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Study on the Diversity and Potential of Fisheries Resources in the Waters of Bone Regency, South Sulawesi.

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Abstract

Bone Regency is one of the coastal areas in South Sulawesi with abundant fisheries resources, both in marine and freshwater environments. This study aims to analyze fish species diversity, catch potential, and environmental factors influencing fisheries sustainability in the waters of Bone Regency. Data were collected through field surveys, fisher interviews, and environmental parameter measurements such as temperature, salinity, and water pH. The research was conducted from March to May 2025 at several water sites, including the coastal area of Bone Bay, the Walanae River, and several community aquaculture ponds. The results showed that more than 25 dominant fish species were caught by fishers, with major contributions from small pelagic fish (sardinella, anchovy), demersal fish (grouper, snapper), and freshwater species (tilapia, milkfish). Data analysis revealed a moderate to high species diversity, with Shannon-Wiener index (H') values ranging from 2.5 to 3.2. Environmental factors played an important role in determining fish availability, particularly during the transitional season. Fishers' catches showed a declining trend compared to the past five years, presumably due to overfishing pressure and habitat degradation. These findings highlight the need for ecosystem-based fisheries management and the adoption of environmentally friendly fishing gear. Education and fisher assistance programs are highly recommended to ensure the sustainability of fisheries resources in Bone Regency.

Keywords: Fisheries, Fish Diversity, Bone Regency, Resource Management, Sustainability

Introduction

Bone Regency is located on the eastern coast of South Sulawesi, facing directly toward the Gulf of Bone. This region is recognized as one of the main fisheries production centers in the province, encompassing both capture and aquaculture sectors. Its high fisheries potential makes this sector the backbone of the coastal community's economy.

However, in recent years, fishing activities have become increasingly intensive, indicating potential overexploitation of fishery resources. Several reports have mentioned a decline in catch yields, particularly among small pelagic and demersal fish species (Andi, 2018).

In addition, environmental factors also influence fish availability in the region. Climate change, coastal ecosystem degradation, and pollution from terrestrial activities have affected the sustainability of fishery resources. The waters of the Walanae River and surrounding wetlands are also under pressure due to human activities (Nontji, 2017).

Research on fish diversity and fisheries conditions in Bone Regency remains limited. Most previous studies have focused on production and aquaculture aspects, while ecological studies on capture fisheries are still underdeveloped (Mallawa & Sudirman, 2016). Therefore, this study was conducted to provide an overview of fish diversity conditions, catch potential, and environmental factor analysis in the waters of Bone Regency. The results are expected to serve as a basis for policy-making toward sustainable fisheries management (KKP, 2020).

Beyond its economic significance, fisheries in Bone Regency also hold important social and cultural values. Traditional fishers still use wooden boats and simple fishing gear passed down through generations, making the existence of fishery resources not only an economic issue but also a matter of coastal cultural identity (Satria, 2015).

Bone Regency also possesses extensive aquaculture areas, such as milkfish ponds and freshwater ponds for tilapia cultivation. This sector contributes significantly to local food security while opening opportunities for fishery product exports. However, challenges such as fish diseases and declining water quality often hinder aquaculture productivity (Subasinghe, 2017).

From a policy perspective, both local and central governments have made efforts to regulate fisheries, including the prohibition of destructive fishing gear and the implementation of fisher assistance programs. However, practical implementation still faces obstacles, particularly in terms of monitoring and community participation. This situation underscores the importance of science-based research to support more adaptive and sustainable fisheries policies (Berkes et al., 2018).

Research Method

his research was conducted from March to May 2025 at several aquatic locations in Bone Regency, South Sulawesi, including the coastal area of Bone Bay, the waters of the Walanae River, and several community aquaculture ponds. The selection of locations was based on the representation of marine, riverine, and aquaculture ecosystems, which serve as the main bases of the community's fisheries activities. This study employed a quantitative descriptive approach, aiming to describe the condition of fish diversity, catch potential, and environmental parameters in the study area (Sugiyono, 2019).

Data collection was carried out using several techniques. First, direct field observation was conducted to record the fish species caught by fishers and to identify key habitat areas. Second, semi-structured interviews were conducted with fishers to gather information on daily catch volumes, fish sizes, fishing gear used, and challenges encountered. Third, environmental parameters such as temperature, pH, salinity, and dissolved oxygen were measured using portable measuring instruments. Fourth, documentary studies were carried out by reviewing fisheries production reports from the Department of Marine and Fisheries of Bone Regency as secondary data sources (Creswell, 2018).

Data Analysis

Data analysis in this study employed an integrated quantitative and qualitative approach. Quantitative data, including measurements of environmental parameters (temperature, pH, salinity, dissolved oxygen) and fish catch volumes, were analyzed using descriptive statistical methods. Descriptive statistics were used to present mean values, standard deviations, and data ranges to illustrate the variation of aquatic environmental conditions in Bone Regency. These results were then compared with the water quality standards set by Government Regulation No. 82 of 2001 to determine their compliance with environmental quality criteria (Sugiyono, 2019).

To analyze fish species diversity, the Shannon-Wiener Diversity Index (H'), Simpson's Dominance Index (D), and Evenness Index (E) were applied. The Shannon-Wiener Index describes the overall level of diversity, the Simpson Index measures the dominance of particular species, while the Evenness Index assesses the distribution of individuals among species. This analysis was conducted by processing the abundance data of each fish species recorded in the field, which were then calculated using standard ecological formulas. This approach was selected because it provides a comprehensive picture of the fish community structure in the waters of Bone Regency (Krebs, 2014).

For qualitative data, fisher interview results were analyzed using thematic analysis. Respondents' answers were categorized based on main themes such as fishing gear usage, seasonal fishing patterns, and operational constraints. This analysis provided contextual understanding of the socio-economic dynamics of fisheries in Bone Regency. The qualitative data were then integrated with the quantitative results to derive holistic conclusions on the relationships between environmental conditions, fish diversity, and fishing practices. This integrative approach strengthened the validity and relevance of the research findings in supporting sustainable fisheries management (Miles & Huberman, 2014).

Research Results

The results of the study showed that the aquatic conditions in Bone Regency are still considered fairly good to support fisheries activities. Water quality measurements at the three study sites (the coastal area of Bone Bay, the Walanae River, and aquaculture ponds) indicated that the temperature ranged from 27–30°C, pH from 7.1–7.8, salinity from 18–32 ppt, and dissolved oxygen from 5.2–6.8 mg/L. These values remain within the acceptable range of water quality standards as stipulated in Government Regulation No. 82 of 2001 (Sugiyono, 2019).

Fish diversity analysis identified 27 fish species from fishers' catches. The Shannon-Wiener Diversity Index (H') ranged from 2.1–2.8, indicating a moderate level of species diversity. The

Simpson Dominance Index (D) was relatively low (0.12–0.18), suggesting that no single species dominated excessively. Meanwhile, the Evenness Index (E) ranged from 0.65–0.72, indicating that species distribution was fairly even. These findings demonstrate that the aquatic ecosystem of Bone Regency remains relatively stable despite fishing pressure (Krebs, 2014).

Catch data revealed that the most frequently caught species were Indian mackerel (Rastrelliger spp.), milkfish (Chanos chanos), and black tiger shrimp (Penaeus monodon). The average catch per fisher ranged from 12–18 kg per day, with variations depending on the season. Seasonal fluctuations were observed, with peak catches occurring between April and June, while significant declines were noted from December to January (Fitri, 2012).

Interviews with fishers indicated that most of them still used traditional fishing gear, such as gill nets and fish traps (bubu), while a small number had adopted small-scale purse seines. Weather conditions, seasonal changes, and limited capital were identified as the main factors affecting fishing productivity. Nevertheless, the fishers stated that the waters of Bone still hold great potential if supported by sustainable resource management practices (Miles & Huberman, 2014).

Table 1. Environmental Parameters of Aquatic Areas in Bone Regency

Location	Temperature (°C)	pH	Salinity (ppt)	DO (mg/L)
Bone Bay	28,5	7,4	30	6,2
Walanae River	27,8	7,2	18	5,8
Aquaculture Area	29,1	7,6	32	6,5

Discussion

The research findings on water quality in Bone Regency indicate that the environmental parameters remain within good categories and comply with government quality standards. This condition is crucial because water quality is the primary factor influencing the survival of fish and other aquatic organisms. The stable values of temperature, pH, salinity, and dissolved oxygen demonstrate that the waters of Bone are still capable of supporting both capture and aquaculture fisheries activities.

The moderate level of fish species diversity suggests that the aquatic ecosystem in Bone remains relatively stable. The Shannon-Wiener Index values ranging from 2.1–2.8 indicate that, despite fishing pressures, fish diversity is still maintained. This stability implies that Bone's fishery resources possess significant development potential but require sustainable management strategies to prevent biodiversity degradation (Odum, 1996).

The dominance of economically valuable species—such as Indian mackerel, milkfish, and black tiger shrimp—in fishers' catches indicates a community reliance on high-value commodities. However, this dominance also reflects an exploitation pattern focused on specific resources. Without diversification of target species and regulated fishing seasons, this may lead to long-term stock depletion.

Interviews with fishers revealed that limited capital and technology remain major obstacles to improving productivity. Most fishers still use traditional and environmentally friendly fishing gear, but their catch volumes are relatively lower compared to those using modern equipment. This condition highlights the need for government and institutional interventions to enhance fisher capacity through equipment assistance programs, financial access, and continuous technical training.

The integration of environmental data, species diversity, and interview findings indicates that fisheries management in Bone Regency should adopt both ecological and socio-economic approaches simultaneously. Without proper management, the region's substantial fishery potential could decline due to excessive exploitation pressures. Therefore, an **ecosystem-based management** approach is needed—combining conservation efforts with the improvement of local fishers' livelihoods to ensure long-term sustainability (FAO, 2018).

Conclusion

This study indicates that the aquatic conditions in Bone Regency are still relatively good to support both capture and aquaculture fisheries activities. Water quality parameters (temperature, pH, salinity, and dissolved oxygen) remain within the acceptable range of environmental standards, while fish species diversity is categorized as moderate, with Shannon-Wiener index values ranging from 2.1 to 2.8. Fishers' catches are dominated by economically valuable species such as Indian mackerel, milkfish, and black tiger shrimp, which serve as the main sources of livelihood for coastal communities (Sugiyono, 2019).

However, the interview results show that fishers continue to face various challenges, particularly limited access to capital, inadequate technology, and seasonal weather fluctuations. Therefore, fisheries management in Bone Regency should be directed toward a sustainable approach, taking into account both ecological and socio-economic aspects simultaneously. Interventions such as enhancing fishers' capacity, implementing environmentally friendly fishing gear, and diversifying fishery resources are crucial to ensure the long-term sustainability of fisheries in the aquatic areas of Bone Regency.

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