mud and sand. Khumar and Siddigui[24] indicated that *L. calbasu* and *L. rohita* as herbivorous, they mainly feed on phytoplankton and few on zooplankton, plant materials and decayed organize matter. The mean ratio of alimentary canal length to standard length of *L. rohita* is 11.15. These ratio is longer than 3 time of the standard length. In opposite fashion from carnivores, the intestine is elongated and arranged in many loops or convolutions in predomintly herbirorous fishes.

There are some variation of food items in the stomach of study species. This variation are probably related to the way fish feed and the prevalence of various food items in the water body at the time of the study. In this study, few stomachs were observed as empty stomach. Empty stomach may be due to the fact that the food items have been regurgitates or digested as the fish struggled for escape [25]. Moreover, lower percentage of empty stomach was found in this study, this indicates the food items they consume are abundance in Ayeyawady River. Therefore, Ayeyawady River is quite suitable for riverine fish to thrive habitat.

4. Conclusions

The study on availability and preference of food contents by the fish helps to find out the feeding habit of fish and accordingly fisheries management in the water body. On the basic of these study it can be concluded that five fish species are carnivorous, one species omnivorous and another one species herbivorous. Variation in some food items in the studied stomach related to fish feeding habit and the prevalence of various food items in the water body. Low percentage of empty stomach was observed. Therefore, Ayeyawady River provides abundance food items that consume by the fish and one of the ecosystem, sustainable for riverine fish stock.

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