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Water Quality Analysis in Relation to Fish Cultivation Development in Tamarupa Waters, Pangkep Regency, Indonesia

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ABSTRACT

This study aims to determine the relationship between water quality and fish farming development around the Tamarupa coastline in Pangkep Regency. The study was conducted over two months, from July to August 2025. Observations were made through observation, measurement, and recording of water quality data at the study site. This study used a descriptive exploratory method. Water quality measurements were conducted in situ. Data were collected and analyzed using descriptive analysis. The results showed that all water quality parameters, including temperature, pH, dissolved oxygen, and salinity, met the quality standards stipulated in Government Regulation of the Republic of Indonesia No. 22 (2021), including for fish farming activities such as milkfish. The exception was the salinity parameters at ST 1 and ST 2, which were quite high, ranging from 38 to 38.5 ppt.

KEYWORDS: water quality, fish farming, waters, Tamarupa

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INTRODUCTION

Water is the habitat of milkfish, influencing their growth and survival. Therefore, pond water must meet both volume and quality requirements (Wahyuni et al., 2020). Generally, water quality parameters are grouped into two categories: primary and secondary parameters. Primary parameters are chemical compounds that enter water bodies without reacting with other compounds, leading to adverse impacts on the waters. In contrast, secondary parameters are formed through chemical reactions that transform into other compounds, which can have both negative and positive effects on the waters (Putriningtias et al., 2021).

The water quality parameters observed to ensure whether the waters in the area are good or bad include physical and chemical parameters such as temperature, pH, dissolved oxygen, salinity, current speed, depth, and brightness (Romimohtarto and Juwana 2001). Pond waters are one area that can be utilized to boost the economic sector (Wahyuni et al., 2020). One location for fish farming in ponds is the coastal area. Monitoring water quality in coastal areas is deemed necessary, especially in areas susceptible to pollution. Furthermore, these areas harbor numerous interests, such as fish farmers, fish farms, fishing communities, and various other activities.

The sustainability of aquaculture, including in coastal areas, is highly dependent on the quality of the aquatic environment. Different aquatic environmental conditions can affect the physical, chemical, and biological quality of the environment. In aquaculture, water quality is a key factor for success because it is an absolute requirement for maintaining cultivated organisms (Wahyuni et al., 2020). Water quality analysis is conducted as an effort to control and minimize pollution and damage to coastal and marine areas (Mudloifah & Tarzan, 2023).

Tamarupa Beach Waters is one of the coastal areas in Pangkep Regency, Indonesia, where there are community activities such as milkfish cultivation and seaweed cultivation. Even around Tamarupa Beach, Pangkep Regency, there are many community activities that are prone to causing a decline in water quality, such as agricultural activities, milkfish pond cultivation, and community waste. According to Gholizadeh et al. (2016), any change in the vulnerable ecosystem due to anthropogenic activities can endanger the habitat of fish and other aquatic organisms. Therefore, water quality testing was conducted to determine whether the Tamarupa coastline was still suitable for fish farming, especially milkfish. Several water quality parameters measured were temperature, pH, dissolved oxygen, and salinity.

MATERIAL AND METHOD

The research was conducted over two months, from July to August 2025, on the Tamarupa coast in Pangkep Regency, Indonesia. Observation is a data collection technique in which researchers directly observe the objects being studied. The observations used for the study were systematically planned. Observations were conducted by observing, measuring, and recording water quality data at the research sites. This study used a descriptive exploratory method. Data collection was conducted at three stations: location 1 (ST 1), located near a mangrove forest; location 2 (ST 2), located on the coast and adjacent to a tourist attraction; and location 3 (ST 3), located near a river estuary and directly connected to residential areas and agricultural areas. Water quality measurements were conducted in situ. Measurement of water quality at the research location includes water temperature, water pH, water dissolved oxygen and water salinity.

Temperature testing or measurement is carried out by taking water samples at designated stations with a thermometer using the method according to the National Standardization Agency (BSN). (2005). SNI-06-6989.23-2005. Temperature testing is carried out by directly dipping the thermometer into the test sample and leaving it for 2 to 5 minutes until the thermometer shows a stable value. Next, record the thermometer scale reading without first removing the thermometer from the water.

pH measurement is done by taking water samples at predetermined stations, determining pH levels using methods according to the National Standardization Agency. (2004). SNI 06-6989.11-2004. Observation of test samples can be done by calibrating the pH meter with a buffer solution according to the tool's work instructions. Condition the test sample to room temperature, dry it with tissue paper, then rinse the electrode with distilled water, rinse the electrode with the test sample, then dip the electrode into the test sample until the pH meter shows a constant reading. Next, record the results of the scale reading.

Dissolved oxygen (DO) testing is performed using a DO meter. The procedure for using a DO meter is to first calibrate the meter at zero, dip the probe tip into the sample, press Ar, then press RUN, and then press enter. Then, wait for the meter reading to stabilize.

Salinity measurements were performed using an Atago Master-3m refractometer. Salinity measurements began with calibrating the refractometer using distilled water. The refractometer was then dried. After drying, the refractometer was dripped with sample water and observed. The results were then recorded.

RESULTS AND DISCUSSION

Water Temperature (°C)

Temperature is one of the important water quality parameters because it is abiotic in the aquatic environment. Because the average aquatic biota is poikilothermic, or cannot regulate its body temperature (Levinton 1982), it is very dependent on the temperature conditions of the waters where the biota lives. If the temperature conditions do not match the tolerance that can be accepted by the biota, it can cause death (Hutagalung 1988). Furthermore, Boyd (2015) stated that temperature is a water quality parameter that affects the metabolic processes of aquatic organism.

The average water temperature range during the study was 27.98–29.5°C, with the highest temperature at location 3 and the lowest at location 1 (Figure 1). The low water temperature at location 1 is thought to be due to its proximity to a mangrove forest. Dawes (1981) stated that the normal range tolerated by marine life is 27–30°C. On the other hand, the temperature indicated by Wulandari et al.'s (2015) research ranged between 28–30°C. Water temperature was relatively stable with modest increases (Putriningtias et al., 2021). This temperature range is still within the temperature tolerance limit for marine life according to the quality standards of the Republic of Indonesia Government Regulation No. 22 (2021); namely, the optimal temperature for the survival of marine biota is between 28 and 32°C. Significant changes in water temperature from high to low can cause disruptions in the respiration, metabolism, and circulation processes in marine biota (Oktafiansyah, 2015). Ismail et al. (1993) stated that the temperature for milkfish growth is 27–31°C. Meanwhile, Ahmad and Ratnawati (2002) stated that fish can still live normally at a temperature of 27–35°C. The temperature range of the results of measurements from all stations is around 27–30°C, in accordance with what is needed by marine biota to grow well (Putriningtias et al., 2021).

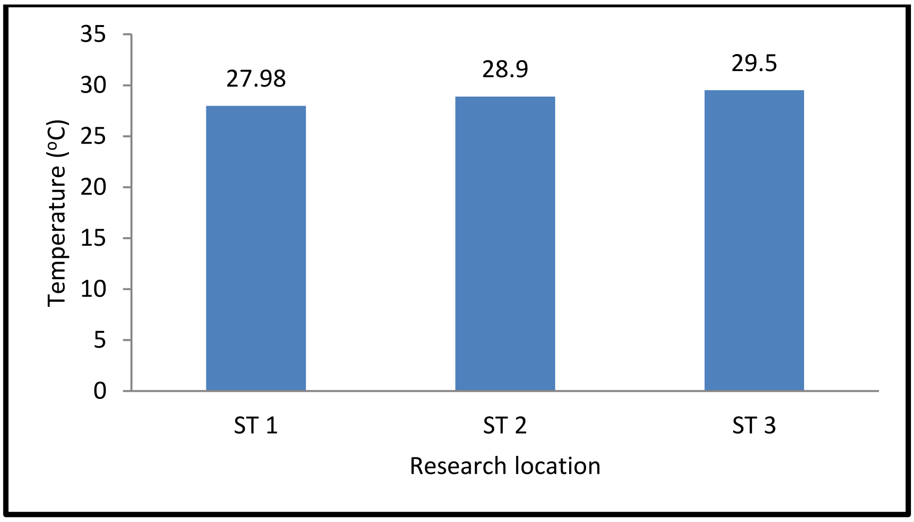

Figure 1. Average Water Temperature During Research

Temperature changes affect the physical, chemical, and biological processes in water bodies. Increased water temperature will have several consequences, including a decrease in the amount of dissolved oxygen in the water, an increase in the rate of chemical reactions, disruption to the life of fish and other aquatic animals, and if the lethal temperature limit is exceeded, fish and other aquatic animals may die (Fardiaz, 1992). Increased temperatures also cause increased decomposition of organic matter by microbes. The optimum temperature range for phytoplankton growth in water is 20–30°C (Effendi, 2003). According to Wardoyo (1975), the higher the temperature, salt content, and partial pressure of dissolved gases in water, the lower the solubility of oxygen in water. This is, of course, greatly influenced by high anthropogenic activity, weather, and water flow, both from river estuaries and community waste discharge.

Dissolved oxygen (ppm)

Dissolved oxygen is a limiting factor for all biota living in a body of water. Dissolved oxygen is a basic requirement for aquatic life (Putriningtias et al., 2021). Dissolved oxygen (DO) is a water quality parameter required for organism metabolism (Mudloifah & Tarzan, 2023). Dissolved oxygen levels during the study ranged from 4.12 to 4.68 ppm, with the highest dissolved oxygen content at ST 2. The high dissolved oxygen levels at ST 2 are thought to be due to its coastal location and proximity to tourist attractions, which are exposed to sunlight daily (Figure 2). The range of dissolved oxygen (DO) levels is below the quality standard set by Government Regulation of the Republic of Indonesia No. 22 (2021), which stipulates an optimal dissolved oxygen (DO) level for marine biota survival of >5 mg/L. Low dissolved oxygen (DO) levels can be caused by low exposure to sunlight in the waters, which inhibits phytoplankton photosynthesis, and by low water current speeds (Mudloifah & Tarzan, 2023). Based on the research results of Susilowati et al. (2012), the measurement of water quality parameters for good dissolved oxygen levels is 7.2 ppm. Based on the standard for marine water quality, especially for marine biota, which is above 5 mg/L, the condition of dissolved oxygen in the waters of Ujung Perling Island is still classified as the standard for marine water quality, so that the waters can be said to have sufficient dissolved oxygen for the survival of marine biota.

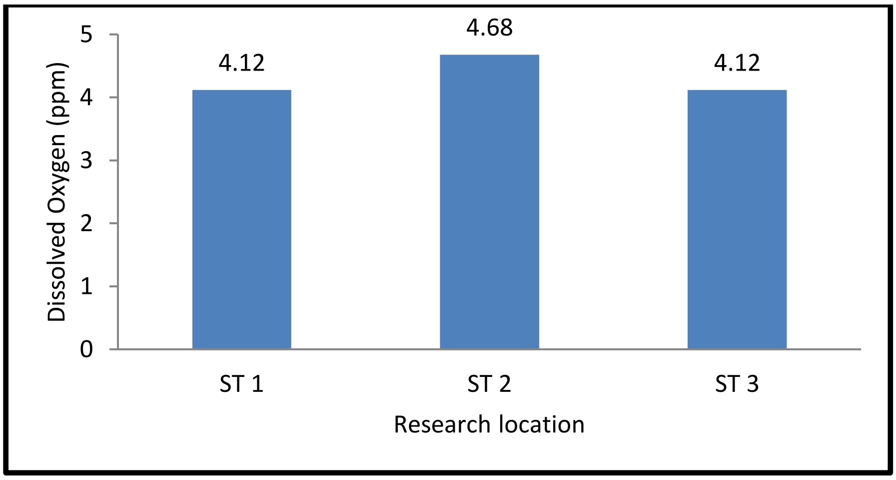

Figure 2. Average Dissolved Oxygen in Water During Research

Dissolved oxygen plays a crucial role in the breakdown of organic matter by microorganisms, which are then utilized by organisms for respiration. It is a key support for biota life and a key indicator of aquatic fertility. Aquatic biota also require dissolved oxygen for metabolism (Putriningtias et al., 2021). However, dissolved oxygen levels will decrease if the water contains high levels of organic waste due to the presence of bacteria that decompose organic matter, which in turn consumes large amounts of dissolved oxygen (Undap et al., 2018). Hardjowigeno and Widiatmoko (2001) stated that DO levels of 3 mg/L are considered suitable for use in milkfish cultivation ponds. Too low oxygen levels in cultivation can affect the survival of milkfish because they can cause suffocation, while too high dissolved oxygen levels can cause gas bubble disease (Utojo and Pirzam, 2000). Dissolved oxygen levels in the coastal waters of Tamarupa, Pangkep Regency, are sufficient and are considered in very good condition, so it can be said that the waters in this area are not exposed to waste.

Water pH

The degree of acidity (pH) is a water quality parameter that plays a crucial role in aquatic biochemical processes (Simanjuntak, 2012). The pH range of water at the research site was 7.59–7.81 (Figure 3). Figure 3 shows that there was no significant difference in the pH ranges across the research sites. This pH range complies with the standards set by Government Regulation of the Republic of Indonesia No. 22 (2021), which states that the optimal pH for marine life is between 7.0–8.5. This pH is classified as alkaline. Water pH has a significant impact on the diversity, abundance, and dominance of plankton, as well as the productivity of marine waters (Megawati et al., 2014). According to Nybakken (1992), in marine environments, pH tends to be stable and is usually in the range of 7.50–8.40. Ferawati et al. (2014) also stated that the ideal degree of acidity (pH) for marine biota growth is 7–8. According to Wulandari et al. (2015), every marine biota requires certain pH conditions for its survival, and this is no exception. Seawater has a significant buffering capacity to prevent pH changes. Even a slight change in pH from its natural pH will indicate disruption of the buffer system (Putriningtias et al., 2021). The pH value for milkfish growth is between 7.0 and 8.5 (SNI 6148.3:2013), pH 6.5-8.5 (Koswara, 2011), and pH 6.5–9.0 (Rangka and Asaad, 2010). According to Odum (1996), the optimal pH for milkfish cultivation is 6–9.

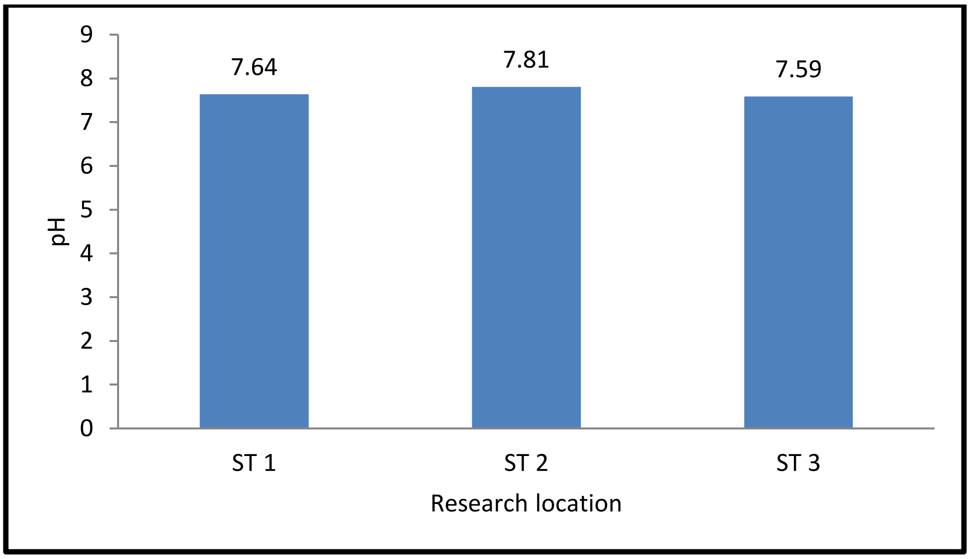

Figure 3. Average pH of Water During Research

Waters Salinity

Salinity is a water quality parameter that indicates the level of dissolved salt in water (Hamuna et al., 2018). Salinity is part of the chemical properties of water, in addition to temperature, pH, substrate, and others. Salinity is influenced by tides, rainfall, evaporation, precipitation, and topography of a body of water. As a result, the salinity of a body of water can be the same or different from other bodies of water, for example, inland waters, seas, and brackish waters. The salinity range of seawater is 30–35‰, estuaries 5–35‰, and freshwater 0.5–5‰ (Nybakken, 1992).

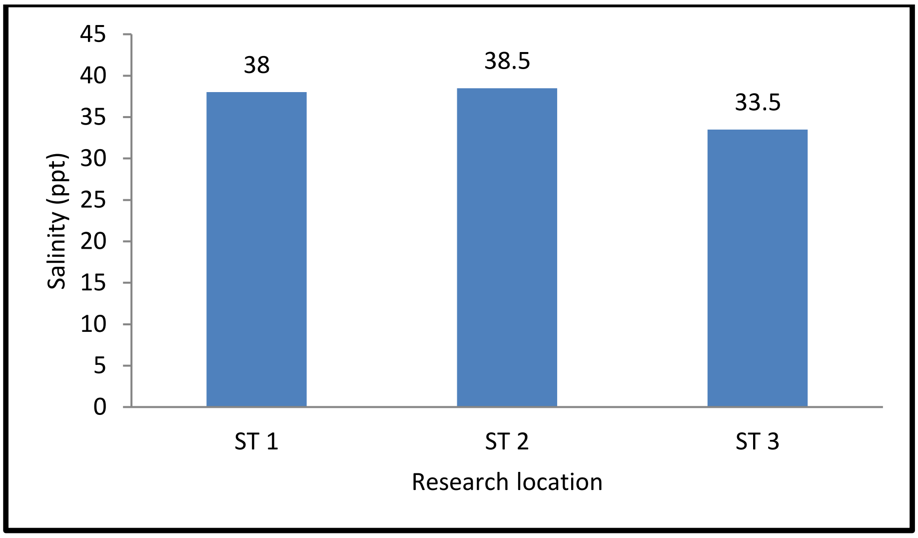

Figure 4. Average Water Salinity During the Research

Seawater salinity affects the distribution, abundance, and growth of aquatic biota, as well as their density in a body of water (Putriningtias et al., 2021). Salinity data in the Tamarupa Coastal waters indicate that the water salinity is still within the marine water quality standards for the survival of marine biota based on Government Regulation of the Republic of Indonesia Number 22 of 2021. Therefore, the water salinity conditions in the Tamarupa Coastal area are still considered good, except for ST 1 and ST 2, which have a salinity of 38–38.5 ppt. Salinity conditions to support the growth of marine biota, as stated by Wulandari et al. (2015), are such that the optimum salinity range for marine biota growth is around 30 ppt. In addition, each marine biota has a different tolerance range for salinity, so salinity is one of the important factors that influence the survival and growth of biota. According to Kadi (2006), a good salinity range for marine biota in tropical areas is in the range of 32–34 ppt water salinity.
The salinity range is below the quality standard of Government Regulation of the Republic of Indonesia No. 22 (2021), which states that the optimal salinity for marine life is between 33 and 34‰. The high salinity values in ST 1 and ST 2 are due to location 1 (ST 1) being located near a mangrove forest and location 2 (ST 2) being located on the coast and close to tourist attractions, while location 3 (ST 3) is located near a river estuary. According to Patty et al. (2020), water salinity is influenced by water distribution patterns, evaporation, weather, and the influx of freshwater carried by river flows.

CONCLUSION

All water quality parameters, including temperature, pH, dissolved oxygen, and salinity, have met the requirements according to the quality standards of the Republic of Indonesia Government Regulation No. 22 (2021), including for fish farming activities such as milkfish, except for the salinity parameters at ST 1 and ST 2, which have high salinity because they are in the range of 8-8.5 ppt. The low salinity at ST 3 is because the ST is directly connected to the river estuary.

REFERENCES

1. Ahmad, T, & Ratnawati, E. 2002. Intensive Milkfish Cultivation: Self-Help Farmers. Bogor
2. Boyd CE, 2015. Water Quality: An Introduction. Berlin: Springer.
3. Dawes CJ. 1981. Marine Botany. New York(US): John Wiley and Sons.
4. Effendi, H. 2003. Water Quality Assessment for Aquatic Resources and Environmental Management. Jakarta
5. Fardiaz, S.1992. Water and Air Pollution. Kanisius Publisher. Yogyakarta.
6. Ferawati, E., Widyartini, D.S., & Insan, I. 2014. Study of Seaweed Communities on Various Substrates in the Permisan Coastal Waters, Cilacap Regency. Scripta Biologica. 1(1):55–60.
7. Gholizadeh., Melesse., & Reddi. 2016. A Comprehensive Review on Water Quality Parameters Estimation Using Remote Sensing Techniques. Florida International University. Miami.
8. Hamuna, B., Tanjung, R.H.R., Suwito., Maury, H.K., & Alianto. 2018. Study of Seawater Quality and Pollution Index Based on Physico-Chemical Parameters in the Waters of Depapre District, Jayapura. Journal of Environmental Science. 16(1): 35-43.
9. Hardjowigeno, S. & Widiatmoko. 2001. Land Suitability and Land Use Planning. Department of Soil, Faculty of Agriculture, IPB. Bogor.
10. Hutagalung, H.P. 1988. The Effect of Water Temperature on the Life of Marine Organisms. Oceania, 13(4),153–164.

11. Ismail, A., Poernomo, A., Sunyoto, P., Wedjatmiko, Dharmadi, & Budiman, R.A.I. 1993. Technical Guidelines for Milkfish Farming in Indonesia. Center for Fisheries Research and Development, Jakarta, 93p.
12. Kadi, A., & Atmadja, S. 2006. Some Notes on the Presence of the Sargassum Species in Indonesian Waters. Lampung (ID): LIPI. 76p.
13. Koswara, B. 2011. Saguling Reservoir Restoration Through the Application of Ecotechnology Methods. Journal of Aquatics. 2(2)
14. Levinton, J.S. 1982. Marine Biology. Prentice-Hall Inc. Englewood clipps. New Jersey. 1–526.
15. Megawati, C., Yusuf, M., & Maslukah, L. 2014. Distribution of Water Quality Reviewed from Nutrients, Dissolved Oxygen and pH in the Southern Waters of Southern Bali. Journal of Oceanography. 3(2), 142–150
16. Mudloifah, I., &, Tarzan, P. 2023. Analysis of Water Quality in Asmoroqondi Beach, Palang District, Tuban Regency Using the Principal Component Analysis (PCA) Method. Lentera Bio. 12(3), 273–280.
17. Nybakken, J. W. 1992. Marine Biology: An Ecological Approach. PT. Gramedia. Jakarta.
18. Odum, E.P. 1996. Fundamentals of Ecology, W.B. Sounders Company Ltd, Philadelphia.
19. Oktafiansyah, A. 2015. Analysis of Water Quality Suitability in the Landak River to Determine the Optimal Location for Fishery Cultivation. Thesis. Pontianak: Faculty of Fisheries and Marine Sciences, Muhammadiyah University of Pontianak.
20. Patty, S., Nurdiansah, D., & Akbar, N. 2020. Distribution of Temperature, Salinity, Turbidity and Clarity in the Tumbak-Bentenan Sea Waters, Southeast Minahasa. Journal of Marine and Island Sciences; 3(1), 77–87.
21. Government Regulation of the Republic of Indonesia [PP RI]. 2021. Government Regulation of the Republic of Indonesia Number 22 Concerning the Implementation of Environmental Protection and Management. Jakarta (ID): PP RI.
22. National Standardization Agency. 2004. SNI 06-6989.11-2004. How to test the degree of acidity (pH) using a pH meter. Jakarta: National Standardization Agency.
23. National Standardization Agency (BSN). 2005. SNI 06-6989.23-2005. Regarding Temperature Testing Methods with a Thermometer. Jakarta: National Standardization Agency.
24. Putriningtias, A., Syamsul, B., Teuku, M.F., & Antoni, H. 2021. Water quality in coastal area of Ujung Perling Island, Langsa City, Aceh. Habitus Aqua J. 2(2), 95–99. DOI: https://doi.org/10.29244/HAJ.2.1.95
25. Rangka, N. A., & Asaad, A.I.J. 2010. Milkfish Cultivation Technology in South Sulawesi. In: Proceedings of the Aquaculture Technology Innovation Forum. Brackish Water Aquaculture Research Center, Maros, South Sulawesi, pp. 187–203.
26. Romimohtarto, K., & Juwana, S. 2001. Marine Biology. Jakarta (ID): Djambatan.
27. Simanjuntak, M. 2012. Seawater Quality Reviewed from Nutrient, Dissolved Oxygen and pH Aspects in Banggai Waters, Central Sulawesi. Journal of Tropical Marine Science and Technology. 4(2), 290–303.
28. Susilowati, T., Rejeki, S., Dewi., & Zulfitriani, E.N. 2012. The Effect of Depth on the Growth of Seaweed (*Eucheuma cottonii*) Cultivated Using the Longline Method at Mlonggo Beach, Jepara Regency. Journal of Fisheries Science and Technology. 8(1),7–12.
29. Undap, S.L., Pangkey, H., Pangemanan, N.P. 2018. Physicochemical analysis of water quality in Bahoi waters, West Likupang District, North Sulawesi. Journal of Aquaculture. 6(3).
30. Utojo, & Pirzam, A.M. 2000. Polyculture of Milkfish (Chanos chanos Forskal) and Seaweed in Ponds. UGM Fisheries Journal. Coastal Fisheries Research Center. Maros.
31. Wahyuni, A.P., Muhammad, F., Nurlaelah, F., & Hastuti. 2020. Water quality study for milkfish (Chanos chanos Forsskal) cultivation in ponds in Samataring Village, East Sinjai District. Journal of Agrominansia, 5(1), 106–113.
32. Wardoyo, S. 1975. Water Quality Management: Higher Education Quality Improvement Project, IPB, Bogor.
33. Wulandari, S.R., Hutabarat, S., & Ruswahyuni. 2015. The influence of current and substrate on the distribution of seaweed density in the waters of Panjang Island, West and South. Diponegoro Journal of Marine Management of Aquatic Resources. 4(3), 91–98.