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Natural Diet Composition of *Botia histrionica* Blyth,1860 From Shwe Kyet Yet Jetty, Ayeyawady River Segment, Mandalay Region, Myanmar

Thi Thi Naing[1], Mon Htwe Lwin[2], Thandar Saw[3], Nyunt Lwin[4]
[1, 3] Dr., Lecturer, Department of Zoology, Yadanabon University, Myanmar
[2] Dr., Lecturer, Department of Zoology, Monyin Degree College, Myanmar
[4] Dr., Lecturer, Department of Zoology, Kyaukse University, Myanmar

Abstract
The natural diet composition of *Botia histrionica* was conducted for twelve months from Shwe Kyet Yet Jetty, Ayeyawady River Segment during December 2017 to November 2018. A total of 120 specimens of were examined and analyzed for food items. In the present experiment, the feeding indexes composition were recorded as insects (32.27)%, crustaceans (5.18)%, fish pieces(14.54)%, worms (11.99)%, Cyclops (3.71), rotifers (3.98), algae (2.35), plant materials (2.02), detritus (4.66), sand and mud (17.51)%, and unidentified food items (1.79)% respectively. Insects were observed the highest volume in May (34.04%) while the mean weight (34.78±14.00)g and the mean relative length of alimentary canal ranged from 0.69 cm to 1.43 cm with the mean of (1.06±0.2) cm. The lowest feeding food item was algae and can be regard as incidental food. The present research can also give knowledge of food and feeding habit that helps to select such species of fish for culture.

Keywords: Food diet, composition, *Botia histrionica*

1. Introduction

The study of food and feeding habits of fish is importance in fishery biology as it facilitates understanding of causative aspects of biology of the fish such as growth, geographical distribution and migration. Certain fisheries can even be forecasted by the appearance of particular food organism which forms the principal food of that species in the environment [1].

Animal population need adequate quantities of usable resources of sustain and one of the most fundamental questions in ecology is what resources a particular species requires to exist [2]. Therefore, it is necessary to identify the resources used by animals and document the availability of those resources. Besides the natural interest in animal ecology and thirst for knowledge, such documentation is critical in efforts to preserve endangered species and manage exploited population [3]. The essential resources are food which animal consumes and the varieties of habitats which animals occupy. The knowledge of the diet composition and feeding habits is, therefore, an important introduction to the natural history of any species [4, 2].

Food habits of different species have been investigated for a variety of specific reasons important in a broader sense. Knowledge of natural diet in an animal species is generally essential for studies of animal nutritional requirements and the recruitment dynamics. In ichthyology, fish ecology and fisheries, the information on diet and food habits are valuable in the decisions making process related to natural resources [5, 6, 7].

The study of the food and feeding habits of fishes have manifold important in fishery biology. The food and feeding habits of fish vary with the time of the day, season, size of fish, various ecological factors and different food substances present in the water body and its ecological factors [8]. The basic function of organisms, like growth, development, reproduction take place at the expense of energy, which enters the organisms in the form of food. A sound knowledge of food habits of fishes is prerequisite for an understanding of their general biology, including vital aspects such as growth, breeding and migration [9].

Consequently, the study of the gut content is not only way to know the diet but also superior source of information on many aspects of fish biology and ecology. Stomach content analysis provides many important information on ecological and biological aspects of fish behaviour, condition, habitat use, energy intake inter and intra specific interactions. It is an essential part of the ichthyological research, fishery, and fish protection. Thus, the knowledge in the gut content analysis of fish is often necessary not only to ichthyologist, but also for other specialists in freshwater ecology, and employees in fishery and aquaculture [10].

The golden zebra loach, *B. histrionica* is a member of the family Cobitidae. The maximum size of *B. histrionica* may be anticipated slightly above 10 cm. It is one of the most fearless and very active swimmers. It is a large genus with about 20 species. These inquisitive and predominate bottom-dwelling fish are found over quite a large geographic area in a wide range of habitats from the cool mountain streams of China to the tropical rivers and flooded forests of India and Myanmar. They never spend all of their time in one habitat. They leave the main river for most of the year and migrate into the river in November or December. These seasonal migration might be one reason why they are harder to obtain, and more expensive at certain time of the year.

The biology of *B. histrionica* has received special attention in recent years because of its use as aquarium trade. Therefore this species was selected as experiment sample for the present study of its food and feeding habit to investigate the diet composition, occurrence and abundance of food frequency and to evaluate the relationship between standard length and alimentary canal length and also evaluate the importance of particular kinds of food in the fish diet.

2. Materials and methods

2.1 Study area

The study was undertaken at the Shwe Kyet Yet Jetty, a distributor of the Ayeyawady River in Amarapura Township, Mandalay Region. The study area is located between 21º 52' 41.70" North and 96º 00' 24.04" East. The experiment worked from December 2017 to N0vember 2018.

2.2 Collected specimens

Fish specimens of *Botia histrionica* were randomly collected from fisherman at the landing sites. The specimens collected were kept chilled in an ice container to reduce post humous digestion of the stomach contents while to carry the laboratory of Zoology Department, Yadanabon University for measurements and stomach contents analysis. Ten fish specimen were used to monthly examined.

2.3 Measurements

In the laboratory, total length (TL) of individual fish was taken from the tip of the snout to the extended tip of the caudal fin and standard length (SL) was measure from the tip of the snout to the caudal peduncle. Each fish was weighed to the nearest 'g' with an electric balance after sufficiently removing the water of body surface by a filter paper.

2.4 Identification and classification of specimens

The species identification was made after Day [11], and classification was followed according to Talwar and Jhingran [12].

2.5 Analysis of stomach contents

The specimens were cut open and the stomachs were removed. Each stomach was slit open, and the contents were poured into a petri dish. The foods were observed with unaided eye. The random samples of the stomach contents were taken and dropped on slides with the aid of a dropping pipette and observed under a light microscope. The stomach contents were identified as possible as and analyzed using the frequency of occurrence method [13].

The analysis of stomach contents was calculated by the following formula:

$$O_i\% = \frac{FO_i}{NS} \times 100$$

Where, $O_i\%$ = percent frequency of occurrence of prey i,

FO_i = frequency of occurrence of prey i,

NS = total number of stomach[14]

Calculation of relative length of alimentary canal (RLA) was done by the following method;

$$RLA = \frac{ACL}{SL}$$

Where, RLA = Relative length of alimentary canal

ACL = Alimentary canal of length

SL = Standard length [15]

2.6 Volume method

In the point volume method, each food item was allocated of points. All identifiable items were grouped into separate piles and allocated one of the following value: 16, 8, 4, 2, 1. The most abundance items were allocated as 16 and the other items were allocated as 8, 4, 2, 1 depending upon their abundance relative to most abundant item. The percentage composition was calculated for each item as its own points value divided by combined total points for all items combined and then multiplied by 100.

2.7 Feeding index

The feeding index was calculated following method given by Kawakami and Vazzoler [16].

$$FI\% = \frac{FO_i \times FV_i}{\sum (FO_i \times FV_i)} \times 100$$

Where, FO_i = Frequency of occurrence (%) of "i" item

FV_i = Frequency of volume (%) of "i" item

3. Results

The determination of food and feeding habit has been made on the basis of maximum percentage of the types of food in the stomach and the relative length of alimentary canal to standard length. The gut of *B. histrionica* was short, muscular bag-shape and somewhat coiled. The relative length of alimentary canal to standard length ranged from 0.78±0.14 to 1.07±0.09 which are similar to those of other carnivorous fishes. This ratio is shorter than 1.5 the standard length. Thus the feeding habitat of *B. histrionica* is carnivorous in nature.

Insects were observed monthly and dominant item in the stomach contents. The percent occurrence and volume of food item was appeared to be 80% and 22.47% respectively. Mostly insect food items were represented by three orders: Diptera, Trichoptera, and Emphemeroptera. These were observed as appendages of larvae, mandibles, tarsal claws, antennal segments, tail and appendages. Sand and mud were observed throughout the year. Follow after Sand and mud was 71.67% and 13.61%, fish pieces was 48.33% and 16.76%, worm 55% and 12.15%, crustanceans 33.33% and 8.65%, detritus 55% and 4.72%, rotifers 40% and 5.54%, Cyclops 35% and 5.91%, algae 33.33% and 3.98%, plant material 30% and 3.75%, and unidentified food items 40% and 2.49% were respectively recorded (Table 1,2 and 3).

A total of 120 specimens were examined and analyzed for food items. Eleven food items were analyzed. The mean percentage composition in feeding indexes of food items, the highest composition was observed in insects (32.27%) and follower after sand and mud (17.51%), fish pieces (14.54%), worms (11.99%), crustanceans (5.18%), detritus (4.66%), rotifers (3.98%), Cyclops (3.71%), algae (2.35%), plant materials (2.02%) and the lowest unifentified food items (1.79%) were recorded (Table 3, Figure 1).

Insects were observed the highest volume in May (34.04%) while the mean weight (34.78±14.00)g and the mean relative length of alimentary canal ranged from 0.69 cm to 1.43 cm with the mean of (1.06±0.2) cm. The lowest feeding food items was algae and can be regard as incidental food. The lowest feeding food items was algae and can be regarded as incidental food (Table 4).

Insects, detritus and sand were observed all months. Worms and fish pieces were found in all months except in the moths of March and May (Table 1 and 2).

Table 1: Monthly variation of percent composition in occurrence of different food item groups in the stomach of *Botia histrionica* during December 2017 to November 2018

Food items	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Insects	80	80	60	100	80	100	80	80	80	80	60	80
Crustaceans	0	60	40	0	80	0	0	60	40	0	40	80
Fish pieces	40	40	40	60	20	0	80	80	80	60	40	40
Worms	40	80	40	60	40	0	0	80	0	40	0	0
Cyclops	80	80	40	60	40	0	0	80	0	40	0	0
Rotifera	80	80	80	60	60	0	0	40	80	0	0	0
Algae	0	0	40	80	60	0	0	0	40	40	60	80
Plant materials	0	40	40	0	60	60	0	60	60	0	40	0
Detritus	40	20	40	60	60	80	40	40	80	40	80	80
Sand and mud	80	60	100	100	80	80	80	40	40	80	80	40
NOID	80	20	40	80	40	80	0	0	0	40	40	60

NOID = unidentified food items

Table 2: Monthly variation of percent composition in volume different food item groups in the stomach of *Botia histrionica* during December 2017 to November 2018

Food items	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Insects	26.67	17.2	17.28	22.86	18.61	34.04	24.56	19.75	20.51	26.02	18.39	23.19
Crustaceans	0	15.05	11.11	0	16.28	0	0	14.81	15.38	0	13.79	17.39
Fish pieces	20	16.13	15.56	17.14	11.63	0	26.32	17.28	17.95	22.76	16.09	20.29
Worms	6.67	12.9	8.89	0	9.3	21.28	28.07	12.35	10.26	13.01	11.49	11.59
Cyclops	13.33	10.75	8.89	11.43	6.28	0	0	9.8	0	9.76	0	0
Rotifer	15	9.68	10	8.57	8.14	0	0	7.41	7.69	0	0	0
Algae	0	0	4.44	10	4.65	0	0	0	6.41	6.5	9.19	5.79
Plant materials	0	4.3	3.33	0	3.49	17.02	0	4.94	5.13	0	6.84	0
Detritus	3.33	3.23	4.44	5.71	4.65	8.5	7.02	3.7	30.85	3.25	4.59	4.35
Sand and mud	10	8.6	13.33	20	13.95	12.77	14.04	9.8	12.82	16.26	17.24	14.49
NOID	5	2.15	2.22	4.27	2.3	6.38	0	0	0	2.44	2.29	2.89

Table 3: The mean percent composition in occurrence, volume and feeding index of different food item groups in the stomach of *Botia histrionica* during December 2017 to November 2018

Food items	Occurrence (foi)	Volume (fvi)	Feeding index (fI)
Insects	80	22.47	32.27
Crustaceans	33.33	8.65	5.18
Fish pieces	48.33	16.76	14.54
Worms	55	12.15	11.99
Cyclops	35	5.91	3.71
Rotifera	40	5.54	3.98
Algae	33.33	3.92	2.35
Plant materials	30	3.75	2.02
Detritus	55	4.72	4.66
Sand and mud	71.67	13.61	17.51
NOID	40	2.49	1.79

Table 4: Measurement of Body weight, standard length, alimentary canal, and the ratios of alimentary length to standard length

Months	No. of specimens	BW(g)		SL (cm)		ACL(cm)		ACL(cm)	SL (cm)
		Range	Mean±SD	Range	Mean±SD	Range	Mean±SD	Range	Mean±SD
January	10	16.54-28.05	22.38±3.13	8.5-12	10.39±0.66	8.0-11.0	9.78±0.95	0.71-1.11	0.94±0.13
February	10	17.59-35.16	23.24±5.05	7-11.5	9.69±0.75	9-11.5	10.33±0.85	0.9-1.23	1.08±0.11
March	10	10.34-30.65	15.34±6.08	8.5-11.5	9.22±1.18	7.5-11	9.33±0.91	0.89-1.14	1.02±0.08
April	10	17.06-36.25	29.36±5.88	8.5-10	10.17±0.78	10.0-12.0	10.83±0.62	0.96-1.21	1.07±0.09
May	10	12.14-23.86	19.38±3.41	8-12.5	9.44±0.37	8.0-11.0	9.17±1.03	0.84-1.17	0.99±0.12
June	10	16.79-55.01	34.78±14.02	6-12	10.33±1.37	8-1.5	10.942.59	0.69-1.43	1.06±0.2
July	10	6.42-39.39	17.66±11.33	8-11.5	9±2	4.5-10	7.1±2.15	0.5-1	0.78±0.14
August	10	14.67-37.63	21.34±7.03	8-9.5	9.39±1.10	6-9.5	8.39±0.70	0.67-1	0.89±0.07
September	10	12.65-21.52	17.37±3.27	8.5-10	8.5±0.65	7-8.5	7.92±0.67	0.78-1.07	0.94±0.07
October	10	17.68-23.12	20.27±1.45	7-9	9.6±0.63	7.0-9.0	8.06±072	0.70-1.06	0.89±0.10
November	10	11.53-25.47	17.79±4.37	9-15.5	8.44±0.72	5.0-9.5	7.56±1.34	0.56-1.36	0.91±0.22
December	10	17.38-102.38	31.04±24.25	10-12	10.67±1.90	9.0-11.0	9.78±0.95	0.80-1.10	0.94±0.09

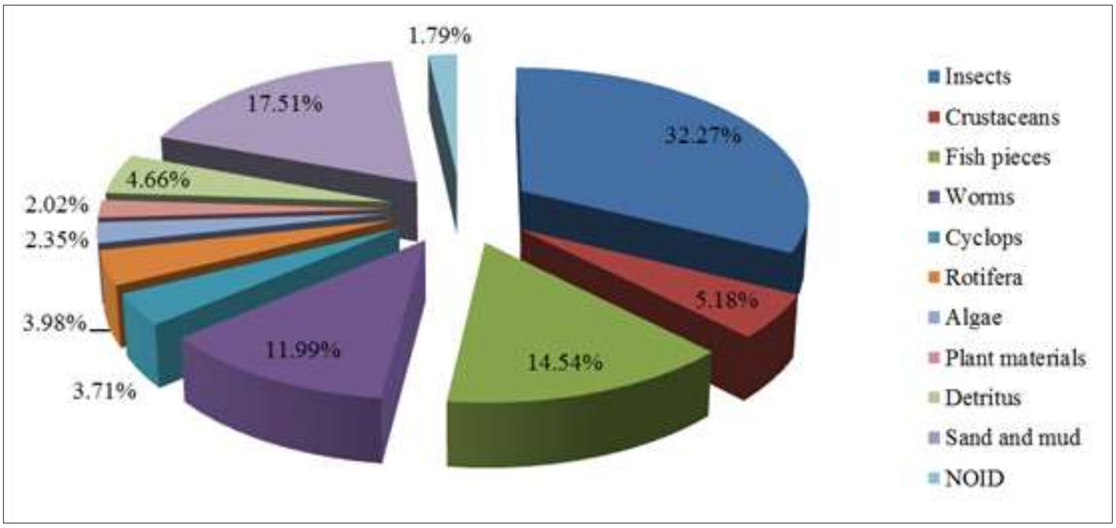

Fig 1: The mean percent composition of feeding index in the stomach of *Botia histrionica* during December 2017 to November 2018

4. Discussion

Feeding is the dominant activity of the entire life cycle of fish. The success of planning and management of fishery depends on the knowledge of their biology in which food and feeding habits include a valuable portion. The occurrence, distribution, and abundance of fish stock mainly depend on the availability of food [16].

On the basis of gut content analysis, it was observed that *B. histrionica* was feeding on different types of food items. The feeding index (FI) clearly determine the actual important of each item in the diet[16] In the present study, the feeding indexes were insects (32.27 %), crustaceans (5.18 %), fish pieces(14.54 %), worms (11.99 %), Cyclops (3.71 %), rotifers (3.98 %),algae (2.35 %), plant materials (2.02 %),detritus (4.66 %), sand and mud (17.51 %), and unidentified food items (1.79 %) respectively. The percentage composition of insects, fish pieces and worms contributed maximum when biomass of food is considered. Plant materials and algae were observed as the least contributing food group that can be regarded as incidental food. On the basis of the percentage, insects was the first preference of *B. histrionica.*

In general, the small fish had eaten a high percentage of insects or zooplanktons whereas the large fish had eaten snails, and fish. This change in diet is not unusual [17] and is presumably related to the energetic benefits of feeding on large items and the gerater vability of large fish to capture,ingest and possibly digest large food items [18].

In the present study, insects were found as the most dominated food item and regularly occurred throughout the year. The highest volume of insects were found in May (34.04%) and the lowest feeding food items was algae and can be regard as incidental food. It is may be due to their favorite food items is insects and also due to they are relatively found near and in the water. Thus, insects have an important role in the diet of this fish. The main order observed in the stomach are Diptera, Emphemeroptera, and Trichoptera. Most of the insect parts found in the stomach of this species indicated that the prey insects were in their immature form as larvae.

Zooplanktons are an important part of the diet of all freshwater fish. They are more important especially in the diet of smaller fish. They play vital roles in aquatic ecosystem. It can be used as an indicator of ecosystem change [19]. In this study, worms, detritus, fish and zooplanktons can be considered as secondary foods but the lowest feeding food items was algae and can be regarded as incidental food.

The length of intestine varied from fish to fish, it has a definite relation with the length of fish which helps to determine the feeding habit of the fish species. The feeding habits of a fish are revealed by the nature of its alimentary canal. Information on relative length of the alimentary (and in fishes relation to their food and feeding habit is limited [20].

Yadav [21] (2013) observed that in carnivorous fishes, the gut-length is less than to the body length whereas in herbivorous fishes, the gut length is more than the body length and in omnivorous fishes, the gut length ratio is between the herbivorous and carnivorous fishes.

Regarding the length of alimentary canal, the gut is muscular bag-shaped and somewhat coiled. The relative length of alimentary canal to standard length ranged from 0.78±0.14 to 1.07±0.09 which are similar to those of other carnivorous fishes. This ratio is shorter than 1.5 the standard length. According to these factors, this species can be considered as carnivorous fish.

There is little evidence of seasonal selection of food. Changes in diet quality are governed by the availability of the type of food. The fishes feed more or less in all months of the year. This fish species has great significance in the life of mankind being and important natural source of protein and provider of certain other useful products as well as economic sustenance to many people and the nations.

The present research can give knowledge of food and feeding habit that helps to select such species of fish for culture, which are optimum yielding varieties, utilizing the available potential food of the water bodies properly without any competition among themselves.

5. Conclusion

Food and feeding habitats of fish vary with time of day, season, species and size of the fish with different food substances present in the water body and its ecological factors. The knowledge of food and feeding habitats helps to select such species of fish for cultures which are optimum yielding varieties, utilizing the available potential food of the water bodies properly without any competition among themselves.

6. References

1. Khanna SS. An Introduction to Fishes. 5th edn. Silverline Publications, Faridabad, 2006.
2. Litvaitis JA. Investigating food habits of terrestrial vertebrates. In: Boitani L. & Fuller T.K (Eds.) Research techniques in animal ecology: controversies and consequences. Columbia University Press, New York, 2000.
3. Manly BFL, Mc Donald L, Thomas D, Mc Donald TL, Erickson WP. Resources selection by animals: statistical design and analysis for field studies. Kluwer Academic Publishers, 2002.
4. Ahlbeck I, Hansson S, Hjerne O. Evaluating fish diet analysis methods by individual-based modeling. Canadian Journal of Fisheris and Aquatic Science. 2012; 69(7):1184-1201.
5. Cutwa MM, Turingana RG. Intralocality variation in feeding biomechanics and prey use in *Archosargus probatocephalus* (Teleostei, Sparidae), with implications for the ecomorphology of fishes. Environmental biology of fishes. 2000; 59(2):191-198.
6. Jordan F, Liv WC, Davis AJ. Topological Keystone species: measures of positional importance in food web. Dikos. 2006; 112(3):535-546.
7. Navia AF, Cortes E, Mejia-Falla PA. Topological analysis of the ecological importance of elasmebranch fishes. A food web study on the Gulf of Tortugas, Colombia. Ecological modeling. 2010; 221(24):2918-2926.
8. Parihar D, Chaturvedi J, Saksena DN, RaO RJ. Food and feeding habits of freshwater teleost: *Ompok bimaculatus*, *Xenentodon cancila, Puntius sarana* and *Labeo boggut* from Tighra Reservoir, Gwalior (M.P.) International Journal of Scientific Research & Growth. 2016; 1(1):20.
9. Golikatte RG, Bhat G. Food and feeding habits of the Whipfin Silver Biddy Gerres filamentous from Sharavaties Stuary. Central West Coast of India. World Journal of Science and Technology. 2011; I(2):29-33.
10. Manko P. Stomach content analysis in freshwater fish feeding ecology. No.1/0916/14 funded by scientific. Grand Agency of Ministry of Education S.R, 2016.
11. Day F. The fishes of India, being a natural history of the fishes known to inhabit the sea and freshwater of India, Burma and Ceylon, Vol. I and II. Willion Dawson and Sons Ltd. London, 1878.
12. Talwar PK, Jhingran AG. Inland fishes of India and *adjacent countries.* Vol 1. A.A. Balkema, Rotterdam, 1991.
13. Bagenal TB. Methods for assessments of fish production in freshwater-IBP Handbook. Blackwell, Oxford, England, 1978.
14. Hyslop EP. Stomach content analysis: a review of methods and their applications. Journal of Fish Biology. 1980; 17:411-429.
15. Taki Y. An analytical study of the fish fauna of the Mekong basin as a biological production system in nature. Research Institute of Evolutionary Biology Special Publications no. 1, 77 p. Tokyo, Japan, 1978.
16. Kawakami E, Vazzoler G. Método gráfico eestimativa de índice alimentar aplicado no estudo de alimentaçãode peixes, 1980.
17. Rowe DK. Factors effecting the food and feeding pattern of lake -dwelling rainbow trout in the North Island of New Zealand. New Zealand J.of Marine and Freshwater Research. 1984; 18:129-141.
18. Hyatt RD. Feeding Strategy. Fish Physiology vol-VIII, Bioenegetic growth. New York, Academic Press, 1979.
19. Shin-ichi U. Human and Climate Forcing of Zooplanktons Population.4th Interational Zooplankton Production Symposium, 2007.
20. Dasgupta M. Relative length of the gut of some freshwater fishes of West Bengal in relation to food and feeding habits, Indian. J. Fish. 2004; 51(3):381-384.
21. Yadav SK, Singh BB. Morphological and histochemical study of digestive system in relation to feeding habit of Channa ranga Asian J. Animal Sci. 2013; 8(2):125-133.