Fish diversity at Cileumeuh River in District of Majenang, Cilacap Regency, Central Java

[Diversitas ikan di Sungai Cileumeuh Kecamatan Majenang, Kabupaten Cilacap, Jawa Tengah]

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Abstract

Cileumeuh River is one of the large rivers in Western Cilacap Regency, Central Java. This river, from its upper reaches to its mouth runs through forest, farming, and housing areas. This condition leads to the prediction that the Cileumeuh River has altered its physic-chemical characteristics which led to be its being inhabited by diverse fish species. This study aims to collect data about fish species that inhabit Cileumeuh River. The survey method used was to cluster random sampling according to upper, middle, and lower parts of the river. The observed variables were number of species and abundance. During the survey a total number of 288 fish individuals were collected. Identification placed the samples into 22 species and 10 families. The obtained families were Clariidae, Loricariidae, Bagridae, Cichlidae, Synbranchidae, Channidae, Belontiidae, Anabantidae, Cyprinidae, and Poeciliidae. Among ten families, Cyprinidae had the highest number of species (ten species) and followed by Bagridae with five species. The other eight families each have one species. High number of species and families has confirms that the Cileumeuh River has high fish diversity.

Keywords: Cileumeuh River, diversity, fishes, water quality.

Abstrak

Sungai Cileumeuh merupakan salah satu sungai yang cukup besar di Kabupaten Cilacap bagian Barat. Sungai tersebut mengalir melalui areal hutan, pertanian, dan perumahan. Kondisi tersebut diduga menyebabkan perubahan fisik-kimiawi perairan yang berdampak pada beragamnya ikan yang hidup di Sungai Cileumeuh. Penelitian ini bertujuan untuk mengoleksi data mengenai spesies ikan penghuni Sungai Cileumeuh. Penelitian dilakukan menggunakan metode survei dengan teknik pengambilan sampel secara acak kelompok. Sungai dibagi menjadi tiga daerah yaitu hulu, tengah dan hilir. Variabel yang diamati adalah jumlah spesies dan jumlah individu tiap spesies. Sebanyak 288 individu ikan berhasil dikoleksi selama penelitian. Hasil identifikasi menempatkan sampel ke dalam 22 spesies dan 10 famili. Di antara kesepuluh famili yang didapatkan, famili Cyprinidae merupakan kelompok dengan jumlah spesies terbanyak yaitu 10 spesies dan diikuti oleh famili Bagridae dengan lima spesies, sedangkan delapan famili sisanya hanya memiliki satu spesies. Tingginya jumlah spesies dan famili yang diperoleh mengindikasikan bahwa Sungai Cileumeuh memiliki keragaman ikan yang tinggi.

Kata penting: Sungai Cileumeuh, keragaman, ikan, kualitas air.

Introduction

Rivers undergo a gradual change of their physic-chemical aspects from their upper reaches to the estuaries (Vannote *et al.*, 1980). These alterations occur due to the unity of several tributaries on the upper part of the river which increases the volume of water at the lower part and widens the main river channel, and also by addition of some materials that result from human activities (Soemarwoto *et al*., 1980). According to Kottelat *et al*. (1993), wide areas show higher habitat variations than do small areas and lead to high diversity of inhabitants. Therefore, it is predicted that a longer and wider river has higher species diversity than does a smaller river. It was demonstrated that there is a positive correlation between species richness and habitat (Wooton, 1991). This relationship is dependent upon two factors: increasing the number of microhabitats and the width of areas. A similar condition is also presumed to occurr at Cileumeuh River because this river runs through a va-

riety of habitats, such as the *Pinus* and *Tectona* forests, farming areas, and also a housing region which might alter its microhabitat and water quality along the river. In addition, it has been noted that habitat variation might increase the number of fish species, hence increases biodiversity (Kottelat *et al*., 1993).

Fish diversity at several areas and habitats has been reported. Among the comprehensive studies of freshwater fish species from the Asian Region including Indonesia's freshwater fish species are Roberts (1989) on the Kapuas River, Kalimantan and Kottelat (1994) on the Mahakam (see Kottelat & Whitten, 1996).

Information on fish diversity from Indonesia's rivers has been reported by several researchers but it was limited on certain locations and with variable results. For example, a total of 174 freshwater fish species has been reported from Mahakam River (Kottelat, 1994) and 320 species from Kapuas River (Roberts, 1989; Kottelat, 1994). Moreover, Yustina (2001) and Andoyo (2004) reported that Indonesia has a high diversity of freshwater fishes. There were also several previous studies on the river fishes. A study reported that 40 species and 20 fish families had been collected from Cimanuk River and Cyprinidae was the richest family with 12 species (Sjafei *et al*., 2001). Another study at Musi Kejalo River found a total number of 16 species among five orders. In this study, Cyprinidae was also the dominant family, followed by Bagridae (Duya, 2008). Additional study by Sulistyarto *et al*. (2007) obtained a total of 50 fish species from Rawa Lebak River which belong to 19 families; again, Cyprinidae was the dominant family. A study at Klawing River Purbalingga collected 351 fish individuals, divided into 24 species and 11 families (Alam, 2005). Kurniasih (2002) collected 371 fish individuals from upper part of Serayu River in Wonosobo. The individuals were grouped into 20 species and 10 families, with the dominant family Cyprinidae. Further study at lower areas of Serayu River found 17 species, 11 families (Murtiningsih, 2009).

However, there were no data reported on fish diversity of the Cileumeuh River in District of Majenang, Cilacap Regency. This is perhaps because Cileumeuh River is smaller than Klawing and Serayu River which lead to no study at Cileumeuh River. Despite the fact that Cileumeuh River is subjected to some impacts from forestry, farming, and house waste which alters the physic-chemical variables of the river, it also under stress from overfishing. Therefore it is important to study on fish diversity at Cileumeuh River to provide a database on freshwater fish species in Banyumas Region which is important for further study about conservation strategy and so on. This study was aimed to obtain data on fish diversity at Cileumeuh River Cilacap Regency.

Materials and methods

A survey method was used during the study. Samples were collected using electroshocker and nets by applying clusters random sampling technique. The river was divided into three regions: upper, middle, and lower parts (Figure 1). Samples were collected at eight sites. Sampling sites were defined based on their accessibility and environmental characteristics. Biological variables were observed with the parameters number of species (S) and abundance. Fish samples were placed in the labeled plastics bag filled with 70% ethanol. In the laboratory, the samples were washed in running water and the old ethanol was replaced with new. For permanent preservation, the samples were

placed in bottles containing new 70% of ethanol (diluted from 100% of pro-analysis ethanol). Samples were identified and described according to identification keys from Kottelat *et al*. (1993) and FishBase (Froose & Pauly, 2011).

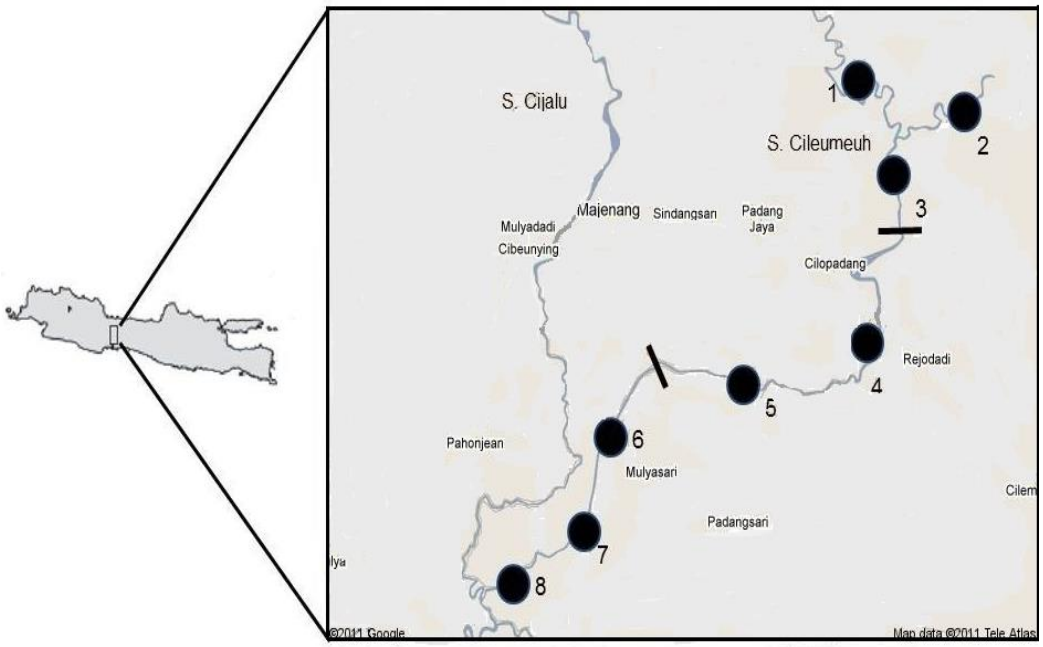

Figure 1. Sampling sites across Cileumeuh River (108^{o} 04' and 109^{o}30', 7^{o}03' and 7^{o}52')
Remarks: 1-8 = sampling site numbers
= border among upper, middle and lower parts

Results

Fish diversity

A total number of 288 fish specimens were obtained during the field trips in June 2011 at Cileumeuh River. All of the individuals can be classified into 22 species and ten families: Clariidae, Loricariidae, Bagridae, Cichlidae, Synbranchidae, Channidae, Belontiidae, Anabantidae, Cyprinidae, and Poeciliidae. Among of those ten families, Cyprinidae has the highest number of species that is 10 species and followed by Bagridae with five species. The other eight families were only had one species, respectively (Table l).

Fish distribution

A total number of 16 species was collected upstream. The species found in these areas were *Pterygoplichthys pardalis, Clarias batrachus, Mystus gulio, Barbonymus gonionotus, Systomus orphoides, Puntius* sp., *P. binotatus, P. microps, Osteochilus vittatus, O. enneaporos, O. microcephalus, Rasbora argyrotaenia, Trigonopoma gracile, Oreochromis niloticus, Monopterus albus,* and *Poecilia reticulata.*

Sampling effort collected a total of 13 species from the middle part of Cileumeuh River. The species were *Pterygoplichthys pardalis, Mystus gulio, M. micracanthus, Hemibagrus nemurus, Barbonymus gonionotus, Systomus orphoides, Puntius binotatus, Osteochilus vittatus, O. enneaporos, Rasbora argyrotaenia, Trichopodus tricopterus, Oreochomis niloticus,* and *Channa striata*.

Table 1. Fish species found at Cileumeuh River

No.	Famili	Species	Individual number	Distribution		
				Upper	Middle	Lower
1.	Clariidae	*Clarias batrachus*	7	+	-	-
2.	Loricariidae	*Pterygoplichthys pardalis*	9	+	+	+
3.	Bagridae	*Mystus nigriceps*	3	-	+	+
		Mystus gulio	118	+	+	+
		Mystus micracanthus	9	-	+	+
		Hemibagrus nemurus	9	-	+	+
4.	Cichlidae	*Oreochromis niloticus*	11	+	-	+
5.	Synbranchidae	*Monopterus albus*	1	+	-	-
6.	Channidae	*Channa striata*	3	+	+	+
7.	Belontidae	*Trichopodus trichopterus*	1	-	-	+
8.	Anabantidae	*Anabas testudineus*	2	-	-	+
9.	Cyprinidae	*Barbonymus gonionotus*	7	+	+	+
		Systomus orphoides	27	+	+	+
		Puntius binotatus	21	+	+	+
		Osteochilus vittatus	25	+	+	+
		Osteochilus enneaporos	8	+	+	-
		Osteochilus microcephalus	3	+	-	-
		Rasbora argyrotaenia	6	+	+	-
		Trigonopoma gracile	5	+	-	+
		Puntius microps	7	+	-	+
		Puntius sp1	2	-	-	+
10.	Poeciliidae	*Poecilia reticulata*	4	+	-	-

At the downstream areas, a sum of 12 fish species found during the field trip. The species are *Pterygoplichthys pardalis, Hemibagrus nemurus, Mystus nigriceps, M. micracanthus, Barbonymus gonionotus, Systomus orphoides, Puntius* sp., *P. binotatus, P. microps, Osteochilus vittatus, Trigonopoma gracile,* and *Trichopodus tricopterus.*

Discussion

Fish diversity

A total number of 22 species found at Cileumeuh River demonstrated that the river has rather high diversity of fish species, though it was lower than that found at Cimanuk River which was as much as 40 species and 20 families was reported (Sjafei *et al*., 2001). However, there is a similarity between this study and the study from Sjafei *et al*. (2001). Both Sjafei *et al*. (2001) and this study reported that Cyprinidae was the most abundant family with thirteen and eleven species, respectively. A similar phenomenon also found when the recent study compared to the study from Sulistyarto *et al*. (2007) which also found a high diversity of Cyprinidae.

A lower number of species of Cyprinidae was found in this study as compared to Sjafei *et al*. (2001) perhaps because of different ecological factors of both rivers such as length, size, and annual water volume. Cileumeuh River is shorter and smaller than Cimanuk River. Moreover, water volume at Cileumeuh River is reduced significantly during the dry season and was almost dried, while Cimanuk River showed constant annual water volume (personal observation). A longer river is usually assumed to have more tributaries on the upper part of the river which leads water volume at the lower part and the main river width to increase (Soemarwoto *et al*., 1980). According to Kottelat *et al*. (1993) wide

areas shows higher habitat variation than do small areas and high habitat variation leads to highly diverse inhabitants. Therefore, it is reasonable that Cimanuk River which is longer and wider than Cileumeuh River has a higher number of fish species. Cimanuk River has more microhabitats than Cileumeuh River. This condition agrees with Wooton (1991) who noted that there is a positive correlation between species richness and habitat and differentiation and the relationship is dependent on two factors: the increase of micro habitat and the width of areas.

In contrast to Sjafei *et al*. (2001) and Sulistyarto *et al*. (2007), comparison with results from Musi River in Kejalo Curup Bengkulu showed that the present study results a higher species number although Cileumeuh River is smaller than Musi River. During this study, a total of 22 species were collected, while the study at Musi River only 16 species were obtained (Duya, 2008). This difference could be due to the different collecting methods used at each site. According to Lapointe *et al*. (2006), sampling effectivity is dependent on sampling tools. For examples, electric shocker is effective at upstream areas, while sampling in the mid-stream is more effective with a net with mesh size of ± 1 cm. A net with ± 2 cm mesh size is effective in downstream areas (Lapointe *et al.*, 2006).

High diversity of Cyprinidae as shown in this and previous studies is a general phenomenon in almost all the areas of the world where they live. Nguyen & De Silva (2006) reported that fish diversity in Asia is dominated by cyprinids (± 1000 species) followed by Balitoridae and Cobitiidae (± 400 spesies), Gobiidae (300 species), catfishes of the Family Bagridae (± 100 species), and gouramies, Family Osphronemidae (85 species). Another study reported that the dominant freshwater fish family in India is Cyprinidae (Kar *et al*., 2006).

Another interesting finding was that two out of the 22 fish species found in Cilemeuh River are non-native species, *i.e. O. niloticus* and *P. pardalis*. *O. niloticus* was introduced for aquaculture, whereas *P. pardalis* was introduced as an ornamental live organism for aquaria. However, we have to pay more attention to the suckermouth catfish, *P. pardalis* at Cileumeuh River or it will become a peril for native species. This species is well adapted to aquatic ecosystems with rather poor water quality whereas the other species are not. Therefore, it is important to control the development of *P. pardalis* populations in Cileumeuh River to reduce the threat to the native species. A study from Yunanto (2000) demonstrated that *P. pardalis* at Situ Cigudeg became highly abundant. This condition has made native species very rare and very difficult to find. Unfortunately, not much is known about the economic value of *P. pardalis*.

Fish distribution

Different parts of the river have different species composition. And some species showed different patterns of distribution. On the one hand, some species tend to be distributed at lower part of the rivers, and on the other hand some species inhabit upper part of the river, while the remaining species distributed in all parts of the river, from upstream to downstream.

At the lower part of the Cilemeuh River, *Trichopodus trichopterus* and *Anabas testudineus* were obtained. This finding was expected since both species are estuary or swamp species. The finding was congruent with Kottelat *et al*.

(1993) that both *T. trichopterus* and *A. testudineus* inhabit swamp areas and ponds that are directly connected to open water.

The typical upstream species such as *Nemacheilus fasciatus* and *Glyptothorax platypogon* were not obtained during the field trips. It could be due to that sample collection only used net. *Mystus nigriceps* (Bagridae) was a species found in almost all stations. However, another study found that *M. nigriceps* was a species with broad longitudinal distribution in Serayu River. *H. nemurus* was only found at middle part of the river. This finding was different from what Setijanto & Sulistyo (2008) found in Serayu River. Setijanto & Sulistyo (2008) obtained *H. nemurus* from the upper to the lower parts of the the Serayu River. The difference could be because Cileumeuh and Serayu River has different microhabitats. At Serayu River, there are many sites with swamp areas and mud susbtrate, whereas in Cilemeuh River there are not. *H. nemurus* prefers muddy habitats with slow current (Nuryanto & Sugiharto, 2011).

Osteochilus vittatus was found at the upper part of the river and *Puntius binotatus* were found from the upper part to downstream. *O. vittatus* showed a similar abundance from upper part to the downstream part of the river, whereas *P. binotatus* had high abundance at station number 7 and *Puntius orphoides* was found from the middle part of the river to downstream. *Puntius orphoides* and *Barbonymus gonionotus* were collected at a part of the river with gravel, sand and clay bottom. Species of the family Cyprinidae could be collected in almost all parts of the rivers. The finding was not surprising since Cyprinidae are commonly found in rivers with either strong or slow current and good water quality (Nikolsky, 1963). According to Ismail & Ahmad (1992) *Puntius binotatus* commonly inhabits upstream habitats, whereas *Osteochilus vittatus* is usually found in the middle portions of rivers.

Conclusions

A total number of 22 fish species classified in 10 families were found during the observation at Cileumeuh River. Therefore, the river has high fish diversity. Cyprinidae was the most abundant family with 10 species. Some species were distributed along the river but other species were restricted to certain parts of the river.

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Volume 12

Henni Syawal, Nastiti Kusumorini, Wasmen Manalu, Ridwan Affandi Respons fisiologis dan hematologis ikan mas (*Cyprinus carpio*) pada suhu media pemeliharaan yang berbeda [Physiological and hematological response of common carp (*Cyprinus carpio*) in different temperatures of media] 1

Irmawati, Alimuddin, Muhammad Zairin Jr., Muhammad Agus Suprayudi, Aris Tri Wahyudi Peningkatan laju pertumbuhan benih ikan gurame (*Osphronemus goramy* Lac.) yang direndam dalam air yang mengandung hormon pertumbuhan ikan mas [Growth enhancement of *Osphronemus goramy* Lac.juvenile immersed in water containing recombinant *Cyprinus carpio* growth hormone] 13

Hesti Wahyuningsih, Muhammad Zairin Jr., Agus Oman Sudrajat, Ligaya ITA Tumbelaka, Wasmen Manalu Perubahan plasma darah dan kematangan gonad pada ikan betina *Tor soro* di kolam pemeliharaan [Changes of blood plasma and gonadal maturity on female *Tor soro* in pond] 25

Suhestri Suryaningsih, Mammed Sagi, Kamiso Handoyo Nitimulyo, Suwarno Hadisusanto Beberapa aspek pemijahan ikan brek *Puntius orphoides* (Valenciennes, 1842) di Sungai Klawing Purbalingga, Jawa Tengah [Spawning aspects of javaen barb *Puntius orphoides* (Valenciennes, 1842) in Klawing River, Purbalingga, Central Java] 35

Asriyana, Lenny S. Syafei Perubahan ontogenetik makanan ikan kurisi, *Nemipterus hexodon* (Famili: Nemipteridae) di Teluk Kendari [Ontogenic shift in the diet of ornate threadfin bream, *Nemipterus hexodon* (Family Nemipteridae) in Kendari Bay] 49

Djumanto, Eko Setyobudi, Rudiansyah Fekunditas ikan gelodok, *Boleophthalmus boddarti* (Pallas 1770) di Pantai Brebes [Fecundity of Boddart's goggle-eyed goby, *Boleophthalmus boddarti* (Pallas 1770) in Brebes Coast] 59

Dedi Jusadi, Achmad Noerkhaerin Putra, Muhammad Agus Suprayudi, Deddy Yaniharto, Yutaka Haga Aplikasi pemberian taurin pada rotifer untuk pakan larva ikan kerapu bebek *Cromileptes altivelis* [The application of rotifers enriched with taurine for larvae of humpback grouper *Cromileptes altivelis*] 73

Haryono Iktiofauna perairan lahan gambut pada musim penghujan di Kalimantan Tengah [Fish fauna of Central Kalimantan peatland waters in rainy season] 83

***Catatan Singkat*:**

Indah Mustika Putri Makanan ikan bilis (*Thryssa hamiltonii*, Gray 1835) di perairan Pantai Mayangan, Jawa Barat [Diet of Hamilton's anchovy (*Thryssa Hamiltonii*, Gray 1835) in the Mayangan Coast, Subang, West Java] 93

Bastiar Nur, Nurhidayat Optimalisasi reproduksi ikan pelangi kurumoi, *Melanotaenia parva* Allen 1990 melalui rasio kelamin induk dalam pemijahan [Optimizing of reproduction kurumoi rainbowfish (*Melanotaenia parva* Allen 1990 through sex ratio in spawning] 99

Zainuddin, M. Iqbal Djawad, Ryan Ardiyanti Pengaruh level protein pakan terhadap laju metabolisme juwana ikan bandeng (*Chanos chanos,* Forsskal 1775) [Effect of dietary protein level on the metabolism rate of milkfish (*Chanos chanos,* Forsskål) juvenile] 111

Ahmad Faizal, Jamaluddin Jompa, Natsir Nessa, Chair Rani Pemetaan spasio-temporal ikan-ikan herbivora di Kepulauan Spermonde, Sulawesi Selatan [Spatio-temporal mapping of herbivorous fishes at Spermonde Islands, South Sulawesi] 121

Arip Rahman, Agus Arifin Sentosa, Danu Wijaya Sebaran ukuran dan kondisi ikan zebra *Amatitlania nigrofasciata* (Günther, 1867) di Danau Beratan, Bali [Size distribution and condition of zebra cichlid, *Amatitlania nigrofasciata* (Günther, 1867) in Lake Beratan, Bali] 135

Agus Nuryanto, Dian Bhagawati, M. Nadjmi Abulias, Indarmawan Fish diversity at Cileumeuh River in District of Majenang, Cilacap Regency, Central Java [Diversitas ikan di Sungai Cileumeuh Kecamatan Majenang, Kabupaten Cilacap, Jawa Tengah] 147

Charles P.H. Simanjuntak Keragaman dan struktur kumpulan ikan di anak sungai-anak sungai Sopokomil, Dairi, Sumatera Utara [Fish diversity and assemblage structure in tributaries of Sopokomil River, Dairi, North Sumatra] 155

Muhaimin Hamzah, M. Agus Suprayudi, Nur Bambang Priyo Utomo, Wasmen Manalu Pertumbuhan dan daya tahan tubuh juwana kerapu bebek (*Cromileptes altivelis*) yang mendapatkan tambahan selenium dan terpapar cekaman lingkungan [Growth and vitality of juvenile humpback grouper (*Cromileptes altivelis*) supplemented with selenium and exposed to environmental stress] 173

Ridwan Affandi, Riri Ezraneti, Kukuh Nirmala Kondisi fisiologis ikan bandeng (*Chanos chanos* Forskal) yang dipelihara pada media yang terpapar merkuri dengan tingkat salinitas berbeda [Physiological condition of milkfish, *Chanos chanos* Forskal reared in medium containing mercury with various level of salinity] 185

Prawira Atmaja R.P. Tampubolon, M. F. Rahardjo, Krismono Pertumbuhan ikan oskar (*Amphilophus citrinellus*, Günther 1864) di Waduk Ir H. Djuanda, Jawa Barat [Growth of Midas Cichlid (*Amphilophus citrinellus*, Günther 1864) in Ir. H. Djuanda Reservoir, West Java] 195