

ECOLOGICAL STATUS ASSESSMENT OF THE MENDELANG RIVER, MEKAR JAYA VILLAGE, SOUTH TABIR DISTRICT, MERANGIN REGENCY, JAMBI PROVINCE BASED ON INTEGRATION OF PHYSICAL-CHEMICAL PARAMETERS AND BIOTIC INDICATORS

Penilaian Status Ekologis Sungai Mendelang Desa Mekar Jaya Kecamatan Tabir Selatan Kabupaten Merangin Provinsi Jambi Berdasarkan Integrasi Parameter Fisik-Kimia Dan Indikator Biotik

Ina Nadya^{1*}, Yun Alwi², Dyah Muji Rahayu³

¹Master's Study Program in Environmental Science, University of Jambi, ²Animal Science Study Program, Faculty of Animal Science, University of Jambi, ³Fisheries Resource Utilization Study Program, Faculty of Animal Science, University of Jambi

Jambi-Muara Bulian Road KM 15, Mendalo Darat, Jambi Outer City, Muaro Jambi, Jambi 36361

*Corresponding Author: inanadya1003@gmail.com

(Received June 24th 2026; Accepted August 8th 2026)

ABSTRACT

Assessment of river ecological status based on the integration of physical-chemical parameters and biotic indicators is a comprehensive approach in sustainable inland water management. This study aimed to assess the ecological status of the Mendelang River, Mekar Jaya Village, South Tabir District, Merangin Regency, Jambi Province using physical-chemical parameters and fish community structure as bioindicators. Data collection was carried out in August 2025 with 16 repeated catches using modified ambat nets. Physical-chemical parameters measured included temperature, pH, dissolved oxygen (DO), water clarity, and current velocity. Biotic indicators were analyzed using the Shannon-Wiener (H'), Evenness (E), and Simpson (C) indices. The relationship between environmental parameters and species abundance was analyzed using *Principal Component Analysis* (PCA). Results showed 21 fish species with a total of 1,541 individuals. The H' value was 2.10 (moderate category), E was 0.69 (high), and C was 0.18 (low). Physical-chemical parameters were still within the water quality standard range of Government Regulation No. 22 of 2021. PCA indicated that temperature and DO were the main variables influencing the distribution of dominant species. Integration of indicators showed that the Mendelang River falls in a good ecological status category with a stable community structure and relatively low environmental pressure.

Keywords: Biotic Indicators, Ecological Status, Fish Diversity, Mendelang River, Physical-Chemical Parameters

ABSTRAK

Penilaian status ekologis sungai berbasis integrasi parameter fisik-kimia dan indikator biotik merupakan pendekatan komprehensif dalam pengelolaan perairan darat berkelanjutan. Penelitian ini bertujuan menilai status ekologis Sungai Mendelang Desa Mekar Jaya, Kecamatan Tabir Selatan, Kabupaten Merangin, Provinsi Jambi menggunakan parameter fisik-kimia dan struktur komunitas ikan sebagai bioindikator. Pengambilan data dilakukan pada Agustus 2025 dengan 16 kali waktu penangkapan pada lokasi yang sama, dengan pengamatan pagi dan sore pada setiap penangkapan, menggunakan ambat termodifikasi. Parameter fisik-kimia yang diukur meliputi suhu, pH, dissolved oxygen (DO), kecerahan, dan kecepatan arus. Indikator biotik dianalisis menggunakan indeks Shannon-Wiener (H'), Evenness (E), dan Simpson (C). Analisis hubungan parameter lingkungan dan kelimpahan spesies dilakukan menggunakan *Principal Component Analysis* (PCA). Hasil menunjukkan 21 spesies ikan dengan total 1.541 individu. Nilai H' sebesar 2,10 (kategori sedang), E sebesar 0,69 (tinggi), dan C sebesar 0,18 (rendah). Dari parameter yang memiliki acuan baku mutu untuk air sungai pada PP No. 22 Tahun 2021, pH dan DO memenuhi kriteria Kelas II; suhu, kecerahan, dan kecepatan arus tidak seluruhnya memiliki ambang Kelas II yang dapat diterapkan langsung pada data penelitian ini. Integrasi deskriptif antara parameter yang dapat dibandingkan dan indikator biotik menunjukkan kondisi ekologis Sungai Mendelang relatif stabil, tetapi hasil perlu ditafsirkan dengan mempertimbangkan keterbatasan selektivitas alat tangkap.

Kata Kunci: Indikator Biotik, Keanekaragaman Ikan, Parameter Fisik-Kimia, Status Ekologis, Sungai Mendelang

INTRODUCTION

Mekar Jaya Village, located in the Tabir Selatan District of Merangin Regency, Jambi Province, is a community that relies on the agricultural and fisheries sectors—whether through active fishing or by utilizing catches from local waters for economic purposes. One of the water bodies utilized by the local community is the Mendelang River, a tributary situated within Mekar Jaya Village. The Mendelang River measures 14 meters in width and 3 meters in depth, featuring a sandy-mud substrate; it originates in Gading Jaya Village and flows downstream to Lubuk Bumbun Village before emptying into the Batang Tabir River, serving as a habitat for various fish species of economic value.

Previous research by Silalahi (2022) in Muara Delang Village indicated that the catch included catfish (**Clarias* sp.*), **Lais** (**Cryptopterus* spp.*), **Keting** (**Mystus**), and **Seluang** (**Rasbora* sp.*). Meanwhile, fish species commonly caught in Mekar Jaya Village include **Baung** (**Hemibagrus nemurus**), **Lais** (**Kryptopterus* spp.*), **Nilem** (**Osteochilus vittatus**), **Keting** (**Mystus* spp.*), **Toman** (**Channa* spp.*), and **Semah** (**Tor* sp.*). The river plays a vital role in the community's social and economic life—particularly for those relying on traditional fishing for their livelihoods—due to the diversity of fish species found within the Mendelang River.

Fish species diversity within an aquatic ecosystem can be measured based on the number of species and the distribution of individuals within each species. Diversity plays a crucial role in maintaining ecosystem stability and resilience, supporting inter-species 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, whereas low diversity can indicate ecological stress. Biological approaches utilizing diversity indices are considered relatively more efficient for characterizing long-term ecological stress compared to purely physicochemical approaches; this is because physicochemical parameters generally reflect conditions only at the specific moment of sampling, necessitating an integration of both methods to obtain a more representative picture of ecological status (Nurrohman *et al.*, 2025; Wibisono, 2024).

Fish diversity levels in a body of water are influenced by various factors, including both abiotic and biotic elements. Abiotic factors include temperature, pH, dissolved oxygen, water clarity, and current velocity, while biotic factors encompass food availability, habitat suitability, adaptability, and species reproductive behavior (Rahmani *et al.*, 2022). Furthermore, human activities—such as overfishing, pollution, and alterations to river flow—can degrade habitat quality and reduce fish diversity (Amaliyah, 2024). Species diversity can be assessed using various fishing gear.

Fishermen in the Mendelang River typically catch fish using various gear, such as gillnets, setlines (*tujur*), and *ambat* nets. The *ambat* is a conical net with a posterior pocket, installed in the middle of a fast-flowing river with its mouth facing the current. It is classified as a passive fishing gear because it simply intercepts fish moving with the current. The use of this gear reflects the application of local technology adapted to local ecosystem conditions (Rohadi *et al.*, 2021). The *ambat* is commonly used by fishermen in Mekar Jaya Village; featuring small mesh sizes and an installation that spans from the riverbed to the surface, it is capable of capturing various fish species of different sizes.

Information regarding the ecological status of the Mendelang River in Mekar Jaya Village—assessed through the integration of physicochemical parameters and biotic indicators—remains limited. This integrative approach is crucial because water quality assessments based solely on physicochemical parameters tend to reflect only momentary conditions, whereas biological indicators, such as fish diversity, can reflect the cumulative, long-term impacts of environmental stressors (Nurrohman *et al.*, 2025). Therefore, this study was conducted to assess the ecological status of the Mendelang River by integrating both approaches. The findings are expected to provide insights into the fish community structure—including species composition and individual abundance—and serve as a baseline reference for conservation efforts aimed at protecting and maintaining biodiversity and fish habitats, thereby enabling wise and sustainable fisheries resource management.

This study aims to assess the ecological status of the Mendelang River in Mekar Jaya Village, Tabir Selatan District, by integrating aquatic physicochemical parameters with biotic indicators (specifically fish species diversity). The results will provide information on the stability of the aquatic ecosystem, serving as a foundation for conservation-based fisheries resource management.

RESEARCH METHODS

Place and Time

This study was conducted in the Mendelang River—located in Mekar Jaya Village, Tabir Selatan District, Merangin Regency, Jambi Province—from August 6 to 22, 2025. The Mendelang River is situated near oil palm plantations and features a sandy-mud substrate. It is a tributary that flows into the Batang Tabir River, the main river in Merangin Regency. The river's habitat is characterized by banks covered in riparian vegetation, such as shrubs and trees, which serve to prevent erosion and provide shelter for aquatic biota.

Tools and Materials

The material used in this study consisted of fish catches obtained using *ambat* fishing gear—a type of trap—operated by local fishermen in the Mendelang River. The *ambat* gear measured 35 m in length, with a mouth width of 2 m, a height of 3 m, and a mesh size of 5 mm. This gear served as the sole standard sampling method throughout the study to collect fish samples from the designated river locations. The results are not treated as a direct representation of catches from gillnets or *tujur* (setlines), as gear characteristics and selectivity vary between types. Consequently, the fish composition observed in this study reflects the assemblage detected by the modified *ambat* rather than an estimate of absolute population abundance. Differences in gear selectivity constitute a source of bias in fish

community assessments and must be considered when interpreting results (Archdeacon *et al.*, 2023). Environmental parameters were measured using a Secchi disk (transparency), a pH meter (pH), a multi-parameter tester (temperature and dissolved oxygen), and a combination of a float, a stopwatch, and a 10 m line as an alternative method for measuring current velocity.

Research methods

This study employed a survey method involving direct observation of the research subjects. The data collected comprised both primary and secondary data. Primary data were categorized into catch data (number of individuals per species, total number of fish caught, catch weight per species, and total catch weight) and environmental parameters (water transparency, pH, temperature, dissolved oxygen, and current velocity). Secondary data were obtained through interviews, village profiles, and other supporting sources. Data collection was conducted during the morning and afternoon over 16 sampling events. Fish samples were photographed according to scientific standards, preserved in 10% formalin, and identified based on visible external morphological characteristics—referencing Kottelat *et al.* (1993)—with nomenclature and name validity subsequently confirmed using the FishBase database. A morphology-based identification approach combined with database verification was used to minimize taxonomic naming errors.

Research Design and Procedures

The study began with a site survey and interviews with local fishers and community members, followed by the development of a research schedule. Fishing operations utilized a modified *ambat* gear—a type of stationary net—featuring wing-like nets attached to both the left and right sides of the net mouth; each wing measured 6 meters in length and was extended toward the riverbank to broaden the area blocked by the gear. This modification potentially alters catch probability compared to a standard *ambat* without wings; consequently, data on abundance and species composition are treated as relative catch results specific to the gear used, rather than direct measures of population density. A consistent gear configuration and mesh size were maintained across all replicates to ensure uniformity in fishing effort. The river site measured approximately 14 meters in width and between 45 and 50 meters in length.

Environmental parameters were measured twice during each fishing event—before and after the catch was retrieved—at three locations (the net mouth, the net body, and the net end) to calculate average values. Water transparency was measured using a Secchi disk in accordance with SNI 6484.4:2014, applying the formula $K = (d1 + d2)/2$, where $d1$ represents the depth at which the disk disappears from view and $d2$ represents the depth at which it reappears. Temperature was measured using a multi-parameter tester (SNI 06-6989.23-2005), pH using a pH meter (SNI 6989.11:2019), and dissolved oxygen (DO) using a DO meter (SNI 06-6989.14-2004). Current velocity was measured using a float-based method—chosen for its practicality, non-electronic nature, and low cost (Fiaz, 2024)—applying the formula $v = d/t$, where d is the distance traveled by the float (10 m) and t is the travel time.

Once the fishing gear was deployed, it was left submerged for 12 hours to allow sufficient time for fish to enter the net. During this period, fish were herded by disturbing the river substrate with bamboo or wood poles twice per sampling event. The frequency, timing, and method of herding were standardized across all 16 replicates to ensure consistent catch probability. As this procedure could potentially increase fish activity and the likelihood of capturing certain taxa, it was treated as part of the standard fishing effort and acknowledged as a limitation regarding the interpretation of results. Periodic visual monitoring was conducted to ensure the fishing gear remained stable in position. Fish retrieval was carried out in three stages: herding the fish toward the end of the net, lifting the net using a pulley system, and collecting the fish from the end of the net using a small boat. The catch was then identified based on the number of individuals and weight per species for further analysis.

Data Analysis

Data analysis was conducted to determine fish community structure by calculating the diversity index (H'), evenness index (E), and dominance index (C) using Microsoft Excel 2019, and by performing Principal Component Analysis (PCA) using Past 4.03 software to reduce data dimensionality and interpret associations between environmental variables and fish abundance—rather than to test for statistical significance. The PCA observation units consisted of morning and afternoon observations across 16 replicates, resulting in an analysis matrix comprising 32 temporal observations from the same river segment. The PCA matrix included five environmental variables (temperature, pH, DO, transparency, and current velocity) and fish taxon abundance for each observation event. As the variables possessed different units, environmental variables were standardized using z-scores prior to ordination. Biplot interpretation was based on vector direction and the proximity of taxa positions to environmental vectors; such proximity was interpreted as an ecological association rather than a cause-and-effect relationship or the result of a significance test.

The Shannon-Wiener diversity index (H') was calculated using the equation (Odum, 1971):

$$H' = -\sum P_i \ln P_i$$

where P_i is the proportion of individuals of the i -th species to the total individuals of all species (n_i/N), n_i is the number of individuals of the i -th fish species, and N is the total number of all fish. A value of $H' < 1$ indicates low diversity; $1 < H' < 3$ indicates moderate diversity; and $H' > 3$ indicates high diversity (Krebs, 1989).

The uniformity index (E) was calculated using the equation (Odum, 1971):

$$E = H' / \ln S$$

where S is the total number of fish species found. The criteria for the E value are: $E < 0.4$ (low evenness); $0.4 \leq E \leq 0.6$ (moderate evenness); and $E > 0.6$ (high evenness).

The Simpson dominance index (C) is calculated using the equation:

$$C = \sum (n_i/N)^2$$

...with the following criteria for C values: $C < 0.4$ (low dominance), $0.4 \leq C \leq 0.6$ (moderate dominance), and $C > 0.6$ (high dominance) (Odum, 1971). The assessment of ecological status in this study is integrative-descriptive in nature and does not constitute a water quality status classification as specifically defined by Government Regulation (PP) No. 22 of 2021. The integration process was carried out in four stages: (1) physicochemical parameters with established quality standards for river water were compared against Appendix VI of PP No. 22 of 2021; (2) parameters lacking direct thresholds for river water—such as flow velocity and water clarity—were reported as environmental conditions without being assigned a quality standard category; (3) biotic indicators (H' , E , and C) were classified based on the applicable index criteria; and (4) PCA results were used as supporting information to explain species associations with environmental gradients. In this study, ecological conditions were considered relatively stable if the comparable parameters met the relevant quality standards, H' fell into at least the moderate category, $E > 0.6$, and $C < 0.4$. These categories serve as operational criteria for the study and are not intended to represent regulatory water quality classes.

RESULT

General Conditions of the Research Site

The Mendelang River, located in Mekar Jaya Village, Tabir Selatan District, Merangin Regency, flows through an area adjacent to oil palm plantations and features a sandy-mud riverbed. It is a tributary that empties into the Batang Tabir River, the main river in Merangin Regency. The river's habitat is characterized by banks covered in riparian vegetation—such as shrubs and trees—which serve to prevent erosion and provide shelter for aquatic life. During periods of heavy rainfall, the water level rises, frequently causing the river to overflow and flood the surrounding area.

Fish Species Composition

Fish species composition provides an overview of the diversity and proportion of each species present in a body of water. Based on the research conducted, 21 fish species were identified in the Mendelang River, with a total of 1,541 individuals, as presented in Table 1.

Table 1. Fish Species Composition in the Mendelang River

No.	Fish Species	Scientific Name	Quantity (Tails)	Composition of Fish Species Abundance (%)
1	Seluang/Wader	<i>Rasbora</i> sp.	527	34,20
2	Nilem	<i>Osteochilus vittatus</i>	218	14,15
3	Lais	<i>Kryptopterus lais</i>	208	13,50
4	Keting	<i>Mystus gulio</i>	169	10,97
5	Climbing perch	<i>Anabas testudineus</i>	118	7,66
6	Giant gourami	<i>Helostoma temminckii</i>	71	4,61
7	Fish cork	<i>Channa striata</i>	70	4,54
8	War-fish	<i>Macrochirichthys macrochirus</i>	35	2,27
9	Tapah	<i>Wallago leerii</i>	30	1,95
10	Baung	<i>Hemibagrus nemurus</i>	20	1,30
11	Catfish	<i>Clarias batrachus</i>	20	1,30
12	Beterung	<i>Pristolepis fasciata</i>	17	1,10
13	Sili	<i>Macrogathus siamensis</i>	9	0,58
14	Puffer fish	<i>Pao leiurus</i>	8	0,52
15	Selincih	<i>Belontia hasselti</i>	7	0,45
16	Baro-baro	<i>Hampala macrolepidota</i>	5	0,32
17	Belut	<i>Monopterus albus</i>	3	0,19
18	Dumbo Catfish	<i>Clarias gariepinus</i>	2	0,13
19	Damaian	<i>Thynnichthys thynnoides</i>	2	0,13
20	Belida fish	<i>Notopterus notopterus</i>	1	0,06
21	Flying fish	<i>Bagrichthys macropterus</i>	1	0,06
TOTAL			1541	100

Based on the fish catch in the Mendelang River, a striking difference is evident between the dominant species and those rarely caught. The three most frequently caught species were *Seluang*/*Wader* (*Rasbora* sp.), totaling 527 individuals (34.20% of the total catch), followed by *Nilem* (*Osteochilus vittatus*) with 218 individuals (14.15%), *Lais* (*Kryptopterus lais*) with 208 individuals (13.50%), and *Keting* (*Mystus gulio*) with 169 individuals (10.97%). While these proportions indicate dominance within the catch, they cannot be directly equated to population dominance in the river, as the selectivity of fishing gear can influence the detection probability of each taxon. The high catch rates for these four species likely reflect their ability to adapt to habitat conditions and the availability of food resources. These results align with the study by Silalahi (2022) in the waters of Muara Delang Village, Tabir Selatan District, Merangin Regency, which also identified *Seluang* (*Rasbora* sp.) as the dominant species.

Conversely, several species were caught in very low numbers: *Belida* (*Notopterus notopterus*) and *Layang-Layang* (*Bagrichthys macropterus*) with only one individual

each; *Lele Dumbo* (*Clarias gariepinus*) and *Damaian* (*Thynnichthys thynnoides*) with two individuals each; *Belut* (*Monopterus albus*) with three individuals; and *Baro-baro* (*Hampala macrolepidota*) with five individuals. The scarcity of these species may be attributed to specific habitat requirements, more selective feeding habits, or sensitivity to changes in water quality, resulting in their occurrence in low numbers (Setiawati *et al.*, 2020).

The composition of fish species found in the Mendelang River not only reflects the ecological condition of the waters but also indicates the presence of fish consumed for food, as well as species that are protected or require protection. The majority of the species caught are food fish with economic value, such as *baung*, *lais*, *gabus*, *tembakang*, and local catfish. However, some species in these waters belong to groups that are protected or warrant protection, primarily due to ecological pressures, population declines, and biological characteristics that make them sensitive to environmental changes (Syafei, 2017). In this study, a single *belida* fish was found. The species' global status on the IUCN Red List (version 2025-2) is "Least Concern" (LC); therefore, the previous classification of "Critically Endangered" (CR) is no longer maintained. Nevertheless, at the national level, *Notopterus notopterus* is subject to limited protection under the Decree of the Minister of Marine Affairs and Fisheries Number 83 of 2024, which supersedes the previous full protection status. Given the very low catch numbers and the selectivity of the fishing gear used, the discovery of a single individual cannot be used to infer population size. The presence of the species remains relevant for conservation information and serves as a basis for avoiding non-compliant fishing practices. Additionally, certain local fish species—such as *tapah* and various *lais* species—are also recommended for population protection due to their vulnerability to overfishing (Yonarta *et al.*, 2023).

The presence of these protected or vulnerable fish species provides a crucial basis for the community and resource managers to raise conservation awareness. In the Mendelang River, potential conservation measures include regulating fishing gear to ensure it is non-destructive and selective, restricting the catch of protected species (in terms of both size and quantity), and prohibiting destructive fishing methods such as electrofishing and poisoning. These efforts align with the principles of sustainable fisheries and fish resource conservation advocated by the FAO (1995) and the Ministry of Marine Affairs and Fisheries (2016).

Overall, the distribution of fish numbers reveals an uneven pattern, wherein a small number of species dominate the catch while others are rarely captured. This condition reflects the community structure... ..diverse fish populations, influenced by each species' adaptability to the environment, its position in the food chain, and the availability of resources in the waters (Zahid *et al.*, 2015). Differences in abundance among species are influenced not only by habitat and feeding habits but also heavily depend on water quality, which determines how well the river environment can support the life of various fish species (Dewi *et al.*, 2019).

Water Quality Condition

Water quality analysis serves as the basis for assessing the condition of water bodies and their suitability for fish and other aquatic organisms. According to Government Regulation Number 22 of 2021, water quality is determined by comparing parameter values against established quality standards. If a parameter value falls within the range of the quality standard, the water condition is categorized as good and supportive of aquatic biota. The results of water quality measurements based on physical and chemical parameters are presented in Table 2.

Table 2. Water Quality

Environmental Parameters	Range	Average
--------------------------	-------	---------

	Pagi	Sore	Pagi	Sore	Category (Quality Standards PP 22/2021)
Current speed (m/s)	0,6-0,9 m/s	0,7-1,04 m/s	0,87 m/s	0,85 m/s	-
Brightness (cm)	37-67 cm	35-58 cm	46,69 cm	45,37 cm	Medium
DO (mg/L)	3,9-5,5 mg/L	4,2-5,8 mg/L	4,86 mg/L	4,84 mg/L	Good
Temperature (°C)	24-26°C	25-28°C	25°C	26,38°C	Good
pH	6,6-7,2	6,7-7,1	6,93	6,93	Good

PCA (Principal Component Analysis) of Water Quality

Principal Component Analysis (PCA) was conducted to understand the relationship between water quality parameters and fish species distribution. This analysis aimed to reduce diverse environmental variables into a few principal components, thereby revealing the dominant factors influencing fish presence at each sampling site. Through PCA, the relationship between water quality parameters—such as temperature, pH, DO, transparency, and current velocity—and fish species distribution could be more clearly illustrated, while also providing information on the habitat preferences of each fish species.

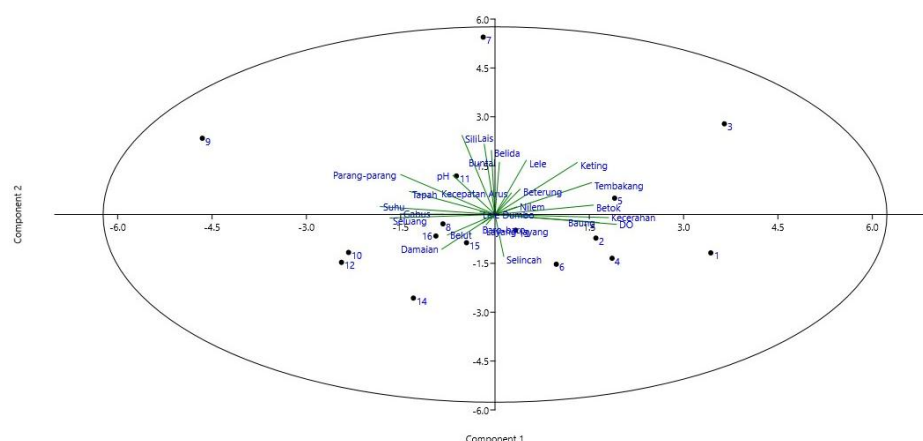


Figure 1. Results of Principal Component Analysis (PCA) of water quality.

Diversity, Uniformity, and Dominance Index

The diversity index provides information on the number of species and the abundance of organisms within a community, whereas the evenness index describes the distribution of individuals among species in a community. Meanwhile, the dominance index indicates the extent to which specific species dominate a community. Data on the fish diversity, evenness, and dominance indices in the Mendelang River are presented in Table 3.

Table 3. Fish Diversity, Evenness, and Dominance Indices in the Mendelang River

Index	Value	Category
H'	2,10	Medium
E	0,69	High
C	0,18	Low

DISCUSSION

Based on Table 3, the Shannon-Wiener diversity index (H') value for the Mendelang River is 2.10, falling into the moderate category. The evenness index (E) value of 0.69 is classified as high, while the Simpson dominance index (C) value of 0.18 falls into the low category. An H' value of 2.10 indicates that the fish community in the Mendelang River is reasonably diverse, although the distribution of individuals across species is not yet uniform. Of the 21 recorded species, *Seluang*/Wader* dominated with 527 individuals (34.20% of the total catch), followed by *Nilem* (218 individuals; 14.15%), *Lais* (208 individuals; 13.50%), and *Keting* (169 individuals; 10.97%). The abundance of *Seluang* is linked to its nature as an omnivore that lives in schools within shallow waters featuring moderate currents (Nurudin, 2015). *Nilem*, an omnivore capable of utilizing diverse food sources—ranging from phytoplankton and aquatic plants to detritus—tends to inhabit waters with moderate to moderately swift currents and muddy substrates (Ekawati *et al.*, 2011). *Lais*, a carnivorous species, adapts well to moderate currents in the mid-water to bottom layers and feeds on small fish, whereas the omnivorous *Keting* tolerates fluctuations in water quality and utilizes muddy substrates for both habitat and foraging (Yonarta *et al.*, 2023). Relatively stable water quality conditions—such as neutral pH (6.6–7.2), temperatures of 24–28°C, dissolved oxygen (DO) of 3.9–5.8 mg/L, and water clarity of 35–67 cm—support the metabolism, growth, and survival of these four species, allowing their populations to dominate the river's catch (Ramadini, 2019).

Some species are found only in very small numbers because they require specific habitats and are easily disturbed by poor water quality. For instance, *Belida* and *Layang-layang* require deep, clear waters and specific current patterns not fully available in the Mendelang River, while *Baro-baro* and *Damaian* prefer large rivers with abundant vegetation—features that are limited at this site. Eels, which typically inhabit swamps or rice paddies with thick, muddy substrates, are also ill-suited to the conditions of the Mendelang River. Moderate currents, low clarity, and moderate DO levels favor species tolerant of such conditions, whereas more sensitive species survive only in limited numbers (Mainassy, 2017). Thus, the observed H' value reflects the dominance of fish resilient to the river's conditions, while sensitive species persist but in very low populations, demonstrating a close relationship between habitat, water quality, and fish community composition in the Mendelang River.

The evenness index (E) value of 0.69 is considered high, indicating that the distribution of individuals across species is relatively uniform and no single species is extremely dominant. This value reflects good fish community stability, where dominant species support ecosystem balance without suppressing the presence of other species. More tolerant species—such as Seluang/Wader, Nilem, Lais, and Keting—showed significantly higher catch numbers due to their adaptability to river conditions. This natural ecological dominance arises because tolerant species benefit from the availability of habitats and resources (Nadian *et al.*, 2021). Conversely, species such as Belida, Layang-layang, Baro-baro, Damaian, Belut, and Lele dumbo were found only in very small numbers due to habitat limitations and their vulnerability to the river's physicochemical conditions (Utomo, 2016). Low water clarity (35–67 cm), moderate dissolved oxygen (DO) levels (3.9–5.8 mg/L), and current speeds of 0.6–1.04 m/s favored the survival of tolerant fish, while vulnerable species struggled to thrive (Miestika, 2024).

The Simpson dominance index (C) value of 0.18 is considered low, indicating that no single species completely dominates the community. Although Seluang/Wader recorded the highest catch numbers, the presence of 20 other species in varying quantities maintained a balanced community structure. This low dominance suggests that the Mendelang River ecosystem remains relatively balanced, as other species contribute to the food web and ecological interactions. Stable water quality conditions—characterized by neutral pH (6.6–7.2), temperatures of 24–28°C, moderate dissolved oxygen (DO) levels (3.9–5.8 mg/L), and low-to-moderate transparency (35–67 cm)—create a suitable environment for tropical fish

(Sulifijar et al., 2022). Consequently, despite disparities in the number of individuals across species, the community structure remains relatively balanced; this allows both tolerant and sensitive species to coexist, thereby maintaining the stability of the Mendelang River ecosystem.

PCA results indicate that fish distribution at each sampling site is strongly influenced by water quality. *Parang-parang*, *Tapah*, *Gabus*, and *Seluang/Wader* show strong associations with temperature and pH, indicating their dominance in waters with relatively warm temperatures and neutral-to-slightly-alkaline pH levels. Temperature and pH are critical factors influencing metabolic activity and fish distribution in aquatic environments (Hayati et al., 2017). Conversely, *Keting*, *Lele*, *Betok*, and *Tembakang* are associated with DO and transparency, suggesting a tendency for these species to inhabit waters with high oxygen levels and good clarity. These conditions are favorable for active swimmers that require an ample oxygen supply in waters with moderate currents (Patangngari et al., 2025).

The Nilem, Beterung, and Belida species are more strongly associated with pH and current velocity, demonstrating good adaptability to waters with moderate currents and neutral to slightly alkaline pH levels. Stable currents facilitate oxygen distribution and maintain suitable benthic habitats for these species (Sa'adah et al., 2023). Meanwhile, Sili, Lais, and Buntal fish are more influenced by pH stability or are positioned near the biplot's origin, indicating that environmental factors do not exert extreme influence on their abundance. The Selincih, Baung, Belut, and Damaian species appear closer to the combination of current and water clarity, suggesting their presence is largely determined by current stability and water transparency—factors crucial for maintaining benthic habitat quality for foraging and shelter (Wiranegara et al., 2023).

Assessing the ecological status of a water body yields more representative results when integrating physicochemical parameters with biotic indicators; physicochemical parameters reflect conditions only at the time of sampling, whereas biological indicators—such as fish diversity—reflect the cumulative impact of environmental stressors over a longer period (Nurrohmah et al., 2025; ITB, 2024). Measurements indicate a pH range of 6.6–7.2 and Dissolved Oxygen (DO) of 3.9–5.8 mg/L; the pH values fall within the Class II range (6–9), and DO levels meet or exceed the Class II minimum threshold of 4 mg/L in most instances, though the minimum value of 3.9 mg/L indicates a momentary reading 0.1 mg/L below that threshold. Consequently, stating that all DO results meet Class II standards should be avoided; it is more accurate to describe the DO results as 'generally compliant, with a single minimum value slightly below the threshold.' These favorable physicochemical conditions align with biotic indicator results, which show a moderate diversity index ($H' = 2.10$), high evenness index ($E = 0.69$), and low dominance index ($C = 0.18$). The consistency between these two types of parameters reinforces the conclusion that the Mendelang River ecosystem is in a relatively stable state. In contrast, a study by Amrullah et al. (2023) on the Tabir River indicated a trend of declining quality, with fish biodiversity remaining moderate but trending downward, thereby necessitating sustainable management and conservation efforts. This suggests that while the Mendelang River—a tributary of the Batang Tabir River system—remains in relatively good condition, vigilance regarding ecological pressures at the broader watershed scale remains essential.

This integrated physicochemical and biotic approach aligns with recent studies emphasizing the importance of using bioindicators to complement physicochemical parameters in water quality monitoring; aquatic organisms can record a history of environmental stressors that are not always captured by instantaneous measurements (Nurrohmah et al., 2025; Putra et al., 2025). Based on this approach, the ecological status of the Mendelang River can be categorized as having good water quality and moderate biotic diversity. This classification is supported by the moderate H' , high E , and low C values; a pH level within the Class II range;

and Dissolved Oxygen (DO) levels generally at or above the Class II threshold, despite a recorded minimum of 3.9 mg/L. Nevertheless, these conditions require ongoing monitoring, particularly because parameters such as water clarity, flow velocity, and temperature could not be definitively classified against Class II standards based solely on the available data, and catch results were influenced by the selectivity of the fishing gear used. The few species encountered—such as *Belida*, *Layang-layang*, *Baro-baro*, *Damaian*, and *Belut*—could be the focus of further monitoring; however, low catch rates do not necessarily indicate that their populations are low throughout the river.

CONCLUSION

Research conducted on the Mendelang River (Mekar Jaya Village, Tabir Selatan District) identified 21 fish species, totaling 1,541 individuals. The *Seluang*/Wader fish (*Rasbora* sp.) was the most abundant species (34.20%), while the *Belida* (*Notopterus notopterus*) and *Layang-layang* (*Bagrichthys macropterus*) were the least abundant. Physicochemical water parameters—specifically temperature (24–28°C), pH (6.6–7.2), DO (3.9–5.8 mg/L), transparency (35–67 cm), and flow velocity (0.6–1.04 m/s)—generally fell within the "good" category and met Class II quality standards as stipulated by Government Regulation (PP) No. 22 of 2021. Biotic indicators revealed a diversity index (H') of 2.10 (moderate category), an evenness index (E) of 0.69 (high category), and a dominance index (C) of 0.18 (low category).

The integration of physicochemical parameters and biotic indicators suggests that the ecological status of the Mendelang River during the observation period was relatively stable, based on the study's operational criteria. This assessment is supported by the H' (2.10/moderate), E (0.69/high), and C (0.18/low) values, with the caveat that fish composition was influenced by fishing gear selectivity and that not all environmental parameters have directly applicable Class II quality standards.

Further research is required regarding species found in low numbers—such as *Belida*, *Layang-layang*, *Baro-baro*, and *Damaian*—to identify the factors influencing their scarcity, thereby enabling conservation efforts aimed at the sustainable management of fishery resources in the Mendelang River. Furthermore, it is recommended that water quality and biotic diversity be monitored periodically and in an integrated manner as part of an early warning system for ecological stress on river ecosystems.

ACKNOWLEDGEMENT

The author expresses gratitude to the Faculty of Animal Science at the University of Jambi, the academic supervisors, the examination committee, and the community of Mekar Jaya Village (Tabir Selatan District, Merangin Regency) for granting permission and providing assistance and cooperation during the conduct of the research at the Mendelang River.

REFERENCES

- Alabaster, J. S., & Lloyd, R. (1980). *Water Quality Criteria for Freshwater Fish*. Butterworth Scientific.
- Amaliyah, A. H. (2024). Dinamika Populasi dan Analisis Aspek Biologi Ikan Kuniran *Upeneus guttatus* (Day, 1868) di Perairan Polewali Mandar [Tesis, Universitas Hasanuddin].
- Amrullah, M. Y., Hertati, R., & Jayanti, E. (2023). Keanekaragaman Jenis Ikan di Sungai Tabir Kecamatan Tabir Lintas Kabupaten Merangin. *Jurnal Pengelolaan Sumberdaya Perairan*, 7(2), 110–117.
- Archdeacon, T. P., Gonzales, E. J., Reale, J. K., Henry, E. B., & Grant, J. D. (2023). Effects of Seining Effort on Estimates of Fish Diversity in a Sand-Bed River. *Environmental Monitoring and Assessment*, 195, 538. <https://doi.org/10.1007/s10661-023-11166-0>.

- Arerapapa, B., Kaparoi, K., Paiderowi, P., & Rahandra, R. M. (2022). Komponen Abiotik pada Sungai Webi di Kampung Marau. *UNES Journal of Scientech Research*, 7(2), 156–166.
- Arifin, M. Y. (2016). Pertumbuhan dan Survival Rate Ikan Nila (*Oreochromis* sp.) Strain Merah dan Strain Hitam yang Dipelihara pada Media Bersalinitas. *Jurnal Ilmiah Universitas Batanghari Jambi*, 16(1), 159–166.
- Dewi, S. A. I. S., Arthana, I. W., & Pratiwi, M. A. (2019). Pengelolaan Populasi Ikan Nila (*Oreochromis niloticus*) alami di Danau Batur, Bangli, Bali. *Current Trends in Aquatic Science*, 2(2), 48–55.
- Effendi, H. (2023). *Telaah Kualitas Air bagi Pengelolaan Sumber Daya dan Lingkungan Perairan* (Edisi elektronik). Kanisius.
- Ekawati, D., Astuty, S., & Dhahiyat, Y. (2011). Studi Kebiasaan Makan Nilem (*Osteochillus hasselti* C.V.) yang Dipelihara pada Karamba Jaring Apung di Waduk Ir. H. Djuanda, Jawa Barat. *Jurnal Akuatika*, 1(1), 1–12.
- Ermawati, R., Yunita, & Rahma, M. (2017). Keanekaragaman Ikan di Sungai Batang Banyu Kecamatan Banua Lawas Kabupaten Tabalong Provinsi Kalimantan Selatan. *Aquatic*, 1(2), 73-83.
- Fajriati, N. A., Halang, B., & Mahrudin. (2022). Keragaman Spesies Ikan Lais Genus *Kryptopterus* di Sungai Nagara Desa Pandak Daun Kecamatan Daha Utara berbentuk buku saku. *Jupeis: Jurnal Pendidikan dan Ilmu Sosial*, 1, 115–129.
- Fiaz, M. (2024). *Exploring Methods for Measuring Velocity and Discharge in Water Flow: A Comparative Analysis Hydrology and Water Resources* [Open ended lab report, International Islamic University]. <https://doi.org/10.13140/RG.2.2.12207.34728>
- Food and Agriculture Organization. (1995). *Code of Conduct for Responsible Fisheries*. FAO.
- Ganesid, M. A. P., Burhanuddin, & 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*, 46(3). <https://doi.org/10.1080/21683565.2022.2032513>
- Gupta, S. (2015). Morphology, Growth Pattern, Feeding and Reproductive Biology of *Mystus gulio* (Hamilton-Buchanan, 1822) (*Siluriformes: Bagridae*). *International Journal of Aquatic Biology*, 2(4), 201–205.
- Hadiroseyani, Y., Sukenda, Surawidjaja, E. H., Bambang, N., Utomo, P., & Affandi, R. (2016). Efek Pemberokan dalam Media Air dengan Salinitas yang Berbeda Terhadap Kondisi Fisiologis Belut, *Monopterus albus* (Zuiew, 1793). *Jurnal Ikhtologi Indonesia*, 16(3), 245–253.
- Hamuna, B., Tanjung, R. H. R., Maury, H. K., & 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>
- Haris, H., Mutiara, D., & Arsyad, N. (2018). Kebiasaan Makan Ikan Seluang (*Rasbora argyrotaenia*) di Perairan Sungai Musi. *Sainmatika: Jurnal Ilmiah Matematika dan Ilmu Pengetahuan Alam*, 15(2), 123–128. <https://doi.org/10.31851/sainmatika.v15i2.2244>
- 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., & 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>
- Herlina, M., Fitriani, A. F., & Hermansyah, P. (2021). Keanekaragaman Jenis Ikan yang terdapat di Sungai Air Jernih Kecamatan Padang Guci Hulu Kabupaten Kaur Provinsi Bengkulu. *Jurnal Bionature*, 22(1), 51–63.

- Humaira, R., & Al Maulida, S. (2022). Keanekaragaman Jenis Plankton di Perairan Kawasan Wisata Alam Iboih Kota Sabang. *Prosiding Seminar Nasional Biotik*, 1, 412–418.
- Institut Teknologi Bandung. (2024, November 25). Pengembangan Bioindikator untuk Pengelolaan Kualitas Air Sungai. ITB News.
- Kantun, W., Kabangnga, A., & Nurhikmah. (2021). Kehadiran dan Komposisi Jenis Ikan pada Habitat Biological Fish Aggregating Device di Perairan Tanekeke, Selat Makassar. *Seminar Nasional Politeknik Pertanian Negeri Pangkajene Kepulauan*, 2, 47–56.
- Kementerian Kelautan dan Perikanan. (2016). Peraturan Menteri Kelautan dan Perikanan Republik Indonesia Nomor 16 Tahun 2016. KKP.
- Kementerian Lingkungan Hidup dan Kehutanan. (2021). Peraturan Pemerintah Republik Indonesia Nomor 22 Tahun 2021 tentang Penyelenggaraan Perlindungan dan Pengelolaan Lingkungan Hidup. KLHK.
- Kottelat, M., Whitten, A. J., Kartikasari, S. N., & Wirjoatmodjo, S. (1993). *Freshwater Fishes of Western Indonesia and Sulawesi*. Periplus Editions.
- Krebs, C. J. (1989). *Ecological methodology* (2nd ed.). Harper & Row.
- Kusuma, N. P. D., Tangguda, S., & 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>
- Lestari, B., Syarif, A. F., Permatasari, S., & Kurniawan, A. (2024). Kinerja Reproduksi Ikan Seluang (*Brevibora dorsiocellata*) dengan Suplementasi Vitamin E dalam Pakan. *Journal of Aquatropica Asia*, 9(2), 92–100.
- Madyawan, D., Hendrawan, I. G., & 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>
- Mainassy, M. C. (2017). Pengaruh Parameter Fisika dan Kimia Terhadap Kehadiran Ikan Lomba (*Thryssa baelama Forsskal*) di Perairan Pantai Apui Kabupaten Maluku Tengah. *Jurnal Perikanan Universitas Gadjah Mada*, 19(2), 61–66.
- Maulana, M. A., & Kuntjoro, S. (2023). Hubungan Indeks Keanekaragaman Makrozoobentos dengan Kualitas Air Kali Surabaya, Wringinanom, Gresik. *LenteraBio*, 12(2), 219–228.
- Mauludi, T., Gustomi, A., & Kurniawan. (2022). Struktur Komunitas Ikan Air Tawar di Beberapa Sungai Kecamatan Mendo Barat Kabupaten Bangka. *Jurnal Ilmu Perikanan*, 4, 11–17.
- Miestika, W. M. (2024). Hubungan Parameter Kualitas Air dengan Kelimpahan Zooplankton di Waduk Pusong Kota Lhokseumawe [Skripsi, Universitas Malikussaleh].
- Minggawati, I., & Lukas. (2015). Tingkat Kematangan Gonad Ikan Lais (*Ompok hypophthalmus*) yang Tertangkap di Rawa Banjiran Sungai Rungan Kalimantan Tengah. *Jurnal Ilmu Hewani Tropika*, 4(2), 40–44.
- Modalo, R. J., Rampengan, R. M., Opa, E. T., Djamaluddin, R., Hermanto, W. K. M., & 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.
- Muliani, Asriyana, & Ramli, M. (2021). Preferensi Habitat Ikan Gabus [*Channa striata* (Bloch 1793)] di Perairan Rawa Aopa, Sulawesi Tenggara. *Jurnal Ilmu Pertanian Indonesia*, 26(4), 546–554. <https://doi.org/10.18343/jipi.26.4.546>
- Nadian, G. R., Kurniawan, & Febrianto, A. (2021). Struktur Komunitas Ikan di Ekosistem Mangrove di Perairan Dusun Tanjung Tedung Kabupaten Bangka Tengah. *Jurnal Sumberdaya Perairan*, 15(1), 53–61.

- Nahlunnisa, H., Zuhud, E. A. M., & Yanto, S. (2016). Keanekaragaman Spesies Tumbuhan di Areal Nilai Konservasi Tinggi (NKT) Perkebunan Kelapa Sawit Provinsi Riau. *Media Konservasi*, 21(1), 91–98.
- Nazar, A., Utami, E., & 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].
- Nurika, F. B. P., Wiryani, E., & Jumari. (2019). Keanekaragaman Vegetasi Riparian Sungai Panjang Bagian Hilir di Kecamatan Ambarawa Kabupaten Semarang. *Jurnal Akademika Biologi*, 8(1), 30–38.
- Nurrohman, D. P., Hapsari, A. T., Insani, M. S., Astuti, R. I. P., Fortuna, V. S. D., & Ramli, M. (2025). Keanekaragaman Biota Sungai Sebagai Bioindikator Kualitas Sungai di Wilayah Jatimalang Kabupaten Sukoharjo. *Biota: Jurnal Ilmiah Ilmu-Ilmu Hayati*, 10(1), 1–12.
- Nurudin, F. A. (2015). Keanekaragaman Jenis Ikan di Sungai Sekonyer Taman Nasional Tanjung Puting Kalimantan Tengah [Skripsi, Universitas Negeri Semarang].
- Odum, E. P. (1971). *Fundamentals of Ecology* (3rd ed.). Saunders.
- Patangngari, F., Musbir, M., & Najamuddin. (2025). Investigating Fish Composition and Diversity About Physicochemical Oceanographic Conditions Captured in the Cape Region, Bone Gulf, South Sulawesi, Indonesia. *Egyptian Journal of Aquatic Biology & Fisheries*, 29(1), 759–777.
- Paujiah, E. (2024). Bioekologi Ikan Keting (*Mystus gulio* Hamilton 1822) dan Model Pengelolaannya di Muara Sungai Kabupaten Cianjur, Jawa Barat [Disertasi, 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, & 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, I. S. (2015). Studi Pengukuran Kecepatan Aliran pada Sungai Pasang Surut. *Info Teknik*, 16(1), 33–46.
- Putra, M., Afiati, N., & Purnomo, P. (2025). Dampak Kualitas Air Terhadap Sumber Daya Ikan di Sungai Seklenting, Kabupaten Demak. *Jurnal Pasir Laut*, 9(1), 31–40. <https://doi.org/10.14710/jpl.2025.69495>
- Rahmani, R. M., Fitri, Y., Sarianto, D., Harisjon, & Aisyah, S. (2022). Kajian Kualitas Air Terhadap Keanekaragaman Jenis Ikan di Perairan Batang Naras Kabupaten Padang Pariaman. *Konservasi Hayati*, 18(2), 88–105.
- Ramadini, L. (2019). Keanekaragaman Makrozoobentos sebagai Bioindikator Kualitas Air di Sungai Way Kedamaian Bandar Lampung [Skripsi, Universitas Islam Negeri Raden Intan Lampung].
- Ridho, M. R., & Patriono, E. (2020). Keanekaragaman Jenis Ikan di Danau Teluk Rasau, Pedamaran Kabupaten Ogan Komering Ilir Provinsi Sumatera Selatan. *Biosfera: A Scientific Journal*, 37(2), 118–125. <https://doi.org/10.20884/1.mib.2020.37.2.1047>
- Ridwantara, D., Buwono, I. D., Suryana, A. A. H., Lili, W., & 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.

- Rohadi, Y., Hertati, R., & Kholis, M. N. (2021). Identifikasi Alat Tangkap Ikan Ramah Lingkungan yang Beroperasi di Perairan Sungai Alai Kabupaten Tebo Provinsi Jambi. *Semah Jurnal Pengelolaan Sumberdaya Perairan*, 4(2), 115–133. <https://doi.org/10.36355/semahjpsp.v4i2.459>
- Rostika, R., Andriani, Y., & Junianto. (2017). Fecundity Performance of Nilem (*Osteochilus vittatus*) from Cianjur, Tasikmalaya and Kuningan Districts, West Java, Indonesia. *Asian Journal of Agriculture*, 1(1), 17–21. <https://doi.org/10.13057/asianjagric/g010104>
- Sa'adah, F., Lisminingsih, R. D., & Latuconsina, H. (2023). Hubungan Parameter Kualitas Air dengan Sintasan dan Pertumbuhan Ikan Nilem (*Osteochillus vittatus*). *Jurnal Riset Perikanan dan Kelautan*, 5(1), 22–30. <https://doi.org/10.33506/jrpk.v5i1.2136>
- Sepriani, W., Rusliadi, & Pamukas, A. (2024). Pengaruh Pemberian Hormon Tiroksin (T4) melalui Perendaman terhadap Pertumbuhan dan Kelulushidupan Ikan Nilem (*Osteochilus hasselti*) dengan Sistem Resirkulasi. *Jurnal Akuakultur Sebatin*, 5(1), 85–91.
- Setiawati, M., Kamall, S., & Amin, N. (2020). Analisis Faktor Fisik-Kimia Habitat Ikan Depik (*Rasbora tawarensis*) di Danau Laut Tawar. *Prosiding Seminar Nasional Biotik*, 1, 47–52.
- Siegers, W. H., Prayitno, Y., & 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., & Alianto. (2017). Status Mutu Kualitas Air Laut Pantai Maruni Kabupaten Manokwari. *Jurnal Sumberdaya Akuatik Indopasifik*, 1(1), 33–42.
- 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, Universitas Jambi].
- Sudia, L. B., Indriyani, L., Erif, L. O. M., Hidayat, H., Qadri, M. S., & 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.v9i1.10342>
- Sulifijar, L., Harfinda, E. M., & Nuraya, T. (2022). Struktur Komunitas Ikan pada Aliran Sungai Peniung yang Melintasi Desa Ribang Kadeng Kecamatan Kalis Kabupaten Kapuas Hulu. *Jurnal Ilmu Kelautan dan Perikanan Papua*, 5(1), 23–30. <https://doi.org/10.31957/acr.v5i1.2266>
- Susanto, & Novitasari, D. I. (2017). Struktur Umur dan Faktor Kondisi Ikan di Sungai Logawa Wilayah Kabupaten Banyumas. *Sainteks*, 14(1), 1–10.
- Susilawati, E., Rahayuningsih, M., & Ridlo, S. (2016). Pengembangan Perangkat Pembelajaran Ekologi SMA dengan Strategi Outdoor Learning. *Unnes Science Education Journal*, 5(1), 1108–1115.
- Syafei, L. S. (2017). Keanekaragaman Hayati dan Konservasi Ikan Air Tawar. *Jurnal Penyuluhan Kelautan dan Perikanan Indonesia*, 11(1), 48–62.
- Sylvain, F. E., Cheaib, B., Llewellyn, M., Correia, T. G., Fagundes, D. B., Val, A. L., & 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>
- Trisnaini, I., Kumalasari, T. N., & Utama, F. (2018). Identifikasi Habitat Fisik Sungai dan Keberagaman Biotilik sebagai Indikator Pencemaran Air Sungai Musi Kota Palembang. *Jurnal Kesehatan Lingkungan Indonesia*, 17(1), 1–8. <https://doi.org/10.14710/jkli.17.1.1-8>

- Ubamnata, B., Diantari, R., & Hasani, Q. (2017). Kajian Pertumbuhan Ikan Tembakang (*Helostoma temminckii*) di Rawa Bawang Latak Kabupaten Tulang Bawang, Lampung. *Jurnal Penelitian Pertanian Terapan*, 15(2), 90–99. <https://doi.org/10.25181/jppt.v15i2.115>
- Ushio, M., Sado, T., Fukuchi, T., Sasano, S., Masuda, R., Osada, Y., & Miya, M. (2023). Temperature Sensitivity of the Interspecific Interaction Strength of Coastal Marine Fish Communities. *eLife*, 12, Article e85795. <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.
- Wiranegara, P., Sunardi, S., Sumiarsa, D., & Juahir, H. (2023). Characteristics and Changes in Water Quality Based on Climate and Hydrology Effects in the Cirata Reservoir. *Water*, 15(17), 1–18. <https://doi.org/10.3390/w15173132>
- Wiriani, E. R. E., Yarifudin, H., & Jalius. (2018). Analisis Kualitas Air Sungai Batanghari Berkelanjutan di Kota Jambi. *Jurnal Pembangunan Berkelanjutan*, 1(1), 123–141.
- Yonarta, D., Muslim, M., Syaifudin, M., & Taqwa, F. H. (2023). Introduction of Prospective Fish Aquaculture Commodities *Kryptopterus palembangensis*. *Jurnal Agroqua*, 21(1), 162–172. <https://doi.org/10.32663/ja.v21i1.3599>
- Yonarta, D., Taqwa, F. H., Wijayanti, M., Jubaedah, D., Muslim, M., & Syaifudin, M. (2023). Potential for Aquaculture of Lais Fish (*Kryptopterus palembangensis*) in Swamplands. *Jurnal Mangifera Edu*, 7, 75–81. <https://doi.org/10.31943/mangiferaedu>
- Zahid, A., & Rahardjo, M. F. (2019). Variasi Spasio-Temporal Jenis Makanan Ikan Motan, *Thynnichthys polylepis* di Rawa Banjiran Sungai Kampar Kiri, Riau. *Jurnal Iktiologi Indonesia*, 9(2), 153–161.
- Zahid, A., Rahardjo, M. F., Syafei, L. S., & Susilowati, R. (2015). Ekologi Trofik Komunitas Ikan di Perairan Segara Menyan, Subang, Jawa Barat. *Ilmu Kelautan: Indonesian Journal of Marine Sciences*, 20(3), 170–186. <https://doi.org/10.14710/ik.ijms.20.3.170-186>