# REPRODUCTIVE PROFILE OF FISH AT SERAYU RIVER IN BANYUMAS DISTRICT

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## *ABSTRACT*

*The purpose of this study is to reveal and describe the growth pattern and profile of fish reproduction and water quality at Serayu River in Banyumas District. This research was conducted using survey method with purposive random sampling technique. The research was conducted in three research locations, each study location was determined by three research stations, and each research station was determined by three sampling points. Fish sampling using fishing nets and hand web, conducted 10 times sampling for each tool at each sampling point. Fish from sampling results were identified by key identification of fish according to Saanin (1968; 1984); Kottelat et al., (1993) and verified at Pusat Penelitian Biologi Lembaga Ilmu Pengetahuan Indonesia (LBN-LIPI) Cibinong and www. FishBase. org. Analysis of condition factor, fecundity, maturity level of gonad, gonad maturity index, and sex ratio based on Susanto (2015); Lagler et al. (1977), and Effendie (1979). Based on the results and discussion, it can be concluded: (1) The quality of waters including physical and chemical parameters of waters, namely: temperature, current velocity, water brightness, dissolved oxygen content and pH and variation of plankton species at Serayu River in Banyumas District are in good condition and suitable for fish life. (2) Reproductive profile of fish at Serayu River in Banyumas District is not ideal.*

***Keywords**: identification, fishing nets, hand web, growth pattern, reproduction profile, Serayu River*

## 1. INTRODUCTION

Whether its been realized or not, every resource usage activity can cause disruption that leading to ecosystem changes on a certain scale. Resource usage that does not look upon the principles of ecosystems can degrade the quality of the environment that will lead to the damage to the ecosystem order and decrease the carrying capacity of the environment. The Watershed on the Serayu River is one of the 35 watersheds in Central Java that fall within the critical category (Susanto, 2015, Yuwono, 2014). According to a survey conducted in 2006, nine percent of Heads of Regions (Governors and Regents) did not care about the environment, 37 percent cared enough, 47 percent cared and only 7 percent cared deeply. Based on these data, the Head of the Region needs to get a counseling about the meaning of sustainable development because not infrequently they pawn natural resources as a political commodity regardless of the preservation of biological resources and

environment (Susanto, 2015; Effendi, 2014).

Susanto (2015); Abdurahim *et al.* (2004) describes *Rasbora aprotaenia* (Paray fish) originally found in the Ciliwung River in 1954, however in the collection of Natural History Museum London, there are species of *R. aprotaenia* collected from Situ Bagendit in 1974. *Rasbora aprotaenia* was also found at Cibareno River, in Taman Nasional Gunung Halimun. Paray fish is an endemic fish of West Java that needs to be protected because its habitat is threatened to be damaged by the presence of foreign fish such as Sapu-Sapu fish (*Liposarcus pardalis*), (especially in Cidanau and Cikalumpang Rivers, Cagar Alam Rawa Danau).

The people of Banyumas District, especially those living on the riverbanks along the Serayu River, utilize the river resources, both biological and non-biological resources, in order to meet the needs of life and increase welfare. To use biological resources they do fishing, and for non-biological resources usage they do sand and stone mining (Class C mining). In fishing and sand and stone mining activities, people do not fully understand about fish species and their properties. They also do not understand if those activities they do will affect fish availability, growth, and species preservation.

The management of fishery resources in Serayu River is an integral part of water management which is suitable with its main objective, to optimize water utilization while maintaining environmental sustainability. The final goal is the achievement of society's welfare. Therefore, to maintain the potential of fishery resources in the waters, we need an integrated handling of the fisheries sector and conservation.

## QUESTIONS AND PURPOSE

As described problems before, then arised questions for this research are: (1) How are the condition of aquatic quality condition including aquatic physical and chemical parameters, which are: temperature, flowrate, brightness, dissolved oxygen, and pH then also plankton species variation at Serayu River in Banyumas District? (2) How are profile reproduction of fish at Serayu River in Banyumas District?

The purpose of this research are to reveal and describe fish condition and aquatic quality in Serayu River Banyumas District,which are: (1) Aquatic quality including physical and chemical parameters, which are: temperature, flowrate, brightness, dissolved oxygen and

pH then plankton species variation at Serayu River in Banyumas District. (2) Profile reproduction of fish at Serayu River in Banyumas District.

## 2. METHOD

The study was conducted in Serayu River Banyumas District at the place where the three major rivers are ended, namely Klawing River, Logawa River and Tajum River (Susanto, 2015). Fish sampling and physics parameter data include: temperature, flowrate and water brightness as well as water chemistry parameters including dissolved oxygen and pH, and biological parameters, such as variation of plankton species, conducted for two years: first year of research (October 2009 - July 2010 ) and the second year of research (October 2010 - July 2011) with a three months time interval. Data sampling is done in the morning until noon (at 08.00 – 13.00) and at night (19.00 – 24.00).

The research was conducted using survey method with purposive random sampling technique (Susanto, 2015; Mantra & Kasto, 1989). Implementation of the research, the sampling of fish and the measurement of water quality in physical and chemical parameters of the waters and variation of plankton species is done in each research location. Each location of the study was determined by three stations: (1) a station before the river was located ± 300 m from the estuary, (2) a the station after the river was located ± 300 m from the estuary and (3) a station in the area ± 300 m before the estuary on the creeks that ended to the Serayu River. Each research station was determined by three sampling points: (1) the sampling point of the right riverbank, (2) the middle sampling point of the river, and (3) the sampling point of the left riverbank. Fish sampling using fishing nets and hand web, conducted 10 times sampling for the net and 10 times sampling for hand web at each sampling point. The fish from all sampling results were identified by key identification of fish according to Saanin (1968; 1984); Kottelat *et al.*, (1993) and verified at Pusat Penelitian Biologi Lembaga Ilmu Pengetahuan Indonesia (LBN-LIPI) Cibinong and www. FishBase. org.

Analysis of condition factor, fecundity, maturity level of gonad (TKG) , gonad maturity index (IKG) and sex ratio of three most caught fish species during the study and seven fish species with important economic value conducted to reveal the condition of fish species population that live in Serayu River Banyumas District based on Susanto (2015); Lagler *et al.* (1977), and Effendie (1979).

## 3. RESULT AND DISCUSSION

The aquatic quality in Serayu River Banyumas Region can be seen from the analysis of the parameters of aquatic physics in Serayu River Banyumas District which includes: temperature, flowrate and water brightness as well as water chemistry parameters including dissolved oxygen and pH. The results of temperature analysis in the first year of research (October 2009 - July 2010) were found to be 27.72 - 29.63 ° C with an average of 28.28 ± 0.342 ° C and the second year of research (October 2010 - July 2011) 27.63 - 29.86 with an average of 28.51 ± 0.724. Flowrate in the first year of the study was obtained in the range of: 0.26 - 0.87 m / s and an average of 0.52 ± 0.207 m / s and the second year the study ranged from: 0.27 - 0.98 m / s with an average of 0.54 ± 0.195 m / s. Brightness of water in the first year of the study obtained results with a range of: 33.75 - 70.00 cm and an average of 42.49 ± 11.888 cm and the second year of research ranged between 24.05 - 61.75 cm and average 33.71 ± 11,676 cm.

The result of dissolved oxygen analysis in the first year of the study was obtained with the results of the range of 5.92 - 8.45 ppm and the average of 6.88 ± 0.782 ppm and the second year of research ranged from 4.20 to 8.23 ppm and an average of 6 , 04 ± 1.241 ppm. The degree of acidity (pH) in the first year of the study obtained results with a range of 6.72 to 7.22 and an average of 6.97 ± 0.183 and the second year of research ranged from 6.72 to 7.22 with an average of 6.97 ± 0.183.

The results of the analysis on the parameters of aquatic physics in Serayu River Banyumas District based on the time of sampling during the study that includes: temperature, obtained the results at noon with the range: 27.61 - 28.99 ° C with an average of 28.25 ± 0, 51 ° C and range: 27.39 - 28.96 with an average of 28.33 ± 0.49 at night. Flowrate during daytime results in a range of: 0.29 - 0.82 m / s and an average of 0.54 ± 0.17 m / s at night ranges from: 0.21 - 0.97 m / s with an average of 0.53 ± 0.23 m / s. The daytime brightness of the water is obtained with the range: 17.890 - 84.33 cm and the average 38.10 ± 1.18 cm.

The results of the analysis on aquatic chemistry parameters in Serayu River Banyumas District based on sampling time during the study which include: dissolved oxygen, obtained by daytime results with the range: 4.82 - 7.80 ppm and 6.29 ± 1,01 ppm and at night ranges from 4.34 to 8.24 ppm and an average of 6.44 ± 1.33 ppm. The degree of acidity (pH) during the day

results in a range of 6.56 - 7.28 and an average of 6.94 ± 0.21 and at night ranges from 6.56 to 7.17 with an average of 6.96 ± 0.18.

Plankton obtained during the study are being identified for the species variations based on identification of plankton according to Sachlan (1982); Anonymous (1989) and Anonymous (1996). The results of identification indicate that the variation of Serayu River plankton in Banyumas District is quite large. During the study, 109 species of plankton belong to 47 families and 23 orders are identified from the samples. The number consists of Phytoplankton of 97 species belong to 36 Famili and 18 Order, and Zooplankton consists of 12 species belong to 11 families and five Orders.

Based on PP No. 82 Tahun 2001 and Susanto (2015)'s opinion; Goldman & Horne (1994); Krebs (1989; 2009); Wardoyo (1981); Odum (1971); Welch (2001); Sumawidjaja (1975); Lee *et al.* (1978); Taylor & Sukarsono (1995) and Barus (2002) indicate that the aquatic condition of Serayu River in Banyumas District are in good condition and suitable for fish life.

This research succeeded in getting fish with individual count of 3,871 fish, including 29 species, 20 families and 11 orders. The most caught fish numbers in the first and second years of the study were members of the Cyprinidae Family: 794 (55.23%) fish and 941 fish (38.65%). The least caught fish numbers in the first year of study was the Family of Anguilloidae, two fish (0.13%), while the least caught fish numbers in the second year of the study were members of Family Clariidae and Family Synbhrachidae, one fish from each family (0, 03% and 0.06%).

Mean comparison: fecundity, gonad maturity level (TKG) and gonad maturity index (IKG) for the three most caught fish species *: R. lateristriata* (fecundity: 649.84, TKG: IV and IKG: 15.99%) *G. giuris* (fecundity 551.50 , TKG: III and IKG: 7.69%) and *D. Pusilla* (fecundity: 30,42, TKG: IV and IKG: 7.96%). Six of the seven species of fish that have important economic value : *O. vittatus, B. gonionatus. B. balleroides, L. leptocheilus, H. macrolepidota, O. goramy* and *M. sangaringan*, analysis of mean fecundity (count of eggs ranged: 168,33 - 2,733,01), TKG (five species are at maturity level IV and *M. sangarignan* is at maturity level III) and IKG (range: 0.34 - 10.90%).

The comparison between fecundity, TKG and IKG of the three most caught fish species and six of the seven species of fish with significant economic value indicate less than ideal results. This is indicated by the number of eggs is not

optimal but the TKG is at maturity level III and IV, as well as IKG, all of them are in the range of less than 50%. The ideal condition is the number of eggs is adequate or optimal, TKG is at maturity level III and IV and IKG 50% or more (Susanto, 2015; Effendie, 2002).

The analysis of the mean gender ratio on the three most caught fish species and seven important economically important fish species all showed good results, less than 50% (meaning more females than males). The circumstances of this sex ratio if supported by good aquatic conditions, this can ensure the existence of these species in their habitat (Susanto, 2015; Purwanto & Bustaman, 1986; Jannah, 2001; Sulistiono *et al.*, 2001).

This condition is caused by the fishing activities in Serayu River done by the fishermen has been categorized as excessive. Their fishing activities are only economically motivated and ignores the conservation factor. Most fishermen that encountered by are not domiciled in the Serayu River area, but are from one region, namely Patikraja District of Banyumas. They claim that fishing in Serayu River is solely a job to earn an income.

This is triggered by the needs of fish consumption from the River Serayu that continues to increase. The current fish needs for the type of *Lembutan* (small fish species) such as *R. lateristriata* (Lunjar andong) and *N. fasciatus* (Uceng) as much as 58 kg per day, while various fish species known as *Putihan* fish, such as: *O. vitatus* (Melem), *B. goniopnotus* (Tawes), *B. balleroides* (Brek), *L. leptocheilus* (Lukes), *H. macrolepidota* (Palung) and *M. singongan* (Baceman) required as much as 80 kg per day. Another factor that causes this condition is the price of fish in the market is also quite high, ranging from Rp 70.000,00 - Rp 125.000,00 per kg. This is the reason for fishermen to catch fish in the River Serayu with economic motives.

Susanto (2015); Krismono (2006) explains that more than 20 species of fish living on the Citarum River have been extinct within the last 24 years. In 1982 there were found 26 non-cultured fish species but currently only six types survive. Fish species that survive are: *Macrones nemurus* (Baung), *Hampala macrolepidata* (Hampal), *Macrones negriceps* (Kabogerang), *Notopterus citala* (Balidra), *Cyprinus carpio* (Mas) and *Puntius javanicus* (Tawes). The fish species that are no longer found include: *Labeo chrysophekadion* (Arengan), *Mystacoleuceus marginatus* (Gunggekek), *Puntius binotatus* (Beunter), *Anabas testudineus* (Betok), *Ophicephalus striatus* (Cork), *Dermogenys pusillus* (Julung-

julung), *Labeobarbus duronensis* (Kancra), *Clarias batracus* (Catfish), *Chryptoterus lempok* (Lempuk) and *Puntius bromoides* (Lachawak). The decreasing number of native fish species in Citarum River is in addition caused by changes in habitat due to river damming, also caused by overfishing and water pollution.

Fishing gear used by fishermen in catching fish, including: gill net with the mesh size of three cm ², spread mesh with mesh size of one mm² and *bubu* or *wuwu*. Fishermen do not select fish that they are going to catch, either based on species or fish size, so all the fish they get are taken for sale. This situation indicates that fishing in Serayu River conducted by fishermen does not consider conservation factor. This has been the cause of fish species that live on the Serayu River Areas of Banyumas Regency are very few able to reach adult phase, so the fish are mostly young fish.

Whether its been realized or not, every resource usage activity can lead to disruption leading to ecosystem changes on a certain scale. Resource usage that does not look upon the principles of ecosystems can degrade the quality of the environment that will lead to the damage to the ecosystem order and decrease the carrying capacity of the environment. Proportional river management, such as resource usege with consideration of sustainability must be done to protect fish biodiversity and increase production (Susanto, 2015; Bain *et al.*, 1988; Das & Chakrabarty 2007; Propst *et al.*, 2008).

Overfishing has become one of the causes of the decline of fish catches in the Enim River of Muara Enim Regency of South Sumatra Province, both in individual counts and in speical variations (Susanto, 2015, Hamidah, 2004). The decline in fish quantity and size is an indication of the decline in the quality and quantity of fish populations (Susanto, 2015; Kottelat *et al.*, 1993). Susanto (2015); Amir *et al.* (2009) stated that excessive fishing activities have a negative impact on biological resources and the environment, but until now there is still very limited research that reveals this problem.

The existence of fish at Serayu River in Banyumas District needs to get attention and protection in order to maintain its sustainability. The ability to understand that the river is a fish habitat is very important, so that in exploiting the river should still be sought to maintain its sustainability and not adversely affect the river biological resources, especially fish (Susanto, 2015; Pander & Geist, 2010).

Excessive fishing occurring in the Serayu River in Banyumas District can lead to reduced abundance and diversity of fish species that degrade the quality of fish communities. Fishing conducted without selection, both in terms of size and time of capture resulted in young fish can not grow up and reach adult phase. The excessive and continuous catching of fish in the Serayu River does not allow fish species to grow at maximum, reach adult phase and perform reproduction well. The analysis of the age structure based on the total length and weight of the three most caught fish species and the seven species of fish with significant economic value shows that most fish are in the lowest age range.

This condition is happened because there has been excessive fishing caused by the needs of fish consumption at Serayu River in Banyumas District that continues to increase. These fish are various species of small fish called *Lembutan* fish, for example: *R. lateristiata* (Lunjar andong) and *N. fasciatus* (Uceng) needs as much as 58 kg per day, while *Putihan* fish, namely species of *O. vitatus* (Melem), *B. gonionotus* (Tawes), *B. balleroides* (Brek), *L. leptocheilus* (Lukas), *H. mecrolepidota* (Palung), and *M. singaringan* (Baceman) needs to reach 80 kg per day. Nyanti *et al.* (2012) states the same thing in his research report on fish and crustacean communities and height-weight corelation in the Lutong River, Miri, Sarawak, Malaysia.

Susanto (2015); Odum (1971) states that populations that have too many young individuals while the number of adult individuals shows very little quantity means that the population is in poor condition. A good or ideal age structure is found in the presence of young (unproductive), adult (productive) and old (non-productive) individuals in a balanced number meaning the youngest population in the most dominant, then the adult population and the last is the elderly population. The decline in fish quantity and size is an indication of the decline in the quality and quantity of fish populations (Susanto, 2015; Kottelat *et al*., 1993).

Improving the quality of the fish community should be done by the parties who have the responsibility and authority over the management of Serayu River together with the community. Authority in managing Serayu River must give serious attention and protection to the fish community in it. Keeping the river ecosystem in balance can be done through a variety of ways, by enhancing the understanding of science concepts, improving management and protection and also conservation (Allan & Castillo, 2007).

Exploitation or fishing at Serayu River in Banyumas District should not be done in excessive way constantly, but must consider fish conservation factor. If this is done, the various fish species at Serayu River in Banyumas District will have the opportunity to grow optimally, reach adult phase and be able to perform reproduction well. This causes various fish species at Serayu River in Banyumas District to produce offspring that meet quality and quantity standards. This situation can improve the quality of fish communities at Serayu River in Banyumas District, so that ecosystems become stable and maintain the preservation of fishery biodiversity resources in it. This situation will ensure the fulfillment of nutrition and additional income for people living on the riverbanks area of Serayu River in a sustainable future (Susanto, 2015).

Local wisdom thinking as indicated by the residents who live around the research location, should be imitated by the wider community, especially the fishermen fishing in Sungai Serayu. They take the fish in the river just as needed, do not use mass fishing gear and do not throughout the year but only at certain times, such as *Mangsa Kapapat* (late dry season early rainy season). Fish are given the opportunity to grow, and spawn or reproduce. The local wisdom should be disseminated to the public, especially the fishermen in Sungai Serayu to understand the importance of maintaining the existence of biological resources of river waters, especially the preservation of fish, in order to be able to benefit continuously for future generations (Susanto, 2015).

## 4. CONCLUSSION

Based on the results and discussion, it can be concluded:

1. Aquatic quality that includes physical and chemical parameters, such as: temperature, flowrate, water brightness, dissolved oxygen and pH and also variation of plankton species at Serayu River in Banyumas District in good condition and suitable for fish life.
3. Reproduction profile of fish at Serayu River in Banyumas District is not ideal.

## SUGESTION

Several things that can be suggested related to research on fish communities at Serayu River in Banyumas District as a continuation of this research activity are:

1. The excessive and continuous exploitation or fishing in Sungai Serayu Banyumas causes the abundance and diversity of fish species to decrease, and also decrease

the quality of the fish community. Therefore, fishing at Serayu River in Banyumas District should consider conservation factors, such as selectivity on the size of fish, type of fishing gear and fishing time.

2. Integrated cooperation between the parties involved in the management of Serayu River, such as the Regional Government, Water Management Service, Universities and communities in the utilization and management of water resources and fishery resources in the Serayu River in a sustainable way.
3. Local Government whose territory is traversed by Serayu River need to issue some Regional Regulations concerning the fishing activities, such as:
   a. The size of fish that can be caught : the length range and weight of adult fish according to the species.
   b. Time of fishing : prohibition of fishing in the season of spawning season that occurs in *Mangsa Kapapat* (late dry season early rainy season).
   c. Fishing tools that can be used, fishing gear that is selective, for example, nets with a mesh size of at least three centimeters and nets with a mesh size of at least one centimeter and prohibit the use of mass fishing tools, such as using poison, explosives and stun.
4. Local Government and Central Government are expected to establish a conservation to preserve the diversity of fish species. The conservation is in a location of Serayu River which is often used by fish to spawn and maintain the juvenil, for example upstream location of Serayu River Banyumas in Sub District of Somagede.

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