Indonesian Journal of Limnology
Vol. 06 No. 02, 2025 (82-95)
E-ISSN :2774-2571

Assessing Fish Alpha Diversity in Relation to Water Quality Parameters in Mendelang River, Merangin, Jambi

Ina Nadya [a], Yun Alwi [b], Dyah Muji Rahayu [a]*, Heru Handoko [b], Lauura Hermala Yunita [a], Yusyam Leni [a], Farhan Ramadhan [a]

[a] Department of Fisheries, Faculty of Animal Husbandry, University of Jambi, Jambi 36361, Indonesia
[b] Department of Animal Husbandry, Faculty of Animal Husbandry, University of Jambi, Jambi 36361, Indonesia

*Corresponding author: dyahmuji86@unja.ac.id

Received 21 Oktober 2025 Accepted 1 December 2025 Published 5 December 2025

DOI: 10.51264/inajl.v6i2.94

Abstract
Information regarding the ecological evaluation of the Mendelang River from abiotic and biotic components is still limited. This study aims to determine species richness and abundance, assess diversity indices, and determine the effect of water quality on fish abundance in the Mendelang River, Mekar Jaya Village, South Tabir Subdistrict, Merangin Regency. The research method used was a survey with participatory observation techniques. The data collected included fish catches using *ambat* net fishing gear and water quality parameters (temperature, pH, dissolved oxygen, transparancy, and current). The results showed that there were 21 species with a total of 1541 individuals. The most dominant species were Seluang and Nilem. The Shannon-Wiener diversity index (H') value of 2.10 indicates a moderate category, the evenness index (E) of 0.69 is classified as high, and the Simpson dominance index (C) of 0.18 is in the low category. The water quality conditions of the Mendelang River were measured based on the water quality parameters. Meanwhile, Principal Component Analysis (PCA) shows that Seluang fish are strongly associated with temperature and pH, while Nilem fish are associated with pH and current. Based on the fish diversity index and water quality parameters, the Mendelang River ecosystem can be classified as ecologically stable. This ecological assessment serves as a foundation for evaluating and monitoring aquatic habitats, thereby supporting sustainable fisheries management.

Keywords: Fish biodiversity index, Mendelang river, Principal Component Analysis, Water quality.

To cite this article: Nadya, I., Alwi, Y., Rahayu, D. M., Handoko, H., Yunita, L. H., Leni, Y., Ramadhan, F. (2025). Assessing Fish Alpha Diversity in Relation to Water Quality Parameters in Mendelang River, Merangin, Jambi. *Indonesian Journal of Limnology*, 6(2), 82–95.

1. INTRODUCTION

The Mendelang River is one of the tributaries located in Mekar Jaya Village, South Tabir Subdistrict, Merangin Regency. The Mendelang River is 14 meters wide and 3 meters deep. This river flows into the Batang Tabir River, which flows into the Batang Merangin Sub-Watershed and eventually joins the Batanghari Watershed. The increase in land use for palm oil plantations, and fields, as well as illegal gold mining activities scattered along the banks of the Batang Tabir River and its tributaries, has caused a decline in the quality of the aquatic habitat (Akhtar *et al.,* 2021; Harmaini, 2021; Syah and Aprio, 2021; Amrullah, *et al.,* 2023; Haryani *et al.,* 2023). Land conversion can result in high erosion rates and accelerate sedimentation in lakes (Aprilliyana, 2015), compounded by the amalgamation mining process, which causes high turbidity, as indicated by high TSS (Total Suspended Solids) and TDS (Total Dissolved Solids) in rivers (Yulianti *et al.,* 2016; Tumbelaka *et al.,* 2023). Runoff sediment into rivers carries particles and materials that are harmful to fish survival (Issaka and Ashraf, 2016). High turbidity levels impact the mobility of several fish species (Rodrigues *et al.,* 2023) and reduce juvenile fish abundance (high mortality) due to damage to the gills (Lowe *et al.,* 2015). Normadic fish are mainly predatory and rely on vision, while stationary fish adapt by enhancing their sense of smell (Suriyampola *et al.,* 2018). The high mortality rate of juvenile fish and the mobility of some fish species have led to a decline in fish catches, especially toman (Channa spp.) and semah (Tor sp.) fish, which has become a complaint among fishermen on the Mendelang River.

These conditions indicate changes in the structure of the fish community that could potentially affect the level of species diversity in these waters (Arpiagam *et al.,* 2017). In addition, other human activities such as overfishing and the use of non-selective fishing gear can also reduce fish diversity (Boopendranath, 2013; Amaliyah, 2024). If these conditions continue without proper management, the ecosystem imbalance will be disrupted, and the sustainability of fish resources and species diversity in the Mendelang River will be threatened. An effective approach to assess alterations in water quality due to anthropogenic activities is by evaluating the diversity of aquatic biota, which serves as an integrative indicator of ecosystem health and helps to reveal how changes in community structure and species diversity, may ultimately affect the Mendelang River's resilience and sustainability.

Biodiversity plays an important role in maintaining ecosystem stability and resilience, supporting interspecies interactions, and ensuring the sustainability of resources that support human life (Gliessman, 2022). High diversity reflects an ecosystem that is stable and resilient to environmental disturbances (Fedor and Zvarikova, 2019). Conversely, low diversity can be an indicator of ecological stress (Aulia, 2020). The level of fish diversity in a water body is influenced by various abiotic factors, including the physical-chemical quality of the water, such as temperature, pH, dissolved oxygen, transparancy, and current velocity, as well as biotic factors such as food availability, habitat suitability, adaptability, and reproductive behaviour of species (Rahmani *et al.,* 2022). Information regarding the condition of the waters in the Mendelang River in Mekar Jaya Village through fish diversity and water quality assessments is still limited. Therefore, this study was conducted to determine species richness and abundance, assess diversity indices, and determine the effect of water quality on fish abundance. Data related to biodiversity and water quality are the first steps in monitoring and evaluating aquatic ecosystems as an effort to mitigate biodiversity loss in ecosystems and support sustainable fisheries (Asche, *et al.,* 2018; Supriatna, 2018; Maureaud *et al.,* 2019).

2. METHODS

2.1 Sampling Site

This research was conducted on the Mandelang River, Mekar Jaya Village, Merangin Regency, Jambi Province (Figure 1). The sampling activity was carried out in August 2025 with eight captures carried out every day in the morning and evening. The method used is a survey method, and data collection will be carried out through participatory observation. The survey method in this study refers to direct field observation and systematic data collection at predetermined stations along the Mendelang River. This approach is commonly used to describe ecological conditions, including species composition and environmental parameters (Ke and Miki, 2015). Data collection was conducted through participatory observation, where the researcher was directly involved in the fishing activities together with local fishers. This technique allows the researcher to observe fish catches, the operation of the *ambat* fishing gear, and river conditions more accurately and contextually (Susilawati *et al*., 2016).

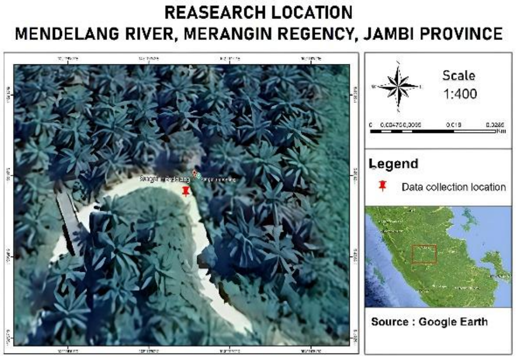
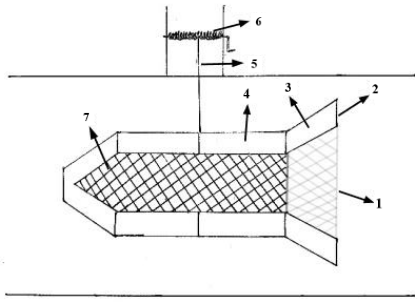


Figure 1. Map station on the Mendelang River

2.2 Fish Sample Collection

The fish were caught using an *ambat* (traditional fishing gear), which was modified at the mouth part (the fish entrance) (Figure 2). The *ambat* has a length of 35 m, a mouth width of 2 m, a height of 3 m, and a mesh size of 5 mm.



Description:
1. Mouth of the net
2. Wood
3. Net Wing
4. Body Mesh
5. Rope
6. Catrol

(a) (b)

Figure 2. (a) Modified *ambat* (a traditional fishing gear), and (b) The modified *ambat* installation.

The operating procedure for the *ambat* fishing gear involves installing the *ambat* with its mouth facing upstream (Figure 2, right). The *ambat* is modified by adding nets on the right and left sides of the mouth, forming wings that extend to the riverbank. The *ambat* is modified by adding nets, each six meters long, on the right and left sides of the mouth of the net, as shown in Figure 2. These nets serve to direct the fish so that they do not escape from the entrance to the mouth of the *ambat*. The *ambat* is submerged for 12 hours to allow sufficient time for the fish to enter the net. Monitoring is carried out to ensure that the position of the *ambat* remains stable and does not shift due to river current pressure or external disturbances. Fish are collected by directing them to the end of the net, then lifting the net using a pulley and using a ketek/canoe to collect the fish at the end of the net.

2.3 Water Quality Measurement

Measurement of environmental parameters of the Mendelang River using a Secchi disk to measure transparency, a pH meter to measure pH, a multitester to measure temperature and dissolved oxygen, and a stopwatch and 10 m rope to measure river flow velocity. Environmental parameters were measured twice during each catch, before and after fish collection. Measurements were repeated at several points to obtain average values, namely at the mouth of the net, the body of the net, and the end of the net. The standards for measuring water quality parameters refer to the Indonesian National Standards (SNI), summarized in Table 1.

Table 1. National standards used in measuring water quality parameters in the Mendelang River

No.	Measurement Parameters	SNI	Tools
1.	Transparency	SNI 6484.4:2014	Secchi disk
2.	Temperature	SNI 06-6989.23-2005	Multitester parameters (DO meter)
3.	pH	SNI 6989.11:2019	pH meter
4.	DO	SNI 06-6989.14-2004	Multitester parameters (DO meter)

Meanwhile, the current velocity parameter using the float-based method was chosen because of its practicality, non-electronic nature, and low cost (Fiaz, 2024). The float was released from the starting point at a distance of 10 meters, and the time taken was recorded using a stopwatch. The current velocity was calculated using the formula:

$$v = \frac{d}{t}$$

Description:
v = Velocity (m/s)
d = Displacement (m)
t = Time (s)

2.4 Data Analysis

The fish were counted individually, then analysed using PAST 4.03 to determine the diversity index (H'), evenness index (E), and dominance index (C). After that, PCA (Principal Component Analysis) was analysed to determine the correlation between water quality and species abundance. The reference categories for the indices are those proposed by Odum (1971), as presented in Table 2.

Table 2. Assessment categories of diversity index, homogeneity index, and dominance index.

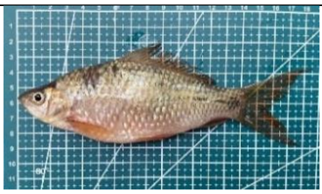
Biodiversity index assessment categories (H')	
H' < 1	: Low, meaning low diversity with an uneven number of individuals and one species dominating.
1 < H' < 3	: Moderate, meaning moderate diversity with a uniform number of individuals and no dominant species.
H' > 3	: High, meaning high species diversity, high number of individuals per species.
Index homogeneity assessment category (E)	
E < 0.4	: Low homogeneity
0.4 ≤ E ≤ 0.6	: Moderate homogeneity
E > 0.6	: High homogeneity
Dominance index assessment categories (C)	
C < 0.4	: Low species dominance
0.4 ≤ C ≤ 0.6	: Moderate species dominance
C > 0.6	: Dominance of all types

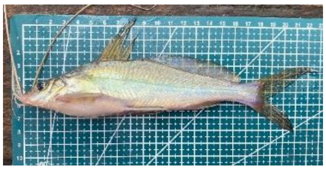
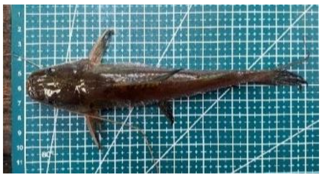
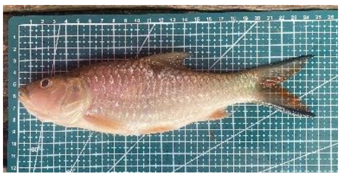
3. RESULTS AND DISCUSSION

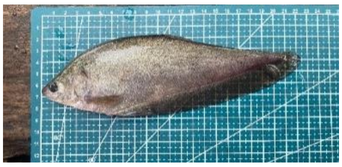
3.1 Species Richness and Abundance

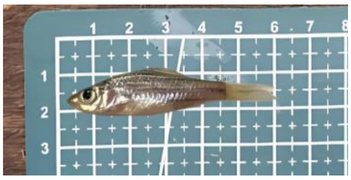
The various fish species and their abundance found in the Mendelang River, Mekar Jaya Village, can be seen in Table 3. Based on the results of the study, there are 21 fish species in the Mendelang River, with a total of 1541 individuals.

Table 3. Composition of Fish Species in the Mendelang River

No.	Local Name	Scientific Name	Image of Fish	Total	Fish composition (%)
1	Nilem	*Osteochilus vittatus*	 18.5 cm	218	14.15
2	Betok	*Anabas testudineus*	 15.5 cm	118	7.66

3	Keting	*Mystus gulio*	 23 cm	169	10.97
4	Lais	*Kryptopterus lais*	 21 cm	208	13.50
5	Baung	*Hemibagrus nemurus*	 19 cm	20	1.30
6	Gabus	*Channa striata*	 30 cm	70	4.54
7	Lele	*Clarias batrachus*	 26 cm	20	1.30
8	Tembakang	*Helostoma temminckii*	 19 cm	71	4.61
9	Selincah	*Belontia hasselti*	 10 cm	7	0.45
10	Parang-parang	*Macrochirichthys macrochirus*	 16.5 cm	35	2.27
11	Baro-baro	*Hampala macrolepidota*	 25 cm	5	0.32

12	Sili	*Macrognathus siamensis*	 27 cm	9	0.58
13	Buntal	*Pao leiurus*	 20 cm	8	0.52
14	Beterung	*Pristolepis fasciata*	 12.5 cm	17	1.10
15	Tapah	*Wallago leerii*	 30 cm	30	1.95
16	Belida	*Notopterus notopterus*	 22.5 cm	1	0.06
17	Lele Dumbo	*Clarias gariepinus*	 26 cm	2	0.13
18	Damaian	*Thynnichthys thynnoides*	 12 cm	2	0.13
19	Belut	*Monopterus albus*	 61 cm	3	0.19
20	Layang-Layang	*Bagrichthys macropterus*	 20 cm	1	0.06

21	Seluang	*Rasbora* sp.	 6 cm	527	34.20
		TOTAL		**1541**	**100**

Based on fish catch results in the Mendelang River, there is a significant difference between the dominant fish species and those rarely caught. The four most common caught fish species were Seluang (*Rasbora* sp.) with 527 (34.20%), followed by Nilem (*O. vittatus*) with 218 (14.15%), Lais (*K. lais*) with 208 fish (13.50%), and Keting (*M. gulio*) with 169 fish (10.97%). The dominance of these four species is most likely influenced by their ability to adapt to various habitat conditions, reproductive patterns, and abundant food availability. These results differ from Silalahi's (2022) research in the Mendelang River, Muara Delang Village, South Tabir District, Merangin Regency, which showed that only four (4) species were found with a total abundance of 451 individuals, namely Catfish (*Clarias* sp.), Lais (*Cryptopterus* spp.), Keting (*Mystus* sp.), and Seluang (*Rasbora* sp.). Meanwhile, the catch results obtained by Amrullah *et al.* (2023) in the Tabir River, Tabir Lintas Subdistrict, Merangin Regency, found 15 species with a total of 460 individuals, namely Nila (*Oreochromis niloticus*), Patin (*Pangius nasitus*), Nilem (*Cyclocheilichthys apogon*), Siamis/Seluang pimping (*Oxygaster anomalura*), Seluang (*Rasbora caudimaculata*), Genggehek (*Mystacoleuscus marginatus*), Kapiat (*Puntius belinka*), Sengiring (*Mystus nigriceps*), Belida (*Notopterus*), Betok (*A. testudineus*), Patung/sepatung (*Pristolepis grrotii*), Tawes (*Barbonimus gonionotus*), Gabus (*C. striata*), Mas (*Cyprinus carpio*), Betutu (*Oxyeleotris marmorata*). Their study used gillnets and traditional gears with larger mesh sizes and sampling was carried out only during daytime in the dry season, which may have limited the number of species caught compared to this study, which used a modified *ambat* with a smaller mesh size (5 mm) and sampled both in the morning and evening during the transition period between dry and rainy seasons. *O. vittatus* and *Rasbora* sp. were also indicated to be found in streams in oil palm plantations, Trengganu, Malaysia (Nasser *et al*., 2024), whose sampling used electrofishing and seine nets during stable dry-season conditions. These differences in fishing gear, sampling time, and sampling season likely explain why this study recorded higher species richness, with both *O. vittatus* and *Rasbora* sp. being found in greater abundance.

3.2 Diversity, Evenness, and Dominance Indices

The diversity index provides information on the number of species and organisms in a community, while the evenness index describes the composition of each individual in each species within a community. The dominance index shows the level of species that dominate a community. Data on the diversity, homogeneity and dominance indices of fish in the Mendelang River, Mekar Jaya Village, in Table 4.

Table 4. Diversity index, homogeneity index, and dominance index

Index	Value	Categories
H`	2.10	Moderate
E	0.69	High
C	0.18	Low

Based on Table 4, the diversity index (H') value in the Mendelang River is 2.10, which is classified as moderate. The homogeneity index (E) value of 0.69 is classified as high, as is the dominance index (C) value of 0.18, which is also classified as low. Based on research by Amrullah *et al.* (2023), who also measured the diversity index in the Tabir River, Merangin Regency, Jambi, it also showed a moderate category with a value range of 1.83–2.39. Meanwhile, the results of research by Syafrialdi and Amrullah (2025), who assessed the diversity index in the Batang Bungo River, Bungo Regency, Jambi, showed results of H' 2.85-3.45 (medium-high), E 0.68-0.83 (high), and C 0.11-0.23 (low). Moderate diversity, high evenness, and low dominance indicate that the Mendelang River in Mekar Jaya Village has begun to experience disturbance. The observed disturbances may be related to various human activities around the river, although further evidence is needed to confirm their direct influence on the fish community structure. Data from the Jambi Central Statistics Agency (BPS) indicates that the area of oil palm plantations in Merangin District in 2023 will be 131,540 hectares. These plantations require intensive fertilisation to support better palm oil growth (Budiargo *et al*., 2015; Afrizon, 2018). Unfortunately, high levels of fertiliser and pesticide use can harm aquatic ecosystems when nutrient residues are carried away by water flow (Comte *et al*., 2015). A case study of Borneo shows contamination by nitrate, phosphorus, potassium, chloride, and sodium resulting from fertiliser and pesticide use in oil palm plantations (Chellaiah & Yule, 2018; Tokuchi *et al*., 2019; Itoh, *et al*., 2023). Water conditions exposed to the use of fertilisers and pesticides in oil palm plantations can affect changes in the structure of fish communities that are able to adapt and the distribution of fish (Ferreira *et al.,* 2018; Azizan *et al*., 2021). As shown in a study conducted by Azizan *et al.* (2021), *Trichopodus trichopterus* and *Anabas testudineus* are abundant fish species in oil palm cultivation areas on peat swamps in Malaysia, where high DOC levels are indicated.

3.3 Water Quality

This water quality analysis is the basis for assessing the condition of the water and its suitability for fish life. According to the Minister of Environment Decree No. 22 of 2021, water quality can be determined by comparing parameter values with established quality standards. If a parameter value is within the quality standard range, the water condition can be categorised as good and supportive of aquatic biota life. Conversely, if it exceeds the threshold, the water quality is declared to have deteriorated and might put pressure on the fish community. The results of the Mendelang River water quality measurements can be seen in Table 5.

Table 5. Results of water quality measurements in the Mendelang River

Environmental Parameters	Range	Average	Water Quality Assessment (PP 22/2021)
Current (m/s)	0,63 - 1,11	0,86	Not classified
Transparency (cm)	34,5 - 77	43,05	Boyd (2019) classifies 30-60 cm as moderate transparency for productive waters.
DO (mg/L)	3,5 - 6,0	4,85	Class II (good) (≥ 4 mg/L)
Temperature (°C)	24 - 28	25,69	Class I-II (good) (25-30°C)
pH	6,6 - 7,2	6,93	Class I-II (good) (6,5-8,5)

Description:
Class I: for raw drinking water, sensitive ecosystems.
Class II: for water recreation, freshwater fish farming, livestock farming, and irrigation.

Based on the results of water quality parameter measurements in Table 5, the measurement values still meet the quality standards in accordance with Government Regulation No. 22 of 2022, especially for DO, temperature, and pH. These parameters experienced fluctuations in values between morning and afternoon measurements. Purification processes may cause these changes through biochemical processes (Parker *et al*., 2018; Muhammad *et al.*, 2020). These changes are important factors for fish responsiveness, behaviour, and survival (Marium *et al.*, 2023). According to Anawar and Chowdhuri (2020), to degrade pollutants, microbial activity will increase, which requires DO and is influenced by pH and temperature.

The condition of the sampling water around oil palm plantations and its brownish colour (Figure 2, right) may indicate sediment runoff, which, according to Cristiano and Sabatino (2024), causes erosion and sedimentation. The sediment contains suspended particles from fertilisation and pesticide use in oil palm plantations. High levels of suspended particles can increase turbidity, give the water its colour, and interfere with light penetration (Boyd, 2019). The depth of the Mendelang River is 3 meters, while the transparency or light penetration is < 1 meter, indicating that the river is quite turbid. The distribution of suspended particles is influenced by the current. Based on Putra *et al.* (2013), current is divided into three categories, namely weak current (0.01-0.19 m/s), moderate current (0.20-0.39 m/s), and strong current (≥0.40 m/s). Meanwhile, the measurement results show that the river current at this study is classified as fast-current category. Water current can affect nutrient decomposition, benthic distribution, and nutrient transport media (Elbrecht *et al*., 2016; Cristiano and Sabatino, 2024).

3.4 Principal Component Analysis (PCA) of Water Quality and Fish Abundances

To understand the relationship between water quality parameters and fish species distribution, principal component analysis (PCA) was conducted. This analysis aims to reduce diverse environmental variables into several main components so that the dominant factors affecting fish abundance in each catch can be identified. Through PCA, the relationships between water quality parameters such as temperature, pH, dissolved oxygen (DO), transparency, and current velocity with fish abundance can be described more clearly, while also providing information about the habitat preferences of each fish species.

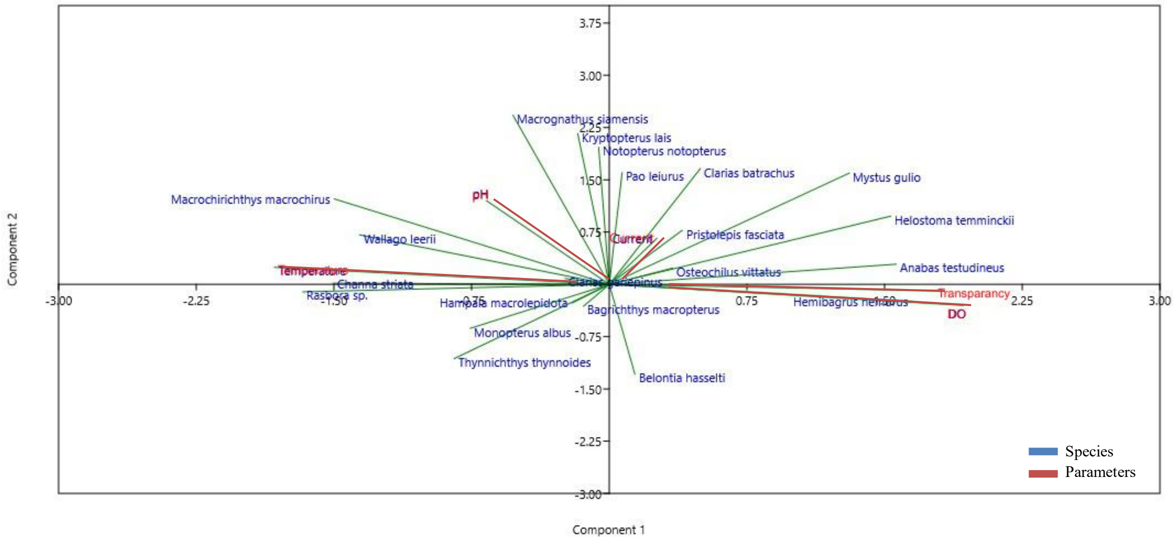


Figure 4. PCA analysis and fish abundance based on catch results in the Mendelang River

The PCA analysis results show that fish distribution in the Mendelang River is greatly influenced by water quality. Seluang fish are strongly associated with temperature and pH, indicating the dominance of this species in waters with relatively warm temperatures and neutral to slightly alkaline pH. Temperature and pH are important factors that influence fish metabolism and distribution in water (Hayati *et al*., 2017). *Rasbora* sp. can live in habitats with temperatures of 25ºC-31.6ºC and pH 4.23-7.24 (Rosadi *et al*., 2014). The best quality *Rasbora* sp. is found at a temperature of 27.03°C, pH 7.02, and DO 6.79 mg/l (Azhar *et al*., 2022). *O. vittatus* and *K. lais* are more associated with pH and current velocity, indicating good adaptability to water conditions with high currents and neutral to slightly alkaline pH levels. Stable currents help oxygen distribution in the water and maintain a suitable bottom habitat for these species (Sa'adah *et al*., 2023). The pH habitat of *O. vittatus* is 5.73-7.19 (Shafiq *et al*., 2014).

Some species, such as *C. batrachus* and *C. satriata*, appear less influenced by the measured parameters in the PCA biplot. This may be due to their eurytopic nature, meaning they can tolerate a wide range of environmental conditions. For instance, *Clarias* spp. are known to inhabit turbid and low-oxygen waters due to their air-breathing ability (Paujiah, 2024). Similarly, *C. satriata* tolerates variable DO and temperature and can survive in hypoxic conditions, explaining their presence across stations with differing water quality. On the other hand, several unique species such as *N. notopterus* and *B. macropterus* were found only in small numbers, possibly due to their preference for clearer and deeper waters. These species are sensitive to turbidity and sedimentation, as suspended particles reduce visibility and interfere with their feeding behavior (Lowe *et al.,* 2015; Rodrigues *et al*., 2023). Their limited occurrence in the Mendelang River suggests that moderate turbidity may restrict their distribution.

The PCA also emphasizes that dominant species such as *Rasbora* sp. And *O. vittatus* benefit from moderate DO levels and neutral pH, which are typical of rivers surrounded by agricultural or oil palm landscapes. Their abundance reflects thrive even under mild environmental stress (Azizan *et al.,* 2021). In summary, the relationship between water quality and fish community structure in the Mendelang River indicates that different species respond differently to environmental gradients. While tolerant and generalist species like *Clarias* sp., *C. satriata,* and *Rasbora* sp. Can adapt to fluctuating conditions, sensitive species such as *N. notopterus* and *B. macropterus* are more restricted by turbidity and flow current. This pattern highlights that habitat heterogeneity particularly variation in current, temperature, and water clarity plays a key role in shaping species composition and maintaining fish diversity in the Mendelang River.

4 CONCLUSION

Based on research conducted in the Mendelang River, Mekar Jaya Village, South Tabir Subdistrict, a total of 21 fish species with 1541 individuals were found. *Rasbora* sp. was identified as the most dominant species, followed by *O. vittatus*, *K. lais*, and *M. gulio*. The fish diversity index (H') was classified as moderate, with high evenness (E) and low dominance (C), indicating that the fish community habitat in the Mendelang River is relatively stable and balanced. This study successfully determined species richness and abundance, assessed diversity indices, and analyzed the effect of water quality on fish abundance using the PCA method. The results show that *Rasbora* sp. and *O. vittatus* are associated with temperature, pH, and current, while other species such as *C. batrachus* and *C. striata* show tolerance to broader environmental conditions. Overall, the Mendelang River exhibits good water quality and supports a stable fish community structure.

Further monitoring should be conducted in different seasons to observe temporal changes in fish community composition and water quality. In addition, the use of multiple fishing gears with varying mesh sizes is recommended to capture a wider range of species. Conservation efforts should also focus on controlling sediment runoff and maintaining riparian vegetation to sustain the ecological balance of the Mendelang River ecosystem.

5. REFERENCES

Afrizon, A. 2018. Pertumbuhan bibit kelapa sawit (Elaeis guineensis Jacq.) dengan pemberian pupuk organik dan anorganik. *AGRITEPA: Jurnal Ilmu Dan Teknologi Pertanian*, 4(1), 95 - 105. https://doi.org/10.37676/agritepa.v4i1.591

Akhtar, N., Ishak, M.I.S., Bhawani, S.A., and Umar, K. 2021. Various natural and anthropogenic factors responsible for water quality degradation: a review. *Water*, 13(19), 2660. https://doi.org/10.3390/w13192660

Amaliyah, A. H. 2024. Dinamika Populasi Dan Analisis Aspek Biologi Ikan Kuniran Upeneus guttatus (Day, 1868) Di Perairan Polewali Mandar. [Tesis]. Universitas Hasanuddin, Makassar.

Amrullah, Mohd. Y., Hertati, R., dan Jayanti, E. 2023. Keanekaragaman jenis ikan di Sungai Tabir Kecamatan Tabir Lintas Kabupaten Merangin. *Jurnal Pengelolaan Sumberdaya Perairan*, 7(2), 110–117. http://ojs.umb-bungo.ac.id/index.php/SEMAHJPSP

Anawar, H. and Chowdhury, R. 2020. Remediation of polluted river water by biological, chemical, ecological and engineering processes. *Sustainability* 2020, 12(17), 7017. https://doi.org/10.3390/su12177017

Aprilliyana, D. 2015. Pengaruh perubahan penggunaan lahan sub DAS Rawapening terhadap erosi dan sedimentasi Danau Rawapening. *Jurnal Pembangunan Wilayah dan Kota*, 11(1), 103-116. https://doi.org/10.14710/pwk.v11i1.8661

Arerapapa, B., Kaparoi, K., Paiderowi, P., dan Rahandra, R. M. 2022. Komponen abiotik pada Sungai Webi di Kampung Marau. *UNES Journal of Scientech Research*, 7(2), 156–166. https://ojs.ekasakti.org/index.php/UJSR/

Arifin, M. Y. (2016). Pertumbuhan dan survival rate ikan nila (Oreochromis. Sp) strain meran dan strain hitam yang dipelihara pada media bersalinitas. *Jurnal Ilmiah Universitas Batanghari Jambi*, 16(1), 159–166.

Arpiagam, Hertati, R., dan Budiyono. 2017. Identifikasi dan keanekaragaman jenis ikan di Sungai Terap Kabupaten Merangin Provinsi Jambi. *SEMAH : Journal Pengelolaan Sumberdaya Perairan*, 1(2).

Asche, F., Garlock, T.M., Anderson, J.L., and Vannuccini, S. 2018. Three pillars of sustainability in fisheries. *PNAS*, 115(44), 11221-11225. https://doi.org/10.1073/pnas.1807677115

Aulia, P.R., Supratman, O., and Gustomi, A. 2020. The community structure of macrozoobenthos as the bioindicator of the water quality in Upang Stream Tanah Bawah Villag Puding Besar Sub District Bangka Regency. Aquatic Science: *Jurnal Ilmu Perairan*, 2(1), 17-30. http://journal.ubb.ac.id/index.php/aquaticscience

Azizan, S.N.F., Huynh, M.N., Padfield, R., Evers, S.L., Noborio, K. and Hara, H. 2021. The Effects of oil palm plantation on fish composition in Selangor Peatlands, Malaysia. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 25 (1), 19-36. https://researchonline.ljmu.ac.uk/id/eprint/16246

Azhar, M.H., Pratama, W.K., Budi, D.S., Mukti, A.T., Santanumurti, M.B., and Memiş, D. 2022. The effect of stocking density on growth performance and water quality of the silver rasbora (*Rasbora argyrotaenia*) fry reared in plastic-lined pond. *Egyptian Journal of Aquatic Biology & Fisheries*, 26 (5), 1165-1176. https://ejabf.journals.ekb.eg/article_267444.html

Boopendranath, M.R. 2013. Biodiversity conservation technologies in fisheries. *Journal of Aquatic Biology & Fisheries*, 1(1&2), 10-22

Boyd, C.E. 2020. Suspended Solids, Color, Turbidity, and Light. *In*: Water Quality. Springer, Cham. 119-113. https://doi.org/10.1007/978-3-030-23335-8_6

Budiargo, A., Purwanto, R., dan Sudradjat. 2015. Manajemen pemupukan kelapa sawit (*Elaeis guineensis Jacq*.) di Perkebunan Kelapa Sawit, Kalimantan Barat. *Buletin Agrohorti*, 3(2), 221-231. https://doi.org/10.29244/agrob.v3i2.14986

Chellaiah, D., and Yule, C. M. 2017. Effect of riparian management on stream morphometry and water quality in Oil Palm Plantations in Borneo. *Limnologica*, 69, 72-80. https://doi.org/10.1016/j.limno.2017.11.007

Comte, I., Colin, F., Grünberger, O., Whalen, J.K., Widodo, R.H., and Caliman, J.P. 2015. Watershed-scale assessment of oil palm cultivation impact on water quality and nutrient fluxes: a case study in Sumatra (Indonesia). *Environmental Science and Pollution Research*, 22, 7676–7695. https://doi.org/10.1007/s11356-015-4359-0

Cristiano, G., and Di Sabatino, A. 2024. How Does Water Current Velocity Affect Invertebrate Community And Leaf-Litter Breakdown In A Physicochemically Stable Freshwater Ecosystem? An Experimental Study In Two Nearby Reaches (Erosional Vs. Depositional) Of The Vera Spring (Central Italy). Integrating Ecohydrology and Ecohydraulics, 17(4), e2532.

Effendi, H. 2023. Telaah Kualitas Air, Bagi Pengelolaan Sumber Daya dan Lingkungan Perairan (V. paska, Ed.; Elektronik). Kanisius.

Elbrecht, V., Beermann, A.J., Goessler, G., Neumann, J., Tollrian, R., Wagner, R., Wlecklik, A., Piggott, J.J., Matthaei, C.D., and Leese, F. 2016. Multiple-stressor effects on stream invertebrates: a mesocosm experiment manipulating nutrients, fine sediment and flow velocity. *Freshwater Biology*, *61*(4), 362-375.

Ermawati, Yunita, R., dan Rahma, M. 2017. Keanekaragaman ikan di Sungai Batang Banyu Kecamatan Banua Lawas Kabupaten Tabalong Provinsi Kalimantan Selatan. *AQUATIC*, 1(2), 73–73.

Fedor, P., and Zvarikova, M. 2019. Biodiversity Indices. *In* Encyclopedia of Ecology (Second Edition) by Fath, B.D. Elsevier, United Kingdom, 337-346. https://doi.org/10.1016/B978-0-12-409548-9.10558-5

Fiaz, M. 2024. Exploring Methods for Measuring Velocity and Discharge in Water Flow: A Comparative Analysis Hydrology and Water Resources. https://doi.org/10.13140/RG.2.2.12207.34728

Ganesid, M. A. P., Burhanuddin, dan Manurung, T. F. 2019. Keanekaragaman jenis vegetasi di Cagar Alam Lho Fat Pun Pie Kecamatan Monterado Kabupaten Bengkayang. *Jurnal Hutan Lestari*, 7(1), 86–96.

Gliessman, S. 2022. Why is ecological diversity important? agroecology and sustainable food systems. In Agroecology and Sustainable Food Systems (3rd ed., Vol. 46, Issue 3). Taylor and Francis Ltd. https://doi.org/10.1080/21683565.2022.2032513

Harmaini. 2021. Analisis yuridis permasalahan perizinan dan dampak lingkungan perkebunan kelapa sawit di Kabupaten Merangin. *Adil : Jurnal Hukum STIH YPM*, 3(2), 1-11. https://adil.stihypm.ac.id/index.php/ojs/article/view/2

Hamuna, B., Tanjung, R. H. R., Maury, H. K., dan Alianto. 2018. Kajian kualitas air laut dan indeks pencemaran berdasarkan parameter fisika-kimia di Perairan Distrik Depapre, Jayapura. *Jurnal Ilmu Lingkungan*, 16, 35–43. https://doi.org/10.14710/jil.16.135-43

Hayati, A., Tiantono, N., Mirza, M. F., Putra, I. D. S., Abdizen, M. M., Seta, A. R., Solikha, B. M., Fu'adil, M. H., Putranto, T. W. C., Affandi, M., and Rosmanida. 2017. Water quality and fish diversity in the Brantas River, East Java, Indonesia. *Journal of Biological Researches*, 22(2), 43–49. https://doi.org/10.23869/bphjbr.22.2.20172

Haryani, W.A., Baskoro, D.P.T., dan Hidayat, Y. 2023. Analisis perubahan penggunaan lahan di DAS Batang Tabir Kabupaten Merangin Provinsi Jambi. *Jurnal Penelitian Pengelolaan Daerah Aliran Sungai*, 7(1), 89-104. https://doi.org/10.59465/jppdas.2023.7.1.89-104

Humaira, R., dan Al Maulida, S. 2022. Keanekaragaman jenis plankton di perairan kawasan wisata Alam Iboih Kota Sabang. *Prosiding Seminar Nasional Biotik*.

Issaka, S., and Ashraf, M.A. 2017. Impact of soil erosion and degradation on water quality: a review. *Geology, Ecology, and Landscapes*, 1(1), 1-11. https://doi.org/10.1080/24749508.2017.1301053

Itoh, M., Osaka, K., Iizuka, K., Kosugi, Y., Lion, M., and Shiodera, S. 2023. *Science of The Total Environment,* 859(2), 160319. https://doi.org/10.1016/j.scitotenv.2022.160319

Ke, P. J., and Miki, T. 2015. Incorporating the soil environment and microbial community into plant competition theory. *Frontiers in Microbiology*, *6*(1066), 1–15. https://doi.org/10.3389/fmicb.2015.01066
Kusuma, N. P. D., Tangguda, S., dan Lau, J. R. 2024. Analisis kualitas air dan hubungannya dengan pertumbuhan ikan lele sangkuriang (Clarias gariepinus) pada padat tebar berbeda. *Journal Galung Tropika*, 13(2), 256–267. https://doi.org/10.31850/jgt.v13i2.1219
Lowe, M.L., Morrison, M.A., and Taylor, R.B. 2015. Harmful effects of sediment-induced turbidity on juvenile fish in Estuaries. *Marine Ecology Progress Series*, 539, 241-254. https://doi.org/10.3354/meps11496
Madyawan, D., Hendrawan, I. G., dan Suteja, Y. 2020. Pemodelan oksigen terlarut (Dissolved Oxygen/DO) di Perairan Teluk Benoa. *Journal of Marine and Aquatic Sciences*, 6(2), 270–280. https://doi.org/10.24843/jmas.2020.v06.i02.p15
Maulana, M. A., dan Kuntjoro, S. 2023. Hubungan indeks keanekaragaman makrozoobentos dengan kualitas air Kali Surabaya, Wringinanom, Gresik. *LenteraBio*, 12(2), 219–228. https://journal.unesa.ac.id/index.php/lenterabio/index
Maureaud, A., Hodapp, D., van Denderen, P.D., Hillebrand, H., Gislason, H., Dencker, T. S., Beukhof, E., and Lindegren, M. 2019. Biodiversity–ecosystem functioning relationships in fish communities: biomass is related to evenness and the environment, not to species richness. *Proceedings of The Royal Society B: Biological Science*, 286(1906), 1-9. https://doi.org/10.1098/rspb.2019.1189
Marium, A., Chatha, A.M.M., Naz, S., Khan, M.F., Safdar, W., and Ashraf, I. 2023. Effect of temperature, pH, salinity and dissolved oxygen on fishes. *Journal of Zoology and Systematic*, 1(2), 1-12. https://doi.org/10.56946/jzs.v1i2.198
Modalo, R. J., Rampengan, R. M., Opa, E. T., Djamaluddin, R., Hermanto, W. K. M., dan Bataragoa, N. E. 2018. Arah dan kecepatan arus perairan sekitar Pulau Bunaken pada periode umur bulan perbani di musim pancaroba II. *Jurnal Pesisir Dan Laut Tropis*, 1, 61–68.
Muhammad, G., Mehmood, A., Shahid, M., Ashraf, R. S., Altaf, M., Hussain, M.A. and Raza, M.A. 2020. Biochemical Methods for Water Purification. In: Inamuddin, Ahamed, M.I., Lichtfouse, E., Asiri, A.M. (eds) Methods for Bioremediation of Water and Wastewater Pollution. *Environmental Chemistry for a Sustainable World*, 51, Springer, Cham. https://doi.org/10.1007/978-3-030-48985-4_8
Nahlunnisa, H., Zuhud, E. A. M., dan Santosa, D. Y. 2016. Keanekaragaman spesies tumbuhan di areal nilai konservasi tinggi (NKT) perkebunan kelapa sawit Provinsi Riau. *Media Konservasi*, 21(1), 91–98.
Naser, M.A., Sahari, M.S.I., Ahmad, M.F., and Ahmad, A. 2024. Fish species richness, their importance and conservation status in Tropical Oil Palm Agroecosystem of Terengganu, Peninsular, Malaysia. *Journal of Oil Palm Research*, 36(1), 51-62. https://doi.org/10.21894/jopr.2022.0077
Nazar, A., Utami, E., dan Umroh, U. 2024. Korelasi keanekaragaman plankton dengan parameter fisika-kimia perairan di estuari Sungai Selan Kabupaten Bangka Tengah. *Journal of Marine Research*, 13(3), 485–492. https://doi.org/10.14710/jmr.v13i3.39310
Nurasmi. 2023. Karakter Morfometrik dan Meristik Ikan Nilem, Osteochilus vittatus (Valenciennes, 1842) di Danau Tempe, Kabupaten Wajo dan Danau Sidenreng, Kabupaten Sidenreng Rappang, Sulawesi Selatan. [Skripsi]. Universitas Hasanuddin. Makassar
Nurika, F. B. P., Wiryani, E., dan Jumari. 2019. Keanekaragaman vegetasi riparian Sungai Panjang bagian hilir di Kecamatan Ambarawa Kabupaten Semarang. *Jurnal Akademia Biologi*, 8(1), 30.
Odum, E. P. 1971. Fundamental Of Ecology (3rd ed.). Saunders. Philadelphia.
Paujiah, E. 2024. Bioekologi Ikan Keting (Mystus gulio Hamilton 1822) dan Model Pengelolaannya di Muara Sungai Kabupaten Cianjur, Jawa Barat. Universitas Padjadjaran.
Pingki, T. 2021. Analisis kualitas air sungai berdasarkan ketinggian Sungai Bladak dan Sungai Kedungrawis di Kabupaten Blitar. *Budidaya Perairan*, 9(2), 54–63.
Purba, R. H., Mubarak, dan Galib, M. 2018. Sebaran total suspended solid (TSS) di kawasan Muara Sungai Kampar Kabupaten Pelalawan Provinsi Riau. *Jurnal Perikanan Dan Kelautan*, 23(1), 21–30.
Putra, A. E., Najamuddin., dan Hajar, M. A. I. 2013. Pengaruh arah dan kecepatan arus terhadap hasil tangkapan jaring perangkap pasif (Set Net) di Teluk Mallasoro, Jeneponto. *Jurnal Sains & Teknologi*. 13(3), 257–263.
Putra, I. S. 2015. Studi pengukuran kecepatan aliran pada sungai pasang surut. *Info Teknik*, 16(1), 33–46.

Rahmani, R. M., Fitri, Y., Sarianto, D., Harisjon, dan Aisyah, S. 2022. Kajian kualitas air terhadap keanekaragaman jenis ikan di Perairan Batang Naras Kabupaten Padang Pariaman. *Konservasi Hayati*, 18(2), 88–105. https://ejournal.unib.ac.id/index.php/hayati

Ridho, Moh. rasyid, dan Patriono, E. 2020. Keanekaragaman jenis ikan di Danau Teluk Rasau, Pedamaran Kabupaten Ogan Komering Ilir Provinsi Sumatera Selatan. *Majalah Ilmiah Biologi Biosfera : A Scientific Journal*, 37(2), 118–125. https://doi.org/https://doi.org/10.20884/1.mib.2020.37.2.1047

Ridwantara, D., Buwono, I. D., Suryana, A. A. H., Lili, W., dan Bangkit, I. 2019. Uji kelangsungan hidup dan pertumbuhan benih ikan mas mantab (cyprinus carpio) pada rentang suhu yang berbeda. *Jurnal Perikanan Dan Kelautan*, 10(1), 46–54.

Rodrigues, J.N., Ortega, J.C.G., Petsch, D.K., Padial, A.A, Moi, D.A, and Figueiredo, B.RS. 2023. A meta-analytical review of turbidity effects on fish mobility. *Reviews in Fish Biology and Fisheries*, 33, 1113–1127. https://doi.org/10.1007/s11160-023-09785-4

Rosadi, E., Yuli, E.H., Setyohadi, D., and Bintoro, G. 2014. Distribution, composition, and abiotic environment of silver rasbora (*Rasbora argyrotaenia Blkr*) fish in Upstream Areas of Barito Watershed, South Kalimantan. *Journal of Environment and Ecology*, 5(1), 117-131. https://repo-dosen.ulm.ac.id//handle/123456789/26974

Shafiq, Z. M., Ruddin, M. A. S., Zarul, H. H., Khaled, P., Syaiful, M., and Maznah, W. W. 2015. The effect of seasonal changes on freshwater fish assemblages and environmental factors in Bukit Merah Reservoir (Malaysia). *Transylvanian Review of Systematical and Ecological Research*, 16(1), 97-108.

Siegers, W. H., Prayitno, Y., dan Sari, A. 2019. Pengaruh kualitas air terhadap pertumbuhan ikan nila nirwana (*Oreochromis Sp.*) pada Tambak Payau. *The Journal of Fisheries Development*, 3(2), 95–104.

Silalahi, H. N., Manaf, M., dan Alianto. 2017. Status mutu kualitas air laut Pantai Maruni Kabupaten Manokwari. *Jurnal Sumberdaya Akuatik Indopasifik*, 1(1), 33–42. www.ejournalfpikunipa.ac.id

Silalahi, M. P. 2022. Perbandingan Hasil Tangkapan Siang Dan Malam Hari Menggunakan Jaring Insang Permukaan Di Sungai Mendelang Desa Muara Delang Kecamatan Tabir Selatan. [Skripsi] Program Studi Pemanfaatan Sumberdaya Perikanan, Fakultas Peternakan, Universitas Jambi. https://repository.unja.ac.id/id/eprint/30827

Sudia, L. B., Indriyani, L., Erif, L. O. M., Hidayat, H., Qadri, M. S., dan Alimuna, W. 2020. Kelimpahan makrozoobenthos dan kualitas air sungai yang bermuara di Teluk Kendari. *Jurnal Ecosolum*, 9(1), 90–100. https://doi.org/10.20956/ecosolum.v9i1.10342https://doi.org/10.20956/ecosolum.v9i1.10342

Supriatna, J. 2018. Biodiversity Indexes: Value and Evaluation Purposes. Web of Conferences, 48, 1-4. https://doi.org/10.1051/e3sconf/20184801001

Suriyampola, P.S., Caceres, J., and Martins, E.P. 2018. Effects of short-term turbidity on sensory preference and behaviour of adult fish. *Animal Behaviour*, 146, 105-111. https://doi.org/10.1016/j.anbehav.2018.10.014

Susilawati, E., Rahayuningsih, M., dan Ridlo, S. 2016. Pengembangan perangkat pembelajaran ekologi SMA dengan strategi outdoor learning. *Unnes Science Education Journal*, 5(1). http://journal.unnes.ac.id/sju/index.php/usej

Syah, H. dan Aprio, E. 2021. Implementasi peraturan Bupati Merangin nomor 12 tahun 2016 tentang sistem pengendalian kebakaran hutan dan lahan dalam pembukaan lahan perkebunan di Desa Seling Kecamatan Tabir Kabupaten Merangin Provinsi Jambi Tahun 2017. *Jurnal Politik dan Pemerintahan Daerah*, 3(2), 62-73. https://doi.org/10.36355/jppd.v3i2.29

Syafrialdi, S., and Amrullah, M. Y. 2025. Diversity and conservation status of fish in Batang Bungo River, Bungo Regency, Jambi Province, Indonesia. *Aquaculture, Aquarium, Conservation & Legislation*, 18(2), 888-902. http://www.bioflux.com.ro/aacl

Sylvain, F. É., Cheaib, B., Llewellyn, M., Correia, T. G., Fagundes, D. B., Val, A. L., and Derome, N. 2016. PH drop impacts differentially skin and gut microbiota of the Amazonian fish tambaqui (Colossoma macropomum). *Scientific Reports*, 6, 1–10. https://doi.org/10.1038/srep32032

Tokuchi, N., Samejima, H., Hon, J., and Fukushima, K. 2019. Influence of Herbicide Use in Oil Palm Plantations on Stream Water Chemistry in Sarawak. In: Ishikawa, N., Soda, R. (eds) *Anthropogenic Tropical Forests*. Advances in Asian Human-Environmental Research. Springer, Singapore, 209–216. https://doi.org/10.1007/978-981-13-7513-2_11

Trisnaini, I., Kumalasari, T. N., dan Utama, F. 2018. Identifikasi habitat fisik sungai dan keberagaman biotilik sebagai indikator pencemaran air Sungai Musi Kota Palembang. *Jurnal Kesehatan Lingkungan Indonesia*, 17(1), 1. https://doi.org/10.14710/jkli.17.1.1-8

Tumbelaka, G. G., Manganka, I. R., dan Pratasis, P. A. 2023. Dampak pertambangan emas tanpa izin (PETI) terhadap kualitas air Sungai Nuangan Kabupaten Bolaang Mongondow Timur. *Tekno*, 21(85), 1517-1523. https://doi.org/10.35793/jts.v21i85.50223

Ushio, M., Sado, T., Fukuchi, T., Sasano, S., Masuda, R., Osada, Y., and Miya, M. 2023. Temperature sensitivity of the interspecific interaction strength of coastal marine fish communities. *ELife*, 12, 1–22. https://doi.org/10.7554/eLife.85795

Utomo, A. D. 2016. Strategi pengelolaan suaka perikanan rawa banjiran di Sumatera dan Kalimantan. *Jurnal Kebijakan Perikanan Indonesia*, 8(1), 13–20. http://ejournal-balitbang.kkp.go.id/index.php/jkpi

Wiriani, E. R. E., Yarifudin, H., dan Jalius. 2018. Analisis kualitas air Sungai Batanghari berkelanjutan di Kota Jambi. 1(1), 123–141.

Yulianti, R., Sukiyah, E., dan Sulaksana, N. 2016. Dampak limbah penambangan emas tanpa izin (PETI) terhadap kualitas air Sungai Limun Kabupaten Sarolangun Propinsi Jambi. *Bulletin of Scientific Contribution,* 14(3), 251-262.