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Analysis of Feeding Habits of Silver Barb (*Barbonymus gonionotus*) in The Waters of Way Sekampung Dam, Pagelaran District, Pringsewu Regency, Lampung

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ABSTRACT
The freshwater ecosystem of Way Sekampung Dam in Pagelaran District, Pringsewu Regency, Lampung Province, was selected as the research site due to its fertile environment, rich biodiversity, and high potential for aquatic biota studies. Silver barb (*Barbonymus gonionotus*), known for their adaptability and herbivorous feeding habits, were the focus of this study, which aimed to investigate their natural food preferences as a basis for sustainable fish resource management. Although primarily herbivorous, silver barb were also known to consume supplementary food such as bran and organic waste. The research was conducted from September to December 2024. Data analysis included the Index of Preponderance (IP), niche breadth, and food overlap. Results showed that silver barb predominantly consumed plant litter and phytoplankton, specifically *Gyrosigma fasciola*, *Rhabdonema arcuatum*, *Oscillatoria*, and *Closterium*. Food overlap between male and female fish remained low throughout the study, with values of 0.1051 at the beginning and 0.0851 at the end of the sampling period. This indicated differing food preferences between sexes during the transition months. Overall, the findings highlighted how seasonal dynamics and ecological variability influenced the feeding behavior and resource use of silver barb in the Way Sekampung Dam.

Keywords: Way Sekampung Dam, Silver Barb, Feeding Habits, Indeks of Preponderance.

INTRODUCTION

The Way Sekampung Dam is one of the 65 dam construction projects and was officially inaugurated on September 2, 2021. The dam was built with the aim of increasing water storage capacity to support irrigation, power generation, and flood control. Its main function is to supply irrigation water to agricultural and plantation areas. The freshwater of Way Sekampung Dam was chosen as the research site due to its fertile environment, support for biodiversity, and its great potential for aquatic biota studies, including fish.

The dam hosts a high diversity of fish species such as silver barb (*Barbonymus gonionotus*), catfish (*Pangasius hypophthalmus*), tilapia (*Oreochromis niloticus*), baung (*Mystus nemurus*), and nilem (*Osteochilus vittatus*), all of which hold significant economic value for the local community. The silver barb was a native fish of Indonesian waters, locally known as "Putuhan" or "Bander Putihan." This fish could be found in various aquatic ecosystems, ranging from brackish water ponds to fast-flowing rivers, with an optimal water temperature between 25–30°C (Rahardjo & Kusmini, 2012).

The silver barb had good adaptability to its environment and was classified as a herbivorous fish, although it could also accept supplementary foods such as rice bran or food scraps.. The analysis of fish feeding habits is crucial in ecological research as it provides insights into trophic interaction patterns within an ecosystem (Widarmanto et al., 2019). Feeding habits can reflect the ecological preferences of a species and help identify their roles in the food web and in maintaining ecosystem balance. According to Pratiwi *et al*. (2021), variations in the diet of silver barb are believed to be closely related to habitat and the availability of natural food in the waters.

The study of the feeding habits of silver barb in Way Sekampung Dam is expected to reveal the natural dietary preferences of this species, which can serve as a foundation for developing improved and sustainable fish resource management strategies. Therefore, this study aims to identify the dominant food items of tawes fish and to analyze

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their feeding habits in order to understand how their diet changes over time.

MATERIAL AND METHOD

This research was conducted over a period of four months, from September to December 2024, in the waters of the Way Sekampung Dam, Pagelaran Subdistrict, Pringsewu Regency, Lampung Province (Figure 1). The research included field activities (fish sampling every two weeks), followed by observations of the feeding habits of silver barb. The food analysis was carried out at the Laboratory of the Department of Fisheries and Marine Science, Faculty of Agriculture, University of Lampung. The determination of fish sampling locations was carried out using the random sampling method or unintentionally, with selected sites representing the overall waters of the Way Sekampung Dam based on the existing ecosystem.

Fish samples were caught using gill nets with a mesh size of 2 inches and a length of 50 meters. The fish capture was conducted in the morning from 07:00 to 10:00 AM (WIB). The fish caught in the nets were placed in a cool box filled with ice. The fish were then dissected using surgical tools, starting from the anus to the rear of the operculum, and the digestive tract was removed and preserved in 4% formalin for further analysis. The analysis of silver barb in the laboratory was carried out by measuring the length of the digestive organ, specifically the intestine, using a ruler. The intestinal contents were then dissolved in 10 ml of distilled water. The separated intestinal contents were directly observed under a microscope at 100x magnification to identify their types.

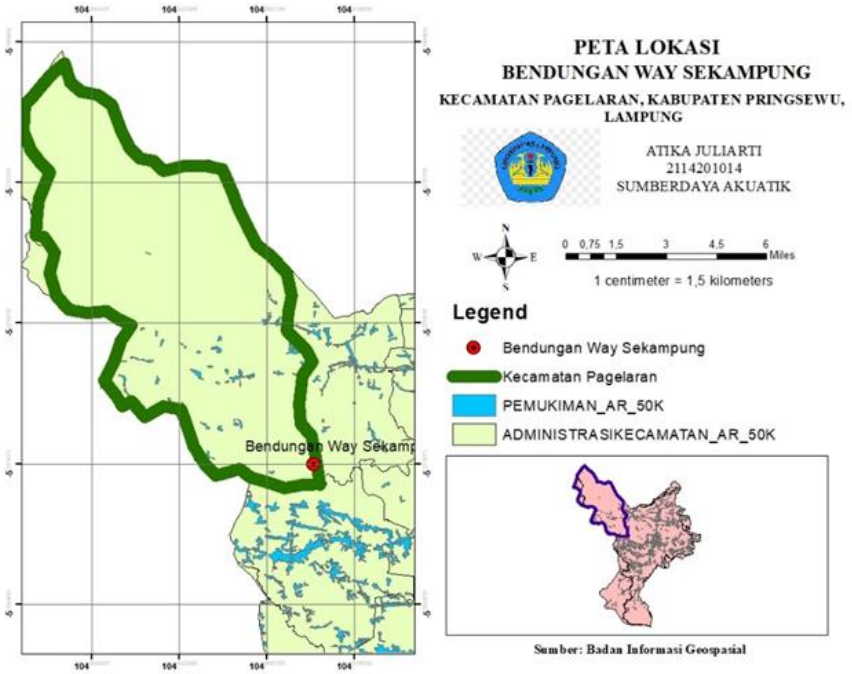

Figure 1. The research location in the Way Sekampung Dam.

Index of preponderance

The calculation of the Index of Preponderance (IP) was carried out to determine the percentage of a specific type of food organism in relation to all food organisms consumed by the sample fish. The Index of Preponderance was calculated using the formula developed by Natarajan and Jhingran (1961), as cited in Effendie (2002):

$$IPi(\%) = \frac{Vi\ x\ Oi}{\sum_{i=1}^{n}(Vi\ x\ Oi)} x\ 100$$

Description:
IPi : Index of Preponderance of the *i*-th type of food organism
Vi : Percentage volume of the *i*-th type of food organism
Oi : Percentage frequency of occurrence of the *i*-th type of food organism
N : Total number of food organism types

The feeding habits of the fish were determined based on the percentage distribution of food types, which were classified into three categories: IP > 40% was categorized as main food, IP between 4–40% as supplementary food, and IP < 4% as additional food (Nikolsky, 1963 in Setyawati *et al*., 2020).

Niche Overlapping

Niche overlap refers to the shared use of one or more resources by two or more fish species, or the degree of similarity in food types between the first and second fish groups. The value of niche

overlap was determined using the following formula:

$$CH = \frac{2\sum Pik.Pij}{\sum Pij\hat{}2 + \sum Pik\hat{}2}$$

Description:
CH : Similarity level of food types (Morisita Index)
Pij : Proportion of species-i in fish group-j
Pik : Proportion of species-i in fish group-k
Pij² : Square of the proportion of species-i in fish group-j
Pik² : Square of the proportion of species-i in fish group-k

The level of competition potential is determined based on the criteria proposed by Moyle & Senanayake (1984): If CH < 0.3 : The potential for competition is considered low; If 0.3 < CH < 0.8 : The potential for competition is considered moderate; If CH > 0.8 : The potential for competition is considered high.

RESULT AND DISCUSSION

Result

Indeks of Preponderance

The observation from September to December, both male and female fish were more dominant in consuming phytoplankton, particularly from the *Bacillariophyceae* group such as *Gyrosigma fasciola*, *Pleurosigma* sp., as well as *Spirulina* sp. from the *Cyanophyceae* group. The dominance of phytoplankton in the diet of silver barb during this period was in line with the study by Welcomme (2001), which stated that omnivorous-opportunistic fish like silver barb would utilize the most abundant food source available in the waters. In addition to the dominant phytoplankton listed in the table, non-dominant phytoplankton such as *Actinastrum* sp., *Bacteriastrum* sp., *Biddulphia* sp., *Cymbella* sp., *Cyclotella* sp., *Dinophysis* sp., *Euastrum turgidum*, *Euglena* sp., *Navicula* sp., *Phormidum granulatum*, and *Selenastrum* sp. were also found in the intestines of silver barb. Furthermore, detritus, leaf litter, and zooplankton such as *Allonella* sp., *Harpacticoida*, *Paramecium* sp., *Stentor*, and *Ceratium* sp. were also consumed.

Table 1. Indeks of preponderance in September to December both of male and female.

Type of food	Indeks of preponderance (%)															
	September				October				November				December			
	Male		Female		Male		Female		Male		Female		Male		Female	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Closterium		14,27				2,50										
Gyrosigma fasciola		32,91		19,59	49,80	85,74	55,38	87,08	47,52	72,65	71,15	70,46	82,13	70,88	73,95	65,53
Oscillatoria				23,60	10,76	8,88	11,73	4,86	24,01	15,14	10,82	14,37		3,20	4,63	
Pleurosigma	11,04		20,8													
Rhabdonema arcuatum													5,73			4,63
Rhizolosenia	10,59															
Serasah		36,54		36,75	22,30		19,24	4,26	19,41	7,80	15,13	9,06	7,29	23,13	15,93	26,61
Spirulina	16,72		12,8													
Stentor			12,8													
Lain-lain	61,62	16,26	53,6	20,04	17,13	1,86	13,63	3,78	9,04	4,38	2,88	6,09	4,82	2,77	5,47	3,21
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Niche Overlapping

This study described the results of a food overlap analysis of silver barb in the Way Sekampung Dam, reflecting patterns of interaction and competition in the utilization of food resources. Based on the observations, the level of food overlap that occurred during the study showed a tendency for similarity in food preferences among individuals, which may have been influenced by the availability of natural food and the environmental conditions of the waters.

Table 2. Food Overlap Analysis Results

Month	Overlap Value	
	1	2
September	0,1051	0,0851
October	0,1297	0,9977
November	0,8389	0,9454
December	0,9886	0,9957

Discussion

Indeks of Preponderance

In this study, the analysis of the index of preponderance regarding the feeding habits of silver barb (*Barbonymus gonionotus*) in the Way Sekampung Reservoir showed variations in food consumption from September to December 2024. These variations were closely related to seasonal changes, hydrological conditions, and biological activities such as spawning.

Figure 2. (a) *Oscillatoria*, (b) *Gyrosigma fasciola*, (c) *Rhabdonema arcuatum*.

Gyrosigma fasciola (*Bacillariophyceae)* and *Oscillatoria* (*Cyanobacteria*) were two dominant types of phytoplankton found in the Way Sekampung Reservoir and served as important natural feed sources for silver barb (*Barbonymus gonionotus*). *Gyrosigma fasciola* had a silica frustule with a sigmoid shape and a high nutritional content, such as unsaturated fatty acids and proteins, which were highly beneficial for supporting fish growth. Meanwhile, *Oscillatoria* was a filamentous cyanobacterium that reproduced rapidly through fragmentation and carried out photosynthesis, although some of its species had the potential to produce toxins under certain conditions. These two types of phytoplankton became dominant in the diet of silver barb because, ecologically, they were abundant in the water column andi easily consumed by the fish.

Silver barb are classified as omnivores with a tendency toward herbivory, primarily consuming aquatic plants, phytoplankton, and detritus such as leaf litter. This explains why the presence of *Gyrosigma* and *Oscillatoria*, which are plant-based primary producers, is highly significant in the silver barb food chain. The nutritional content of these two phytoplankton species complements the dietary needs of silver barb, which are not fully met by consuming detritus alone especially when the supply of coarse organic matter declines. With their herbivorous characteristics, silver barb naturally filter and consume phytoplankton as their main energy source in aquatic habitats such as the Way Sekampung Dam.

During September to December, observations showed that silver barb consumed a mixture of

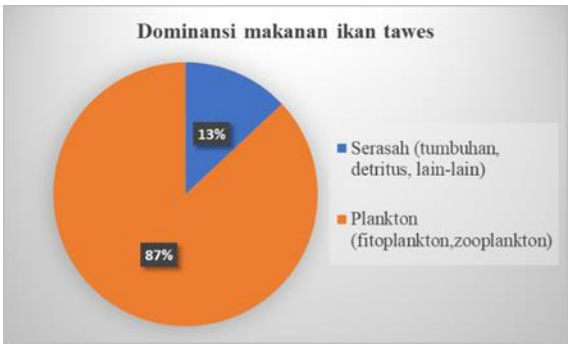

Figure 3. Percentage of Tawes Fish food

detritus, plankton, and aquatic plants. The dominant food source consumed by silver barb was plankton, accounting for 87% including both phytoplankton and zooplankton while leaf litter and other detrital plant material made up the remaining 13%. This aligns with Kurnia (2017), who stated that silver barb are omnivorous with a tendency toward herbivory, feeding on phytoplankton, aquatic plants, detritus, and other small organisms. This diverse feeding pattern indicates that silver barb utilize various available food sources in their environment with great flexibility. Wahyuni (2020) also noted that silver barb tend to exploit the most abundant food sources in their habitat, allowing them to adapt to seasonal changes.

A study by Sulistiyarto (2018) further revealed that in environments with limited plankton availability, silver barb rely more heavily on aquatic plants as their primary food source. This is also in line with the study by Rahayu (2013), which showed that in habitats with clearer water conditions and relatively stable flow, silver barb tend to consume a greater amount of aquatic plants. Overall, the changes in the dietary patterns of silver barb from month to month are influenced by seasonal fluctuations, the availability of natural food sources, and biological needs, particularly spawning. The Way Sekampung Dam environment, which experiences seasonal variations in water discharge, also contributes to the variability in food source availability. This condition is consistent with the findings of Anggraini (2017), who stated that dam aquatic ecosystems are highly dynamic and sensitive to changes in rainfall and river discharge

Overlapping

Based on data on food overlap between male and female silver barb in the Way Sekampung Dam, it was observed that in September, the overlap values were still low, both at the beginning (0.1051) and end of the month (0.0851). This indicates that during this month, there was a significant difference in food preferences between male and female fish. This difference may have been caused by variations in available food sources, such as phytoplankton and plant detritus, which were utilized differently by the two sexes. In October, the overlap value increased, especially at the end of the month (0.9977), indicating that male and female fish began to share nearly identical feeding patterns.

This rise was likely due to changes in food availability in the habitat, which led both sexes to rely on similar food sources. This phenomenon aligns with the niche overlap theory proposed by Krebs (2014), which suggests that when food sources become limited or more homogeneous, species within an ecosystem tend to exhibit increasingly similar consumption patterns. A similar trend occurred in November and December, where the overlap values continued to increase, reaching 0.9957 by the end of December. The high food overlap in the final months indicates that both male and female fish became increasingly dependent on the same food sources, such as plant detritus and dominant phytoplankton species, including *Gyrosigma fasciola* and *Oscillatoria*.

This may indicate a particular season during which the primary food sources become either more limited or more abundant, leaving the fish with few options other than to share the same resources. According to Odum (1993), the greater the food niche overlap, the higher the potential for competition among individuals in a population. Therefore, the increasing food overlap values from October to December may suggest a rise in competition for food resources in the Way Sekampung Dam.

CONCLUSION

The Index of Preponderance (IP) analysis indicated that silver barb are omnivorous with a tendency toward herbivory, as reflected in the dominant food types consumed, including phytoplankton such as *Gyrosigma fasciola*, *Oscillatoria*, and *Closterium*, as well as plant detritus. The diet of silver barb still varied between males and females, with low levels of food overlap. Their feeding habits changed from month to month, which could be linked to the availability of food resources in the aquatic ecosystem. These changes were likely due to ecological shifts in the waters, such as seasonal variations that affect food availability. Overall, this study showed that silver barb in the Way Sekampung Dam possess strong adaptive abilities in selecting food according to the conditions of their ecosystem.

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