

Mapping The Distribution Of Fish Caught In The Jatigede Reservoir, Indonesia

ABSTRACT

This research aims to map the structure of the fish community living in the floodplain of the Jatigede reservoir based on the catch. This research uses the field observation method, taking fish samples every 14 days and doing 6 times. The results of the survey show that the number of fish caught during the survey was 799 individuals, and the fish species identified at 6 stations of Jatigede Reservoir consisted of 9 families of 18 species. The fish species with the highest abundance was Pepetek fish at station 1. At stations 2, 3, 4, and 5, the fish with the highest abundance was Hampal fish, and at station 6, the fish with the greatest abundance was Boboso fish. The distribution of native fish is more dominant than introduced fish with a comparison of 11 native fish species and 7 introduced fish species. The water quality at each station still meets the requirements of environmental quality standards according to Government Regulation (Indonesia) No. 22 of 2021 on Water Quality Standards and is suitable for fish life.

Keywords: Jatigede Reservoir; mapping; abundance; water quality

1. INTRODUCTION

The water of the Jatigede reservoir was undergoing an ecosystem change from a river ecosystem with running waters (Lotic) to a reservoir ecosystem with standing waters (Lentic) at the time of its flooding in 2015. The shift from a lotic ecosystem to a lentic ecosystem can affect changes in the abundance and composition of fish species and impact fish habitat, behavior, feeding habits, hiding from predators and fish reproduction will be disturbed. Riverine fish, especially diadromous fish, which are fish species that regularly move between fresh and marine waters, will lose their habitat or lose the opportunity to complete their entire life cycle [1]. This is consistent with Jubaedah's (2006) statement that changes in the ecosystem from flowing to flooded are likely to cause changes in species and fish population composition [2].

From 2015 to 2017, 19.750.600 fish have been stocked in the Jatigede reservoir. The types of fish stocked consisted of Nila, Nilem, Tawes, Beureum Panon, Lalawak, Goldfish, Kancra, Koan / Grass Crap, Milkfish, Patin, Tambakan, Sepat Siam, and Giant Prawns. The types of fish that are stocked are different each time they carry out activities. Based on Herawati's research (2017), 11 families of fish caught and identified in Jatigede Reservoir consisted of 25 species, namely Lalawak, Seren, Hampal, Genggehek, Nilem, Hike, Paray, Tawes, Nila,

Mujair, Sepat, Gabus, Sapu-Sapu, Patin, Senggal, Milkfish, Berod, Julung-Julung, Lalawak Jengkol, Beureum Panon, Catfish, Goldfish, fresh water Pomfret, Marinir, and Red Devil [3].

At the beginning of the flooding of the original fish species of the Cimanuk River, which increased in quantity and spread evenly, namely Lalawak fish and Hampal fish. Catches in 2016 reached 25 kg to 50 kg per day, according to fishermen. In 2017, it has now dropped from 2 kg to 3 kg per day. The decrease in catches was due to the increase in the number of fishermen, the number and type of catches and the lack of institutions regulating fishing activities in Jatigede reservoir [4]. If excessive fishing continues and the catch resources are not managed, the fish in the Jatigede reservoir will eventually become extinct.

In order to support trap fishing activities, it is necessary to manage natural fisheries through stocking, introduction of fish and conservation. This management is one of efforts to increase the stock of caught fish to be stocked in the waters of Jatigede Reservoir. However, management to add fish stocks cannot be done haphazardly as the presence of new fish or introduced fish has no direct beneficial impact on Indonesia's aquatic ecosystems. This introduced fish is known to be aggressive and potentially invasive to native Indonesian fish [5].

Based on these conditions, it is necessary to study the distribution of fish through mapping. The mapping analysis required a system called the Geographic Information System (GIS). Arcview is one of the GIS tools that can visualize, examine (explore), answer (query), and analyze data geographically related to spatial and nonspatial data. The combination of GIS and studies on several ecological aspects of the fish community, such as distribution patterns, composition of fish species and structure of fish community, will be very useful to provide information on fish existence and sustainability [6]. Consistent with this statement, this research aims to map the structure of the fish community living in the floodplain of the Jatigede reservoir based on the catch.

2. MATERIAL AND METHODS

2.1 Time and Place

This research was conducted from August to October 2021 in Jatigede reservoir with fish sampling intervals every 14 days, 6 samples were taken, sampling was performed at 6 stations (Figure 1).

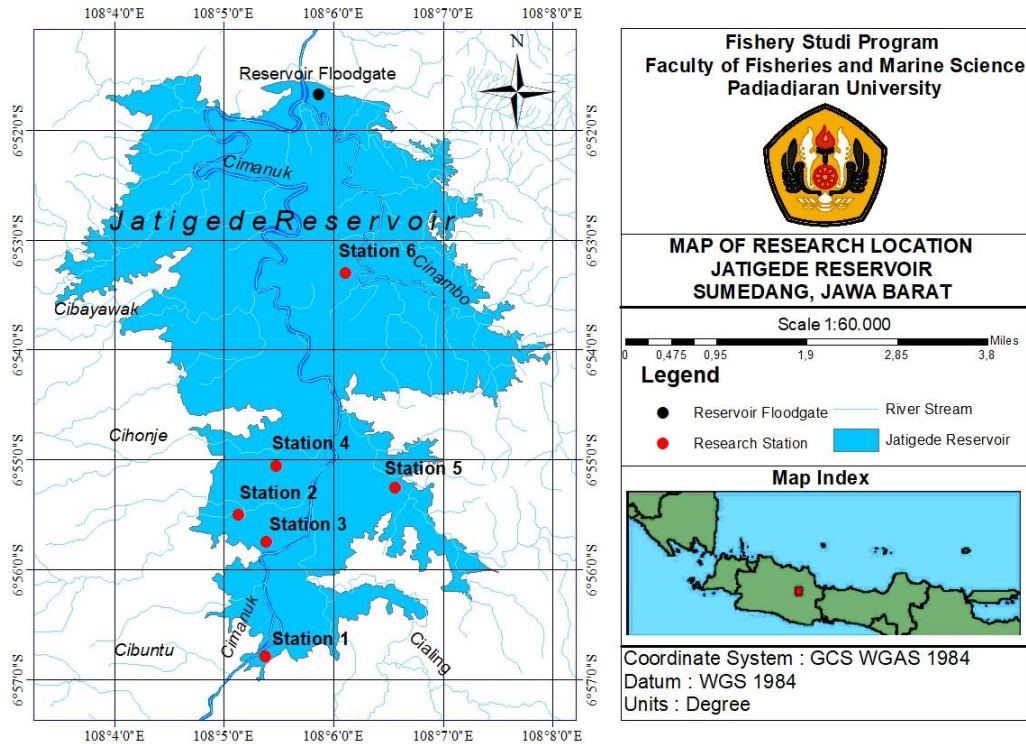


Figure 1. Research Location Map

- Station 1 : The main inlet is sourced from the Cimanuk River, this station is a riverine zone. With coordinates 6°55'48,9"S & 108°5'24,0"E
- Station 2 : The riverine zone that flows from the cialing river. With coordinates 6°55'50,2"S & 108°5'42,3"E
- Station 3 : The location where water comes from two small rivers, namely the Cimuja River and the Cijajaway River. This station is *riverine zone*. With coordinates 6°55'59,3"S & 108°5'01,2"E
- Station 4 : The transition zone with water supply comes from the Cihonje River, Cimuja River, and Cacaban River. At station 4 there is a catch fishery activity. With coordinates 6°55'02,9"S & 108°5'28,3"E
- Station 5 : The estuary of the Cacaban River and the beginning enter the flooded zone. At station 5 there are fishing activities using gillnets. With coordinates 6°55'18,0"S & 108°6'45,6"E
- Station 6 : The location of station 6 is a flooded zone. At this station, there is rarely catch fishery activity because of the strong winds. with coordinates 6°54'23,6"S & 108°6'19,9"E

2.2 Research Methods

The research method used in sampling fish is a field observation method with a targeted sampling technique. Fish caught were descriptively identified to provide a complete description of each fish species at each station.

2.3 Data Analysis

The data analysis used the quantitative-descriptive method by providing an overview of the species and abundance of fish. In addition, the data from the analysis is displayed on a map

using the ArcMap GIS 10.3 software and Microsoft Excel. Catch composition analyses, water quality measurements and physical and chemical measurements such as temperature, light transparency, carbon dioxide (CO₂), acidity (pH) and dissolved oxygen (DO) were carried out in Jatigede reservoir. For fish identification and chemical measurements, ammonia (NH₃) was analyzed at the Laboratory of Water Resources Management, Faculty of Fisheries and Marine Sciences, Padjadjaran University.

3. RESULTS AND DISCUSSION

The composition of fish caught in the Jatigede Reservoir was 799 individuals, covering 18 species from 9 families. The following is the composition of caught fish during the research (Table 1).

Family	Local Name	Common Name	Scientific Name	Based On Origin		Based On Biodiversity			Station						
				Native	Introduced	Invasive	Protected	Prohibited	1	2	3	4	5	6	
Cyprinidae	Gengehek	Beardless barb	<i>Mystacoleucus marginatus</i> (Valenciennes, 1842)	√			√L C		1						
	Paray	Silver rasbora	<i>Rasbora argyrotænia</i> (Hubbs & Brittan, 1954)	√			√L C		1						
	Goldfish	Common carp	<i>Cyprinus carpio</i> (Linnaeus, 1758)		√	√V U			5		3	4	8		
	Hampal	Hampala barb	<i>Hampala macrolepidota</i> (Kuhl & Van Hasselt, 1823)	√			√L C		4 3	3 0	1 7	3 0	6 5		
	Lalawak	Barbodes / Java barb	<i>Barbodes baleroides</i> (Valenciennes, 1842)	√			√L C		2 7	1 7	1 2	6	2 1		
Cichlidae	Nila	Nile tilapia	<i>Oreochromis niloticus</i> (Linnaeus, 1758)		√	√L C			3	1	5	3			
	Mujair	Mozambique Tilapia	<i>Oreochromis mossambicus</i> (Peters, 1852)		√	√V U			5			4			
	Marinir	Jaguar guapote	<i>Parachromis managuensis</i> (Gunther, 1867)		√	√L C			1			3			
	Oscar	Midas cichlid	<i>Amphilophus citrinellus</i> (Gunther, 1864)		√	√L C			5		1	4	4		
Bagridae	Senngaringa	Bagrus singaringan	<i>Mystus Singaringan</i> (Bleeker, 1846)	√			√L C		1					1	

	n																
	Keting	<i>Twospot catfish</i>	<i>Mystus nigriceps</i> (Valenciennes, 1840)	√			√LC		5								
	Tagih	<i>Asian redtail catfish</i>	<i>Hemibagrus nemurus</i> (Valenciennes, 1840)	√			√LC		3				2	2			
Eleotridae	Boboso	<i>Marble goby</i>	<i>Oxyeleotris marmorata</i> (Bleeker, 1852)	√			√LC		13				1				12
Gobidae	Bungo	<i>Tank goby</i>	<i>Glossogobius giurus</i> (Hamilton, 1822)	√			√LC		136								1
Ambassidae	Pepetek	<i>Ponyfishes</i>	<i>Parambassis siamensis</i> (Fowler, 1937)	√			√LC		233				1				
Loricariidae	Sapu-Sapu	<i>Common pleco</i>	<i>Liposarcus pardalis</i> (Castelnau, 1855)		√		√LC		32	4	4	6	2				
Pangasiidae	Patin	<i>Silver catfish</i>	<i>Pangasius hypophthalmus</i> (Valenciennes, 1840)		√	√LC			1		3	3	3				
Hemirhamphidae	Julu ng-Julu ng	<i>Wrestling half beak</i>	<i>Dermogenys maxillus</i> (Kuhl & Van Hasselt, 1823)	√			√DD		1								
Presentase (%)				61%	39%	33%	61%	6%									

Table 1. Types of Fish Caught in Jatigede Reservoir

Source : IUCN Redlist and Fishbase.org
Description : LC= Least Concern, VU= Vulnerable, DD= Data Deficient

The results showed that the distribution of native fish in Jatigede Reservoir was more dominant than that of introduced fish in Jatigede Reservoir, identifying a ratio of 11 native fish species and 7 introduced fish species. 18 species of fish are caught at all stations, the fish included in Red List status were Boboso, Senggaringan, Genggehek, Paray, Pepetek, Sapu-Sapu, Nila, Hampal, Lalawak, Patin, Keting, Marinir, Oskar, Tagih and Bungo with the Least Concern (LC) category. Meanwhile, goldfish and mujair fish are included in the *Vulnerable* (VU) category and Julung-Julung fish are included in the *Data Deficient* (DD) category.

The LC category is a category for species that have been assessed but do not fall into any category. While the VU category is Vulnerable or Near Vulnerable, this category is given to species that are threatened with future extinction in the wild. And the DD category is a taxon that is declared "uninformed" when the available information is insufficient to estimate its risk of extinction based on the distribution and status of the population [7].

3.1 Fish Abundance

The abundance of fish at each station in the waters of the Jatigede Reservoir during the research can be seen in Figure 2.

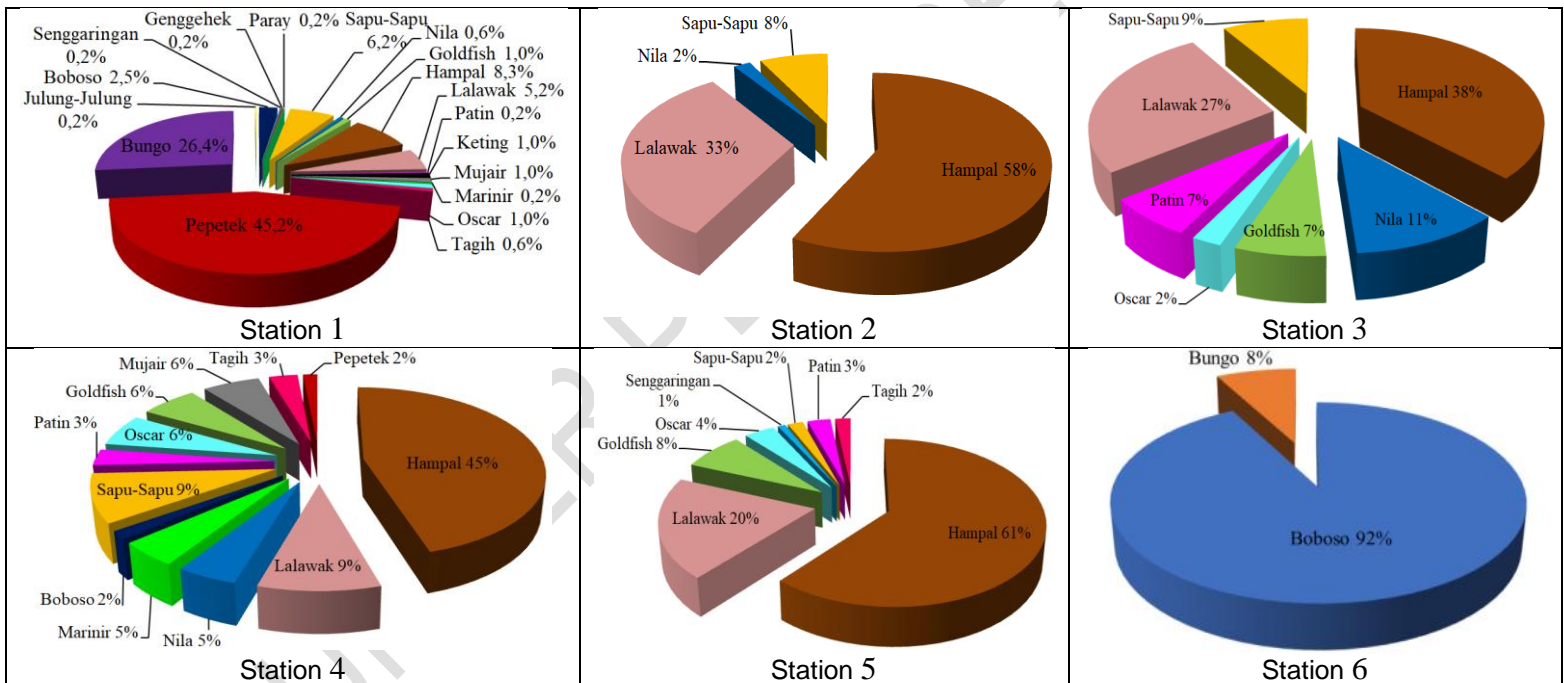


Figure 2. Graph of Fish Abundance Caught at Stations 1,2,3,4,5, and 6

The fish with the highest frequency at Station 1 was Pepetek fish, Stations 2, 3, 4 and 5 were Hampal fish, and at Station 6 Boboso fish. Fish species that have a high abundance value rely on their ability to adapt to the environment and use the potential of existing resources to meet their living needs. According to Gonawi (2009), Individuals who are in groups or *schools* and have large numbers can affect the high frequency, since they are usually found in very abundant amounts with each identification [8].

3.2 Mapping The Distribution of Fish Species

The mapping of the distribution of fish species in the Jatigede Reservoir based on fish abundance can be seen in (Figure 3).

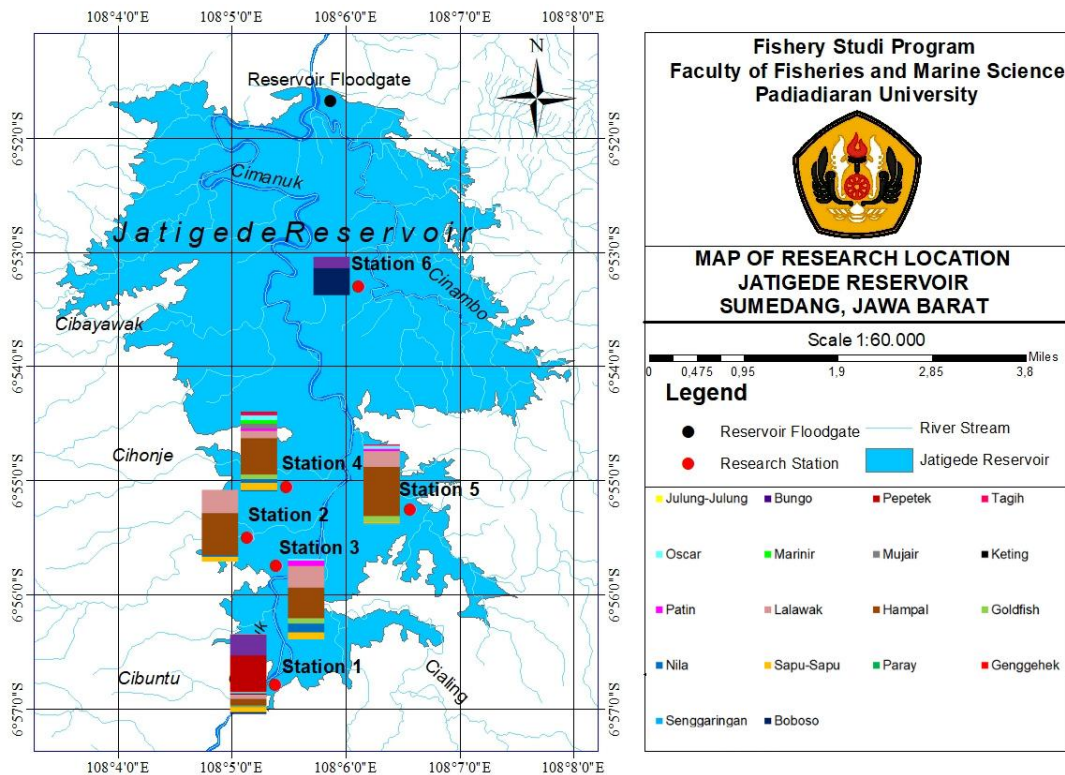


Figure 3. Map of Fish Species Distribution of Jatigede Reservoir

The distribution of fish species in Jatigede Reservoir can be distinguished based on origin, namely native fish (indigenous) and introduced fish, and differentiated based on protected fish species based on data from the IUCN (International Union for Conservation of Nature and Natural Resources) Redlist. The results showed that the distribution of native fish in the Jatigede Reservoir was more dominant than the introduced fish in the Jatigede Reservoir with a ratio of 11 native fish species and 7 introduced fish species.

At Station 1, the fish identified were Boboso, Senggaringan, Genggehek, Paray, Pepetek, Sapu-Sapu, Nila, Goldfish, Hampal, Lalawak, Patin, Keting, Mujair, Mariner, Oscar, Tagih, Pepetek, Bungo, and Julung-Julung. There are 11 native fish species and 7 introduced fish. At Station 2, the identified fish were Hampal, Lalawak, Nila and Sapu-Sapu. There are 2 native fish species and 2 introduced fish. At Station 3, the identified fish were Hampal, Nila, Goldfish, Oscar, Patin, Lalawak, and Sapu-Sapu. There are 2 native fish species and 5 introduced fish. At Station 4, the identified fish were Hampal, Lalawak, Nila, Mariner, Boboso, Sapu-Sapu, Patin, Oscar, Goldfish, Mujair, Tagih, and Pepetek. There are 5 native fish species and 7 introduced fish. At Station 5, the identified fish were Hampal, Lalawak, Goldfish, Oscar, Senggaringan, Sapu-Sapu, Patin, and Tagih. There are 4 native fish species and 4 introduced fish species. At Station 6, the identified fish were Boboso and Bungo. There are 2 native fish species.

3.3 Water Quality of Jatigede Reservoir

The results of observations of physical and chemical parameters can be seen in (Table 2).

Table 2. Water Quality Parameters

Parameters	Unit	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Class II*	Class III*
Physical									
Temperature	°C	28.0	28.3	28.4	28.2	28.4	28.6	Dev 3	Dev 3
Light transparency	cm	45	47	43	65	69	81	-	-
Chemical									
pH	-	6.0	6.6	7.1	6.8	6.1	6.3	6-9	6-9
CO ₂	mg/L	33.3	23.3	23.3	20.0	26.7	20.0	-	-
DO	mg/L	5.50	4.63	5.13	5.43	4.53	5,53	4	3
NH ₃	mg/L	0.0025	0.0023	0.0030	0.0025	0.0018	0.0028	0,2	0,5

The results of the temperature measurements in the Jatigede reservoir were between 28.0°C and 28.6°C. The temperature range showed that the Jatigede reservoir's water conditions were still good to support fish life. Aquatic organisms such as fish and shrimp can live well in the temperature range between 20°C and 30°C [9]. The range of temperature values is in accordance with Government Decree No. 22 of 2021, the temperature value in class II and III waters is a deviation of 3. Thus, the temperature value in Jatigede reservoir has met the water quality standards. The results of measuring the light transmittance in the Jatigede reservoir ranged from 43 cm to 81 cm. The level of transparency is affected by suspended matter in the form of fine particles and colloids that can cause turbidity and a lack of light entering the water. High turbidity can cause disturbances in the osmoregulation system such as respiration and disrupt the life of fish when foraging due to visual impairment and cause stress and even death of fish.

The results of the pH measurements in the Jatigede reservoir were between 6.0 and 7.1. The pH achieved in the water of the Jatigede reservoir is still good enough to support the life of aquatic organisms such as fish. According to the Government Decree No. 22 of 2021, the pH in class II and III waters is 6 to 9. Thus, the pH in Jatigede reservoir has met the quality standard for fisheries. The results of the CO₂ measurements in the Jatigede reservoir at each station ranged from 20.0 to 33.3 mg/L. In general, the carbon dioxide level in the water is between 10 and 30 mg/L, this range is very good for aquatic plants and not harmful for fish. However, if when it is more, it become very dangerous because it inhibits the binding of oxygen (O₂), and when the CO₂ level exceeds 40 mg/L, the fish die [10]. The range of CO₂ values in the water of the Jatigede reservoir is therefore still quite good for aquatic organisms such as fish.

The results of measuring the dissolved oxygen in the Jatigede reservoir at each station ranged from 4.53 to 5.53 mg/L. When the concentration of dissolved oxygen decreases, it affects aquatic organisms, especially organisms like fish. According to Government Decree No. 22 of 2021, the DO value in Class II waters is 4 mg/L and Class III is 3 mg/L. So the DO value in Jatigede reservoir at each station still meets the fish life quality standards. The results of the analysis showed that the ammonia level in the water of the Jatigede reservoir was between 0.0018 and 0.0030 mg/L. This value is determined by the water quality

standards according to the Government Decree no. 22 In 2021, the ammonia value in class II water is 0.2 mg/L and class III is 0.5 mg/L. Thus, the ammonia levels in the water of the Jatigede reservoir at each station still meet the quality standards for fish life. According to Makmur *et al.* (2012) Ammonia in the aquatic environment generally originates from the decomposition of organic matter and the results of fish metabolism [11]. The higher the organic matter in the water, the higher the concentration of ammonia in the water. High levels of ammonia can damage fish organ systems and damage fish gill tissues [12].

4. CONCLUSION

Fish species identified at 6 stations in Jatigede Reservoir consisted of 9 families, namely Cyprinidae, Cichlidae, Bagridae, Eleotridae, Ambassidae, Loricariidae, Pangasiidae, Gobiidae, and hemiramphidae which consisted of 18 species. The distribution of native fish in the Jatigede Reservoir is more dominant than the introduced fish in the Jatigede Reservoir with a ratio of 11 native fish species and 7 introduced fish species. The water quality at each station still meets the requirements of environmental quality standards based on Government Regulation No. 22 of 2021 concerning water quality standards and is suitable for fish life.

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