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Ichthyofaunal Diversity and Its Role in Aquatic Ecosystem Functioning: Bibliographic Approach

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Abstract

Ichthyofaunal diversity refers to the variety and abundance of fish species in a specific aquatic ecosystem. Studying ichthyofaunal diversity is crucial for understanding aquatic ecosystem health, biodiversity conservation, and the impact of environmental changes like pollution, habitat destruction, and climate change on fish populations. Considering this fact, the present research work is devoted the Bibliometrics analysis for the keywords, ichthyofaunal diversity, role, and aquatic ecosystem functioning for the last decade, followed by conclusion and future scope of the research.

Keywords: Ichthyofaunal diversity, role, aquatic ecosystem, Bibliometrics analysis.

1. Introduction

The literature on ichthyofaunal diversity highlights its critical role in maintaining the ecological balance of aquatic ecosystems. Hernández-Ojendi et al. (2020) examined the fish community structure in the Mecoacán Lagoon, Tabasco, emphasizing the ecological and economic significance of fish as indicators of ecosystem health and their role in energy flow and ecosystem. Their study involved extensive sampling across different seasons, revealing the importance of understanding fish diversity in relation to environmental variability. Similarly, Jerde et al. (2011) demonstrated the utility of environmental DNA (eDNA) in detecting rare aquatic species, showcasing its potential as a non-invasive method for monitoring biodiversity and informing conservation strategies. This innovative approach can enhance our understanding of ichthyofaunal distribution and dynamics, particularly in the face of habitat degradation and climate change.

The impact of anthropogenic activities on ichthyofaunal diversity is a recurring theme in the literature. Konan et al. (2019) provided an update on the ichthyofauna and conservation status

in the Aghien Lagoon, Côte d'Ivoire, highlighting the detrimental effects of fishing and pollution on fish communities. Their findings underscore the need for effective management practices to mitigate species loss and preserve aquatic biodiversity. Lamboj et al. (2020) further emphasized the consequences of habitat loss on endemic species, specifically the Ghanaian cichlid Limbochromis robertsi, illustrating how environmental changes can restrict species distribution and threaten biodiversity (Lamboj et al., 2020). These studies collectively point to the urgent need for conservation efforts to address the challenges posed by human activities on aquatic ecosystems.

In addition to documenting diversity and threats, recent research has focused on the methodologies for assessing ichthyofaunal health and diversity. Machowski et al. (2019) investigated the chemical composition of bottom sediments in water bodies near industrial sites, revealing significant contamination that adversely affects fish populations (Machowski et al., 2019; . Kumar et al., 2019) assessed the ichthyofaunal diversity in the Tumaria Reservoir, emphasizing the importance of biodiversity for ecosystem stability and the provision of ecosystem services. Furthermore, Ud et al. (2020) highlighted seasonal variations in fish diversity in the Hiran-II Reservoir, using various diversity indices to evaluate ecosystem health (Ud et al., 2020). These studies contribute to a growing body of knowledge that underscores the importance of ichthyofaunal diversity in sustaining aquatic ecosystems and the need for ongoing research and conservation efforts.

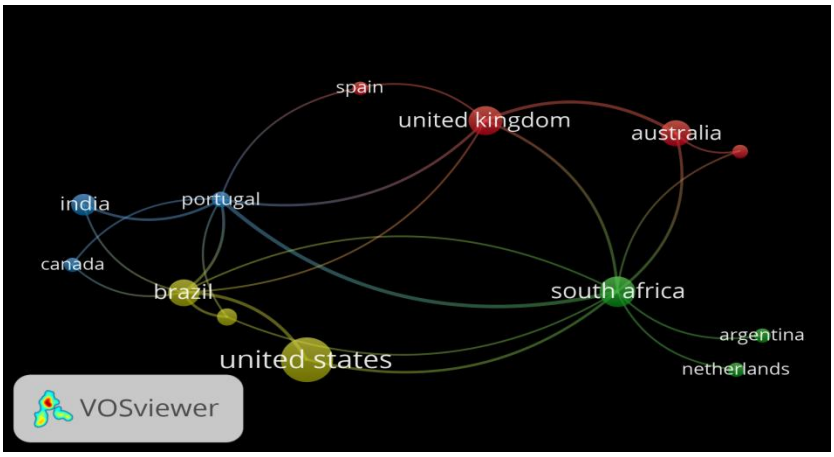
Considering the importance of the topic the present Bibliometrics analysis for the keywords, ichthyofaunal diversity, role, and aquatic ecosystem functioning for last decade, followed by conclusion and future scope of the research.

2. Bibliometrics Analysis

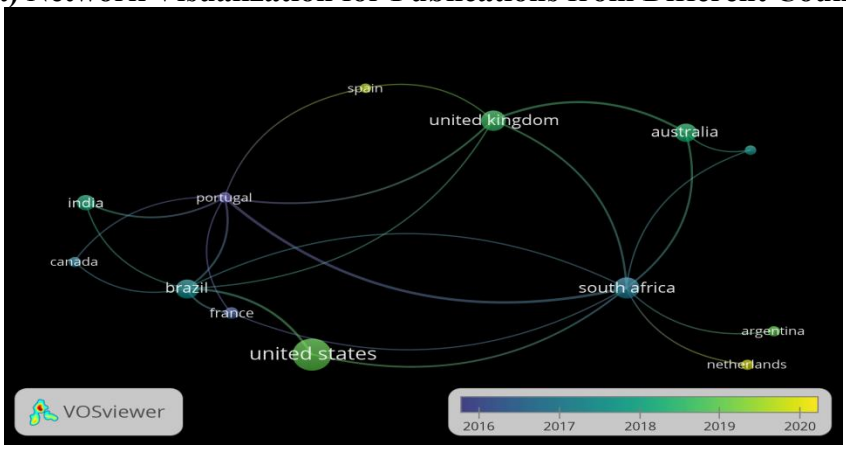
The following subsections represent the details of Bibliometrics analysis.

2.1.1 Country wise Citation Analysis

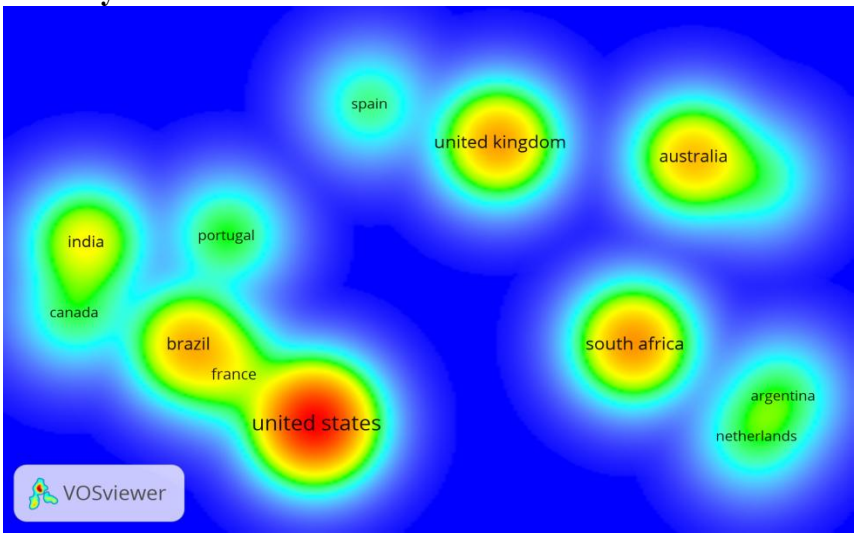
Figure 2.1 represent the country wise citation analysis.



(a) Network Visualization for Publications from Different Countries



(b) Overlay Visualizations for Publications from Different Countries



(c) Density Visualizations for Different Countries

Figure 2.1: Network, Overlay and Density Visualizations of Research Publications for Different Countries

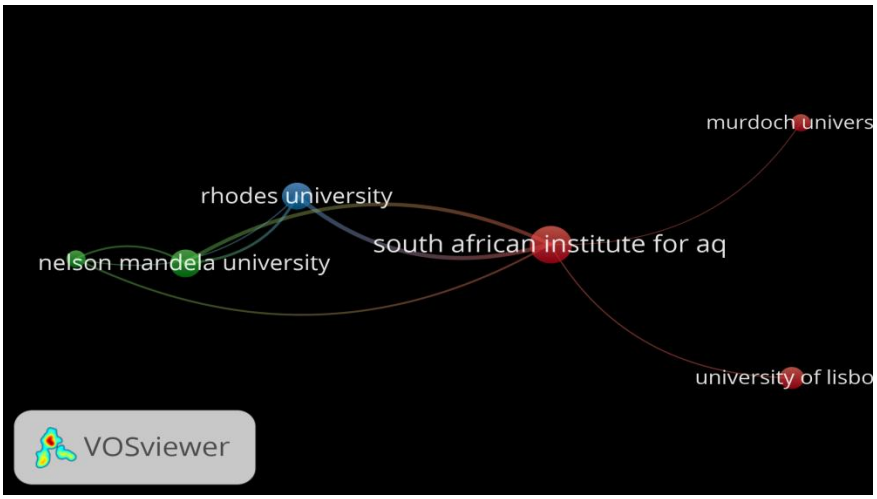
The network visualization illustrates the collaboration among different countries in publications related to ichthyofaunal diversity *and its* role in aquatic ecosystem functioning. The size of each node represents the volume of research output, while the connections indicate co-authorship or research collaboration strength. The *United States, United Kingdom, Brazil, and South Africa* appear as major contributors, signifying their significant role in studying fish diversity and ecosystem interactions. Countries like *India, Portugal, and Australia* also show active participation, highlighting global efforts in understanding how fish communities contribute to aquatic health. The diverse connections emphasize the interdisciplinary and international nature of research in this field.

The overlay visualization represents the temporal evolution of research collaborations on *ichthyofaunal diversity* and its *role in aquatic ecosystem functioning* across different countries. The color gradient, ranging from blue to yellow, indicates the progression of research activity. The *United States, United Kingdom, and South Africa* have been central contributors, with countries like *Brazil, India, and Portugal* emerging as active participants in recent years. The presence of *Netherlands and Argentina* in yellow suggests a growing focus on ichthyofaunal diversity and its ecological implications. This visualization highlights the dynamic nature of global research in aquatic ecosystems, emphasizing increasing international collaborations and evolving research trends over time.

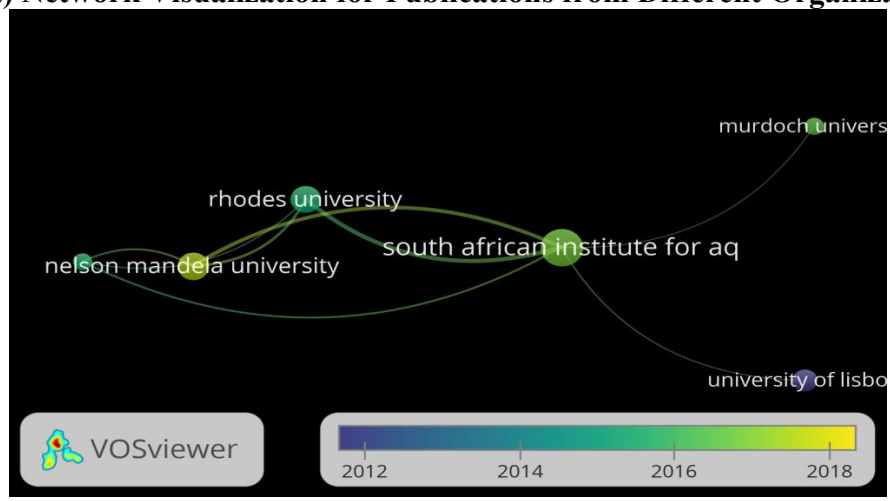
The density visualization represents the concentration of research activity on *ichthyofaunal diversity* and its *role in aquatic ecosystem functioning* across different countries. The red and yellow regions indicate high research output, while blue areas represent lower activity. The *United States* emerges as the most significant contributor, followed by *Brazil, South Africa, the United Kingdom, and Australia*, indicating strong research efforts in fish diversity and ecosystem studies. Countries like *India, Portugal, and Argentina* also show notable contributions but with relatively lower intensity. This heatmap highlights the global distribution of research, with major hubs driving advancements in understanding aquatic ecosystems and their biodiversity.

2.1.2 Organization wise Citation Analysis

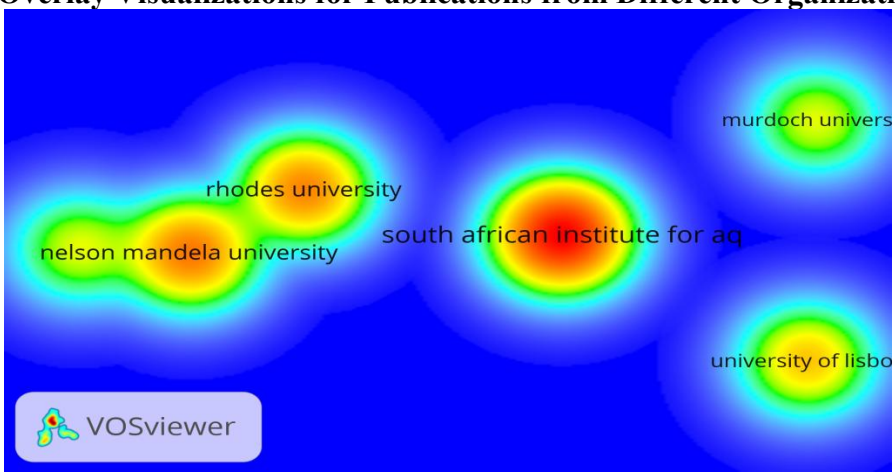
Figure 2.2 represent the organization wise citation analysis.



(a) Network Visualization for Publications from Different Organizations



(b) Overlay Visualizations for Publications from Different Organizations



(c) Density Visualizations for Different Organizations

Figure 2.2: Network, Overlay and Density Visualizations of Research Publications for Different Organizations

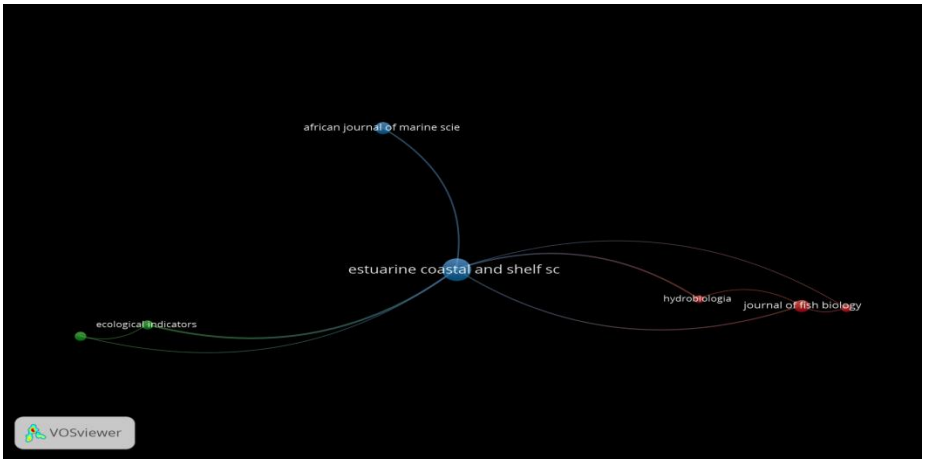
The network visualization illustrates institutional collaborations in research related to *ichthyofaunal diversity* and its *role in aquatic ecosystem functioning*. The *South African Institute for Aquatic Biodiversity* appears as a central hub, closely linked with *Rhodes University* and *Nelson Mandela University*, indicating strong regional research partnerships in South Africa. Connections with *Murdoch University* (Australia) and the *University of Lisbon* (Portugal) suggest international collaborations in studying fish diversity and aquatic ecosystems. The structure highlights the role of key institutions in advancing ichthyofaunal research, with South African universities forming the core of knowledge production and dissemination.

The overlay visualization highlights the temporal evolution of institutional research collaborations on *ichthyofaunal diversity* and its *role in aquatic ecosystem functioning*. The color gradient, ranging from blue to yellow indicates the timeline of research activity. The *South African Institute for Aquatic Biodiversity*, along with *Rhodes University* and *Nelson Mandela University*, has been a long-standing leader in this field, with research collaborations intensifying in recent years. *Murdoch University* and the *University of Lisbon* have engaged in more recent contributions, indicating expanding global participation. This visualization showcases the growing international focus on ichthyofaunal studies and aquatic ecosystem research.

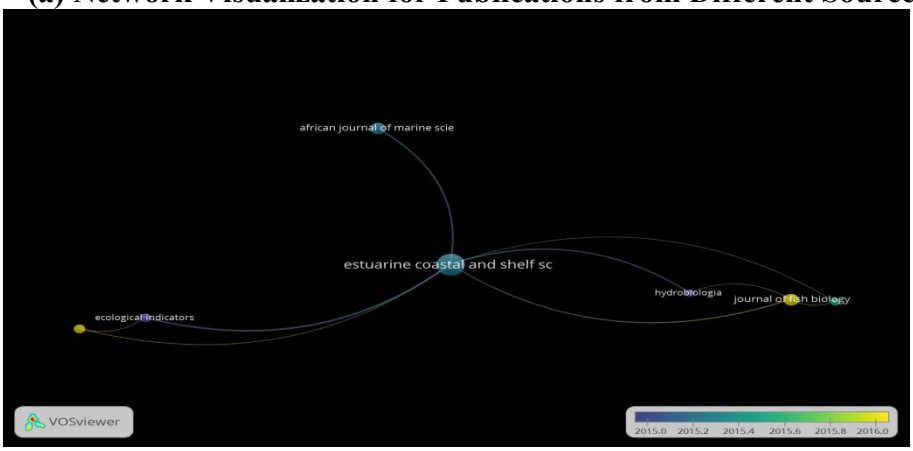
The density visualization highlights the intensity of research contributions from various institutions on *ichthyofaunal diversity* and its *role in aquatic ecosystem functioning*. The color gradient, with red indicating the highest research activity and blue the lowest, suggests that the *South African Institute for Aquatic Biodiversity* is a major hub for studies in this field, followed by *Rhodes University* and *Nelson Mandela University*. The presence of *Murdoch University* and the *University of Lisbon* in the visualization indicates global research participation, though with comparatively lower intensity. This heatmap underscores South Africa's leading role in advancing knowledge on fish diversity and its ecological functions, with international collaborations playing a supporting role.

2.1.3 Source wise Citation Analysis

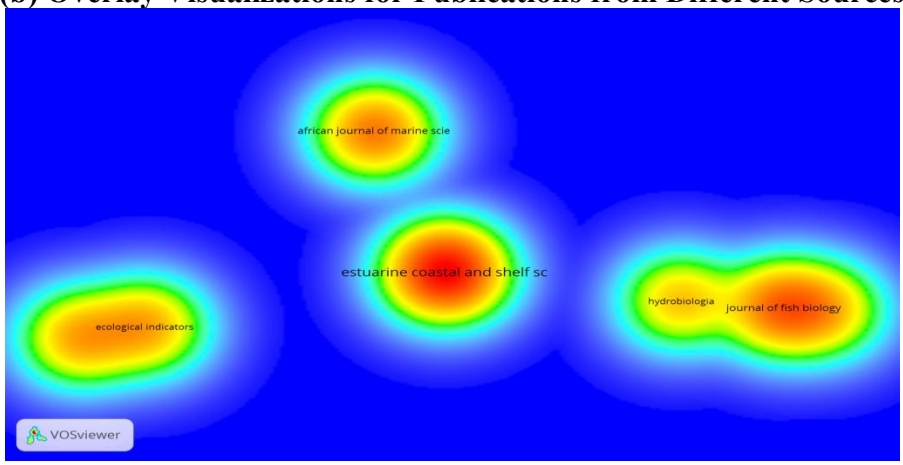
Figure 2.3 represent the source wise citation analysis.



(a) Network Visualization for Publications from Different Sources



(b) Overlay Visualizations for Publications from Different Sources



(c) Density Visualizations for Different Sources

Figure 2.3: Network, Overlay and Density Visualizations of Research Publications for Different Sources

The network visualization illustrates the relationships between different journals publishing research on *ichthyofaunal diversity* and its *role in aquatic ecosystem functioning*. *Estuarine, Coastal and Shelf Science* is the central hub, indicating its prominence in this research domain. It is closely linked to journals such as *Hydrobiologia* and the *Journal of Fish Biology*, which specialize in aquatic biodiversity and ecology. Additionally, connections with *Ecological Indicators* and the *African Journal of Marine Science* suggest an interdisciplinary approach, integrating ecosystem health assessments and regional marine studies. This visualization highlights the diverse academic sources contributing to ichthyofaunal and aquatic ecosystem research.

The overlay visualization represents the temporal distribution of publications related to *ichthyofaunal diversity* and its *role in aquatic ecosystem functioning* across different academic journals. The color gradient, ranging from blue (older publications, around 2015) to yellow (more recent studies, around 2016), indicates the evolving research landscape. *Estuarine, Coastal and Shelf Science* remains the central publication hub, with older research linked to the *African Journal of Marine Science* and more recent studies appearing in *Hydrobiologia* and the *Journal of Fish Biology*. The presence of *Ecological Indicators* in yellow suggests an increasing focus on ecosystem health assessments. This visualization highlights the shifting trends and expanding interdisciplinary nature of ichthyofaunal research in aquatic ecosystems.

The density visualization illustrates the concentration of research publications on *ichthyofaunal diversity* and its *role in aquatic ecosystem functioning* across different academic journals. The color gradient, with red indicating the highest research intensity and blue representing lower activity, highlights *Estuarine, Coastal and Shelf Science* as the most influential journal in this field. Other significant contributors include *Hydrobiologia* and the *Journal of Fish Biology*, which focus on fish ecology and biodiversity. *Ecological Indicators* and the *African Journal of Marine Science* also show strong research activity, reflecting a growing interdisciplinary approach. This visualization underscores the key publishing sources driving advancements in ichthyofaunal and aquatic ecosystem research.

3. Conclusion and Future Scope of the Research

Following points represent the conclusion of the research work:

- The study highlights the significance of *Ichthyofaunal Diversity* in maintaining aquatic ecosystem health, biodiversity conservation, and ecological balance.
- Bibliometric analysis indicates that the *United States, United Kingdom, Brazil, and South Africa* are major contributors to research in this field, with growing participation from *India, Portugal, and Australia*.
- Institutional collaborations are strong in South Africa, with the *South African Institute for Aquatic Biodiversity*, *Rhodes University*, and *Nelson Mandela University* playing key roles.
- *Estuarine, Coastal and Shelf Science* is the leading journal in publishing research on ichthyofaunal diversity, with significant contributions from *Hydrobiologia*, *Journal of Fish Biology*, and *Ecological Indicators*.
- The impact of human activities such as pollution, habitat destruction, and climate change on fish diversity is well-documented, emphasizing the need for conservation strategies.
- Technological advancements, such as *environmental DNA (eDNA) analysis*, have emerged as innovative tools for monitoring fish biodiversity and conservation.
- The temporal evolution of research shows increasing global collaborations, highlighting an interdisciplinary approach to understanding fish diversity and its role in ecosystem functioning

Following points represent the future scope of the research work:

- Development of region-specific conservation policies to protect fish diversity from pollution, overfishing, and habitat destruction.
- Further exploration of *eDNA-based monitoring*, remote sensing, and AI-driven predictive modeling to study fish biodiversity and ecosystem dynamics.
- Assessing the long-term effects of climate change on fish species distribution, reproduction, and ecosystem resilience.
- Strengthening collaborations between ecologists, marine biologists, data scientists, and policymakers to enhance biodiversity management.

- Encouraging participation from underrepresented regions in ichthyofaunal research to create a more comprehensive understanding of global aquatic biodiversity.
- Conducting long-term studies to track changes in fish populations and ecosystem health over time.
- Establishing stronger international policies and conservation frameworks to mitigate threats to ichthyofaunal diversity.
- Engaging local communities in sustainable fisheries management and conservation programs.

References

- Hernández-Ojendi, R., Ayala-Pérez, L., Herrera, A., & Vega-Rodríguez, B. (2020). Estructura de la comunidad de peces de la laguna mecoacán, tabasco. Jaina Costas Y Mares Ante El Cambio Climático, 2(1), 1-18. https://doi.org/10.26359/52462.0120
- Jerde, C., Mahon, A., Chadderton, W., & Lodge, D. (2011). “sight-unseen” detection of rare aquatic species using environmental dna. Conservation Letters, 4(2), 150-157. https://doi.org/10.1111/j.1755-263x.2010.00158.x
- Konan, K., Assi, S., Boussou, K., & Gourène, G. (2019). Update of ichthyofauna and its conservation status in the aghien lagoon, côte d’ivoire. Croatian Journal of Fisheries, 77(4), 253-262. https://doi.org/10.2478/cjf-2019-0019
- Kumar, P., Shyam, R., & Badola, S. (2019). Ichthyofaunal diversity of tumaria reservoir, kashipur, u.s. nagar (uttarakhand). Environment Conservation Journal, 20(3), 79-82. https://doi.org/10.36953/ecj.2019.20311
- Lamboj, A., Lucanus, O., Darko, P., Arroyo-Mora, J., & Kalácska, M. (2020). Habitat loss in the restricted range of the endemic ghanaian cichlidlimbochromis robertsi. Biotropica, 52(5), 896-912. https://doi.org/10.1111/btp.12806
- Machowski, R., Rzętała, M., Rzętała, M., & Solarski, M. (2019). Anthropogenic enrichment of the chemical composition of bottom sediments of water bodies in the neighborhood of a non-ferrous metal smelter (silesian upland, southern poland). Scientific Reports, 9(1). https://doi.org/10.1038/s41598-019-51027-w

- Ud, V., AY, D., MN, M., & Ug, V. (2020). Diversity of ichthyofauna in hiran-ii reservoir, gujarat (india). Journal of Entomology and Zoology Studies, 8(5), 1181-1188. https://doi.org/10.22271/j.ento.2020.v8.i5q.7671