

FISH FAUNA OF GUNUNG HALIMUN NATIONAL PARK REGION: ADDITIONAL INFORMATION ON THE UTILIZATION

[Fauna Ikan Taman Nasional Gunung Halimun: Informasi Tambahan Tentang Pemanfaatannya]

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ABSTRACT

Gunung Halimun National Park is known to be the area of headwaters of a number of rivers/streams originate. However, there is no information about the fishes living in these rivers systems. In this regard, a series of ichthyofauna study was conducted from 1996 to 2002 in Cikaniki, Cimaja/Cisarua, Cisukawayana, Ciberang, Cidurian and Cibareno that covered 94 sampling stations. Method that was used was Catch Per Unit of effort (CPU) where electric fishing gear (and) cast net, trap were used. Forty fish species belonging to 16 families and 26 genera have been found. Gobiidae, the diadromous fishes, was dominant, comprising 14 species or 35 %, followed by Cyprinidae comprising 5 species or 12.5 %. These Gobioid fishes were derived from Cisukawayana, Cimaja, and Cibareno River, where these rivers flow south to the Indian Ocean. It was found that Paray, *Rasbora aprotaenia*; Beunteur, *Puntius binotatus*; Bogo, *Channa gachua*; Lele, *Clarias batrachus*; Kehkel, *Glyptothorax platypogon*; Soro, *Tor tambra*; Bungkreng/ Ikan Seribu *Poecilia reticulata* and Paris, *Xiphoporus helleri* were found in common in rivers flowing north and south, and *Lentipes* as well as *Schismatogobius marmoratus* extend their range to Java (new record for Java). The utilization of fishes for food by local people is presented including Gobioid fishes, which are at the juvenile stage (called as impun) are utilized as a part of their food source.

Key words: Gobiidae, diadromous, juvenile.

INTRODUCTION

The information on fish fauna in rivers within and around the Gunung Halimun National Park, as well as the fish collection from this area is still lacking. The information on fish fauna available near this park or Bogor (Buitenzorg) was alluded by Jordan and Seale (1907), Robert (1993), in part, information on fish fauna at this park was reported by Rachmatika (1998) and Nurcahyadi (2000). Current information on the fish fauna in Gunung Halimun National Park and the adjacent area including conservation aspects and the potency was presented by Rachmatika *et.al.* (2001).

A comprehensive fish fauna study is required that the information on *fish diversity*, abundance and distribution, will be a base line data for future monitoring. There are river systems flowing south (Indian Ocean) such as Cimaja River, Cisukawayana River, Cimadur River, Cibareno and Citarik River and flowing south (Java Sea) such as Cikaniki/Cisadane River, Cidurian River and Ciujung River, that in general these

opposite slope river systems are separated by the Halimun mountain, which according to Nijima (1997) this mountain was formed as a result of Bayah Dome occurring in Pleistocene era (10 - 20 million years ago)

The objective of this study are:

- (1) to examine fish diversity and the distribution
- (2) to test a hypothesis that fishes in rivers flowing north is different than those in rivers flowing south
- (3) To examine the fish utilization and the potential.

METHODOLOGY

Sampling stations were segment of river or stream, which is $\pm 50 - 100$ m long. In stream, electricfishing gear (12 V, 10 A) was employed for ± 1 hour per station, while in river, cast net was performed for ten times per station in addition to electric fishing gear operation. The collected fish specimens were fixed by formalin 10 %. Then, in Laboratory of Ichthyology of Division of Zoology,

Research Center for Biology LIPI, these specimens were preserved by alcohol 76 % and deposited in MZB as permanent collections.

The fish identification was based on Weber and de Beaufort (1913; 1916; 1936; 1953), Brittan (1954), Robert (1993) and Kottelat *et al.* (1993), Watson and Kottelat (1994), whereas for Gobioid method of Prince Akihito et al. (1988); Hoese and Allen (1990) were used. The collection from Cisukawayana River and the middle of Cisadane River (at Cidokorn village, Rumpin in 1992) are also used for discussion. In revealing the localities, term of Sungai (S) that refers to a particular stream or tributary, and term of Kampung (Kp.) that refers to a group of households, and a part of Desa (Village) were used. Abundance was estimated by dividing the total number of particular fish species by the number of station of occurrence, then the level of abundance designated was based on 0 -10 individual per station for low abundance, 10 -20 individual per station for moderate abundance, and more than 20 individual per station for high abundance category

Water quality parameters such as pH, dissolved oxygen, water temperature and conductivity were measured *in situ* by using Kagaku Kit-Type UC Series. In few localities in Cikaniki, Cisukawayana, Cimaja, Ciberang, Cidurian River, water samples were taken for chemical analysis such as BOD 5, alkalinity, nitrate (N-NO₃), nitrite (N-NO₂), and orthophosphate.

Collecting Stations

In Cikaniki River, the first survey (from December 27, 1995 to January 5, 1996) covered five stations where this period coincided with the rainy season. The second survey (from June 14 to June 28, 1999) was coincided with the dry season (Nurcahyadi, 2000). This second survey covered former collecting sites and five additional sites located upstream. These are stretched from Leuwi (Water pool) Kekep (at Kp. Cilanggar) until the curug (waterfall) Cikudapaeh

In Cisukawayana River, the first survey (from February 29 to March 5 1999), which was coincided with the rainy season, was located at the mouth of S. Citimur (7 stations). The second survey (from July 1 to July 14, 1999), which was coincided with the dry season, was located at these localities (Nurcahyadi, 2000). The third survey (from September 27 to October 1 1999) covered the headwater within the park (3 stations: at Mushola Geger Hanjuang, at the headwater of S. Citimur and at the confluence of S. Citimur and S. Cisukawayana). In the middle part was at Desa Pasir Badak and Desa. Margalaksana and the lower part were at the water purification service in Desa Cikakak, Cisolok.

In Cimaja River, the survey (from February 23 to February 28, 1999) covered S. Cisarua (2 stations: at the confluence of Cimaja and Cisarua and at the bridge connecting to Ds. Cipta Rasa.), Ciguyang (2 stations, at the bridge of the main road to Panguyangan and at the bridge of the road to Ds. Cipta Rasa), S. Cipeuteuy (3.stations: behind the Guest House, at the bridge to Kp.Cipta Rasa, at Situ Legok Batu.). In Cimaja River, 2 stations were all located at Kp.Ciganas and Panguyangan, Ds Sirna Rasa. In the period of September 23 to September 28, 1999, the survey was at Cisarua i.e. at the confluence of S. Cisarua and S. Ciawitali (2 stations), below Curug Cisarua (2 stations), below Curug Ciawitali (2 stations) and up Curug Ciawitali (1 station: within Gunung Halimun National Park).

In Ciberang and Cidurian River, the survey (July 21- August 2, 2000) was conducted in the dry season. In Ciberang River, all sampling sites were within the park, and there were each 2 sampling sites in Ciberang River and S. Ciberang Deet. In S. Cikalap, S. Ciparay, S. Cipangbeasan and S. Ciawitali (tributaries of Ciberang River), there was one sampling station in each of these tributaries. In Cidurian River, there were two sampling stations and one station in each of its tributaries: S.

Cibeureum, S. Cisamad, S. Cikatomas, S. Cilongok and S. Cipatat.

In Cibareno sampling (from 19-26 Mei 2002) covered the segments within the park (4 stations) such as S. Cibentang, S. Cidasirun and downstream the park (11 stations).

RESULT

Fish Species Diversity

Up to the present, the number of fish species occurring in Gunung Halimun National Park and the adjacent area is 33 species (Table 1). They belong to 25 genera, 17 families and six orders. The fishes mostly belong to Gobioid fishes, or complimentary fishes as represented by 24,24 %, that some of these i.e. *Lentipes*, *Sicyopus* and *Sicyopterus* require further taxonomic examination. Primary, secondary, diadromous and complimentary fresh water fishes exist at this park; excluding primary and secondary freshwater fishes, two other categories are assigned as peripheral freshwater fishes (Helfman, *et al.*, 1977) that refers to the fishes that colonize inland water throughout the marine route (Banarescu, 1990)

There were nine fish species belonging to Ostariophysi. River by river examination, it was found that the percentage of Ostariophysan fish in each river flowing north i.e. Cikaniki, Cidurian and Ciberang River are higher than in Cisukawayana, Cimaja and Cibareno River (Table 2), eventhough the sampling sites are just at the upper part of these drainages or plus from the middle section of Cisadane River (for Cikaniki). Up to the present, ten fish species can be found in stream and river within GH National Park i.e. *Channa gachua*; *Glyptothorax platypogon*; *Puntius binotatus*; *Rasbora aprotaenia*; *Poecilia reticulata*; *P. latipinna*; *Monopterus albus*, *Lentipes* sp, *Sicyopus* sp. and *Tor tambra*. In addition Carp, *Cyprinus carpio* is found to be cultivated by people in the ponds in enclave area within the park, such as in Kp.Citalahab, Desa Mekarsari.

Exotic fishes such as *Poecilia reticulata*, *P. latipinna*, *Xiphoporus helleri* and *Oreochromis mossambicus* exist at this park either within or adjacent the park. The localities in which these fishes lived were mostly water whose the bank was already converted into agricultural land or human settlement (open water), a habitat mostly occurred in Cisukawayana, Cimaja and Cidurian River. In forested stream these fishes was not found.

Fish composition in rivers flowing north and south

In Cimaja, Cisukawayana, and Cibareno River, where sampling activities were more intensively than in the northern area (Table 2), there were accumulatively 13 species of Gobiidae and 3 species of Eleotrididae from 25 fish species found in these rivers. Ostariophysi which were found from these three rivers *ajte~Rl' aprotaenia*, *P. binotatus*, *O. hasseltii*, and *Tor tambra*. In contrast, in rivers flowing north i.e. in Ciberang, Cikaniki and Cidurian River, the Ostariophysi that were found were six species (46.15 %) from 13 fish species that were found minus fishes from the middle section of Cisadane River. They are *Nemachilus chrysolaimos*, *Hemibagrus nemurus*, *Glyptothorax platypogon*, *Tor tambra*, *R. aprotaenia* and *P. binotatus*. Gobiidae and Eleotrididae have not been found. Seven species i.e., *Tor tambra*, *R. aprotaenia*, *P. binotatus*, *C. gachua*, *C. batrachus*, *P. reticulata*, and *X. helleri* are shared in the rivers flowing north and flowing south.

Distribution

In general, fishes occurring in GH National Park have wide geographic distribution. *R. aprotaenia*, however, occurred only in North Java (Brittan, 1954 and Kottelat, 1996) (Table 1). By finding this fish in the southern area of South Java, this fish locally extends its known range. Genus *Lentipes* that was formerly found in Hawaii (Maciolek, 1978), Japan (Prince Akihito *et al.*, 1988), Bali (Watson and Kottelat, 1994), Irian Jaya

(Allen, 1997; Watson and Allen, 1999; Allen, 2001) was found in Cimaja, Cisukawayana, and Cibareno River, as well as *Schismatogobius marmoratus* that was formerly found in Sulawesi, Philippines, and Japan (Kottelat et al. 1993) was found in Cisukawayana, and Cibareno River. Ecologically, the occurrence of Cyprinidae in GHNP i.e.: *R. aprotaenia*, *P. binotatus* and *T. tambra* in the observed area followed the presence of forest along the river/stream. While the occupation of Gobioids were mostly in the middle and lower part whose the banks are already open or converted to agricultural land (open stream), in which the water temperature was apparently higher. Complete finding on fish diversity until the latent survey (June 2002) and discussion on longitudinal distribution on the fish communities along water quality parameters is presented in separate papers.

General water quality

Water quality such as dissolved oxygen, pH, and nitrite in Cikaniki, Cisukawayana, Ciberang and Cidurian River was within the range for aquatic life especially for fishes (Table 3). The dissolved oxygen ranged from 4.11 to 8.6 mg/l for main rivers and from 4.43 to 7.46 mg/l for tributaries. The pH value was at the range from slightly acidic to neutral, i.e. from 5 to 7.13 for main rivers, and from 6.10 to 7.29 for tributaries. The nitrite (N-NO₂), in these rivers was very low ranging from 0.003 to 0.006 mg/l for main rivers, and less than 0.01 to 0.008 mg/l for tributaries. However, it has relatively poor alkalinity or poor in carbonate (CO₃) and bicarbonate (HCO₃) system. It ranged from 0.30 to 34 mg/l for main rivers and from 6.75 to 50 mg/l for tributaries.

The orthophosphate value ranged from 0.02 to 0.99 mg/l for main rivers, and from 0.01 to 0.20 mg/l for tributaries, the conditions described by Wardoyo (1978) as water with low until very good productivity for tributaries, and moderate until excellent productivity for main rivers. The orthophosphate value in the lower part of

Cisukawayana River that is apparently high (0.99 mg/l) was still at the normal level.

It was found that the water quality of Cidurian, Cimaja, and most part of Cisukawayana River, whose riparian ecosystem was already converted into agricultural land or human settlements, had higher temperature, pH, and ionic content (conductivity) (Table 3).

Fish for Utilization and Potential

Fishes in rivers/streams in Gunung Halimun National Park and its adjacent area have been utilized as food for long time. Generally, they catch fish by using sustainable means such as trap, cast net, dip net and gill-net. This is practised as an alternative activities for their living, who are mostly farmer. As the water resources is plenty they cultivate ikan Mas, *C. carpio*; Nila, *O. mossambicus* and Ikan Sepat, *T. trichopterus* that mainly are aimed for domestic consumption or sell among them within the village. They practiced pond aquaculture by using available resources for additional feed (such as talas/aroid leaves and dedak halus/ milled rice husk) with or without spawning the adult for fry stock.

The utilization of fishes at juvenile stage called *impun* by using bamboo trap (*bubu*) is practised in the lower part of rivers draining south. Trap is set for 2 hours, 4 hours (day hours) or 12 hours (all night) by taking advantage of their behavior i.e. upstream migration from the coast to the nursery ground. Initial observation indicated that fishes constituting *impun* stock were *Stiphodon* cf. *semoni*, *Awaous grammepomus*, *Sicyopterus* spp., and *Lentipes* sp. Juvenile of Tereponid i.e. *Kuhlia marginata* and Syngnathid i.e. *Wlibrophis argulus* were also found. From this initial observation, juvenile of *Awaous grammepomus* (Plate 1.) constituted high portion of *impun* stock: 1 *bubu* (trap) of May contained 77 or 19.79% juvenile of 389 total individual; June contained 77 or 13.13 % juvenile of 389 total individual. Gobiid fish that is already known as

ornamental fish/ trade commodity from this area is Ikan Selusur, *Awaous grammepomus*.

A number of fish species could be developed as aquaculture commodities i.e. for food and ornamental fish as well as for sport fishing. Ikan Soro, *Tor tambra*, could be developed as an aquaculture commodity for food fish, ornamental fish and sport fishing (Table 1). *Clarias batrachus* and *Clarias* cf. *teijsmanni* can be used for further selection for food fishes. Ikan Sarolet, *Macrognathus aculeatus* can be developed later as an ornamental fish. Likewise Ikan Paray, *Rasbora aprotaenia* can be developed later as ornamental fish. Ikan Bogo, *Channa gachua* (Dwarfsnake head) had price up from S \$ 30 to S \$ 60, - per adult fish (Ng and Lim, 1989) also could be developed as ornamental fish as this fish has colourful fins. There are at least five species of Gobioids from GHNP region that have beautiful coloration, especially the male. For examples, *Sicyopterus cyanocephalus*, *S. macrostatholepis*, *S. microcephalus*, *Stiphodon* cf. *semoni* and *Lentipes* sp.

Discussion

The high occurrence of Gobioid and Eleotriid in rivers flowing south can be associated with the theory of devoid niche (Myers 1951 in Inger and Chin, 1962, and in Banarescu 1990) where in the void of Ostariophysian fishes, the Gobiid will be dominant. In these rivers (Cimaja, Cisukawayana, and Cibareno) the Ostariophysian that were found are *R. aprotaenia*, *P. binotatus*, *G. platypogon* and *T. tambra*. In contrast, in rivers flowing north such as Cidurian, the Ostariophysian fishes is relatively high (five species or 41.67 %), i.e. *P. binotatus*, *R. aprotaenia*, *H. nemurus*, *Glyptothorax platypogon*, *Nemachilus chrysolaimos* even from just seven collecting stations (Table 2). In Cikaniki/Cisadane River the Ostariophysian fishes was nine species (64.28%) if combined with the middle of Cisadane's collection that consist of *Lobocheilus falcifer*, *Glyptothorax robustus*, *Mastacembelus unicolor*, *Homaloptera gymnogaster*, *H. waasinkii*, *Crossochilus cobitis*, *Puntius orphoides*, *Nemachilus chrysolaimos* If follow this theory, it is predictable that Gobioids (if these are present in the lower part) might be not dominant in these rivers.



Plate 1. Juvenile of Ikan Selusur, *Awaous grammepomus*, is me of the fish species in the catch of impun stock

Table 2 shows that the number of fishes in Cisukawayana River might represent the actual fish species living in this river. Fishes that were found in common in rivers flowing south and north were *R. aprotaenia*, *P. binotatus*, *C. gachua*, *C. batrachus*, *T. tambra*, *G. platypogon* *P. reticulata* *X. helleri*. Historically, the existence of primary freshwater fishes that were found in common in these direction opposing rivers (i.e. *R. aprotaenia*, *P. binotatus*, *C. gachua*, *C. batrachus*, *T. tambra*, *G. platypogon*) that in Cisukawayana, Cimaja, and Cibareno these fishes might be the result of the head water capture of drainages in northern area of Halimun mountain in the pasca -Pleistocene. The genetic analysis might confirm on how long they have diverged from their parent population i.e. from northern form, and is the period of divergent concomitant with the emerging of barrier (Halimun mountain). This mountain might have acted as a relative barrier for the northern species i.e. primary fresh water species to spread south. Another Asian fish's i.e. *O. hasseltii* that occurred in S. Ciguyang (2-6 m wide, 700 m above sea level, a tributary of Cimaja River) might be derived from the ponds existing in the village. As it is known that in its natural range, *O. hasseltii* occurred in lakes and large rivers at the low elevation (Karnasuta, 1993), and there has no collection of this fish in MZB from the rivers flowing south*

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Table 1. Fish species found in the Gunung Halimun National Park and its adjacent area, classification, distribution and the potency

No.	Species and Classification "	Division ²	Local Name	River by river distribution	Abundance and Potency	Geographic Distribution ³¹
1.	Order Anguilliformes					
	Family Anguillidae					
	<i>Anguilla bicolor</i> (Me Clelland, 1845)	P	Lubang	Csk ⁶ , Cmj"	L;F	-East Africa to the Philippines, New Guinea and North Australia
	<i>A.marmorata</i> (Quoy and Gaimard, 1824)	P	Lubang	Cbr ⁶¹	L;F	-From East Africa to Polynesia, and Ryukyu
	Family Ophichthyidae					
	<i>Lammostoma</i> sp	P	Moa/pucuk - kiray	Csk ⁶⁾	L;F	-New Guinea, Philippines, India
2.	Order Cypriniformes					
	Family Cyprinidae					
	<i>Cyprinus carpio</i> (Linnaeus, 1846)	1"	Kantjra, Lauk Mas	In the ponds along	F	-Originally from Japan,China, and Central Asia; introduced throughout the world
	<i>Osteochilus hasseltii</i> (Valenciennes in Cuvier & Valenciennes, 1842)	1 ^a	Nilem	Ckn, Cdr.Cmj, Cmj ⁶⁾	L;F	-Sundaland, Indochina, Burma
	<i>Puntius binotatus</i> Valenciennes, 1842	1 st	Beunteur	Csk ⁶⁾ ,Cmj ⁶⁾ ,Ckn ⁵⁾ , Cdr"	M; Orn	-Sundaland, Bali, Lombok, Philippines, Indochina
	<i>Puntius</i> sp.	1 st	Beunteur	Csk ⁶⁾	L;Orn	-Cisukawayana River
	<i>Rasbora aprotaenia</i> Hubbs & Brittan, 1954	1 st	Paray	Csk",Ckn ⁵⁾ ,Cdr"	M;Orn	-Java North
	<i>Tor tambra</i> (Valenciennes in Cuvier & Valenciennes, 1842)	1"	Soro	Cbr ⁵¹	L;F;Orn;SF	-Sundaland
	Family Cobitidae					
	<i>Nemachilus chrysolaimos</i> (Valenciennes in Cuvier & Valenciennes, 1846)	1 st	Jeler	Cdr."	L;Om	- Java
	Family Bagridae					
	<i>Hemibagrus</i> cf. <i>nemurus</i> (Valenciennes in Cuvier and Valenciennes, 1840)	1 st	Sengal	Cdr. ⁶¹	L; F; Orn	-Sundaland, Indochina
	Family Sisoridae					
	<i>Glyptothorax platypogon</i> (Valenciennes in Cuvier & Valenciennes, 1840)	1 st	Kehkel	Ckn ⁵⁾ , Cbr^Cdr ⁶⁾	L;0m	-Sumatra, Borneo, Java, Malaya
	Family Clariidae					
	<i>Clarias batrachus</i> Linnaeus, 1758	1 st	Lele	Cdr ⁶⁾	L; Om; F	-Sunda land, Simeulue, Burma, Philippines, India, Indochina
	<i>Clarias</i> cf. <i>teijsmanni</i> Bleeker, 1857	1 st	Karae	Cdr"	L; Om; F	-Sunda land

3 Order Cyprinodontiformes						
Family Poeciliidae						
	<i>Poecilia reticulata</i> Peters, 1859	2 nd	Bungkreg	Csk ⁶ , Cm ⁶ , Ckn ⁵ , Cd ⁶	L; MC	-Venezuela, introduced to Sunda land, Sulawesi
	<i>P. latipinna</i> Temminck and Schlegel 1846	2 nd	Bungkreg	Ckn ⁵¹	L; MC	-Mexico, Southeastern USA
	<i>Xiphoporus helleri</i> , Heckel 1848	2 nd	Cinir Putri	Cm ⁶ , Cdr. ⁶	L; Orn	-Mexico; introduced to Java N, Sulawesi
4. Order Syngnathiformes						
Family Syngnathidae						
	<i>Microphis argulus</i> (Peters, 1855)	P	Kuda Laut	Cbr ⁶	L; M	-Java, Flores, Madagascar, Fiji, Polynesia
5. Order Synbranchiformes						
Family Synbranchidae						
	<i>Monopterus albus</i> (Zuiew, 1753)	P	Belut	Ckn, Cdr	L; F	-Sunda land, Sulawesi, Lesser Sundas.
Family Mastacembelidae						
	<i>Macrognathus aculeatus</i> (Bloch, 1786)	1 st	Sarolek	Cdr	L; F	- Sunda land
6. Order Perciformes						
Suborder Anabantoidei						
Family Belontiidae						
	<i>Trichogaster trichopterus</i> (Pallas, 1777)	1 st	Sepat	Cbr	L, F	-Sunda land, Indochina
Suborder Percoidei						
Family Teraponidae						
	<i>Kuhlia marginata</i> (Cuvier, 1829)	P	Corengang	Cbr	L, F	- Indo-West Pacific
Family Cichlidae						
	<i>Oreochromis mossambicus</i> Peters	2 nd	Nila/mujaer	Cmj	M, F	- Africa, introduced into Sumatra, Borneo, Java, Sulawesi etc.
Suborder Gobioidi						
Family Rhyacichthyidae						
	<i>Richthichys aspro</i> (Valenciennes in Cuvier & Valenciennes, 1837)	P	Nayapan/Selusur	Cmj, Cbr	L, Om	- Sumatra, Java, Bali, Sulawesi, Moluccas, New Guinea, Philippines, Taiwan, Solomon
Family Eleotrididae						
	<i>Belobranchus belobranchus</i> (Valenciennes, 1837)	P	Blosoh/ Nayapan	Csk, Cbr	L, Om, F	- Nias, Java, Sulawesi, Lesser Sundas, Moluccas, Philippines, New Guinea
	<i>Eleotris melanosoma</i> Bleeker, 1852	P	Blosoh/Nayapan	Csk, Cbr	M, Om	- Indo — Pacific, Panama, Canal zone
Family Gobiidae						
	<i>Awaous grammepomus</i> Bleeker, 1849	P	Menga	Csk, Cbr	M; Om	-Indonesia, Philippines
	<i>Lentipes</i> sp.	P	Menga	Csk, Cm ⁶ , Cbr	L; Om	-Cisukawayana, Cimaja and Cibareno River

Continued Table 1...

<i>Sicyopterus macrostatholepis</i> (Bleeker, 1853)	P	Menga	Csk., Cbr	M; Orn	-Sumatra West, Java, Bali, Lessers Sundas, Moluccas
<i>Sicyopterus cyanocephalus</i> (CuvierA Valenciennes, 1837)	P	Menga	Csk, Cbr	M; Orn	-Indonesia, Philippines, Java, Sulawesi, Lesser Sundas, Andaman Is.
<i>Sicyopterus microcephalus</i> (Bleeker, 1854)	P	Menga	Csk	L; Orn	-Nias, Bali, New Guinea
<i>Sicyopus cf. balinense</i> (Bleeker, 1857)	P	Menga	Csk, Cbr	L; Orn	-Nias, Bali, Moluccas, New Guineas, Philippines
<i>Sicyopus</i> sp.	P	Menga	Csk, Cmj	L; Orn	-Cisukawayana and Cimaja River
<i>Schismatogobius marmoratus</i> (Peters, 1869)	P	Menga	Csk, Cbr,	L; Om	-Sulawesi, Philippine, Japan
<i>Stiphodon semoni</i> Weber, 1895	P	Menga	Csk, Cmj	L; Om	-Indonesia, Philippines, Pacific

1) Eschemeyer (1998)

2) Helfmann *et al.* (1997) categoryP: peripheral; 1st: primary freshwater fishes; 2nd: secondary freshwater fishes3) Kottelat *et al.* 1993

4) Dr. S. Wirjoatmodjo's collection (1972)

L: Low (0-10 indiv./station); M: Moderate (10-20 indiv./station); High (>20 indiv./station)

F: Food fish; Om.: Ornamental fish; SF: Sport fishing; MC: Mosquito control

Csk: Cisukawayana River; Cmj: Cimaja River, Ckn: Cikaniki River, Cbr: Ciberang River, Cdr: Cidurian River, Cbr: Cibareno

river

Table 2. The number offish species and family in relation with the number of stations and the longitudinal zone of rivers/stream observed at the Gunung Halimun National Park

No.	River System	Direction of the flow	Number of stations	Number of Fish species	Number & % of Ostariophysi ¹⁾	Number of Families	Part of river system
1.	Cisukawayana	South (Indian Ocean)	18	18	3(16.66%)	8	Head water, Middle and Lower part
2	Cikaniki (+ Cisadane collection)	North (Java Sea)	10 11	6 14	6 (60%) 9 (64.28%)	5 8	Upper part Middle part
3	Cimaja	South (Indian Ocean)	28	13	2(15.38%)	8	Upper part, Middle part
4	Cidurian	North (Java Sea)	7	12	6 (50%)	9	Upper part
5	Ciberang	North (Java Sea)	8	2	2(100%)	2	Upper part
6.	Cibareno	South (Indian Ocean)	15	22	4(18.18%)	10	Head water, Middle and Lower part ²⁾

1) Robert (1998)

2) Paper on the fish communities along the longitudinal zone of this river is in preparation

Table 3. Physical and chemical parameters in several main rivers " in GHNP

No.	Parameters	Cisukawayana 1999		Cikaniki 1999		Cimaja 1999	Ciberang 2000	Ciberang Deet 2000	Cidurian 2000
		DS ²¹ /Up	RS/Mp, Lp	DS ²¹ /Up	RS/Up	RS/Up	DS/Up	DS/Lp	DS/Up
		Range (5 st)	Range (2 st.)	Range (1 Ost)	Range (2 st)	Range(1 st)	Range (1st)	Range (3 st)	Range (2st)
1.	Depth (m)	0.12-0.35	0.20 - 0.50	0.07 - 3.86	-		2	0.20-1.5	0.20-0.40
2	Width (m)	2.27 - 9.40	6 - 15	4.50 - 20	-	6-10	10-14	8-14	8-12
3	Velocity (m/sec.)	0.20 - 0.65	-	0.50-1.44	-	-	0.58-0.89	0.40-1.16	0.32 - 0.44
	Conductivity	0.01-0.04	-	-	-	0.03-0.07	0.04	0.05	0.05-0.15
4	T (oC)	18.0-21.0	-	17.0-19.80	-	21.1-22.6	19.0- 19.1	18.1 -19.9	21.60-21.80
5	Stream Bank	PF, RF&CP	RF, CP, AP	PF, RF &CP	PF; RF & CP	RF, CP, AP	PF	PF	PF, AP
6	Canopy coverage (%)	1 -98	0	1-98	-	0	80	5-80	0 - 5
7	PH	5	6.65-6.85	5-6	6.87-7	7	6.83-6.87	6.67-6.95	7.07-7.13
8	Dissolved Oxygen (mg/l)	5.35 - 6.99	7.51 -7.66	4.11-6.99	7.75- 7.98	8.04	7.8-8.6	7.5-8.5	5.80-7.60
9	BOD	0.21- 3.29	4.83-6.28	0.41 -4.52	2.08 -2.62	1.31	-	-	-
10	Orthophosphate (mg/l)	0.02 - 0.06	0.15-0.99	0.05 -0.08	0.04	0.053	0.031	0.33	0.053
11	Nitrate (mg/l)	0.10-0.91	3.51-3.59	0.11-0.39	0.24 -0.36	<0.1	0.169	0.11	0.011
12.	Alkalinity (mg/l)	0.60-1.40	17.2-23.5	0.30 - 0.80	14.2-19.5	0.57	34	.32	34
13.	Hardness (mg/l)	-	-	-	-	-	12	12	10
14	Nitrite (mg/l)	-	0.01	-	0.006-0.008	0.05	0.006	0.60	0.009

1) Main River; 2) Nurcahyadi (2000)

DS: Dry Season; RS: Rainy Season; Mp: the middle; Lp: lower part of the river; Up: Up stream

PF: Primary Forest; CP: Crop Planted; AP: Annual Planted

3) Salinity: in Upper Cisukawayana 0.00 gr/kg; Middle Cisukawayana 0.045 gr/kg; Lower Cisukawayana 0.009 gr/kg.