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## Economically food fish at coral reef of Kotania bay, Western Seram regency, Maluku province, Indonesia

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### Abstract

Study on economically food fish at coral reef of Kotania Bay was conducted from April to October 2017. Underwater Visual Census and Focus Group Discussion method were used to collect and examine data concerning species richness, standing stock and potency of economically food fish. The result showed that there are 115 species of economically food fish which inhabit 735.98 ha of coral reef in Kotania Bay. Species richness of economically food fish was higher at excellent and good categories of coral reefs condition while density, standing stock and potency (biomass) were higher at excellent category. Total potency, Maximum Sustainable Yield and Total Allowable Catch of economically food fish in coral reef area of Kotania Bay were 2,811, 1,406 and 1,125 tons, respectively.

**Keywords:** Species richness, density, standing stock, potency, coral reef

### 1. Introduction

Kotania Bay is a unique bay in the Western Part of Seram Regency because it has five small islands and three tropical ecosystems i.e. coral reef, seagrass beds and mangroves that interact with each other <sup>[1]</sup> and 10 small to medium lagoons. Therefore, this bay becomes important as a spawning, nursery and feeding ground as well as shelters for various species of economically important finfish <sup>[1, 2]</sup>. Previous studies show that Kotania Bay has varied fisheries resources such as fish <sup>[3, 4]</sup>, crustacean, echinoderms <sup>[5]</sup> and mollusk <sup>[6]</sup>. However, due to continued population growth and utilization activities, then those fishery resources declined and of their habitat degraded <sup>[1]</sup>.

Reef fishes are categorized into three groups, namely target, major and indicator species <sup>[7, 8]</sup>. Economically food fish which belonged to target species are one of the popular and important reef fish in Kotania Bay. Utilization of economically food fish in this area has been done for long time by artisanal fishers using simple gears and only based on their experience <sup>[1]</sup>. In the recent year, utilization of economically food fish continues to increase due to market demand and local consumption needs. The utilization activities are not based on data and information regarding status of the economically food fish potency and condition of their coral reefs habitat. As the results, their potency becomes decreased and also their habitat was damaged due to utilization of destructive fishing gear <sup>[1]</sup>. In addition, lack of government awareness to socialized fishery regulation make traditional fishers in this area do not know how to exploit and utilize their economically food fish eco-friendly and sustainably.

Research on the potency of fish resources in Kotania Bay coral reefs is still lacking. Up to now, there are only three literatures on fish in Kotania Bay <sup>[1, 3, 4]</sup>. Therefore, this study was conducted to present the potency of economically food fish which consist of their taxa composition and species richness, density, standing stock, potency as well its relation to coral reef conditions.

### 2. Materials and Methods

This research was conducted in Kotania Bay, Western Seram Regency, Maluku Province (Figure 1) on April to October 2017. Data of taxa composition and species richness, individual number of economically food fish species were obtained through survey on 14 reef station using Underwater Visual Census <sup>[7, 8, 9]</sup>. Data and information on utilization of economically food fish was also collected through Focus Group Discussion <sup>[10]</sup> with fishers of Osi Island, Kotania dan Wael villages.

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Species of economically food fish was identified according to Munro (1967) [11], Amesbury & Myers (1982) [12], Kuitert (1992) [13], Heemstra & Randall (1993) [14], Allen (2000) [15], Kuitert & Tanozuka (2001) [16], Allen *et al.* (2003) [17], and White *et al.* (2013) [18]. Data of economically food fish species was tabulated presented in graph and explain descriptively.

Based on data of fish species individuals number were tabulated, then density, standing stock and potency (biomass) of economically food fish were analyzed following English *et al.* (1997) [7] and Amesbury *et al.* (1982) [19]. Data on distribution of economically food fish was also described according to the condition of coral reefs habitat.

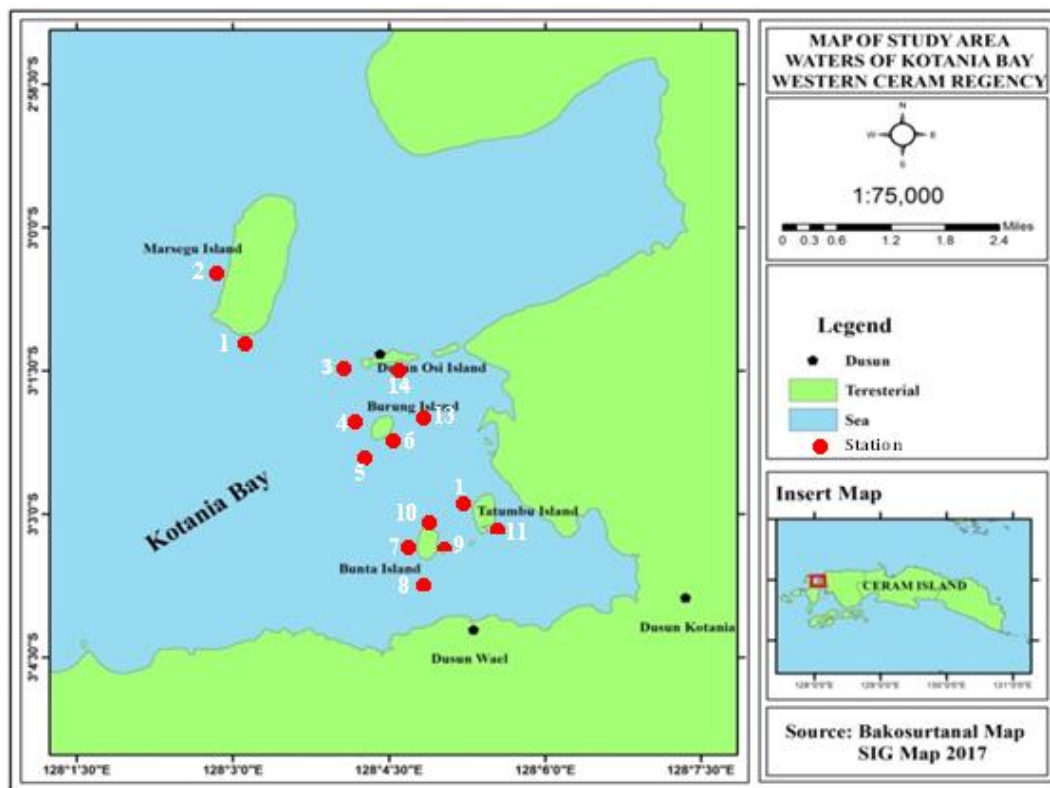


Fig 1: Map showing research station in Kotania Bay

### 3. Results and Discussion

#### 3.1 Taxa Composition and Species Richness

A total of 115 species of economically food fish which consists of 40 genera and 18 families were found during this study. Family Serranidae (grouper) has high species richness, followed by Acanthuridae (Surgeonfishes), Lutjanidae (Snappers) and Scaridae (Parrotfishes). On the contrary, Ehippidae (Spadefishes), Holocentridae (Squirrelfishes), Sphyrnidae (Barracudas) families, especially Khyposidae

(Lowfin Drummer) and Scombridae (Mackerel) have low richness species (Figure 2). Species richness of economically food fish in Kotania Bay coral reef areas were relatively higher than Eastern Part of Seram coral reefs i.e. 106 species of reef fishes (Sahetapy and Matakupan 2010), while number of genera and families i.e. 46 and 20 respectively were relatively lower than those in coral reefs of Eastern Part of Seram.

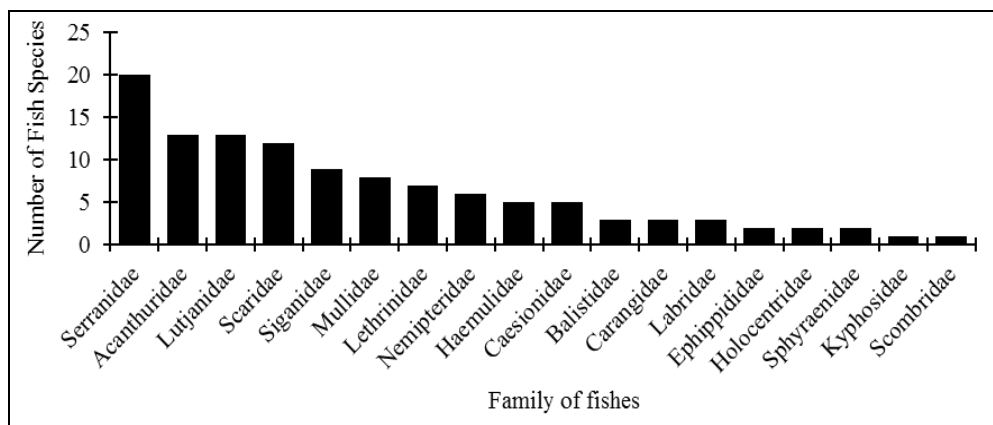


Fig 2: Species richness of 18 families of economically food fish in Kotania Bay

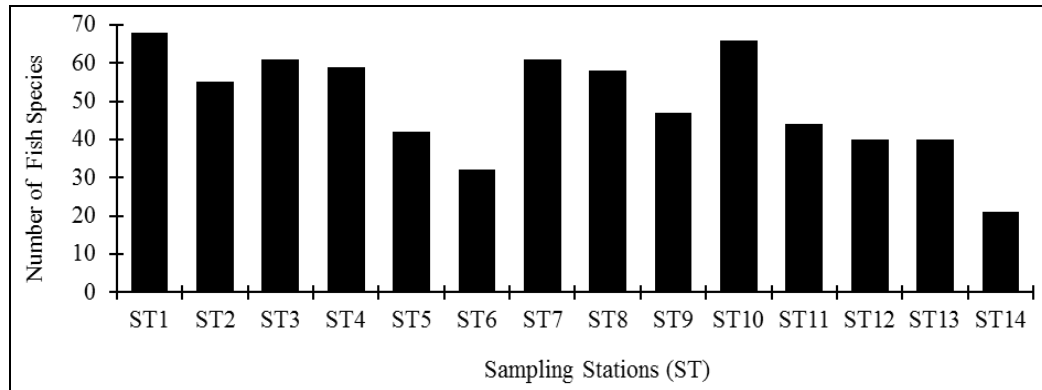
The species richness of groupers found in this study is relatively lower compared to those reported by Huliselan *et al.* (2017) [1] who found 35 species of groupers in Kotania Bay.

This could be due to differences of data collection methods in which the Underwater Visual Census (UVC) method used in this study only covered reef margin until slope zone, while

groupers was also caught by fishers in the waters surrounding coral reefs which relatively deeper. In addition, when data of economically food fish was collected through UVC method, it is possible some grouper species were not seen because they take cover under or in crevices of coral colonies.

Spatially, station 1 and station 10 had more species compare to other stations especially station 6 and station 14 (Figure 3). According to Sahetapy and Matakupan (2010) [20], low or high

species richness of reef fish is determined by condition and diversity of coral reef as habitat of those fishes. Station 1 and station 10 have better condition i.e. excellent category and more diverse coral reef than condition of coral reef at station 6 and station 14 i.e. a fair category. This results is similar to the study of Sahetapy (2002) [21] and Sahetapy & Far-Far (2008) [22] who reported higher species richness of reef fish at good and excellent categories than those at fair category.



**Fig 3:** Species richness of economically food fish at 14 coral reef stations

### 3.2. Density, standing stock and potency

Density of economically food fish on four coral reef areas were higher (2.4 - 3.1 individuals  $m^{-2}$ ) than other 10 stations, especially four coral reef stations with a density of 0.3 - 0.7 individuals  $m^{-2}$  (Table 1). The highest fish density are due to excellent and good categories of coral reef condition, and the presence of *Rastrelliger kanagurta* (Long Jawed Mackerel), *Pterocaesio tile* and *Caesio teres* (Fusiliers) fish species with

relatively larger populations than other species of reef fishes. According to Kuitert and Tanozuka (2001) and Allen *et al.* (2003) [16, 17], *R. kanagurta*, *P. tile* and *C. teres* form aggregation with large schooling on coral reefs, so that the reef fish density becomes high. In contrast, four coral reef stations that had low density of reef fish because they are in fair category of coral reef conditions, as well as the presence of *P. tile* and *C. teres* with low populations.

**Table 1:** Density, standing stock and potency (biomass) of economically food fish

Station	Density (ind. $m^{-2}$ )	Standing Stock (ind $ha^{-1}$ )	Potency (ton $ha^{-1}$ )	Standing stock Criteria	Potency Criteria
ST1	3.1	31,375	8.12	High	High
ST2	2.9	29,150	7.21	High	High
ST3	1.5	14,625	3.74	Moderate	Moderate
ST4	2.0	20,150	4.94	Moderate	Moderate
ST5	1.0	9,750	2.44	Low	Low
ST6	0.6	6,150	1.54	Low	Low
ST7	2.4	24,200	6.13	High	High
ST8	1.5	14,600	3.76	Moderate	Moderate
ST9	1.2	11,925	3.01	Moderate	Moderate
ST10	2.5	24,775	6.19	High	High
ST11	1.0	10,100	2.30	Low	Low
ST12	0.7	7,425	1.86	Low	Low
ST13	0.7	6,525	1.63	Low	Low
ST14	0.3	3,475	0.87	Low	Low
Total	1.5	15,286	3.82	Moderate	Moderate

Standing stock and potency of economically food fish are classified as high criteria in four stations (Table 1) because they have excellent category of coral reef condition, while four stations are moderate criteria due to a good category of coral reefs. On the contrary, the other six stations which have fair category of coral reef conditions have low criteria of standing stock and potency of economically food fish. Total standing stock (15,286 individuals  $ha^{-1}$ ) and potency (3.28 tons  $ha^{-1}$ ) of economically food fish in Kotania Bay coral reef areas were lower than those in small island coral reefs in Eastern Part of Seram Regency i.e. 30,607 individuals  $ha^{-1}$  and 7.65 tons  $ha^{-1}$  [20].

Among 115 species of economically food fish, only three

species of reef fish had high standing stock and potency (Table 2). *Rastrelliger kanagurta*, *Caesio teres* dan *Pterocaesio tile* had high standing stock and potency because *R. kanagurta* form tightly bunched schools, while *C. teres* and *Pterocaesio tile* form large aggregations [17] in lagoon and seaward reefs, as well as upper edge of reef slopes of Kotania Bay. Except for *R. kanagurta*, high potency of *P. tile* and *C. teres* also found in the coral reefs of East Flores Regency, Nusa Tenggara Province [23]. Total standing stock of economically food fish on 735.98 ha of coral reef area in Kotania Bay is 11,250,190 individuals with total potency (biomass) is 2,811 tons.

**Table 2:** Species of economically food fish with high standing stock and high potency

No	Fish Species	Common Name	Standing Stock (ind. ha <sup>-1</sup> )	Potency (ton ha <sup>-1</sup> )
1	<i>Rastrelliger kanagurta</i>	Long-Jawed Mackerel	2,502	0.625
2	<i>Caesio teres</i>	Blue and yellow Fusilier	1,805	0.451
3	<i>Pterocaesio tile</i>	Bluestreak Fusilier	1,768	0.442

#### 4. Conclusion

There are 115 species of economically food fish which belonging to 40 genera and 18 families inhabit coral reef in Kotania Bay. Species richness of economically food fish is higher at coral reef conditions belong to excellent and good categories. Density, standing stock and potency of economically valuable food fish are higher at coral reef condition belongs to excellent category. Total potency, maximum sustainable yield and allowable total catch of economically food fish at 735,98 ha of coral reef area in Kotania Bay are 2,811, 1,406, 1,125 tons, respectively.

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