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EFFECT OF ECOLOGICAL FACTORS ON ABUNDANCE OF CHAETODONTIDAE ABUNDANCE AT KARANG BONGKOK ISLAND, DKI JAKARTA

Fazar D. Gustiar[1], Sunarto[2], Wahyuniar Pamungkas[2], Moch. Rudyansyah[2]

Author Details (optional)
1 StudentAuthor name is currently pursuing masters degree program in electric power engineering in University, Country, PH-01-12-345-6789. E-mail: author_name@mail.com
Co-Author name is currently pursuing masters degree program in electric power engineering in University, Country, PH-01-12-345-6789. E-mail: author_name@mail.com
(This information is optional; change it according to your need.)

ABSTRACT

The goal of this research is to analyze the correlation between ecological factors and the abundance of coral fish from the family Chaetodontidae. It was conducted in the waters of Karang Bongkok Island in 4 stations, each at a depth of 3 meters and 7 meters. The methods in this research are Underwater Visual Census (UVC) and Line Intercept Transect (LIT). The data that are collected consist of : Chaetodontidae fish abundance, live coral percentage, and the physical-chemical water quality. The results indicate that the average live coral cover in the waters of Karang Bongkok Island is 32.08%. This value indicates that the live corals are in a moderate condition. From 8 species that are found, there is a total number of 73 Chaetodontidae fish per 2000 m^2. The results showed that there are no significant differences between depth and Chaetodontidae abundance, as well as between depth and live coral cover percentage. From the Paired Sample T-Test, the probability values were 1.31 for Chaetodontidae abundance and 0.702 for live corals. And the correlation between live coral cover with *Chaetodontidae* abundance is positive and very strong, with a correlation coefficient of 0.93 and a determination coefficient of 84%.

Keywords: *Chaetodontidae,* Correlation, Ecology, Live Coral Cover

1. INTRODUCTION

Coral fish is one of the biota that live in the coral reef ecosystem and its life depends on the condition of the coral reef. Chaetodontidae is a family of reef fishes that belong to the group of reef fish. Indicators, the existence and abundance of individual fish species can provide an overview of the condition of coral reefs. Experts agree in placing Chaetodontidae fish as an "indicator species" of coral reef conditions, because these fish are true reef dwellers (Hutomo 1986). The distribution of fish from the Chaetodontidae family is determined by the type of food available. The Chaetodontidae family is scattered in tropical and subtropical waters and these fish species live in shallow coral reef areas and are therefore dependent on coral reefs as a place to find food and shelter, so their distribution and density are more influenced by habitual ecological factors, such as coral reef ecosystems and conditions oceanography which includes salinity, brightness, dissolved oxygen content, water pH, and temperature. Madduppa (2006) states that Chaetodontidae allows it to be an indicator of coral reef degradation due to environmental pressures.

Between the condition of ecological factors and the abundance of Chaetodontidae fish is of course very closely related to each other, so it is necessary to do a research on how big the correlation of ecological factors to the abundance of Chaetodontidae fish covering coral reef cover, water quality, and depth of Chaetodontidae fish. This is the background for conducting research on the influence of ecological factors on the Karang Bongkok Island in the Thousand Islands National Park area with the aim of analyzing the correlation between ecological factors including the condition of coral reefs and depth factors on the abundance of coral fish of the Chaetodontidae family in the waters of Karang Bongkok Island.

2. MATERIALS AND METHODS

Time and Location of Research

This research was conducted in December to February 2020 in the waters of Karang Bongkok Island, Kepulauan Seribu Regency, DKI Jakarta. This research lasted for approximately 3 months which included initial condition monitoring, in situ data collection, data collection, data processing, and data analysis. Initial condition monitoring for data collection was conducted in December 2019, at four research stations. The initial survey results were selected and determined by 4 (four) research stations located in the east, south, southwest and west with depths of 3 and 7 meters determined based on geomorphological zoning, namely the reef crest (2-3 meters) and reef slope (3-10 meters).

Research Methods

The data used in this study consisted of coral reef data, Chaetodontidae fish, and oceanographic data. The method used in this research is to use the method of observation or direct observation at the study site, through surveys, and by collecting primary data. Data taken in the form of physical and chemical parameters of waters, live coral cover, and abundance of Chaetodontidae.

The abundance of Chaetodontidae fish was carried out using the UVC (Under Water Visual Census) method, the number of belt transect areas having a distance of 2.5 meters to the left and 2.5 meters to the right, if the total area observed was 250 m^2 (50 m x 5 m = 250 m^2). Data collection is carried out 5-15 minutes after pulling the rollmeter, this can allow the fish to behave normally again. The data collection must be done by swimming slowly along the transect while recording the fish that are encountered, this aims to prevent the fish from escaping due to fear (English et al. 1994).

And for coral reef cover using LIT (Line Intercept Transect), data collection on live coral cover with the offending line transect is by spreading a roll meter along 50 m. 50 m line transects are placed parallel to the coastline (English et al. 1997), the coral reef component recorded in this method is based on coral lifeforms in centimeters at depths of 3 and 7 meters. Coral colonies located under the transect line are measured following the growth patterns of coral colonies. The known coral colonies were recorded immediately.

Furthermore, the data collection of physical and chemical parameters aims to see the environmental conditions when conducting research. This study took 6 physical and chemical parameters to see environmental conditions (temperature, salinity, brightness, dissolved oxygen levels, acidity, and speed of current).

And to analyze the correlation between the depth factor and the abundance of chaetodontidae, a Paired Sample T-Test was conducted. In addition to calculating the coefficient of determination and regression analysis to analyze how much influence the condition of coral reef cover has on the presence of Chaetodontidae fish (Akbar, et al., 2014)

3. RESULT

Water Ecological Condition

Karang Bongkok Island is an uninhabited island and is surrounded by a stretch of sandbar and there is a lagoon in between. Coral reefs that can be found in the research location occupy a depth of 2 – 40 meters. Coral reefs in the waters of Karang Bongkok Island belong to the Fringing Reef type of coral reef, this type of coral reef can generally be found up to a depth of 40 meters with growth vertically towards the open sea. Factors that influence the shape of the growth of this fringing coral reef is the vertical space and depth available for coral to occupy (Kennedy, 2002).

Percentage Cover and Diversity Index of Coral Reefs

Based on observations of the condition of coral reef cover around the waters of Humpback Coral Island, the live coral cover ranged from 5.28% - 53.66% (Figure 1.). This shows that the condition of living coral reef cover has poor to moderate criteria.

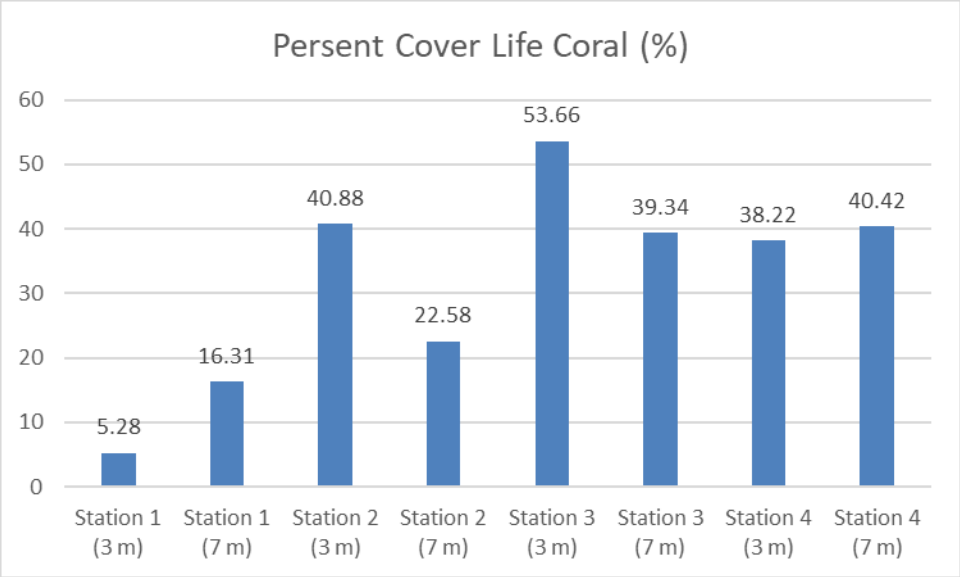

Figure 1. Persent Cover Life Coral

At station 1, namely the eastern part of the humpback coral island waters at a depth of 3 meters has a cover value of 5.28% and is the lowest percentage value of coral reef cover, while the highest percentage value of coral reef cover is at station 3 at a depth of 3 meters with a value of 53. 66%. In terms of utilization, Karang Bongkok Island is often used as a place for local fishermen to find fish, but at station 1 it is close to Kelapa Island which is a densely populated island and there are human activities, and at station 3 it is a place that is often used for conservation activities and at this location there is no influence from the surrounding environmental factors because it is an area adjacent to an uninhabited island so there is no influence of human activity. Differences in environmental conditions are thought to cause differences in the percentage of live coral cover. Broadly speaking at a depth of 3 meters is greater than the depth of 7 meters. Referring to Fachrurrozie's research (2012), this is influenced by the difference in light intensity on the growth rate of zooxanthella which has a major effect on the profile of live coral reef cover.

The percentage of live coral cover has decreased every year, this is evidenced by research by Estradivari et. al (2009) which states that in 2003 the percentage of live coral cover was 71.8%, in 2005 it was 67.6%, and in 2007 live coral cover was 63.7%. And in 2020, the largest percentage of coral reef cover is 53.66%. This is presumably due to anthropogenic pressure, including destructive fishing.

Physical and Chemical Parameters of Karang Bongkok Waters

Based on the results of observations of the physical and chemical factors of the waters at each station, in general the waters of the island of Karang Bongkok still meet the standard criteria for seawater quality as stated in the Decree of the Minister of State for the Environment Number 51 of 2004 (Table 1.), concerning seawater quality standards for marine life.

Table 1. Quality Water at Karang Bongkok Island

No	Parameter	Unit	Value				Quality Standart*
			Station 1	Station 2	Station 3	Station 4	
1	Temperature	°C	30,6	29,3	29,3	29,9	28 - 30
2	Current	m/s	0,7	0,2	0,3	0,3	
3	Brightness	%	100	100	100	100	100
4	Salinity	Ppm	33,3	34	33,8	32,3	33 - 34
5	Dissolve Oxygen	mg/L	7	7,8	7,8	7,9	>5
6	pH		8,3	7,9	7,8	7,8	7 – 8

Abundance of Chaetodontidae

The Chaetodontidae family found at 4 stations with a depth of 3 and 7 meters respectively in the waters of the humpback coral island were 8 species from 4 genera. Those found in the waters of the humpback coral island were *Chaetodontidae rafflesii, Chaetodontidae trifascus, Chaetodontidae adiergastos, Chaetodontidae decussatus, Chaetodontidae octofasciatus, Chelmon rostratus, Heniocus varius, and Hemitaurichthys polypelis* with a total of 73 individuals (Figure 2.).

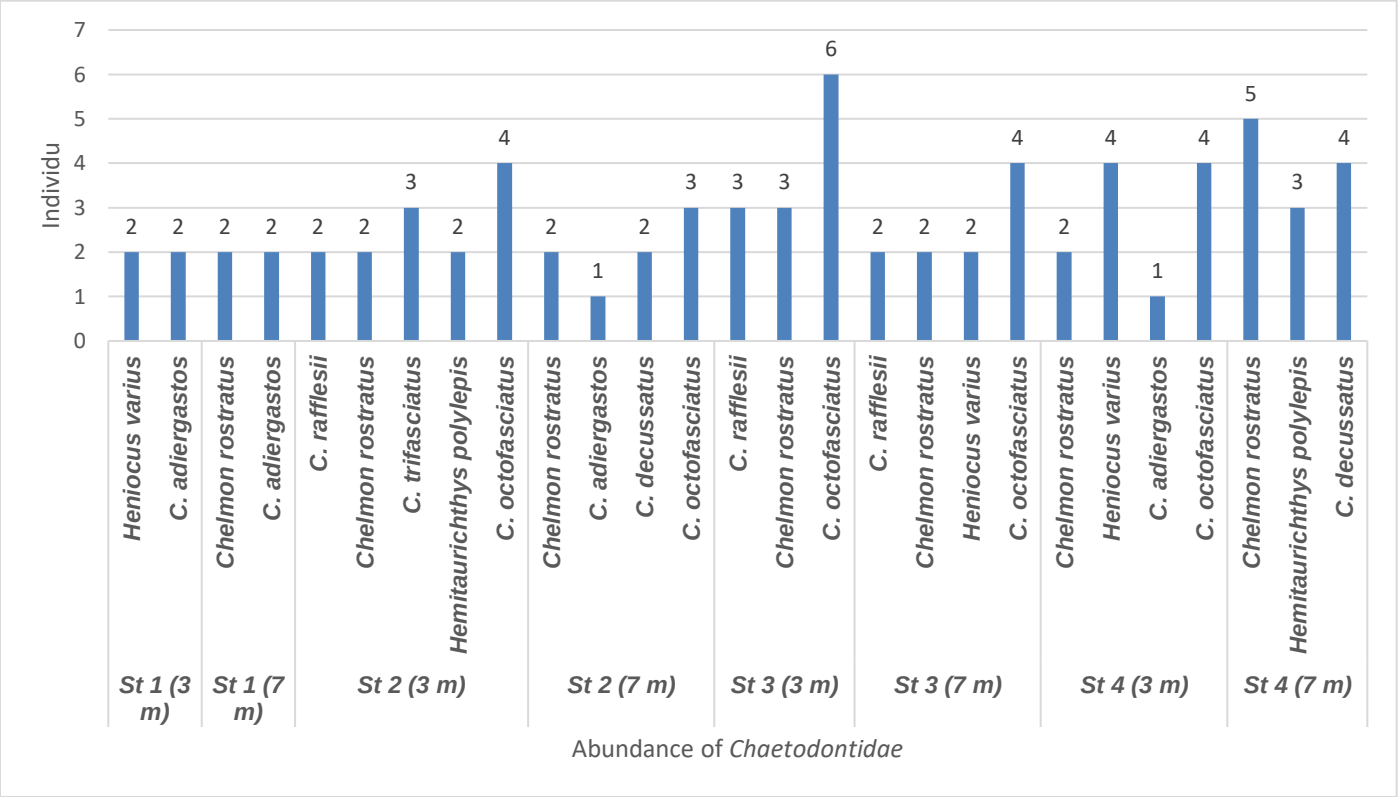

Figure 2. Abundance of *Chaetodontidae* at Karang Bongkok Island

According to Maddupa (2006), Chaetodontidae fish are divided into two, namely obligate corralivores (depending on coral reefs) and falcultative corralivores (not too dependent on coral reefs and there are 7 species of Chaetodontidae whose food type is known.

The Chaetodontidae species included in the obligate corralivores according to Maddupa (2006) are *C. trifascus, C. octofasciatus*. While those belonging to the falcultative corralivores group are *C. rafflesii, C. decussatus, Chelmon rostratus, Heniocus varius*, and *Hemitaurichthys polypelis*. The most common Chaetodontidae species from all observation sites were C. octofasciatus and Chelmon rostratus with 20 and 19 individuals respectively. This can be caused by the food available in their respective habitats. According to Utomo (2010) the type of coral favored by Chaetodontidae is a type of coral that has gaps or a type of branching coral which is used as a place to find food and a place to live. During observations at each station, these Chaetodontidae fish were found to live alone or in pairs.

At station 1, which had coral cover classified as in poor condition, which was dominated by Dead Coral with Algae, there were many findings of *Chelmon rostratus, Heniocus varius,* and *C. adiergastos*. Type of fish from the genus Chelmon eats small benthic invertebrates such as Polychaeta and small crustaceans.

Correlation between Live Coral Cover Percentage and *Chaetodontidae* Abundance

The calculation of the regression results shows a correlation value of 0.930 which shows that live coral cover to the abundance of Chaetodontidae in the waters of Karang Bongkok Island has a very strong relationship, with the value of live coral cover at each observation location of 5.28% - 53.74% and the abundance value Chaetodontidae fish of 4 ind/250m^2 – 13 ind/250m^2. And the magnitude of the influence of the presence of Chaetodontidae fish on live coral cover can be seen from the value of the coefficient of determination obtained from the calculation indicated by the value (R square) of 0.8625 or 86% or it can be said that there is a very strong influence of coral reefs on the abundance of *Chaetodontidae* (Figure 3.).

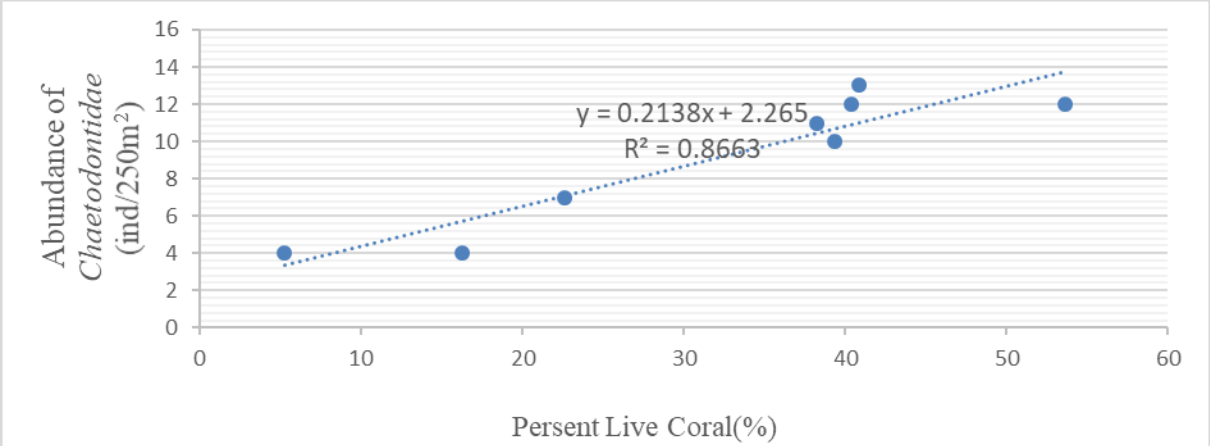

Figure 3. Result of Regresion Analysis

Judging from the determination value of 86%, which means that live coral cover does not completely affect the abundance of Chaetodontidae, or the condition of live coral cover only affects Chaetodontidae abundance by 86%. This means that there are other factors that affect the abundance of Chaetodontidae by 14% in the waters of Karang Bongkok Island such as the type of coral it eats, other types of marine biota that act as coral predators or competitors and coral predators.

Conclusion

Based on the observations, it can be concluded that the condition of coral reefs in the waters of Karang Bongkok Island is included in the good category with an average percentage value of 32.08%, there is no significant difference between the 3 meter and 7 meter depth factor on the abundance of Chaetodontidae and the percentage of cover. coral reefs live in the waters of Karang Bongkok Island. And a very high and very strong relationship between coral cover and the abundance of Chaetodontidae with a correlation coefficient of 0.93 and a coefficient of determination of 84% or 0.84.

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