

## Coral health levels of wild ornamental coral in East Belitung waters, Indonesia

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**Abstract.** Johan O, Ginanjar R, Priyadi A. 2015. Coral health levels of wild ornamental coral in East Belitung waters, Indonesia. *Nusantara Bioscience* 7: 133-138. The distribution of coral diseases has been reported in waters having coral reef in the world including Indonesia, but there had been no report from East Belitung, Indonesia. This study was conducted on 25 March 2014 and on 26-27 April 2014 in nine locations, offshore of Belitung, namely in the Islands of Memperak, Bakau, Buku Limau, Pesambung, Muranai, Sembilan, Berlian, Tempuling and Gresik. The objective of this study was to distinguish the levels of ornamental coral health due to infection and other coral health compromisers. Data were collected using line transect method to estimate coral cover condition and using belt transect method to estimate coral disease prevalence. The results showed that the Black Band Disease (BBD), White Syndrome (WS), and Skeleton Eroding Band (SEB) were the main diseases, while the coral health compromisers were competition among coral, algae, sedimentation and pigmentation response. This is the first report of SEB disease from East Belitung, while other diseases have been found frequently. The prevalence of diseases was categorized as normal, and so, no management intervention is needed.

**Keywords:** Black Band Disease, coral disease, East Belitung, Skeleton Eroding Band, White Syndrome

### INTRODUCTION

Coral diseases have broad impacts and have become interesting research topics. The real impacts have been documented in Caribbean water, where the diseases changed the coral structure and reduced the coral diversity. The diseases have become the biggest threats for coral all over the world for the last 30 years (Harvell et al. 2009). A disease which has serious impact is White Band Disease, which has killed more than 98% of *Acropora palmate* and *A. cervicornis*, two species of coral living in shallow Caribbean water (Aronson and Precht 2001).

The high prevalence and virulence of coral diseases in the last three decades is the combined impact of human activities (Sutherland et al. 2010) and global climate changes (Harvell et al. 2002). Data on prevalence and virulence of coral diseases have been reported frequently from the research activities in Caribbean water, but only limited data are available for Indo-Pacific and especially Indonesian water.

Twenty-seven diseases have been reported to infect the world's coral (Scleractinia) (Smith et al. 2014). Meanwhile, in Indonesia, only few diseases have been known, namely Black Band Disease (BBD), YBD (Yellow Band Disease), White Syndrome (WS) and Brown Band Disease. The Skeleton Eroding Band (SEB) disease has been found only in East Belitung water during our present survey.

The symptoms of SEB disease are the followings: Grey or blackish grey band develops gradually in the infected coral; then, part of the coral dies and the coral tissues and skeleton break down due to chemicals produced by *Hallofoliculina ciliates*. This disease is commonly found

in Indian and Pacific Oceans, and in the Red Sea. It has been reported to attack 82 species from 26 genera and 12 families of hard coral (Scleractinia), and hydrozoan, Millepora. Families Pocilloporidae and Acroporidae are vulnerable to SEB (Page and Willis 2008).

The objective of this study was to distinguish the prevalence of coral diseases in the study sites where wild ornamental corals are harvested. It is hoped that this study provides database of coral disease distribution which is needed for formulating the policy and management of coral reef in Indonesia.

### MATERIALS AND METHODS

This study was conducted in two stages. The first stage was done on 25 March 2014 in 3 locations, namely the Islands of Memperak, Bakau and Buku Limau, and the second stage was done on 26-27 April 2014 in 6 locations, namely the Islands of Pesambung, Muranai, Sembilan, Berlian, Tempuling, and Gresik. This study was conducted in reef slope at a depth of 5-7 m, representing the coral condition in each island. The sites were expected to represent the closest to the farthest location from the mainland, which is Belitung Island. The order of locations from the closest to the farthest from Belitung is shown in Figure 1.

#### Data of coral conditions

The data of coral conditions were needed in order to assess coral conditions on infected sites. Data of coral conditions were collected using Pointless Transect method:



**Figure 1.** Locations of study in East Belitung, consisting of 9 sites: Island of Buku Limau (A), I. Sembilan (B), I. Memperak (C), I. Bakau (D), I. Pesambung/Sanabung (E), I. Muranai (F), I. Gresik/Berisi (G), I. Tempuling (H), I. Berlian (I). The alphabet of each site represents the distance from the main island, Belitung Island, from the nearest to the farthest (Google Earth 2014)

at intervals of 0.5 m along the 20 m-length transect line, the coral life form, type of substrate and the presence of other organisms were recorded. The sampling was done in 3 replications. The live coral cover was divided into two: Acropora and Non-Acropora. The types of substrate were classified as Dead Coral, Other Fauna, Algae, and Abiotic (English et al. 1997).

Based on the live coral cover, Acropora and Non-Acropora, the conditions were categorized into four categories: very bad (0-25%), bad (>25%-50%), good (>50%-75%) and very good (>75%-100%) (UNEP 1993).

#### Data of coral diseases

The observation of ornamental coral diseases was conducted using Belt Transect method according to English et al. (1997). Observation was done along the 20 m-length transect, 1 m toward the left side and 1 m toward the right side. The sampling was done with 3 replications, so the total area sampled was 120 m<sup>2</sup>. Every species of coral was recorded, including the infected one. Coral type recording was done prior to genus or species level, if possible to be conducted on site. Coral disease identifications was done directly underwater using the manual of Raymundo et al. (2008) and Beeden et al. (2008).

## RESULTS AND DISCUSSION

#### Live coral cover

The highest cover was found in Buku Limau Island (78.18%), although this island was inhabited. But the

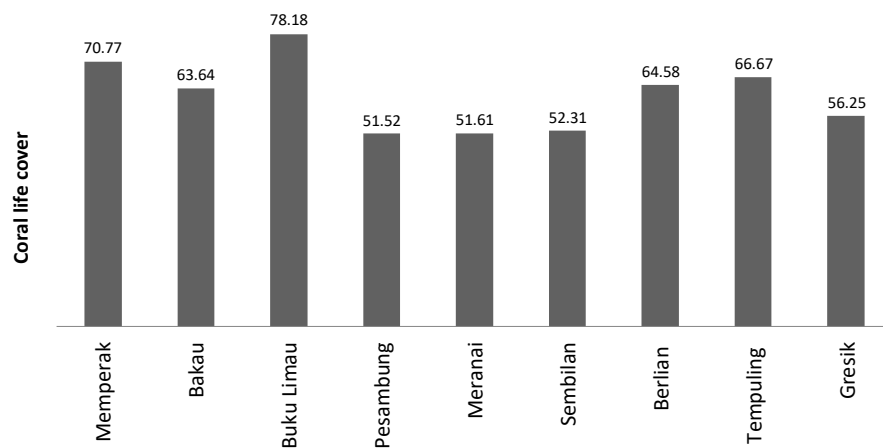
diversity on this island was low. This location was dominated by three species of coral, namely *Echinopora* sp., *Montipora* sp, *Goniopora* sp., with the abundance levels of 0.63 colony/m<sup>2</sup>, 0.48 col/m<sup>2</sup> and 0.42 col/m<sup>2</sup> respectively. Locations dominated by single coral species had lower coral diversity than other locations. In these locations, which were close to human settlement, many corals died due to stress and then, a fast-growing coral species inhabited the sites. The next highest coral cover was found in Memperak Island (70.77%) and Tempuling Island (66.67%). Based on live coral cover, the coral health was categorized as good to very good, with cover from 51.52% to 78.18% (Figure 2).

#### Prevalence of coral diseases

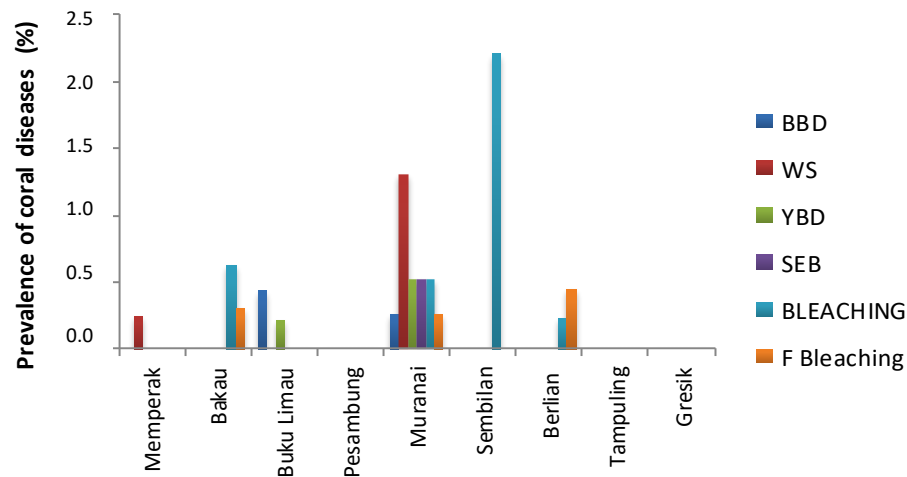
Coral diseases naturally occur in coral reef ecosystem. Their abundance increases with the presence of supporting factors, such as sharp increase of temperature, like what happens in Seribu Archipelago (Johan et al. 2014) and in Australia, where the prevalence of coral diseases in summer is higher than in winter (Haapkylä et al. 2009; Sato et al. 2009).

The number of diseases in Muranai Island (6) was higher than that in other islands. This means that the prevalence of diseases is not caused by the proximity to the source of pollutant, the main island, but also by other factors, such as light intensity and temperature.

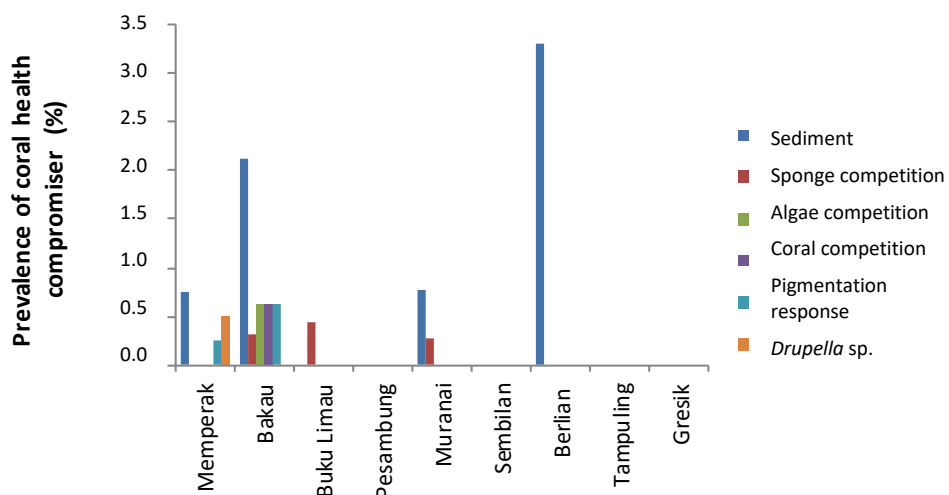
The presence of Skeleton Eroding Band (SEB) with prevalence of 0.52% in Muranai Island is the first record in Bangka Belitung Archipelago. The prevalence of this



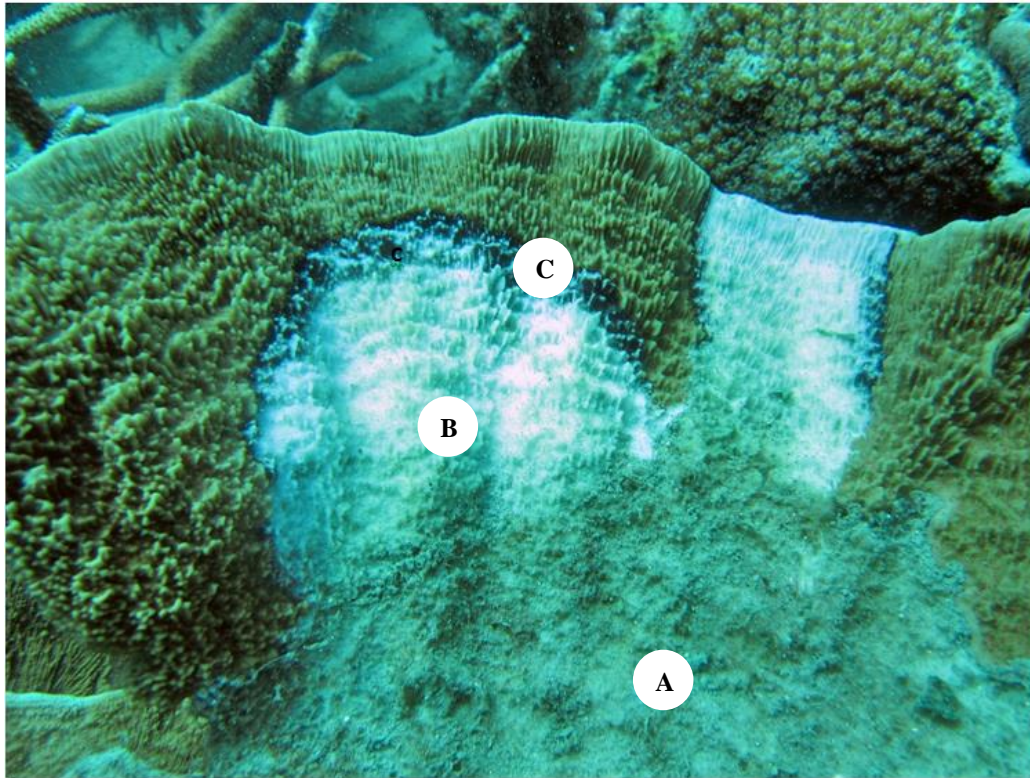
**Figure 2.** Coral conditions in study sites with cover > 50%, categorized as good to very good (>75%)



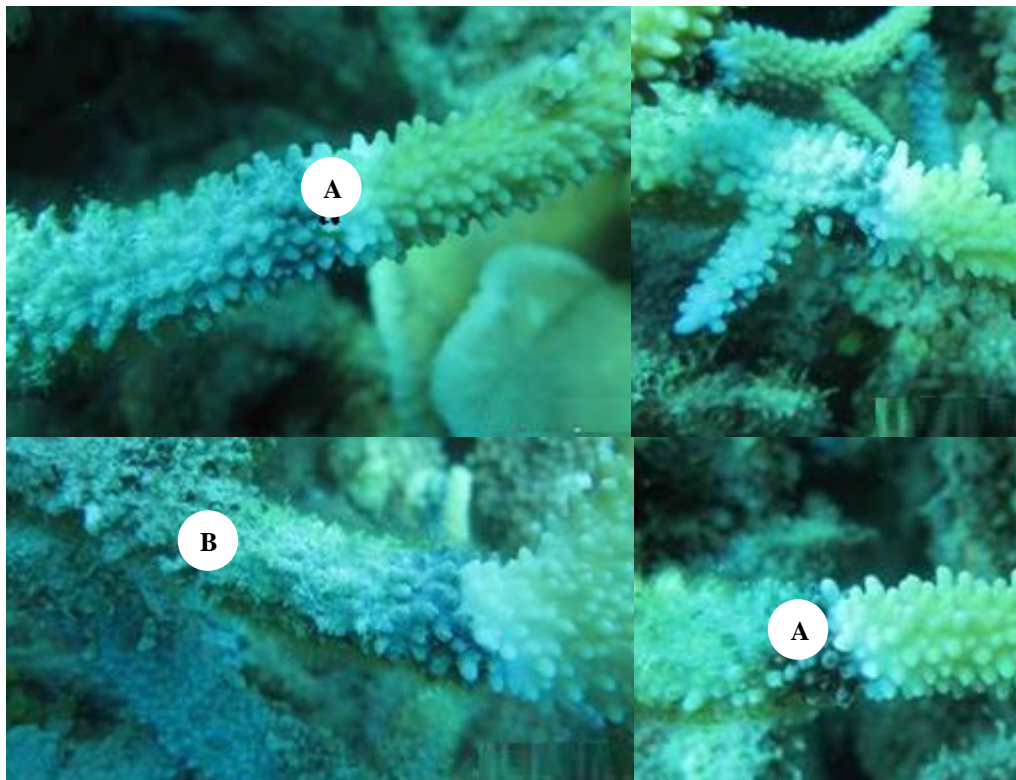
**Figure 3.** Prevalence of coral diseases in several locations in East Belitung. BBD (Black Band Disease), WS (White Syndrome), YBD (Yellow Band Disease), SEB (Skeletal Eroding Band), F Bleaching (Coral Bleaching)



**Figure 4.** The prevalence of coral health compromiser in several locations in East Belitung



**Figure 5.** Coral *Montipora* sp. infected by Black Band Disease in Muranai Island. In the colony there is a sign of former infection as indicated by the presence of sediment (old sign: A), the white color (new sign; B) and the black circle are the current infection (C)



**Figure 6.** The coral *Acropora* sp. infected by SEB (Skeleton Eroding Band) in Muranai Island (A). The crumbled part of the skeleton structure (B) was caused by ciliates which released toxin. The currently infected part is black, similar to that infected by BBD (Black Band Disease)



disease was much lower than that of WS (White Syndrome). The highest prevalence of disease was bleaching, 2.21% in Sembilan Island and 0.625 in Bakau Island, followed by WS, 1.30% in Muranai Island. The highest prevalence of Black Band Disease (BBD), 0.44%, was found in Buku Limau Island, then in Muranai Island, 0.26%. The Yellow Band Disease was found in two locations, Muranai Island and Buku Limau Islands with prevalence of 0.52% and 0.23% respectively. Meanwhile, Focal Bleaching was found in 3 locations, namely Berlian Island (0.45%), Bakau Island (0.31%) Muranai Island (0.26%) (Figure 3). No water quality test was conducted in our study, but there were data of water quality parameters from Tanjung Binga and Keciput Villages, Belitung District, located close to the study sites, showing high salinity (31.0-32.0‰) and temperature (31.0-32.0°C), which exceeded the normal range (Widodo et al. 2013).

### The factors compromising coral health

Many factors may compromise coral health, but in East Belitung there were six factors: sedimentation, competition with other organisms, such as sponge, algae and other corals, pigmentation response, and gastropod *Drupella* sp, a coral predator. The main factor compromising coral health was sedimentation, as observed in the Islands of Berlian (3.31%), Bakau (2.13%), Muranai (0.78%) and Memperak (0.74%). The highest competition with sponge was found in the Islands of Buku Limau (0.44%), Muranai (0.26%) and Bakau (0.31%). Competition with algae was found frequently only in Bakau Island (0.62%), and not recorded in other islands. Competition with other corals was found only Bakau Island (0.62%). Pigmentation response was found in two locations, the Islands of Bakau (0.62%) and Memperak (0.25%). *Drupella* sp. was recorded in Memperak Island with prevalence of 0.5%. The prevalence of coral health compromiser is presented in Figure 4.

The number of coral diseases was higher in the middle location, the Island of Muranai, while the coral health compromisers were found more often in locations close to land where the water quality has declined because they were close to source of sedimentation and human activities in coastal development. Coral diseases are present both in location close to and far from mainland because of global warming (Harvell et al. 2007; Johan et al. 2014).

### Discussion

There have been no clear explanations on the correlation between the high live coral cover and the prevalence of coral diseases in Indonesian water due to the limited data of coral disease abundance. To get accurate data of the disease abundance, continuous monitoring must be done in many permanent sampling locations distributed across Indonesian waters. The researches in Caribbean water showed that most coral death was caused by diseases. The coral disease white-plague has caused the decline of live coral cover up to 60% in Virgin Island in 2005 (Miller et al. 2009). The coral diseases have caused the decline in coral diversity in the world (Anderson et al. 2013), changed

the coral reef structure and become serious threat for the world's coral reef (Harvell et al. 2009).

The number of coral diseases found in East Belitung was 6, while in Spermonde and Wakatobi water was 5, including skeletal eroding band (SEB), atramentous necrosis (AtN), white syndromes (WSs), brown band (BrB), and growth anomalies (GA). The commonly found disease is WS, infecting 42 coral colonies from 13 genera. The density of this disease is high, which may reach 28 cases in one observation transect (Muller et al. 2012). In Wakatobi water, WS was found with prevalence of 0.42%, and other diseases, BBD and SEB were also found (Haapkyla et al. 2007).

In Seribu Archipelago where BBD was found in locations located near-through-far from the mainland, indicating that mainland, as a source of pollutant, is not the only factor causing diseases. Other factors, such as temperature and light intensity may cause diseases. The highest disease prevalence during one-year observation was found in the middle location (Johan et al. 2013), which is the same with the result of this study in East Belitung although the observation was done only once.

The prevalence of coral diseases in East Belitung water was higher than that in the Red Sea, which were sedimentation (0.08%), sponge competition (0.04%), alga competition (0.06%), pigment response (0.13%), predation by *Drupella* sp. (0.1%), but coral competition was not reported in the Red Sea study (Mohamed et al. 2012).

The increasing prevalence of coral diseases can be caused by the increasing temperature, which may cause the coral to be stressful and pathogenic microbes which may infect the coral. Each coral has different resistance to stress and infection. Only those who have low resistance can get attacked. The species of coral which have low resistance to diseases are those from the family Acroporidae, such as *Acropora* sp. and *Montipora* sp. This was evident from the fact that many of those corals, especially *Montipora* sp, were attacked by BBD and WS in Seribu Archipelago (Johan et al. 2014).

It can be concluded in this study that the prevalence of diseases in Muranai Island, located in the middle distance from the mainland, was higher than that in the locations near or far from the mainland. The prevalence of diseases was categorized as normal. There were 6 coral health compromisers in East Belitung water. The SEB (skeleton eroding band) disease was the first time recorded in East Belitung water.

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