Different Forms of Coral Fungia Paumotensis, in Each Different Location on The Island of Mamburit, Sumenep District

Sawiya[1*], Abdul Muqsith[1]

[1]*Ibrahimy University*
*Email: Sasa.syahid@yahoo.com

Abstract
Coral morphological characters are mainly caused by environmental factors. The method used is random sampling with one sample, two repetitions at each station. The stations selected were Leeward I, Leeward II, Windward I, and Windward II. Based on the results obtained in the waters of Mamburit, Fungia paumotensis, General physical characteristics included a hilly colony surface, pointed teeth and small grains and curved corals. Morphological characters show differences from discrete and morphometric characters in each sample where these differences are influenced by the environment

Keywords: *Mamburit Island, fish house, Coral reefs*

Introduction

Coral reefs are nursery ground for marine biota, providing shelter, food, and various mutually supportive bioecological interactions for the availability of diverse and abundant fisheries resources in the Indo-Pacific. There are functions of live coral reefs attached to the sub extract, some are free colonies, with varying shapes ranging from oval, and some are elongated (Supriyarsono 2000). Various types of coral reefs that grow and dominate are influenced by environmental and habitat factors (English et al, 1994). Different types of coral reefs will determine the function of marine biota (Sancia at al. 2015). Especially coral fungi which have an important role for habitat (Stella et al. 2010). Fungia also recruit other corals for related invertebrate habitats (Chadwik et al. 1992). This study will mainly focus on morphological characters. Using morphology, especially the coral Fungia paumotensis, because the diversity of coral reefs in Mamburit waters has not been identified morphologically (Miguel et al. 2016) and also based on the morphology of the coral skeleton (Wolstenholme et al, 2003)

Materials and Method

Materials

The materials and tools used in this study are: Coral fungiidee, alcohol, ethanol, Sodium hypoclorite, Roller meter, thermometer, refractometer, stationery, sechi disk, guess ball, snorkel, mask, fins, boat, under camera water, GPS, a set of scuba devices, tubes, dropper drops, hammers, calipers

Method

In this study, using the belt transect method (BELT TRANSECT). It used to describe the population of a type of coral that has a relative size of various methods. This method can be used to determine the existence of ornamental corals, (number of colonies, largest diameter, type) in a coral reef ecosystem. The length of the transect used is 10 m and the width of one meter, then the recording is carried out on all individuals who are the research objectives that exist in the area of the transect. The coral samples were analyzed for morphological characters, given sodium hypoclorite so that the coral samples were white, and then rinsed with fresh water and dried. The coral samples analyzed for morphological characters consisted of interrelated descriptive and morphometryc characters (Oppen et al. 2000, Wolstenholme et al. 2003, Stefani et al. 2008, Filatov et al. 2013, Kitano et al. 2014). Morphometryc characters will then be measured using a caliper (0.01 mm) (STEFANI et al. 2008) with a test consisting of 12 characters (Budd and Stolarchy 2009, Caselbolt 20011, Arrigoni ET AL. 2012, Benzoni et al.2012 Budd et al.2012, Arrigoni et al. 2014). Descriptive coral characters were carried out by a test consisting of 5 characters (Budd and Stolarski 2009, Casebolt 2011, Arrigoni et al. 2012, Benzoni et al. 2012, Budd et al. 2012, Arrigoni et al.

2014a, Arrigoni et al. 2014b) . Each character is coded using numeric numbers (0 or 1) to be analyzed by PAUD 4.0 software analysts

Data Analysis

Morphological character data were analyzed by Correspondent Analysis of Principal Coordinates (CAP), (Wolstenholme et al. 2003, Stefani et al. 2008). Descriptive and morphometryc character data from the welding results, then analyzed using the Unweighted Pair Group Method with Arithmetic Mean (UPGMA) using PAST software (Swofford 2002, Arrigoni et al. 2012, Benzoni et al. 2012, Arrigoni et al. 2014b) for produce cladograms based on descriptive and morphometryc characters.

Result and Discussion

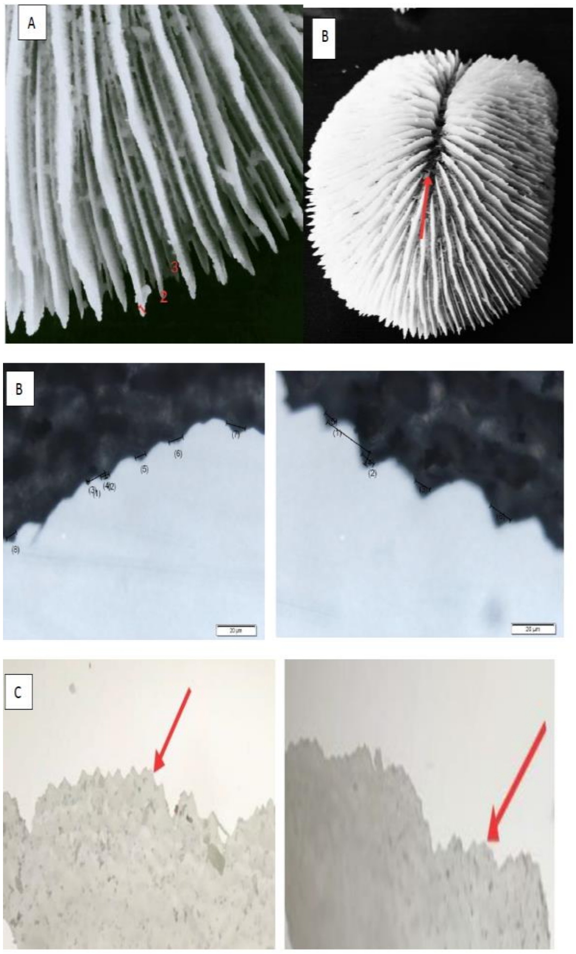
a.) Morphological character of Fungia

Fungia paumotensis has the shape of a coral shape of the mouth is rounded and elongated oval, shape varies curved, flat, septa rather loose and straight dense and prominent (Stutchbury, 1833). *Fungia paumotensis* has a slightly hilly colony surface, the shape of teeth that belong to small granules and the shape of a curved coral with medium columns, the size of a thick and very heavy coral. The genera of fungia can be distinguished by the morphological character of the corrallum, circular or elongated shape of the oval and shape of the teeth (Bert W.1989). The mouth shape extends to the edge having a straight septa, the shape of the coral is slightly curved, this is in accordance with the statement (Veron 2000). The length of corallite *Fungia paumotensis* at each site varies, ranging from 3 cm - 11 cm. Coralite width between 6 cm to 10 cm. The depth of corallite in almost all sites is not more than 1 cm and coralite wall thickness is also the same, not more than 1 cm. The shortest septa length, there are differences in Leeward and Windward, as well as the longest septa length. The range of septa ranges from more than 150 to less than 300. The range between the teeth of the septa is almost uniform, which is less than 1 mm and indirectly the range between the teeth is also not much different, which is less than 1 mm.
Columella ranges from less than 1 cm to more than 2 cm. Morphometryc characters can be seen below.

Table 2. Morphometryc characters of *Fungia paumontensis*

Lokasi	P_K	L_K	K_K	K_D_K	P_S_T	P_S_P	J_S	J_A_G_S	J_A_G	K_L	J_A_S
Satuan	cm	cm	cm	cm	cm	cm	buah	mm	mm	cm	mm
Leeward I	11.2	10.3	0.3	0.4	2.45	0.7	286	0.1	0.2	2.45	0.2
Leeward II	3.4	9.4	0.6	0.55	2.25	3	234	0.1	0.3	1.5	0.15
Windward I	7.3	6.5	0.85	0.4	0.5	3.6	176	0.15	0.5	0.75	0.15
Windward II	9.5	9.1	0.75	0.5	0.6	5.2	238	0.1	0.5	1.05	0.2

Table 2. The length of corallite (P_K), width of corallite (L_K), depth of corallite (K_K), thickness of corallite wall (K_D_K), length of shortest septa (P_S_T), longest septa length (P_S_P), number of septa (J_S), range between corallite walls (K_D_K) teeth (J_A_G_S), Range between teeth (J_A_G), Kolumella (K_L), Range between teeth



(J_A_S)

Figure 2. Morphological form of coral *Fungia paumotensis* in the form of septa and number. b). Columella. c). tooth shape using a 100x magnification BX5 microscope. d). tooth shape using a 40X magnification SZX stereo microscope

Attachment 1

Tabel 2. The result of relationship environmental parameters with morphometry of *Fungia paumotensi*

Variables	Temp	Salinity	pH	DO	Current Speed	Brightness
Coralitte length	0.553	0.301	-0.559	-0.378	-0.007	-0.402
Coralitte width	0.442	-0.080	-0.179	**-0.675***	**0.737****	-0.121
Coralitte depth	0.051	-0.182	0.463	-0.323	0.408	0.378
Coralitte wall thickness	0.455	-0.099	-0.302	-0.553	**	-0.230
Shortest septa lenght	0.333	-0.057	-0.433	-0.529	**0.797**	-0.353
Longest septa lenght	-0.600	-0.391	0.223	0.241	-0.562	0.099
Number of septa	-0.260	-0.332	-0.096	-0.444	0.207	-0.140
Range of septa teeth	0.357	-0.061	-0.463	-0.526	**0.778****	-0.378
columella	-0.435	-0.446	0.119	-0.210	-0.185	0.028
Range of septa	0.389	-0.277	-0.201	-0.154	0.034	0.000

Ket: * Significant at the 10% level; ** Significant at the 5% level

r table 10% = 0.621, r table 5% = 0.707

b.) Environmental Parameters

There are several environmental parameters that support the survival of coral reefs (K.A. Furby et al. 2014) this shows that the more light intensity, the faster the growth of coral reefs (Fachrurrozie, et. Al., 2012). Light that penetrates the waters is needed by zooxanthellae corals that live in the body tissues of coral reefs (Antoine et al. 2015), because several environmental parameters that support the life of coral reefs (K.A. Furby et al. 2014) this shows that the more light the better. rapid growth of coral reefs (Fachrurrozie, et. Al., 2012). Light penetrating the waters is needed by zooxanthellae corals that live in the body tissues of coral reefs (Antoine et al. 2015), because it is related to depth which will affect the growth of coral reefs (Rembet et al., 2013). This will support the growth of coral reefs because of the photosynthesis process from sunlight on corals that penetrates the bottom. Environmental parameters that affect coral growth include sunlight, air brightness, current velocity, salinity, substrate (Richmond 1987 and Grigg, et al. 1992).

Coral growth can be interpreted as the length, weight, area, and volume of the limestone structure of hard coral species within a certain period of time that cannot be changed, in other words, there is no difference. growth is highly dependent on environmental factors such as current speed, temperature, and light (Supriharyono, 2000). Based on this, there is a relationship between environmental parameters and coral morphometric characters. The following table presents the correlation between each fungal species and environmental parameters

Based on 1 Fungia klunzingeri, Fungia paumotensis, Fungia consinna, positive correlation was obtained with the parameters of the shortest septa length and the distance between the septal teeth. None of the environmental parameters had a significant correlation of 5 percent or 10 percent alpha levels. Then a negative correlation was obtained with the parameters of coral length, coral width, coral depth, coral wall thickness, longest septa length, number of septa, columella, and distance between septa to depth which will affect coral reef growth (Rembet et. al., 2013). This will accelerate the growth of coral reefs because of the photosynthesis process from sunlight on coral reefs that penetrates the bottom. Environmental parameters that affect coral growth include sunlight, water brightness, current speed, salinity, substrate (Richmond 1987 and Grigg, et al. 1992).

Coral growth can be defined as the length, weight, area, and volume of the hard coral limestone structure within a certain period of time which is irreversible in other words it does not experience shrinkage. Growth is highly dependent on environmental factors such as current speed, temperature, and light (Supriharyono, 2000). Based on this, there is a relationship between environmental parameters and coral morphometric characters. The following table presents the correlation between each fungal species and environmental parameters

Based on the data obtained by Fungia paumotensis, a positive correlation was obtained with the parameters of the shortest septa length and the distance between the septal teeth. None of the environmental parameters had a significant correlation of 5 percent or 10 percent alpha levels. Then obtained a negative correlation with parameters of coral length, coral width, coral depth, coral wall thickness, longest septa length, number of septa, columella, and distance between septa.

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Conclusion

From the results of welding morphological characters there are differences at each location obtained, this is caused by several environmental factors including temperature, salinity, pH, current velocity, depth, DO. Fungia paumotensis small hilly colony surface, small granular tooth septa form, curved coral shape, and medium sized columns. While the morphometric and descriptive characters of corals starting from the number of septa, tooth shape, column, coral shape, surface, septa length, distance between teeth, septa thickness, influenced by environmental factors, and morphological characters are not suitable. Morphological characters show differences ranging from descriptive characters and morphometric characters that have different sizes in each sample species, differences in morphological characters are influenced by environmental factors.

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References

Antoine Gilbert, Tom Heintz, Bert W. Hoeksema, Francesca Benzoni, Jean Michel Fernandez. 2015. Endangered New Caledonia Endemic mushroom coral Cantharellus noumeae in turbit, metal- rich, natural and artificial environments. Marine Pollutan Bulletin 100(2015) 359-369

Arrigoni R, Richards ZT, Chen CA, Budd AH, Benzoni F, 2014 A. Taxonomy and phylogenetic relationship of the coral genera Australomussa and Parascolymia (Scleractiia, Lobophyllidae). Contribution to Zoology. 83 (3): 195-215

Budd AF, Romano SL, Smith ND, Barbeitos MS. 2010. Rethinking the Phylogeny of Scleractinian Corals: A Review of Morphological and Molecular Data. *Integrative and Comparative Biology.* 50(3)**:** 411-427

Chadwick, N. E, dan Loya. L. 1992. Migration, habitat use, and competition among mobile corals (Scleractinia: Fungiidae) in the Gulf of Eliat, Red Sea. *Marine Biology* 114, 617-623.

Chin Soon Lionel Ng, Tai Chong Toh, Loke Ming Chou. 2016. Coral restoration in Singapore's sediment-challenged sea. Regional Studies in Marine Science 8 (2016) 422-429

E Sancia, T. Van der Meiji, Charles H. J. M. Fransen, R Leon.Pasman.W Bert.Hoeksema. 2015. Phylogenetic ecology of gall crabs (Cryptochiridae) asassociates of mushroom corals (fungiidae). ecology and evolution. 2015, 5(24);5770-5780

Effendi, H. 2003.*Telaah Kualitas Air Bagi Pengelolaan Sumber Daya danLingkungan Perairan.*Kanisius.Yogyakarta.

Eliza. 1992. Dampak Pariwisata Terhadap Pertumbuhan Terumbu Karang Lingkungan dan Pembangunamhal.158-170.

English, S., C., Wilkinson, and V. Baker 1994.Survey manual for tropical marine resources.

Fachrurrozie.*et al*, 2012. Pengaruh Perbedaan Intensitas Cahaya Terhadap Kelimpahan Zooxanthella Pada Karang Bercabang (Marga: *Acropora*) Di Perairan Pulau Pari, Kepulauan

Seribu. Jurnal akuatik Vol. III No.2/ September 2012 (115-124).

Fachrurrozie.*et al*, 2012. Pengaruh Perbedaan Intensitas Cahaya Terhadap Kelimpahan Zooxanthella Pada Karang Bercabang (Marga: *Acropora*) Di Perairan Pulau Pari, Kepulauan Seribu. Jurnal akuatik Vol. III No.2/ September 2012 (115-124).

Filatov MV, Frade PR, Bak RPM, A. Vvermeij MJ, Kaandorp JA. 2013. Comparison between colony morphology and molecular phylogeny in the Carribean Sleractinian Coral Genus Madracis. PloS ONE. 8(8): e71287.10.371 journal.pone.0071287

Flot J-F, Megalon H, Cruad C, Coulox A, Tiller S. 2008. Patterns of genetic structure among Hawaiian corals of the genus Pocillopora yield clusters of individuals that are compotible with morphology. Comptes rendus biologies.331239-247.10. 1016/j.crvi.2007.12.003.

Francesca Benzoni, Roberto Arrigoni, Febrizio Stefani, Bastian T. Reijien, Simone Montano, 2012. Phylogenetic position and taxonomy of Cyloseris explanulata and C/ wellsi (Scleractinia: Lost mushroom coral find their way home. Contribution to zoology, 81 (3) 125-146 (2012)

H Danwei, R Meier, Peter A. Todd, L, Ming Chou, 2008. More evidence for pervasive paraphyly in scleractinian corals: Systematic study of Southeast Asian Faviidae (Cnidaria; Scleractinia) based on molecularand morphological data. Molecular phylogenetic and evolution, 50 (2009) 102-116

K. A. Furby. A. Apprill. J. M. Carvino, J. E. Ossolinski. K. A. Hughen. 2014. Incidence of lesion on Fungiidae corals in the eastern Red Sea Is Related To Water Temperature And Coastal Pollutan. Marine Enviromental Research 98 (2014) 29-38

Kitano YF, Benzoni F, Arrigoni R, Shirayama Y, Wallace CC, Fukami H. 2014. A phylogeny of the family poritidae (Cnidaria, Scleractinia) based on molecular and morphological analyses. PloS ONE. 9(s):e98406.10.1371/journal.pone. 0098406.

Menteri Negara KLH, 2004. Keputusan Menteri Negara Lingkungan Hidup No.51 Tahun 2004 Tentang Baku Mutu Air Laut Untuk Biota Laut.Jakarta, hal. 32.

Miguel Costa Leal, Christine Ferrier, Pages. 2016. Molecular tropic markers in marine food webs and their potential use for coral ecology

Rembet, *et. al*,. 2013. Distribusi dan Kelimpahan Ikan Karang Family Pomacentridae Di Perairan Terumbu Karang Desa Poopoh Kecamatan Tombariri Kabupaten Minahasa. Jurnal Ilmiah Platax, Vol. 1-2, Januari 2013

Stefani F, Benzoni F, Pichon M, Mitta G, Galli P. 2008. Genetic and morphometryc evidence for unresolved species boundaries in the coral genus *Psammocora* (Cnidaria; Scleractinia). *Hydrobiologia*.596153-172.10.1007/s10750-007-9092-3.

Supriharyono. 2000. Pengelolaan Ekosistem Terumbu Karang, Jakarta: Djambatan.

Wolstenholme JK, Wallace CC, Chen CA. 2003. Species boundaries within the *Acropora humilis* species group (Cnidaria; Scleractinia): a morphological and molecular interpretation of evolution. *Coral Reefs*.22(2)**:** 155-16