

Research Article

The Abundance of Fish Species in Branched (*branching*) and Table (*tabulate*) Coral Habitat on Tanjung Beach, Muna Island, Southeast Sulawesi

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ABSTRACT

This research aimed to study the types and abundance of fish which was found in branched and table coral habitat. The quadrat transect method was used at the location of the habitat of branched and table corals. The observation was carried out for 3 days. It was conducted 3 times/day, in the morning, the afternoon, and the evening with ± 10 minutes of observation time for each observation. The method used was transect quadrat 5 m x 5 m with direct observation techniques by means of snorkeling. The types and numbers of individual fish were recorded using the visual census method. Snorkeling was done straightforwardly and looking around by following the contour of the reef. In branching coral habitat, 11 species of fish were found with a total of 66 individuals. On the other hand, on the tabulate reef habitat, there were 9 species of fish with a total of 50 individuals. Both habitats have different types of fish. In the branched coral habitats there were more individual than in the table reef habitats. Fish species found in branched coral habitat and table type fish habitat were different. In branched coral habitats were found more reef fish species than in table coral habitats. These results illustrated that the condition of the coral reefs at Tanjung Beach is still in good condition.

Keywords: abundance, branched coral, reef fish, table coral, transect square

INTRODUCTION

The coral reef ecosystem is one of the marine ecosystems in habited by various type of marine life. The coral reef ecosystems are part of the marine ecosystem which is the place of life for various types of biota ([Burke et al. 2012](#)). Biota that lives on coral reefs is a community that consists of various tropical levels, where each component in this community is interdependent with each other and forming a complex ecosystem. One type of biota that lives on coral reefs is reef fish, with a high level of species diversity ([Odum 1996](#)). Coral reefs have ecological functions as a spawning ground, nursery

ground, and feeding for reef fish. Therefore the damage of coral reefs will affect the diversity and abundance of reef fish.

Corals have a variety of different growth forms. Various types of coral growth are affected by the intensity of sunlight, current waves, and sediment. The form of stony coral growth is divided into Acropora and non-Acropora corals. This type of branching coral is a type of *Acropora* coral ([English et al. 1994](#)). Branched coral is a type of coral with longer branches like tree branches. One type of branching coral is *Acropora abrollbosensis*. Table coral is a branching coral with a horizontal and flat direction like a table. This coral is supported by a rod that is centered or resting on one side which forms a flat angle. One type of table coral is *Acropora latistella* ([Veron 2000](#)).

The current condition of coral reef ecosystems in various territorial waters in Indonesia is in quite a rapid degradation. Southeast Sulawesi until 2016 having serious damage to coral reefs, around 80% of coral reefs are in a severely damaged condition ([Department of Marine Affairs & Fisheries of Southeast Sulawesi Province 2016](#)). The condition of coral reefs in Indonesia was around 6.39% in the very good condition level, 23.40% good, 35.06% damaged, and 35.15% in very critical conditions ([Giyanto et al. 2017](#)).

Tanjung Beach is one of the coastal areas in the Tongkuno district of Muna Regency, Southeast Sulawesi which is bordered by Buton Strait and has quite high fisheries resources, where around 80% of the people in this area work as fishermen. We identified there were four types of corals in Tanjung Beach. There was growth type with ramified (branching), solid growth type (massive), leaf type (foliose), and table form (tabulate). Coral growth type on the coast of Tanjung is dominated by branching form and the shape of table corals that are still in good condition ([Department of Marine Affairs & Fisheries of Southeast Sulawesi Province 2016](#)).

This is related to the interest of various species of fish in certain coral habitats that provide a variety of needs such as, places to find food, shelter, breeding places, and others. The presence of fish species against certain coral habitats may also be related to fluctuations in environmental conditions. Several studies reveal that the factors that influence the presence of fish (community structure and abundance of fish) in a reef community include a high and low percentage of coral cover ([Bell & Galzin 1984](#)). Besides the physical condition of the waters such as currents, brightness, and temperature were greatly affect the existence of reef fish ([Nybakken & Bertness 2005](#)).

The purpose of this study was to determine the types and abundance of fish found in branched coral habitat and table coral habitat.

MATERIALS AND METHODS

Materials

Animals

Fish species are found in branched coral habitats and reef fish species in tabulated reef habitats on Tanjung Beach, Muna Island Southeast Sulawesi.

Instruments

In this study, instruments used were boats or canoes as transportation during observation, GPS (Global Position System) to determine the coordinates of the research location, underwater writing instruments (water proof) to record observational data, underwater cameras to take documentation pictures, hand refractometer to measure sea water salinity, thermometer to measure sea water temperature, roller meter, and ping pong ball to measure current velocity, raffia rope to make square plots in coral reef communities, and coral fish identification book for identification.

Methods

This research was conducted from December 2017 to January 2018. The coordinate points of coral fish observation in branching coral habitats are $05^{\circ} 36'42.5$ LS and $122^{\circ} 42'59$ BT, observation of coral fish in table coral habitats, namely $05^{\circ} 36'42.5$ LS and $122^{\circ} 44'51$ BT (Figure 1).

Data collection for reef fish was carried out using the quadrat transect method $5\text{ m} \times 5\text{ m}$. Observation of reef fish using a visual census method by snorkeling on the surface of the water straight ahead and following the contour of the reef (poking left and right) (English et al. 1994). The visual census was carried out for 3 days, in which 3 observations/day, namely morning, afternoon, and evening, with a length of observation of ± 10 minutes for each observation. Fish found during the visual census were documented, their species observed and the number of each individual was counted.

The collected data analyzed quantitatively, which was measured against the parameters of the reef fish community, namely the abundance and Similarity Index (IS) (Muller-Dumbois & Ellenberg 1974).

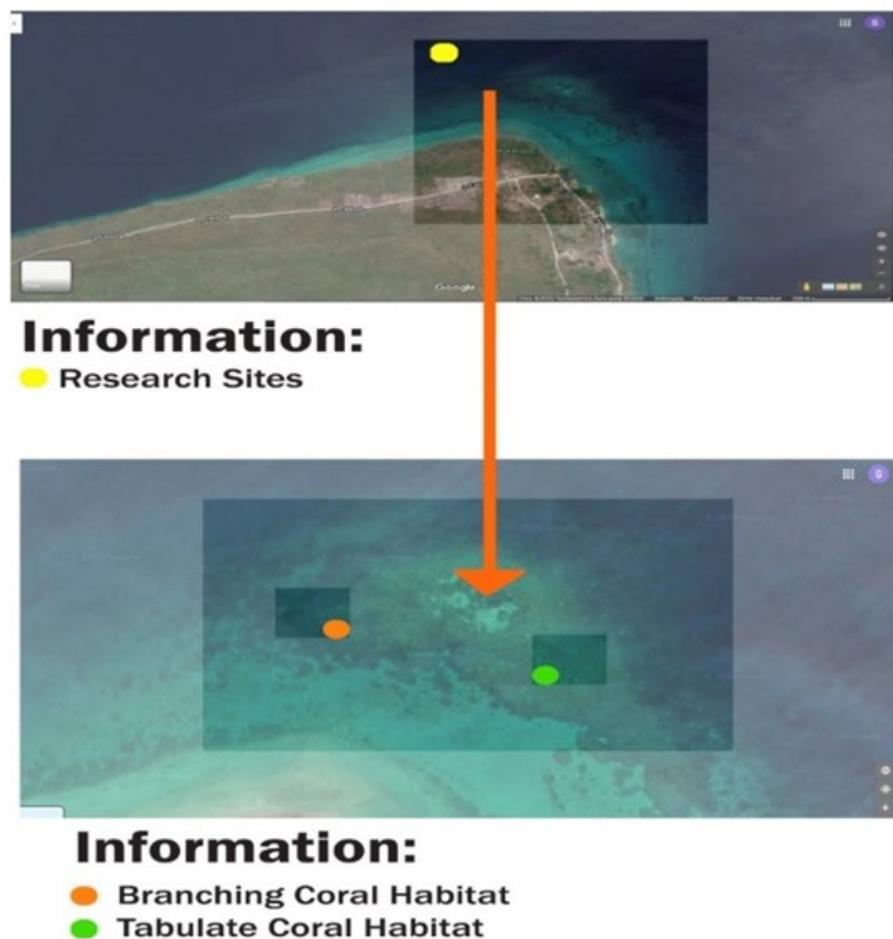


Figure 1. Research location for reef fish in Tanjung Beach, Muna Island, Southeast Sulawesi.

RESULTS AND DISCUSSION

The physical condition of the environment at Tanjung Beach

Physical environmental condition is one of the indicators that greatly affect the life and survival of various biota. Based on the results of the survey, the condition of the coral at Tanjung beach was dominated by 2 types of coral, namely the type of branching coral (branching) and the type of table coral

(tubulate). The existence of several types of reef fish in the community of table and branching corals is certainly influenced by water conditions or environmental parameters. Physical environment parameters for branching and tubulate coral types include water temperature, current velocity, and salinity. Environmental parameters measured in branching and tabulate coral habitats are presented in Table 1.

Table 1. The Measurement result of environmental parameters in the research location.

No.	Location	Parameters		
		Water Temperature (°C)	Salinity (%)	Current speed (m s ⁻¹)
1.	Branching Coral	31	31.88	0.20
2.	Tabulate Coral	30	31.00	0.21

The physical condition of the environment in branching coral habitat (branching) and table reef habitat (tabulate) relatively has similar measurements. The physical condition of these waters is still in the optimal range of marine life to survival, especially reef fish. The optimal temperature for the reef fish to grow is between 25-32 °C, this temperature range is generally found in tropical climates such as Indonesia (Whitten et al. 1984). The classified current speeds into several categories, very fast (>1 m/sec), fast (0.5-1 m/sec), moderate (0.25-0.5 m/sec), slow (0.1-0.2 m/sec) and very slow (<0.1 m/sec) (Laevastu & Hayes 1982). The currents can spread fish larvae as well as the food for reef fish such as plankton and currents scatter eggs and also larvae of various aquatic animals to reduce food competition with their mothers (Koesoebiono 1981).

Fish species found in branching and tabulate coral habitat

The highest presence and abundance were found in branching coral habitats compared to table coral habitats. 11 species of branching corals and 9 species of table corals were found. Fish species found in branching and tabulate coral habitat were presented in Table 2.

Table 2. Fish species found in branching and table reef habitat.

Family	Name of Species	Branching Coral	Tabulate Coral
Pomacentridae	<i>Amblyglyphidodon curacao</i>	12	8
	<i>Amblyglyphidodon aureus</i>	-	5
	<i>Dischistodus melanotus</i>	-	5
Siganidae	<i>Siganus vulpinus</i>	4	5
Pomacanthidae	<i>Chaetodontoplus mesoleucus</i>	5	-
Chaetodontidae	<i>Heniocbus varius</i>	4	-
	<i>Chaetodon triangulum</i>	-	3
Labridae	<i>Cheilinus fasciatus</i>	5	-
	<i>Halichoeres chloropterus</i>	-	11
	<i>Thalassoma lunare</i>	-	8
Scaridae	<i>Scarus bleekeri</i>	4	-
	<i>Scarus schlegeli</i>	-	3
	<i>Scarus Oviceps</i>	-	2

Table 2. Contd.

Family	Name of Species	Branching Coral	Tabulate Coral
Lutjanidae	<i>Lutjanus biguttatus</i>	5	-
	<i>Lutjanus monostigma</i>	3	-
Apogonidae	<i>Apogon chrysopomus</i>	12	-
	<i>Cheilodipterus artus</i>	8	-
Nemipteridae	<i>Scolopsis margaritifera</i>	4	-
Total of individual numbers		66	50

Based on Table 2, 18 species of reef fish were found and divided into 9 families. 11 species of branching corals and 9 species of table corals were found. There were 2 types of reef fish with the highest individual chopping on branching coral types, namely *Amblyglyphidodon curacao* 12 individual and *Apogon chrysopomus* 12 individual. On the other hand, there were 3 types of reef fish with the highest individual chopping on table coral, namely 11 individuals of *Halichoeres chloropterus*, 8 individuals of *Amblyglyphidodon curacao*, and 8 individuals of *Thalassoma lunare*.

The discovery of several species of fish with various individual numbers in the branched corals habitat can illustrate that there are a lot of micro habitats in branching corals. This allows these reef fish to use them together based on their needs such as spawning, foraging, and protection. Besides, the complex form of corals, branched, and the cavernous structure makes this type of coral attractive for fish to form their colony (Allen 1997; Thresher 1984).

Based on Table 2, there are 2 types of fish found in these 2 types of coral. These two species of fish are *Amblyglyphidodon curacao* and *Siganus vulpinus*. From this result observation *Amblyglyphidodon curacao* and *Siganus vulpinus* conjectured attracted with branching coral habitat and tabulate coral habitat. The species of reef fish would show a preference or suitability to the two habitats, it means the suitable habitat determines the abundance of these fish (Rondonuwu 2014).

The fish preference for certain habitats causes species diversity in coral reefs (Triana 2004). The complexity of habitat structure and environment of coral reefs plays an important role in the structure of the reef, therefore, fish communities enabling to share a habitat with many species and the existence and resilience of a fish species in one or more habitats depending on the habitat carrying capacity (Chabanet et al. 1997; Lee & Shin 2013).

The fish similarity index in branching and tabulate coral habitat

The similarity index analysis of reef fish species in branching and table coral habitats showed very different results. The results of the index calculation of fish species similarity between branched coral habitat (branching) and table reef (tabulate) are presented in Table 3.

Table 3. Similarity and dissimilarity index of branching and tabulate coral habitat.

IS/ID	Branching Coral	Tabulate Coral
Branching Coral	-	79.31
Tabulate Coral	20.69	-

Based on Table 3, the Similarity Index (IS) value between types of fish in branched coral habitat and table coral habitat was obtained 20.69. The results of analysis about the similarity of coral fish communities by using the

similarity coefficient (Similarity) of Sorensen show that the similarity of the community is relatively different in branching coral habitat and tabulate coral habitat. The similarity value $<50\%$ or $0.49 < 0.50$ there are differences in community structure from the two coral habitats (Odum 1996). This means, a low similarity index showing an indication that the types of fish occupied in branched coral habitat and table coral habitat are not the same. This means that the calculation of the similarity index aims to compare the composition and variations in the quantitative value of species at a location or habitat. This proves that the structure of the habitat complexity of branching and table corals in the research location is still in good condition (Ford et al. 2017).

CONCLUSION

In branching coral habitat founded 11 species of fish. *Amblyglyphidodon curacao* and *Apogon chrysopomus* are types of fish that have the highest individual numbers that were 12 species, while *Lutjanus monostigma* is a type of fish that has the lowest number of individual counts, namely 3. In the tabulate coral habitat, 9 species of fish were found. There are 3 types of fish with the highest individual number namely *Halichoeres chloropterus* 11 species, *Amblyglyphidodon curacao* 8 species, and *Thalassoma lunare* with 8 species. Conversely, the lowest individual numbers were *Chaetodon triangulum* and *Scarus schlegeli*, each of them with 3 species, and *Scarus oviceps* with 2 species. The Similarity index of fish in branching coral habitat and tabulate coral habitat is 20.69%. These results illustrate that the condition of the coral reefs at Tanjung Beach is still in good condition.

AUTHORS CONTRIBUTION

MT conduct research in the field, collected and analyzed the data and wrote the manuscript. MS guides and designs studies and carries out fieldwork.

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CONFLICT OF INTEREST

The authors declare there is no conflict of interest.

REFERENCES

- Allen, G.R., 1999, *Marine Fishes of Tropical Australia and South East Asia: A Field Guide for Angler and Diver*, 1st Edition, Western Australia Museum.
- Bell, J.D., & Galzin, R., 1984, 'Influence of live coral cover on coral-reef fish communities, *Marine Ecology Progress Series*, 15, pp.265–274.
- Burke, L., Reytar, K., Spalding, M. & Perry, A., 2012, *Menengok Kembali Terumbu Karang yang Terancam di Segitiga Terumbu Karang*, 1st Edition, World Resources Institut.
- Chabanet, P., Ralambondrainy, H., Amanieu, M., Faure, G., & Galzin, R., 1997, 'Relationships between coral reef substrata and fish', *Coral Reefs*, 16, pp.93–102.
- Department of Marine Affairs & Fisheries of Southeast Sulawesi., 2016, *Survei Potensi Terumbu Karang di Sulawesi Tenggara*, Sultra.

- English, S., Wilkinson, C. & Baker, V., 1994, *Survey Manual for Tropical Marine Resources*, 2nd Edition, Australia Institute of Marine Science, Australia.
- Ford, B.M., Stewart, B.A., & Roberts, J.D., 2017, 'Species pools and habitat complexity define Western Australian marine fish community composition, *Marine Ecology Progress Series*', 574, pp.157–166.
- Giyanto, Abrar, M., Hadi, T.A., Hafizt, A.B.M., Slatalohy, A. & Iswari, M.Y., 2017, *Status Terumbu Karang Indonesia*. Coremap-CTI., Pusat Peneliti Oseanografi-LIPI. Jakarta.
- Koesoebiono., 1981, *Biologi Laut*, 1nd Edition, Institut Pertanian Bogor, Bogor.
- Laevastu, T. & Hayes, M., 1982, *Fisheries Oceanography and Ecology*, Fishing News Book, Ltd, Farham, England.
- Lee, T., & Shin, S., 2013, 'Echinoderm Fauna of Kosrae, the Federation States of Micronesia', *Animal Systematics Evolution and Diversity*, 29(1), pp.1–17.
- Muller-Dumbois, D. & Ellenberg., 1974, *Aims and methods of vegetation ecology*, 1nd Edition, John Wiley and Sons, Inc, New York.
- Nybakken, J.W. & Bertness, M.D., 2005, *Marine Biology an Ecological Approach*, 6nd Edition, Pearson Education Inc, San Fransisco.
- Odum, E.P., 1996, *Dasar-Dasar Ekologi, Terjemahan: S. Samingan*, 3nd Edition, Gadjah Mada University Press, Yogyakarta.
- Rondonuwu, A.B., 2014, 'Ikan karang di wilayah terumbu karang Kecamatan Maba Kabupaten Halmahera Timur Provinsi Maluku Utara', *Jurnal Ilmiah Platax*, 2(1), pp.1–7.
- Thresher, R., 1984, *Reproduction in Reef Fishes*, T.F.H, Publications, Neptune City, NJ.
- Triana, Y., 2004, 'Kajian Struktur Komunitas dan Interaksi Substrat Dasar Terumbu Karang dengan Ikan Karang di Daerah Perlindungan Laut, Pulau Sibesi, Teluk Lampung, Kabupaten Lampung Selatan', Skripsi, Institut Pertanian Bogor, Bogor.
- Veron, J.E.N., 2000, *Corals of the World*, 1nd Edition, Australian Institute of Marine Science and CRR Qld Pty Ltd, Queensland, Australia.
- Whitten, S.J., Damanik. & Hisyam, N., 1984, *Ekologi Ekosistem Sumatera*, 1nd Edition, Gadjah Mada University Press, Yogyakarta.