Asian Journal of Aquatic Sciences, December 2024. Vol 7, Issue (3) 349-358
e-issn: 2716-4608
p-issn: 2655-366X

WATER QUALITY AND PLANKTON COMPOSITION FOR FRESHWATER FISH FARMING IN THE WATERS OF PARIT KELADI VILLAGE, KUBU RAYA REGENCY, WEST KALIMANTAN

M. Farhan Budi Pratomo[1*], Hastiadi Hasan[1], Tuti Puji Lestari[1]
[1]Department of Aquaculture, Faculty of Fisheries and Marine,
Universitas Muhammadiyah, Pontianak, 61019 Indonesia
*tomobudi18pnk@gmail.com

ABSTRACT

Waters in Parit Keladi Village have potential fish resources that cannot be developed due to household and agricultural waste contamination. This study aims to analyze water quality and plankton composition in the waters of Parit Keladi Village for freshwater fish farming. The study used a survey method in three locations, namely waters upstream, around residential areas, and downstream. Water quality parameters analyzed were temperature, depth, brightness, salinity, IDS, DO, BOD, COD, ammonia, nitrite, and nitrate. Plankton species, density, and biological index were analyzed. The results showed that the three locations' temperature, salinity, brightness, IDS, DO, COD, ammonia, nitrate, and nitrite met the national water quality standards for freshwater fish farming. However, BOD and depth values still did not meet the standard values. Planktons found consisted of 29 phytoplankton species and I zooplankton species with a total density of 9,350x10^3 cell/mL at location I, 9,540x10^3 cell/mL at location II, and 8,300x10^3 cell/mL at location III. The level of diversity was low, with the dominance of *Chlorella vulgaris* and *Chroococcus* species. It is concluded that water quality and plankton composition in the waters of Parit Keladi Village still need to be managed to develop freshwater fish farming.

Keywords: Freshwater Fish Farming, Parit Keladi Village, Water Quality, Plankton

1. INTRODUCTION

Parit Keladi Village in Kubu Raya Rave Regency is one of the West Kalimantan areas crossed by the Kakap River, with small rivers between settlements and agricultural land. The community uses the waters in Parit Keladi Village as a means of transportation: water source and fishing ground. Several types of fish, including tilapia, catfish, betok, seluang, bawal, baung, sepat, sandfish, and other natural fish, are still often found in the waters of Part Keladi Village. These fishery resources will support the development of freshwater fish farming in the waters of Parit Keladi village because, according to Lestari et al.[1]; Koniyo[2], the potential fishery resources available in that area.

Freshwater fish farming has excellent potential in fulfilling animal protein food needs and making a significant economic contribution to society[1,3-4]. Despite this, several problems are still obstacles to the development of freshwater fish farming in the waters of Parit Keladi Village. One of these problems is the contamination of waters by garbage and waste from residents and agricultural land around the seas.

Freshwater fish are fish that spend part of all of their lives in freshwater, with a salinity of less than 0,05%[5]. Most types of freshwater fish require plankton as their natural food[6-7]. To live healthy and grow optimally, freshwater fish need a suitable habitat. For this reason, water quality and

Received: 20 October 2024
Accepted: 21 November 2024

plankton abundance need to be considered in freshwater fish farming activities.

The potential of waters in Parit Keladi Village for the development of freshwater fish farming still needs to be evaluated. It is vital to analyze water quality and measure plankton composition as factors that will support sustainable freshwater fish farming in Parit Keladi village. This study aimed to analyze water quality and plankton composition as a support for freshwater fish farming in the waters of Parit Keladi Village. Hopefully, the study results can provide a better understanding of the water conditions in Parit Keladi Village as a basis for the development of freshwater fish farming in the region.

2. RESEARCH METHOD

Time and Place

The research was conducted in Parit Keladi Village, Kubu Raya Regency, West Kalimantan province, in June 2024.

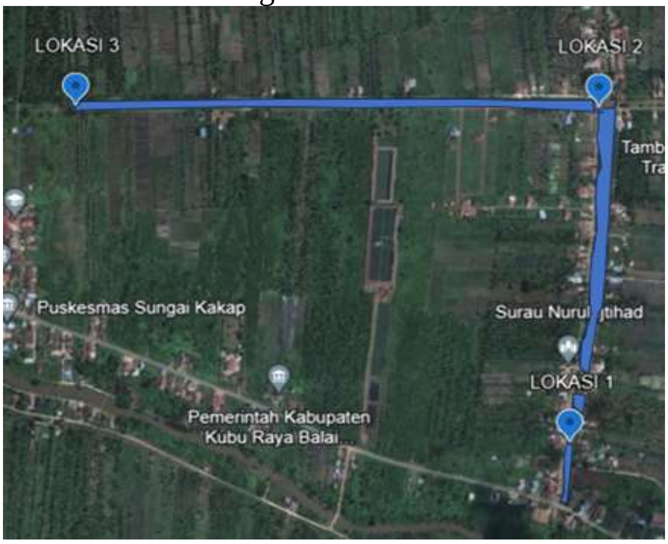

Figure 1. Maps of the locations and research stations

Method

The study used a survey method to describe water quality and plankton composition in the waters of Parit Keladi Village. Sampling was carried out at 3 points in the seas of Parit Keladi village (Figure 1).

Determination of sampling location points using a purposive sampling method. Location point I is at the entrance to the upstream waters. Point location II is in the waters around densely populated residential areas. At the same time, location point III is in the downstream waters. Water quality measurements and plankton sampling at each location point were repeated 5 times.

Plankton sampling was done in the morning. Water samples as much as 100L filtered using Plankton net mesh 30µm. The filtered sample is put into a black glass sample bottle with a capacity of 100 mL. The sample bottle was stored in a cooling box and brought to the Pontianak State Polytechnic Laboratory for identification. Plankton density was calculated using a hemocytometer. Observations using a digital microscope with a magnification of 10 x 10. Identification of plankton refers to the identification book of Biggs & Kilroy[8]; Van Vuuren et al.[9].

Water quality data was analyzed descriptively and qualitatively by comparing the measurement results of water quality parameters in the waters of Parit Keladi village with water quality parameters for freshwater fish farming required by national water quality standards according to PP No. 22 of 2021 Appendix VI.

Plankton composition was analyzed using biological indices consisting of the Shannon-Wiener diversity index, Pielou uniformity index, and Simpson's dominance index. Interpretations for each of these biological index values are shown in Table 1.

Table 1. Interpretation of biological index

Value	Interpretation
Shannon Wiener Diversity Index*	
H' < 1	Low diversity
1 ≤ H' ≤ 3	Medium diversity
H' > 3	High diversity
Pielou Index of Uniformity**	
E < 0,4	Low community uniformity
0,4 ≤ E ≤ 0,6	Medium community uniformity
E > 0,6	High community uniformity
Simpson's Dominance Index**	
0 < C ≤ 0,5	Low dominance
0,5 < C ≤ 0,75	Medium dominance
0,75 < C ≤ 1,00	High dominance

Descriptions: *Wheater et al.[10]; **Odum[11]

Calculation of plankton species diversity index using the formula:

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

Where: H' is the Shannon-Wiener diversity index, and pi is the number of individuals of each species divided by the total number of individuals (ni/N). Calculation of the uniformity index using the formula:

$$E = \frac{H'}{Hmax}$$

Where: the Pielou uniformity index (E) is the quotient of the Shannon-Wiener diversity index to the natural logarithm (In) of the number of species found. Calculation of the dominance index using the formula:

$$C = \sum\left(\frac{ni}{N}\right)^2$$

Where: Simpson's dominance index (C) is the total proportion of the number of individuals of each species divided by the total number of individuals squared.

3. RESULT AND DISCUSSION

Water Quality

The measurement results of physical and chemical parameters at the three sampling locations showed variations, especially in brightness, depth, TDS, DO, COD, BOD, ammonia, nitrate, and nitrite. In contrast, the temperature and salinity parameters of the waters in Parit Keladi Village show the same average value. The results of the water quality measurement are shown in Table 2. At the same time, the results of the comparative analysis of the suitability of water quality parameters with quality standard parameters for freshwater fish farming are shown in Table 3.

Water quality at the depth parameter in the three Parit Keladi Village water locations does not meet the requirements for freshwater fish farming. In the BOD parameter, location I is suitable for freshwater fish farming, but locations II and III are unsuitable because they have concentrations above the 6 mg/L threshold. However, the three locations in Parit Keladi Village waters showed suitability for freshwater fish farming based on temperature, salinity, brightness, TDS, DO, COD, ammonia, nitrate, and nitrite parameters.

Plankton Composition

The results found 29 phytoplankton and one species of zooplankton spread in 3 different locations in the waters of Parit Keladi Village. The types of plankton are classified into 6 phyla, 10 classes, and 23 families.

Plankton dominates the waters in Parit Keladi Village, and phytoplankton is from the phylum Chlorophyta and Cyanobacteria. Phytoplankton from the phylum Charophyta, Heterokontophyta, and Euglenophyta were found in all three locations in small amounts with a percentage of less than 1%. Zooplankton species from the phylum Ciliophora were only found in location II, in waters near residential areas. No zooplankton species were found in upstream and downstream waters in places I and III. The percentage of plankton composition found in each location is shown in Figure 2.

Plankton composition was also calculated using biological indices to determine species diversity, community uniformity, and dominance. The results of the biological index calculation are shown in Figure 3.

Table 2. Results of water quality measurements in the waters of Parit Keladi Village

Parameters	Location			Average
	I	II	III	
Temperature (°C)	28	28	28	28
Salinity (‰)	0	0	0	0
Brightness (cm)	35	36,2	34,6	35,3
Depth (m)	2	1,7	1,9	1,9
TDS (mg/L)	54	51,8	54,8	53,5
DO (mg/L)	5,38	4,68	4,92	4,99
Ammonia (mg/L)	0,08	0,04	0,04	0,05
COD (mg/L)	4,13	8,59	8,91	7,21
BOD (mg/L)	2,74	6,59	6,88	5,40
Nitrate (mg/L)	0,18	0,32	0,32	0,29
Nitrite (mg/L)	0,44	0,42	0,42	0,43

Table 3. Conformity of water quality parameters of Parit Keladi Village waters with water quality standard parameters for freshwater fish farming

Parameters	Quality Standard	Location		
		I	II	III
Temperature (°C)	24-30	✓	✓	✓
Salinity (‰)	0	✓	✓	✓
Brightness (cm)	30-40	✓	✓	✓
Depth (m)	10-15	×	×	×
TDS (mg/L)	≤ 1000	✓	✓	✓
DO (mg/L)	≥ 3	✓	✓	✓
Ammonia (mg/L)	≤ 0,2	✓	✓	✓
COD (mg/L)	≤ 40	✓	✓	✓
BOD (mg/L)	≤ 6	✓	×	×
Nitrate (mg/L)	≤ 10	✓	✓	✓
Nitrite (mg/L)	< 1	✓	✓	✓

Notes: *according to Annex VI of Government Regulation No. 22 of 2021; ✓ = compliant with quality standards; × = not compliant with quality standards.

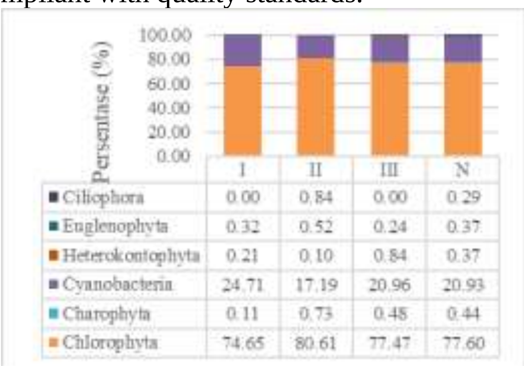

Figure 2. Description: I, sampling location in the upstream waters; II, sampling location in the area near the settlement; III, sampling location in the downstream waters; N, percentage of total plankton data found in the study

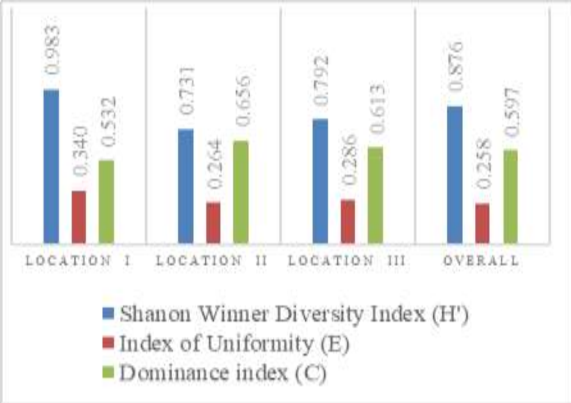

Figure 3. Composition of diversity, uniformity, and dominance of plankton at three research locations in the waters of Parit Keladi Village

The results of the biological index value calculation at the three research locations show the same criteria. The value of the Shannon-Wiener species diversity index is less than 1, which means that the diversity of plankton species in the three locations is in the low category. The uniformity index value shows a number less than 0,4, which means the uniformity of the plankton community in the area is in the low category. The dominance index value gets a number in the range above 0.5 but less than 0.75, which shows that the dominance of plankton in three locations in the waters of Parit Keladi Village is in the medium category.

The identification results show that *C.vulgaris* is the type of plankton from the Chlorophyceae phylum class most commonly found in the waters of Parit Keladi village. This species had a density of 6,510x10^3 cells/mL at location I, 7,570x10^3 cells/mL at location II, and 6,310x10^3 cells/mL at location III. *Chroococcus* is from the class Chroococaceae, and Cyanobacteria is the second dominating genus. The overall plankton species and density of individuals found in the waters of Parit Keladi Village are shown in Table 4.

Table 4. Distribution of plankton species and density in Parit Keladi Village waters

No	Genus/ Species	Location		
		I	II	III
PHYTOPLANKTON				
Chlorophyta (Green Algae)				
1	*Carteria*	10	0	0
2	*Chlamydomonas*	0	50	10
3	*Chlorococcum*	350	60	80
4	*Dunaliella*	10	0	10
5	*Monoraphidium contortum*	0	10	0
6	*Selenastrum capricornutum*	40	0	10
7	*Pleodorina californica*	10	0	0
8	*Scenedesmus dimorphus*	20	0	0
9	*Chlorella vulgaris*	6510	7570	6310
10	*Oocystella*	30	0	0
11	*Tetraselmis*	0	0	10
Charophyta (Desmid)				
12	*Closterium lanceolatum*	0	10	20
13	*Closterium navicula*	10	20	20

No	Genus/ Species	Location		
		I	II	III
14	*Closterium pronum*	0	10	0
15	*Staurastrum teliferum*	0	30	0
Cyanobacteria (Blue Green Algae)				
16	*Chlorogloeopsis sp*	0	0	180
17	*Chroococcus*	1990	1530	1530
18	*Merismopedia*	150	30	0
19	*Nostoc*	50	30	10
20	*Oscillatoria*	60	50	20
21	*Phormidium uncinatum*	60	0	0
Heterokontophyta (Diatom)				
22	*Botrydium granulatum*	0	0	10
23	*Centritractus sp*	10	0	0
24	*Chromulina sp*	10	0	0
25	*Dinobryon sp*	0	10	0
26	*Goniochloris mutica*	0	0	60
	Euglenophyta			
27	*Colacium vesiculosum*	10	0	0
28	*Euglena*	20	20	10
29	*Trachelomonas*	0	30	10
ZOOPLANKTON				
Ciliophora (Protozoa)				
30	*Paramecium*	0	80	0
Total Plankton		9.350	9.540	8.300

Water temperature affects feed consumption and fish growth[12,13]. The average temperature of the waters in Parit Keladi Village is 28ºC, and the average temperature is 25-32oC, which is optimal for supporting freshwater fish growth. This is in line with the statement by Suraya et al.[14] that a temperature of 25-32ºC is the optimal temperature for freshwater fish growth.

The salinity of the waters in Parit Keladi village is 0%, which is very suitable for freshwater fish farming because, according to Kulla et al.[5], freshwater spend part or all of their lives in waters with a salinity of less than 0,05‰. Salinity affects the process of osmoregulation and growth of biota in the waters[15].

Brightness in the waters of Parit Keladi village ranged from 34-38 cm, with an average of 35 cm in location I, 36,2 cm in location II, and 24.6 cm in location III. In general, the size of brightness is suitable for freshwater fish farming. Water brightness in the 30-40 cm range supports photosynthesis and improves water quality[2,13,16].

The TDS value refers to the total solids dissolved in the water[17]. Various human activities and sediments from rice fields carried by water flow influence the amount of dissolved solids. The TDS value in this study ranged from 4760 mg/L, which means that the dissolved solid particles in the waters of Parit Keladi Village are very few, so they are expected not to clog the gills and will not affect fish health.

The measurement results of DO values in the waters of Parit Keladi Village ranged from 4.4-6.1 mg/L. Although low, this value has met the value of water quality standards according to PP no 22 of 2021. However, this value is not optimal for freshwater fish farming because, according to Soliha et al.[18], dissolved oxygen of more than 5 mg/L is very supportive of the life of aquatic organisms.

Low DO values in the water will be a limiting factor that reduces production in fish farming[19]. Low dissolved oxygen values will cause aerobic organisms in the waters to die and require oxygen to decompose their organic matter. The BOD value shows the total oxygen required to decompose organic matter biologically[4,20]. Therefore, the lower the DO value, the higher the BOD value. In this study, the appropriate BOD value was only in location I, while in locations II and III, the BOD value exceeded the threshold required by water quality standards, which is 6 mg/L.

The COD value indicates the amount of oxygen required in the oxidation process in organic and inorganic compounds[21]. The measurement results show that the COD value in the waters of Parit Keladi Village is in the range of 4.1258.91 mg/L. Although the BOD values at locations II and III were slightly above 6 mg/L, the COD values at the three research locations were less than 40 mg/L. This means that, despite the decomposition process, the waters in Parit Keladi Village are still free from pollution by organic matter that is difficult to decompose.

Ammonia is a dissolved form of nitrogen resulting from the metabolism and decomposition of organic compounds. At values above 0.2 mg/L, ammonia is toxic to several types of fish[1,13]. The ammonia value at three locations in the waters of Parit Keladi village has an average value of 0.05 mg/L. This value is below 0.2 mg/L, following national water quality standards for freshwater fish farming. This value also indicates that the nitrification process is running smoothly[1].

The nitrate content in the waters will support the growth of plankton, which is fish's natural food. The optimal value required by plankton is 0.93.5 mg/L[22]. The nitrate value at three locations in the waters of Parit Keladi Village ranged from 0.1 to 0.7 mg/L, with an average value of 0.29 mg/L. This value is following water quality standards for freshwater fish farming.

The nitrate content in the waters will support the growth of plankton, which is fish's natural food. The optimal value required by plankton is 0.93.5 mg/L[22]. The nitrate value at three locations in the waters of Parit Keladi village ranged from 0.1 to 0.7 mg/L with an average value of 0.29 mg/L. This value is following water quality standards for freshwater fish farming.

Nitrite is a gas resulting from protein breakdown. Nitrite content of more than 1 mg/L is toxic and harmful to fish[7]. In this study, three water locations in Parit Keladi Village contained nitrite in the 0.2-0.7 mg/L range. This value indicates that the nitrite content in the research location is not toxic to fish and follows water quality standards for freshwater fish farming.

Plankton in the water supports the development of freshwater fish farming. Plankton plays a vital role as a source of nutrients and oxygen. An ideal plankton composition ensures the availability of natural food and supplies dissolved oxygen (DO)[21]. However, in high-density conditions, plankton can have a negative impact on the ecosystem because the oxygen concentration becomes over-saturated, and there will be competition for oxygen at night[15].

The three research sites in the Parit Keladi village were dominated by phytoplankton from the phylum Chlorophyta, with an average percentage of 77.6%. The Trebouxiophyceae and Chlorophyceae classes, as well as Chlorodendrophyceae, dominate the waters. The species found from the Trebouxiophyceae class are Chlorella vulgaris at locations I, II, and III and Oocystella only at location I. The species found from the Chlorophyceae class were Chlorococcum at sites I, II, and III. Genera Carteria, Pleodorina, and Scenedesmus were only found at location I. Genera Dunaliella and Selenastrum were found in sites I and III. Chlamydomonas were found in sites II and III, while Monoraphidium was only found in site II. From the Chlorodendrophyceae class, only one genus, Tetraselmis, was found at location III.

The dominance of Chlorophyta, especially the type of *C.vulgaris*, plays a role in aquaculture because it contains nutrients such as protein, vitamins, and essential fatty acids needed for the growth of cultured fish. *C. vulgaris* in the waters will also help water quality management as it absorbs excess nutrients and reduces harmful algal blooms. Phytoplankton species from this class are also commonly found in freshwater waters due to their high adaptability[23].

Another type of phytoplankton found was blue-green algae from the phylum Cyanobacteria, which had an average of 20.93%. The most commonly found genus of this phylum is Chroococcus. In freshwater fish farming, Cyanobacteria has a complex role. This phytoplankton can increase fisheries productivity due to its ability to fix nitrogen and become natural fish food. On the other hand, it can produce toxins and cause algal blooms that reduce water quality[24]. In this study, the dominance of Cyanobacteria is still balanced and can support the development of freshwater fish farming in the waters of Parit Keladi Village.

Other phytoplankton found in the waters of Parit Keladi village are desmids from the phylum Charophyta with an average of 0.44%, as well as the phylum Euglenophyta and diatoms from the phylum Heterokontophyta, each with an average percentage of 0.37%. These types of phytoplankton are widespread. According to Wirabumi et al.[26] Plankton from green algae, blue algae, and diatoms groups are very common in fresh waters.

In addition to phytoplankton, zooplankton were found in location II of Parit Keladi village waters. Zooplankton was found in Paramecium, phylum Ciliophora, and class Oligohymenophorea. Although the percentage of some types of phytoplankton and zooplankton is very small (less than 1%), these types still contribute to the diversity of plankton species in the waters of Parit Keladi village.

In general, the results of the calculation of biological index values show that plankton composition in Parit Keladi village's waters has a slight variation with an uneven distribution of individuals. Some plankton species, such as *C. vulgaris* and *Chroococcus*, dominate the waters and suppress the growth of other plankton because environmental conditions are more favorable for these two types of phytoplankton. Nevertheless, changes in plankton composition are still very likely to occur. Changes strongly influence changes in plankton in the chemical and physical factors of water. Plankton are usually very fertile in nutrient-rich conditions and a stable water column[21].

Overall, with good management, water quality and plankton composition in the waters of Parit Keladi village are by the national water quality standards for freshwater fish farming according to PP No. 22 of 2021. The types of fish that can be developed for aquaculture include white baung, freshwater pomfret, belida, eel, betok, gabus, gourami, carp, toman, jelawat, lais, catfish, tilapia, catfish, tawes[26].

4. CONCLUSION

Water quality in three Parit Keladi Village water locations in temperature, salinity, brightness, TDS, DO, COD, ammonia, nitrate, and nitrite meet national water quality standards for freshwater fish farming. However, in the BOD parameter, only location I in the upstream part of the river meets the standard value, while location II around residential areas and location III in the water quality standard for freshwater fish farming. The three locations also do not have sufficient depth for freshwater fish farming.

The plankton found in this study consisted of 29 species of phytoplankton and one species of zooplankton with a total density of 9,350x10^3 cell/mL at location I, 9,54x10^3 cell/mL at location II, and 8,300x10^3 cell/mL at location III. Plankton composition in the waters of Parit Keladi Village has a low level of diversity and dominance of the *C.vulgaris* and *Chroococcus* species. The analysis of water quality and plankton composition results indicate that the waters in Parit Keladi Village still need to be managed for use in developing freshwater fish farming.

REFERENCES

1. Lestari, Y.I., Mardhia, D., Syafikri, D., Kautsari, N., & Ahdiansyah, Y. Analisis Kualitas Perairan untuk Budidaya Ikan Air Tawar di Bendungan Batu Bulan. *Indonesian Journal of Applied Science and Technology*, 2020; 1(4): 126-133.
2. Koniyo, Y. Analisis Kualitas Air pada Lokasi Budidaya Ikan Air Tawar di Kecamatan Suwawa Tengah. *Jurnal Techopreneur (JTech)*, 2020; 8(1): 52-58.
3. Santoso, P., & Alayubi, A. Kajian Potensi Lahan untuk Pengembangan Akuakultur di Daerah Aliran Sungan (DAS) Talau-Loes, Lintas Batas RDTL-Indonesia. *Jurnal Vokasi Ilmu-Ilmu Perikanan (JVIP)*, 2022; 3(1): 44-51.
4. Saputra, N.E., Puspadewi, C.A., & Propantoko, H. Analisis Kualitas Air untuk Pengembangan Sarana Rekreasi dan Budidaya Perikanan di Situ Cicadas *Journal of Tropical Silviculture*, 2023; 14(02): 90-96.
5. Kulla, O.L.S., Yuliana, E., & Supriyono, E. (2020). Analisis Kualitas Air dan Kualitas Lingkungan untuk Budidaya Ikan di Danau Laimadat, Nusa Tenggara Timur, *Pelagicus,* 2020; 1(3): 135-144
6. Andriyani, N., Mahdiana, A., Hilmi, E., & Kristian, S. (2020). The Correlation Between Plankton Abundance and Water Quality in Donan River. *Omni- Aquatics*, 2020; 16(3): 14-20
7. Muslimin, B., Khotimah, K., Nizar, M., Yowono, H., Neri, W.P., Alhusna, I.S., & Al-Ansori, M.A.L. (2024). Analisis Kualitas Air dan Biodiversitas Plankton di Kawasan Konservasi PT PHE Raja Tempirai. *Journal of Global Sustainable Agriculture*, 2024; 4(2): 186-191.
8. Biggs, B.J., & Kilroy, C. *Stream Periphyton Monitoring Manual*. NIWA. Christchurch, New Zealand, 2000.
9. Van Vuuren, S.J., Taylor, J., Ginkel, C.V., & Gerber, A. *Easy Identification of the Most Common Freshwater Algae: A Guide for the Identification of Microscopic Algae in South African freshwaters*. Resource Quality Services (RQS), 2006.
10. Wheater, C.P., Bell, J.R., & Cook, P.A. *Practical Field Ecology: A Project Guide (Vol. 38)*. Wiley–Blackwell, 2011.
11. Odum, E.P. *Dasar- Dasar Ekologi* (*Third Edition*). Gadjah Mada University Press, 1993.
12. Manunggal, A., Hidayat, R., Mahmudah, S., Sudinno, D., & Kasmawijaya, A. Kualitas Air dan Pertumbuhan Pembesaran Ikan Patin dengan Teknologi Biopori di Lahan Gambut. *Jurnal Penyuluhan Perikanan dan Kelautan*, 2018; 12(1): 11-19.
13. Minggawati, I., & Saptono, S. Parameter Kualitas Air untuk Budidaya Ikan Patin (Pangasius pangasius) di Karamba Sungai Kahayan, Kota Palangka Raya. *Jurnal Ilmu Hewani Tropika*, 2012; 1(1): 27-30
14. Suraya, U., Gumiri, S., & Permata, D.D. Hubungan Kualitas Air dengan Pertumbuhan Ikan Lele Sangkuriang (*Clarias* sp.) yang dibesarkan di dalam Ember. *Journal of Tropical Fisheries*, 2021; 16(2): 109-115.
15. Renitasari, D.P., Yunarty, Y., & Asma, S. Studi Monitoring Kualitas Air pada Tambak Intensif Budidaya Udang Vaname, Situbondo. *Jurnal Airaha,* 2021; 10(02): 139-145
16. Yulius, Y., Aisyah, A., Prihantono, J., & Gunawan, D. Kajian Kualitas Perairan untuk Budidaya Laut di Teluk Saleh, Kabupaten Dompu, *Jurnal Segara*, 2018; 14(1): 57-68.
17. Denindya, Z.A.P., Haribowo, R., & Rubiantoro, P. Analisis Status Kualitas Air Metode STORET Saluran Irigasi di Mondoroko. *Jurnal Teknologi dan Rekayasa Sumber Daya Air*, 2023; 3(2): 178-185.

18. Soliha, E., Rahayu, S.Y.S., & Triastinurmiatiningsih, T. Kualitas Air dan Keanekaragaman Plankton di Danau Cikaret, Cibinong, Bogor. *Ekologia*, 2016; 16(2): 1-10
19. Pasaribu, R.P., Sewiko, R., Djari, A.A., Rahman, A., & Nata, R. Analysis of Water Quality in the Mangrove Ecosystem on Karangsong Beach, Indramayu District. *Journal of Airaha*, 2024; 13(1): 128-140.
20. Saputra, P.Y., Yudasmara, G.A., & Maharani, I.M.D.K. Analisis Storet Kualitas Sumber Air pada Kegiatan Pembenihan di Balai Perbenihan Ikan (BPI) Bulelreng, Bali. *Pena akuatika: Jurnal Ilmiah Perikanan dan Kelautan*, 2023; 22(2): 63-70.
21. Sudinno, D., Jubaedah, I., & Anas, P. Kualitas Air dan Komunitas Plankton pada Tambak Pesisir Kabupaten Subang, Jawa Barat. *Jurnal Penyuluhan Perikanan dan Kelautan,* 2015; 9(1): 13-28.
22. Wahyuni, A P., Firmansyah, M., & Hastuti, N.F. Studi Kualitas Air untuk Budidaya Ikan Bandeng (*Chanos chanos* forsskal*)* di Tambak Kelurahan Samataring Kecamatan Sinjai Timur. *Jurnal Agrominansia*, 2020; 5(1): 106-112.
23. Wedhawati, N.K.V., Julyantoro, P.G.S., & Pebriani, D.A.A. Keanekaragaman dan Komposisi Jenis Plankton pada Kolam Bioflok Ikan Nila (*Oreochromis niloticus*). *Bumi Lestari Journal of Environment*, 2022; 22(2): 7.
24. Newcombe, G., House, J., Ho, L., Baker, P., & Burch, M. *Management Strategies for Cyanobacteria (Blue- Green Algae): A Guide for Water Utilities* (Research Report 74; p. 100). WQRA: Water Quality Research Australia, 2010.
25. Wirabumi, P., Sudarsono, S., & Suhartini, S. Plankton Community Structure in the Waters of Wadaslintang Reservoir, Wonosobo Regency. *The Journal of Biological Studies*, 2017; 6(3): 174-184
26. Tejo, H., & Pabendon, T. Analisis Potensi Pengembangan Perikanan Budidaya Ikan Air Tawar di Kabupaten Mimika. *Jurnal Kritis,* 2022; 6(1): 21-44