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TYPE COMPOSITION AND INDEX OF SPECIES DIVERSITY OF GROUPER (Serranidae) LANDED AT LEWOLEBA FISH AUCTION SITE

Komposisi Jenis dan Indeks Keanekaragaman Ikan Kerapu (Serranidae) yang di Daratkan Pada Tempat Pelelangan Ikan Lewoleba

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ABSTRACT

Lembata Regency marine waters have a high level of biota diversity. The purpose of the study was to determine the species composition and diversity index of grouper (Serranidae). Data analysis was carried out by calculating the index value of species diversity, species evenness and species dominance. The results showed that the species composition landed at Lewoleba Fish Auction Site (TPI) was dominated by Cephalopholis boenak species at 10%, followed by Variola louti, Epinephelus ongus, Epinephelus fasciatus, and Cephalopholis miniata at 9%, then followed by Plectropomus leopardus, Epinephelus coeruleopunctatus, and Anyperodun leucogrammicus at 8%, followed by Plectropomus oligacanthus, Plectropomus areolatus, and Epinephelus macrospilos at 7%, followed by Cephalopholis sonnerati at 6%, and the last was Epinephelus undulosus at 3%. The diversity index (H') varied from 2.452 to 2.548. Based on the index value, the diversity index category is moderate (1 < H' < 3). The diversity index (E) varied from 0.956 to 0.993. Based on the index value, the evenness index category is high or evenly distributed. The dominance index (E) varies from 0.080 to 0.093. Based on the index value, the dominance index category is low or almost no dominance.

Keywords: Diversity Index, Grouper, Lewoleba, Type Composition

ABSTRAK

Perairan laut Kabupaten Lembata memiliki tingkat keanekaragaman biota yang tinggi. Tujuan penelitian yakni untuk mengetahui komposisi jenis dan indeks keanekaragaman ikan kerapu (Serranidae). Analisis data dilakukan dengan menghitung nilai indeks keanekaragaman jenis, kemerataan jenis dan dominansi jenis. Hasil penelitian menunjukkan bahwa komposisi spesies yang didaratkan di Tempat Pelelangan Ikan (TPI) Lewoleba didominasi oleh spesies *Cephalopholis boenak* sebesar 10%, diikuti oleh *Variola louti*, *Epinephelus ongus, Epinephelus fasciatus*, dan *Cephalopholis miniata* sebesar 9%, kemudian disusul oleh *Plectropomus leopardus*, *Epinephelus coeruleopunctatus,* dan *Anyperodun leucogrammicus* sebesar 8%, diikuti oleh *Plectropomus oligacanthus*, *Plectropomus areolatus,* dan *Epinephelus*

macrospilos sebesar 7%, disusul oleh *Cephalopholis sonnerati* sebesar 6%, dan yang terakhir adalah *Epinephelus undulosus* sebesar 3%. Indeks keanekaragaman (H') bervariasi dari 2,452 sampai 2,548. Berdasarkan nilai indeks tersebut maka kategori indeks keanekaragaman sedang (1 < H' <3). Indeks kemerartaan/keseragaman (E) bervariasi dari 0,956 sampai 0,993. Berdasarkan nilai indeks tersebut maka kategori indeks kemerataan tinggi atau merata. Indeks dominansi (E) bervariasi dari 0,080 sampai 0,093. Berdasarkan nilai indeks tersebut maka kategori indeks dominansi rendah atau hampir tidak ada yang mendominansi.

Kata Kunci: Ikan Kerapu, Indeks Keanekaragaman, Komposisi Jenis, Lewoleba

INTRODUCTION

Indonesia boasts a rich diversity of natural resources. Indonesian waters are home to approximately 37% of the world's fish species (Parliansyah et al., 2023). Groupers from the Serranidae family are among the most economically valuable fish species found in Indonesia's coastal areas. Coral reefs are a habitat for groupers (Ernaningsih et al., 2023). According to Kusuma et al. (2021), grouper habitats are in coral reef ecosystems with substrates consisting of sand, mud, or rock. Groupers not only have ecological value but also high economic value as a capture and aquaculture fishery commodity, particularly for the export market, both live and fresh. Several species of grouper, such as *Plectropomus leopardus* and *Epinephelus coioides*, are highly sought after due to their high selling prices. Furthermore, in other regions such as Papua and Youtefa Bay, *Epinephelus coioides* (tiger grouper) is a type of grouper commonly caught using simple fishing gear such as gillnets (Sari et al., 2022).

The waters around Lembata Island, particularly around the Lewoleba TPI Port, are a potential area utilized by fishermen to catch various types of fish, including grouper. Some grouper species landed at the Lewoleba TPI market include *Epinephelus fasciatus*, *Cephalopholis miniata*, and several other fish species (Lasmi & Halija, 2025). However, information on the level of grouper diversity caught by fishermen in this region remains limited. This type of data is crucial for supporting sustainable fisheries management and optimal utilization of fish resources (Sugara et al., 2022). Therefore, research on the composition and diversity of grouper species is necessary. The purpose of this study was to determine the species composition and analyze the species diversity index, species evenness index, and species dominance index of grouper fish landed at fish auction sites. The results of this study are expected to serve as a source of information for sustainable fisheries management, particularly for grouper fish. Proper management can contribute to improving the welfare of fishermen (Lasmi & Halija, 2025).

METHODS

Time and Place

This research was conducted at the Lewoleba Fish Auction Place (TPI) from September to December 2024, with 12 sampling sessions.

Tools and Materials

The tools used in this study included a camera, writing utensils, plastic bags, label paper, and trays. The materials used were grouper fish landed at the Lewoleba Fish Auction Place (TPI).

Research Procedure

Fish sampling was carried out using a random sampling method. The fish caught were recorded, documented, and stored in labeled plastic bags. Fish identification was carried out by

observing their morphological characteristics, referring to a species identification guidebook. After identification, the fish were counted according to their species.

Data Analysis

Data analysis in this study included population counts of various fish species. Analysis of the species composition of the catch was conducted descriptively using simple calculations, which were then presented in a table representing the percentage distribution of individuals. Furthermore, biodiversity assessment is directed at the composition of diversity groups, including species diversity, species evenness, and species dominance. Each index value is calculated using the following formula (Hidayat & Nurulludin, 2017):

Diversity Index

The Shannon-Wiener formula (Magurran, 1988) is used to calculate the diversity index:

$$H' = -\sum_{i=1}^{S} Pi \ln Pi$$

Where:
H' = Shannon-Wiener Diversity Index, denoted by
ni = Number of individuals of the i-th species at each station
N = Total number of members of the i-th species at each station.
S = Total number of species

The following categories apply to the Shannon-Wiener diversity index:
H' < 1 indicates low diversity.
1 < H' < 3 indicates moderate diversity.
H' > 3 indicates high diversity.

Evenness Index

The evenness index for demersal fish species is determined using the Shannon-Wiener species diversity index (Krebs 1989), which is represented by the formula:

$$E1 = \frac{H'}{H\ Max}$$

Where:
E1' = evenness index
H' = Shannon-Wiener species diversity index
H max = ln S
S = total number of species

The Shannon-Wiener evenness index is classified as follows:
According to Pielou (1977), the species evenness index is categorized as follows:
a. 0.00 - 0.25 = unevenly distributed
b. 0.26 - 0.50 = somewhat uneven
c. 0.51 - 0.75 = relatively even
d. 0.76 - 0.95 = almost evenly distributed
e. 0.96 - 1.00 = evenly distributed

Dominance Index

As stated by Odum (1971), the dominance index formula is as follows:

$$C = \sum \left(\frac{ni}{N}\right) 2$$

Where:
C = Dominance index
ni = Number of i-th species
N = Total number of individuals

The dominance index is classified as follows: if the value is close to 0, this indicates that no individual significantly dominates, while a value close to 1 indicates that one species is the dominant species.

RESULTS

Species Composition

Based on the research results, 13 species of grouper (Serranidae) were identified, totaling 885 individuals. The highest observed species composition at the Lewoleba Fish Farm (TPI) was *Cephalopholis boenak*, with 10%, followed by *Variola louti, Epinephelus ongus, Epinephelus fasciatus*, and *Cephalopholis miniata*, each with 9%. Next came *Plectropomus leopardus, Epinephelus coeruleopunctatus*, and *Anyperodon leucogrammicus*, each with 8%. *Plectropomus oligacanthus, Plectropomus areolatus*, and *Epinephelus macrospilos*, each with 7%. *Cephalopholis sonnerati* was next with 6%, while *Epinephelus undulosus* was last with 3%. The data is then displayed in Figure 1.

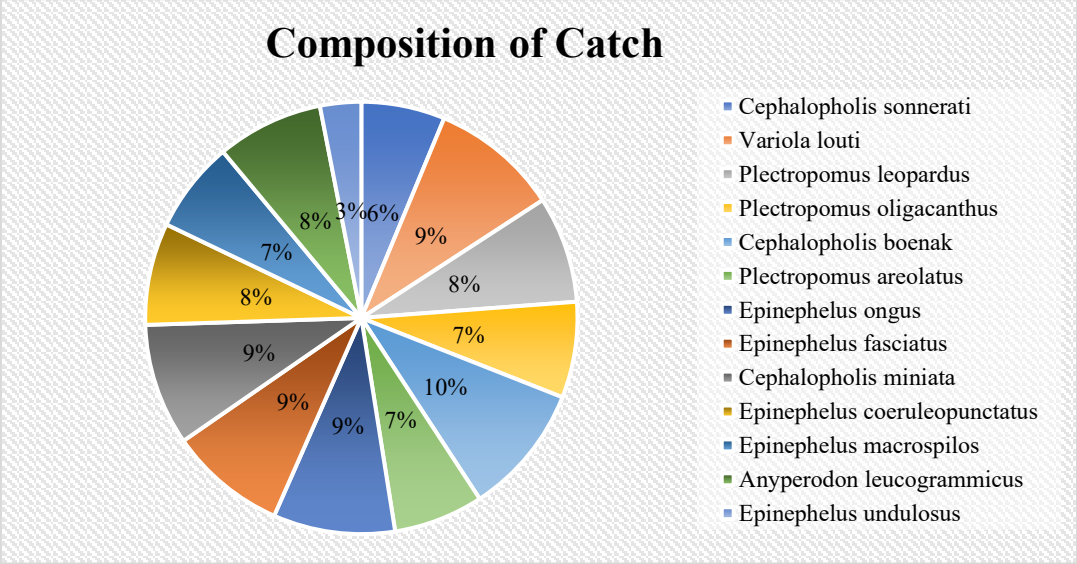

Figure 1. Composition of Fishermen's Catch Landed at the Fish Auction Place (TPI)

Diversity Index

The diversity index (H') varied from 2.452 to 2.548. The results showed that the Shannon-Wiener diversity index (H') values for grouper landed at the Lewoleba TPI ranged from 2.452 to 2.548, with the highest value recorded in week 5 and the lowest in week 1. Based on these index values, the diversity index is categorized as moderate ($1 < H' < 3$). The data is then displayed in Figure 2.

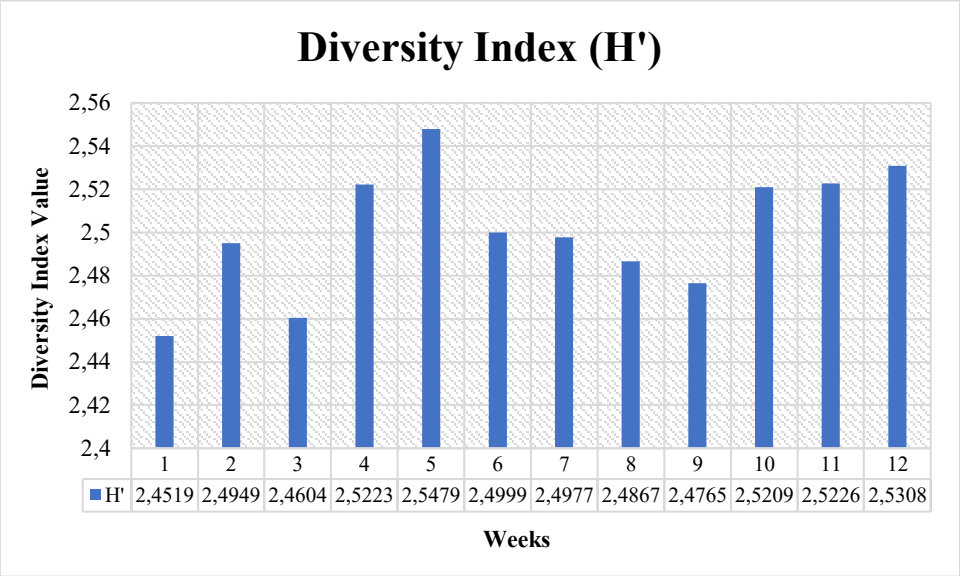

Figure 2. Diversity Index

Evenness/Uniformity Index

The evenness/uniformity index (E) varied from 0.956 to 0.993. The results of the study showed that the evenness index (E) values for grouper caught by fishermen ranged from 0.956 to 0.993, with the highest value in week 5 and the lowest in week 1. These values are considered high, indicating that the distribution of individuals among grouper species is relatively even within the community. The data are presented in Figure 3.

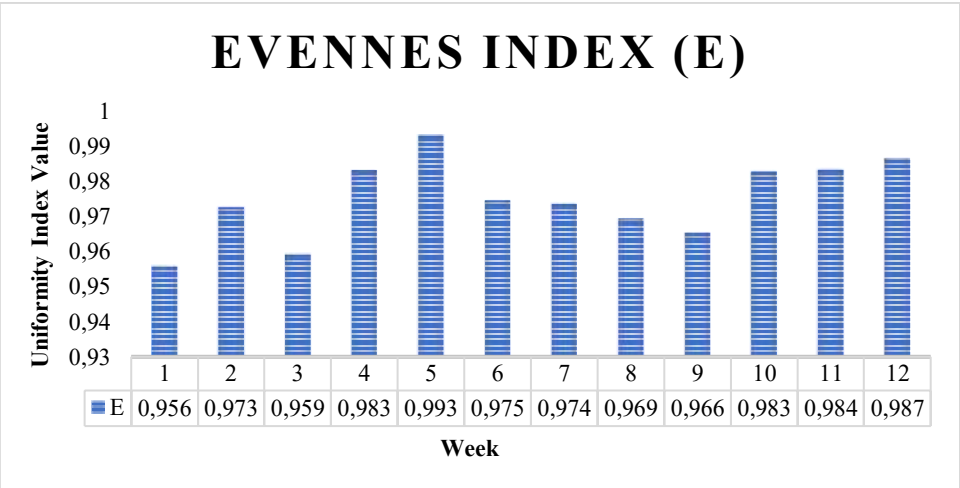

Figure 3. Evenness Index

Dominance Index

The results showed that the dominance index (D) values for grouper at the Lewoleba Fish Farm ranged from 0.080 to 0.093, with the highest value in week 1 and the lowest in week 5. These values are considered low, indicating that no single grouper species significantly dominates the community. The data are presented in Figure 4.

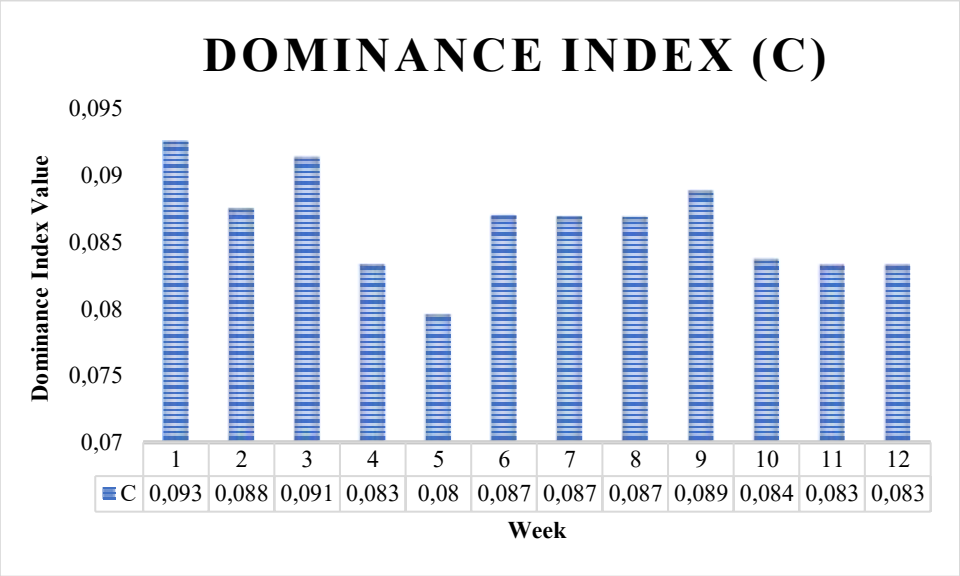

Figure 4. Dominance Index

DISCUSSION

The composition of grouper (Serranidae) fish showed quite high diversity, with a total of 13 species identified. From the observations, *Cephalopholis boenak* was recorded as the most dominant species, accounting for 10% of the total individuals observed. Several other species such as *Variola louti, Epinephelus ongus, E. fasciatus*, and *Cephalopholis miniata* each contributed around 9%. This moderate diversity index indicates that the grouper community structure in the waters around Lewoleba is quite stable, although not particularly high. Moderate diversity reflects the dominance of certain species, but there is still a fairly even distribution among species within the community. The moderate diversity index value is due to the even distribution of species and supported by a healthy aquatic environment (Lusiana et al., 2024). Moderate diversity accompanied by a high evenness index indicates that the distribution of individuals between species is quite even and the community is in a balanced condition (Nurulludin et al., 2022). Furthermore, it can also mean that the fishing gear used is more environmentally friendly (Rahayu et al., 2022).

This condition is still quite good compared to several other locations in Indonesia that have experienced a decline in biodiversity due to overfishing and habitat degradation, as explained by Haryanti et al. (2022) in their study of coastal waters in Sulawesi. Because reef fish live and forage in coral reef areas, coral reef damage will significantly impact the diversity of biota (Zamdial et al., 2020). Healthy waters and environmentally friendly utilization can maintain the diversity of fish and other biota (Edrus & Hadi, 2020). Conversely, unhealthy waters and environmentally unfriendly utilization can reduce the diversity of fish and other biota due to the lack of food and shelter (Adijaya, 2024).

The evenness index (E) indicates the level of species evenness (Dimara et al., 2020). Differences in evenness index values between weeks can be caused by various factors, including changes in environmental conditions, fish migration patterns, and fishing activities by fishermen. A high evenness index in week 5 reflects ecosystem balance and stable environmental conditions, which support species diversity without pressure that leads to dominance by one or a few particular species. A high evenness index value in a body of water indicates that the environmental conditions in that area are relatively good. These supportive environmental conditions will encourage increased diversity in aquatic organism communities (Angin et al., 2017). This supports the finding that ecosystems with good environmental

conditions tend to have an even distribution of individuals between species (Riyantini et al., 2023).

A low dominance index reflects a balanced community structure, with a relatively even distribution of individuals across species. Differences in dominance index values between weeks in Lewoleba can be caused by various factors, including changes in environmental conditions, fish migration patterns, and fishing activities by fishermen. Lower dominance values in week 5 reflect periods with lower fishing pressure or environmental conditions that are more conducive to species diversity. According to Saleky et al. (2021), balanced evenness and dominance index values indicate an even distribution of species without any particular species dominating. This supports the finding that ecosystems with favorable environmental conditions tend to have an even distribution of individuals across species.

This condition needs to be maintained through ecosystem-based fisheries management and regular monitoring of species diversity dynamics. As explained by Sari et al. (2022), diversity monitoring is an important indicator in the sustainable management of fisheries resources, especially for species with important economic and ecological values such as grouper. Fishing activity management can also be carried out by determining net mesh sizes and establishing minimum length limits for fish that can be caught (Monika et al., 2021). Considering that human activity is the primary cause of damage to coral reef ecosystems, this is in accordance with research by Kalauw et al. (2024) which states that human activities, such as waste disposal, destructive fishing gear, coral harvesting, and marine tourism, are factors in coral reef damage. Therefore, efforts to preserve coral reef ecosystems require a comprehensive approach that not only protects against natural threats but also emphasizes strict control of various human activities that have negative impacts (Lasaiba, 2023).

CONCLUSION

The captured grouper community exhibited a relatively good level of species diversity, with a relatively even distribution of individuals across species. The grouper community in the waters around Lewoleba exhibited relatively stable conditions, with moderate diversity, high evenness, and low dominance.

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