Abundance of Ichthyoplankton as Support of Fisheries Production Sustainability in Morosari Demak Coastal Water

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A B S T R A C T

The Demak area is an area that has changed its ecological function from land to sea. This area has a mangrove ecosystem which is a conservation area. The increasing level of water fertility will also cause an increase in aquatic organisms that come to feed in this area. In addition to being a feeding ground, mangrove ecosystems are also a spawning and nursery ground for some fish that reproduce giving birth to fish larvae. Research on the composition and distribution of ichthyoplankton has been done many times before. This research has been intended to look at the distribution of fish larvae and juveniles with their environmental conditions both by type. his research was carried out by sampling which was carried out in August 2021. Determination of sampling points is determined based on differences in environmental conditions of the coastal waters of Morosari Demak which are divided into 3 stations horizontally from the coastline. The research method used is the survey method. Ichthyoplankton obtained in the Morosari Demak water area were 10 families, namely Chanidae, Lutjanidae, Clinidae, Terapontidae, Schalopagidae, Mugilidae, Ambassidae, Gobidae, Apogonidae, and Engraulidae. The most abundant fish larvae obtained during the study were from the Engraulidae family. . Larvae of the family Engraulidae were the most abundant larvae caught during the 3 repetitions with a total of 85 individuals with a percentage of 34%. While the least fish larvae caught during the 3 repetitions were larvae from the Clinidae family, totaling 7 individuals with a percentage of 3%. The range of diversity values (H') obtained is 1.67-1.94. The range of uniformity values (e) in the Morosari Demak area is 0.726-0.843. The dominance index value (C) of fish larvae in the Morosari Demak area has a value with a range of 0.178-0.254

Keywords: Ichthyoplankton, fish larvae, Estuary, Community Structure, Morosari Demak

1. Introduction

The Demak area is an area that has changed its ecological function from land to sea. This area has a mangrove ecosystem which is a conservation area. The fertility of mangrove ecosystems is strongly supported by the presence of nutrients in the waters. Nutrients in the waters will also affect the productivity of the waters.(Jati et al., 2022). The increasing level of water fertility will also cause an increase in aquatic organisms that come to feed in this area. In addition to being a feeding ground, mangrove ecosystems are also a spawning and nursery ground for some fish that reproduce giving birth to fish larvae. Research on the composition and distribution of ichthyoplankton has been done many times before (Subiyanto et al., 2009), However, information on the distribution of ichthyoplankton communities in coastal waters is relatively little reported on survival, distribution patterns and migration. (Stottrup, 2002 in Sugiharto, 2005). Fish larvae (ichthyoplankton) is a stadia where biota is planktonic, meaning that its movement or distribution is still influenced by its environment. (Subiyanto et al, 2009). Larvae and adult forms that represent almost all animal phyla belong to zooplankton. Studies on the distribution of zooplankton in Indonesian waters are still rare, even though the distribution and diversity of ichthyoplankton is one indicator of the biological quality of a water body. (Sulawesty et al., 2008). Fish larvae and juveniles distribute passively and actively. Passively, that is, with the help of currents or waves (horizontally) or commonly referred to as spatial distribution, while actively, that is, using their means of movement (vertically) or commonly referred to as temporal distribution. This research has been intended to look at the distribution of fish larvae and juveniles with their environmental conditions both by type.

2. Research Method

The research was conducted in the mangrove and estuary area of Morosari, Demak. This research was carried out by sampling which was carried out in August 2021. Determination of sampling points is determined based on differences in environmental conditions of the coastal waters of Morosari Demak which are divided into 3 stations horizontally from the coastline. The research method used is the survey method. The survey method is a method that

limits research where data is collected from a sample of the population to represent the entire population. The location of the sampling station can be seen in table 1..

Table 1 – Station

Station	Coordinate	
1	-6,9245816	110,4802953
2	-6,9250939	110,4808636
3	-6,9161383	110,4908719

Ichthyoplankton sampling uses Bonggo Net with a diameter of 0.8 meters, a net length of 1.5 meters and a mesh size of 125 µm which has been given a pipe to accommodate samples and weights at the end. Sample collection is done by pulling the net obliquely at a depth of 1 meter using a boat with a stable speed of $\pm$ 0.5 m s^{-1} for 10 minutes using the swap area method. Analysis for the abundance of ichthyoplankton was done using the modified formula from the American Public Health Association (2005).

$$Volume\ sample = (\pi r^2)x\ distance \qquad (1)$$

Volume sample = Filtered water volume (mL^{-1})
r = radius of Bonggo Net
Distance = Bonggo Net pulling distance

$$N = \frac{c}{v}1000 \qquad (2)$$

N = Abundance of Ichthyoplankton (ind 1000 m-3)

c = the number of Ichthyoplankton chopped in the sample (individual)

v = Volume of filtered Water

All Ichthyoplankton samples obtained were then preserved using 5% formaldehyde solution for 1 hour, then transferred in 70% alcohol solution. Storage of Ichthyoplankton samples at 5% formaldehyde concentration is intended to minimize the shrinkage that may occur before identification and to maintain rigid samples for morphometric measurements for species identification, while storage with 70% alcohol is intended to keep larval otoliths in good condition (undamaged) before identification is made. All samples obtained (Ichthyoplankton samples) were stored in a dry box for identification. Identification of Ichthyoplankton was done using the identification book of Okiyama (1989).

Captured ichthyoplankton data were analyzed by abundance, Shanon-wiener diversity index (H') (Anwar, 2008), uniformity index (E) (Basmi, 1999) and Simpson's dominance index (D) (Anwar, 2008). To see the relationship between abundance with salinity and current velocity, linear regression analysis was used (Steel and Storrie 1980 in Anwar (2008).

3. Result and Discussion

Ichthyoplankton obtained in the Morosari Demak water area were 10 families, namely Chanidae, Lutjanidae, Clinidae, Terapontidae, Schalopagidae, Mugilidae, Ambassidae, Gobidae, Apogonidae, and Engraulidae. The overall composition of fish larvae caught by sampling point is presented in Figure 1. Based on Figure1, it can be seen that not all families of fish larvae were caught at each repetition. Larvae of the family Engraulidae were the most abundant larvae caught during the 3 repetitions with a total of 85 individuals with a percentage of 34%. While the least fish larvae caught during the 3 repetitions were larvae from the Clinidae family, totaling 7 individuals with a percentage of 3%.
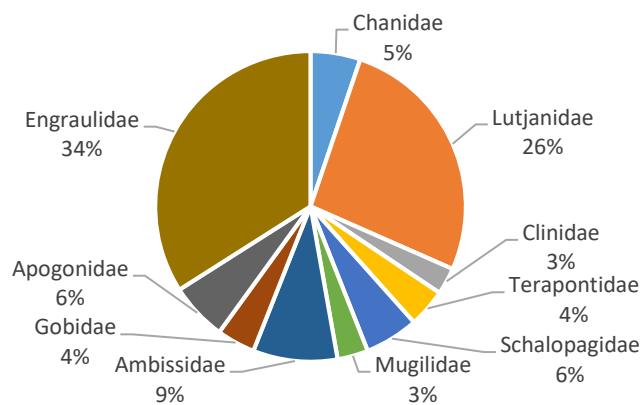

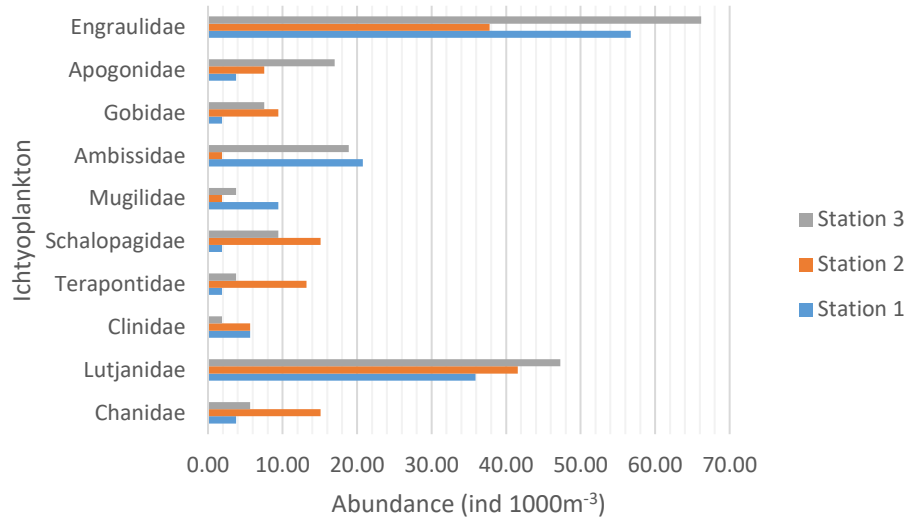Fig 1. percentage of ichthyoplankton abundance

Fig 2. ichthyoplankton abundance

The most abundant fish larvae obtained during the study were from the Engraulidae family which could be found at all sampling points. The Engraulidae family is one of the economically important fishery commodities. Fish caught and including one type of fish from this family is Anchovy. Engraulidae is classified as a euryhaline fish that can be found in fresh, brackish and marine waters. According Fauziyah et al. (2016) During the growth period, fish of the Engraulidae family like to live in estuaries. When they reach adulthood, they will return to the sea to breed.

Table 2. Community Structure of Ichthyoplankton

Station	H'	e	c
1	1,67	0,726	0,254
2	1,94	0,843	0,178
3	1,78	0,773	0,227

The diversity index (H') obtained based on calculations at each sample point shows a variety of values. The range of diversity values (H') obtained is 1.67-1.94 included in the diversity value criteria 1>H'<3 so it can be concluded that the value of fish larvae diversity that has been caught during the research can be classified in a moderate level of diversity. The level of diversity will be high if the H' value is close to 3, so this indicates good water quality conditions. (Pujiono et al., 2020). The range of uniformity values (e) in the Morosari Demak area is 0.726-0.843 included in the value criteria close to 1, it

can be concluded that the level of uniformity is high, relatively the same and not much different. The dominance index value (C) of fish larvae in the Morosari Demak area has a value with a range of 0.178-0.254 including the value criteria close to 0, it can be concluded that the level of dominance is low and almost no dominating species are found (Pujiono et al., 2020)

Table 3. Water Quality

Station	Temperature (^oc)	pH	DO (mg L^{-1})	Salinity (‰)
1	30	7	4,57	28
2	32	7	4,24	28
3	32	7	4	28

Ichthyoplankton abundance in the Morosari Demak area is classified as moderate because the water quality conditions at the research site are fairly good. The salinity value is stable and optimum for the development and growth of fish larvae and the water depth is stable and not too far away at each sampling point. The DO of the waters at some sampling points is low and the abundance of fish is small, while at the sample point with an optimum DO value of > 5 the abundance of larvae is greater. Based on these environmental conditions, DO and temperature are factors that play an important role in the reproduction of fish in tropical seas. (Fauziyah et al, 2016). The ichthyoplankton obtained in this area is quite diverse, this happens because the Estuary can be a spawning and nursery area.. For nekton, coastal areas, and estuaries function as nurseries. Estuaries provide for biota in the early life stages protection and a good food supply. The dependence of large numbers of fish that have high commercial value to the estuary environment is one of the main economic reasons for the preservation of this habitat (Rojas, 2014). The currents in Morosari Demak are lower and fish larvae usually prefer calm

waters. The high and low abundance of fish larvae is related to the spawning period, one of which is the ebb and flow of the waters. Vertical and horizontal fish migration patterns also affect the abundance of fish larvae. (Arshad et al., 2012)

4. Conclusion

The number of ichthyoplankton caught during the study amounted to 10 families, namely Chanidae, Lutjanidae, Clinidae, Terapontidae, Schalopagidae, Mugilidae, Ambassidae, Gobidae, Apogonidae, and Engraulidae. The most captured larvae came from the Engraulidae family, while the least came from the Clinidae family. Then Ichthyoplankton abundance in the Morosari Demak area is classified as moderate because the water quality conditions at the research site are fairly good.

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