ABIOTIC FACTORS AS INDICATORS OF THE ABUNDANCE OF PENJAH FISH OF THE *GOBIIDAE* FAMILY IN THE MAPILLI RIVER ESTUARY, POLEWALI MANDAR DISTRICT, WEST SULAWESI

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ABSTRACT

The aim of this study was to determine the effect of abiotic factors on the abundance of tilapia in the family of Gobiidae in the river of the Mapilli estuary. Sampling was carried out in two locations at three points each repeated three times. Samples were taken using a fish net by attaching to the edge of the river mouth and waiting for five minutes. Data collection for each station includes brightness, temperature, pH, salinity, current speed, conductivity, and the number of fish caught. The results showed that the abiotic factor had a significant influence on the abundance of penjah fish because at the time of abundance the migration season of fish heading to the estuary and in the Mapilli river had water conditions which were still suitable as a place to find food for Penjah fish when migrating. Abiotic factors that affect the abundance of anchovy fish in January, namely salinity, in March are influenced by current velocity, in April and May are influenced by temperature, current speed and brightness with the most abundant number of fish. Spread fish is the dominant species found in all locations and stations. The number of Penjah fish found during the research conducted over five months showed that the average appearance of anchovy fish fluctuated. The lowest abundance in February was 0, while the highest abundance occurred in April of 453 Tails.

Keywords: *Abiotic Factors, Abundance, Penjah Fish, Polewali Mandar*

1. INTRODUCTION

Sulawesi is an island rich in marine resources. Most of the people of Sulawesi work as fishermen. Each region has the characteristics of each fish. In West Sulawesi there are fish that are popular with the community and have a certain season, they are known as penjah fish. Penja fish are considered to be Indigenous Species of the Polewali Mandar watershed, West Sulawesi (Muthiadin, 2017).

Fish resources in the sea and in rivers are affected by resources at the larval and juvenile stages. In the early stages of the fish life cycle, there are many cases of mortality due to several things, namely sensitivity to predators, food availability, and environmental changes. The disruption of the initial stages of fish life will have a negative impact on fish populations in water. If at the larval stage there has been excessive fishing activity, in the future it will have an impact on the fish stocks that have matured to a smaller age (Olii, 2003).

Understanding the physical and chemical factors of the sea and their effects on the development of marine biota is an important factor in the framework of managing marine aquatic resources. Factors of physics and marine chemistry that have many uses in the process of survival of fish, such as abundance and distribution. The condition of the waters greatly determines the abundance and spread of organisms in it, but in each organism has different needs and environmental preferences for life-related to the characteristics of its environment. There are three main reasons for fish choosing a place of life, namely 1) according to the condition of the body, 2) abundant food sources, 3) suitable for spawning and breeding (Anwar, 2008). In general, there are no permanent fishing areas but will change according to the conditions of fishing activities. The Mapilli river estuary was chosen as the research location because this bay is considered to be very potential as an intensive spawning and fishing area. In addition, these waters have distinctive water characteristics with an abundance of fish

called the Penjah fish by the Mandar community.

This type of fish can only be found once a month, namely at the turn of the new moon in the Hijri calendar. Information about larvae and juvenile of anchovy in the waters of Polewali Mandar has not been widely known and has not been widely studied so that data on the exploitation of these fish are not yet known. Therefore it is considered important to know the effect of abiotic factors on the abundance of anchovy fish, this study was conducted.

2. MATERIAL AND METHOD

Sampling location

Location: Sampah fish sampling is carried out on the Mapilli river estuary, in Desa Buku, Kec. Campalagian, Polewali Mandar Regency, West Sulawesi Province. The study was conducted on 12 January - 17 May 2018. A sampling of nekton and neuston was carried out in two locations based on the location of the discovery of penjah fish every month during the study. A sampling of anchovy fish and measurement of abiotic factors were carried out at 3 points for each location and replicate 3 times at each point.

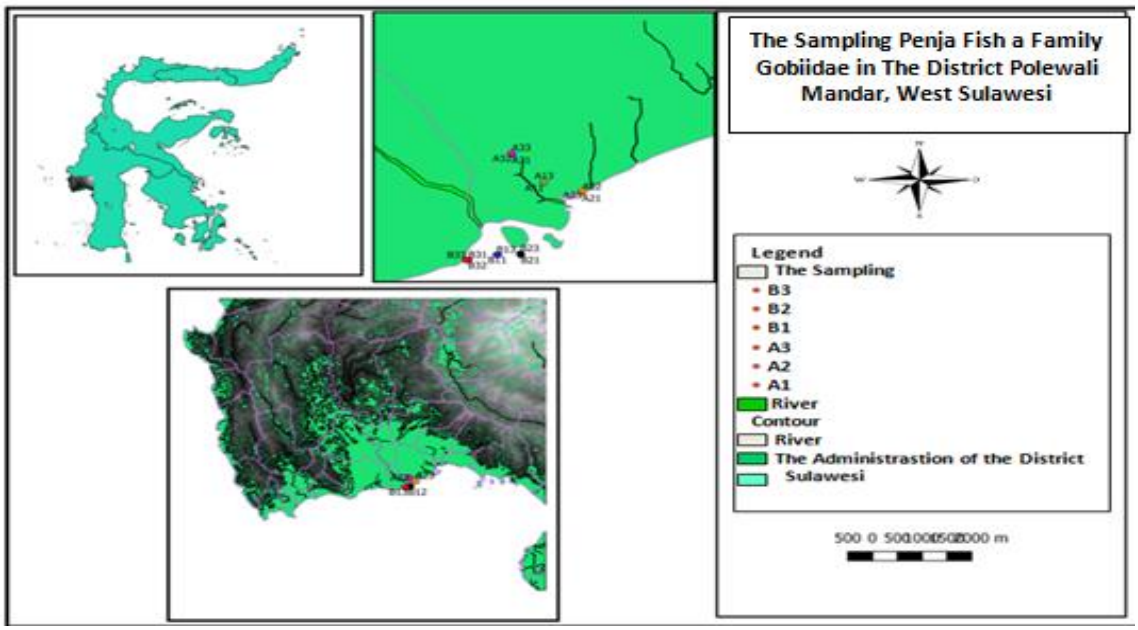

Figure 1. Location of Sampling of Gobiidae Family Catching Fish on Mapilli River, Kec. Tinambung, Kab. Polewali Mandar, West Sulawesi.

2.1. Sampling of Penjah Fish

The sampling method of anchovy fish is done by using a fishing net mounted on the edge of a flowing estuary which is waited for 5 minutes. Catching fish that have been obtained, counted, and documented. Identification was carried out based on morphological characters and compared with literature in the Ecology and Animal Diversity laboratory, Faculty of Mathematics and Natural Sciences, Brawijaya University, Malang.

2.2. Analysis of the Relationship of Abiotic Factors to the Booming of Penjah Fish

The analysis is carried out by taking water samples at each location, point, and test. The parameters used include current speed, brightness, temperature, pH, salinity, conductivity and depth that affect the life of fish in the estuary.

2.3. Statistic analysis

Sampling fish samples that have been captured and their abiotic factor parameters are

then analyzed by SPSS and presented in the table. The PCA (Principal Component Analysis) results will provide information about the relationship between nekton and neuston with physicochemical parameters) (Krebs, 1989).

3. RESULT AND DISCUSSION

The Influence of Aquatic Conditions Against the Abundance of Penja. There are several abiotic factor parameters that are used to determine the abundance of fish at sampling locations including depth, current velocity, brightness, temperature, pH, salinity, and conductivity.

Based on the results of this study, it is known that brightness has an unrealistic influence on the abundance of penjah fish on the Mapilli river. This is related to the fluctuating brightness level of the amount of abundance of the fish. The brightness of water determines the intensity of sunlight which is able to penetrate water and the depth that influences the optimal photosynthesis process. The brightness that can support if the Seiichi disk reaches 20-40 cm from the surface. Brightness is a measure where light in water is caused by the presence of alkaloid particles and suspension of a pollutant (Rinaldi, 2017).

Then the water pH based on the results of research in the field is known for each location and month, that is, in January at points J1, J2, J3 ranges from 7.3 to 8.3, in March at points M1, M2, M3 ranges from Ph 7-9, in April at points A1, A2, A3 ranging from 7-8, and in May at points ME1, ME2, ME3 ranging from 7-9. The pH indicator for high water in the research location can be caused by community activities using calcification in the pond area. The existence of the calcification process results in an increase in pH in pond water, where the location of the pond has a pond drainage water that has undergone a calcification process will enter the estuary ecosystem. This is one of the factors that can cause a higher Ph value (base). Aquatic biota is sensitive to changes in Ph and likes the pH range of 7 to 8.5. Based on the results of the study it can be seen that the average pH at all points is in the ph range favored by marine biota including anchovy fish (KEPMEN, 2004).

Temperature has a role in controlling aquatic ecosystems. In addition, temperature also acts as a limiting factor for organisms and distribution of aquatic organisms. Increased temperature can cause decomposition of organic matter by microbes. The optimum temperature to support the growth of aquatic organisms which ranges from 20-30 of (Nyabakken, 1988). Based on the results of observations of temperature parameters along the Mapilli river estuary the overall locations and points ranged from 17-29˚C. The temperature difference of the three stations is probably caused by differences in the state of the surrounding vegetation such as the brightness and intensity of the light entering the water which affects the water temperature. Temperature is closely related to the intensity of light entering the water and affects the density, viscosity, and density of water and the solubility of gas and water elements. Both, directly and indirectly, the temperature will affect the ecology and distribution of living organisms around it, including nekton. If the water temperature increases, the amount of dissolved oxygen in the water decreases, the animal's life will die (Apridayanti, 2008;Wardiah, 2012).

Temperature fluctuations during the study at river estuaries ranged from 19-27 ºC. The fluctuation graph can be seen in figure 4.3. The results of this study are in accordance with research (Effendi, 2000), where the temperature range obtained is still in accordance with the range of growth and development of phytoplankton and zooplankton as food indicators for fish larvae. In addition, the temperature can also limit the spread of juvenile fish and adult fish because each has a difference in temperature tolerance (Wulandari, 2004). The temperature difference that occurs in the study location can be caused by differences in measurement time at the location of the river mouth. Measurement of rivers at the mouth of the sampling location every month is carried out at different times depending on the time of abundance of fish catcher. Temperature measurements carried out in the morning are lower than the temperature measured at higher afternoons. This difference is caused mainly due to the influence of solar radiation on increasing the surface temperature of the bay waters (Sanusi, 1993). The temperature factor in the location ranged from 17.6ºC - 26.6ºC. The highest temperature is found in point 2 in March (M2) and May (ME2) 26.6 ºC while the lowest

temperature is at point A3, 17 ºC. The high and low temperatures at each location depending on the water discharge and light intensity that covers the water surface in that location. The temperature range is still in the general category of the temperature content in a marine organism between 28.6 - 32.6 ºC. Based on this, the temperature range found in Polewali Mandar waters is still within normal limits and can be tolerated by marine biota and river estuaries.

Salinity is the amount of dissolved salt contained in 1 kg of seawater. Seawater is a mixture of 97% water and 3% dissolved material. The unit for salinity is Ppt (Part per mile), the salinity of seawater in all waters in the world ranges from 33-37% with a median value of 34.7%. Water salinity in the estuary area is smaller due to the mixture of seawater and fresh water. The range of salinity obtained in this study is in the range of 30-0%. Referring to seawater standards decided by the Minister of Environment No. 51 of 2004 which is in the range of 34%, it is known that the level of salinity at the location of this observation is good for the life of marine life, including fish larvae. Salinity in free sea water has a higher salinity than the coastal waters (King, 1963).

Based on the research, it can be seen that salinity has no significant effect on the abundance of fish colonizers. The range of salinity changes depending on the entry of fresh water into the sea through the river, through the soil and through evaporation on the surface of the water. This is in accordance with the conditions of the waters at the time of sampling. In January to March, the overflow of river water towards the sea was not so large, unlike the case in April and May which when the sampling was the rainy season which caused the water discharge from the river to the sea was very large. This is in accordance with a statement (Nontji, 2005), stating that the distribution of marine salinity is influenced by various factors such as the pattern of water circulation, evaporation, rainfall. River flow enters the sea and (Wulandari, 2004), states that salinity is influenced by season, pressure and wind. River estuaries experience fluctuations in salinity caused by tides. At high tide, salinity in the estuary area increases due to water in the river estuary mixed with seawater, while at low tide, the salinity of the river mouth is low due to water in the river estuary dominated by freshwater (Suryanti, 2008). The relative abundance of larvae in the estuary of the tropics is strongly influenced by salinity and the entry of fresh water (Kusdaryanti, 2018).

Flow Speed is related to its role as limiting the presence of types of living organisms in the waters. Based on the results of research on the velocity of currents in each location in January ranged from 10-14 m / s with the average number of anchovy caught 253 animals, in March the current velocity ranged from 12-16 m / s with the average number of fish 430 tail, in April the flow speed was 12-16 m / s with an average number of fish of 453 mats, in May the flow rate ranged from 9-13 m/s with an average number of fish of 351 tails. Based on these results, it shows that there is a higher fluctuation in the flow rate, the higher the catcher catches fish. The current velocity fluctuations have a relationship with gravitational factors. The current density in April is very high due to the high flow of water flowing from upstream due to high rainfall. Flow velocity influences the type and number of organisms living in it and this factor becomes one of the causes of the low level of diversity in station III, namely with high current speeds and low levels of diversity (Lihan, 2008).

Based on the above results, it shows that all the abiotic factor parameters do not significantly affect the abundance of tilapia, and in the range of the results of the abiotic factor, it is in accordance with the environment favored by the penjah fish.

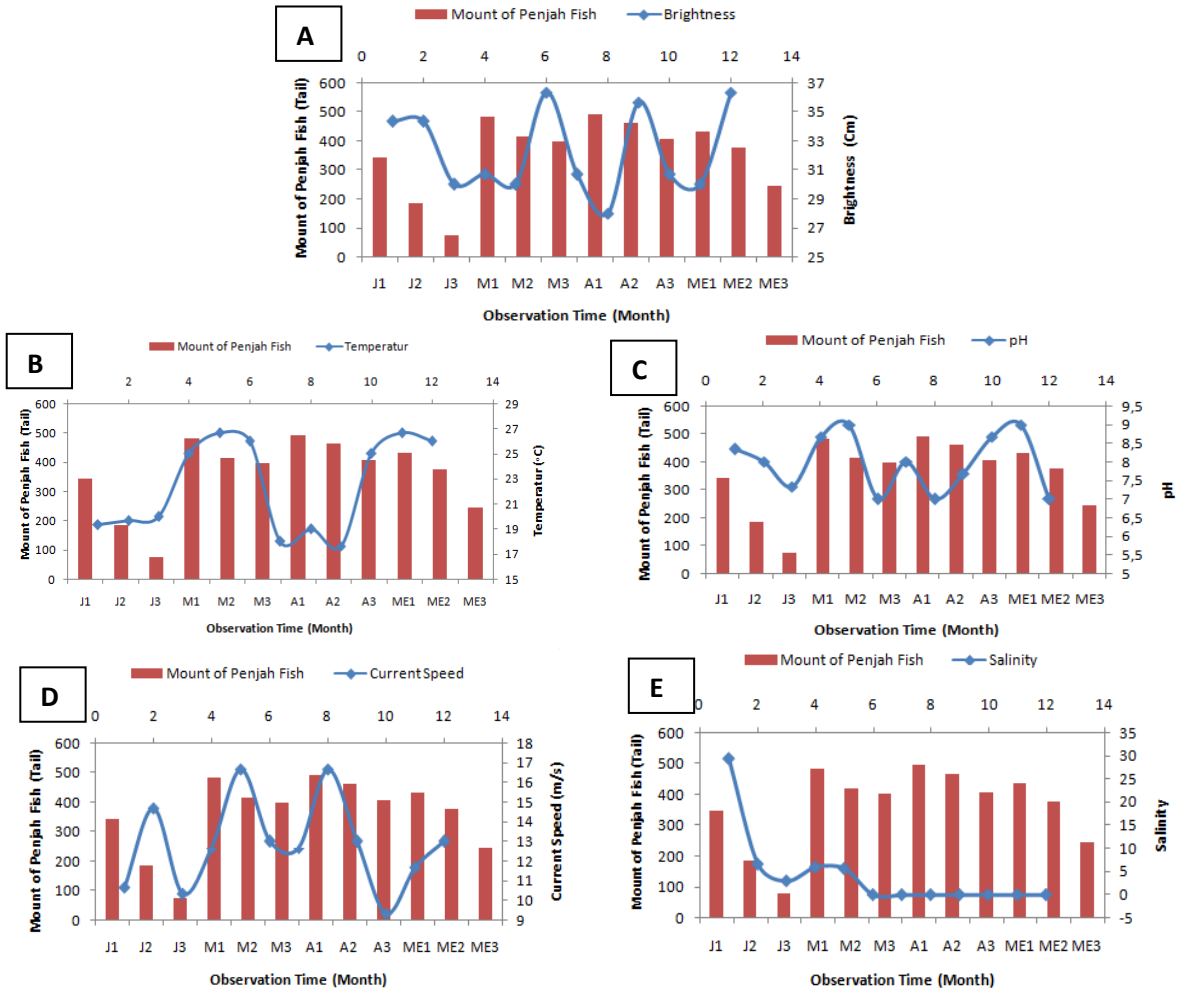

Figure 2. Graph of Influence of Abiotic Factors (**A** = Brightness, **B** = Temperature, **C** = pH, **D** = Current Speed, **E** = Salinity) Against Abundance of Fish Breeding in the Gobiidae Family on the Mapilli River, Polewali Mandar Regency.

The main component analysis (PCA / Principal Component Analysis) of Past 3 software was used to determine the similarity of each habitat. Habitats that have high similarities will form in the same cluster. The aspects used in making clusters are abiotic factors such as brightness, temperature, pH, salinity, current velocity, and a number of fish. In addition, data based on retrieval time is used as a comparison between habitats so that the influence of abiotic factors is known every month on the number of abundant fish.

Based on PCA analysis that has been done, it was found that abiotic factors that affect the abundance of anchovy fish in January, namely salinity and negatively correlated with the temperature with a relatively small number of fish, in March abiotic factors that affect the abundance of anchovy fish namely flow velocity and brightness with the number of fish which is quite abundant but negatively correlated with pH, in April abundance of anchovy is influenced by abiotic factors, namely temperature, current velocity and brightness with the most abundant fish. Whereas in May the abiotic factors affected were temperature, current speed, and brightness and the most abundant number of fish.

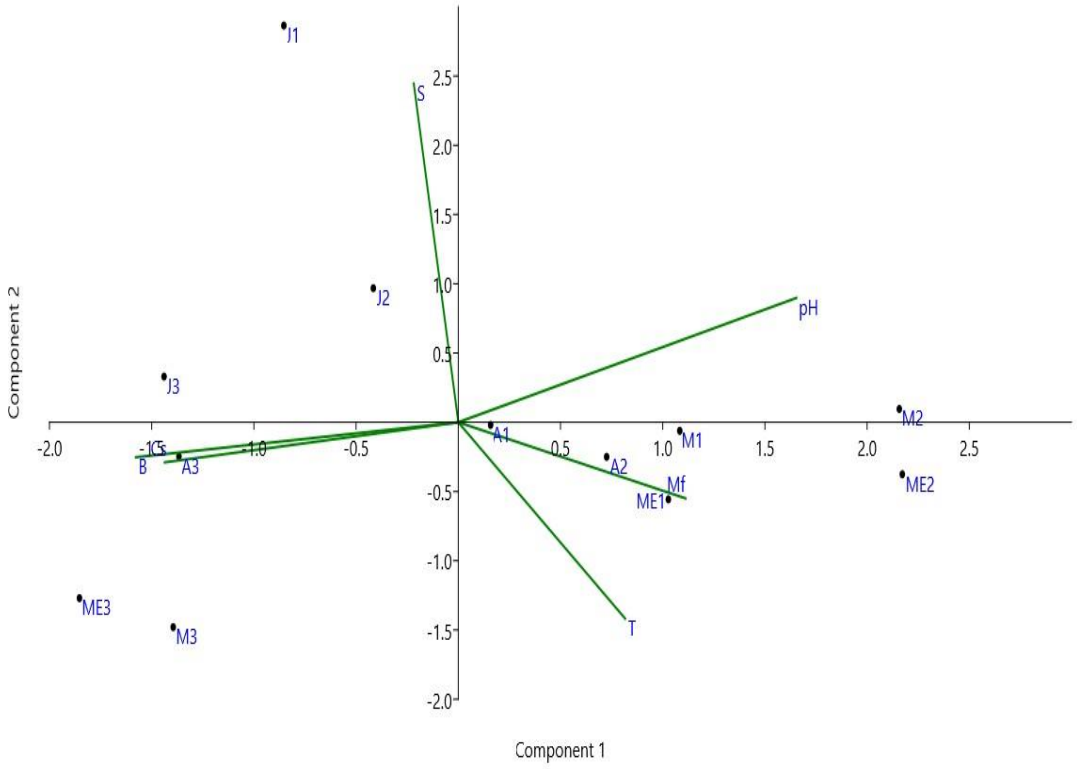

Figure 3. PCA analysis based on the Effect of Abiotic Factors and Fish Amounts and Sampling Locations
(J = January, M = March, A = April, ME = May, SC = Flow velocity, B = Brightness, T =Temperature, S = Salinity, pH = pH, Mf = Mouth of Invader Fish).

Based on the results of the research conducted, it shows that the average number of captive fish caught has fluctuations, which are shown in (figure 4). In January, there were 253 individuals caught, but in January there were no detainees caught at all during the month with no migration from anchovies. In March, penjah Kembalii fish appeared, and in April the biggest abundance occurred and declined again in May. The pattern of the spread of biota is influenced by habitat types which include physical-chemical parameters of water and food and the adaptability of biota in an ecosystem (Alfitriatussulus, 2003). The number of fish during sampling at each point always fluctuates. This is related to fish migration looking for suitable environmental conditions and the need for growth. Besides that, it is influenced by tides that distribute fish to various habitats. According to Genisa (2000) explained that biota living in the estuary are biota that has a high tolerance for environmental changes, which are characterized by a small number of species and high potential. An estuary is a meeting place between freshwater and seawater. This habitat is more fertile and productive so this area is often used as a nursery for fish children. One of the estuaries is river estuary which is always affected by tides and fluctuating salinity, which affects the life forms of biota in the area.

The results of the calculation of the relative abundance of individuals from compositions dominated by penjah fish found at the location of river estuary. The tilapia has the greatest abundance value at the Mapilli river estuary location during the study of 100%.

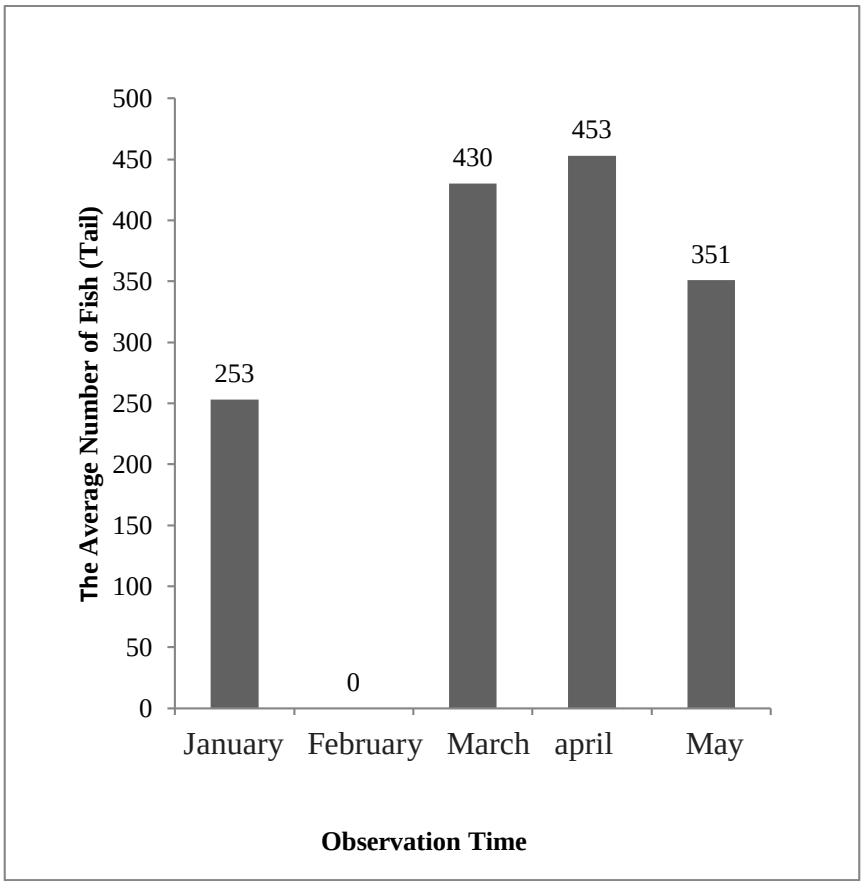

Figure 4. Average number of fish caught each month

4. CONCLUSION

Based on the results of the research conducted, it can be concluded that all abiotic factor parameters which include Brightness, Temperature, pH, Salinity and current velocity affect the abundance of tilapia, and in the range of values based on abiotic factors are still in accordance with the environment favored by the penja fish. Abiotic factors that affect the abundance of anchovy fish in January are salinity and negatively correlated with temperatures with relatively few fish, in March abiotic factors that affect abundance of anchovy fish are flow velocity and brightness with a relatively abundant number of fish but negatively correlated with pH, in April the abundance of anchovy is influenced by abiotic factors, namely temperature, current speed and brightness with the most abundant number of fish. Whereas in May the abiotic factors affected were temperature, current speed, and brightness and the most abundant number of fish.

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