



## Assessment of Organic Matter and Chlorine Levels in Watu Kenong Coastal Waters, Situbondo

Anita Diah Pahlewi

Faculty of Agriculture, Science and Technology, Abdurachman Saleh Situbondo University, Indonesia

\*anitadiah123@gmail.com

### Abstract

The coastal area that has potential natural resources both tourism and coral conservation in Situbondo Regency, East Java, is the coastal area in Bungatan District. In Bungatan, there are several beaches along the Pantura as marine tourism objects, one of them called Watu Kenong Beach. A case reported online in June 2025 where there was a complaint from a marine community group to local government about an extensive coral reef's damage in Watu Kenong covering a dozen hectares area. The purpose of this study is to determine the concentration of organic matter and chlorine in Watu Kenong waters as an initial study material for evaluating the water quality of Watu Kenong waters in order to assist the research in the rehabilitation process of coral reefs. Water sampling locations are divided into 3 parts, namely location 1 at the Pasir Putih area, locations 2 and location 3 at the Watu Kenong section. Research method used is descriptive method. The value of organic matter parameters in Watu Kenong at Location 1 is 79,63 mg/L, Location 2 is 84,69 mg/L and Location 3 is 97,33 mg/L. The chlorine parameter value is 0.01 mg/L at 3 water sampling locations. The conclusions of this research are the organic matter has higher level that exceed the normal threshold and it can be considered as a pollution and the chlorine concentration is below the threshold but still need the further research.

**Keywords:** Water quality, organic matter, chlorine, watu kenong

## 1. INTRODUCTION

Water quality is an important aspect in maintaining the balance of aquatic ecosystems and the sustainability of their utilization for the benefit of mankind (1,2). Marine waters are economically valuable because they have natural resources that can be managed for exploitation, just as in Situbondo marine waters are utilized for various activities such as capture fisheries, aquaculture, even marine tourism and submarine gas pipelines (3). In addition, the attractiveness of Situbondo's potential marine waters invites investors to conduct business by developing the infrastructure near marine spaces such as the hotel, hatchery industry, brackish water aquaculture, marine aquaculture, fishing and fishery product processing. One coastal area that has potential natural resources both tourism and coral conservation in Situbondo Regency, East Java, is the coastal area in Bungatan District. In Bungatan, there are several beaches along the Pantura (Pantai Utara) route that have become marine tourism objects, one of them called Watu Kenong Beach. In line with the existence of these attractions, the development of infrastructure around them with economic value is also increasingly intensive. Infrastructure development that results in the release of pollutants from poorly managed pollutant sources, and the entry of pollutants into coastal and marine waters is a negative impact that can cause a decrease in water quality around coastal and marine waters and can have an impact on the economy at that area.

The high utilization of marine waters has the consequence of adding pressure to the aquatic environment, which can lead to degradation of aquatic ecosystems, including a decrease in seawater quality (5). This is reflected in a case reported online in June 2025 where there was a complaint from a community group to the local government about extensive coral reef's damage in Watu Kenong covering a dozen hectares area (6). Coral reefs have an important role in the marine ecosystem so the damage of coral reefs can change the marine ecosystem negatively. Watu Kenong Beach is located at the east of Pasir Putih Beach, in the Bungatan, Situbondo. This beach is commonly used as a marine tourism destination such as boat rides, snorkeling or diving. As tourism destinations, the human activities are intense around this area, such food vendors, some



copyright is published under [Lisensi Creative Commons Atribusi 4.0 Internasional](https://creativecommons.org/licenses/by/4.0/).

hotels, shrimp ponds, floating net cages, and etc. In order to conduct the research about the cause of coral reef damage and its recovery process, it is necessary to take steps for assessing, monitoring and evaluating the components that affect the coral reef health both from internal and external factors. Evaluation needs to be carried out comprehensively in water quality, biota conditions, residues on biota and reef and others factors. This research focuses on monitoring the water quality around Watu Kenong coral reefs area, specifically in the organic matter and chlorine parameters. These two parameters were chosen because of some opinion that these two are the reason of coral reefs damage at Watu Kenong. Organic matter and chlorine can be indicators of water quality because organic matter comes from the waters themselves which have passed the process of decomposition, weathering, and decomposition of plants and the remains of dead organisms where organic matter plays a role in the existence of aquatic phytoplankton, which they providing nutrients in the waters (7). Meanwhile, chlorine is a disinfectant to kill microorganisms. The presence of chlorine in waters can cause coral reefs to lose color so that they are susceptible to disease, reduce the number of plankton and microorganisms that become fish food, and can affect water temperature which has an effect on migration patterns and reproduction of biota in the ecosystem (8). Research on water quality around Watu Kenong, precisely in the Pasir Putih waters, has been conducted starting from the physical and chemical parameters of the waters (9,10,11), determining the quality status of the waters (12). But focusing on organic matter and chlorine content has not been done. The purpose of this study is to determine the value/concentration of organic matter and chlorine in Watu Kenong waters as an initial study material for evaluating the water quality of Watu Kenong waters and its surroundings in order to assist in the rehabilitation process of coral reefs.

## 2. METHODS

The area that will be the research site is marine waters in Bungatan Situbondo District, more precisely in Watu Kenong and one sample in the Pasir Putih area of Situbondo Regency. The location selection will be carried out by purposive sampling with the aim that research activities can run efficiently. Water sampling locations (Table 1) are divided into 3 parts, namely Location 1 at the Pasir Putih area, Location 2 and Location 3 at the Watu Kenong section.

Table 1. Research Location

No	Location	Coordinate
1	Location 1	-7.695358, 113.817854
2	Location 2	-7,6855820, 113.8324590
3	Location 3	-7.6852890, 113.8338180

The sample of seawater was collected during the day at once sampling. This sampling was carried out in 20<sup>th</sup> May 2025. The tools and materials used in this study are as in Table 2.

Table 2. Research Tools and Material

No	Tools	Material
1	GPS	Sea waters
2	Plastic bottles	
3	Glass bottles	

The procedure for collecting water quality data in Watu Kenong sea waters uses laboratory testing methods. Water sampling uses plastic bottles and glass bottles from a depth of 0.5 m from the surface of the water. Sampling of seawater that requires laboratory analysis is done by putting seawater samples into bottles and stored in a cool box to be analyzed in the Water Quality Laboratory of the Situbondo Brackish Aquaculture Center (BPBAPS). The parameters and their method specification as in Table 3

Table 3. The Parameters and Method Specification

No	Parameters	Method Specification
1	Chlorine (Cl <sub>2</sub> )	Kolorimetric
2	Organic Matter	Titrimetric



Research method used is descriptive method, which is a method that provides a systematic description of the factors of an area. The analyzed data were compared with the quality standards set by the Minister of Environment Regulation No. 5/2014 on wastewater quality standards and some other literature on organic matter and chlorine content. Data analysis was done descriptively by presenting data in the form of tables and graphs.

### 3. RESULTS AND DISCUSSION

Based on the results of laboratory testing conducted at the Water Quality Laboratory of the Situbondo Brackish Aquaculture Center (BPBAPS), the values of organic matter and chlorine parameters were obtained as shown in Table 3.

Table 4. Result

No	Parameters	Unit	Result		
			Location 1	Location 2	Location 3
1	Organic Matters	mg/L	79,63	84,69	97,33
2	Chlorine	mg/L	0,01	0,01	0,01

The data results as graphic shown on Figure 1.

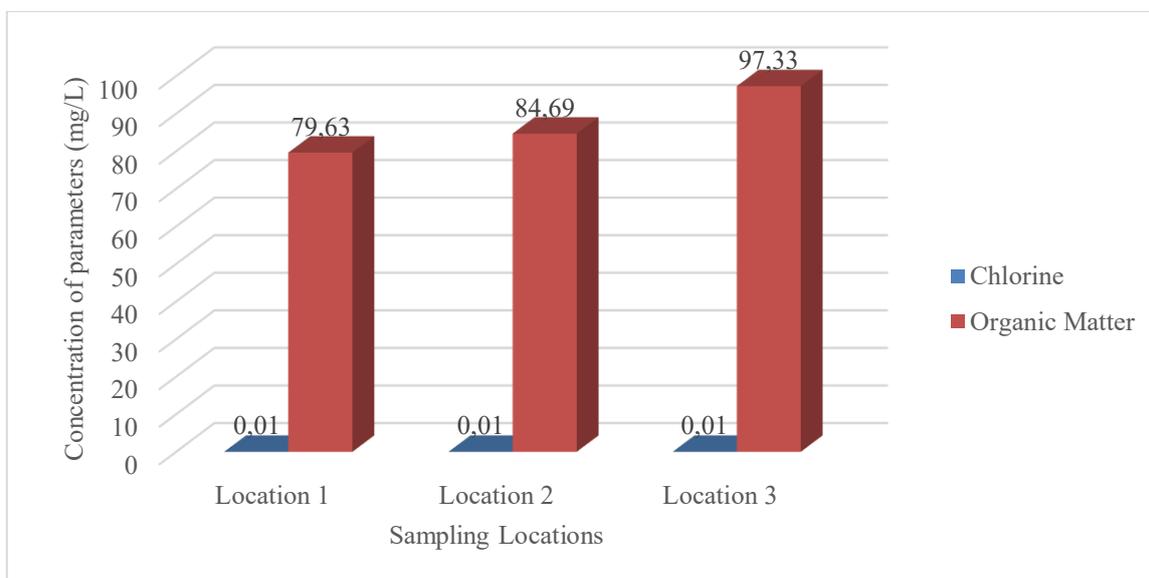


Figure 1. The Chlorine and Organic Matter Concentration

Based on the research results in Table 4 and Figure 1, known that the value of organic matter parameters in the waters of Watu Kenong at Location 1 is 79,63 mg/L, Location 2 is 84,69 mg/L and Location 3 is 97,33 mg/L. According to Supriyantini et al in (13), organic matter content exceeding 30 mg/L will cause water pollution. Based on the data above, it is known that the value of organic matter in Watu Kenong waters exceeds 30 mg/L, so it has the potential to cause water pollution. The content of organic matter in these waters can be influenced by the aquatic environment itself, the flow coming from the river around Watu Kenong, and current patterns. Watu Kenong waters are the downstream of several rivers. These rivers allegedly bring organic matter to the Watu Kenong waters. According to Jubaedah *et.al.* (13) the concentration of organic matter is also influenced by depth, distance from the source of input of organic matter and dilution of seawater mass. The highest concentration is at Location 3 where it is located near the hotels and homestay. Human activities such as settlements, ports, agriculture, household and industry can cause an increase of organic matter in coastal waters (14,15). This statement is related with the fact of organic matter content in Watu Kenong water where there are many of marine agriculture activities (shrimp ponds, floating net cage), hotels, and food street vendors



along the area. Therefore, further research is needed for the clear information about organic matter sources. This high organic matter content also causing the blooming phytoplankton and its consequent to the death of coral reefs (15). As Nusantara TV, the Youtube channel, shows that the damage of coral reef in Watu Kenong caused by algae's invasive (16).

The chlorine parameter value based on Table 4 is 0.01 mg/L at 3 water sampling locations. The threshold chlorine concentration determined by the Regulation of the Minister of Environment of the Republic of Indonesia Number 5 of 2014 concerning wastewater quality standards for industrial activities is 1 mg/L. Based on this, the chlorine value in Watu Kenong waters is still below the water quality standard threshold, which means that there is no chlorine concentration that can endanger the life of marine biota (17). But, the presence of chlorine content in the seawaters often comes with disinfectant, where it used for water treatment such as for the pool. In Watu Kenong, there are several hotels or homestay with pool. There is no information about their pool wastewater treatment. The further research about wastewater treatment for industries around Watu Kenong, the residual of chlorine at reefs, biota, and sediment need to be conducted.

#### 4. CONCLUSION

The concentration of organic matter in Watu Kenong waters at Location 1 is 79,63 mg/L, Location 2 is 84,69 mg/L and Location 3 is 97,33 mg/L. The chlorine concentration ranges at 0,01 mg/L at three sampling location. The organic matter has high level that exceed the normal threshold and it can be considered as a pollution. The chlorine concentration is below the threshold but still need the further research.

#### ACKNOWLEDGMENTS

I would like to express my gratitude to all those who supported this research. First my sincere thanks to Abdurrachman Saleh Situbondo University through Research and Community Service Unit (LP2M) UNARS in the 2024 period. I am also grateful to FPST UNARS, Ocean Engineering Study Program and Misi Bahari Situbondo for providing the necessary resources and support.

#### REFERENCE

- [1] C.E Boyd, Water Quality, USA: Springer International Publishing, 2014.
- [2] M. Hossain and P. K. Patra, "Water Pollution Index – A New Integrated Approach to Rank Water Quality", *Ecological Indicators*, 117, 106668, 2020.
- [3] Nugroho Putro, Dimas Haryo, and Yanto Budisusanto, "Analisis Izin Lokasi dan Pengelolaan Pemanfaatan Ruang Laut dengan RZWP3-K (Studi Kasus: Kab. Situbondo, Provinsi Jawa Timur)," *Jurnal Teknik ITS*, vol. 8, no. 2, 2019, doi:10.12962/j23373539.v8i2.44615.
- [4] A. Diah Pahlewi and H. Rahayu, "Penentuan Status Mutu Air dengan Metode Indeks Pencemaran di Perairan Pasir Putih Situbondo", *CERMIN: Jurnal Penelitian*, 4(2): 269-280. 2020.
- [5] E. Rina Mailisa, B. Yulianto, B. Warsito, "Water Quality Condition of Sani River as Source of Drinking Water of PDAM Tirta Bening in Pati Regency", *E3S Web of Conferences*, vol 202, pp. 06040, 2020, doi: 10.1051/e3sconf/202020206040
- [6] A. Zuhaidi Anwar, "Belasan Hektar Terumbu Karang di Perairan Situbondo Rusak", Seru.co.id, 20 Juni 2025, [Online]. Available at: <https://seru.co.id/201124-belasan-hektar-terumbu-karang-di-perairan-situbondo-rusak> [Diakses 25 Juni 2025]
- [7] E. Supriyantini, R. A. Tri Nuraini, A. Putri Fadmawati, "Studi Kandungan Bahan Organik Pada Beberapa Muara Sungai Di Kawasan Ekosistem Mangrove, Di Wilayah Pesisir Pantai Utara Kota Semarang, Jawa Tengah", *Buletin Oseanografi Marina*, vol. 6, no 1, pp. 29–38, 2017.
- [8] Seafood Inspection Laboratory, "Manfaat dan Bahaya Klorin : Penggunaan dan Dampak Bagi Kesehatan dan Alam", 16 Agustus 2023 [Online]. Tersedia: <https://baliseafoodlab.com/manfaat-dan-bahaya-klorin/#:~:text=Gangguan%20pada%20ekosistem%20perairan,makhluk%20hidup%20di%20ekosistem%20tersebut> [Diakses 25 Juni 2025]
- [9] A. Diah Pahlewi, "The Study on Physical and Chemical Water Quality Parameters at Pasir Putih, Situbondo", *In the 6<sup>th</sup> ISOCEEN 2018*, pp.77-81, 2020 [Online], doi 10.5220/0008374800770081.
- [10] A. Diah Pahlewi and C. Handayani, "Temperature and Salinity Condition Based on Field Measurement at Pasir Putih Waters Situbondo", *In the IOP Conf. Ser.: Earth Environ. Sci.* 698 012041, 2021, doi: 10.1088/1755-1315/698/1/012041



copyright is published under [Lisensi Creative Commons Atribusi 4.0 Internasional](https://creativecommons.org/licenses/by/4.0/).

- [11] A. Diah Pahlewi and W. Sakinah, "The Content of Nitrates In Water Pasir Putih, Bungatan, Situbondo", *zona laut*, vol. 1, no. 2, pp. 38-42, Jul. 2020.
- [12] A. Diah Pahlewi and H. Rahayu, "Penentuan Status Mutu Air dengan Metode Indeks Pencemaran di Perairan Pasir Putih Situbondo", *CERMIN: Jurnal Penelitian*, vol. 4, no. 2, pp. 269-280, 2020.
- [13] R. W. Ningrum, M. Zainuri, and S. Y. Wulandari, "Studi Kandungan Dan Sebaran Bahan Organik Di Perairan Kota Pekalongan," *Indonesian Journal of Oceanography*, vol. 6, no. 2, pp. 159-164, May. 2024. <https://doi.org/10.14710/ijoce.v6i2.18193>
- [14] D. Yoswaty, B. Amin, Nursyirwani, H. Winanda, D. D. Sianturi, and A. Lestari, "Analysis of Organic Matter Content in Water and Sediment in the Coastal Waters of Bengkalis Island, Riau Province", In the IOP Conf. Ser.:Earth Environ. Sci. 934012055, 2021, doi : 10.1088/1755-1315/934/1/012055
- [15] O.H. Cahyonugroho, S. Hariyanto, G. Supriyanto, "Dissolved organic matter and its correlation with phytoplankton abundance for monitoring surface water quality", *Global Journal Environmental Science and Management*, vol. 8(1), pp. 59-74, 2022.
- [16] Nusantara TV, "Invasi Alga, 13 Hektar Terumbu Karang di kawasan Watu kenong, Situbondo Rusak!", Youtube, 23 Juni 2025. [Online]. Available at <https://www.youtube.com/watch?v=Rz38QsAioKg>
- [17] P. Wahyuni and T. Prartono, "Chlorine (Cl<sub>2</sub>) Waste Concentration in Laba Banten Sea Waters from Electric Generator Cooling Process Activities", Undergraduate theses, IPB University, Marine Science and Technology, Faculty of Fisheries and Marine Science, 2015 [Online], available at <http://repository.ipb.ac.id/handle/123456789/75395>.

