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Distribution Ovum in Various Parts of Branch Bamboo Coral *Isis hippuris* in Bone Tambung Island, Spermonde Islands, Makassar

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Abstract

Bamboo coral is a soft coral that has limited energy resources should be divided among the various biological functions; include sexual and asexual reproduction, growth, maintenance and repair of cells. Interactions between growth and reproduction is an important part functionally as they compete in the use of energy left after the fulfillment of basic needs for maintenance and repair of cells. This study aims to determine the existence of ovum according to level of development, the number of ovum per piece of polyps and polyps reproductive proportions in various parts branches of the Bamboo coral *Isis hippuris* and prove the hypothesis that there is an interaction between the growth and reproduction of the resources availiable. This research was done on coral reefs Bone Tambung Island impertinent, Spermonde Islands, Makassar. At this location distribution of colonies obtained considerable bamboo coral as for preparation and histology analysis performed in the laboratory of the Veterinary of Maros South Sulawesi.A total of 10 colonies were sampled randomly in groups of colonies were found on the island. Coral branches broken with a hammer or chisel. Samples were taken at 5-month immersion and sampling is done every month.

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Colonies of bamboo coral sampled diameter> 15 cm and predictable classified as reproductive size. The number of ovum showed significant differences in levels of development among branches of the bamboo coral *Isis hippuris*. The end of a branch of coral polyps have proportions that contains more ovum with the average number of ovum per piece polyps higher, amounting to 5.13 grains and significantly different from the middle and the base of the branches, each of which has a number of ovum per piece polyp only by 4.07 piece and 1.4 piece.

Keyword: distribution; ovum; Isis hippuris; spermonde; Makassar.

1. Introduction

Bamboo coral is a soft coral that has limited energy resources should be divided among the various biological functions; include sexual and asexual reproduction, growth, maintenance and repair of cells. Interactions between growth and reproduction is an important part functionally as they compete in the use of energy left after the fulfillment of basic needs for maintenance and repair of cells [1].

The rate of growth in the majority of coral species decreased with increasing size. This is due to the commencement of sexual reproduction and fecundity increase along with the growth of coral [2]. Suspect that gametogenesis and budding process coral may interact and compete against the resources available for the growth of their interstitial cells [3], as seen in Hydra [4].

Some research of growth (*calcification*) coral shows framework density variations by month or season, and suspected that variation associated with the reproductive cycle [5,6]. Reduction in growth or reduction in calcification allegedly took place when energy is allocated for reproductive activity [6]. Likewise, the growth is localized at a specific part of a coral colony is also responsible for the low fecundity.

Bamboo coral *Isis hippuris* is genus coral that generally have a form branching colonies and one of the main components of coral building. Some research indicates that the growth of branching corals proceed faster at the end of the branch without zooxantela compared with the basal portion [7,8,9,10]. If there is competition in the allocation of resources between growth and reproduction in different parts of the branches, it is expected that there is a difference between the number of ovum in the branch sections and at the ends of branches that grow faster alleged to have less number of ovum.

his study aims to determine the existence of ovum according to level of development, the number of ovum per piece of polyps and polyps reproductive proportions in various parts branches of the Bamboo coral *Isis hippuris* and prove the hypothesis that there is an interaction between the growth and reproduction of the resources available.

2. Materials and Methods

a. *Time and Place*

This research was done on coral reefs Bone Tambung Island impertinent, Spermonde Islands, Makassar. At this location distribution of colonies obtained considerable bamboo coral as for preparation and histology analysis performed in the laboratory of the Veterinary of Maros South Sulawesi.

b.*Research Procedure*

A total of 10 colonies were sampled randomly in groups of colonies were found on the island. Coral branches broken with a hammer or chisel. Samples were taken at 5-month immersion and sampling is done every month. Colonies of bamboo coral sampled diameter> 15 cm and predictable classified as reproductive size.

In this study, the presence of ovum in various parts of the branch only monitored at bamboo coral species *Isis hippuris*, each piece of ± 5 cm. ,

On 9 colonies were selected, then be selected branch length of ± 20 cm and is divided into three pieces, namely the ends of the branches (*apical*), the middle, and the base branch (*basal*) with the length of each piece are ± 5 cm , In the apical portion of the branch, the branch pieces 5 cm long were taken by measuring from the tip of the branch towards the middle branch, on the other hand at the branch basal pieces 5 cm long were taken by measuring from the base of the branch towards the middle of the branch. For the central part of the branch, the branch pieces 5 cm long were taken between the end and basal.

Branch pieces being sampled and then preserved in formalin fixative solution (5% dilution with sea water) for at least one week, then decalcified with 10% solution of HCl 12 N (dissolved in distilled water) for 4-6 hours or more [11,12,13].

Polyps that have decalcified then stored in special containers (*tissue cassette*) and washed in running tap water for 24 hours to remove HCl on tissue surfaces. Polyps are then stored in a solution of 70% alcohol for a while [13,14] prior to preparation for histology.

Preparation of histological preparations follow a standard network engineering processes [11,12,13,15,16]. First performed dehydration process by using a series of graded alcohol (70-100%), are incorporated into the solution xilol (clearing) and then infiltrated with liquid paraffin. The polyps are then planted in paraffin blocks (embedding) and oriented for cutting longitudinally (vertical pieces). Polyp tissue was cut with a microtome 4-6 μm thick, and in the paint with Harris hematoxylin-eosin dye.

The middle section of the piece polyps taken 2-3 incisions per slide for observation of gonadal development and distribution of oocytes under a microscope with a magnification of 100x and 200x. Polyps were assessed only for incisions containing mesenteri network of more than 50% [12]. To obtain statistically valid comparison of the histological observation of the five polyps for each piece of branch [11]. Preparations histology of polyps in the section analyzed to determine the most branches reproductive parts.

Determining the stage of ovum development is based on the cell size and shape of the morphology and the character color displayed by the results of Harris hematoxylin-eosin staining. Ovum development is divided into four phases (Phase I-IV) criteria by Glynn and his colleagues [11,12].

c. *Data Analysis*

The number of ovum according to the development stage are recorded and categorized according to section coral branches (apical, middle and basal). Differences in the distribution of the number of ovum in development levels and the proportion of reproductive polyps (polyps 45) on each branch sections were analyzed with Chi-square test. While the difference in the average number of ovum per piece polyps in every part of the branch were analyzed with the Kruskal-Wallis test [17]. The calculations carried out with the aid of computer software Statistix 1.0.

3. Result

Isis hippuris bamboo coral is one component of reef building because it is part of a soft coral that live in the waters of Bone Tambung Island. This species has a size range of 5 cm to 1 m. trailer sections branches along ± 5 cm on the three parts of the branch, namely the tip (apical), the middle and the base branch (basal). Of 45 polyps were examined at each branch section showed significant differences (p <0.001) the distribution of the number of ovum according to the stage of development. At the center of the branch obtained all the maturity level of the ovum with a higher number of ovum compared with basal and apical part of branches (Figure 1).

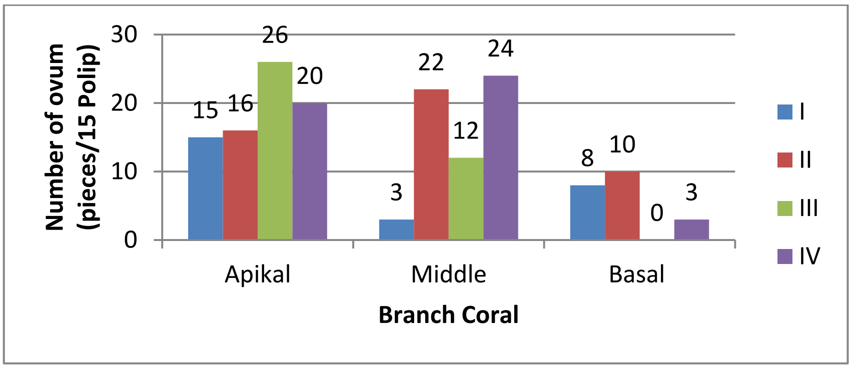

Figure 1: Distribution of the number of ovum in its development stage (I- IV) in various parts of the bamboo coral branches *Isis hippuris*.

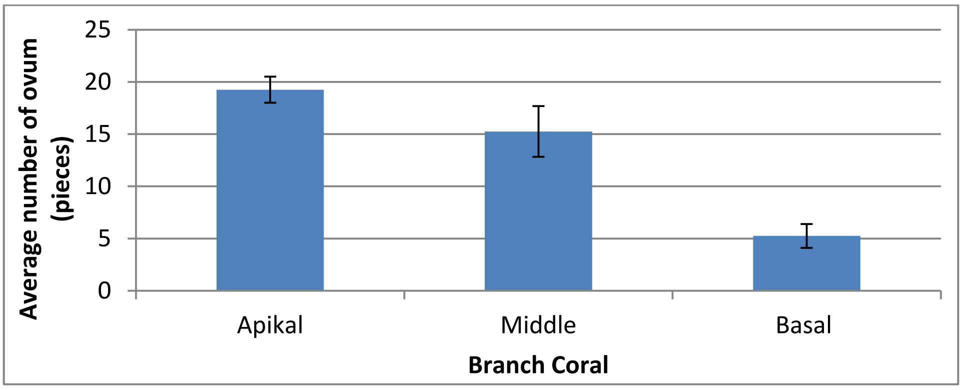

Figure 2: The mean number of ovum and the proportion of reproductive polyps in various parts of the branch *Isis hippuris* ** : significantly different ($\chi 2$: 18.411 ; $p < 0.00$) .

Different letters above the graph showed significant differences ($p < 0.0001$) based on the Kruskal - Wallis test

Similarly, the average number of ovum per piece polyps and polyps proportion of cells containing ovum between the branches showed significant differences (Figure 3) . The mean number of ovum at the end of the branch amounted to 5.13 ± 0.15 grains / polyps higher and significantly different (Kruskal - Wallis Value : 73.08 ; $P < 0.0001$) with the central part (4.07 ± 0.11 grains / polyps) and the base (1.4 ± 0.04 grains / polyps).

4. Discussion

Data on the number of ovum and development levels confirms that the ends and middle of the reproductive branching more in comparison with the base of that and more late the level of maturity (Figure 1) . The same is indicated also on the data the average number of ovum per piece polyps and polyps proportion containing ovum (Figure 2).

The decline in reproductive activity, as a result of the limited energy resources and energy allocation among the various biological functions of the reef makes the difference between fecundity and growth in the colony or colonies section included in the coral branches.

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Bamboo coral *Isis hippuris* morphology showed tiller buds or branches around the end of the branch, as well as on the basal part of the branch. But in general the germination is more common at the end. In addition to their sprouting around the end of branches, some studies show that calcification or growth on the ends of the branches is faster than the basal part [7,8,9,10]. Rapid growth at the ends of branches due to active translocation of organic molecules of photosynthesis polyps bottom branches to the ends of the branches. Consumption of the organic metabolites at the end of the branch is also rapid, proven by high content of ATP as an energy source in calcification [18]. The pattern of faster growth at the end of the branch confirms that the growth center of branching corals are in the apical portion , thus polyps in that section is a young polyps. On the other hand polyps in the basal part of the relatively older than the middle or apical branches. Polyps are still young (immature), the rapid growth and budding at the apical and older polyps and their germination in the basal part may explain the low number of ovum contained by a polyp on the section (Figure 2). Polyps located around the central area of growth (linear growth or growth from the division polyps) will have a low fecundity [1].

From the research results show that there are certain biological division of functions among the branches, namely at the end of the branch more resources are allocated to the vertical growth and budding, as well as on the basal branching more devoted to the formation of buds. While in the end and the middle branch more resources devoted to the activity of sexual reproduction.

From the results of this study also support the hypothesis of "the interaction between the growth and reproduction of the resources available" because their functions are functionally compete in utilizing existing resources [1]. Allocation of resources for growth around the end of the branch (apical portion) and the formation of buds around the base of the branch (the base) will be sacrificed or decrease the activity of reproduction.

In a one study who wanted to give an idea of the potential or aspects of coral reproduction, must take a sample from a part of the reproductive colony of polyps or avoid sterile samples (less reproductively) to avoid bias the data. Therefore, information about the distribution of ovum (gonads) in different parts of the coral colonies are very useful in designing a study on coral sexual reproduction. In this case, for the type of branching corals sample snippet from the end and the middle branch is highly recommended.

5. Conclusion

The number of ovum showed significant differences in levels of development among branches of the bamboo coral *Isis hippuris*. The end of a branch of coral polyps have proportions that contains more ovum with the average number of ovum per piece polyps higher, amounting to 5.13 grains and significantly different from the middle and the base of the branches, each of which has a number of ovum per piece polyp only by 4.07 piece and 1.4 piece.

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