Volume 16, No. 2, 2023

ISSN: 1907-9931 (print), 2476-9991 (online)

DIVERSITY OF CORAL REEFS AT INSROM BEACH, BIAK NUMFOR REGENCY

Eka Oviani Msen, Galuh P. W. Utami*, Iriani Ira Bukorpioper

Department of Biology, Faculty Science & Technology, University of Ottow Geissler Papua. Jalan Perkutut Kotaraja Jayapura, Papua, Indonesia.

*Corresponding author email: utamig03@gmail.com

Submitted: 07 December 2022 / Revised: 14 August 2023 / Accepted: 16 August 2023

http://doi.org/10.21107/jk.v16i2.17681

ABSTRACT

Coral reef represent tropical ecosystem encompassing a diverse marine biota associated with it. The aim if this study was to determine the types of coral reefs, diversity of coral reefs species, and the water quality on the Insrom coast. This study used a line transect method that stretched 50 meters in 3 stations at a depth of 3-5 meters. The results of this study indicated that there are 53 types of coral reefs. Overall diversity index (3.27). The water quality measurements yielded the following result: temperature 28-30^{o}C, pH 7- 8- 2, salinity 30-32%, brightness ranging from 2.5-3 meters, current 3-8 m/sec, dissolved oxygen levels of 3-5 mg/l. The study's conclusion is that there are 53 types of coral reefs. The insrom coast's diversity index is 3.27 which shows high category according to Shannon-Wienner. The water quality of Insrom coast remains within tolerable range for the growth of coral reefs.

Keywords: *Diversity, Types, Coral reefs.*

INTRODUCTION

Indonesia is the largest archipelagic country with more than 17,000 large and small islands with a coastline of 81,000 km. It has coral reefs and an ecosystem area of 2.5 million ha with rock coral species from 82 genera spread widely in Indonesian waters (Giyanto, 2017).

Coral reefs are a typical ecosystem of the tropics that have high potential both from the economic and ecological perspectives. Economically, coral reefs are a source of income for fishermen and a source of attraction for underwater tourism. Ecologically, coral reefs serve as nursery areas, protected areas for the biota associated with them. Dahuri (2002) in Anwar *et al.* (2014) stated that coral reef is home to over 100 types coral, 200 fish species, numerous mollusks, crustaceans, sponges, algae, seagrass and various marine life. However, in fact, the high or low diversity of coral reefs depend on fluctuation of environmental factor both physically and chemically such as temperature, pH, DO, salinity, brightness, current speed. Furthermore, human activities sometimes cause detrimental impact on coral reef ecosystems (Sunarto, 2006).

The process of species identification is necessary to consider the shift in environmental factors that might inhibit coral growth (Sunarto, 2006). Therefor, the study aims to determine various coral reefs, and water quality, of the Insrom Coastal. The objective of study is also to share valuable insight to public and certain organizations.

MATERIAL AND METHODS

Location and Duration

This research was carried out from January to May 2020 at Insrom Beach, Biak Numfor District.

Station Selection

The selection of station include observation of representative area along Insrom beach. The primary station was in publicly-used bathing area. Additionally, the second station was along fishing spot area. Lastly, the third station situated distant from human activity including fishing area.

Tools and Materials

Tools

The equipment were diving goggles (masks), roll meter, underwater camera, GPS (Global Positioning System), thermometer, refractometer, DO meter, Secchi disk, current meter, boat, stationery, rope, hammer, chisel, sample bottle, field notes, catalog of coral reef species from Suharsono, 2008.

Materials

Coral reefs, alcohol, tissue.

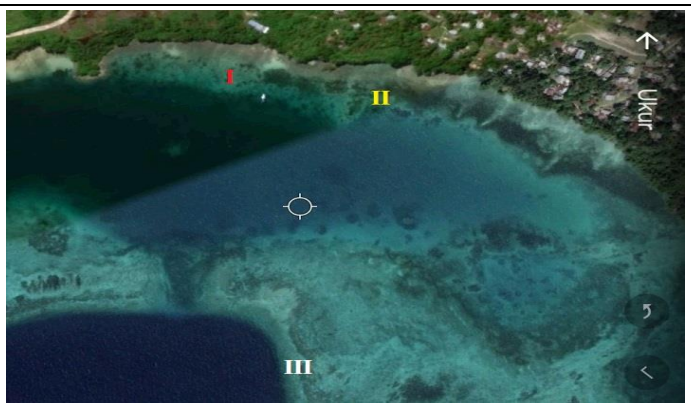

Figure 1. Map of research locations and stations.

Data Collection Technique

This research used the transect method (Line transect) with a transect length of 50 meters and 5 times measurements. The results of the sampling were identified using the guide book of the identification of the types of coral reefs in Indonesia by Suharsono (2008). The finding were recorded in tabular format to facilitate quantitative data. Then, the analysis was applied using the Shannon-Winner formula.

$$H' = -\sum_{i=1}^{s} Pi \ \ InPi$$

After calculating the diversity index, then proceed with calculating the domination index of coral reef species using the formula by (Simpson, 1949 in Odum, 1971) as follows:

$$C = \sum_{i=1}^{s} \mathbf{Pi}\ (\mathbf{ni}/\mathbf{N})^{\mathbf{2}}$$

RESULTS AND DISCUSSION

Overview of Research Site Condition

Administratively, Insrom Beach is located in Insrom Village, Biak City District, Biak Numfor district with precise coordination of 1º09º05 S 16º02'16 E. Insrom Village has an area of 6.5 hectares, with the territorial boundaries of Maryendi Village (north), the open sea (south), Inggiri Village (east) and Wapoga Village (west) (Msen, personal com.)

Insrom Beach is one of the rocky shorelines, predominantly comprised of rocks. Rocky beaches are strongly influenced by tides with large to small volumes. Rocky beaches have the potential to have the highest level of animal and plant diversity compared to sandy beaches (Msen, personal com.) The findings from observation indicate that local community is often engaged in several activities. These activities include laundering, bathing, fishing and fishing ports (Msen, personal com.)

Variety od Discovered Coral

Based on the results of research conducted at Insrom Beach, Biak Numfor District, the number of coral species found was 55 species, but only 5 species were identified from 10 families and 2 genera.

Table 1. Types of Coral Reefs at Insrom Beach, Biak Numfor District

No	Order	Family	Genus	Species
1	Scleractina	Acroporidae	Aropora	*Acopora millepora*
2				*Acropora donei*
3				*Acropora palifera*
4				*Acropora* sp
5				*Acropora tenuis*
6				*Acopora humilis*
7				*Acropora valenciennesi*
8				*Acropora* sp1
9				*Acropora divaricata*
10				*Acropora* sp2
11			Anacropora	*Anacropora spinosa*
12			Isopora	*Isopora* sp
13			Montipora	*Montipora capricornis*
14				*Montipora stellata*
15				*Montipora informis*
16				*Montipora danae*
17	Scleratina	Faviidae	Favites	*Favites pentagona*
18			Leptastrea	*Leptastrea purpurea*
19				*Leptastrea traversa*

No	Order	Family	Genus	Species
20			Favia	*Favia danae*
21				*Favia lizardensis*
22			Favia	*Favia pallida*
23			Platygyra	*Platygyra daedalea*
24			Oulophyllia	*Oulophyllia crispa*
25	Scleractina	Faviidae	Diploastrea	*Diploastrea heliopora*
26			Goniastrea	*Goniastrea edwardsi*
27				*Goniastrea pectinata*
28			Cyphastrea	*Chyphastrea microphtalma*
29	Scleractina	Pectinatidae	Pectinata	*Pectinata alcicornis*
30	Scleractina	Mussidae	Symphyllia	*Symphyllia radians*
31			Lobophyllia	*Lobophyllia corymbosa*
32			Pocillopora	*Pocillopora* sp
33	Scleractina	Pocilloporidae		*Pocillopora damicornis*
34			Seriatopora	*Seriatopora hystrix*
35				*Seriatopora caliendum*
36	Scleractina	Fungiidae	Cycloseris	*Cycloseris tenuis*
37				*Cycloseris patelliformis*
38				*Fungia scutaria*
39				*Fungia concinna*
40	Scleractina	Fungiidae	Fungia	*Fungia fungites*
41				*Fungia* sp
42				*Heliofungia actiniformis*
43			Coeloseris	*Coeloseris mayeri*
44	Scleractina	Agariciidae	Pachyeris	*Pachyeris speciosa*
45				*Pacyeris rugosa*
46			Pavona	*Pavona* sp
47			Porites	*Porites mayeri*
48	Scleractina	Poritidae		*Porites (syneria) rus*
49			Goniopora	*Goniopora tenuidens*
50	Scleractina	Oculinidae	Galaxea	*Galaxea fascicularis*
51				*Galaxea* sp
52	Scleractina	Milleporidae	Millepora	*Millepora intrincata*
53				*Millepora dichotoma*

Diversityof Coral Reefs at Insrom Beach, Biak Numfor District

At station I (coordinates of S 1º8’51,57996” E 136º2’9,38328”), the diversity index (H’) of coral species indicate moderate diversity index of 2,753. According to findings, there are 21 species from 7 families. The results suggest that the diversity of coral reefs at station I particularly influenced by its capability to adapt to environmental conditions. As stated by (Mulya, 2006), the growth and distribution of coral reefs are influenced from various environmental factor including physical and chemical components, alongside the impact from human activity.

The coral reef species index (H’) observed at station II (coordinates 1º8’52,8216 E 136º2’12,05268”), show a moderate diversity of 2.553. This index score is slightly lower than Index score at station I. The reason is that the station II is as an area of entry and exit for fishing boats. Moreover, the presence of cloudy sandy sedimentation (at the depth of 4 m) leads to limited growth of coral. Coral reefs dominantly growth at a depth of 3 m which condition of water is relatively light, characterized by slightly rocky sandy sedimentation. Tomascik *et al.* (1997) as cited in Anwar (2017) stated that high sedimentation can lead tp reduced species diversity, low coverage, and slower growth rates.

The index (H') of coral reef types at the station III with coordinates S 1º8’57,04296” E 136º2’16,23588” is included in the medium diversity index category of 2,822 or the highest compared to the stations I and II. The reason is that the infrequent presence of human activities such as swimming and fishing in which coral reef ecosystem remains in a good condition.

Table 2. Diversity Index

No	Station	Diversity Index (H’)
1	I	2,753
2	II	2,553
3	III	2,822
	Total	3,263

Presentation of Coral Reef Diversity Based on Family

The graph above shows that the Acroporidae become dominant family at station I point I. Conversely, at point II, the Fungiidae family appears dominance, whereas at point III is dominated by Poritidae family. Coral species from the 3 families are found in almost every station and it is inseparable from their ability to adapt to environmental conditions (Anwar *et al.,* 2014).

At station II point I, the dominant type of coral reef is the Faviidae family, while point II is dominated by the Poritidae family, and point III lacks of dominant species.

At sation III, point I and II are dominated by the Acroporidae family, whereas the Potridae family found dominance in point III. Coral species from the 3 families above were found at each station and dominated especially by the Acroporidae family because corals from this family have the ability to adapt to the environment and are easy to develop and grow quickly compared to other types of coral reefs (Johan, 2013).

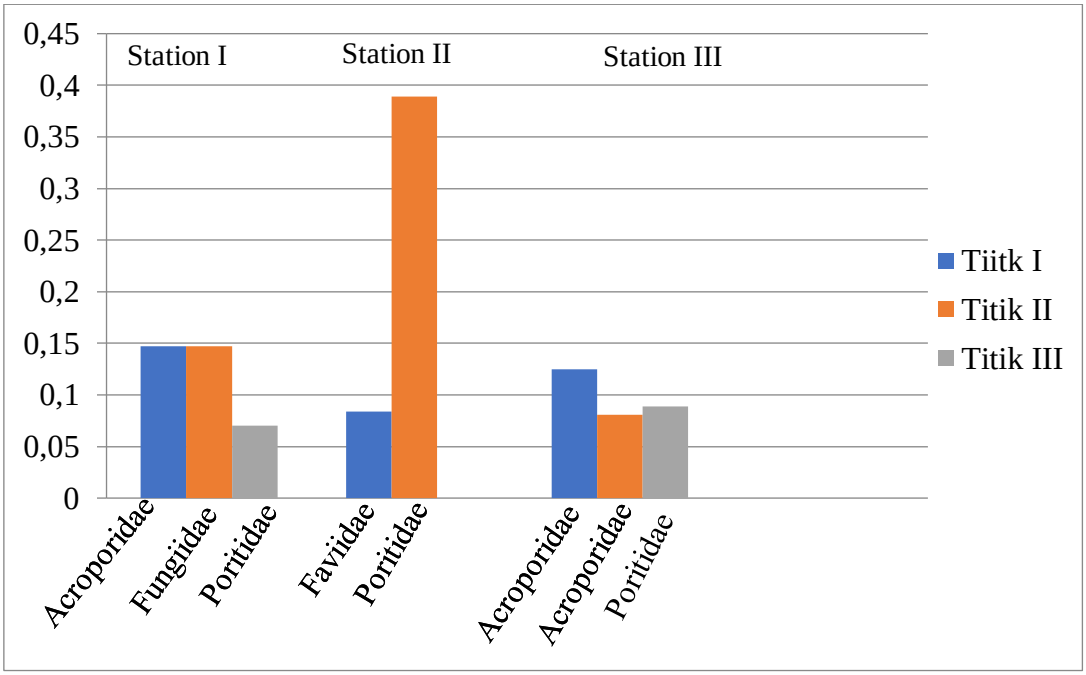

Figure 2. Graph of the Coral Reef Domination

Water Quality Measurement at Insrom Beach, Biak Numfor District

In addition to the impact of coral growth habitats, water quality is also affected by environmental physicochemical factors, including temperature, pH, salinity, brightness, water currents, and DO levels.

At each station, the temperature recorded from30-31 °C, classified as favorable temperature. pH at each station obtains an average of 8, salinity at each station ranges from 26-31%, The brightness level across all station ranges from 2-3, meanwhile speed of current is within range of 3 to 6. The DO level is various among stations observed within 3 to 5 mg/l.

CONCLUSION AND SUGGESTION

Based on the results of research conducted at Insrom Beach, Biak Numfor District, it can be concluded that. The types of coral reefs found on Insrom Beach are 53 species consisting of 12 families and 23 genera. The Diversity Index of coral reef species in Insrom Beach, Biak Numfor District is 3,263, which according to Shannon-Wiener, is considered in the high diversity index category. The results of water quality measurements at Insrom Beach are still within the tolerance range for coral reef growth with the temperature 30°C, pH 8, Salinity of 30-32, Brightness of 2-3, Current speed of 3-6, DO of 3-5 mg/l. Future research is recommended to measure the percentage of coral cover based on human activities at Insrom Beach, Biak Numfor District. It is necessary to monitor the condition and presence of Coral Reefs at Insrom Beach, Biak Numfor District as data will be used from time to time. For further research, it is recommended to measure the percentage of coral cover based on human activities at Insrom Beach, Biak. It is necessary to monitor the condition and presence of Coral Reefs at

Insrom Beach, Biak Numfor Regency as data that will be used from time to time.

ACKNOWLEDGMENT

The author would like to thank the chief of Insrom village for granting permission to research team to conduct this study. Appreciation is also given to all those who provide assistance and contribute to successful of this research.

REFERENCES

Afni, N. (2017). Kondisi Terumbu Karang di Pulau Samathelu Pedda Kecamatan Liukang Tubbiring Kabupaten Pangkep Sulawesi Selatan. [Skripsi]. Fakultas Sains dan Teknologi. UIN Alaudin: Makasar.

Anwar, V. H., Zakaria, I. J., & Afrizal, S. (2014). Komposisi dan Struktur Komunitas Karang (Scleractinia) di Ekosistem Terumbu Karang di Perairan Pantai Nirwana Padang. *Jurnal Biologi UNAND*, *3*(1), 20-26

Dahuri, R. (2003). "*Keanekragaman Hayati Laut*". Jakarta: Gramedia Pustaka Utama.

Darmadi. (2010). "*Ekosistem Terumbu Karang di Indonesia*" https//dhamdharma. wordPres.com diakses pada tanggal 10 april 2019.

Direktoral Konservasi Taman Nasional Laut (2006). "*Pedoman Pelaksaan Transplantasi Karang.DKP. 36.p".*

Giyanto, A. M., Hadi, T. A., Budiyanto, A., Hafizt, M., Salatalohy, A., & Iswari, M. Y. (2017). Status terumbu karang Indonesia. *Jakarta (ID): Puslit Oseanografi–LIPI*.

Hadi, T. A., Giyanto, P. B., Hafizt, M., & Suharsono, A. B. (2018). Status Terumbu Karang Indonesia. *P2O LIPI*.

Haerul. (2013). Analisis Keragaman dan Kondisi Terumbu Karang di Pulau Sarappolompo, Kabupaten Pangkep. [Skripsi]. Fakultas Kelautan dan Perikanan. Universitas Hasanuddin: Makasar.

Hamuna, B., Tanjung, R.H., Suwito., Hendra, K. M., Alianto., (2018). Kajian Kualitaas Air Laut dan Indeks Pencemaran Berdasarkan Parameter Fisika-Kimia diPerairan Distrik Depapre, Jayapura. *Jurnal ilmu lingkungan, 16*(1), 35-43.

Idasari, R. (2015). Keanekaragaman Spesies Terumbu Karang (Coral Reef) di Kawasan Perairan Pantai Lhok Kruet Kecamatan Pulo Aceh Kabupaten Aceh Besar. [Skripsi]. Fakultas Keguruan dan Ilmu Pendidikan Biologi. Universitas Syiah Kuala: Banda Aceh.

Johan. (2013). Beberapa Genus Karang yang Umum di Indonesia. Yayasan Terangi, (*Online*). http://www.terangi.or.id diaskes pada tanggal 8 Juli.

Kartikasari, S. N., Marshall, A. J., & Beehler, B. (2012). *Ekologi Papua* (No. 6). Yayasan Pustaka Obor Indonesia.

Kamal, S., & Mahdi, N. (2017). Keanekaragaman Karang Di Zona Litoral Perairan Iboih Kecamatan Sukakarya Kota Sabang. *Biotik: Jurnal Ilmiah Biologi Teknologi dan Kependidikan*, *3*(1), 45-56.

Keputusan Mentri Negara Lingkungan Hidup LH No. 51 tahun 2004 tentang "*Baku MutuAir Laut Untuk Biota Laut"*.

Laranisa, S. (2016). Struktur Terumbu Karang di Pantai Sindangkerta Kecamatan Cipatujuh Kabupaten Tasikmalaya Jawa Barat. [*Skripsi*]. Fakultas Keguruan dan Ilmu Pendidikan. Universitas Pasundan: Bandung.

Mulya, M. B. (2006). Kondisi Terumbu Karang Berdasarkan Persen Tutupan di Pulau Karang Provinsi Sumatea Utara dan Hubungannya dengan Kualitas Perai-ran. *Jurnal Komunikasi Penelitian*, *18*(2), 1-6.

Nugraha, M. A., Purnama, D., Wilopo, M. D., & Johan, Y. (2016). Kondisi Terumbu Karang di Tanjung Gosongseng Desa Kahyapu Pulau Enggano Provinsi Bengkulu. *Jurnal Enggano*, *1*(1), 43-56.

Paulangan, Y. P. (2015). Kondisi terumbu karang di daerah perlidungan laut Pulau Nusi dan Pulau Wundi Kepulauan Padai-do, Kabupaten Biak Numfor. *The Journal of Fisheries Development*, *2*(3), 71-81.

Pemerintah Kabupaten Biak Numfor, (2011-2019). Situs resmi pemerintah www.biakkab.go.id diakses pada tanggal 27 maret 2019.

Rahman, F. (2014). Keanekaragaman dan Tutupan Terumbu Karang di Pulau. Giligenting Kabupaten Sumedap-Madura. [*Skripsi*]. Fakultas Sains dan Teknologi. Universitas Islam Negeri (UIN) Muala Malik Ibrahim: Malang.

Salmin, S. (2005). Oksigen terlarut (DO) dan kebutuhan oksigen biologi (BOD) sebagai salah satu indikator untuk menentukan kualitas perairan. *Oseana*, *30*(3), 21-26.

Suharsono. (2008). *Jenis Jenis Karang di Indonesia*. ISBN 978-979-799-229-3, Coremap program Jakarta.

https://coral.aimsgov.au diakses pada tanggal 8 april2019.

Timotius, S. (2003). *Biologi Terumbu Karang. Makalah Training Course*. Yayasan Terumbu Karang Indonesia.

Woesik, R.V. (2013). *ScleractinianTaxonomy*. www.my.fit.edu/~rvw/Taxonomy/

Wahyudi, R. (2013). Keanekaragaman Jenis Terumbu Krang di Pantai Kondang Merak Kabupaten Malang. [*Skripsi*] Fakultas sain dan teknologi. Universitas Islam Negeri (UIN) maulana matik Ibrahim: Malang.