



Larval Diversity in Mangrove and Seagrass Ecosystems: A Case Study from Teluk Awur, Jepara, Indonesia

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ABSTRACT

Aquatic organisms in the larval stage are still heavily influenced by environmental factors for their survival and determine the survival of a species. The survival rate of the larval phase is very low in nature. Only a small percentage are able to survive and live to adulthood due to the harsh and lethal nature of the marine environment. The objectives of this study were to determine the families of fish and crustacean larvae caught and to determine the distribution, abundance, uniformity, diversity, and dominance of larvae in Teluk Awur, Jepara, Indonesia. The research was conducted in November 2024 in the Seagrass zone and Mangrove area of Teluk Awur, Jepara, Indonesia. It used a survey method. The location of data collection stations was determined based on the random sampling method in the seagrass and mangrove ecosystem. The results obtained in the mangrove area were 18 families, with the highest percentage of presence by the type of Penaeidea by 35%. Then the results obtained in seagrass areas were 11 families, with the highest percentage by Portunidae by 33%. Mangrove zones favor crustacean larvae, especially Penaeidae, which depend on mangrove roots and nutrient-rich environments. The Seagrass Meadow Zone supports a wider variety of species, especially larval pelagic fish and crustaceans such as Portunidae and Palaemonidae, which utilize open but sheltered conditions.

Keywords: Crustacea, fish larvae, Mangrove, Seagrass

Introduction

Knowledge of the life cycle of fish and aquatic organisms can be used to determine stock units, assess resource conditions, and determine utilization strategies. The success of sustainable fisheries resource management depends on the accurate determination of these three components (Wagiyo *et al.*, 2019). 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 (Prakoso, *et al.*, 2023). A very important early phase of the fish life cycle is known as the larval phase, where the life of the fish is highly dependent on environmental conditions. In the larval phase, fish face the challenges of finding habitat for settlement, becoming prey for predatory fish, and losing the ability to obtain food. Therefore, how well fish make it through the larval phase determines how well they gather resources (Wagiyo *et al.*, 2019). Aquatic organisms in the larval stage are still heavily influenced by environmental factors for their survival and determine the survival of a species. The survival rate of the larval phase is very low in nature. Only a small percentage are able to survive and live to adulthood due to the harsh and lethal nature of the marine environment. The distribution and abundance of fish and crustacean larvae is highly dependent on the water conditions in which they live. Each aquatic organism has different environmental needs and preferences for survival that are related to the characteristics of its environment. (Elisa, *et al.*, 2020). Many species of fish and crustaceans, especially in larval and juvenile stages, are found in mangrove and seagrass meadow ecosystems (Ara, *et al.*, 2013). Studies on the distribution of zooplankton in Indonesian waters are still rare, even though the distribution and diversity of larvae are one indicator of the biological quality of a water body. (Sulawesty *et al.*, 2008). The many human activities in Teluk Awur Beach area can suppress the carrying capacity of the environment, so the study of the inventory and distribution of fish and crustacean larvae in seagrass beds and mangrove ecosystems is one of the topics that need to be known. The objectives of this study were to determine the families of fish and crustacean larvae caught and to determine the distribution, abundance, uniformity, diversity, and dominance of larvae in Teluk Awur, Jepara, Indonesia.

Research Method

The research was conducted in November 2024 in the Seagrass zone and Mangrove area of Teluk Awur, Jepara, Indonesia. It used a survey method. The location of data collection stations was determined based on the random sampling method in the seagrass and mangrove ecosystems in Teluk Awur, Jepara, Indonesia. The number of station locations used was 10 stations each in both areas, so there were 20 sampling stations. The location of the sampling station can be seen in Figure 1.



Fig 1. Research Location

The sampling method for fish larvae in the seagrass meadow zone was carried out actively, by pulling the net by humans at a distance of 25 meters and by pulling back and forth 2 times at each point using a 2x1 meter seine net with a mesh size of 1 mm. Larval sampling in mangrove ecosystems using dip nets. The dip nets have a diameter of 23 cm x 15 cm at the opening and have a 0.8 mm net mesh and a handle that is 40 cm long. Fish larvae samples that have been obtained are put into sample bottles that have been added with 4% Formalin. 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).

Result and Discussion

The number of fish and crustacean larvae found in the mangrove and seagrass areas varied greatly. The results obtained in the mangrove area were 18 families, with the highest percentage of presence by the type of Penaeidea by 35%. Then the results obtained in seagrass areas were 11 families, with the highest percentage by Portunidae by 33%.

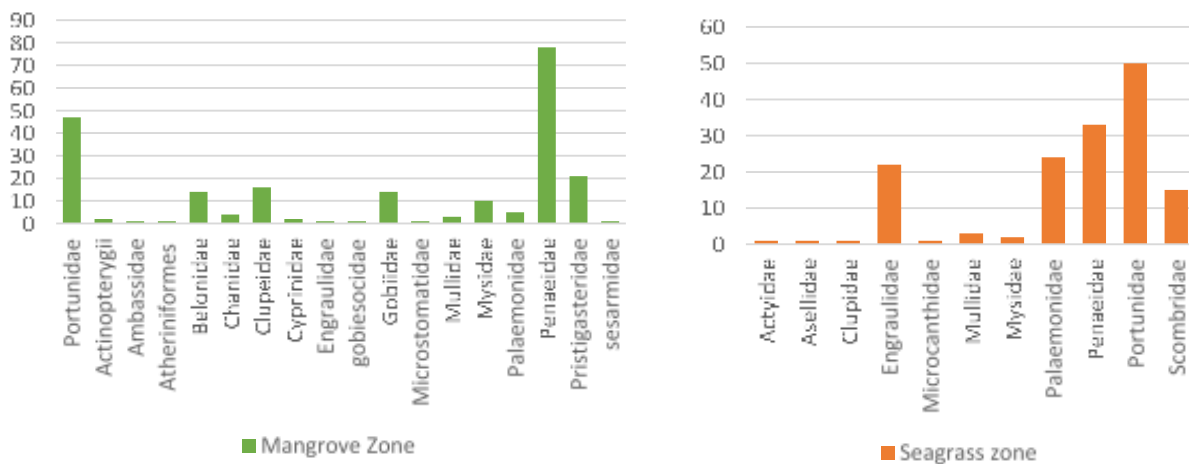


Fig 2. Larvae abundance

Five families of crustacean larvae are found in mangrove areas: Portunidae, Palaemonidae, Penaeidae, Sesarmidae, and Mysidae.

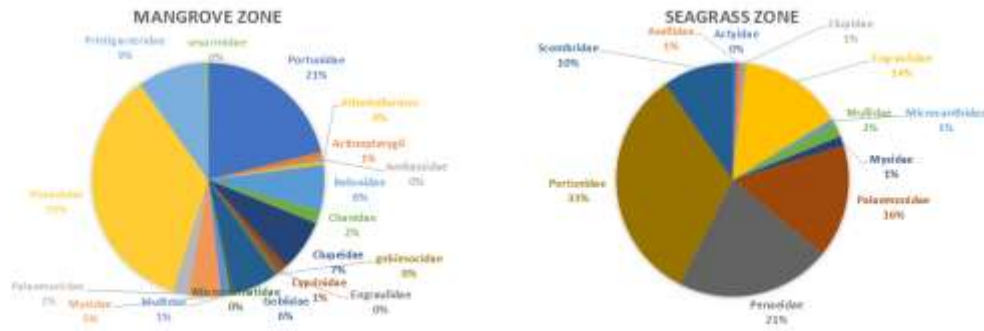


Fig 3. Percentage of larval abundance

Penaeidae larvae are more prevalent in mangrove areas due to the unique ecological characteristics of these habitats, which provide essential nursery functions. Conversely, Portunidae larvae are more commonly found in seagrass areas, where environmental factors favour their development. The mangrove zone was dominated by crustaceans such as Penaeidae and Portunidae, which utilize the mangrove environment rich in organic matter and protected from strong currents. Larval fish such as Pristigasteridae and Gobiidae are also commonly found in mangroves, showing adaptation to the muddy ecosystem and mangrove roots. In seagrass zones, fish larvae were more diverse than in mangroves, with groups such as Engraulidae, Scombridae (10%), and Microcanthidae (2%) showing a preference for seagrass habitats. Crustaceans such as Penaeidae and Portunidae remained significant, but the seagrass zone also supported pelagic and other small fish species.

Figure 4 shows water quality data obtained from the research site

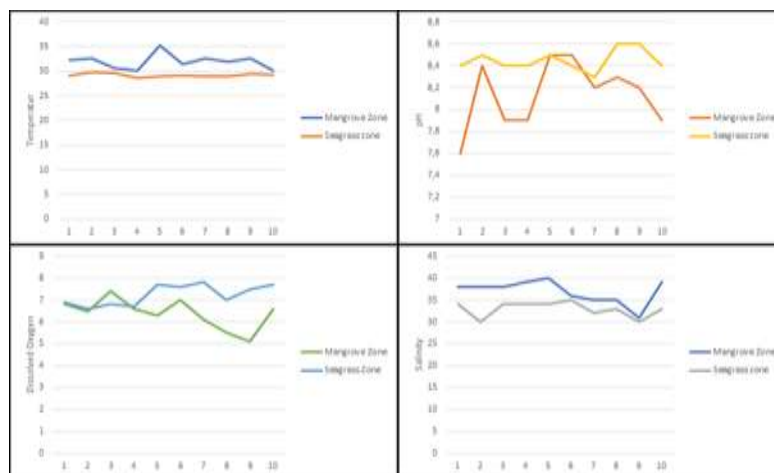


Fig 4. Water Quality in the Mangrove and Seagrass zone

Salinity in the mangrove zone was higher than in the seagrass zone. Salinity can affect the osmoregulation of organisms. Sudden changes in salinity can cause osmotic stress and death in larvae that are unable to adapt quickly (Elisa, *et al.*, 2020). There are significant fluctuations in dissolved oxygen levels, especially in the mangrove zone. Based on these environmental conditions, DO and temperature are two important factors in tropical sea fish reproduction. (Fauziyah *et al.*, 2016). There are significant temperature fluctuations in both zones, with mangrove zone temperatures being higher. High temperatures can increase the metabolic rate of organisms, resulting in increased oxygen demand. However, excessively high temperatures can cause stress and mortality in some species, especially larvae that are sensitive to temperature changes (Ara *et al.*, 2013). The pH values in both zones are stable, but there are slight fluctuations. The pH changes can affect nutrient availability, gas solubility, and enzyme activity in organisms. Extreme pH (too acidic or alkaline) can interfere with larval growth and development (Jati *et al.*, 2022). There are significant temperature fluctuations in both zones, with mangrove zone temperatures tending to be higher. High temperatures generally increase the metabolic rate of organisms, resulting in increased oxygen demand. However, temperatures that are too high can cause stress and mortality in some species, especially larvae that are sensitive to temperature changes (Nastiti *et al.*, 2017).

The larvae obtained in this area are quite diverse; this happens because the Mangrove and Seagrass zones can be spawning and nursery areas.

4. Conclusion

The results obtained in the mangrove area were 18 families, with the highest percentage of presence by the type of Penaeidae by 35%. Then the results obtained in seagrass areas were 11 families, with the highest percentage by Portunidae by 33%. Mangrove zones favor crustacean larvae, especially Penaeidae, which depend on mangrove roots and nutrient-rich environments. The Seagrass Meadow Zone supports a wider variety of species, especially

larval pelagic fish and crustaceans such as Portunidae and Palaemonidae, which utilize open but sheltered conditions. Both ecosystems have important ecological functions in supporting the early life phases of various species, demonstrating complementarity in the life cycles of fish and crustaceans.

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