THE DIVERSITY OF FRESHWATER FISHES IN HAYA, MAMBERAMO-PAPUA

(Keanekaragaman Ikan air tawar di Haya, Mamberamo-Papua)

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ABSTRAK

Penelitian ini bertujuan untuk menambah data spesies dan kelimpahan ikan air tawar untuk digunakan dalam perencanaan konservasi di daerah Mamberamo. Survei dilaksanakan selama 18 hari dari 5 Februari sampai 24 April 2008 pada beberapa habitat, berupa sungai, kali, telaga, dan aliran-aliran air. Sejumlah 20 spesies yang tergolong ke dalam 17 genus dan 14 famili telah dikoleksi dan ditangkap menggunakan gillnet, cast net, hand net, long line dan tumbuhan beracun Deris sp. Dua catatan baru ditemukan dari Mamberamo, yaitu Chilaterina lorentzi yang sebelumnya hanya diketahui dari sungai Tawarin pada pantai utara Papua sekitar 200 km sebelah barat Jayapura dan kali Puive, anak sungai Pual dekat Vanimo, PNG; dan Monopterus albus (sejenis ikan introduksi) yang sebelumnya tidak diketahui ada di Mamberamo. Pada umumnya fauna ikan air tawar yang dikoleksi di Haya sekitar 70% mirip dengan catatan dari Dabra.

***Kata kunci**: keanekaragaman, ikan air tawar, Haya, Mamberamo-Papua*

INTRODUCTION

Mamberamo region has both the highest percentage of endemic fishes and the highest percentage of introduced fishes of any major river system in New Guinea (Allen, 2002). In this region the freshwater fishes that have been collected in Mamberamo are about 35 species including introducee fishes. It is equal with Sepik and Ramu River in PNG were the amount that have been collected is 57 species and 54 species, in this region a few species have documented. The research in Mamberamo have been done only in Dabra were 23 species have been recorded including the first specimens of *Gobius tigrellus*, which were collected by American Archbold Expedition in the late 1930.

Mamberamo region in north-central of Papua covers nearly 7,700,000 hectares have a domain of unique freshwater type such as sinuous river flood and turbid rainy season and clear dry season, swamps, tidal area, seasonally inundated area, creeks, streams and oxbow lakes that have been composed from river break. This domain has an important target for research, especially freshwater fish's fauna that has not been intensively documented. This research aims to improve data of the species and abundance of freshwater fishes in Haya for conservation planning in Mamberamo.

MATERIALS AND METHODS

The samples were collected in 18 days from 5 February to 24 April 2008 in several habitats (river, creeks, oxbow lake and streams) (site survey on Table 4). Fish was captured using gillnet (size 1.5 inch), cast net (size 1 inch), hand net, long line and fish poison (ichthyocide rotenone) from plant *Deris* sp was used at creeks. Besides that, fishes were observed underwater using mask and snorkel. Fishes have been caught in fresh condition for easy identification. Identification was done using field guide books of freshwater fishes of New Guinea and Timika Region by Allen (1991) and Allen *et al*. (2000).

Small fishes, such as rainbowfishes, gobies and gudgeons were photographed alive in a small landscaped aquarium. Larger species, such as ariidae (ariid), some gudgeons and introduce species (cyprinidae, cichlidae) were photographed out of water while still fresh. Photography equipment consisted of a Nikon 80 mm macro lens. The photos or images were saving to CD (compact discs) and deposited at Department of Biology, University of Papua Manokwari and CI-Indonesia. Fish specimen were initially fixed in a 10 percent formalin solution and later transferred to 75 percent ethanol for permanent storage collection. Specimens were deposited at the Biology Laboratory University of Papua, Manokwari.

Analysis of data use Shannon-Winner diversity index and Sorensen similarity index (Krebs, 1989; Molles, 2005) following the formulas:

$$H' = \sum_{i=1}^{s} p_i \log_e p_i$$

H' : the value of the Shannon-Wiener diversity Index
p_i : the proportion of the species i
Log_e : the natural logarithm of p_i
S : the number of species in the community

$$Ss = \frac{2C}{A+B} \times 100\ \%$$

Ss : the value Sorensen similarity index
A : the number of species in the community A
B : the number of species in the community B
C : the number same species between in the community A and B

RESULTS AND DISCUSSION

The freshwater type in the Haya area have a basis landscape consists of swamps area (river, oxbow lake), plain forest area (creeks, forest pool) and hills forest area (stream). Particularly in Haya, area is covered with swamps forest that has been seasonally inundated with flood during rainy season and clear dry season. Five sites survey were observed, consists of Oii River, Kuahuwei creek; Koruwe creek, Kra stream, Kerjakeri oxbow lake and Suuda oxbow lake (see Table 4). During rainy season, the rivers or creeks will flood, fast flowing, very turbid water with dark brown color. At that time some species were easy to find such as *Arius velutinus*, *Zenarcopterus alleni*, *Oreochromis mossambica*, *Barbodes gonionotus* and *Puntius orphoides*. Species accumulative in each habitat can be seen at Figure 1.

Species Richness

The number of species that were captured at four domain habitat is 20 species (17 genera, 14 families) where 15 species are native species and five introduce species (see Table 3). The most exciting native species is *Chilaterina lorentzi* which was found in streams. This species previously known only from Tawarin River on the north coast of Papua about 200 km west of Jayapura and Puive creek, a tributary of the Pual River near Vanimo, PNG (Allen, 1991). This species have a wide distribution area to Mamberamo region. The other species is the exciting introduce species *Monopterus albus* that was found in oxbow lake near Haya village which have not previously known in Mamberamo and Papua. Dr. Gerald R. Allen, who did a research on this species, reported that this species previously did not known in Mamberamo region. With a founding of this species, the number of the introduce species increase in the Mamberamo Region. Species and the number of species that were captured on each habitat domain can be seen in Table 1 and Figure 2.

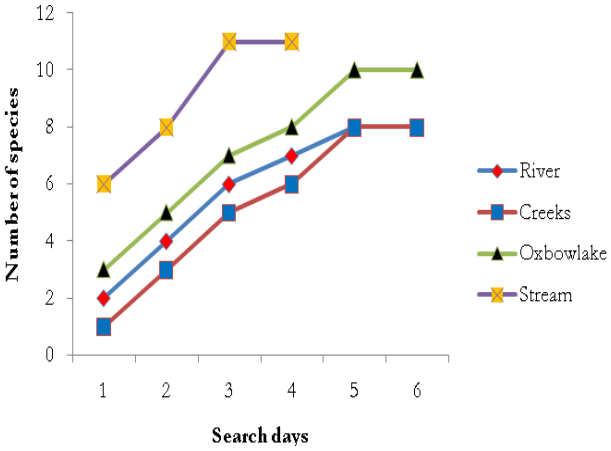

Figure 1. Species accumulative curves at Haya

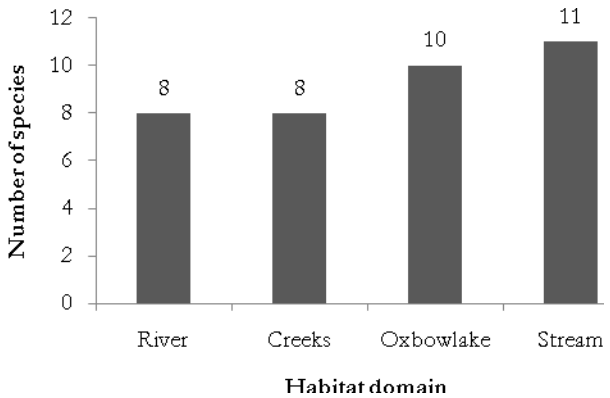

Figure 2. The number of the species captured in each habitat domain.

Species Abundance

The native species that were found previously at the stream and creeks is *Chilatherina fasciata*. This species like water flows and good forest in the streamside. In stream the most exciting species was found is *Chilaterina lorentzi*. It's common abundance most upstream, because of good water quality with habitat condition such as rocky, gravel, and sand and steep-gradient streams. The particularly species was found at the oxbow lake is *Glossolepis multisquamatus*. This species like slow running water with many aquatic plants for feeding and breeding. Fishes at the stream habitat that was found is *Arius velutinus*. This species have a good adaptation to the strong current velocity. The introduce species that were found particularly is *Barbodes gonionotus* and *Puntius orphoides* mostly in every domain habitat this species could be found. This species is threatened to native species. Population of *Monopterus albus* will be fast increase in Mamberamo, because it's good adaptation in swamps, therefore is called blackfish. The abundance of each domain habitat can be seen in Figure 3 and Table 3.

Table 1. Species of freshwater fishes found in Haya, February – April 2008

Family/species	Common names	Local names
Native species		
Ambassidae		
Parambassis altipinnis **Allen, 1982**	High-Finned Glass Perchlet	Esehei/Tek
Anguillidae		
Anguilla bicolor **McClelland, 1844**	Indian Short-Finned Eel	Bosik/Tor
Apogonidae		
Glossamina beauforti **(Weber, 1908)**	Beaufort's Mouth Almighty	Dow/Olei
Ariidae		
Arius velutinus **(Weber, 1909)**	Papillate Catfish	Korwakeit/Kolakeit
Eleotridae		
Giurus margaritaceus **(Valenciennes, 1837)**	Snakehead Gudgeon	Kakare/Kakale
Oxyeleotris fimbriata **(Weber, 1908)**	Fimbriate Gudgeon	Kosak/Kosa
Oxyeleotris **sp.**	Gudgeon	Kot
Mogurnda **sp.**	Mogurnda	Kuatukweri/Suatre
Gobiidae		
Glossogobius bulmeri **Whitley, 1959**	Bulmer's Goby	Kuatukweri/Suatre
Hemiramphidae		
Zenarchopterus alleni **Collette, 1982**	Allen's River Garfsh	Julung
Plotosidae		
Neosilurus novaeguinea **(Weber, 1908)**	New Guinea Tandan	Kobek/Sarek
Melanotaeniidae		
Chilatherina fasciata **(Weber, 1913)**	Barred Rainbowfish	Sauw
Chilatherina lorentzi **(Weber, 1980)**	Lorentz's Rainbowfish	Sauw
Glossolepis multisquamatus **(Weber and de Beaufort, 1922)**	Sepik River Rainbowfish	Sauw
Terapontidae		
Hephaestus transmontanus **(Mees and Kailola, 1977)**	Sepik Grunter	Te/Huti
Introduced species		
Cichlidae		

***Oreochromis mossambica* (Peters, 1852)**	Tilapia	Warote/Mujair
Clariidae		
***Clarias batrachus* (Linnaeus, 1758)**	Walking Catfish	Lele
Cyprinidae		
***Barbodes gonionotus* (Bleeker, 1850)**	Java Barb	Teawatidi/Dedahatidi
***Puntius orphoides* (Valenciennes, 1842)**	Spot-Tailed Barb	Awateguai/Ahatidie
Synbranchidae		
Monopterus albus	Swamp-Eels	-

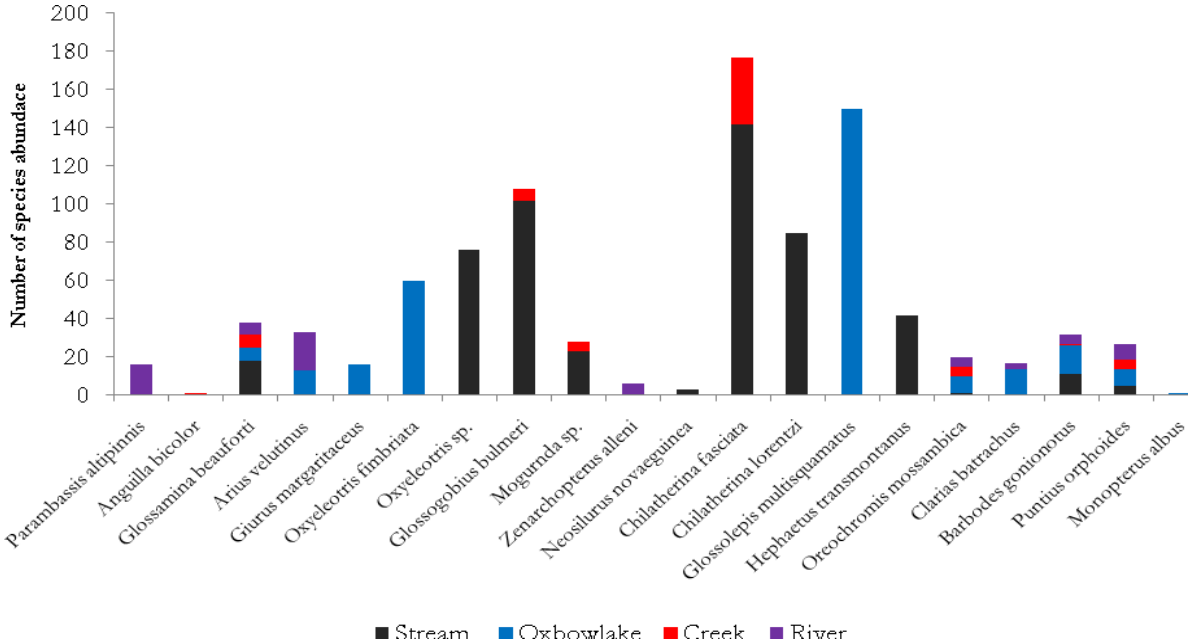

Figure 3. The number of the abundance fish species in each habitat domain

Diversity index

The diversity index aims to appeal of species diversity level that was found and compare between richness and evenness. The highest diversity of the species were found at the stream habitat as many as 11 species. The lowest of the diversity species were found at the creeks and oxbow lake habitat. If appealed between creeks habitat and oxbow lake habitat same as 8 species, but evenness species was different between habitats. Level of the diversity index is very influence of the wide habitat and water quality. The Haya freshwater fishes are relatively few documented although there is unique adaptation. Diversity index on each domain habitat can be seen in Figure 4.

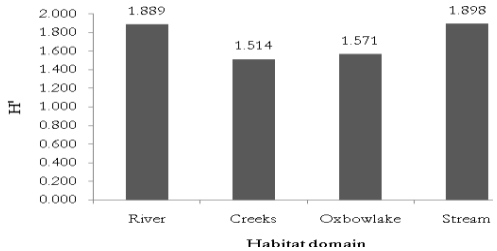

Figure 4. The value of the diversity index in each habitat domain.

Similarity index

The similarity index aims to appeal of species similarity level by site in the form of percentage (%). The highest of the similarity index between creeks and stream is about 73 %. Kra stream is located in hills area and into the Oii River. This river has creeks such as Kuahuwei creek and Koruwe creek thus some species was found in both creeks. The lowest of similarity is between oxbow lake and stream with a similarity of about 38 %.

Both habitats are far isolated, thus some species was not facing. Some species that enter habitat are particularly the introduce species such as *Oreochromis mossambica, Barbodes gonionotus,* and *Puntius orphoides* which have a wide distribution in Haya. Comparison of the similarity index can be seen in Table 2.

Table 2. The percentage (%) of similarity of each habitat

Habitat	River	Creeks	Oxbow lake	Stream
River	0	50	44.44	42.10
Creeks		0	44.44	73.68
Oxbow lake			0	38.09
Stream				0

Note: Stream (Kra stream); Oxbow lake (Kerjakeri and Suuda); Creeks (Kuahuwei dan Koruwe); River (Oie river).

Table 3. Species and abundance by survey sites, February – April, 2008

Family/species	Site survey					
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Native species						
Ambassidae						
***Parambassis altipinnis* Allen, 1982**	C					
Anguillidae						
***Anguilla bicolor* McClelland, 1844**		R				
Apogonidae						
***Glossamina beauforti* (Weber, 1908)**	O	O		O	R	O
Ariidae						
***Arius velutinus* (Weber, 1909)**	O			O	O	
Eleotridae						
***Giurus margaritaceus* (Valenciennes, 1837)**				O	O	
***Oxyeleotris fimbriata* (Weber, 1908)**				O	O	
***Oxyeleotris* sp.**						O
***Mogurnda* sp.**		O				O
Gobiidae						
***Glossogobius bulmeri* Whitley, 1959**		O				C
Hemiramphidae						
***Zenarchopterus alleni* Collette, 1982**	O					
Plotosidae						
***Neosilurus novaeguinea* (Weber, 1908)**						R
Melanotaeniidae						
***Chilatherina fasciata* (Weber, 1913)**		O	O			C
***Chilatherina lorentzi* (Weber, 1980)**						O
***Glossolepis multisquamatus* (Weber and de Beaufort, 1922)**				C	O	
Terapontidae						
***Hephaestus transmontanus* (Mees and Kailola, 1977)**						O
Introduced species						
Cichlidae						
***Oreochromis mossambica* (Peters, 1852)**	O	O	R	O	R	R
Clariidae						
***Clarias batrachus* (Linnaeus, 1758)**	R			O	O	
Cyprinidae						

***Barbodes gonionotus* (Bleeker, 1850)**	O	R		O	O	O
***Puntius orphoides* (Valenciennes, 1842)**	O	O		O	R	O
Synbranchidae						
Monopterus albus				R		
Number	**8**	**8**	**2**	**10**	**9**	**11**

Note: R (Rare) = 3 or fewer individuals per site; O (Occasional) = 5–30 per site; C (Common) = many per site, often more than 100 individuals (Sounce of data: Allen, 2002).

Table 4. Description of Survey sites, February – April, 2008

No	Description
Site 1	Oii River, in the north coast from Haya village 02°49'29" S, 138°06'032" E and elevation 90 m above sea level. The biggest river in this village (8-10 m wide and 4-6 m deep), fast flowing, turbid and all along river luxuriant closed-canopy forest. If raining the river will flooded and inundate surroundings. Bottom substrate has the shape of sand, gravel and mud.
Site 2	Kuahuwei creek, in the west from Haya village in plains area and straight flows behind to the east from village 02º48'718" S, 138º06'611 E and elevation 90 m from sea. The wide of creek 1.5-3 m and deep 0.5-2 m. If raining the creek will flooded and inundate surroundings, but in the dry season this creek will be withdraw as if drainage ditch. All long creeks are closed-canopy forest, fast flowing, turbid. Bottom substrate has the shape of sand, mud and manure.
Site 3.	Koruwe creek, in the east of Haya village in plains area to elevation 90 m from sea and collected with the Kuahuwei creek. This creek most small than Kuahuwei creek and luxuriant closed-canopy forest, slow flowing and if raining the creek will flood and inundate surroundings. Bottom substrate has the shape of sand, gravel, mud and wide of creek 1-2.5 m and deep 0.5-1 m.
Site 4	Kerjakeri or Kedaket oxbow lake, in the north from Haya village in swamps 02º49'216" S, 138º06'402" E and elevation 90 m from sea. This oxbow lake is near the village about 100 m. This oxbow lake was formed from Oii River broken off. The water surface is closed with aquatic plant and the oxbow lakeside consists of sago trees and other aquatic plant and trees. Wide of oxbow lake 4-5 hectare and deep 1.5-4 m and bottom substrate have the shape of mud and the dark of the water color.
Site 5	Suuda or Suurja oxbow lake, in the east of Haya village in swamps 02º49'216" S, 138º06'402" E and elevation 100 m from sea and 1 km from village. This oxbow lake is from river broken off. The water surface is not closed with aquatic plant and the oxbow lakeside consist sago trees and underbrush. Bottom substrate has the shape of mud and clear of water. Wide of oxbow lake at least 2-3 hectare and deep 1-2 m.

Site 6	Kra stream, in the east of Haya village in hills forest 02º49'216" S, 138º06'402" E and elevation 200 m from sea and at least 10 km from village. Bottom substrate consists of rocky, gravel and sand. This stream is fast flowing and clears of the water. Deep of stream from some meter to two meters, particularly in the pool zone. Vegetation of the all long stream form luxuriant closed-canopy forest.

Site 1 = Oii river; Site 2 = Khuahuwei creek; Site 3 = Koruwe creek; Site 4 = Kerjakeri oxbow lake; Site 5 = Suuda oxbow lake; Site 6 = Kra stream

Table 5. Species proportion of freshwater fishes found in Haya, Dabra, and Mamberamo, Papua

Family/Species	Haya	Dabra	Mamberamo
Native species			
Anguillidae			
Anguilla bicolor **McClelland, 1844**	x	x	x
Ariidae			
Arius solidus **Herre, 1935**		x	x
Arius utarus **Kailola, 1990**		x	x
Arius velutinus **(Weber, 1909)**	x	x	x
Plotosidae			
Neosilurus idenburgi **(Nichols, 1940)**			x
Neosilurus novaeguinea **(Weber, 1908)**	x	x	x
Melanotaeniidae			x
Chilatherina bleheri **Allen, 1985**			x
Chilatherina crassispinosa **(Weber, 1913)**			x
Chilatherina fasciata **(Weber, 1913)**	x	x	x
Chilatherina lorentzi **(Weber, 1980)**	x *		
Glossolepis multisquamatus **(Weber and de Beaufort, 1922)**	x	x	x
Melanotaenia maylandi **Allen, 1982**			x
Melanotaenia praecox **(Weber and de Beaufort, 1922)**			x
Melanotaenia vanheurni **(Weber and de Beaufort, 1922)**		x	x
Hemiramphidae			
Zenarchopterus alleni **Collette, 1982**	x		x
Zenarchopterus kampeni **(Weber, 1913)**			x
Ambassidae			
Parambassis altipinnis **Allen, 1982**	x		x
Parambassis coninis **(Weber, 1913)**			x
Terapontidae			
Hephaestus transmontanus **(Mees and Kailola, 1977)**	x	x	x
Apogonidae			
Glossamia beauforti **(Weber, 1908)**	x	x	x
Glossamia gjellerupi **(Weber & de Beaufort, 1929)**			x
Mugilidae			
Mugilid **sp.**			x
Eleotridae			
Giurus margaritaceus **(Valenciennes, 1837)**	x	x	x
Mogurnda aurofodinae **Whitley, 1938**			x
Mogurnda nesolepis **(Weber, 1908)**		x	x
Oxyeleotris fimbriata **(Weber, 1908)**	x	x	x

***Oxyeleotris heterodon* (Weber, 1908)**		x	x
***Oxyeleotris* sp.**	x		
***Mogurnda* sp.**	x		
Gobiidae			
***Eugnathogobius tigrellus* (Nichols, 1951)**		x	x
***Glossogobius bulmeri* Whitley, 1959**	x	x	x
***Glossogobius koragensis* Herre, 1935**		x	x
Introduced species			
Cyprinidae			
Cyprinus carpio		x	x
***Barbodes gonionotus* (Bleeker, 1850)**	x	x	x
***Puntius orphoides* (Valenciennes, 1842)**	x	x	x
Clariidae			
***Clarias batrachus* (Linnaeus, 1758)**	x	x	x
Cichlidae			
***Oreochromis mossambica* (Peters, 1852)**	x	x	x
Channidae			
***Channa striata* (Bloch, 1793)**			x
Synbranchidae			
Monopterus albus	x*		
Number	**20**	**23**	**40**

SUMMARY

The freshwater fishes found in Haya are relatively low, but have a unique adaptation in each habitat. Two species have new record in Mamberamo that is *Chilaterina lorentzi* that was previously known only from Tawarin river on the north coast of Papua about 200 km west Jayapura and Puive creek, tributary of the Pual River near Vanimo, PNG; and the *Monopterus albus* (an introduce fish) that was not previously known in Mamberamo although Papua. *Chilaterina lorentzi* will be threaten of local extinction because of its distribution only at the Kra upstream and was not find downstream. Condition of the freshwater habitats in Haya is good for fishes and not yet disturbed. The local people use fishes only for food and not for sale. Threat of introduce fishes that will disturb the native species is *Barbodes gonionotus, Puntius orphoides* and *Oreochromis mossambica*. The impacts of these introduced species on native fish populations should be assessed as a matter of urgency.

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