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THE EXISTENCE OF ORNAMENTAL CORAL IN DIFFERENT LIVE CORAL COVERAGE CONDITION IN SALEH BAY, WEST NUSA TENGGARA

KEBERADAAN KARANG HIAS DALAM PERBEDAAN KONDISI TUTUPAN KARANG HIDUP DI TELUK SALEH, NUSA TENGGARA BARAT

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ABSTRACT

Ornamental coral is one of the trading commodities targets with high demand in all of the world because of its color and unique shape. Various types of ornamental corals are usually found in a specific area and out of reach, where one of them situated in water depth that it so difficult to find. West Nusa Tenggara Province is known as one of the ornamental coral suppliers that has not been touched much by research related to the existence of ornamental coral natural resources. This study aims to obtain preliminary data on the existence of ornamental coral, especially in Saleh Bay waters. Observations carried out from 6 to 11 May 2015 at 6 locations, determined based on distance from the mainland with respective representation, which divided into categories such as near, medium and far using the straight-line transect methods for coral reefs condition, while belt transect methods used for ornamental corals assessment. The results showed the health of coral reefs in good condition with the cover above 50% at all stations except station 4 (medium category), where Acropora coral species dominated at stations 5 and 6 (distant category). The bottom substrate dominated by coral fragments and dead corals with algae (DCA), which are found 28 genera of ornamental corals and considered as trade commodities such as Euphyllia glabrescens, Euphyllia cristata, Euphyllia ancora, Echinophora sp, Gonioporasp, Lobophyllia sp, Physogyra sp, Merulina sp, and Turbinaria sp. The research location can be used as a permanent study area for ornamental coral focus subject and as an indicator for sustainable ornamental coral management in the region.

Keywords: Coral reefs condition, ornamental coral, trading target, Saleh Bay.

ABSTRAK

Karang hias adalah salah satu target komoditas perdagangan dengan permintaan tinggi di seluruh dunia karena warna dan bentuknya yang unik. Berbagai jenis karang hias biasanya ditemukan di daerah tertentu dan di luar jangkauan, di mana salah satunya terletak di kedalaman air sehingga sangat sulit ditemukan. Provinsi Nusa Tenggara Barat dikenal sebagai salah satu pemasok terumbu karang hias yang belum banyak tersentuh oleh penelitian terkait dengan keberadaan sumber daya alam karang hias. Penelitian ini bertujuan untuk memperoleh data awal tentang keberadaan karang hias, terutama di perairan Teluk Saleh. Pengamatan dilakukan dari 6 hingga 11 Mei 2015 di 6 lokasi, ditentukan berdasarkan jarak dari daratan dengan perwakilan masing-masing yang dibagi menjadi beberapa kategori seperti dekat, sedang dan jauh menggunakan metode transek garis lurus untuk kondisi terumbu karang, sedangkan metode transek sabuk digunakan untuk penilaian karang hias. Hasil penelitian menunjukkan kondisi terumbu karang dalam kondisi baik dengan tutupan di atas 50% di semua stasiun kecuali stasiun 4 (kategori sedang), di mana spesies karang Acropora mendominasi di stasiun 5 dan 6 (kategori jauh). Substrat dasar didominasi oleh fragmen karang dan karang mati dengan alga (DCA), yang ditemukan 28 genus karang hias dan dianggap sebagai komoditas perdagangan seperti: *Euphyllia glabrescens*, *Euphyllia cristata*, *Euphyllia cristata*, *Euphyllia*

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ancora, *Echinophora sp*, *Goniopora sp*, *Lobophyllia sp*, *Physogyra sp*, *Merulina sp* dan *Turbinaria sp*. Lokasi penelitian dapat digunakan sebagai area studi permanen untuk subjek fokus karang hias dan sebagai indikator untuk pengelolaan karang hias berkelanjutan di wilayah tersebut.

Kata kunci: bentang alam pesisir, citra Landsat, revitalisasi pesisir, Pati, Jawa Tengah.

INTRODUCTION

Ornamental corals are a kind of corals that has beauty in shape and colors, so they classified as marine ornamentals. Therefore, they are highly exploited and exported abroad due to high demand, which worth a huge money industry and businesses (Grey *et al*., 2005). Some ornamental coral species such as *Cynarina lacrymalis*, *Trachyphyllia geoffroyi*, *Euphyllia ancora*, *E. glabrescen*, and *Catalaphyllia jardenei* have been banned for export to European countries because the availability of stock of these species in nature is depleted (Green & Shirley, 1999). Globally, the collection of living invertebrates from coral reefs has increased over the past two decades (Murray *et al*., 2013). Some species of ornamental corals have been successfully cultivated, so that meet the requirements of market demand. Furthermore, the management of marine ornamentals trade needs to develop traceability between marine ornamental organisms immediately catches from the field and from cultural products as a necessity in conducting sustainable trade practices (Johan, 2009; Johan *et al*., 2007; Olivotto *et al*., 2011).

Coastal and small island management must follow the principles blue economy, which is a balance between economic use of the natural resource (marine ornamental corals) and their sustainability (Pauli, 2010). The economic value of coral reefs can be seen from its potencies such as raw materials for many industries and marine services, fisheries industries, marine ecotourism, food processing, medical, and others (Cesar, 1996). Coral reefs as habitats and nurturing places for marine biota also function to produce oxygen from the photosynthesis process, which needed by other living things. The condition of Indonesia's coral reefs varies, with conditions that are categorized as poor and fair, dominating at 70.48% of 1067 locations (Hadi *et al*., 2017). Indonesia's coral reefs condition considered as less satisfactory and far from expectation, so that hoped ornamental coral exploitation did not add further damage, which conflicted with the principle of sustainable development in West Nusa Tenggara Province (Radjawane, 2006).

Radjawane (2006) emphasizes the potential of natural resources, especially marine and coastal resources, as the main key for West Nusa Tenggara's economic development in the future if managed sustainably. Based on satellite imagery interpretation, the total area coverage of coral reefs in Saleh Bay is approximately 0,244 km^2, while LIPI described the life coral coverages in the region consisted of non-Acropora hard coral and Acropora hard coral with 32.12% and 11.33% respectively, which indicates the potencies of ornamental corals as trading commodities.

Ornamental corals utilization should consider the current condition of coral reefs in nature, such as coral reefs condition in Moyo island, which has an excellent condition and well managed by the community (Anonymous, 2013). As a comparison, three places, namely Gili Kebo, Sejangan Island, and Keramat Island, have less coral cover due to overexploitation and some destructive fishing practice (fish bombing and poisoning) applied in the region. Coral reefs distribution in Saleh Bay can be found at Long Island, Keramat Island, Sejangan Island, Moyo Island, Raft Island, Ngali Island, and Medang Island.

The purpose of this study is to determine and evaluate the existence of ornamental corals in a different condition of coral reefs coverage based on the satellite imagery interpretation in Saleh Bay, West Nusa Tenggara. The results of this study are expected to provide in-depth information and material as input for policy recommendations related to the ornamental coral trade and sustainable marine development in the future.

METHODOLOGY

Location and Time

The research on coral reefs' condition was conducted on May 6–11, 2015 coincide with the transition season from rainy season to dry season, which occurred from March to May and El Nino event. The sampling sites (Figure 1) were grouped into 3 locations based on the distance to the mainland, which considered as a source of sedimentation.The closest locations to the mainland (inshore stations) such as Station 1 (Lat: -8.54306°, Long: 117.69689°) and Station 2 (Lat: -8.56383°, Long:117.70729° E); the middle locations (mid-shore stations); Station 3 (Lat: -8.47397°, Long:117.72778°) and station 4 (Lat: -8.51145°, Long: 117.68039°); the farthest (offshore stations); Station 5 (Lat: 117.6513°, Long:117.6513° E); and 6: (Lat: -8.42195°, Long: 117.6287°E). This classification evaluates the impact of sedimentation from the mainland and the influence of local community supervision against destructive fishing such as the fish-

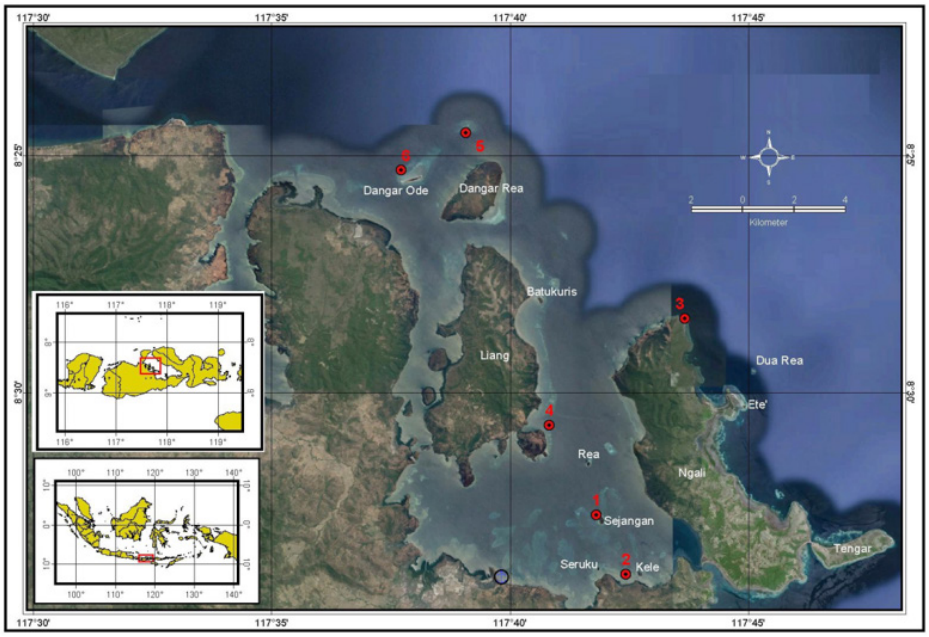

Figure 1. Map of the sampling sites based on distance from the mainland.

bombing and fish-poisoning.

The Coral Reefs Condition

The assessment of coral reefs condition was done using Point Intercept Transect methods on three different transects as replications with 15 meter in length as representation. Each transect placed along with the targeted coral, paralleled to the coastline at 5–7 meter depth, with distance 5 meters among the transects. The benthic category was recorded every 50 cm along the transect line, where the total data collected come from 90 observation points. The reefs benthic categories were based on English et al. (1997), where there were 30 categories of benthic observed and recorded. The results of living coral coverage classified using a standard condition of coral reefs by Gomes & Yap (1984), which divided into four groups of coral reef conditions such as: badly damaged (0-25%), poor (26-50%), good (51-75%) and very good conditions (>75%).

Ornamental Corals Existence Observation

The observation focus on ornamental corals conducted with belt transects methods in 50 x 2 meter area to record the genus and entire colonies of ornamental corals species in the region. Supervision was made on certain genera of ornamental corals, which targeted for trade and prohibited or banned by European countries such as *Symphyllia sp*., *Lobophyllia sp*., *Hydnophora rigida*, *Echinophora sp*., *Cynarina sp*., *Trachyphyllia sp*. dan *Euphyllia spp*.

Water Quality Parameters

Water quality parameter was collected using TOA DKK equipment to explain the water quality condition in the region based on several parameters such as temperature (°C), dissolved oxygen (mg/l), salinity (ppt), pressure (psi), turbidity (NTU) and level of acidity (pH). The current meter also used for current and velocity (m/sec) measurement to support the water quality aspect from the hydro-oceanography perspective. Combining both measurements may give an in-depth understanding related to the natural habitat of coral conditions in the region.

RESULTS AND DISCUSSION

Coral Reefs Condition

Coral reefs condition in Saleh Bay describes an ecological function, resource potential, and the recent condition of the reefs ecosystem in the region. Good coral reefs ecosystem indicated by the high percentage of living corals, so when the coral reefs condition clasified as a very good condition (living coral cover > 75%), it can be concluded that the nature of the region is well conserved and far from disturbance, especially from human activities such as destructive fishing practice or other damaging activities. The condition of coral reefs also can be used as an indicator of destructive fishing practice when mass rubble and fine coral fragments easily found near the basin or adjacent to the coral reefs. Figure 2 shows the benthic life form as the result of field observation in the 6 transects

Percentage of living coral coverage in the region mostly considered as a good condition (> 50%) in all stations, except in station 4 with 45.54% coverage and categorized as poor condition, while station 2 as

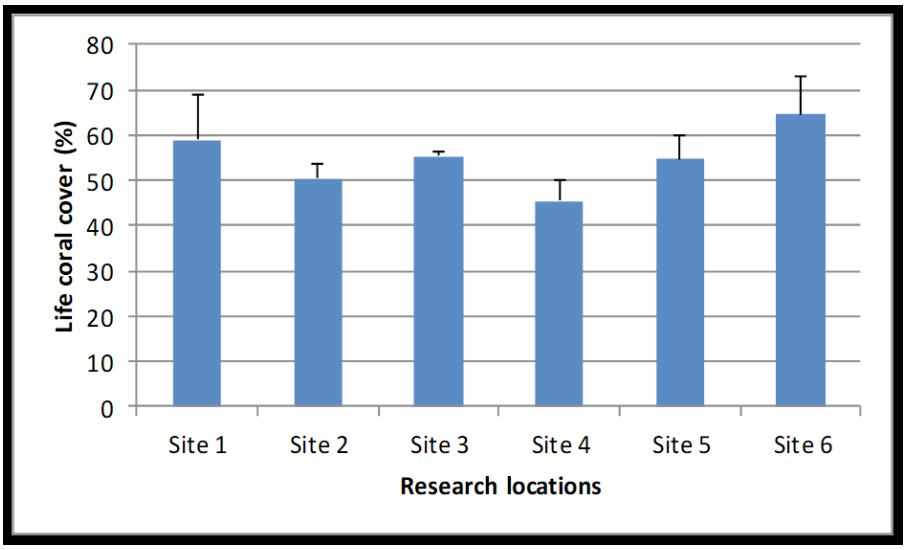

Figure 2. Coral reefs condition according to life coral coverage based on distance.

Table 1. Benthic life form and percentage (%) in 6 transect stations

Life form	Stn #1	Stn #2	Stn #3	Stn #4	Stn #5	Stn #6
ACB	0.00	0.00	10.11	0.00	29.61	44.3
ACD	0.00	0.00	0.00	0.00	2.22	0.0
ACT	1.11	0.81	0.00	0.00	0.00	5.6
CB	19.65	18.19	13.62	24.71	12.39	4.2
CE	0.00	1.92	2.15	0.00	1.08	2.5
CF	28.06	15.29	4.89	0.00	1.94	0.8
CM	10.00	5.74	20.44	8.85	6.25	6.3
CMR	0.00	1.89	1.08	0.00	0.00	0.0
CS	0.00	6.59	3.00	11.97	1.08	0.8
CME	0.00	0.00	0.00	0.00	11.40	0.0
DC	0.00	0.00	3.30	1.08	0.00	0.0
DCA	8.82	4.96	6.50	3.02	16.42	11.9
R	1.04	22.24	11.18	31.10	15.38	9.1
RCK	0.00	0.00	12.85	7.74	1.67	7.9
S	6.53	12.67	4.66	10.69	2.19	0.0
SP	2.08	9.70	1.92	0.83	1.08	0.0
SC	0.00	0.00	0.00	0.00	1.11	0.0
MA	21.60	0.00	0.00	0.00	0.00	6.6

the second-lowest with 49%. Clear water visibility in Saleh Bay aquatic environment showed that some region has less influence from anthropogenic activities, which may support the habitat of coral reefs growth and more tolerant due to less sedimentation (Foden *et al*., 2013), compared to other sites which located near from the mainland as sediment source and indicated with low visibility. The highest living coral coverage was found in off-shore sites (59.53%), in-shore sites (58.52%), and the lowest was in the mid-shore sites (50.41%). These conditions concluded that coral reefs located farther from the mainland mostly considered as good condition compared to the other sites, even though in general, all sites can be reckoned as good condition as well (Gomes & Yap, 1984). The coral reefs coverage located inshore are strongly influenced by land use and land use-change along the mainland and worsened by the utilization of coral reefs by the local community for other purposes besides the other influence related to the physical, geological conditions such as the existence of estuaries, coast type, and substrate type.

Even though almost all coral reefs in study sites categorized in good condition except station 4, most of the waters in the region has low visibility due to terrestrial run-off causing high sedimentation, which affected the coral reefs ability to survive (Linan-Cabello *et al*., 2016; Lionel Ng *et al*., 2016; Messina & Biggs, 2016). Moreover, destructive fishing activities such as fish bombing and fish poisoning reported in the study sites, mainly for local community consumption

and commercial purposes. As consequences, these kinds of activities contributed to the environmental degradation of corals reefs habitat in coastal region such as in Raja Ampat (Bailey & Sumaila, 2015); Spermonde Islands (Grydehøj & Nurdin, 2015; Nurdin & Grydehøj, 2015); the Philippines (Bacalso & Wolff, 2014) and other places.

Based on Table 1, it can be seen that the live coral coverage ordered from the highest to the lowest is Rubble (R), Dead Coral with Algae (DCA), Sand (S), Rock (RCK), Macro-algae (MA), Sponge (SP), Dead Coral (DC) and Soft Coral (SC). The highest substrates (R, DCA, S, and RCK) indicates the high rate of coral mortality at the sampling site, where DC might be caused by natural factors, and different sedimentation as what had happened in Raja Ampat where destructive fishing practice play an integral part in damaging the coral reefs (Bailey & Sumaila, 2015).

Assessment of living coral coverage percentage divided into two groups, namely Acropora and non-Acropora. Acropora species were the most common species and consisted of several species, which provide a clearer picture of the study site's condition. As shown in Figure 3, the distribution of Acropora coverage was higher in the off-shore (Station 5 and 6), mid-shore (station 3) came after, and followed by the in-shore site as the lowest distribution, except in station 4 where there were no Acropora found. This phenomenon explains the possibility of water clarity combined with turbidity as the main factor that influences the Acropora distribution in the region. Occurrence on Acropora coral contrasted with non-Acropora coral, where the nearer location towards the mainland has coverage higher than the farthest study site. The highest coverage of non-Acropora found around in-shore (stations 1 and 2), followed by mid-shore (statiosn 3 and 4), and lastly off-shore (stations 5 and 6). These non-Acropora corals have the ability to adapt to the condition of the waters with high turbidity compared to Acropora type.

The observed study sites and surroundings experienced disturbance frequently by destructive fishing techniques and toxic utilization, which causes detrimental effects to the region, particularly the coral reefs (Anonymous, 2013). Several evidence can be found to strengthen the occurrence of destructive fishing practice such as the high presence of R, DCA and RCK, which made the substrate unstable and influencing coral larva ability to survive (Fox *et al*., 2003; Fox & Cadwell, 2006), while fish poisoning practice can be seen directly to the coral reefs, especially Acropora sp species which infected as a whole colony or partly, whether in the top or the bottom part of the colony. The use of poisons that were concentrated in the bottom part of corals reduced the impact of the corals as a whole colony, particularly in the tip part caused by the influence of the current that generates mixing in the water body and decrease level of the poison. The death of corals for a certain period of time caused by poison can be identified based on its whitening color and the absence of algae cover. The high death rate of corals flourishing macro algae growth, so that more macro-algae (MA) can be found in the study sites. The usage of destructive fishing practices such as fish bomb made from fertilizer can trigger the growth of algae rapidly in the adjacent environment.

Ornamental Corals Existence

The presence of ornamental corals describes the distribution and frequency of the ornamental corals in the region. Detail information can be found in Table 2, where there were 28 genera of targetted ornamental

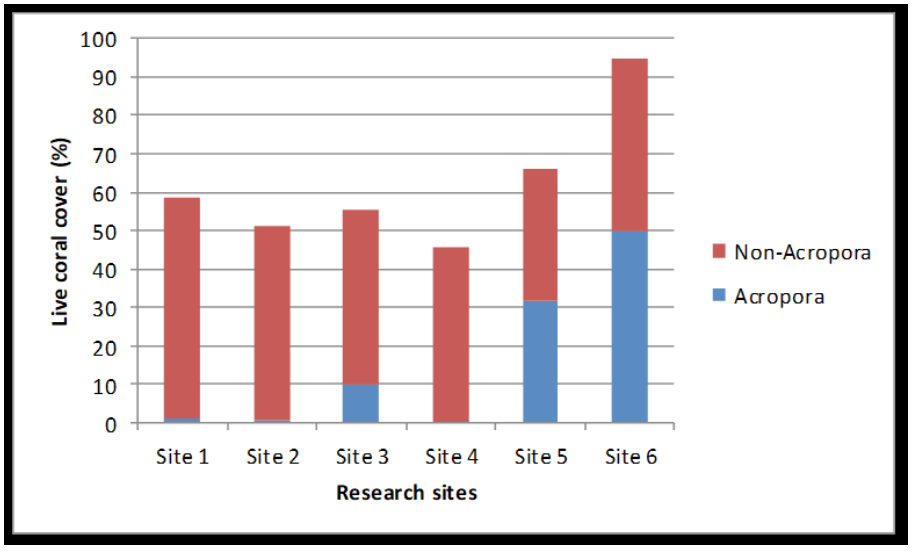

Figure 3. The live coral coverage of Acropora and Non-Acropora at the sampling site.

corals adjacent the study sites and some of them considered as a species with high-demanded trading commodities such as *Echinophora sp*., *Euphyllia ancora*, *Euphyllia cristata*, *Euphyllia glabrescens*, *Goniopora sp*., *Hydnophora rigida*, *Leptoseris sp*., *Lobophyllia sp*., *Merulina sp*., *Physogyra sp*. and *Turbinaria sp*., while other coral species are less-demanded commodities. Other ornamental corals which considered as a targetted commodities such as *Cynarina lacrymalis*, and *Trachyphyllia geoffroyi*, was hard to find in study sites due to different habitat characteristics, which suitable with sandy substrate, moderate current and situated in a deeper layer that ornamental corals found in the region. The species Catalaphyllia jardenei was found in out side of the line transect (Figure 4).

Station 2 and 3 diverse in term of genus number (14) genus compare with other stations that have less than 10 genus, while Porites cylindrica has the highest genus in term of occurence (100%) followed by *Favia sp* (83.3%), *Porites sp* (83.3%) and *Pysogyra Sp* (50%), other genus <50%.

Ornamental corals are coral reefs biological resources that became export commodities in many tropical countries in the world, including Indonesia. The ornamental corals trading in Indonesia started since 1997 and increased significantly, wherein 2001 the total value for ornamental corals export reached 891.000 pieces (pcs) or approximately 35% from the total world quota for ornamental corals trading (Raymakers, 2001). Even though ornamental corals considered as natural and wild animals in its habitat, but nowadays, it has successfully cultivated into 49 species, which allowed to be traded internationally under the regulation from CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) Appendix II. This trading mechanism authorize a limited and monitored trading scheme to avoid overexploitation of ornamental corals that may threat its existence in the wild (Purwanto, 2003), and decrease its health and natural condition as reported by several studies (Ellis, 1999; Bruckner, 2001; Calfo, 2007; Olivotto *et al*. 2016).

Table 2. The ornamental coral genus at sampling station

Genus	**Stations**						**Occurence (%)**
	1	**2**	**3**	**4**	**5**	**6**	
Anacropora sp	-	-	-	-	-	+	16.7
Astreopora sp	-	+	-	-	-	-	16.7
Cyphastrea sp		+		+			33.4
Dendronephtya sp					+		16.7
Echinophora sp		+	+				33.4
Euphyllia ancora			+				16.7
Euphyllia cristata				+			16.7
Euphyllia glabrescens			+				16.7
Favia sp		+	+				33.3
Favites sp	+	+	+	+	+		83.3
Fungia sp		+					16.7
Galaxea sp				+	+		33.3
Goniopora sp			+				16.7
Hydnophora rigida						+	16.7
Leptoseris sp						+	16.7
Lobophyllia sp		+					16.7
Merulina sp		+					16.7
Montipora sp			+		+		33.3
Padina sp	+						16.7
Pavona cactus	+	+					33.3
Pavona decusata		+					16.7
Pectinia alcicornis			+				16.7
Physogyra sp	+	+	+				50.0
Pocillopora verucosa					+		16.7
Pocillopora sp			+				16.7
Podabacia sp		+					16.7
Porites cylindrica	+	+	+	+	+	+	100.0
Porites sp		+	+	+	+	+	83.3
Symphyllia sp			+				16.7
Turbinaria sp			+				16.7
Number of Genus	5	14	14	6	7	5	

Note: – not present, + present

Figure 4. Ornamental coral species was found on the site Lobophyllia sp (left) and out side of line transect Catalaphyllia jardenei.

According to visibility measurements using Secchi disk in all stations, it can be concluded that it was found more than >3 meters that mean meet criteria of seawater quality standard according to Kepmeneg LH, 2004 Annex II. Turbidity in Saleh Bay ranging from 0 to 23.3 NTU, where the highest value found near the river area, which generated high organic matters from the river current and tide and mixing the substance, and as a consequence, visibility became low which found in site 4 (0.8 NTU) and site 2 (23.3 NTU).

Temperature measurements, as shown in Table 3, ranging from 29.20°C - 31.57°C, where the range of temperature for coral reefs according to the Ministerial Decree of Environment and Forestry No. 51 the Year 2004 is from 28°C-30°C and 28°C-32°C for mangrove. Some area in Saleh Bay has temperature exceeded the limit of the normal range but still survived by adapting to the environment and increase its resilience.

The current plays an important role in the movement of nutrients in the water body, which needed for the growth of aquatic organisms such as plankton. It can also induce vertical sediment mixing from the bottom rise up to the water column and surface resulting sedimentation in the region. Previous research from Mujiyanto and Wasilun (2006) in four different seasons showed that the current velocity was ranging from 0.051 to 0.283 m/s. Several sites indicate high sedimentation due to the current velocity, while others mostly influenced by its distance to the mainland as the impact of anthropogenic pressure. Coral species such as Acropora sp was hard to find in these locations due to the high sedimentation and turbidity, but not for other species like Anacropora which found in site 6.

The level of acidity (pH) in the study sites still meets the criteria of seawater quality according to the Ministerial Decree of Environment and Forestry No. 51 the, Year 2004 Annex II. High pH can be considered from the characteristics of each station, especially due to its location to the mouth of the river or in off-shore water. According to Paramitha (2004), an increase of pH value in off-shore waters mostly caused by the input of waste from the mainland to the aquatic environment. The minimum and maximum salinity value in the study sites considered below the standard requirement for coral reefs, mangrove, and seagrass, but still good in supporting marine life.

Dissolved Oxygen in the study sites was still within the range for water quality standards according to the Ministerial Decree of Environment and Forestry No. 51, the Year 2004, which is >5 mg/l, which support the aquatic biota in the region. Other paramaters, such as phosphate a little bit exceeded the threshold for marine tourism suitability, and need attention to be solved.

The value of nitrate concentration in all stations has exceeded the quality standard according to the

Table 3. In situ water quality measurement in Saleh Bay waters

Parameters	Minimum	Maximum	Average	Standard Deviation
Current (m/s)	0	0.4	0.14138	0.07800
Turbiditas (NTU)	0.00	23.33	1.26	4.82320
Temperature (ºC)	29.20	31.57	30.35	0.47464
Salinity (‰)	27.17	30.67	30.26	0.64926
pH (unitless)	7.96	8.12	8.08	0.03664

Source : Saraswati *et al*., (2016).

Ministerial Decree of Environment and Forestry No. 51, the Year 2004. High concentrations of nitrate believed to come from land-based activities around the sites in the form of either liquid waste from agriculture or plantation activities.

In general, it is evident that the water quality (visibility, temperature, pH, salinity, and DO) in Saleh Bay are still met the standard requirement of water quality according to the Ministerial Decree of Environment and Forestry No. 51 Year 2004 for the life of aquatic biotas. However, there were some parameters that have exceeded the quality standard, such as turbidity, phosphates, and nitrates, that need to be noticed and pay attention to the changes ahead.

Future Action and Expectation

Developing ornamental coral industry is important for all stakeholder, which can be achieved by enhancing the cultivation methods, and upgrading the breeding technique for better results and sustainable resources (Priono *et al*., 2014; Johan *et al*., 2013), which might decrease or stopping direct exploitation from nature.

Routine ornamental coral observation and assessment needed in the study sites to monitor the impact of ornamental coral exploitation for trading purposes as what had happened in Lampung, Rembang (Johan *et al*., 2002a), and Kendari (Johan *et al*., 2002b). Comparison study with an area without exploitation on ornamental coral can be useful to describe the differences of treatment from its natural condition in the wild (Johan *et al*., 2016).

CONCLUSION

The coral reefs condition in Saleh Bay divided into three different categories, where the best condition mostly located far from the mainland, followed by the medium distance, lastly is the coral reefs near the shore. Damage on coral reefs occurred mostly from in-shore to mid-shore area and dominated by dead coral rubble, fine coral fragment, and algae cover. Ornamental corals with high biodiversity and distribution such as *Echinophora sp*., *Euphyllia ancora*, *Euphyllia cristata*, *Euphyllia glabrescens*, *Goniopora sp*., *Hydnophora rigida*, *Leptoseris sp*., *Lobophyllia sp*., *Merulina sp*., *Physogyra sp*. and *Turbinaria sp*. spread equally in the mid-shore area compared to other locations. Conservation policy needed to manage the utilization of natural resources by using a quota system for better recovery to reach sustainable development goals. There was no significant issue regarding the water quality parameter in Saleh Bay, where all the parameters still meet the required standard from the Ministry of Environment and Forestry based on its Ministerial Decree No 51, the Year 2004 regarding the standard water quality for aquatic biota.

For sustainable fisheries, suggestions on special zoning systems, especially in the coral reefs location, might be useful in maintaining the natural condition and recovery process in the region. Core zone for an area with high coral reefs cover (good condition) to protect from human activities particularly destructive fishing practice, while area with medium and low coral reefs cover (below bad condition) rehabilitation zone can be applied.

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