

Community Structure of Macrobenthos Inhabiting Bangkong River and Fish Farming Pond Minapolitan Area of Menayu Village, Muntilan District, Indonesia

by Sapto Purnomo Putro

Submission date: 20-Jul-2018 09:56PM (UTC+0700)

Submission ID: 983919614

File name: 6.Fajria_Darell_et_al.pdf (621.82K)

Word count: 2173

Character count: 11727



Community Structure of Macroenthos Inhabiting Bangkok River and Fish Farming Pond Minapolitan Area of Menayu Village, Muntilan District, Indonesia

Fajria Darell Sofiana¹, Sapto P. Putro^{2,*}, and Fuad Muhammad¹

¹Department of Biology, Faculty of Science and Mathematics, Diponegoro University, Jl. Prof. Soedarto, SH, No.1 Tembalang, Semarang, 50275, Indonesia

²Center of Marine Ecology and Biomonitoring for Sustainable Aquaculture (MEBSA), Diponegoro University, Semarang 50275, Indonesia

Minapolitan is an area or village for aquaculture as the main business sector, supported by good water ecosystem and legalited by local government. Bangkok River is one of the rivers located in Minapolitan area of Menayu Village, Muntilan District. Bangkok River is the main source of water for aquaculture activities. Community structure of Macroenthos is used to determinate water quality in Bangkok River. The research was conducted on April and June 2016 at four location, representing upstream, middle, downstream parts of the river, and fish pond. The result found 33 species consisting of 16 families and 7 classes. The most prevalent family at the four sampling sites is Thiaridae (Class: Gastropoda). Thiaridaeis one of family of macroenthos that easily adapt to environmental conditions. Species that dominates on all four sampling sites were *Melanoidestherculata*. The Values of Diversity index (H') ranged from 1,77 to 2.19. The similarity index value type (J') ranged from 0.92 to 0.97. Dominance index value (C) ranges from 0,90 to 0.98. The abiotic parameters of water quality in the Bangkok River in four sampling locations is considerably in normal range based on Indonesian government regulation number 82 year 2001 about water quality for aquaculture. The average carbon content ranging from 1.42 to 8.21% and the nitrogen content ranged from 0.15 to 0.65%. Based on the data obtained in four sediment sampling locations were is dominated by fine sand with fine sand highest value of 71% in the sampling location 1. In addition to fine sand, sediment composition also consists of coarse sand with a highest score of 31% in the locations 2. By using BIO-ENV software to analysis the correlation abiotic and macroenthos it was known that the value of the DO, and nitrogen levels are the most influential abiotic components for the abundance of macroenthos (BIO-ENV: $r = 0, 91$).

Keywords: Minapolitan Areas, Macroenthos, Shanon-Wiener Diversity Index (H').

1. INTRODUCTION

Minapolitan is an area or village for fish farming aquaculture as the main business sector, supported by good water ecosystem and legalited by local government. Bangkok River is one of the rivers located in Minapolitan area of Menayu Village. This river has an important role for the community around Menayuvaccinity for agricultural purpose and the main source of fresh water that flows all year long the year so it is suitable for freshwater aquaculture activities the current conditions can not be separated from the events of cold lava from the eruption of Mount Merapi in 2010. The flow of cold lava eruption of Mount Merapi as the impact of causing the death of fish juvenile in an area cultivated with approximately 70 Ha. However, in addition to adversely affect their cold lava events also have a positive impact on the flow of

the river because of volcanic sediment carried by the river flow contains a lot of organic material from the sediment of Merapi eruption that is essential for agricultural irrigation and aquaculture activities. Macroenthos are organisms that live in bottom waters. Organism lived in the bottom of waters, either in the form of animals and plants, both living in or on the bottom surface and bottom waters.¹ Macroenthos structure is used to determine the level of disturbance is also an abundance and diversity of macroenthos bangkong in the river and fish ponds.

The quality of river water, can be seen by the physical, chemical, and biological parameters. Menayu aquaculture in the area managed by of Mina Karya Mandiri Menayu. Farmer group of freshwater fish are mostly arwana fish farmers whose sales have reached export to many countries especially China. Bangkok river is closely related to the activity of freshwater farming as the main reason conducted research on diversity makroenthos

*Author to whom correspondence should be addressed.

structure contained in the river and in the arwana fish ponds to determine the water quality in the region Menayu. problems to be addressed for this research is how macrobenthos existing community structures in Bangkong river waters and an arwana fish farming related to their activity freshwater fish farming in the village Menayu. Bangkong river flow is the water source for freshwater fish farming by Menayu Village community, how the level of impaired quality of Bangkong river waters and an arwana fish farming seen from the relationship abiotic and biotic community structure makrobenthos in the region.

2. EXPERIMENTAL DETAILS

The research was held on Minapolitan areas Menayu village, Muntilan district with coordinates 7° 35'43.3" latitude and 110° 15'13.5" E. Time of research was on January–July 2016. The activities is location determination of Macrobrachium sampling, Macrobrachium sampling with the steps samples were taken using 51 mm diameter wilcoo hand corer, sediment is moved into a plastic bag and fixed with 4% formalin. In the laboratory, the samples were transferred in plastic jar and then performed cleansing (rinsing). The samples were then filtered (sieving) using makrobenthos sieve with mesh size of 1 mm. Macrobrachium obtained washed with fresh water and then in preservation using ethanol 70%. Macrobrachium then sorted (sorting) under the stereoscopic microscope 10 × 10. Macrobrachium identification using identification books. Measurements taken were was the water temperature, acidity (pH), turbidity, water depth, light intensity, Dissolved Oxygen (DO), and salinity. Sample sediment were analysed to know the to know the content of carbon and nitrogen. Data analysis non parametrical is to know the indeks of similiarity, diversity, abundance and dominance. The correlation between biotic and abiotic components were calculated by used BIO-ENV the PRIMER software V.6.1.5.

3. RESULTS AND DISCUSSION

The result from four sampling sites, identified 33 macrobrachium species of 16 family. Total macrobrachium on the location of the observations consists of 7 classes. Multidimensional Bray Curtis Graphics by location shown about there is any grouping of

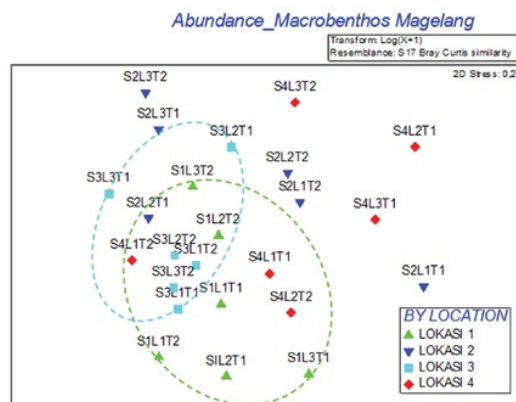


Fig. 1. Ordinated grouping macrobrachium abundance of bray curtis multidimensional scaling (MDS) by location.

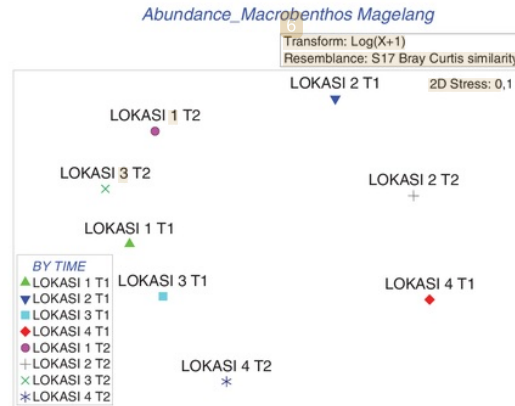


Fig. 2. Ordinated grouping abundance makrobenthos curtis bray multidimensional scaling (MDS) by time.

Macrobrachium abundance at location 1 which is upstream part of the river and location 3 which is fish farming pond. This shows that the condition of waters in the upper reaches have a good condition, because not many disturbance such as agricultural activities. In addition to the upstream part of the river is still clean so makrobenthos abundance in one location is abundant and consistent to the grouping. Location 3, namely an arwana farming also indicate grouping makrobenthos abundance. It is also influenced by the water conditions are good for the aquaculture pond water conditions have been conditioned as a place of growth, maintenance and arwana fish spawning. Multidimensional Bray Curtis Graphics by time shown that is not any grouping of Macrobrachium abundance at time sampling on April, and July. So, the sampling time didn't influence Macrobrachium abundance (Figs. 1 and 2).

Physical and chemical factors of Bangkong river is temperature, DO, turbidity, light intensity, pH, conductivity, carbon content, nitrogen content, and granular composition of the substrate. Data obtained from measurements at four locations, namely the upstream, midstream, and downstream Bangkong river and arwana fish farming pond temperature results obtained (27.06 to 34.42 °C), DO (4.78 to 5.64 mg/L), turbidity (13.77 to 35.64%), light intensity (lux 0.09 to 20.99), pH (7.23 to 7.55), conductivity (244.33 to 295.66 S).

The results of the analysis of the relationship and abiotic factors and Macrobrachium abundance in the Bangkong rivers using BIO-ENV PRIMER software V.6.1.5. Based on the above table the correlation between biotic and abiotic components of highest abundance Makrobenthos with DO levels that have a value

Table I. Total macrobrachium on the location of the observations.

No.	Macrobrachium taxa	Total species
1	Gastropods	19 species
2	Bivalves	2 species
3	Insecta	2 species
4	Polychaeta	4 species
5	Oligochaeta	1 species
6	Crustaceans	1 species
7	Malacostraca	2 species

Table II. The results of the analysis of the relationship and abiotic makrobenthos abundance in the bangkong rivers using BIO-ENV PRIMER software V.6.1.5.

No.	Correlation (<i>r</i>)	Variable	Total variable
1	0,91	1	1
2	0,77	1,8	2
3	0,69	1,4,8	3
4	0,61	1,2,8	3
5	0,56	4,8	2
6	0,55	1,2,4,8	4
7	0,52	1,4,8,9	4
8	0,50	1,8,9	3
9	0,43	1,4	2
10	0,43	4	1

Notes: 1 DO, 2 temperature, 3 light intensity, 4 turbidity, 5 pH, 6 conductivity, 7 content C%, 8 content N%, 9 gravel, 10 coarse sand, 11 fine sand 12 silt.

of correlation (*r*) of the total of 0.091. A high correlation value indicates the higher the correlation between macrobenthos and abiotics factors. This indicates the value of DO is the most influential component with Makrobenthos abundance in Bangkong rivers, Menayu village. The second abiotic factors that affect is a nitrogen content (%N) with a correlation value Macroenthos abundance with two variables: DO and N is 0.77. It shows in addition to the levels of DO, the nitrogen content is abiotic factors that most influence the abundance Macroenthos because nitrogen is a nutrient source for the benthos (Table I).

The average indeks of diversity (H') is 1,77–2,19. The diversity of macrobenthos in Bangkong River is medium if $1 < H' < 3$, so the diversity of macrobenthos classified as *medium*. The average indeks of similiarity (J') is 0,92–0,97. The abundace of macrobenthos in Bangkong River is *high* because $J' > 0,6$. The average indeks of dominance (C) is 0,31–0,92. The dominance of macrobenthos in Bangkong River is *high* because closer to 1.

4. CONCLUSION

Macrobenthos based on research results found 7 Macroenthos classes consisting of 16 Family with a total of 33 species.

Macrobenthos taxa which dominates in the four sampling sites are *Melanoides tuberculata* derived from the family Thiaridae. Thiaridae is generally Gastropods family could potentially be used as a bio-indicator to determine the quality of the water environment. Thiaridae relative abundance indicate that the water quality of Bangkong river is good. The value of diversity index indicating the ecosystem is relatively stable, the index of the similarity is high which indicates the criteria that the presence of any type of biota in the waters is equally same and the dominance index is medium, which means there is no certain species that dominate in Bangkong river. The physics-chemical factors waters and sediments based on research results did not show any significant difference between the four sampling sites. Abiotic factors that most influence the community structure Makrobenthos is DO and nitrogen content with strong correlation.

Acknowledgments: The authors would like to thank Ministry for Research, Technology and Higher Degree for funding this project through 'Science and Technology for Region' (IbW project) 2016. We also appreciate fish farmers on Menayu Village, Muntilan District for all supports.

References and Notes

1. S. P. Putro, Metode Sampling Penelitian Makrobenthos dan Aplikasinya. Graha Ilmu, Yogyakarta (2014).
2. A. Yuliana, Produktivitas Perairan, Bumi Aksara, Bogor (2012).
3. R. Dahuri, Sustainable Coastal and Ocean Development, Roda Bahari, Bogor (2015).
4. P. Kristianto, Ekologi Industri, LPPM, Penerbit ANDI, Yogyakarta (2002).
5. S. M. Natsir and Rubiman, *Jurnal Ilmu Dan Teknologi Kelautan* 2, 74 (2010).
6. A. Nontji, Laut Nusantara, Djambatan, Jakarta (1993).
7. E. P. Odum, D.-D. Ekologi, and T. T. Samingan, Gadjah Mada University Press, Yogyakarta (1993).
8. S. P. Putro, *Journal of Coastal Development* 12, 155 (2009).
9. P. Raven, *Journal of Applied Ecology* 10, 136 (2013).
10. A. Saliot, M. Goux, A. Fevrier, D. Tusseau, and C. Andrie, *Journal Marine Chemistry* 11, 257 (1982).
11. W. Schmitz, River monitoring network in the federal republic of Germany, Limnology in the Federal Republic of Germany, edited by W. Lampert and K. Rothhaupt, International Association for Theoretical and Applied Limnology, Plon (1989), pp. 143–145.
12. M. F. Sukadi, *Jurnal Iktiologi Indonesia* 2, 169 (2002).

Received: 5 September 2016. Accepted: 13 December 2016.

Community Structure of Macrobenthos Inhabiting Bangkok River and Fish Farming Pond Minapolitan Area of Menayu Village, Muntilan District, Indonesia

ORIGINALITY REPORT

11%

SIMILARITY INDEX

4%

INTERNET SOURCES

7%

PUBLICATIONS

4%

STUDENT PAPERS

PRIMARY SOURCES

- 1 Sapto P. Putro, Fuad Muhammad, Amalia Aininnur, Widowati, Suhartana. " The Roles of Macrobenthic Mollusks as Bioindicator in Response to Environmental Disturbance : Cumulative -dominance curves and bubble plots ordination approaches ", IOP Conference Series: Earth and Environmental Science, 2017
Publication 2%
- 2 Submitted to Universitas Diponegoro
Student Paper 2%
- 3 M Abyan Syuja', Sapto P. Putro, Fuad Muhammad. "Biomonitoring on Integrated Multi-Thropic Aquaculture (IMTA) activities using macrobenthic mollusks on Tembelas Island, Kepulauan Riau Province", Journal of Physics: Conference Series, 2018
Publication 2%
- 4 irep.iium.edu.my
Internet Source 1%

5	www.portalgaruda.org Internet Source	1%
6	epubs.scu.edu.au Internet Source	1%
7	Jeanny Sharani, Jafron W. Hidayat, Sapto P. Putro. "Correlation between macrobenthic structure (biotic) and water-sediment characteristics (abiotic) adjacent aquaculture areas at Tembelas Island, indonesia", Journal of Physics: Conference Series, 2018 Publication	1%
8	Charles B. Yackulic. "Competitive exclusion over broad spatial extents is a slow process: evidence and implications for species distribution modeling", Ecography, 2017 Publication	1%
9	A. Saliot, J. Tronczynski, P. Scribe, R. Letolle. "The application of isotopic and biogeochemical markers to the study of the biochemistry of organic matter in a macrotidal estuary, the Loire, France", Estuarine, Coastal and Shelf Science, 1988 Publication	<1%
10	www.eng.uwo.ca Internet Source	<1%

Exclude quotes Off

Exclude matches Off

Exclude bibliography Off

Community Structure of Macrobenthos Inhabiting Bangkok River and Fish Farming Pond Minapolitan Area of Menayu Village, Muntilan District, Indonesia

GRADEMARK REPORT

FINAL GRADE

/0

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3
