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

[Disertas 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 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, Chanidae, 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


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 occur 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 Cileumah River in District of Majenang, Cilacap Regency. This is perhaps because Cileumah River is smaller than Klaping and Serayu River which lead to no study at Cileumah River. Despite the fact that Cileumah 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 Cileumah 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 Cileumah 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°04’ and 109°30’, 7°03’ and 7°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: Claridae, 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 1).

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 orboides, Puntius sp., P. binotatus, P. microps, Osteochilus vittatus, O. enneaporos, O. microcephalus, Rasbora argyraotaenia, 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 orboides, Puntius binotatus, Osteochilus vittatus, O. enneaporos, Rasbora argyraotaenia, Trichopodus tricopterus, Oreochomis niloticus, and Channa striata.
Fish diversity at Cileumeuh River

<table>
<thead>
<tr>
<th>No.</th>
<th>Family</th>
<th>Species</th>
<th>Individual number</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Clariidae</td>
<td><em>Clarias batrachus</em></td>
<td>7</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Loricariidae</td>
<td><em>Pterygoplichthys pardalis</em></td>
<td>9</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Bagridae</td>
<td><em>Mystus nigericeps</em>, <em>Mystus galio</em>, <em>Mystus micracanthus</em>, <em>Hemibagrus nemurus</em></td>
<td>3, 118, 9, - + + -</td>
<td>+ + + +</td>
</tr>
<tr>
<td>4.</td>
<td>Cichlidae</td>
<td><em>Oreochromis niloticus</em></td>
<td>11</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Synbranchidae</td>
<td><em>Monopterus albus</em></td>
<td>1</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>Channidae</td>
<td><em>Channa striata</em></td>
<td>3</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>Belontidae</td>
<td><em>Trichopodus trichopterus</em></td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>8.</td>
<td>Anabantidae</td>
<td><em>Anabas testudineus</em></td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>9.</td>
<td>Cyprinidae</td>
<td><em>Barbonymus gonionotus</em>, <em>Systomus orphoides</em>, <em>Puntius binotatus</em>, <em>Osteochilus vittatus</em>, <em>Osteochilus microcephalus</em>, <em>Rasbora argyrotaenia</em>, <em>Trigonopoma gracile</em>, <em>Puntius microps</em>, <em>Puntius sp1</em></td>
<td>7, 27, 21, 25, 8, 3, 6, 5, 7, 2</td>
<td>+ + + + + + - + - - +</td>
</tr>
<tr>
<td>10.</td>
<td>Poeciliidae</td>
<td><em>Poecilia reticulata</em></td>
<td>4</td>
<td>+</td>
</tr>
</tbody>
</table>

At the downstream areas, a sum of 12 fish species found during the field trip. The species are *Pterygoplichthys pardalis*, *Hemibagrus nemurus*, *Mystus nigericeps*, *M. micracanthus*, *Barbonymus gonionotus*, *Systomus orphoides*, *Puntius binotatus*, *Osteochilus vittatus*, *Osteochilus enneapodos*, *Osteochilus microcephalus*, *Rasbora argyrotaenia*, *Trigonopoma gracile*, *Puntius microps*, *Puntius sp1*, and *Trichopodus trichopterus*. 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

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.
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 effectiveness 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 species), 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 Cileumeuh 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 sucker-mouth 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 Cileumeuh 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 platypocon* 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 & Sulisty (2008) found in Serayu River. Setijanto & Sulisty (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 substrate, whereas in Cileumeuh 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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Henni Syawal, Nastiti Kusumorini, Wasmen Manalu, Ridwan Affandi Respon 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 (Osphromenus goramy Lac.) yang direndam dalam air yang mengandung hormon pertumbuhan ikan mas [Growth enhancement of Osphromenus 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


Asriyana, Lenny S. Syafei Perubahan ontogenetik makanan ikan kurisi, Nemipterus hexodon (Famili: Nemipteridae) di Teluk Kendari [Ontogenetic 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 [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 Hamiltioni, Gray 1835) in the Mayangan Coast, Subang, West Java] ........................................................................................................ 93


Zainuddin, M. Iqbal Djawad, Ryan Ardiyanti Pengaruh level protein pakan terhadap laju metabolisme juwana ikan bundang (Chanos chanos, Forsskål 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 Cileumueh River in District of Majenang, Cilacap Regency, Central Java [Diversitas ikan di Sungai Cileumueh 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