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Reef Fishing Resources and their Utilization in Southwest Maluku Regency, Indonesia

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Abstract:- Remote islands in Southwest Maluku have received the government's attention concerning collecting information about coastal resources. This research was conducted on the islands of Leti, Moa, Lakor, Metimialam, and Metimiarang. The purpose of the study was to obtain data and information on reef fish resources and their utilization. The method used in collecting data and information is a visual census in belt transect an area of 250 m 2 and semi-structured interviews. Research results on 2 1 location of sampling data show that at least has 309 species of reef fish of 45 tribes. Diversity varies on the value of 8 to 18. Community diversity is classified as moderate level. Individual densities per square meter are low in most transect sites. The utilization rate of reef fish in most locations is subsistence, except in the Metimialam and Metimiarang areas, where the current exploitation of reef fish is relatively high.

Keywords:- *Coral Fish, Biodiversity, Coral Fish Utility, Southwest Maluku.*

I. INTRODUCTION

The development of the Maluku province, including the development of the agricultural sector, adheres to 'Island Cluster Unit' based on geographical proximity, cultural similarities, natural unity, orientation tendencies, economic similarity, and natural resource potential (Bustaman and Susanto, 2003). The study area is included in the island cluster VI, where Leti-Moa-Lakor, Luang, used to be in cluster VIII and the Southern Islands sub-district, which later separated itself into a new regency, the Wetar Islands known as Southwest Maluku Regency (Diskanlut, 2007). The formation of the Regency is based on experience so far where the Southern Islands are marginalized in development. At the same time, the sea potential is relatively high. It becomes a strategic trade gateway because it is directly adjacent to the State of Timor Leste and the Province of Kupang.

The growth-directed p region has centers of growth on the 'Doors Exit' (multigate system). These exits are located in strategic areas and have great potential to establish economic linkages with their outer regions (Bustaman and Susanto, 2003).

Conditions geomorphological and agro-climate on small islands in the Maluku parts of Southeast and Southwest less support especially has a lot of class land capability low and cause much limiting geomorphologically on developing agricultural on the mainland (Herman, 1991), therefore the people putting the sector of business marine as an alternative and superior in development. The fisheries sector is expected to become a leader in developing drought-prone regions such as Maluku Barat Daya (Edrus and Bustaman, 2005), which encourages trade in the goods and services sector, followed by agriculture and tourism.

In subsequent developments, the issue of small islands bordering neighboring countries became the government's attention (Saputro et al ., 2005), especially after the events of the seizure of Ligitan and Sipadan. As a result, the need for information about small islands is increasing. Islands that were previously marginalized in the development portion get priority in extracting useful information for regional development. Several important coastal ecosystems with high biodiversity need to be described and mapped.

Southwest Maluku Regency has four islands directly bordered by Timor Leste, such as Kisar and Leti Islands, and borders with Australia, such as Luang and Sermata. Therefore, the islands became strategic, Direktori on small islands became necessary for social, economic, cultural, legal, and political (Saputro et al ., 2005).

As an area still marginalized, the abundant fishery resources in the four islands are under-exploited by residents to obtain an economic surplus in family income. As a result, most of the fisheries industry in the research area is still subsistence, except in the Metiamiarang island group where nomadic people create an intensive effort to exploit sum helpless abundant marine, both the content of fish and cultivation.

Recognizing regional diversity is essential because it involves regional wealth or assets that must be appropriately managed. For example, the diversity of habitats and substrates on the coast of Southwest Maluku Regency has formed a diversity of marine vegetation, corals, and reef fish. The diversity of reef fish can reflect the conditions of the habitat in which the fish live. Therefore, each site has a variety of life forms that difference each other. Apart from being an environmental indicator, marine biodiversity is also a precious development asset in supporting the community's welfare through the fisheries and tourism sectors.

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The purpose of this study was to obtain data and information on reef fish resources and their utilization.

Table 1. Study sites of reefs and coral fishes

St.	East	South	*Areas*	*Islands*
1	08° 13' 34,2"	127° 37' 47,5"	Eul	P. Leti
2	08° 12' 49,7"	127° 35' 53,8"	Nuwewang	P. Leti
3	08° 10' 53,1"	127° 38' 11,3"	Nuwewang	P. Leti
4	08° 09' 21,2"	127° 40' 44,0"	Serwaru	P. Leti
5	08° 09' 25,2"	127° 42' 16,4"	Batumeow	P. Leti
6	08° 10' 17,3"	127° 44, 27,8"	Laitutun	P. Leti
7	08° 13' 01,3"	127° 44' 10,9"	Luhulele	P. Leti
8	08° 06' 23,1"	127° 49' 02,4"	Kaiwatu	P. Moa
9	08° 07' 26,9"	127° 53' 39,8"	Moa Utara	P. Moa
10	08° 08' 17,5"	128° 00' 01,5"	Wet	P. Moa
11	08° 08' 11,2"	128° 04' 32,7"	Moa Timur	P. Moa
12	08° 12' 34,3"	128° 06' 59,8"	Lakor Barat	P. Lakor
13	08° 12' 38,6"	128° 09' 16,5"	Worwawan	P. Lakor
14	08° 12' 02,5"	128° 12' 03,0"	Sera	P. Lakor
15	08° 10' 56,9"	128° 24' 03,7"	Wekenau	Metimi lam
16	08° 12' 12,7"	128° 27' 41,7"	Padang Lamun	Metimi lam
17	08° 15' 26,8"	128° 26' 54,8"	Tepi goba	Metimi lam
18	08° 17' 06,8"	128° 27' 59,6"	Tepi goba	Metimi arang
19	08° 19' 10,5"	128° 26' 43,3"	Sisi Barat Gugus	Metimi arang
20	08° 18' 12,0"	128° 29' 47,3"	Tepi goba	Metimi arang
21	08° 16' 40,9"	128° 29' 44,8"	Pintu keluar gugus	Metimi arang

II. RESEARCH METHOD

The research area will be located in the coastal around. The research location is Southwest Maluku Regency, which includes Leti, Moa, Lakor, and the Metimialam and Metimiarang island clusters (Appendix Figure 1). The coasts of these islands consist of critical ecosystems such as seagrass beds and coral reefs, which are open to wind and waves. Morphophysiography of the coast starts from land to sea in steep rocks or sand beaches, seagrass beds, and coral reef flats. Reef slopes and reef walls are enchanting at specific locations due to the clear and warm waters and the wide variety of coral species and reef fish. The research location includes several coordinate points that have been chosen randomly. The geographic position of the census locations is presented in Table 1 below)

Data was collected using the visual census method (English et al . , 1994; Halvor d & Thompson, 1994) by snorkeling at 21 coral reef sites. Area census at each location of 25 0 square meters composed of belt transect along 50 meters x 5 meters. Need time of 45 minutes on each transect to download sens us the area. The maximum vertical observation distance that can be reached is up to a depth of 15 meters. Repeated and fast free dives are often done to observe cryptic fish.

The majority of recorded fish names are common species often found in coral reef areas, where enumerators can distinguish them from one another. The ability to recognize fish is based on more than 20 years of diving experience in various areas of Indonesian coral waters. The illustrated guidebook also aided species identification by Kuiter (1992), Kuiter & Tonozuka. (2001), and Lieske & Myers (1997).

Information on fishing activities and results was obtained through semi-structural interviews involving fishers and local fishery officers.

Analysis of data using i Index This diversity of reef fish, such as species richness Margalef : R1 = (S-1) / ln (n) , the dominance of the population (index Simpson) : $\lambda = \Sigma\{(ni (ni - 1) / (N (N -1) \}$, and diversity their beliefs Shannon Weaver: $H = \Sigma \{ (n i / N) \ln (n i / N) \}$, where ni = number of fish species to I, and N = total individual fish for all species . the preparation of fish classification right of individual density per unit area. Grouping fish in addition ordered by taxonomists general (such as the name of species, genus, and tribe) is also determined according to their statuses, such as groups of a fish majority of reefs, target fish catch of fishermen, and fish indicators of coral health.

III. RESULT AND DISCUSSION

At least 309 species of reef fish were identified from 45 tribes in all research locations. This does not include several types of cryptic fish because they live burrowing, drilling, or hidden in coral crevices. According to the research location, the number of species is very diverse, the lowest is 54 species, and the highest is 138 species. However, this number is still relatively low when compared to the results of the census in the waters of Saleh Bay and its surroundings, namely the variation between locations ranges from 55 to 187, where the total number of identified 405 species with a total of 47 tribes and 147 genera (Bakosurtanal, 2009).

Species richness between locations is different due to habitat variation. The taxonomic conditions at each location are illustrated in Figure 1. The highest number of species was found at stations 6 (Leti), station 10 (Moa), station 11 (Lakor), and station 21 (Metimiarang). This is also shown by the Margalef R wealth index above 17, as illustrated in Figure 2.

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Majority index This diversity of Shanon Weaver (H) in the range of value of "medium," unless pad a station 10, 12, 17, 20 and 21 that the value of its slightly above the limit value H medium (Figure 3). The criteria for assessing the index value are based on the provisions, as illustrated in Table 2.

The dominance of reef fish populations can affect the value of the species diversity index, especially when the value of the dominance index becomes high, for example, due to significant environmental pressures, such as pollution or environmental damage resulting in an explosion of species population survival. However, all sites' index calculation dominance results were located on the boundary criteria " low " (Figure 4). This means that there is no prominent dominance of a reef fish population, which means no environmental pollution.

Table 2. Valuating Criteria for index levels

Kisaran Dominasi Krebs (1989)	**Kisaran Keanekaragaman Mason (1981)**		**Tingkat Kepadatan - *Density Ranking***	
Dominant Ranking of Krebs (1989)	***Diversity Ranking of Mason (1981)***		**(Djamali & Darsono, 2005)**	
			1 - 5	: Sangat Jarang/*Very rare*
0,00 < D < 0,30 : Rendah/*Low*	H < 2,30	: Rendah/*Low*	5 - 10	: Jarang/*Rare*
0,30 < D < 0,60 : Sedang/*Fair*	2,30 < H < 3,45	: Sedang/*Fair*	10 - 20	: Cukup melimpah/*quite Abundant*
0,60 < D < 1,00 : Tinggi/*Hight*	3,46 < H < 5,75	: Tinggi/*Hight*	20 - 50	: Melimpah/*abundant*
	5,76 < H < 6,90	: Sangat Tinggi/*Very hight*	> 50	: Sangat Melimpah/*very abundant*

Unlike the high diversity value, the density of reef fish is very low and low (Figure 5). In general, fish communities with high diversity have low numbers of individuals, as is the case in many trophic areas. One piece of the reef can accommodate a population of various species, but of course, with a small number of individuals. On the other hand, certain reefs, such as coral branching, usually accommodate one or two specific populations, but the population type is schooling. For example, Chromis virid is Chromis ternatensis or Pomacentrus molluccensis. In this situation, the high abundance of fish occurs in groups in a limited area (clumped distribution). There is also an abundance of clusters formed by vertically spreading schooling fish in water bodies. These fish species include Abudefduf spp., Amblyglyphidodon spp., Thalassoma amblycephalum, Abudefduf spp., Caesio spp., Pterocaesio spp., and Odonus niger. Fast-swimming species generally establish a reasonably even abundance (e.g., Thallas omma spp., Labroides spp., Halicoeres spp.). Several other species and often form a distribution that is not far from the niche or shelter is the schooling type which builds density in a zone of 1 to 2 meters above the substrate (Examples are Apogon spp ., Cheilodipterus spp., Anthias spp., Pseudoanthias spp., Pomacentrus spp. . Cirrilabrus spp. The rest are solitary fish species with rare abundances, such as grouper, snapper, gobid, and blenid.

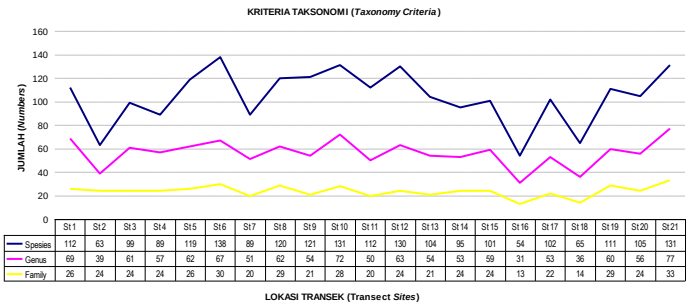

Figure 1. The numbers of species, genus and families of coral fish by study sites

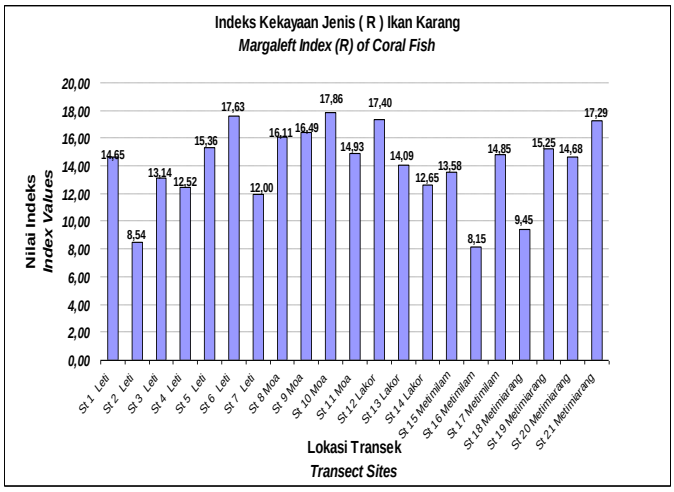

Figure 2. Margaleft species index values by study sites

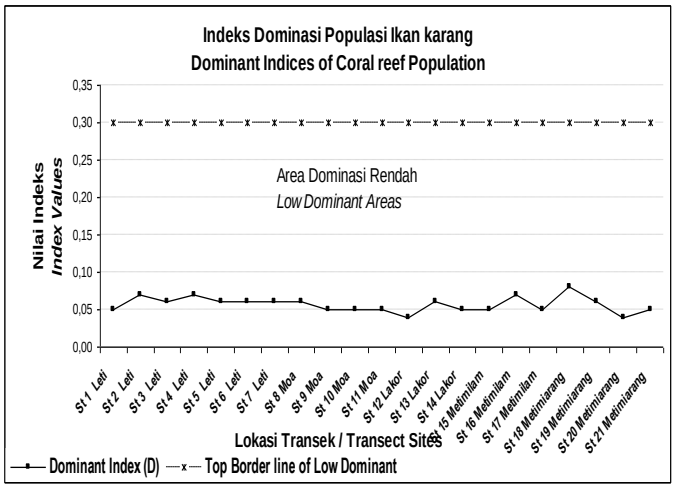

Figure 3. Dominant Index values of coral fish by study sites

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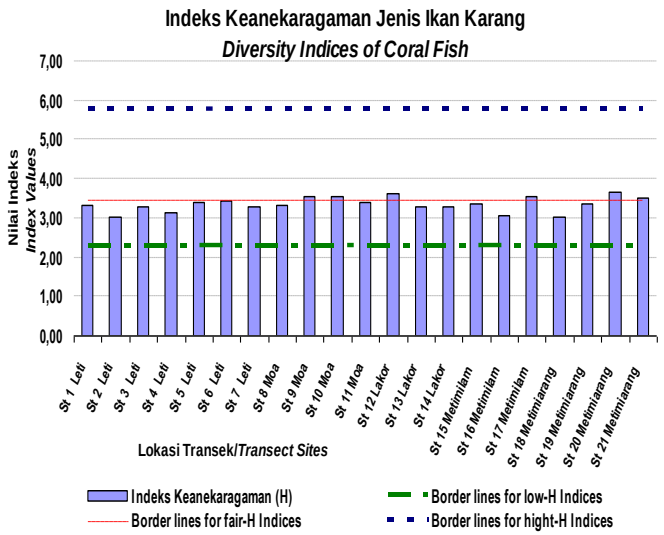

Figure 4. Diversity Indices (H) of coral fish by study sites

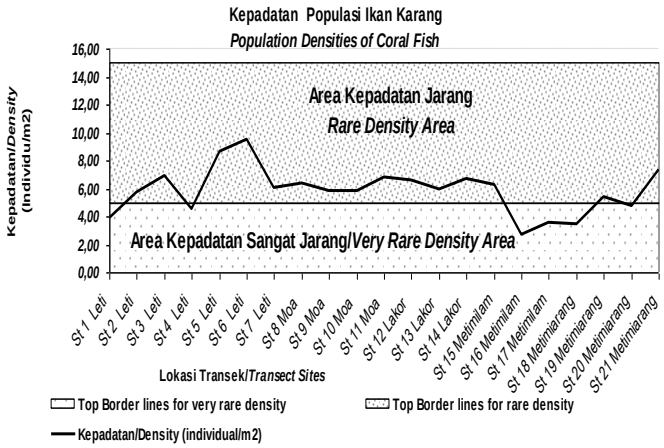

Figure 5. Density level of coral fish by study sites

The presence of reef fish can also be seen from the group's utilization status. Major fish groups are reef fish species consistently present and strongly associated with the reef area as their home. The presence of groups of fish, both in individual numbers and in large numbers of species in a reef area, can signify that the area has varied ecological niches with varied forms of benthic life. The major fish groups are generally in fish, and coral presence in an area can be an attraction to bring in the fish passer generally foraging (Carnivora). Groups of large carnivores and groups of herbivores can be used as targets for fishing catches for consumption. Groups that fishers target are generally classified as target fish. The main target fish groups are grouper, sunu, snapper, lencam, jackfruit seed, thick lip, yellowtail, baronang, butana/Sekar Taji, cockatoo, kuwe, and barracuda. The order of dominance by the family of the presence of primary and target fish is illustrated in Table 3. The tribes of the target fish are represented by eight tribes that stand out in the number of species, while from the significant fish groups, two tribes always dominate coral reefs in Indonesia. Clear and open waters, such as the Pomacentridae, Labridae, and Balistidae tribes.

Table 3. Coral fish families by predominant species ranking in study sites

NAMA SUKU *Family Names*	NAMA LOKAL *Local Names*	LOKASI/*LOCATIONS* LETI	MOA	LAKOR	METI-MIALAM	METI-MIARANG	RANKING *Ranks*	KELOMPOK *Groups*
POMACENTRIDAE	Betok, Kromis	38	35	38	38	38	1	Ikan Major
LABRIDAE	Bayeman, Keling, Koja, Pilo	32	33	28	24	27	2	Ikan Major
CHAETODONTIDAE	kepe-kepe, daun-daun	24	22	23	16	21	3	Ikan Indikator
ACANTHURIDAE	Gutana, Kulit pasir	19	19	14	8	19	4	Ikan terget
SCARIDAE	Kakatua/Moan	13	12	11	12	13	5	Ikan terget
SERRANIDAE	Kerapu, Sunu/Garopa	12	8	4	6	10	6	Ikan terget
LUTJANIDAE	Kakap/Gaca	9	9	7	7	9	7	Ikan terget
BALISTIDAE	Mendut/Tatu	7	8	7	6	6	8	Ikan Major
MULLIDAE	Biji nangka/Salmaneti	6	5	4	5	6	9	Ikan terget
CAESIONIDAE	Ekor kuning/Lalosi	6	4	5	4	6	10	Ikan terget
CARANGIDAE	Kuwe/Bubara	4	5	2	2	7	11	Ikan terget
SIGANIDAE	Baronang/Samandar	4	5	4	7	4	12	Ikan terget

Groups of fish indicators of coral reef health are not always present in large numbers of individuals and large numbers of species if the coral waters are in poor condition. However, the coral reef area in Southwest Maluku Regency is quite good in terms of coral diversity and transparent water bodies, so indicator fish from the Chaetodontidae tribe is relatively prominent, which is included in the third domination order (Table 3). In addition, there were 26 species of butterflyfish identified in all study sites (Table 4).

Table 4. Chaetodont species (Chaetodontidae) identified in study sites

No	*Chaetodont Species*	No	*Chaetodont Species*
1	*Chaetodon adiergastos*	14	*Chaetodon speculum*
2	*Chaetodon auriga*	15	*Chaetodon semeion*
3	*Chaetodon baronessa*	16	*Chaetodon trifascialis*
4	*Chaetodon citrinellus*	17	*Chaetodon trifasciatus*
5	*Chaetodon ephippium*	18	*Chaetodon ulientensis*
6	*Chaetodon kleiini*	19	*Chaetodon unimaculatus*
7	*Chaetodon lunula*	20	*Chaetodon vagabundus*
8	*Chaetodon melannotus*	21	*Coradion chrysozonus*
9	*Chaetodon meyeri*	22	*Forcipger flavissimus*
10	*Chaetodon ocellicaudus*	23	*Hemitaurichthys polylepis*
11	*Chaetodon ornatissimus*	24	*Heniochus chrysostomus*
12	*Chaetodon oxycephalus*	25	*Heniochus singularis*
13	*Chaetodon rafflesi*	26	*Heniochus varius*

Figure 6 shows the percentage of species presence of the three groups of reef fish. Major fish are always present in a dominant percentage in all locations, ranging from the standard value of 60%. In comparison, the target fish is in the second position with a range of 30% values and then indicator fish which ranges from the standard value of 10%.

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In some supporting locations, target fish can dominate, such as at station 20, in the Metimiarang goba, which is a barn for large consumption fish, especially snapper. Furthermore, what is quite encouraging is the presence of a relatively large number of butterflyfish species and the number of individuals with the majority percentage between 10% to 20%. This shows that the coral reefs in the MTB area are well preserved.

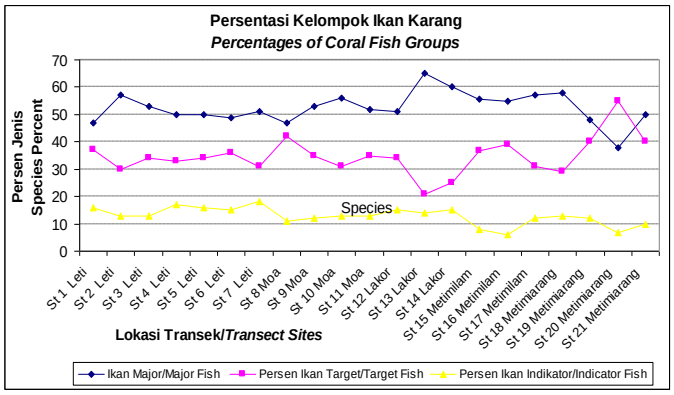

Figure 6. Percentages of coral fish groups by study sites

Some reef fish species are sometimes an exclusive review of economic value da n shades of color and rarity. The picture on the right is a type of marine ornamental fish found on the island of MOA, Mendut spotted (Balistoides conspicillum), which is very expensive in the market because it is rarely found anywhere. As obtained from experience that it is rare to find reef fish species with complete composition in one location; some species are sometimes not found in a coral area, while in other places, they are present. Likewise, some types of ornamental fish with high selling prices are often not found in a coral location due to unfavorable conditions. Some types of reef fish that are attractive and have high economic value are presented in Table 5. The utilization of reef fish as ornamental fish commodities has not been realized following the expected projections. There have been no reports of the entry of ornamental fish traders or collectors.

Fish, known by the name of Napoleon (Chelinus undulates - wrasse) or maming an economic target fish, is high, but the numbers in the wild are not many and even hard to find. This fish belonging to the Labridae tribe is included in the IUCN red list with the criteria of CITES Appendix II, and its trade is regulated in the global market, where Indonesia has its quota and harvest size that has been determined by the management authority (Ministry of Forestry) and scientific management - LIPI (Sadovy). 2006). Napoleon fish were only found in 4 research locations, namely stations 9 and 11 (Moa Island) and stations 19 and 20 (Metimiarang Island). The sizes found are pretty significant, and some are still juveniles (Juvenile). This type of fish has become a catch target in recent years, especially by Metimiarang fishers with a selling price of IDR 50 thousand per kg. Arrests are made when the collecting vessel makes an order (reserved).

Table 5. Marketable coral fish species identified in study sites

Latin Names	***Local Names***	***Latin Names***	***Local Names***
Pterois volitans	Lepu ayam	*Pygoplites diacanthus*	Injel belang
Anthias Dispar	Pelangi	*Amphiprion spp*	Giru pasir
Anthias tuka	Pelangi	*Chrysiptera spp.*	Blu seton
Pseudanthias pleurotaenia	Pelangi	*Bodianus diana*	Bayeman
Pseudanthias squamipinnis	Pelangi	*Coris gaimard*	Koja
Pseudochromis paccagnellae	Kromis palsu	*Labroides dimidiatus*	Ikan dokter
Chaetodon spp.	Kepe-kepe	*Cetoscarus bicolor*	kakatua (juvenile)
Forcipger flavissimus	Kepe sumpit	*Plagiotremus rhinorhynchus*	Blenid penari
Hemitaurichthys polylepis	Kepe bendera	*Plagiotremus laudandus*	Blenid sayap
Centropyge bicolor	Piyama	*Ptereleotris evides*	Lapik sejoli
Centropyge bispinosus	Piyama	*Ptereleotris heteroptera*	Gobid pasir
Centropyge eibli	Piyama	*Nemateleotris magnifica*	Lapik tanduk
Centropyge tibecen	Piyama	*Valenciennea strigata*	Gobid peliang
Pomacanthus semicirculatus	Injel cincin	*Zanclus cornutus*	Ikan bendera
Pomacanthus imperator	Injel betman	*Balistoides conspicillum*	Mendut totol
Pomacanthus navarchus	Injel loreng	*Oxymonocanthus longirostris*	Kulit tebal totol
Pomacanthus xanthometopon	Injel topeng	*Ostracion spp*	Buntel kotak
Pomacanthus sexstriatus	Injel lurik	*Canthigaster papua*	Buntel papua

The majority of fishery businesses in the six islands where the research was conducted are still in the subsistence category, a business activity whose production is only for own consumption and a small portion is sold. The fishing gear used is generally fishing rods, hand lines, and gill nets. The fleet used ranged from boats without engines to small motorized boats, especially Honda 5 to 7 PK. Motorized vessels under 2GT are not typical, and above 2 GT are rarely used for fishing, but only for freight transport. The catchment area is still around the coast. The catch is that the general get fishers in the study site (Table 6) were not much variation due to the limited fishing gear used.

The general constraint in the fisheries sector is the low skill of human resources and the lack of physical support for offshore fishing activities. This is also associated with high investment in fishing fleets. Therefore, fishery investment by local fishers is still low. In addition, the work ethic is low because it is pampered by nature, and the adoption of technology is also low so that the production process becomes sober. However, the fishery work ethic is relatively high in the nomadic community from Luang Island, which temporarily resides in the Metialam and Metimiarang island clusters. A fixed and transparent market supports this.

These nomadic fishermen take the opportunity to produce at the time of great meti (lowest tide), so they can only walk on foot looking for clams, octopus, and sea cucumbers. Some of these nomadic fishermen also work as reef fish catchers and, at the same time, as fish salters. There are ten net fishermen and six anglers. The main products of Metimialam and Metimiarang islands are salted fish, live fish, and dried octopus which are picked up once a month by fish collectors from Luang Island. Live fish yan g cultivated among other napoleon fish, groupers, coral trout, tonsing. These results are mainly marketed to Tual, Southeast Maluku, and next, it is distributed to a large market in Ambon and Surabaya. The price of Napoleon is Rp. 50 thousand/kg live and live grouper is between Rp. Thirty-five thousand to 45 thousand/kg live. Salted fish costs Rp. 15 thousand/kg at the production center, while dry octopus costs Rp. 25 thousand/kg.

The limited market for fishers on Leti, Moa, and Lakor makes fishing businesses less developed. Fish products are usually peddled around the village or even in neighboring villages that are a bit far away. Hence, there is an additional cost (marginal cost) for motorcycle taxis for fish vendors. The salting of fish is only to stockpile fish stocks for the famine season or the season of big waves.

Table 6. Fishing caught of local fishers by gear types

Latin Names	***Local Names***	***Fishing Gears***
Lutjanus spp.	Kakap/Gaca	Bubu, jarring, pancing
Letrinus spp.	Lencam/Sikuda	s.d.a.
Epinephelus spp., *Cephalopholis* spp., *Plectropomus* spp., *Variola* spp., *Gracilla albomarginata*	Kerapu, sunu/Garopa	Bubu, pancing
Cheilinus undulatus	Napoleon/Maming	Pancing, bius
Acanthurus spp.	Butana/Kulit pasir	Bubu, pancing
Parupeneus spp.	Biji nangka/Salmaneti	Bubu, jaring
Plectorinchus spp.	Bibir tebal/Rajabau	Bubu, pancing
Siganus spp.	Beronang/Samandar	Bubu, jaring
Scarus spp.	Kakatua	Bubu, pancing
Caranx spp., *Carangoides* spp., *Elagatis bipinnulata*, *Selaroides* sp., *Restrilliger* sp., *Decapterus* spp., *Sphyraena barracuda*	Kuwe, selar, kembung, layang, barakuda (Bobara, selar, lema, momar, barakuda)	Pancing, jaring
Caesio spp, *Pterocaesio* spp	Ekor kuning, Lalosi	Jaring
Scomberoides spp.	Tenggiri	Pancing
Thunnus spp	Tuna, Cakalang, tongkol	Pancing ulur, pancing tonda
Cheilopogon spp. *Oxyrundichthys* spp	Ikan terbang/Superboy/ Ikan indosiar	Jaring

The recommended recommendation for the fishery pattern as mentioned above, in order to further increase the effectiveness and efficiency, is to improve or develop post-harvest and use fish collection tools. Post-harvest improvements improve the quality of processed fish and or build floating cage facilities to maintain live fish from fishing rods. Live fish have a higher price, while net fishing gear often finds non-economical fish used as fish feed. Another alternative to fish feed is derived from salted fish processing waste. In addition, fuel efficiency can be improved by developing fishing gear because the pattern of fishing needs to be changed from hunting fish to picking up fish. For this reason, shallow water FADs from coconut fronds can be used as a means of collecting fish (Fish Aggregating Devices).

IV. CONCLUSION

Conclusion

Reef fish identified at 21 transect locations amounted to 309 species from 45 tribes. Variations between locations ranged from 54 to 138 species.

Locations with the highest number of species are station 6 (Leti), station 10 (Moa), station 11 (Lakor), and station 21 (Metimiarang). This is also indicated by the wealth index of Margalef R above the value of 17.

The diversity index in most research sites is classified as "medium," which is around the value of 3.

The density of fish per square meter is low and very low, where the types of schooling fish have aggregated spatial distribution.

The community dominance index is classified as low, meaning that the population is present at the same opportunity. Therefore, there is no contamination of the area that encourages inevitable population explosions and suppresses other populations.

The target fish groups are represented by eight tribes that stand out in the number of species, while two tribes always dominate coral reefs from the significant fish groups. The indicator fish group consisted of 26 types of butterflyfish. The composition ratio of the three groups is 60% major fish: 30% target fish: 10% indicator fish.

The majority of fishery businesses at the research site are still in the subsistence category, except for the Metimialam and Metimiarang locations.

Common obstacles in the fisheries sector are low human resource skills, unsupportive physicality, low work ethic, limited market conditions, and fish distribution trading systems.

RECOMMENDATIONS

Post-harvest improvement and development, especially the improvement of the quality of processed fish and the use of floating cages to store live fish.

The introduction of fish collection tools (FADs) for fuel-efficiency.

Restructuring of fishery institutions, especially programs to increase fishing fleets, distribution systems, and marketing trade systems, and development of fisheries household systems or horizontal fisheries industry based on separate professions of catchers, cultivators, processors, collectors, and marketing so that that fishery resources can become assets regional economic excellence.

Neighbors of the MBD Regency are in the same archipelagic region, so the fishery market share needs to be addressed outside the region. Therefore, post-harvest performance and technology need to be improved.

Some essential commodities that are marketable are salt fish, live fish, and ornamental fish.

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