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## Evaluation of coral growth and survival on spider frame transplant media on Samalona Island, Makassar

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### Abstract

Coral reefs are one of the main ecosystems in coastal areas that are very stretched with damage, so it requires efforts to preserve them through rehabilitation activities. This study aims to determine the growth rate and survival of transplanted corals from 2021 - 2023 on Samalona Island, Makassar City. This study uses a survey method approach by making direct observations and measurements of transplanted corals on spider frames by utilizing previous data (2021) and comparing current measurement data (2023). The type of transplanted coral studied was *Acropora branching* at a depth of 3-4 meters. The results showed that the growth rate of transplanted corals was 9.22 cm with an average per month of 0.38 cm. Its survival was 58.15% with the number of surviving coral fragments as many as 314 and dead as many as 226.

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### Introduction

Indonesia has a coral reef area of 14% of the total coral reef area in the world (Januardi, 2016) [10]. Coral reefs have important value in life, both in terms of ecology to promising economic value. The biological benefits of the presence of coral reefs are as a place to live for various types of biota such as various types of fish, crustaceans, molluscs, and others (Zurba, 2019) [29]. Meanwhile, its economic value is that it can advance coastal areas in the tourism sector. The attraction of coral reefs is very popular with marine tourists, especially in diving and snorkeling activities (Hoegh-Guldberg, 1999) [9].

Coral reefs are known for their sensitive and highly sensitive ecosystems so that damage to coral reefs cannot be avoided. Damage to coral reefs has increased every year, if left continuously for a long time it will disrupt the ecosystem in the sea (Januardi, *et al*, 2016; Purwanto, *et al*, 2023) [10, 19]. According to Gianto, *et al* (2017) that almost 85% of the distribution of coral reefs in Indonesia is threatened with damage and the other 50% are threatened with high damage. About 36.5% of coral reefs are in poor condition and 33% in coral cover condition which is in very good and good condition. Human activities are the cause of pollution that causes the condition of coral reefs in the world to be threatened (Dahuri, R. (2003) [3]; Burke *et al.*, 2012) [2].

Samalona Island is one of the islands in the Spermonde Islands cluster which is famous for its coral reefs located in Makassar City. By making it a tourist destination, along with the passage of time and tourist activities which include anchoring activities from tourism boats to snorkeling and diving activities, the coral reef area of Samalona island is one of the affected (Kordi, 2018) [11]. Sudaryanto, *et al*, (2022) [27] stated that damage to coral reefs on Samalona island which reached 35% was caused by community activities (anthropogenic), so there is a need for action to restore coral reefs in the waters of Samalona island. Some recovery efforts that can be done are one of them doing coral transplantation (Prameliasari, *et al.*, 2012; Subhan, *et al*, 2014; Saiful, 2023) [16, 26].

There are several methods of coral reef restoration commonly carried out in coastal areas, ranging from building artificial reefs to transplanting coral reefs (Rachmawati, 2001; Rani, *et al*, 2017; Saputra, *et al*, 2021) [20, 21, 24]. The efforts that will be made by researchers are adjusted to the conditions of damage and conditions that exist on Samalona Island.

One of the current coral rehabilitation techniques to be used is the spider skeletal method. This study aims to determine the survival rate and growth rate of transplanted corals from 2021 - 2023 on Samalona Island.

## Method

This research was conducted in August 2023 on Samalona

Island, Makassar City, South Sulawesi Province. Samalona Island is one of the islands in the Spermonde archipelago. This study used survey method (English, *et al*, 1994; Giyanto, 2013) <sup>[5, 6]</sup> to conduct research on the growth rate and survival of transplanted corals using the spider skeleton method. The map of the research location can be seen in Figure 1.

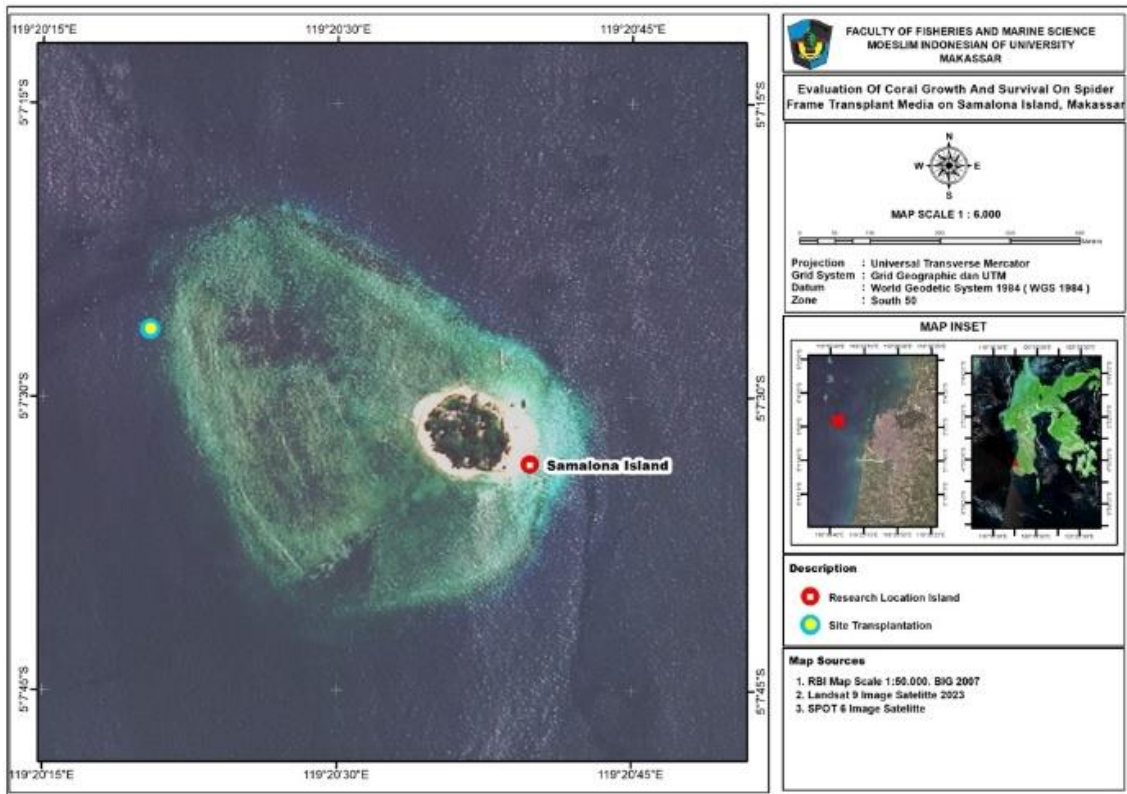


Fig 1: Map of Research Location

## Data collection Methods

Based on the source, the data collected includes primary data and secondary data. Primary data are types and sources of research data obtained directly from the first source (not through intermediaries), both individuals and groups. So the data is obtained directly. This study used planting data in August 2021 and data from collection in August 2023 on Samalona Island. Data collection was 30 artificial media frames with each frame having 18 coral saplings. The process of collecting survival data and growth rate of transplanted corals is directly carried out in water with the help of the SCUBA tool then recording data on coral survival rate (*survival rate*) and measuring coral growth rate using a bar. Secondary data is a source of data for a study obtained by researchers indirectly through intermediary media (obtained or recorded by other parties). Secondary data collection is carried out by literature study and reviewing previous research that is still relevant to this writing.

## Data Analysis

### a) Survival

Coral survival rates are calculated using the following formula (Ricker, 1975).

$$SR = \frac{Nt}{No} \times 100\%$$

## Information

SR = Survival Rate

Nt = Number of individuals at the end of the study

No = Number of individuals at the start of the study

### b) Growth Speed

Observation of the growth rate of transplanted corals is carried out by measuring the height of coral fragments. Coral measurements are carried out using a ruler

The measurement of the absolute growth rate of corals can be calculated using the formula (Effendi, 1997):

$$\beta L = Lt - Lo$$

## Information

$\beta L$  = Absolute consolidation of height or diameter (cm)

$Lt$  = Average height or diameter after the t-th month (cm)

$Lo$  = Average height or diameter at the time of initial measurement (cm)

## Discussion

The success rate of coral survival is the ability of corals to survive without experiencing death during the study expressed in units of %. Where the success rate of living corals is a determining factor of the success of coral reef

transplantation (Mulyadi, *et al*, 2018). According to Harriot and Fisk (1988)<sup>[8]</sup>. The *survival rate of Acropora Branching corals* observed was 30 transplant media with each initial

seedling planting of 18 fragments with a total of 540 tillering fragments. The survival rate results can be seen in the following diagram. (Fig. 2).

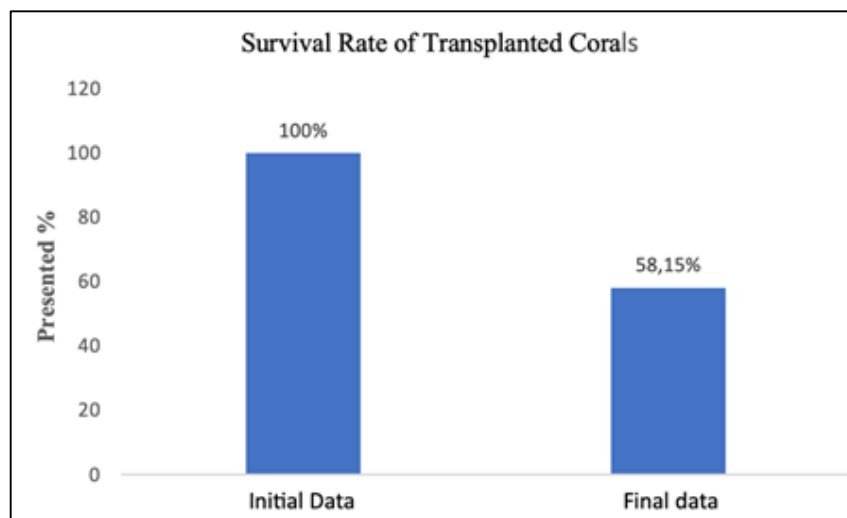


Fig 2: Survival Rate of Transplanted Corals

The survival of *Acropora Branching corals* from the beginning of observations to the end of the study decreased with the final results of observations of 58.15% with the number of surviving fragments as many as 314 coral fragments and the death of 226 coral fragments.

The results above show that *Acropora Branching type transplant corals using spider skeletal modules* on Samalona Island are classified as successful. According to Mompala *et al.* (2017; Caterpillars, *et al*, 2022)<sup>[13]</sup>, transplanted coral

activities are declared successful if they have a survival rate between 50 to 100%.

Total coral growth is the difference in coral height or diameter change at the end of the study with the beginning of the study (Arimbi, *et al*, 2023)<sup>[11]</sup>. Based on measurements of transplanted corals on Samalona Island after 24 months of planting, the results of measuring the length growth of *Acropora Branching* during the study were obtained. (Fig. 3).

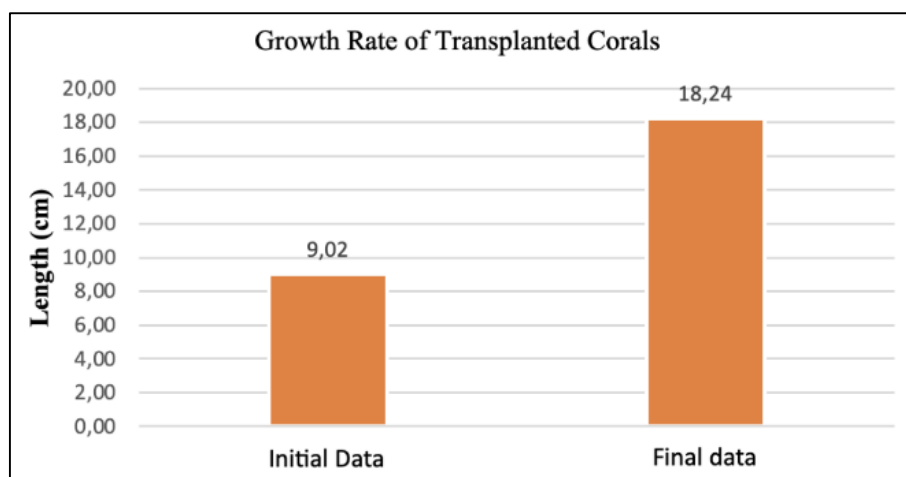


Fig 3: Growth Rate of Transplanted Corals

Based on the results of the diagram above, it is known that the growth rate of *Acropora Branching transplanted corals from August 2021 to August 2023 is 9.22 cm and the average length of the monthly growth rate of transplanted corals is 0.38 cm*. One of the possible environmental factors that can inhibit coral growth is sediment (Nurcahyani, 2018; Malik, *et al*, 2023)<sup>[15, 12]</sup>. High sedimentation of polyp bodies can interfere with synthetic photos that occur in coral polifs and can cause inhibition of coral growth (Simanjuntak, 2012; Pratiwi, *et al*, 2012; Pratiwi, *et al*, 2023)<sup>[25, 17, 18]</sup>.

### Conclusion

Based on the results of research on Samalona Island, Makassar City can be concluded as follows:

- The presentation of the survival rate of transplanted corals in 2021 to 2023 reached 58.15%. And the growth rate of transplanted corals is 9.22 cm with a length growth of 0.38 cm / month.
- Factors that affect the survival rate and growth rate of Transplanted Corals are the appearance of algae covering coral fragments that cause death.

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