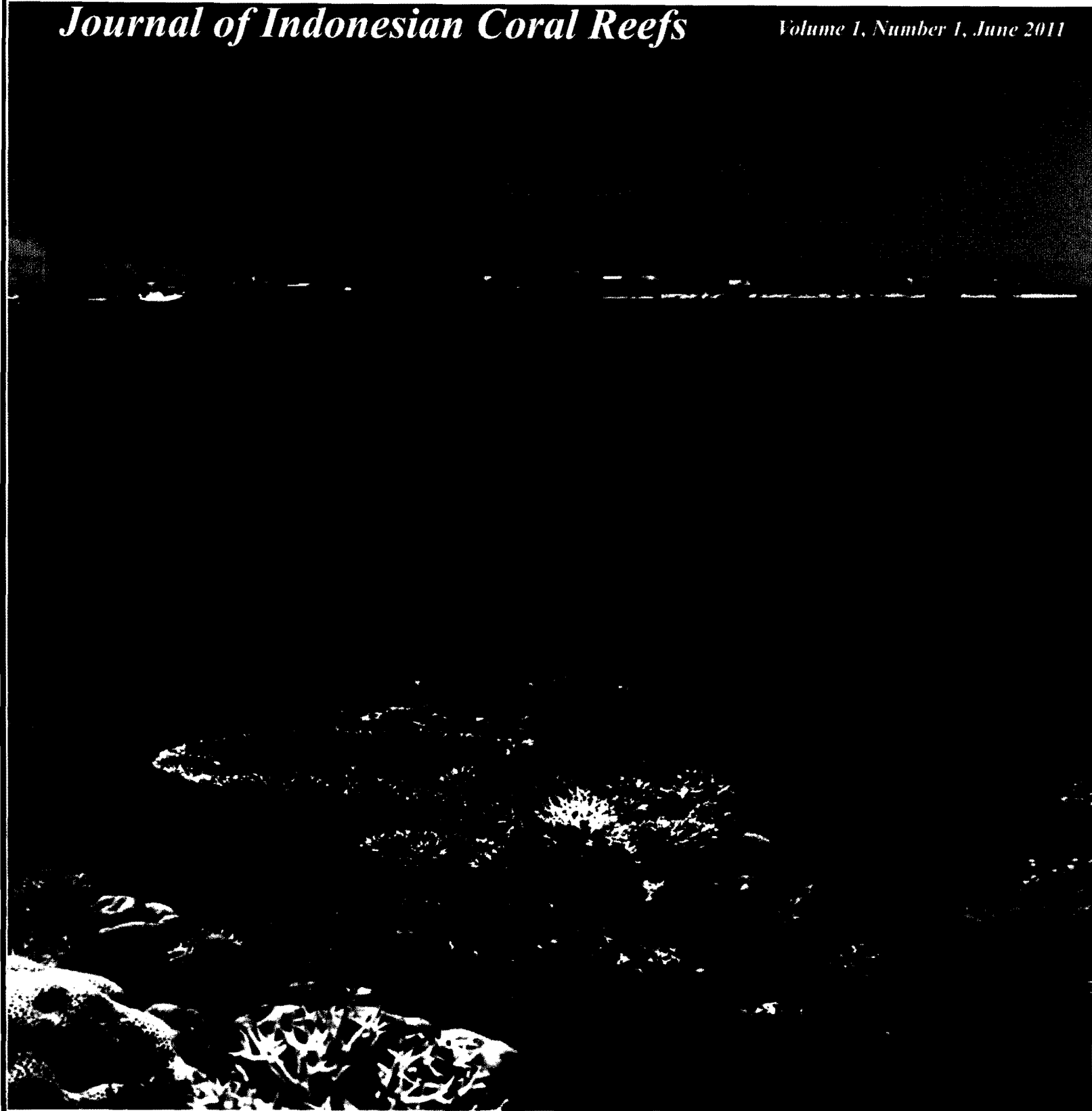


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Journal of Indonesian Coral Reefs (JICoR)



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Journal of Indonesian Coral Reefs (JICoR)

Preface

Indonesian coral reefs comprise the largest and most diverse coral reef ecosystem on the planet, but at the same time, they are among the most threatened due to mounting human- and climate change-related stressors. In the last few decades, many coral reefs in the region have been significantly degraded by a range of activities and disturbances, including destructive fishing, coral mining, sedimentation, and recently, by warm temperature anomalies causing coral bleaching. For Indonesia, whose population is spread across an archipelago of islands, and where millions of people depend on coral reefs for food and livelihood, the degradation of coral reefs represents a serious threat to the economy of the nation.

In recognition of the significant economic value of Indonesian coral reefs and the high dependency of Indonesian people on reef resources, several management efforts involving a variety of programs, especially the Coral Reef Rehabilitation and Management Program (COREMAP), have been ongoing since 1998. A new regional program called the CTI-CFF (Coral Triangle Initiative for Coral Reefs, Fisheries, and Food Security) emerged in 2009 and is also focused on protecting our invaluable resources. Despite these and other management efforts, ongoing and emerging challenges relating to the protection and sustainable use of these resources remain to be resolved, and will require strategic management actions based on strong scientific research and principles.

Recognizing the urgent need to provide and share scientific data and information to improve coral reef management, the Indonesian Coral Reef Society (INCRES), in collaboration with the Research & Development Center for Marine, Coastal, and Small Islands (MaCSI), Hasanuddin University, have joined forces to jointly publish the Journal of Indonesian Coral Reefs (JICoR). This is the first journal especially dedicated to and focused on publishing interdisciplinary research related to Indonesian coral reefs.

This first volume of JICoR covers a number of crucial issues pertaining to coral reefs, particularly examples of strategies for coral reef management, the status of coral reef charismatic species, marine protected areas, coral biology, coral diseases, coral reef ecology, and socio-economic aspects of coral reefs to highlight some of the contributions. We hope that the presence of JICoR will enrich and progress academic research related to Indonesian coral reefs, and become an invaluable repository of knowledge for the development of basic and applied research, as well as a source of strategic and unbiased information for improving coral reef management in Indonesia.

Editor in Chief,
Jamaluddin Jompa

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Coral Recruitment, Survival and Growth of Coral Species at Pari Island, Thousand Islands, Jakarta : A Case Study of Coral Resilience

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Abstrak

Penelitian tentang kelulusan hidup dan pertumbuhan rekrutmen karang telah dilakukan di Perairan Pulau Pari Kepulauan Seribu, Jakarta, dari Bulan Maret sampai November 2010 dan pengaruhnya terhadap factor biotik dan abiotik. Pengamatan rekrutmen dilakukan pada bentuk koloni massive dan bercabang yang ditemukan dalam transek 2 x 70 meter pada kedalaman 5-7 meter. Pada masing-masing bentuk koloni setiap rekrutmen dikelompokkan dalam tiga kelas ukuran yaitu < 3cm (small), 3-6 cm (medium), dan > 6 cm dan < 10 cm (large) dan semua rekrutmen ditandai dengan plastik label. Keanekaragaman rekrutmen karang yang ditemukan mencapai 14 genera dari 9 famili, terdiri dari 9 genera pada Stasiun ST1-Pari dan 8 genera Stasiun ST2-Tikus, dimana genera *Porites* dan *Fungia* ditemukan pada kedua stasiun dan rekrutmen karang dari *Faviidae* lebih mendominasi. Keanekaragaman rekrutmen karang termasuk dalam tingkatan moderat dengan indeks keanekaragaman 1,85 pada ST1-Pari dan 1,59 pada ST2-Tikus. Laju pertumbuhan rekrutmen karang bervariasi menurut bentuk koloni dan kelas ukuran, yaitu pertumbuhan koloni massif tertinggi 4,4 mm/bulan pada ukuran small dan koloni bercabang 9,2 mm/bulan pada ukuran large. Kepadatan rekrutmen karang mencapai 7,3 koloni/m² dan termasuk dalam kategori resiliensi tinggi. Hasil penelitian menunjukkan bahwa kelulusan hidup rekrutmen karang massif lebih tinggi dibanding rekrutmen karang bercabang, sedangkan kelulusan hidup rekrutmen karang dengan kelas ukuran medium lebih rendah dibanding kelas ukuran lainnya.

Kata kunci : rekrutmen karang, survival, spesies komposisi, Pulau Pari

Abstract

Research concerning survival and growth of coral recruits has been conducted in Pari Islands, Kepulauan Seribu, Jakarta, from March to November 2010, which purpose to determined the effect of biotic and abiotic factors on coral recruitment survival and growth. We observed two life forms of coral recruit, Massive and Branching within a transect area of 2 meter x 70 meter at 5-7 meter depth. Furthermore, for each life form, the coral recruit was grouped into 3 classes, Small (<3 cm), Medium (3-6 cm), and Large (> 6 cm and 10 cm ≤) and all colonies were marked by plastic tag. Coral recruits in this study site were diverse with species diversity reaching 14 genera from 9 families, consisting of 9 genera at ST1-Pari Site and 8 genera at ST2-Tikus Site which there were 2 genera founded at each site, *Porites* and *Fungia*, and genera of *Faviidae* were the most dominate. Diversity of coral recruits was moderate level with 1,85 diversity index at ST1-Pari Site and 1,59 at ST2-Tikus Site. The growth of coral recruitment was variated, according to the colony form and size class, which the highest growth of massive colonies to 4.4 mm / month in the small size and branching colonies to 9.2 mm / month in large size. The result of study show that survival of massive corals was higher than branching corals. Survival of medium size colonies was lower compared to the other size categories.

Keywords : coral recruitment, survive, species competition, coral reef, Pari Islands

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INTRODUCTION

Coral reefs ecosystem are highly dynamic, but more sensitive and very vulnerable to changing environmental conditions. Conditions of coral reefs is indicated by dynamic changes that occur in the corals community and the existence of strong interactions between the corals and others reef biota and also with abiotis conditions (Nybaken and Bertness, 2003). Changes in environmental conditions as a result of various human activities or by environment stressor have affected the damage to coral reefs on a wide scale. Naturally, the response of coral reefs to environmental change and the pressure are trying to resistance, adaptation or tolerant and showing signs of recovery and to the formation of a stable community (resilience) after they have been damaged (Obura and Grimsditch, 2009).

Indication of coral reefs recovery can be seen from the increase in cover of coral colonies (scleractinia) as the main component of building reefs. In nature, the early stages of recovery is marked by the emergence of young corals (juvenile) with relatively small size as a sign has been the addition of a new colonies on coral community (recruitment) (Harrison and Wallace, 1990). Coral recruitment with planktonic larvae are grouped in three main stages prior to the settlement of larvae (pre-settlement), settlement and metamorphosis of larvae (settlement and metamorphosis) recent developments and mortality after attachment (post-settlement and mortality) (Lamare and Barker, 2001). Many estimates of recovery based solely on the stage before and during the settlement of larvae and predict the colonies that appear after the settlement is a successful colony forming coral communities. In fact many studies show no like that, high coral recruitment rate when the attachment is not followed by an increase in live coral cover as an indication of recovery.

Group of Pari Island including one of all island in Kepulauan Seribu with the condition of coral reefs that tend to decline over time. Sukarno (2008) classifies coral reefs Pari Island group into zone III with the percentage of live coral cover of 40-60% at

a depth of 1-3 meters. Furthermore Suharsono (1994) reported that the condition of coral reefs in Pari Island continued to decline wick they were 30-50% live coral cover on reef slopes and 5-20% on reef flats. The results of TERANGI study (2007) also shown that condition continued to decline wick they have been live cover only 29.13% to 38.13% in the southern island of Pari and 30.85% to 54.15% in the northeastern part. On the observation that recovery is signed by the emergence of new coral colonies (recruitment) results are quite high. The results of Rudi Study (2006) shows that the density of settlement of coral colonies on artificial substrates in Pari Island to reach 5-9 colonies /0.4 m² or about 12-22 colonies/m² with very high recruitment category (Engelhardt, 2000).

The research on the survival and growth after the attachment of coral recruitment was conducted in Pari Island on two different sites. In this study, observations were made of bio-ecological aspects of coral recruitment and its relation to biotic factors and abiotas (oceanographically chemical physics) in order to get the causes of success and failure of natural recruitment. The base data are expected to answer the following questions: Is the ability to survive of coral larvae after the attachment is depended on by internal conditions such as colony shape, size or more influenced by external factors such as abiotis factors by environmental conditions or interactions with biotic factors such as predators, competitors or disease infections. Based on the above formulation of the problem, this study aims to determine the ability of recruits live and graduation rates based on the shape and size of coral colonies and determine the impact of environmental and biological interactions to it.

METHODS

Periode and study site

Research carried out for nine months from March to November 2010. Allocation periode for nine months indicated that the representation of the season at Pari Island, they are the end of West Moonson (March), the transition from West Moonson to East

(June-September), and transition of East Moonson to West Moonson, (October - November), where each of season show oceanographically and the weather that typically. Monitoring of coral recruitment made at intervals of time every one month start on March to August (T0-T5) and the time interval of three months September to November (T5-T6). Research sites is reef of Pari Island, Thousand Islands, Jakarta. Observations in the field is spatially divided into two sites based on characteristics of the marine environment, and the condition of coral. Besides, the form of utilization and conservation status of territorial waters is also a consideration. Based on these criteria established two study site namely Pari-South (ST1-Pari) in position 05° 52' 212" latitude and 106° 36' 754" longitude and Tikus-North (ST2-Tikus) at position 05°51' "168" latitude and 106°34'795" longitude

Sampling methods

At study site were taken measurements survival and growthrate of coral recruitment at two massive and branching colonies, and also at three different size classes. they were small (<3 cm), medium (3-6 cm) and large (> 6 cm ≤ 10 cm) respectively they were number 5 colonies and marking by

plastic tag. Recruitment of corals in the area selected on permanent belt transect 2 meters x 70 meters in size. First monitoring record (T0) was included the number of colonies, colony size and type of bottom substrate, and continued monitoring record in the second month as T1 covered the number of dead live colonies and size colony that still living (Obura and Grimsditch, 2009), and so on as T2, T3, T4, until T6. Identification was conducted directly in the field supported underwater photographs and sample collections for further identification and was done until genus level by reference to Veron (2000), and Suharsono (2008). At the same time water quality measurements were taken, covered salinity by refractometer, the acidity by pH universal, the surface current by conventional method, the surface temperature by thermometer, visibility by secchi disc, the levels of nutrients by DR/980 Colorimeter unit, and sedimentation by sediment traps. Data supporting a population of coral recruitment was conducted at both stations in the one depth 5-7 meters. Sampling method of observation was a method of benthic quadrat 1 x 1 meter with 6 replications and placement randomly along the permanent transect same depth using the method of Line Intercept Transect (LIT), whereas

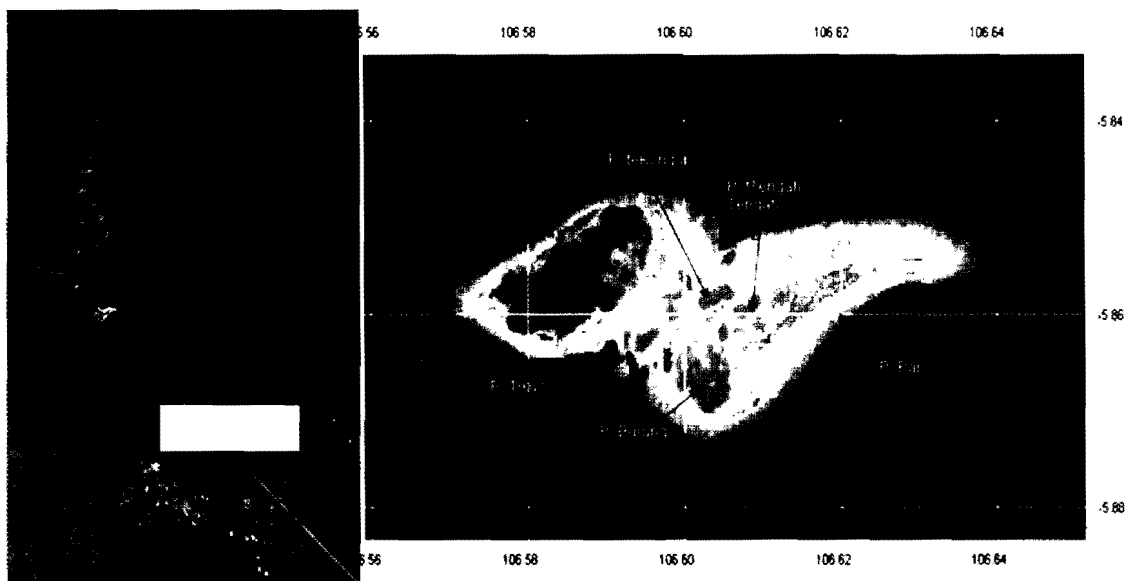


Fig. 1. Map of research location and sites, ST 1 Pari and ST 2- Tikus, Pari Island Kepulauan Seribu Jakarta

The results of regression analysis showed that the stations ST1-Pari there was a significant connection between the survival of coral recruits due to periods to large and massive in size medium ($P < 0,05$, where the large $r^2 = 0.8$ and r^2 medium = $0,78$). While in the branching occurs in medium and small size ($P < 0,05$, showed that only the survive of the medium size from both massive and branching colonies that impact to the change of periods, they were decreased ($P < 0.05$, where the $r^2 = 0.77$ massive-medium and $r^2 = 0,84$ branching-medium). This condition indicated that the size of a medium was a vulnerable stage in the survival of coral recruits both massive and branching colonies. In a medium size is predicted to begin a change of orientation and dimensions of growth and energy needs for space in its development (Ritson-William *et al.* 2010).

Growth rate of coral recruitment

The results of measurements of the rate of growth in the ST1-rays show the differences between the shape of the colony and also inter-size class. In Fig. 4 can be seen that the growth rate of

branching for each measure is higher than massive corals except for size medium. The highest rate of growth shown by the massive form of 4.4 mm / month in the small size, while in the form of branching reaches 9.2 mm / month in large size. Lowest growth rate was 2 mm / month in the form of branching, slightly higher than the massive form of 3.8 mm / month. The trend shows massive growth in the form of higher in small size and decreased successively in medium and large sizes. Unlike the branching growth form showed a higher tendency in large measure followed by small and medium size is lowest.

The growth rate of coral recruits at ST2-Tikus Site was different inter-colony shape and inter-size classes. The Shape of branching coral recruits had a higher growth rate than the shape of massive and occurs in all size classes. Massive form of the highest growth rate achieved during the small size of 3.1 mm / month and branching occurs in the form of large size is 20.4 mm / month. Conversely the lowest growth in massive colonies of large size is achieved at 2.4 mm / month while in branching colonies occurred on the small size of 9 mm / month (Fig. 4). In large measure

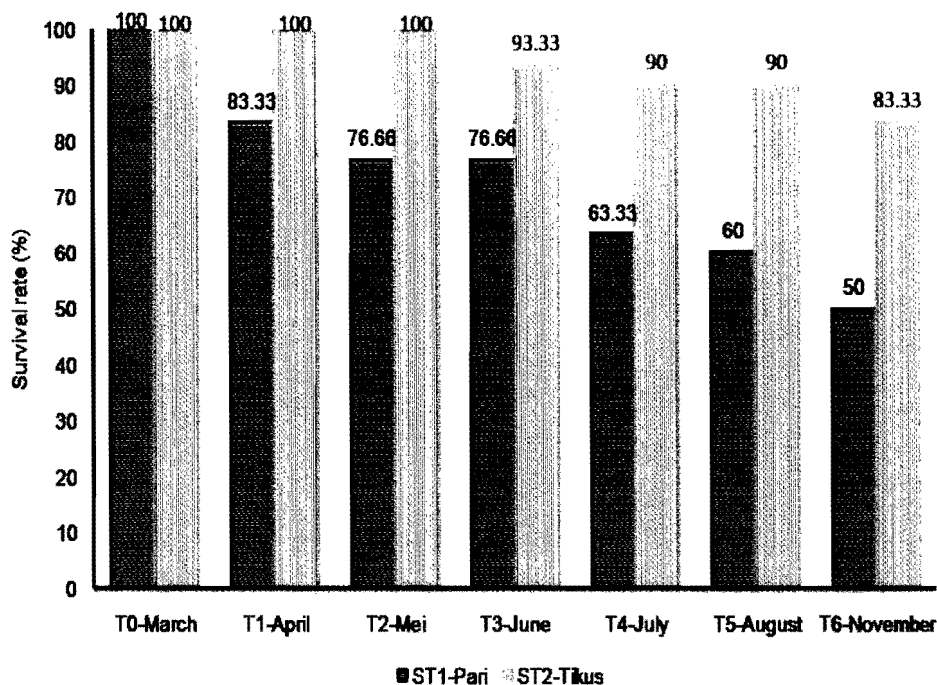


Fig. 3. The survival rate of coral recruits in both ST1-Pari Site and ST2-Tikus for nine months periods at Pari Island, Kepulauan Seribu, Jakarta

2. Small and large class sizes have higher survive than the medium size.
3. The rate of sedimentation and nutrient levels affect aquatic life passing coral recruitment, whereas the biological interactions of predation, competition and disease had no impact.
4. Change of time (season) gives a marked influence on the survival of coral recruitment medium size at both massive and branching colony.

From the research results can be put forward suggestions as follows:

1. Conduct advanced research to a wider scale (spatial and temporal)
2. Compare the size of the colony in an effort to transplant corals and restocking
3. Make a coral recruitment data after settlement to assess the pace of recovery and resilience of coral reefs after damage

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