



Diversity and Density of Pleco (*Pterygoplycthis* sp) in Ciliwung River, Jakarta Indonesia

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Abstract

There has been a lot of information about some species of fishes, plants, insects, planktons, river quality, including heavy metal concentrations from organisms, water and sediment, from some research in Ciliwung River since 2008. But, there is still very limited data that related to the diversity and density of pleco in the Ciliwung River. Pleco is a native species from Costarica, Panama and South America and it's known as an invasive species which is potentially to reduce local biodiversity by eliminating local species of fishes in Ciliwung rivers. The aims of this study is to analyzing the diversity and density of pleco from Ciliwung River in the Jakarta area. Purposive sampling was used with a consideration that the three points represent the presence of pleco. The location of sampling was the Ciliwung river in Jakarta which flows along the Cawang-Condut. Sampling has been done using 4x2 m² cast nets with a 2.5-inch mesh size. The sampling activity was carried out in 09.00-15.00 AM. The results showed that the index diversity of pleco in the Ciliwung river in Jakarta was low, which was equal to $H' = 0$ because there is only one species of pleco was found there, *Pterygoplichthys pardalis*. The population density of pleco in the Ciliwung river in Jakarta was 58 individuals/m².

Keywords: *Pterygoplichthys pardalis*, native species, index diversity, population density, Ciliwung river Jakarta

Introduction

Pleco is a suckermouth armored catfish that is found in Ciliwung River in large quantities. It is an introductory species from Costarica, Panama and South America as an object of commercial ornamental fishes in Indonesia (Zworykin & Budaev, 2013). Pleco is also known as invasive species, which can be predators and competitors of local species (Hill & Lodge, 1999), potentially spread parasites and pathogens in their habitats (Torchin, et al., 2003), can cause unexpected hybridization (Mallet, 2007), and potential to reduce local biodiversity by eliminating local species of fishes (Chapin, et al., 2000).

The decline in number of the fish species in Ciliwung River has been happening since 2009. It is noted that there were found 20 fish species in 1910 on the river. One of the main role factors towards the decline of the fish species in Ciliwung River is the existence of pleco that is relatively able to adapt to the river's condition that is polluted and no other predators that hunt them. Pleco in Ciliwung River is categorized as introduced fish that is able to dominate the river, this is supported by its body morphology structure. It has a flat body, all covered with hard scales but its abdomen, it has a wide head and jaw. The main characteristic of this *loricariidae* group is that they have a sucker mouth. The shape of its mouth and



from each coordinate, namely S 06.244053°-E 106.862654° at the first station, S 06.25830°-E 106.86040° at the second station and S 06.28599°-E 106.84717° at the third station (Figure 3). The coordinates were determined using purposive sampling method in consideration that samples collection along Cawang-Condet of Ciliwung River is regarded as a highly polluted area. In every coordinate, samples were collected in consideration that the samples caught from the nets were placed in every coordinate.

The Identification of Pleco Species at the River Stream Area of Ciliwung

The identification has been done at the Center of Integrated Laboratory UIN Syarif Hidayatullah Jakarta by identifying morphology characteristics of pleco that have been caught by the nets. The specimen was preserved in an 70% alcohol solution. The specimen labels used its scientific names, its caught places, and its collection dates. The identification of pleco specimen at the River Stream Area of Ciliwung used some methods by looking at the patterns of head, lateral, and abdomen. This research was conducted by looking at the pattern of its abdomen which is the salient morphology characteristic of pleco. This happens because the samples have spots patterns or vermicularis on its ventral (Armbruster & Page, 2006). The pleco species identification refer to the book of fish identification from Kottelat *et al.*, (1993) and other secondary data from scientific journals.

The Diversity of Pleco Types at the River Stream Area of Ciliwung

The relationship between the number of types and individuals can be stated in Diversity Index. To determine the fish diversity, Shannon-Wiener index was employed (Ludwig dan Reynold, 1988):

$$H' = -\sum p_i \ln p_i$$

Notes:

H' = Shannon-Wiener Diversity Index

n = The number (i) of individual species

N = The number of individuals from all species

The scoring criterion based on diversity types is:

$H' < 1$ = Low diversity

$1 < H' < 3$ = Moderate diversity

$H' > 3$ = High diversity

The Density of Pleco at the River Stream Area of Ciliwung

The density of pleco is calculated using the following formula (Barus, 2004):

$$D_i = X_i / N_i$$

Notes:

D_i = Density (individual/m)

X_i = Total number of individual

N_i = Total number of area

Results

The diversity index calculation result towards 1.401 plecosp gained from the three locations at Ciliwung River, resulted in the value of H' equal to 0 (zero). It can be stated that the diversity of pleco in Ciliwung River is low. The Diversity Index (H') is categorized low if, based on the identification result, it is only found one species of pleco in the three locations along the river stream area of Ciliwung River in Jakarta, namely *Pterygoplichthys pardalis*.

Morphologically, pleco's abdomen has big white spots pattern with merged patterns that are attached together to its sucker-mouth beneath (Page & Robins, 2006). Rosnaeni, et al. (2017) research is a



DNA analysis of *barcodes* CO1 in the fragment's length of 650bp supports the identification result of *Pterygoplichthys pardalis*, that even though there are diverse abdomen patterns of the found plecoco, all is from one species that is *P. pardalis*.

Identification result of the abdomen pattern on plecoco from the three locations of Ciliwung River shows matched result with the research conducted by Wu *et al.* (2011). The plecoco species in Indonesia has a different abdomen pattern. *P. pardalis* has black spots abdomen pattern (in the shape of commas or dots), *P. disjunctivus* has curved patterns, meanwhile the inter-grade species has a combination pattern between inter-grade or hybrid species. The three different patterns of the abdomen can be characterized as one type of plecoco in the family of *Loricariidae* that is *P. Pardalis*.

Two different patterns on its head (geometrical light stripes pattern and spots and blotches patterns) that could be identified by Armbruster and Page (2006) show that the two characteristics are the morphological characteristics of *P. Pardalis* species. The difference in the two lateral patterns (merged patterns forming chevrons (<) and separated patterns and do not create chevrons) also shows the morphological characteristic of *P. Pardalis* species. The result is supported by a statement that the different patterns between the abdomen patterns on plecoco are not the main characters to identify the type of plecoco (Rosnaeni, *et al.*, 2017).

Density of plecoco population in Ciliwung River in the three locations results in different values. At the first station, it has the density value of 58 ind/m², at the second station it has the density value of 80 ind/m² and at the third station it has the density value of 36 ind/m². The average number of plecoco density population in Ciliwung River is 58 individu/m². This shows that the density of plecoco in this research is higher than the number of population that was found in Halwa's research (2016) that was 22 individuals.

The biggest density value was found at the second station that is around 80 ind/m², meanwhile the lowest is at the third station for only 36 ind/m². The biggest density value at the second station is caused by the number of individual species of *Poecilia reticulata* and *Mystacoleucus marginatus* is lower than the number of individuals at the first and the third stations. It is caused by the interaction between plecoco and the species of *Poecilia reticulata* and *Mystacoleucus marginatus*. An interaction occurred in a population can be in the form of competition if among organisms from the same or different type use the same resource. If an organism uses the same resources, then every organism has to compete to feed themselves to survive and to grow.

The abundant number of plecoco in Ciliwung River is probably due to an excellent interspecific competition in taking advantages of food resources with other fish in Ciliwung River such as *Poecilia reticulata* and *Mystacoleucus marginatus*. Supported with a statement coming from Josefsson and Andersson (2001), the aggressive characteristic to get food performed by *Pterygoplichthys pardalis* when they were present at certain locations so that they could change another community in a water area may cause the decline of fish and invertebrate populations.

According to De-Merona (2004), the fish population number is also affected by the number of food resources in the water. Pambudi *et al* (2016) states that there are 5.834 individuals of phytoplankton. This shows that the fish population in every station is influenced by the existence of phytoplankton in Ciliwung River. The biggest population number is gained at the second station for 80 ind/m² because the water condition is at its optimum point for the life of phytoplankton. The condition is influenced by the speed of the stream. At the second station, the speed of the stream is found lower than the first and third stations. According to (1988) a water area that is relatively placid is suitable for the habitat of phytoplankton. For the number of stream speed at the second station is 0,4 m/s lower than the first station for 1,5 m/s and the third for 2,1 m/s so that at the second station, it has a relatively placid stream. A research by Pambudi, *et al.* (2016) figures out that most phytoplanktons in Ciliwung River are highly-tolerated phytoplankton such as *Navicula*, *Nitzschia*, *Synedra*, *Cymbella*, and *Fragilaria*.



According to Krebs (1972), the existence of a fish in a water area is heavily influenced by the presence of predators. The pleco's body has several adaptations to predators that have hard bones and are able to regenerate its pectoral, so that pleco is not hunted by other fish living in Ciliwung River and become the competitor by original fish to get some food, additionally to its life cycle (Sinha, et al., 2010). The research results of Rice *et al.* (2007) and Power (1984) state that a predator from *P. pardalis* species is not from other fish type but from reptiles such as snakes and freshwater turtles, birds, and also human (Aguilar & Di-Beernardo, 2004) (Bonino *et al.*, 2009) (Nico, 2010).

The cause of the high density of pleco for 80 ind/m² in Ciliwung River at the second station is because few local people along the riverbank to do activities of fishing or catching fishes compared to the first and third stations. For instance, the act of catching fish commercially to invasive fish of *Pterois volitans* has proven to help inhibit the *Pterois volitans* fish population growth (Barbour *et al.*, 2011).

Cause of the high density of pleco in Ciliwung River at the third station is the low number of predator individuals. It is proven by a research by Rasmendero, et al (2009) that describes no finding of bird prey based on the composition analysis of bird types at Kalibata Station and at other stations in South Jakarta. The low number of pleco predators at the three stations enable pleco at the third station to have high density.

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