Global Scientific JOURNALS

GSJ: Volume 7, Issue 2, February 2019, Online: ISSN 2320-9186
www.globalscientificjournal.com

FISH FOOD HABITS IN UPSTREAM OF CIMANUK, GARUT DISTRICT WEST-JAVA

Ayi Yustiati *, Citra Melinda Astuti *, Astri Suryandari **, Iskandar * and Titin Herawati *

*Fisheries Department of Padjadjaran University
**Staff of Institute for Fish Resources Enhancement Purwakarta

E-mail:

ABSTRACT

The study of food habits is the first step to manage the aquatic resources. This research was conducted in July-October 2018 at the Aquaculture Laboratory of Fisheries and Marine Sciences Faculty, Padjadjaran University and Laboratory of Research Institute for Fish Resources Enhancement. The purpose of this research is to determine food habits of fish in the upstream of Cimanuk river. This research used survey method (non-experimental) with two research stations, station one was Copong Dam area and station two was Sasak Beusi with twice sampling at each station. The fishes caught during the research were 54 fishes of two families and six species, that were barb fish (*Barbodes balleroides*), carp (*Mystacoleucus marginatus*), masheer (*Tor tambroides*), hampala (*Hampala macrolepidota*), beardless barb (*Diplocheilichthys pleurotaenia*), and goonch (*Bagarius yarrelli*). Plant material was main dietary item of barb fish, carp and beardless barb. Insects was main dietary item of masheer and hampala. Crustacea was main dietary item of goonch. The trophic level of fishes in the upstream of Cimanuk consists of herbivores (barb fish, carp, beardless barb), omnivorous (masheer) and carnivorous (hampala, goonch).

Keywords: fish, food habits, trophic level, upstream of Cimanuk.

1. INTRODUCTION

One of the rivers in West Java is the Cimanuk river. Cimanuk river flows start from Papandayan Mount Garut and ends in the Java sea. Cimanuk river flows across several regions, that are Garut, Sumedang, Majalengka and Indramayu (Minister of Public Works Decree 2010). Various activities around the Cimanuk river can produce various types of pollutants. The pollutant load can causes serious problems and threaten the life of aquatic organisms, especially fishes and natural feeds. An efforts to optimize the management of aquatic resources need to be done to maintain the balance of aquatic ecology in Cimanuk river. The first step that can be done before further management is by studying of food habits aspects. Because the study of food habits has an important role in ecological study related to the utilization of feed resources in their environment (Krebs 1989). Therefore, this research needs to be done to determine food habits of fish in Cimanuk river between Copong Dam and Sasak Beusi Garut, West Java.

2. MATERIAL AND METHODS

The research was carried out in the Cimanuk river, Garut District, West Java in March-October 2018. Identification of fishes and macrozoobenthos was carried out at the Aquaculture Laboratory of Fisheries and Marine Sciences Faculty, Padjadjaran University. Analysis of fish food habits and identification of plankton were carried out at the Laboratory of Research Institute for Fish Resources Enhancement, Purwakarta. The parameters of water quality was analyzed in the field.

The tools used in this research include cool boxes, plankton net, modifications of surber mesh, sieve, secchi dish, mercury thermometers, DO meters, pH meters, sample bottles, plastic, millimeter blocks, digital scales, knives, scissors, tweezers, petri dish, ziplock plastic, label paper, pipette drops, object glass, cover glass, measuring cup, stereozoom microscope, binocular microscope, stationery and observation form.

The material used in this research includes fishes caught by fishermen's, formalin solution 5%, lugol solution, ice cubes, and distilled water.

This research used survey method (non-experimental) and described quantitative descriptive. Sampling was carried out at two stations in upstream of Cimanuk :
Station I: Bojong Larang Village, Copong Dam area, Garut City. Geographically located at coordinates 7 7^0 1122.04 4 LS and 107'55 23 1.23 BT. This station was the exit of the dam, agricultural areas, residential areas, sand mining, and fishing ground.
Station II: Sasak Beusi Village, Limbangan Garut. Geographically located at coordinates 7^0 2 37 37.98 LS and 107^0 18 59 18 18.09 BT. This station was the sand mining and fishing ground.

Water quality parameters observed during the research included physical parameters were temperature and transparency, also chemistry parameters were pH and Dissolved Oxygen.

The analysis to find out fish food habits have used the index of preponderance method based on the formula Natarajan & Jhingran (1961) *in* Effendie (1979). Index of preponderance is a combination of event and volumetric frequency methods with the following formula:

$$\mathbf{Ii} = \frac{\mathbf{Vi \times Oi}}{\sum_{\mathbf{i=1}}^{\mathbf{n}} \mathbf{Vi \times Oi}} \mathbf{\times 100}$$

Information:
Ii = Index of Preponderance
V_i = Volumetric frequency percentage
O_i = Occurrence frequency percentage

The diet preferences and feeding specialization of the different species were evaluated on the basis of an Ii ≥ 50% criterion for a given category or type of item (Oliveira *et al*. 2014).

The trophic level of fishes was determined based on the relation between trophic levels of feed organisms and fish food habits so that the position of fish in the ecosystem can be known by a modified formula Mearns *et al.* (1981) as follows:

$$\boldsymbol{Tp = 1 + \sum \left(\frac{T_{tp} x I_i}{100} \right)}$$

Information:
Tp = trophic level of fish
• Herbivorous 2.00 p Tp ≤ 2.49
• Omnivores 2.50 p Tp ≤ 2.99
• Carnivores Tp ≥ 3.00.
Ttp = Trophic level of p-feed group
Ii = Index of preponderance for p-feed group

Determination of plankton abundance was calculated using the Lackey Drop Micro Transect Counting method (APHA 2005) with the following equation:

$$\boldsymbol{N = n\, x \frac{A}{B} x \frac{C}{D} x \frac{1}{E}}$$

Information:
N = Total plankton (cell L^{-1}, ind L^{-1})
n = Number of individual total averages each field of view
A = Area of dark cover (mm^2)
B = Area of view (mm^2)
C = Volume of concentrated water (mL)
D = Volume of one drop water under the cover (mL)
E = Volume of filtered water (L)

Determination of abundance of benthic species is calculated using the formula with the following equation (Rahayu et al. 2015):

$$\boldsymbol{K = \frac{10.000\, x\, a}{b}}$$

Information:

K = Abundance of benthic type (ind/m^2)
a = Number of individual total in the sample (ind)
b = Cross-sectional area of surber mesh (m^2)

Data obtained was presented in the tables and figure. The data were then analyzed quantitative descriptive and compared with the existing standards. Quantitative descriptive analysis was carried out by describing all results obtained during the research including data on species, length and weight of fish, identification of natural feed, identification of fish food habits, and water quality parameters to find out the index of preponderance, trophic level and abundance of natural feed sources.

3. RESULTS AND DISCUSSION

The total number of fishes caught in the research was 54 individuals consisting of two families, that were Cyprinidae and Sisoridae. The Cyprinidae family consists of five species while the Sisoridae family consists of only one species (Table 1).

Table 1. Composition Type, Number, length and weight of fish caught

No	Local Name	Scientific Name	Common Name	Family	Distribution of Length and Weight			Number (tail)		Total fish (tails)
					TL (mm)	SL (mm)	Weight (gr)	Station I	Station II	
1	Lalawak	*Barbodes balleroides*	Barb fish	Cyprinidae	178-300	135-230	81-397	7	3	10
2	Genggehek	*Mystacoleucus marginatus*	Carp		122-200	96 - 160	24-104	29	2	31
3	Tambra	*Tor tambroides*	Masheer		367	300	567	-	1	1
4	Hampal	*Hampala macrolepidota*	Hampala		222-345	183-284	125-425	2	4	6
5	Seren	*Diplocheilichthys pleurotaenia*	Beardless barb		185-318	142-254	71-342	3	2	5
6	Lika	*Bagarius yarrelli*	Goonch / Giant devil catfish	Sisoridae	290	205	100	-	1	1
Amount (tail)								**41**	**13**	**54**

The limitation of caught was caused by the limited human resources that caught fish using throwing nets, seasons, and competition for fishing with other fishermen in the area around the research site. The timing of fishing carried out during the dry season affects the amount of catch due to a decrease in river water level. The decrease in river water level was caused by the reduced volume of river water due to low rainfall in the dry season.

The most caught fish in the upstream of Cimanuk comes from the Cyprinidae family. This is because fish from the Cyprinidae family are found mostly in freshwater (Buwono *et al.* 2017). According to Nikolsky (1963), this was usual because the Cyprinidae family can live well in river areas that have strong or weak currents.

The dietary items were consumed by fish in the upstream of Cimanuk consist of phytoplankton, zooplankton, plants material, mollusca, insects, fish, crustacea, and detritus. Fish food habits in the upstream of Cimanuk can be seen in Figure 1. Observations of food composition and trophic level of fish in the upstream of Cimanuk were presented in Table 2.

Barb fish, carp, and beardless barb are included of herbivorous fish with plants material as the main of diet items. Barb fish, carp, and beardless barb have very long intestinal tract sizes. Kramer & Bryant 1995 *in* Meliawati *et al.* 2014 states that herbivorous fish have an intestinal length between 2-21 times their body length.

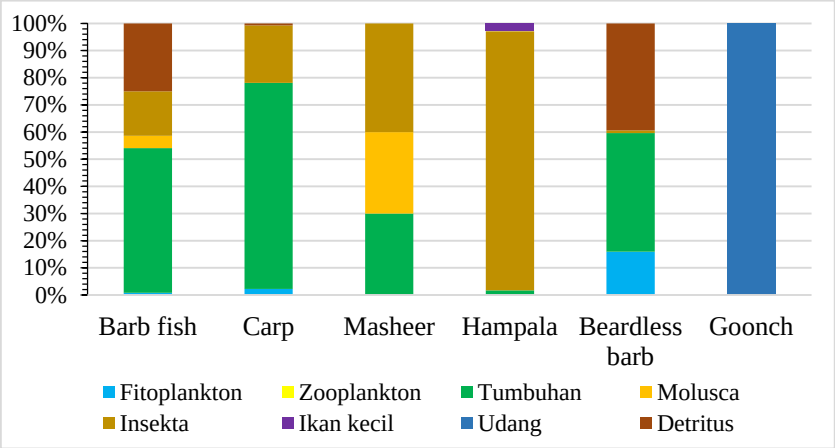

Figure 1. Fish Food Habits

Table 2. Feed Composition and Trophic Levels of Fish

Type of Fish	Scientific Name	Feed Composition	Trophic Level
Barb fish	*Barbonymus balleroides*	phytoplankton, plants *, mollusca, insects, detritus	Herbivore
Carp	*Mystacoleucus marginatus*	phytoplankton, plants *, insects, detritus	Herbivore
Masheer	*Tor tambroides*	flora, mollusca, insects *	Omnivore
Hampala	*Hampala macrolepidota*	plants, insects *,fish	Carnivorous
Beardless barb	*Diplocheilichthys pleurotaenia*	phytoplankton, zooplankton, plants *, insects, detritus	Herbivore
Goonch	*Bagarius yarrelli*	crustacea *	Carnivorous

Information: * Main food

Hampala was comsumed insects as the main diet item and belong to carnivorous. Goonch iwas also carnivorous with crustacea as the main diet item. Hampala and goonch have a short intestine tract. According to Singh *et al*. (2012), carnivorous fish have a relatively long intestine tract which is shorter than the total body length.

Masheer consumed insects as the main diet item and belong to omnivorous. This was supported by a statement from Haryono (2006); Muchlisin *et al.* (2015), that masheer is omnivores. The length of the intestine tract of the masheer was slightly

longer than the total length of the body. The intestinal length of masheer 1.5 times their body length (Haryono 2006). According to Smith (1989) *in* Muchlisin *et al.* (2015), omnivorous fish have an intestine tract 1.5 to 2 times their total body length.

Differences in food habits can be influenced by differences in the anatomical structure of the digestive organs (Lagler *et al*. 1977; Effendie 2002). In addition, the feed composition of fish was very influenced by season and location (Medeiros & Arthington 2008). The composition of natural feed in the dry season was less than the composition of natural feed in the rainy season because the submersion that occurs in aquatic ecosystems has an impact on the formation of potential food storage areas (Wootton 1992). The reverse happens in the dry season where the water volume of river will be significantly reduced due to low rainfall and nutrients entering the waters will be reduced.

The human activities around the upstream of Cimanuk which pollute the environment can cause environmental changes and have an impact on changes in fish feed supplies (Effendie 2002). This threatens the life of fishes that were unable to adapt the environmental changes. Therefore, it was necessary to control activities that have the potential to pollute or damage the waters in the upstream of Cimanuk by related parties.

Table 3. The Composition and abundance of Plankton

No	Class	Genera	Abundance (ind/L) Station I	Station II	Total
		PHYTOPLANKTON			
1		*Cyclotella* sp.	80498,96	92573,80	173072,77
2		*Cymbella* sp.	12074,84	20124,74	32199,58
3		*Gomphonema* sp.	8049,90	4024,95	12074,84
4	Bacillariophyceae	*Navicula* sp.	32199,58	12074,84	44274,43
5		*Nitzschia* sp.	12074,84	12074,84	24149,69
6		*Pleurosigma* sp.	8049,90	4024,95	12074,84
7		*Synedra* sp.	84523,91	40249,48	124773,39
	Total		**237471,93**	**185147,61**	**422619,54**
1		*Coelastrum* sp.	4024,95	0	4024,95
2		*Cosmarium* sp.	20124,74	0	20124,74
3	Chlorophyceae	*Pandorina* sp.	4024,95	0	4024,95
4		*Scenedesmus* sp.	16099,79	20124,74	36224,53
5		*Staurastrum* sp.	12074,84	0	12074,84
	Total		**56349,27**	**20124,74**	**76474,01**
1	Cyanophyceae	*Peridinium* sp.	4024,95	0	4024,95
	Total		**4024,95**	**0**	**4024,95**
1	Euglenophyceae	*Phacus* sp.	28174,64	0	28174,64
	Total		**28174,64**	**0**	**28174,64**
		ZOOPLANKTON			
1	Rotifera	*Notholca* sp.	8049,90	0	8049,90
	Total		**8049,90**	**0**	**8049,90**
1	Protozoa	*Arcella* sp.	16099,79	0	16099,79
	Total		**16099,79**	**0**	**16099,79**

Plankton abundance is the number of individual plankton each unit volume of water and can also be expressed in the number of cells per liter of water (Iswanto *et al.* 2015). The composition and abundance of plankton in the upstream of Cimanuk were presented in Table 3. The highest plankton abundance was found in Bacillariophyceae class, which was 237471,93 ind/L at station I and 185147,61 ind/L at station II. That was because the Bacillariophyceae has the ability to adapt with the environment, cosmopolitan, resistant to extreme conditions and high reproductive power (Anggraini *et al*. 2016).

Table 4. The Composition and abundance of Benthic

Class	Genera	Abundance (ind / m^2)	
		Station	
		I	II
MOLLUSCA			
Gastropod	*Lymnaea sp*	44	-
	Pseudosuccinea sp	22	44
	Galba sp	-	56
	Stagnicola sp.	-	22
	Tryonia sp.	-	44
	Tarebia sp.	-	67
Pelecypoda	*Alasmidonta* sp.	-	67
ANNELIDA			
Clitellata	*Helbdella* sp.	33	33
	Glossiphonia sp.	11	-
Amount		110	333

The composition and abundance of benthic species in the upstream of Cimanuk were presented in Table 4. The Gastropod class has the highest abundance at both research stations. Gastropods were types of facultative benthic organisms in nature (Fisesa et al. 2014). Facultative benthic was one that can survive in conditions of environmental quality at the level of moderate pollution. These organisms can survive in waters that contain a lot of organic matter, but can't survive in waters where was heavily polluted (Wilhm 1975 *in* Fisesa *et al.* 2014). The difference in benthic abundance at each research station occurred because of differences in the availability of organic materials, substrate, and human activities in each station (Rahayu *et al.* 2015).

The results of water quality assessment in the upstream of Cimanuk were presented in Table 5. Temperature was a factor that affects the growth of fish in tropical waters (Effendie 2002). The measured temperature ranges from 26º-27.8ºC. The optimum range of water temperature for fish in tropical waters was range from 25ºC-32ºC (Indrayana *et al*. 2014). Transparency ranges from 46 cm-62.5 cm. According to Asmawi (1983) *in* Suparjo (2009), the transparency value for fish life was good if more than 45 cm.

Table 5. Water Quality of Cimanuk River

Parameters	Unit	Station I		Station II		Standard
		July 18	Aug' 18	July 18	Aug' 18	
Temperature	º C	26	27	26.5	27.8	22- 28
Transparency	cm	55	62.5	46	47, 5	> 25
pH	-	7.65	7.97	7.69	7.84	6.00-9.00
DO	mg/L	6.7	6.2	6.1	5.4 5.4	3

Source: Class III Water Quality Criteria Regulations Government No. 82 of 2001

pH values measured at each station range from 7.65-7.97. Low pH conditions in waters will endanger the life of aquatic organisms because they cause various disorders such as metabolic disorders and respiration, including in benthos (Barus 2004). DO values in the upstream of Cimanuk ranged from 5.4 mg/L -6.7 mg/L. Water organisms will live well if DO was more than 5.0 mg/L (Barus 2004). All water quality parameter values were still within the specified standard range. Based on this, it can be concluded that the value of temperature, transparency, pH, and DO in the upstream of Cimanuk were good to support the life of aquatic organisms.

4. CONCLUSION

Based on the results of this research, it can be concluded that the main diet item of barb fish, carp and beardless barb were plants material and belongs to the herbivorous fish. The main diet item of masheer was an insect and belongs to the omnivorous fish. The main diet item of hampala and goonch were insects and crustacea thats belongs to the carnivorous fish.

References

[1] Anggraini, A., Sudarsono, and Sukiya. 2016. Plankton abundance and fertility rates in the waters of the Bedog River. Biology Journal. Vol. 5 No. April 6, 2016: 1-9.

[2] APHA (American Public Health Association). 2005. Standard Methods for the Examination of Water and Waste Water. 17th ed. APHA. Washington DC. 1193 p.

[3] Barus, TA 2004. Introduction to Limnology Study of Mainland Water Ecosystems. USU Press. Field.

[4] Buwono, NR, F. Fariedah, RE Anestyaningrum. 2017. Fish Community in Jerowan River, Madiun Regency. Journal of Aquaculture and Fish Health. Vol. 6 No. March 2, 2017: 81-88.

[5] Effendie, M.I. 1979. Fisheries Biology Method. Dewi Sri Foundation. Bogor. 112 p.

[6] Effendie, M.I. 2002. Fisheries Biology. Nusantara Library Foundation. Yogyakarta. 163 p.

[7] Fisesa, ED, I. Setyobudiandi, M. Krisanti. 2014. Community Service Center for the Structure of Macrozoobenthos in Belumai River, Deli Serdang District, North Sumatra Province. Depik. Vol. 3 No. April 1, 2014: 1-9.
[8] Haryono. 2006. Biological Aspects of Tambra Fish (Tor Tambroides Blkr.) That Exotic and Rare for Its Domestication. BIODIVERSITY. Vol. 7 No. April 2, 2006: 195-198.
[9] Indrayana, R., M. Yusuf, A. Rifai. 2014. Effect of Surface Flow on Quality Distribution; s Air in the Genuk Waters of Semarang. Oceanographic Journal. Vol. 3 No. 4 2014: 651-659.
[10] Iswanto, CY, S. Hutabarat, PW Purnomo. 2015. Analysis of Aquatic Fertility Based on the Diversity of Plankton, Nitrate and Phosphate in the Jali River and Lereng River in Keburuhan Village, Purworejo. Diponegoro Journal Of Maquares (Management of Aquatic Resource). Vol. 4 No. 3 2015: 84-90.
[11] Decree of the Minister of Public Works. 2010. The Pattern of Management of Water Resources in the Cimanuk-Cisanggarung River Region.
[12] Krebs, CJ 1989. Ecological Methodology. Harper and Row Publisher. New York. 652 p.
[13] Lagler, KF, JE Bardach., RR Miller., DRM Passino. 1977. Ichtiology. John Wiley and Sons. Inc. London. 506 p.
[14] Medeiros, ESF and AH Arthington. 2008. Diel Variation in Food Intake and Diet Composition of Three Native Fish Species in Floodplain Lagoons of The Macintyre River, Australia. Journal of Fish Biology. Vol. 73 No. September 4, 2008: 1024-1032.
[15] Meliawati, R. Elvyra, and Yusfiati. 2014. Analysis of the Content of Stomach of Long Lampung Fish (Kryptopterus apogon) in Mentulik Village, Kampar Kiri River and Garo City, Tapung River, Riau Province. JOM FMIPA. Vol. 1 No. October 2, 2014: 500-510.
[16] Muchlisin, ZA, US Coal, MNS Azizah, M. Adlim, A. Hendri, N. Fadli, AA Muhammadar, S. Sugianto. 2015. Feeding Weight Relationship of Fish, Tambra Valenciennes, 1842 (Cyprinidae) from The Western Region of Aceh Province, Indonesia. BIODIVERSITY. Vol. 16 No. April 1, 2015: 89-94.
[17] Nikolsky, GV 1963. The Ecology of Fishes. Academic Press. New York. 325 p.
[18] Oliveira, JC, R. Angelini, VJ Isac-Nahum. 2014. Diet and Niche Breadth and Overlap in Within Fish Communities The Area Affected by An Amazonian Reservoir Apama, Brazil. Anais da Academia Brasileira de Ciências. Vol. 86 No. 1 2014: 383-350.
[19] Rahayu, S., R. Mahatma, Khairijon. 2015. Macrozoobenthos Abundance and Diversity in Some of the Batang Lubuh River Children in Rambah District, Rokan Hulu Regency. JOM FMIPA. Vol. 2 No. 1, February 2015: 198-208.
[20] Singh, CP, RN Ram, RN Singh. 2012. Food and Feeding Pattern of Channa punctatus in Two Different Habitats at Tarai Region of Uttarakhand. Journal of Environmental Biology. Vol. 34 July 2013: 789-792.

[21] Suparjo, MN 2009. Pollution Conditions in Babon River, Semarang. Saintek Perikanan Journal. Vol. 4 No. 2 2009: 38-45.
[22] Wootton, RJ 1992. Fish Ecology. Blackie and Sons Ltd. London. 211 p.