Density of *Acanthaster planci* in the waters of Olele Village

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Abstract

This study aims to determine the density level of *Acanthaster planci* in Olele Village waters in Kabila Bone District, Bone Bolango Regency. This research was conducted in October 2016 to May 2017. The method used was the Line Intercept Transect (LIT) method with a size of 50 x 5 meters. The research location was divided into 3 stations namely Station I (no influence of human activity), Station II (affected by human activity), and Station III (snorkeling and diving areas). The density was analyzed using the Krebs formula (Napitupulu et al., 2013). The results showed that the population density of *Acanthaster planci* in the waters of Tomini Gulf, Olele Village, Kabila Bone District is in the alarming or threatening category.

Keywords: *Acanthaster planci*; density; Tomini Gulf.

Introduction

Coral reefs are organisms that live on the seabed of the tropics and are built by lime-producing marine biota (CaCO3), especially species of corals and algae. Nybakken (1992) states that coral reefs are the most productive marine ecosystems and have the highest biodiversity. The high diversity in coral reef ecosystems is supported by the presence of other associated organisms such as Porifera, Mollusca and Echinoderms.

According to Thamrin et al. (2011) that the echinodermata group has a significant role in the coral reef ecosystem, especially its role in the food network. One of the animals included in the Echinodermata group that lives in coral reef ecosystems is *Acanthaster planci* (Suharsono, 1991).

Acanthaster planci is one type of sea star with a large number of thorns and is a coral polyp eater. Yamaguchi (1986); Pratchett (2001) reports that the abundance of *Acanthaster planci* in large numbers (blooming) has caused damage to coral reef ecosystems in the Indo-Pacific region. This organism has the potential to cause considerable damage to coral reef ecosystems.

Sahputra et al. (2014) reported that the population density of *Acanthaster planci* in the waters of Tomini Bay, Leato Selatan Subdistrict has been categorized as worrying or threatening. It is also possible for other coral reef areas in the waters of Tomini Gulf to also have a population of *Acanthaster planci*, including sea waters in Olele Village.

The results of preliminary observations made in the waters of Olele Village show that in these waters *Acanthaster planci* was found, but information about its density was not available. Olele Village is one of the underwater nature tourism areas in Gorontalo and is an area that has been designated as a Regional Marine Conservation Area (KKLD). Therefore, it is necessary to save from the danger of predation from *Acanthaster planci*.

The purpose of this study was to determine the level of density of *Acanthaster planci* in Olele Village waters.

Research Methodology

This research was conducted for 6 months from October 2016 to May 2017 which took place in the waters of Tomini Gulf, Olele Village, Kabila Bone District, Bone Bolango Regency. The research location can be seen in Figure 1.

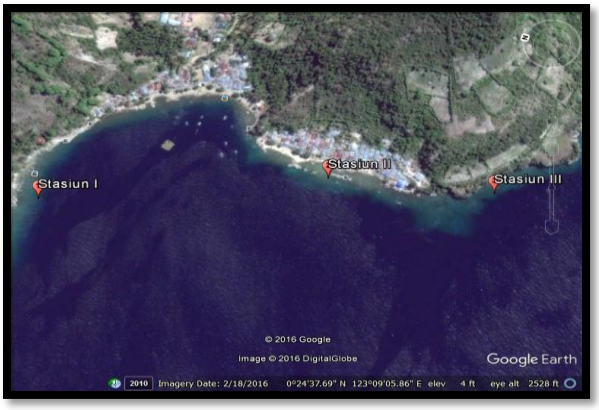

Figure 1. Research stations at Olele Village

Density was calculated using the Krebs Formula (Napitupulu et al., 2013). The ecological status category of *Acanthaster planci* density is based on Rani et al. (2011) which is categorized as natural if the density is less than 14 ind / 1000 m2 (0.014 individuals / m2) and the threat if the density is more than 14 ind / 1000 m2.

Results and Discussion

Environmental parameters that affect *Acanthaster planci* growth

Water quality parameters measured were temperature, pH, current speed, and salinity carried out directly in the field together with *Acanthaster planci* observations. The results of water quality measurements at the study site are seen in Table 1.

Tabel 1 Water quality parameters

No	Parameters	Station I	Station II	Station III
1	Temp.(^{0}C)	31	28	30
2	pH	7	7	7
3	Current (m/s)	0,005	0,006	0,005
4	Salinity (ppt)	31	30	30

Temperature

According to Effendi (2003), temperature is a very important physical factor in the sea. The natural temperature of sea water ranges from 0ºC to 33ºC. Changes in temperature can have a major influence on other properties of sea water and marine biota.

Based on the measurement results (Table 1) there is a difference in temperature in each station. Where the temperature at Station I has a higher temperature of 31ºC, Station III of 30ºC and Station II has a lower temperature of 28ºC.

The low temperature at Station II might be influenced by the time of measurements made when it rains in the afternoon, while the rise in temperature at Station I is caused because measurements are made during the day with hot weather conditions. This is consistent with Odum's statement in Nento (2013), that sunlight absorbed by a body of water will increase the temperature of the waters.

Sahputra (2015) reported in his research on the waters of South Leato Village that the temperature range was still in the normal category for the growth of *Acanthaster planci*. While Suharsono (1991) states that the maximum temperature limit for growth of *Acanthaster planci* is 33ºC.

Acidity

According to Nybakken (1992) that the acidity of water plays an important role in the waters for the growth of organisms in it. The results of the average pH measurements for all three stations are 7.

Current

Based on the results of current speed measurements that the three stations are still in the good category for the growth of *Acanthaster planci*. As stated by Aziz (1995) that *Acanthaster planci* live in waters with slow currents.

Salinity

Based on the measurement results (Table 1) the salinity at the study site is in the range of 30-31 ppt, a range supportive to the growth of *Acanthaster planci*. As stated by Aziz (1994) that echinoderm fauna are considered as pure marine biota with relatively narrow tolerance to changes in salinity.

Population density of *Acanthaster planci* in Olele Village waters

Based on observations at all research stations, 31 total individuals with different body diameters were found.

Table 2. The number of individual *Acanthaster planci* is based on body diameter

Station	Number of A. planci based on diameter				Total
	≤ 14 cm (juvenile)	15-26cm (teenage)	27-38cm (Adult)	>38 cm (late adult)	
I	5	2	0	0	7
II	12	8	0	0	2
III	4	0	0	0	4
Total	21	10	0	0	31

Source: primary data

The table shows that individuals found at the study site are still in young sizes, whereas adults are not found. The total number of puppies found at all observation stations was 21 individuals, whereas the small size found at Station I was 5 individuals, Station II was 12 individuals, Station III was 4 individuals. Of the three observation stations, Station II is the most common station with *Acanthaster planci*.

The results of this study differ from the results of Sahputra (2016) who reported that in the Leato Selatan Village the young *Acanthaster planci* category was very rarely seen. It has been suggested that this is thought to be because small ones usually only hide during the day to avoid predators and start actively foraging at night. Lack of young *Acanthaster planci* type due to lack of availability of food. This is in accordance with the opinion of Suharsono (Banata (2015) that young *Acanthaster planci* tends to avoid predators by hiding between coral reefs and doing solitary eating activities.

Station II is the location that has the highest number of young *Acanthaster planci* individuals, namely 8 individuals, Station I is found by 2 individuals, and Station III is not found with young *Acanthaster planci*. Many young individuals at Station II are thought to be due to environmental conditions that meet the requirements for growth and there are spatial differences between stations. The results of the calculation of the *Acanthaster planci* density value at the study site are presented in Table 3.

Table 3. Density of *Acanthaster planci*

Station	Number of individu	Density (ind/1000m^2)
I	7	28
II	20	80
III	4	16
Average	41.33	

Source: primary data

Based on the results of the density analysis it can be interpreted that the density of the *Acanthaster planci* population at all stations has reached an alarming or threatening stage to the coral reef growth conditions contained at the station. Endean in Rani et al. (2011) suggested that the density of *Acanthaster planci* that exceeds 14 individuals / 1000 m^2 is considered alarming. Sahputra (2014) in his research also reported that the density in the waters of Leato Selatan Village has reached an alarming level to coral reef conditions, where population density of *Acanthaster planci* has exceeded 14 individuals / 1000 m2.

References

Anwar, A. 2006. Tingkat Kematian Karang Keras (Scleractinia) Akibat Predator Bulu Seribu (*Acanthaster planci*) di Kepulauan Spermonde Makassar. *Skripsi* (Tidak Dipublikasikan). Jurusan Ilmu Kelautan Fakultas Ilmu kelautan dan Perikanan. Universitas Hasanuddin. Makassar.

Aziz, A.1995. Beberapa Catatan tentang Kehadiran Bintang Laut Jenis *Acanthasterplanci* di Perairan Indonesia. Oseana. 20(2); 23-32j.

Bachtiar, I. 2009. Bintang Laut Mahkota Duri (*Acanthaster planci, Asteroidea).* (http://mycoralreef.wordpress.com/2009/01/26/bintang-laut-mahkota-duri-acanthaster-planci-asteroidea/.Di akses Pada Tanggal 20 Maret 2014).

Effendi, H. 2003. Telaah Kualitas air (Bagi pengelolaan Sumberdaya dan Lingkungan Perairan). Kanisius. Yogyakarta.

Hamzah, S.N. dan Yapanto, L. 2015. Dampak Pengembangan Kawasan Wisata Bahari Terhadap Kondisi Lingkungan, Sosial, dan Ekonomi Masyarakat Desa Olele Kabupaten Bone Bolango Provinsi Gorontalo. (Laporan Penelitian). Universitas Negeri Gorontalo. (*Tidak Dipublikasikan*).

Ikhtiarto, S. 2011. Ekstraksi, Pemurnian dan Uji Aktivitas Anti Bakterial Racun Duri *Acanthaster planci* Perairan Maluku dan papua. *Skripsi.* Departemen Teknik Kimia Fakultas Teknik. Universitas Indonesia. Depok.

Napitupulu, P., Tioho, H., dan Windarto, A. 2013. Struktur Populasi *Acanthaster planci* di Rataan Terumbu Bagian Selatan Pulau Bunaken. Jurnal Pesisir dan Laut Tropis. 1(1). hal 34-36.

Pratchett MS. 2001. Influence of coral symbionts on feeding preferences of crown-of-thorns starfish *Acanthaster planci* in the western Pacific. Marine Ecology Progress Series 214:111-119 · April 2001 DOI: 10.3354/meps214111

Rani, C., Arifin. D., dan Alfian. A. 2011. Status Ekologi Kepadatan Predator Karang *Acanthaster planci* Linn: Kaitannya Dengan Kondisi Terumbu Karang di Perairan Tomia, Taman Nasional Wakatobi. Universitas Hasanudin. Makassar.

Rani, C., Syafiudin. Y., Florentina. DS. B. 2007. Preferensi dan Daya Predasi *Acanthaster planci* Terhadap Karang Keras. Jurusan Ilmu Kelautan Fakultas Ilmu kelautan dan Perikanan. Universitas Hasanudin. Makassar.

Sahputra D dkk. 2014. Analisis Populasi *Acanthaster planci* Di Perairan Teluk Tomini Kelurahan Leato Selatan Kota Gorontalo. *Nike*. Jurnal Ilmiah Perikanan dan Kelautan, Vol.2, No.3, September 2014, hal. 97-101. Fakultas Perikanan dan Ilmu Kelautan- UNG

Suharsono. 1991. Bulu Seribu (*Acanthaster planci*).Oseana Vol. XVI, 3: 2-6. Jakarta

Thamrin, Setiawan, Y.J., dan Siregar, S.H. 2011. *Analisis Kepadatan Bulu Babi Diadema Setosum Pada Kondisi Terumbu Karang Berbeda Di Desa Mapur Kepulauan Riau*. Jurnal Ilmu Lingkungan. V:5 (1). Hal 46.

Yamaguchi M. 1986. *Acanthaster planci* infestations of reefs and coral assemblages in Japan: a restrospective analysis of control efforts. Coral Reefs, 5, 23 (1986).