

40

PROCEEDING

**INTERNATIONAL SEMINAR AND EXPO ON SUSTAINABLE
UTILIZATION OF COASTAL RESOURCES IN TROPICAL ZONE
(ISECOASTAL)**

19-20 OCTOBER, 2016, BENGKULU, INDONESIA



**FACULTY OF AGRICULTURE
UNIVERSITY OF BENGKULU
2017**

**PROCEEDING
ISECOASTAL
FACULTY OF AGRICULTURE, UNIVERSITY OF BENGKULU
19-20 OCTOBER, BENGKULU, INDONESIA
ISBN: 978-602-9071-20-7**

EDITORS

Dr. Ir. Endang Sulistyowati, M.Sc
Bertoka Fajar SP Negara, S.Kel., M.Si

REVIEWERS

Dr. Ir. Endang Sulistyowati, M.Sc. (Indonesia)
Prof. Ir. Iin P. Handayani, M.Sc., Ph.D (USA)
Prof. Dr. Ir. Bambang Sulistyo, M.Sc. (Indonesia)
Dr. Ir. Irnad, M.Sc. (Indonesia)
Ir. Dede Hartono, MT. (Indonesia)
Ir. Zamdial, M.Si. (Indonesia)

SCIENTIFIC COMMITTEE

Prof. Dr. Manabu D. Yamanaka (Japan)	Dr. Pao Srean (Cambodia)
Prof. Hery Suchyo Utomo, M.Sc. (USA)	Prof. Dr. Dwinardi Aprianto, M.Sc. (Indonesia)
Dr. Ir. Lucky Adrianto, M.Sc. (Indonesia)	Dr. Ir. Zainal Arifin, M.Sc. (Indonesia)
Dr. Ir. Neviaty P. Zamani, M.Sc. (Indonesia)	Ir. Fahrurrozi, M.Sc., Ph.D (Indonesia)
Ir. Guswarni Anwar, MP., Ph.D (Indonesia)	Dr. Ir. Sigit Sujatmiko, M.Sc. (Indonesia)

LAYOUT EDITORS

Aradea Bujana Kusuma, S.Si., M.Si
Evanila Silvia, STP., M.Si
Yessi Rosalina, STP., M.Si
Apri Andani, SP., M.Si
Septri Widiono, SP., M.Si

Published by:

**Badan Penerbitan Fakultas Pertanian
Universitas Bengkulu
2017**



PREFACE

In supporting one of Indonesia's concerns on coastal development and as a way of disseminating research results among researchers all over places, there has been conducted "International Seminar and Expo on Sustainable Utilization of Coastal Utilization of Coastal Resources in Tropical Zone", ISECoastal, on 19- 20 October, 2016 at University of Bengkulu, Bengkulu, Indonesia. There were several keynote speakers (from Kemenko Maritim and LIPI), invited speakers (from UBB Cambodia, Japan, USA, and CP- Prima Indonesia), and presenters (from Fiji, Yaman, USA, and Indonesia) presented their articles.

These articles (55) consisting of Marine Science (18), Fisheries (14), Agriculture (23), and posters (20) are then compiled in this Proceeding. Many of them are drawing very significant contribution for Science and Government concerns regarding on these topics. On this occasion, we would like to express our gratitude to all members of Scientific Committee and Reviewers for their hard work and valuable time that made the ISECoastal was successful. We were very grateful to all Editors who had been working so hard to publish this Proceeding. Very high appreciations were directed also to Rector of the University of Bengkulu and Dean of Faculty of Agriculture who provided all that matters for this ISECoastal happened. To some sponsors, Bank Mandiri Cabang Bengkulu, Bank BNI Cabang Bengkulu, CP- Prima Sidoarjo, and PT. Bio Farma Bandung, we thank you for all valuable contributions.

We do hope, this Proceeding will serve as valuable resources for advancing knowledge and innovation in Marine Science, Fishery, and Agriculture that will provide benefits for human beings and industries.

Bengkulu, March, 2017

Best regards,

Editors

Formulation Tuna Fishery Management Issues in the Indian Ocean Fisheries Management Area 573	
<i>Tri Wiji Nurani^{1*}, Prihatin Ika Wahyuningrum¹, Sugeng Hari Wisudo¹, Soraya Gigentika²</i>	192
Productivity of Bubu as Eel Trap Installed in Swamp Water Around University of Bengkulu	
<i>Dede Hartono, Eko Nofridiansyah, Randi Anoma Putra</i>	200
Development Roadmap of Fishery Product Processing Industry in Pondok Kelapa, Central Bengkulu Regency	
<i>Zulman Efendi¹, Zamdial²</i>	208
Human Resources Development Strategy for Fishermen in Bengkulu Province	
<i>Anzori Tawakal[*]</i>	218
Economic Valuation of Mangrove Ecosystem Resources in Enggano Islands, North Bengkulu Regency, Bengkulu Province	
<i>Nurlaila Ervina Herliany¹⁾, Zamdial²⁾</i>	230
The Estimated Value and Economic Impact of Polyculture Fishpond Cultivated Area with Mangrove Relatedness (Case Study at Langensari Village, Blanakan Sub-District, Subang Regency)	
<i>Prabanugraha, R., A. Fauzi and B. O. Nababan</i>	239
A Review of Genetic Diversity of Marine Macrozoobenthos for Marine Conservation	
<i>Aradea Bujana Kusuma[*]</i>	252
An Application of Marine Cellulose Enzyme: A Review	
<i>Bertoka Fajar SP Negara</i>	259
Fish Drying Temperature, Relative Humidity and Moisture Content Profiles of the Hybrid Solar-Biomassa Dryer	
<i>Y. Yuwana, B. Sidebang and E. Silvia</i>	266
Study of HACCP (Hazard Analysis and Critical Control Point) on Beledang Fish Chips Processing in Pelangi Household Industry in Bengkulu City	
<i>Yessy Rosalina, Evanila Silvia and Laili Susanti</i>	281
Growth and Survival Rate of Leatherback Sea Turtles (<i>Dermochelys coriacea</i>) in Sekube Beach, Kaur Regency	
<i>Maya Angraini, Rodi Hartono, Yar Johan[*]</i>	292
Comparing Object-based and Pixel-based Classifications for Benthic Habitats Mapping in Pari Islands	
<i>Ari Anggoro^{1*}, Vincentius P Siregar², Syamsul B Agus²</i>	295
PART C AGRICULTURE	303
The Effect of Fermented <i>Sauropus androgynus</i> Leaf Extract on Fat Deposition, Toxicity, and Meat-Bone Ratio in Broiler Chickens Reared in Coastal Areas	
<i>U. Santoso, Kususiyah and Y. Fenita</i>	305
Efficacy of Fresh Jiringa Pods Water Extracts From Bengkulu Coastal on Growth <i>Ludwigia Octovalvis</i> (Jacq) Revans	
<i>Uswatun Nurjanah^{1*}, Edhi Turmudi¹, and Helfi Eka Saputra¹</i>	311

**Remark from Dean of Faculty of Agriculture University of
Bengkulu**

Distinguished delegates and participants,

It is my privilege to welcome all the participants in this International Seminar and Expo on "Sustainable Utilization of Coastal Resources in Tropical Zones" (ISECOASTAL) in Faculty of Agriculture University of Bengkulu.

As we all might aware, improper utilization of coastal resources in the tropical areas failed to protect coastal environment, benefit coastal inhabitants, foster balanced economic growth, and improve the health of people in many coastal areas.

It is very flattering to note that the agenda of this seminar covers a wide range of very interesting items relating to sustainable utilization of coastal resources in tropical zones. The increasingly serious situations relating to the sustainable coastal resource management have been thoroughly presented during this seminar. Such research findings and experiences could provide the guidelines for a collective approach for effective sustainable coastal resource management especially in the tropical areas. No matter how much we can do by ourselves, whether research or development, it is never enough, we must join in action-oriented efforts to maintain the sustainability of coastal resources in the tropical zones.

Finally, I would like to wish all of you to have two fruitful days of interesting and beneficial programs and also have a pleasant and memorable stay in Bengkulu.

Bengkulu, October 2016,
Dean Faculty of Agriculture
University of Bengkulu,

Ir. Fahrurrozi, M.Sc. Ph.D

Ecological Status of Coral Disease Threatened by Reef Sessile Organisms Overgrowth in the Savu Sea National Park of Indonesia

Syafyudin Yusuf¹, Rizya Ardiwijawa², M.E. Lazuardi³, Rodney Salm⁴

¹Hasanuddin University, Makassar, Indonesia

²The Nature Conservancy, Indonesia Program

³Coral Triangle Center, Indonesia

⁴The Nature Conservancy, Pacific Division

* Corresponding author email: s.yusuf69@gmail.com

ABSTRACT

Anthropogenic impacts in combination with natural stressor may lead to coral disease. Coral disease is one of the most recent in a series of threats that is a challenging the resilience of coral community. Naturally, beside threatened by predation of benthic invertebrates and fishes, the scleractinian are also compete for spaces with various sessile organisms such as sponge, algae and soft corals. These interactions bring a negative impact to the corals. This study attempts to observe coral disease, and reef health condition in the Savu Sea National Park. In addition, it includes the overgrowth disturbances of sponge, algae and soft corals to the community of the scleractinian corals. Collection of coral health data was done during the Rapid Ecological Assessment survey as initiated by The Nature Conservancy Indonesia in Savu Sea Marine National Park (SSMNP) in November 2014. We were diving for 60 minutes at each dive sites. Of 54 surveyed reefs, we recorded 2,068 scleractinian coral colonies with health problems. The result shows 31% of corals were experiencing overgrowth. Those mostly overgrowth by algae, sponge and soft corals, whereas disturbance from cyanobacteria and flat worms is lower. The coral colonies that suffered by sponge and soft coral overgrowth have bigger colony size compared to those attacked by Cyanobacteria and Coralline Algae. The ratio of coral mortality disturbance caused by these sessile animals is between 0.259 – 0.353. Intensity of coral colony disturbance due to overgrowth was categorized as high and may harm to the existence of coral community. This is considered to be caused by the decrease of the immunity of the coral polyps at certain coral species, or by the high toxicity of these sessile animals. The future challenge is to understand the toxicity of these sessile organisms to the community of hard corals. Owing to the significance of corals as indicators for the status of the marine environment. This scientific information is crucial for management of coral reef conservation areas within the Marine Conservation Area especially in the Savu Sea Marine National Park.

Keywords: Coral Disease, Reef Health, Savu Sea National Park, Coral Triangle

INTRODUCTION

Coral reefs are sentinel indicators of ocean health and the impacts of climate change. The link between recent dramatic declines in the health of coral reefs around the world and local and global anthropogenic stressors is well documented (Knowlton & Jackson, 2008; Bruno & Selig, 2007; Pandolfi, et al., 2003). Coral disease is now recognized as a significant cause of coral mortality and the growing number of reports reflects real increases in the number of diseases, host species affected, and geographic range (Sokolow 2009).

The presence of coral diseases give the negative impacts to the coral reef's health and the corals community structure. This lead to corals death and sobrings to the coral resilience degradation (Willis *et al.*, 2004). However, coral disease occurs naturally in certain organisms population and play an important role in regulating the community as a

dynamic spatiotemporal competition (Ostfeld *et al.*, 2008). Coral disease research in the Indo-Pacific since the 2000s suggests that coral disease coverage is still very small (less than 10 percent) and relatively secure to the coral reefs existence. However, when human and climate change pressure continues, it leads to a serious problem to the coral reefs. As a result, coral disease can be used to be a bio-indicator of climate change and marine life threat (Harvell *et al.* 1999; Ward & Lafferty, 2004).

Coral disease research in Indonesia recorded from Johan *et al.* (2014 & 2015). Savu Sea National Park of Indonesia is legally established in 2013 covers an area of 3.5 million hectares, within 10 administrative districts in the East Nusa Tenggara Regency. The Rapid Ecological Assessment (REA) in the Savu Sea National Park is a program of 'Coastal Resource Assessment' from The Nature Conservancy. The assessment includes coral reefs health, reef fish communities, mangrove condition, as well as observation of sea turtle, birds and marine mammals. In the assessment of these marine resources, coral disease is one indicator of the health of coral reefs in the Sawu Sea.

There are only few of coral disease research in Indo-Pacific (Harvell, *et al.*, 2013; Wilson *et al.* 2015 *unpublished*). Whilst coral disease research is considered to an important knowledge as well as how to deal with in the future. In addition, the Indo-Pacific region is the epicenter of the world's coral reefs and the hotspot of marine biodiversity (Veron *et al.*, 2009). Therefore, the aim of the survey is to provide information of coral disease evidence and coral reef health condition in the Savu Sea as a part of the World's Coral Triangle.

MATERIALS AND METHODS

This Rapid Ecological Assessment (REA) in the Savu Sea National Park conducted from 28 October to 17 November 2016. The locations ranging from Manggarai District of west Flores Island, Sumba Island, Sabu Island, Raijua Island, Ndana Island, Rote Island to Timor Island and Batek Island (in the border with Timor Leste). The REA covers 54 dive sites.

The REA used two methods of Belt Transect and Time Swim (English, *et al.* 1997; Hill & Wilkinson, 2004). The belt transect sized 50 m x 4 m, while the observation method based on time swim used the time for approximately 50-60 minutes or equivalent to the belt transect coverage. During the dive, we recorded the type and number of hard corals (into genus level) experienced by disease. All corals were measured the maximum diameter and their diseased portion in centimeters.

The REA includes observation of coral reef substrate coverage [Hard Coral (HC), Soft

Coral (SC), Sponge (SP), Algae (AL), Dead Coral (DC), Dead Coral with Algae (DCA), and coral's Rubble (R)] and coral diseases. Coral disease can be divided into four groups, namely (1) a group of coral infected with microbes (infectious disease), (2) groups of corals affected by bleaching, (3) groups of coral predation by other animals (predation), (4) a group of coral disrupted due excess growth (overgrowth). Especially for coral impaired due to overgrowth of other biota divided into five categories, namely CYA_OG = Cyanobacteria overgrowth; CCA_OG = Crustose Coraline Algae overgrowth; SC-OG = Soft Coral overgrowth; AL_OG = Algae overgrowth; SP_OG = Sponge overgrowth. Disease Index analysed by extensive damage to coral colonies compared to the overall area of each genera of coral colonies. All the data is analysed using an Excel program.

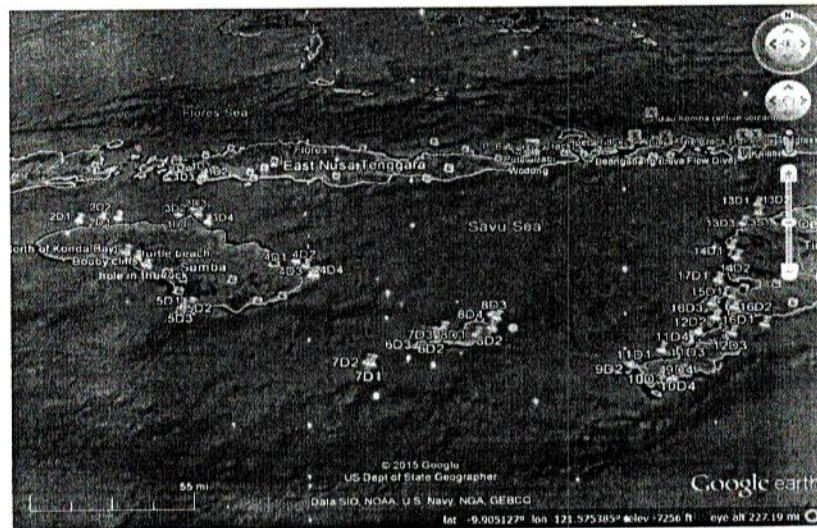


Figure 1. Dive sites of REA 28 Oktober – 17 November 2014 .

RESULTS AND DISCUSSION

Coral Reef Habitat Condition

Coral reef habitat in Laut Sawu are facing serious threats. Based on the analysis of the live coral cover of 54 diving spots, there were 52% and 40% coral in bad and moderate conditions, respectively. However, there was only 8% coral in good condition and none was in very good condition. Based on the hard coral cover (the Scleractinians) the condition of the coral reefs was low, due to natural (such as storms) and anthropogenic activities (destructive fishing, such as bomb-fishing). In parts of Kupang bay, good coral reef condition was mostly found in waters with low clarity, because high frequencies of bomb-fishing are conducted in clear waters, as to ease the fishers in sighting and collecting their catch. Other natural threats are storms (due to Sawu Sea that is

directly facing the Indian Ocean) and dominant algae competition. The westernly monsoon in this area may give significant impact to the coral reef condition.

The coral reef of Savu Sea NP are affected by numerous factors including both anthropogenic and nature stressing. Based on the hard Scleractinians coral cover, the condition of the coral reefs was low. In parts of Kupang bay, good coral reef condition was mostly found in waters with low clarity, because high frequencies of bomb-fishing are conducted in clear waters, as to ease the fishers in sighting and collecting their catch. Other natural threats are storms (due to Sawu Sea that is directly facing the Indian Ocean) and dominant algae competition. High wave storm from open sea in this area may give significant impact to the coral reef condition.

Coral Disease Index

Overgrowth can be defined as the over growing of coral associated organisms or shading by other organisms that can affect the growth of the reef. Moreover, only algal overgrowth is considered as a threat to hard coral (compromised health) (Raymundo et al. 2008). However, during REA Sawu National Marine Park survey, there were several types of overgrowth especially by sponges (SP-OG), soft coral (SC-OG), cyanobacteria (CYA_ OG), crustose coralline algae (CCA_ OG) and algae (AL_ OG).

From 54 diving sites per 60 minutes, it was recorded that 2.068 coral colonies (Scleractinians) were unhealthy. Thirty one percent of those colonies were overgrowth by sessile reef organisms and 45% were under predation and lesions. Results showed that there were more coral colonies under sessile organisms overgrowth i.e., by algae (AL-OG) compared to sponges (SP-OG), soft coral (SC-OG), cyanobacteria (CYA-OG) and crustose coralline algae (CCA_ OG). Coral disease prevalence index due to overgrowth did not correlate with the number of coral colonies under algal and CCA overgrowth with 175 and 12 colonies, respectively, but correlated with both disease wide from the colony size of the scleractinian.

The highest coral disease index was due to crustose coralline algae overgrowth (0,470), then from cyanobacteria (0,424) and the lowest disease index was recorded from soft coral (0,259). Although algae overgrowth have a most coral colonies affected, but its prevalence is lower than soft coral overgrowth. On the other hand, the Crustose Coralline Algae and Cyanobacteria overgrowth have less affected to the coral colony number, but they have higher disease index because of small colonies size with wider disease infected. Sponge overgrowth had been threatening more and the bigger size of

coral colonies (98 cm²) and most wide of disease (Table 1).

Table 1. Disease Index of coral were threatened by reef organisms overgrowth

Reef Organisms Overgrowth	Code	Scleractinian corals			
		Number of Colony	Colony Size (cm ²)	Disease wide (cm)	Disease Index
Algae	AL-OG	175	29,67	10	0,337
Sponge	SP-OG	149	98,00	34,6	0,353
Soft Coral	SC-OG	92	84,16	21,83	0,259
Cyanobactery	CYA-OG	27	66,55	28,19	0,424
Crustose Coralline Alage	CCA-OG	12	58,07	27,29	0,470

Coral Genera Disease Index

In this research, there were 58 coral genera known to have been infected by various diseases and other health problems (compromised health). Coral genera dominantly infected by diseases are *Porites*, *Acropora*, *Montipora*, *Stylophora*, *Pocillopora*, *Seriatopora* (Table 2). These coral genera are mostly found in coral reef areas and characterised as fast grower, opportunistics and are prone to diseases.

Disease Index or health problems due to reef organisms overgrowth are varied according to coral genera. Results showed a weak correlations between values of overgrowth colony and disease index ($R^2 = 0.027$), where *Porites*, *Acropora*, dan *Montipora* had the most overgrowth colony with low disease index compared to *Seriatopora*, *Goniopora*, *Platygyra* dan *Favia*.

Soft coral overgrowth affected 28 genera and mostly were *Seriatopora*, *Galaxea* and *Stylophora*. Sponge overgrowth attacked 29 genera, such as *Acanthastrea*, *Favia*, *Lithophilon* and *Labophyllia* (the lowest impacted). Algal overgrowth impacted 34 genera, such as *Alveopora*, *Lobophyllia* dan *Lithophylon*. Eventhough *Porites*, *Acropora*, and *Montipora* had the most colonies, yet did not received many algal threats. The highest threats of crustose coralline algae (CCA_ OG) was found in *Isopora*, *Millepora* dan *Platygyra* (Table 2). Each overgrowth threats had varied prevalences as according to coral species.

135

Springer-Verlag, berlin, pp.69-104.

Yusuf, S., Rappe, A.R., Amri, K., Selamat, B., et.al., 2015. Baseline Study of Coral Reef and Other Ecosystem in Makassar. LIPI-Unhas. Coremap-CTI.

139