

Conservation of Fish Species in Buguey Lagoon, Cagayan, Northern Philippines



S&T in Natural Resources

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Key Findings and Policy Implications

- Results of the study showed significant differences in fish diversity index in terms of Shannon–Weinner index, Simpson’s Reciprocal Index (1/D), Margalef’s diversity index (d), and Berger–Parker dominance index (D), Sorensen’s similarity index (Cs) at ($p < 0.05$) only Pielou’s measures of evenness (J) has no significant difference in the (3) sampling station.
- IUCN Red List assessments on finfish species revealed that 79% identified appeared to be of least concern, 14% data deficient and 7% not evaluated while only 45% of the species appeared to have data on Length at maturity.
- The results of this study served as a basis for policy

formulation toward the sustainable management of resources along Buguey Lagoon. Sangguniang Bayan Council of LGU Buguey had cited the adoption of a Policy Paper developed by Cagayan State University for the Conservation and Management of the Buguey Lagoon highlighting the designation of a Protected Area.

Background

Species diversity, which encompasses the number of different species and their relative abundance, is crucial for assessing fish communities. The Philippines,

a megadiverse country, faces challenges in managing fish diversity due to human activities and habitat changes, particularly in coastal areas like Buguey Lagoon, which is a productive aquatic ecosystem with limited studies on its species diversity. Recent study of Fernandez & Felix in 2024 revealed deteriorating water quality and occurrence of heavy metals in the lagoon, thus there a is a need to study the status both on the fish species and the waters of the lagoon to as basis for a more concrete policies to conserve and manage Buguey Lagoon.

Research Objectives

This study generally aimed to assess the diversity and document the species richness of fishes. Specifically, the study was conducted to determine diversity indices, IUCN status, and to generate a database for policy formulation towards the conservation of species and its management.

Methodology

Study Sites

Brgy. Villa Leonora (mouth/estuary), Centro (east of bridge), and Cabaritan (west of fish port) were selected for data collection. These fishing villages have a higher frequency of fishing activities compared to other barangays.

Data Collection

Fresh fish samples were collected three times a month (2:00–8:00 AM) from fyke net catches of three fishermen in each of the selected barangays.

Data Analysis

Species diversity was analyzed using six indices: Shannon-Wiener Index (characterize species diversity and detecting impacts of pollution or human activity) Simpson's Reciprocal Index (quantifies species diversity in a community), Margalef's Diversity Index (measures species richness), Pielou's Measure of Evenness,(even distribution of individuals among species in a community) Berger-Parker Dominance Index (measure of species dominance), and Sorensen's Similarity Index (compare similarities of species composition in different sampling sites). IUCN Red List was used to classify species status.

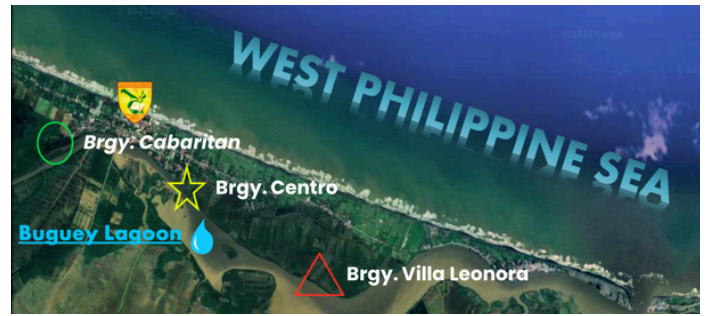


Figure 1. Study site (Source: Google Earth Image).

Key Findings

Results of the study showed significant differences in fish diversity index in terms of Shannon –Weinner index, Simpson’s Reciprocal Index (1/D), Margalef’s diversity index (d), and Berger-Parker dominance index (D), Sorensen’s similarity index (Cs) at (p<0.05) only Pielou’s measures of evenness (J) has no significant difference in the (3) sampling station.

UCN Red List assessments on finfish species revealed that 78.5% identified appeared to be of least concern, data deficient and not evaluated while only 45% of the species appeared to have data on Length at maturity.

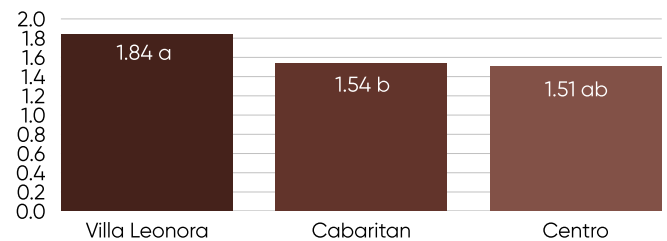


Figure 2. Shannon-Weiner Index of Fishes Caught along Buguey Lagoon.

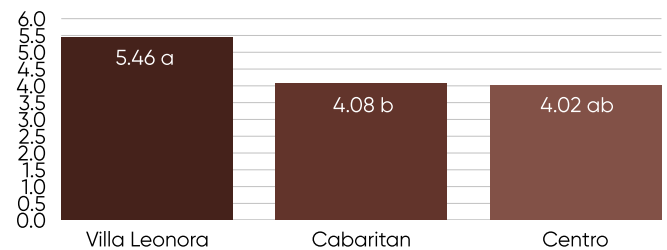


Figure 3. Simpson's Reciprocal Index of Fishes Caught along Buguey Lagoon.

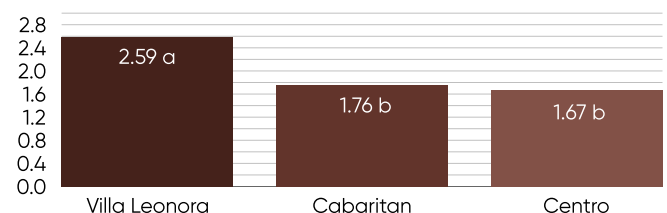


Figure 4. Margalef's Diversity Index of Fishes Caught along Buguey Lagoon.

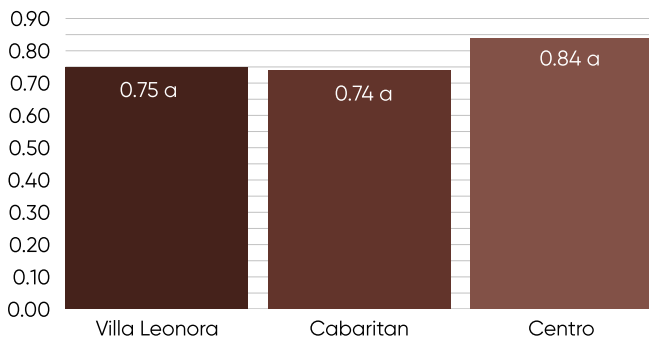


Figure 5. Pielou's Measure of Evenness of Fishes Caught along Buguey Lagoon.

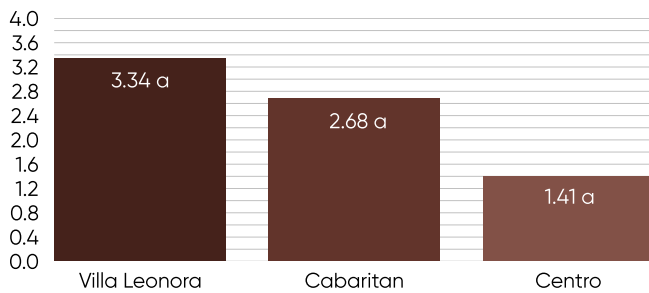


Figure 6. Berger-Parker dominance index of Fishes Caught along Buguey Lagoon.

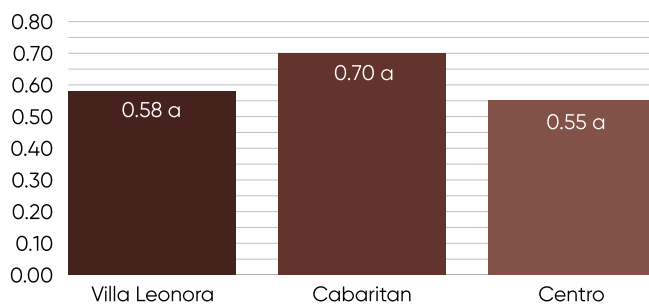


Figure 7. Sorensen's similarity index of Fishes Caught along Buguey Lagoon.

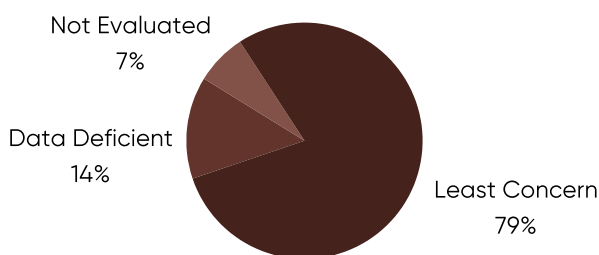


Figure 8. IUCN Status of Fishes Caught along Buguey Lagoon.

Conclusion

There are fifty-six (56) species of finfishes identified along Buguey Lagoon belonging to forty (40) families. Family *Gobiidae* was the highest in species richness among the finfishes. *Ambassis gymnocephalus* dominated the catch followed by Family *Eleotridae* and *Mugilidae*. *Mugil cephalus* (Mullet) is the most abundant among finfishes followed by *Ambassis*

gymnocephalus (Glass perch) and *Glossogobius aureus* (Goby).

One-way ANOVA tests for all the diversity indices among finfishes reveals that there is a significant difference in terms of Shannon-Weinner index, Simpson's Reciprocal Index (1/D), Margalef's diversity index (d) and Berger-Parker dominance index (D), Sorensen's similarity index (Cs) at ($p < 0.05$), only Pielou's measures of evenness (J) has no significant difference in the (3) sampling stations. The Shannon-Weinner Index values generated with a mean range value of lower than 3.0 indicates that the habitat structure along Buguey Lagoon is deteriorating.

IUCN Red List assessment on the majority of finfishes (79%) identified in the lagoon appeared to be of least concern, while only 45% of species appeared to have data on Length at maturity, thus data on this is deficient.

Policy Recommendations

While the research has provided valuable baseline data on biodiversity in Buguey Lagoon, there is a need for continued monitoring and research to track changes over time, assess emerging threats, and evaluate the effectiveness of conservation interventions. Long-term studies and interdisciplinary research collaborations will be crucial for advancing our understanding of the lagoon's ecosystem dynamics and informing evidence-based management decisions.

Target Policy Actors and Beneficiaries



Interventions to be made in support to conservation of fish species along Buguey Lagoon:

- Presentation of the results of the study to the Sangguniang Bayan Council of LGU Buguey as basis to craft a policy for the establishment of a Protected Area along the lagoon.

- Development of a compendium of fish species caught along the lagoon as IEC material to be provided in the coastal communities to increase their awareness.
- Conduct of Fisherfolk Forum presenting the research results and the crafted policy.

References

Akbar, J. B., Jalal, K. C. A., & Kamaruzzaman, B. Y. (2013). Macrobenthic diversity in horseshoe crab nesting ground—Balok Station, Pahang, Malaysia. *Oriental Journal of Chemistry*, 29(4), 1311–1318.

Bolarinwa, J. B., Fasakin, E. A., & Fagbenro, A. O. (2015). Species composition and diversity of the coastal waters of Ondo State, Nigeria. *International Journal of Research in Agriculture and Forestry*, 2(3), 51–58.

Broad, G. (2003). *Fishes of the Philippines: A guide to identification of families*. Anvil Publishing.

Camarao-Tamaray, M., & Torio-Tattao, S. (2012). *PhilReefs: State of the coast II – Cagayan North*. PhilReefs Project.

Corpuz, H. N., & Paller, V. G. (2016). Diversity and distribution of freshwater fish assemblages in Lake Taal river systems in Batangas, Philippines. *Asian Journal of Biodiversity*, 7(1), 37–54.

Emmanuel, L. O., & Modupe, O. (2010). Fish diversity in three tributaries of River Ore, South West, Nigeria. *World Journal of Fish and Marine Sciences*, 2(6), 524–531. IDOSI Publications.

Olawusi-Peters, O. O., & Ajibare, A. O. (2014). Species richness, diversity and abundance of some decapod crustaceans in coastal waters of Ondo State, South West, Nigeria. *International Journal of Fisheries and Biological Sciences*, 1(5), 44–45.

Regional Development Council Region II. (2005). *Cagayan Riverine Zone development framework plan 2005–2030*. Tuguegarao City, Cagayan: Regional Development Council Region II.

Editor's Note

This policy brief is based on results of the CSU-funded project “Assessment of Species Diversity of Fishes in Buguey Lagoon, Cagayan, Northern Philippines” This project was implemented by the Cagayan State University – Aparri Campus. The CSU – Aparri Campus project team is composed of Quirino G. Pascua, Ph.D and Mr. Jasper Allain B. Argonza

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