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Conditions of Aquatic Biodiversity Around the Port of Pototano, District of West Sumbawa

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Abstract: Pototano Harbor is one of the locations that crosses a potential marine conservation area, namely the Gili Balu Marine Tourism Park Area.The use of the Pototano port location as a port location has long existed before the formation of the waters area of the Gili Balu water tourism park. This area consists of eight groups of islands which are characterized by beautiful beaches, hills, mangrove forest areas and also the beauty of underwater ecosystems. Natural conditions that support abundant biodiversity make this area have several ecosystems in the aquatic environment, including coral reefs, sea grasses and mangroves. This study aims to determine the condition of the biodiversity of the surrounding watersPototano Port and Core ZoneGili Balu Tourism Park Areanamely Gili Belang, Gili Paserang and Gili Namuby increasing knowledge and human resources regarding water area management. This area has both positive and negative values.The results showed that the highest level of diversity in coral reef ecosystems and seagrass ecosystems was found in the Core Zone of TWP Gili Balu, namely Gili Belang with 86% and 80.8% coverage.The diversity of mangrove species in the four locations is relatively the same, but the abundance or individual density of each species is relatively different.Conditionwaters in the research location classifieddry waters and under normal conditions or not pollutedbecause it has an abundance of plankton communitiesas big 62,33 Eng/L with the most common type is *Thalassionema frauenfeldii* and *Chaetoceros tortissimus.*

Keywords: biodiversity, coral reefs, seagrasses, mangroves, port of potatano.

Introduction

Biodiversity is the diversity of life in all forms of living things at various levels of organization of life, starting from the level of species, genetic composition, communities, ecosystems, to landscapes. Indonesia is an archipelagic country that has an abundant level of ecosystem diversity or mega biodiversity (Bappenas, 2020). One of the ports in Indonesia which is located in Sumbawa Regency, West Nusa Tenggara Province, namely Pototano Port is located in a potential water conservation area.

The conservation area that is passed is the Gili Balu Marine Tourism Park area. area of Gili Balu Marine Tourism Park has an area of approximately 5,845.67 hectares. This area has the characteristics of beautiful beaches, hills, mangrove forest areas and also the beauty of underwater ecosystems (KepMen nHi.74 of 2021).

Gili Balu consists of several islands including Kalong Island, Namo Island, Kenawa Island, Snake Island, Mandiki Island, Paserang Island, Kambing Island and Belang Island. In this regard, the existence and determination of the utilization status of the Pototano port location as a port location long before the designation of the tourism park water area as a conservation area.

In accordance with existing provisions, the Gili Balu area is designated as a conservation area because this area is very good for developing into potential resources. Supportive natural conditions with abundant biodiversity and this area has several ecosystems in the

aquatic environment including coral reef ecosystems, seagrass ecosystems and mangrove ecosystems.

Image analysis of the Gili Balu area shows that the area the mangrove ecosystem is 604.8 hectares, wide seagrass meadow is 130.5 hectares, and wide coral reef area of 665.5 hectares. The condition of coral reefs in the Gili Balu cluster shows very good conditions with a percentage of 21.95%, good coral reef locations. with a percentage of 39.02%, while for locations with moderate coral reef conditions 36.95% and bad coral reef locations with a percentage of 2 .44% (DKPNTB, 2019).

Figure 1.TWP Gili Balu water conservation area (right) and study location (left) Left image caption: White polygon = coral reef; green=daydream; yellow=mangroves

The diversity of living things in various ecosystem conditions has important value for an environment (Bappenas, 2020). The value of this species diversity has an ecological function for the environment and the survival of living things, functions in producing value products and services in socio-economic and mitigation aspects that are very important for the life of living things in it both in the waters and on land including humans. In this regard, four survey locations were taken, namely the Pototano port area and the TWP Gili Balu area closest to the Pototano port area, namely Gili Namo and the crossing area for ships entering and leaving from Pototano port and the location which is the Core Zone of the TWP Gili Balu.

The description of the four locations are coral reef ecosystems, sea grass ecosystems and mangrove ecosystems (Figure 1). In this regard, the four locations used as surveys are locations that have positive and negative values. This area is an area with a very potential abundance of ecosystems, and is also an area with a large potential for ecological risk. Ecological risks are caused by the impacts of the existence and operation of the Pototano port, for example unforeseen conditions that occur at the Pototano port, such as ship oil spills, waste disposal, passenger waste, sediment scattering and shipwrecks.

Material and Methods

Material

Stationery, roll meter measures 100 meters, cameras and underwater cameras, swimming and diving equipment, plastic strap, and bamboo stakes.

Research methods

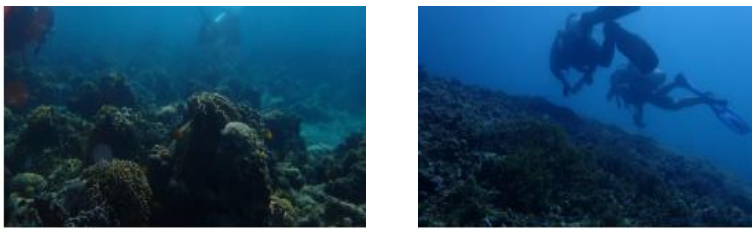
The method used in this study is to use 3 (three) methods directly, namely direct research in the field by making transects on the Poto Tano beach, survey research, and interview with people around the beach in Pototano

Results and Discussion

Condition of coral reefs

Coral reef ecosystem is one of the most productive ecosystems in marine waters. Classified as a dynamic ecosystem type with rich biodiversity and high productivity (Suryanti *et al*., 2011). This ecosystem has a very important ecological role because coral reefs have a very significant role as a place for animal and plant organisms to find food and shelter so that they can increase the abundance of habitats and maintain biogeochemical cycles. In addition, it is useful in the economic aspect as a producer of high production goods and services, especially for the fisheries and tourism sectors and is useful in the mitigation aspect or as a breakwater, such

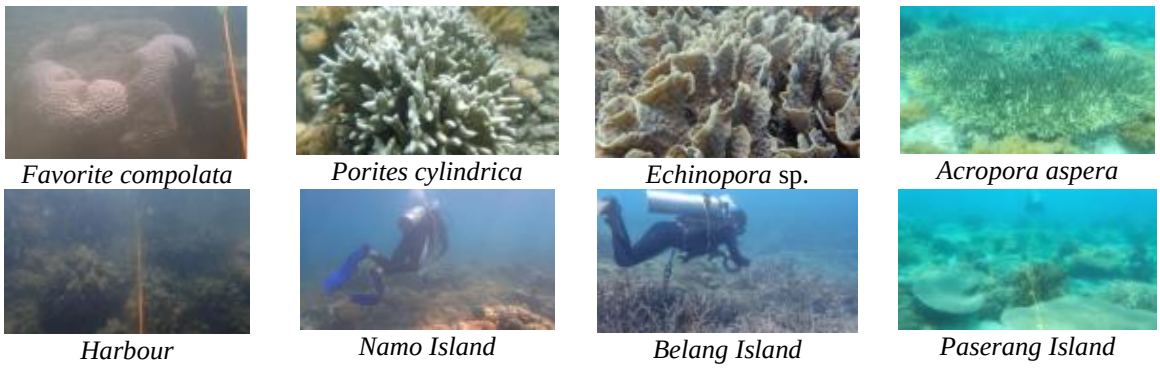
as the one around the Pototano port. The coral reef ecosystem at the sampling location is generally a type of fringing reef. This type is most commonly found in Indonesia, because it is located on a beach that is less than 100 meters from the sea (Amin, 2009). Its abundance is spread both around the coast of the island of Sumbawa and the coast of a smallisland (Gili). Coral reefs around Pototano harbor are scattered to form reef plates and reef slopes (Figure 2).



Reef plate *Reef slove*

Figure 2. Distrubution of coral reefs around Pototano part

Based on the results of coral reef data collection using the Point Intercept Transect (PIT) method, 26 species of hard coral and several other benthos species were found at 4 sampling locations. The diversity and percentage of cover for each species are relatively different at each location (Figure 3 and Figure 4). This difference may be caused by differences in the general condition of the waters at each location, such as the condition of the water brightness, current speed and the number of human activities at that location (Figure 3).



Favorite compolata *Porites cylindrica* *Echinopora* sp. *Acropora aspera*

Harbour *Namo Island* *Belang Island* *Paserang Island*

Figure 3. Several types of coral reefs were found at the sampling location (above) and water conditions (brightness) at the dive site at relativly the same depth (4-7m)

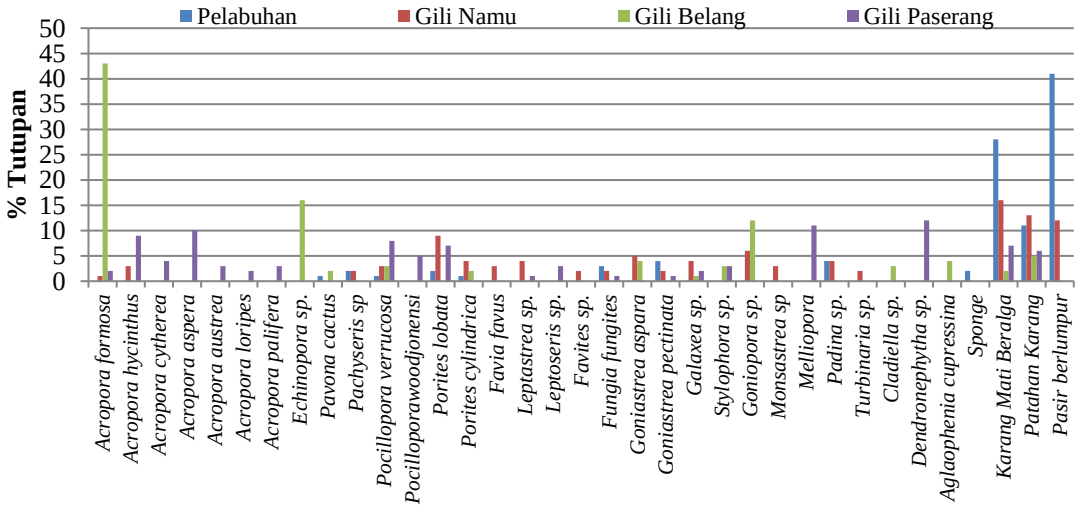
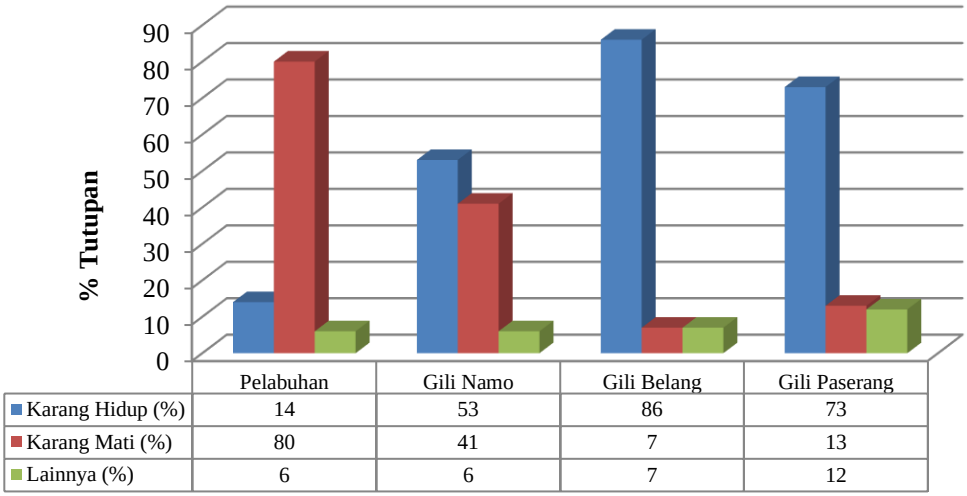


Figure 4. Diversity of coral reefs and other benthic species and their percentage of cover at 4 survey locations

Based on an analysis of the condition of the coral reefs which was determined based on the percentage of live coral cover, it appears that the Pototano harbor area has the lowest percentage of coral reef cover, while the coral reefs in the survey locations which are included in the TWP Gili Balu area have relatively high conditions of cover, especially in Gili Belang which is the Core Zone of Aquatic Tourism Park reaches 86% (Figure 5). Based on English reference sources, 1994 regarding the grouping of coral reef community conditions and Kep.Men. LH No. 4 of 2001 concerning standard criteria for damage to coral reefs, the condition of the coral reef community in the Pototano port area is classified as bad (<25%) with ecosystem health status classified as damaged or unhealthy (<50%). Meanwhile on Gili Namo.



	Pelabuhan	Gili Namo	Gili Belang	Gili Paserang
Karang Hidup (%)	14	53	86	73
Karang Mati (%)	80	41	7	13
Lainnya (%)	6	6	7	12

Figure 5. Percentage of live coral cover in the 4 survey locations

The poor condition of the coral reef ecosystem in the Pototano port area can be caused by ship activity around the port, especially when the ship is about to dock (Weber, et al, 2012). At that time there will be a rotation of the ship's propeller which is quite loud and not in the same direction which can cause the scattering of the bottom substrate, especially in the form of silt and sand. Scattering of mud and sand has the potential to cause disturbance and death of coral colonies, especially hard corals. The damage to the coral reef ecosystem outside the port area including in the survey site in the southern part of Gili Namu was mostly caused by fishing activities, namely fishing activities and tourism activities because almost every day there are fishing and tourism activities around the port area.

The high price of reef fish triggers people to carry out fishing by bombing or using cyanide poison (Sunarto, 2006) which can have a huge negative impact on damage to coral reefs. Several other activities can also exacerbate the condition of the coral reef ecosystem, including marine tourism activities which indicate intentional or unintentional physical contact between tourists and coral reefs (Yusnita, 2014). In this regard, the existence of coral reef ecosystems is threatened because physical contact can occur such as stepping on, holding, taking marine biota in these waters or it can also occur due to diving equipment that comes into contact with coral reefs.

Damage to the coral reef community causes a decrease in the quality and function or role of the coral reef ecosystem. Considering the coral reef community as the main component of the ecosystem. One of the important roles that will be disrupted or reduced or even lost is its function as a habitat (a place to find food, breed, shelter) for most of the biota in coastal waters including fish. Based on the results of data collection on fish communities in coral reef ecosystems using the Belt Transect method at four survey locations, ± 25 species of reef fish were found, which were dominated by reef fish from large groups (Figure 6). The diversity and distribution of reef fish species are relatively

different in the four locations. Pototano Harbor is known to have the least abundance both in terms of the number of species and the abundance of individuals, whereas in the core zone of the Gili Balu Aquatic Tourism Park, especially in Gili Paserang, it has the largest and largest number of species. Abundant or dense number of individuals (Table 1). This is likely caused by the condition of coral reefs and water quality and human activities.

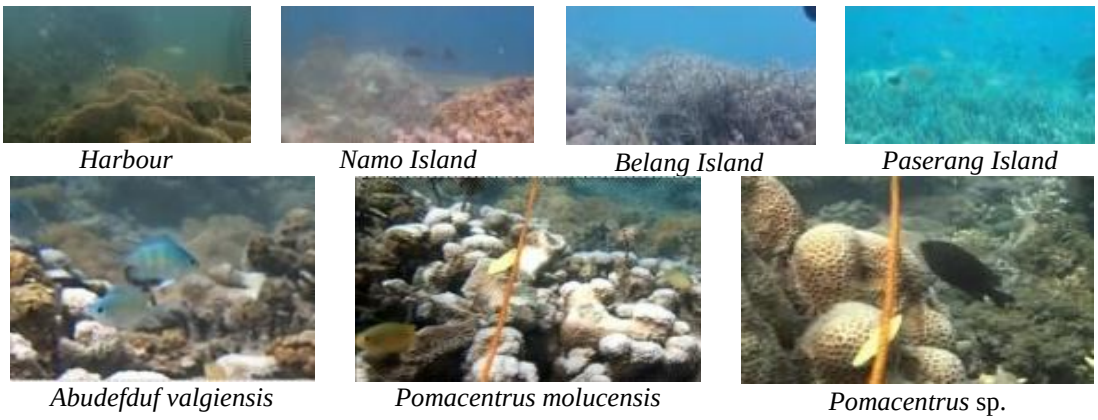


Figure 6. Several types of coral reefs were found at the sampling location (above) and water conditions(brightness) at the dive site at relatively the same depth (4-7m)

Table 1. Reef Fish community ecological parameters found in 4 survey locations

Ecological Parameters	Harbor	G Namo	TWP Gili Balu Core Zone	
			G Striped	G Pasang
Number of Types	8	11	12	20
Species Abundance (ind./m^2)	0.28	0.81	0.99	2.25
Domination Index	0.16	0.21	0.21	0.10
Community Stability	Stable	Stable	Stable	Stable
Diversity Index(H)	1.94	1.87	1.90	2.53
Diversity level	Curently	Curently	Curently	Curently

Based on interviews with the chairman and management of the Fisheries Monitoring Community Group Communication Forum (POKMASWAS) of the Gili Balu Marine Tourism Park during the survey, it is known that in the TWP Gili Balu area there are also and easy to find fish species. hawksbill turtles, green turtles and sharks (black species). and several types of light. Some of these turtles will lay their eggs in bunds in the TWP Gili Balu area and on several other beaches such as Lembewe beach, Selambetan beach and Mawil beach. From early 2022 to mid- September 2022, 5 hawksbill turtles were found that had died (Figure 7). This has been reported by Pokmaswas Bulawah together with Fokom Pokmaswas Gili Balu to the Provincial DKP and the NTB BPSPL Working Unit, but until now the cause of the turtle's death has not been identified.

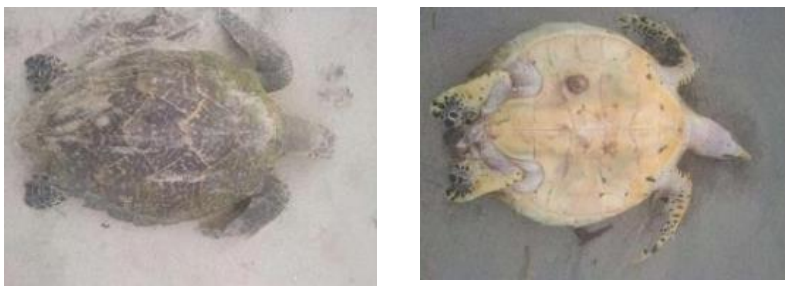


Figure 7. The hawksbill turtle that was found dead in mid-September 2022 by the TWP Balu Island Pokmaswas Forum

Seagrass conditions

The seagrass ecosystem is one of the important ecosystems in coastal areas including around the port of Pototano. Seagrass ecosystems are distributed in the coastal to subtidal intertidal zone (depth of ± 0.5 to 3 m at high tide) on Sumbawa Island (Pototano Village) and in the gili-dyke intertidal zone in TWP Gili Balu. Based on the results of data collection on seagrass communities using the quadratic transect method at four survey locations, namely the harbor area, Gili Namo, Gili Belang Core Zone and Gili Paserang Core Zone, 7 species of seagrass were found (Figure 7 and Table 2). The highest percentage of seagrass cover was found in the Gili Belang Core Zone (80.8%) and the lowest at the Gili Namu sampling location (64.3%). Based on the Decree of the Minister of Environment No. 200 of 2004 concerning Standard Criteria for Damage and Determination of Seagrass Status, seagrass beds in the four survey locations were classified as abundant or healthy with a total percentage of > 59.9%.

Thalassia hemprichii *Cymodacea rotundata* *Enhalus acroides*

Figure 8. Photos of several types/species of seagrass found at the survey location

Table 2. The diversity and percentage of cover for each of lamu found at the sampling locations around the project area

No	Jenis	Cover Per Locatoin (%)			
		Harbour Area	**Gili Namo**	**Gili Belang**	**Gili Paserang**
1	*Enhalus acroides*	43.6	15	10.4	7.6
2	*Halodule uninervis*	9	6.8	14	12.2
3	*Halophila ovalis*	4.2	5.5	5.3	4
4	*Thalassia hemprichii*	7.5	21.2	24.6	19.6
5	*Thalassodendron ciliatum*		4	8.5	8
6	*Cymodocea rotundata*		18.5	12	11.3
7	*Cymodocea sirulata*			6	3.5
	Amount (%)	64.3	71	80.8	66.2
	Status*	**Healthy**	**Healthy**	**Healthy**	**Healthy**

*Kep.Men. LH No. 200 of 2004 concerning Criteria for standard damage and determining the status of seagrass. Status Poor (≤29.9), Less rich/less healthy (30-59.9 %) and Rich/healthy (≥ 60 %).

Condition of mangroves

The closest mangrove ecosystem to the port of Pototano is on the coast of Pototano Village and the TWP Gili Balu area. Almost all of the Gilis in TWP have mangrove ecosystems, especially in Gili Belang, Gili Paserang and Gili Namo. Most of the mangrove forests in TWP Gili Balu are primary or natural forests, except in Gili Kenawa and Gili Namo where some have been rehabilitated or replanted, as well as the mangrove forests on the coast of Pototano Village.

Based on the identification of mangrove species at survey sites in four locations around the port of Pototano and TWP Gili Balu (Gili Namu and Gili Belang and Gili Paserang), approximately 14 true mangrove species were found (Figure 8 and Table 3). The diversity of mangrove species in the four locations is relatively the same, but the abundance or individual density of each species is relatively different.

Mangrove conditions in the core zone of TWP Gili Balu

Mangrove cover measurement

Rhizopora stylosa

Sonneratia alba

Avicennia marina

Figure 9. The condition of the mangarove ecosystem in the core of TWP Gili Balu and several types of mangroves found at the sampling location around Pototano port and TWP Gili Balu

The results of measuring mangrove forest cover using the quadratic transect method showed that mangrove forests in four locations were dominated by the genus Rhizopora, especially Rhizopora stylosa and Rhizopora mucronata (Table 3). The dominance of this species is most likely due to the fact that the genus Rhizopora has a high reproductive capacity and is the easiest to grow and has high adaptability compared to other species. This genus is also the most widely used for the rehabilitation of mangrove ecosystems, because it is easy to grow and has a high survival rate, as well as the availability of many seeds in nature and society. Based on the abundance or density of individuals with tree habit (Diameter ≥ 10 cm) in Gili Belang (± 1681 ind./Ha) (Figure 9), Gili is mostly covered by mangrove forests.

Table 3. Relative abundance of true mangarove species found at the sampling site

No	Jenis	Relative Abundance (%)			
		Pototano	**G Namo**	**G Striped**	**G Pasang**
1	*Lumnitzera racemosa*	3.8	2.8	2.7	0.6
2	*Rhizopora stylosa*	28.7	22.1	25.5	39.2
3	*Rhizopora mucronata*	26.8	26.2	33.6	41.4
4	*Rhizopora apiculata*	7.6	8.8	15.6	6.9
5	*Sonneratia alba*	7.2	7.0	5.8	4.3
6	*Avicennia alba*	11.9	13.5	4.0	1.5
7	*Avicennia marina*	5.6	1.7	1.9	3.7
8	*Avicennia lanata*	2.0	1.3	0.7	
9	*Ceriop decandra*	2.8	3.5	3.9	
10	*Aegiceras sp.*	0.7	5.4	0.3	
11	*Brugueira gymnorhiza*	0.5	3.6	3.7	2.1
12	*Phempis ocidula*	1.4	3.0	0.5	0.3
13	*Xylocarpus granatum*	0.3	0.7	0.3	
14	*Excoecaria agallocha*	0.8	0.6	1.4	
		100	100	100	100

In this regard, it is known that the density of mangrove trees in the four locations refers to the Decree of the Minister of Environment No. 200 of 2004 concerning Standard Criteria for Mangrove Damage, the condition of the mangrove ecosystem on the coasts of Pototano, Gili Belang and Gili Paserang is classified as dense with very good status (≥ 1500 ind/Ha). The mangrove ecosystem in Gili Namu is moderate (1000-<1500 trees).

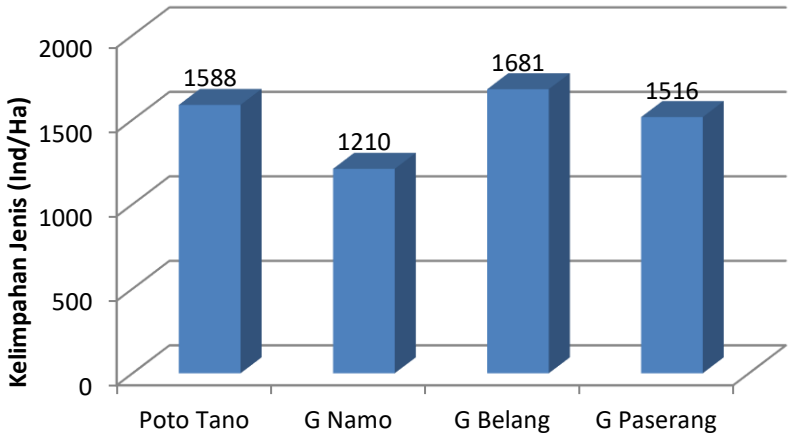
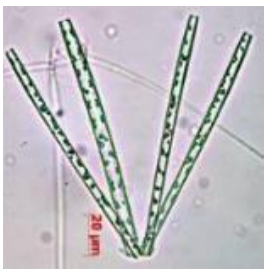


Figure 10. Abundance/density of true mangrove individuals with the habit of trees making up the mangrove forest in the 4 survey locations

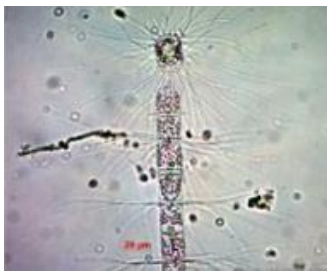
Plankton community conditions

Plankton are aquatic organisms that float with water currents and are mostly microscopic in size and are the lowest group of producer organisms (phytoplankton) in the food chain in waters, including marine waters. In addition, plankton is an indicator of water quality, especially water fertility. The existence and condition of plankton communities are relatively sensitive to changes in the aquatic environment, both caused by natural factors and human factors. Based on their ability to make their own food, plankton is divided into 2 groups, namely phytoplankton which are autotrophic and zooplankton which are heterotrophic.

Based on the results of seawater screening at the Pototano port and identification of plankton species, 26 types of plankton were found consisting of 23 types of phytoplankton and 3 types of zooplankton, with a total plankton density of 62.33 Ind/L (Figure 10). Most of the species density is due to diatom classes, especially species*Thalassionema frauenfeldii* and*Chaetoceros tortissimus.*In general, the abundance of plankton from the diatom group indicates that the waters are classified as dry and in normal or unpolluted conditions. This is also in accordance with seawater quality standards based on Attachment VIII PP No. 22 of 2021 concerning the implementation of environmental protection and management, where the density value is still far below the quality standard for the number of seawater plankton/phytoplankton, both for biota (1000 cells/mL) let alone for unlimited ports.



Thalassia onemafrauenfeldii



Bacteriastrum variance

Trichodesmiun erythraeum

Figure 11. Some photos of the types of phytoplankton (left and center) and zooplankton (right) found from waer samples at Pototano port

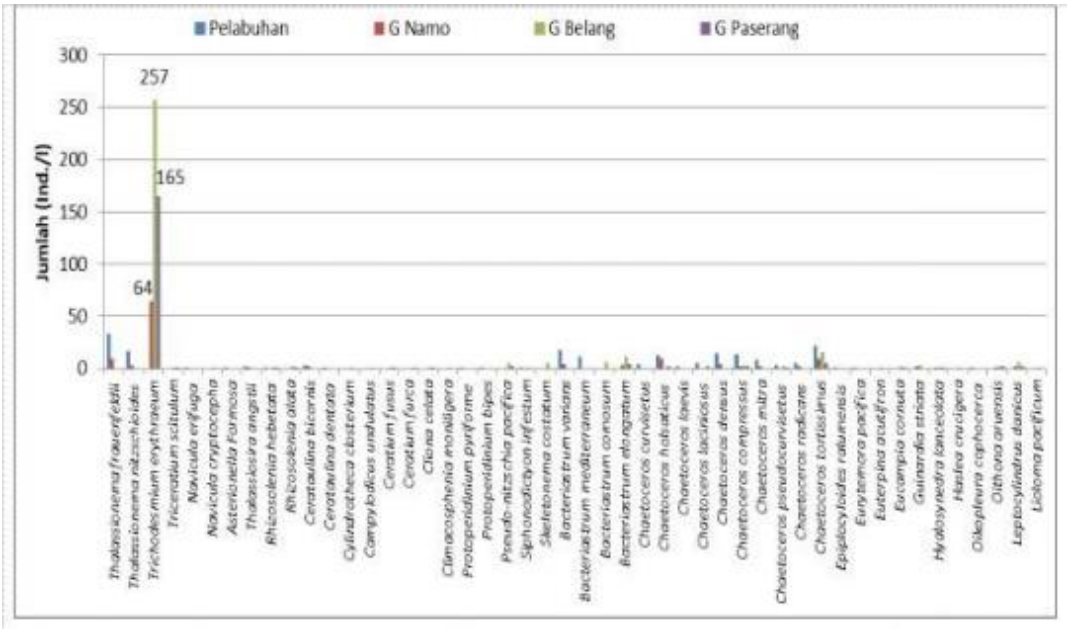


Figure 12. The diversity of species and the abundance of individual plankton found in the 4 survey locations

Based on the graph above, it can be seen that the density of plankton is dominated by the type of *Trichodesmium erythraeum*. This type is a phylum Cyanophyta or Cyanobacteria which is capable of photosynthesis. This plankton is resistant to high salt content and drought and is able to fix nitrogen from the air. This ability coupled with certain water conditions causes these types of plankton to often experience population explosions in various parts of the world, including in Indonesian waters. It was first reported in 1939 in the Sunda Strait and Java. The plankton population explosion causes sea water to turn light brown or red, so it is often called the Red Tide Phenomenon.

Conclusion

The biodiversity found inthe port area of Pototano, and around the Gili Balu area namely Gili Namu, Gili Belang and Gili Paserang are conservation areas with very potential resources. Coral reef ecosystem is one of the most productive ecosystems in marine waters. Coral reefs forming reef slabs and reef slopes. Found types of hard coralswith the most abundant cover types were Acropora formosa and Echinopora sp. The coral reefs in the TWP Gili Balu area have relatively high conditions of cover.ison Gili Belangwith a percentage of86%. Dfound 7 species of seagrasswith the most abundant species are Enhalus acroides and Thallasia hemprichii.The highest percentage of seagrass cover was found in the Gili Belang Core Zoneas big80.8% .The diversity of mangrove species in the four locations is relatively the same, but the abundance or individual density of each species is relatively different.The most condition of the plankton common type found isThalassionema frauenfeldii and Chaetoceros tortissimus. This shows that the waters in the research location are classified asdry waters and under normal conditions or not polluted.

Acknowledgment

The authors wish to thank the district government of West Sumbawa through the Department of Fisheries and Marine Affairs who have given the trust to carry out this research as a basis for making decisions in environmental management, especially coastal issues in the Pototano area.

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