The Influence of Using Bait Types to the Number and Compositi on of Fishing Traps Catch in South Ternate Waters

Umar Tangke[1], Sitkun Deni[2] and Asri Aunaka[3]

[1] Fisheries Technology Products, Faculty of Agriculture, Muhammadiyah University of North Maluku, Indonesia
E-mail: umbakhaka@gmail.com
[2] Fisheries Technology Products, Faculty of Agriculture, Muhammadiyah University of North Maluku, Indonesia
E-mail: ikun.deni@gmail.com
[3] Fisheries Technology Products, Faculty of Agriculture, Muhammadiyah University of North Maluku, Indonesia
E-mail: aunaka_asri@gmail.com

Abstract. Differences in the types of baits are thought to improve catch from fishing traps, but sci entific information, especially on coral reef fish, has not been widely available. Therefore, the obje ctive of this research is to know the amount and composition of the type of catches from fishing tra ps by using different types of bait on demersal fish. This research was conducted in Ngade waters of Ternate South City through experimental method with three types of bait used as treatment, suc h as intestines of village chicken, broken white ceramic plate, and rough fish during 16 fishing trip s, where the research data were analyzed using a randomized block design. The total catch obtaine d during the research in 16 trips was 1,390.5 kg, consisting of 8 families, spreading on traps with c eramic plate was 513 kg, with rough fish was 410.4 kg, with village chicken's intestines was 237.6 kg and without baits was 229.5 kg. The highest catch was found in Acanthuridae fish family speci es with 2,913. 30 kg and fish species from the Labridae family with 2,843.10 kg, with a compositi on of 16% and which is a major fish species in coral reef ecosystems. While the lowest catch was i n Lethrinidae family fish species with 1,544.40 kg, with the composition of 8% which is an import ant type of economical fish or type of fish consumption. The result of data analysis at F test shows that the feed type treatment with Fcount is 13,017 with the significance value is 0.000 smaller than □ 0.05, so it can be concluded that the treatment with types of baits has significant influence on th e catch from fishing traps.

Keywords: Fishing Traps, Types of Baits, South Ternate

1. Introduction

Utilization of fishery resources of Indonesia has not been fully done optimally. In certain waters many of the utilization has not been managed, while other waters have over fishing as a result of the num er of vessels that make continuous catches and do not pay attention to the sustainability of fish resources t hat became the aim of their catch. The potential of fishery resources in North Maluku sea waters is estima ted to reach 69,438,248 tons/year. The large amount of potential is due to the area of sea as the largest are a of North Maluku region, which is 70.08% [1]. This fishery potential consists of pelagic fish species suc h as pelagic fish with percentage of 60% consisting of large pelagic fish such as tuna and small pelagic fis h such as flying fish, mackerel, and anchovies and 40% of demersal fish group of grouper and snapper fis h. Seeing the large potential of demersal fish, it is still possible to be developed. One of the tools used to c atch demersal fish is the fishing traps.

Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.
Published under licence by IOP Publishing Ltd

Fishing traps is a trap that has one or two entrances commonly known among fishermen. Fishing t raps is a type of fishing equipment that is passive or sedentary based waters aimed at catching demersal fi sh. In relation to the number of fish to be caught, the determination of the fishing area is based on the plac e where many demersal fish are predicted, usually marked by the number of coral reefs or the experience of the fishermen. Increasing the number of catch by using the fishing traps while maintaining the sustaina bility of resources can be done, that is by attracting the fish. To attract the attention of fish to get into the f ishing traps, then some treatments are given into the traps such as bait feeding, in the form of organic mat erial which in principle can provide reactions to fish to be attracted into the fishing traps. Ayodhyoa know s that the big or small size of the reaction of the bait will depend on the nature of the bait used, the approp riate conditions, and the nature of the fish itself.

The baits put in fishing traps are in the form of intestines of village chicken, broken white cerami c plate, and rough fish. These three types of bait can be a food stimulant for demersal fish to enter and ge t trapped in the traps. Agood bait should meet requirements that are easily accessible, have a distinctive o dor and taste so they can attract fish or other organisms that are meant to be caught. Based on the above, it is necessary to do research on the comparison of organic and anorganic types of bait to the amount of the catch from fishing traps while maintaining the sustainability of fish resources in the waters of South Tern ate.

This research aims to determine the amount and composition of the fishing traps with different ty pes of bait on catching demersal fish in the waters of South Ternate. While the benefits of this research is as an information for fishermen about the best bait feeding treatment to increase the optimal catch amount to increase the income of fishermen while maintaining the sustainability of fish resources in the waters.

2. Methodology

2.1. Procedure of the Research

This research was conducted for two months from May - June 2016 in the waters of South Ternat e City District in North Maluku Province. Materials and research tool used in this research are bait (intesti nes of village chicken, broken white ceramic plate, and rough fish), 1 unit kite currents, 1 unit of stop wat ch, 1 unit of fishing vessel, 4 units of fishing traps, 1 unit of scales, 1 unit of fish finder, 1 unit of salinom eter, 1 unit of thermometer.

Four fishing catch units with different baits are randomly operated by 16 trips in the same fishing area as sandy or roundabout waters. The distance between one fishing traps and the other one is $\pm$ 10 m in $\pm$ 12-17 meter of depth and the duration of soaking the tool is 24 hours.

Data of the catch is the number of catches from the fishing traps being calculated per experiment unit of each hauling (kg/unit/hauling) with the composition of type of catch from the fishing traps being c alculated per experiment unit of each hauling (%/unit/hauling). Other supporting data are data of current v elocity, salinity, temperature and water depth.

2.2. *Data Analysis*

1. To determine the influencing of using baits on the catch, then used a randomized block design on the SPSS 20 program whose mathematical model is:

   $$Y_{ij} = \square + \square_i + \square_j + \square_{ij}$$

   Where:

   Y_{ij} = Response or observation value of the variable from the ith treatment and the jth blo ck

   μ = General average

   $\square_I$ = The influence of ith treatment

   $\square_j$ = The influence of the jth block

   $\square_{ij}$ = The influence of experimental tool due to ith treatment and the jth block

2). A composition of the type of catch is identified by using a book of important types of fisheries econo mics. If there are unknown fish species, they will be identified using Taxonomy and Identification of Fish [2]. At the same time, to know the composition of catch type per experiment unit uses Krebs' for mula, that is [3]:

Where: P = Percentage of number of catches (%)
ni = Number of individuals of each type (tail)
N = The total number of fish caught (species)

3). Current velocity is calculated using the formulation:

$V = S / t$

Where: V = Current velocity (m/s)
S = The length of the water-leased straps (m)
t = Time required (s)

3. Result and Discussion

3.1. Fishing Area and Season of the Catch

The area of operating fishing traps during the study was carried out on areas with sandy and cragg y bottom waters with a depth of about 10-17 meters. The fishing area during the research is the waters in Ngade sub-district, South Ternate District (Figure 1). According to Suhadja, the requirements of the fishin g ground for the fishing traps are that the bottom of the waters consist of sandy and craggy areas, grow wi th a depth of 10 to 200 meters, have abundant fish stocks to be caught, have large areas, and have low tide [4].

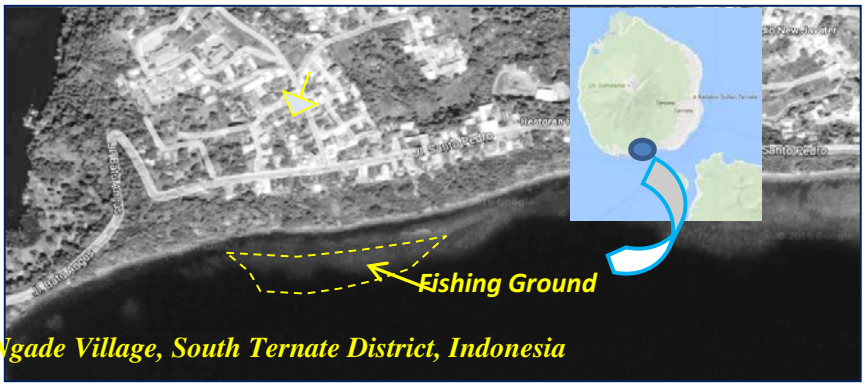


Figure 1. Fishing Ground During the Research

The oceanographic condition of the fishing area during the research was good enough for the life of demersal fish. The current velocity of the fishing area ranges from 0.09-0.1 meters/sec with an average of 0.1 meters/sec. The current velocity is thought to be sufficiently good for the operation of the fishing tr aps because the traps are in equilibrium condition. This assumption is consistent with the opinion of Raha rdjo and Sanusi, which states that fish generally swim against the current and will swim faster than the cur rent if it follows the current. If thecurrent is weak, the fish usually swim against the current [5]. The fish b ecome passive in waters where temperatures are very low and they allow themselves under the current. T he assumption is reinforced by Gunarso who suggested that the fish use the ocean currents to spawning, f oraging or in connection with the their development process.

The depth of the waters in the fishing area ranges from 12-17 meters. This depth is presumably sti ll suitable for the installation of fishing traps. This opinion is in line with Syahrodin and Suhadja stating t hat the conditions of the fishing area using fishing traps is the sandy and craggy water base with a depth o f 10 to 200 meters. This opinion is reinforced by Ismail, who revealed that demersal fish includes into the important economical fish group, the price is relatively expensive, its catchment is done in coastal waters up to a depth of 80 meters.

A good fishing area is not the only factor that influences the optimum of fishing operations with t he fishing traps but the other factors that are equally important is the seasonal factor. The seasonal factors greatly influence the distribution of fishing areas and the safety of fishermen and their fishing units. Fishi ng season using fishing traps in the waters of Ternate South City can be seen in Table 1.

Table 1. Coral Fishing Season in the Waters of South Ternate

No.	*Musim*	*Bulan*											
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1	Puncak												
2	Biasa												
3	Paceklik												

Source: Primary Data 2016

Table 1 shows that the peak of the reef fishing season lasts for 3 months between March and May. In those months the number of catches using fishing traps can reach maximum results. The regular season lasts for 6 months between June and November. In those months the number of catches using fishing trap s is very uncertain. The famine lasts for 3 months from December to February. In those months the catch is generally very low. In famine season fishermen generally do not do fishing operations using fishing tra ps but using other equipment.

3.2. Fishing Operation

The fishing operation is done after arriving in the fishing area. Fishing operations are carried out by setting fishing equipment, soaking the equipment and hauling the equipment out of the water. In gener al, fishing operation using fishing traps consists of three stages such as lowering fishing equipment, soaki ng the equipment and hauling the equipment.

a. Setting the Fish Equipment

The setting of fishing equipment is done upon arrival in the fishing area, whereas the equipment i s lowered shortly after the fisherman checks the condition of the waters such as the current velocity, depth and water base conditions. The process of setting the fishing equipment is started by preparing the baits in the fishing traps; then the traps is lowered to the bottom of the rocky waters. After the trap is lowered, the fishing vessel is directed towards the beach while holding out the towing rope. The towing rope is directe d towards the beach so that at the time of the hauling, it will be easy to get the towing rope equipped with a life rope. The fishing traps are lowered generally at 17.00 - 18.00 of East Indonesian Time because at th at time the water condition is generally good.

b. Soaking the equipment

The fishing traps are soaked under the waters for approximately 1 day; this period of soaking is b ased on the knowledge of local fishermen for the effectiveness of the tool and also the consideration that organic bait will decompose if it takes too long to be under water and the catch inside the traps will die an d rot.

c. Hauling the equipment

The hauling is carried out after 1 hour of soaking; starting with the lifting of the sign buoy, the wi thdrawal, and it ends with hauling the fishing traps. The hauling process generally takes about 30 minutes. After the hauling is done, it proceeds to collecting the catch which is subsequently carried out by the repla cement of organic feed. At the end, the equipment is lowered back.

3.3. *Number and Type of Catch Result*

The total catch obtained during the research in 16 trips was 1,390.5 kg, consisting of a variety of i mportant economical reef fish; major and minor reef fish species. Fish types from each family can be seen in Figure 2 and Figure 3. Types of fish from the *Pomacentridae* family is the type of major fish, the type of fish from the *Seranidae, Lutjanidae, Letrinidae, Siganidae*, and *Haemulidae* families are important eco nomic fish type; the type of fish from *Acanthuridae* and *Labridae* families are the type of minor fish.

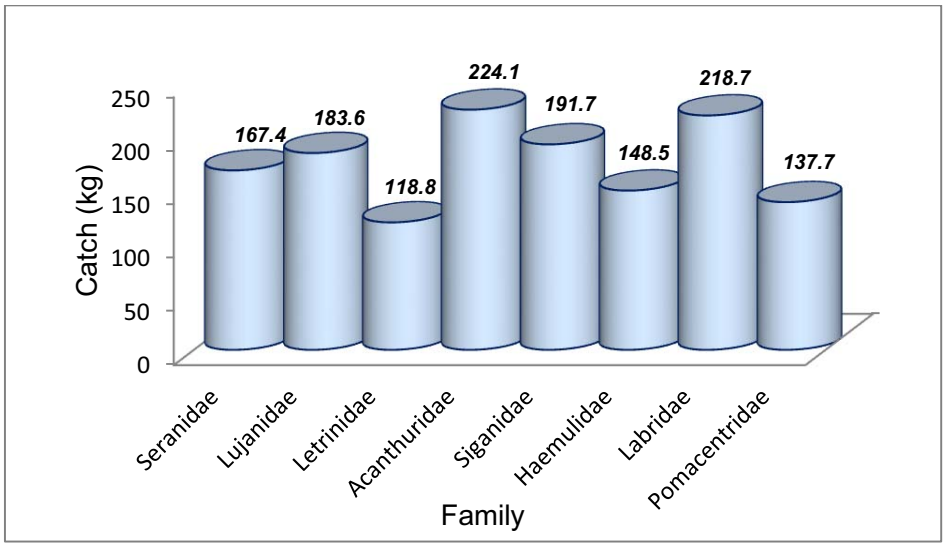
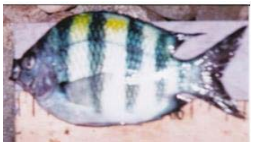


Figure 2. The Catch from Fishing traps per Fish Family During Research





Family Acanthuridae *Family Pomacentridae*





Family Lethrinidae *Family Labridae* *Familiy Siganidae*





Family Lutjanudiae *Family Seranidae* *Family Haemulidae*

Figure 3. Types and Family of Catch from Fishing traps

The distribution of the catch by types of bait in each trip during the research is presented in Figur e 4. It is seen that the number of catches in the fishing traps using different types of baits gives different r esults. The highest number of catches from fishing traps is found in the white ceramic plate bait with a tot al weight of 513 kg and the average of 32.06 kg/trip; it is followed by a rough fish bait with a total of 410. 4 kg and an average of 25.65 kg/trip; then chicken intestine bait with a total of 237.6 kg and an average of 14.85 kg/trip and the last one is without a bait (control) with a total of 229.5 kg and an average of 14.34 k g/trip. The results of this research differ from the results of research conducted by Riyanto et al who obtai ned that the use of natural bait as a whole had a better effectiveness for grouper fishing using fishing traps than artificial baits, whereas the results of this research showed that the use of inorganic bait was better th an organic/natural bait [6].

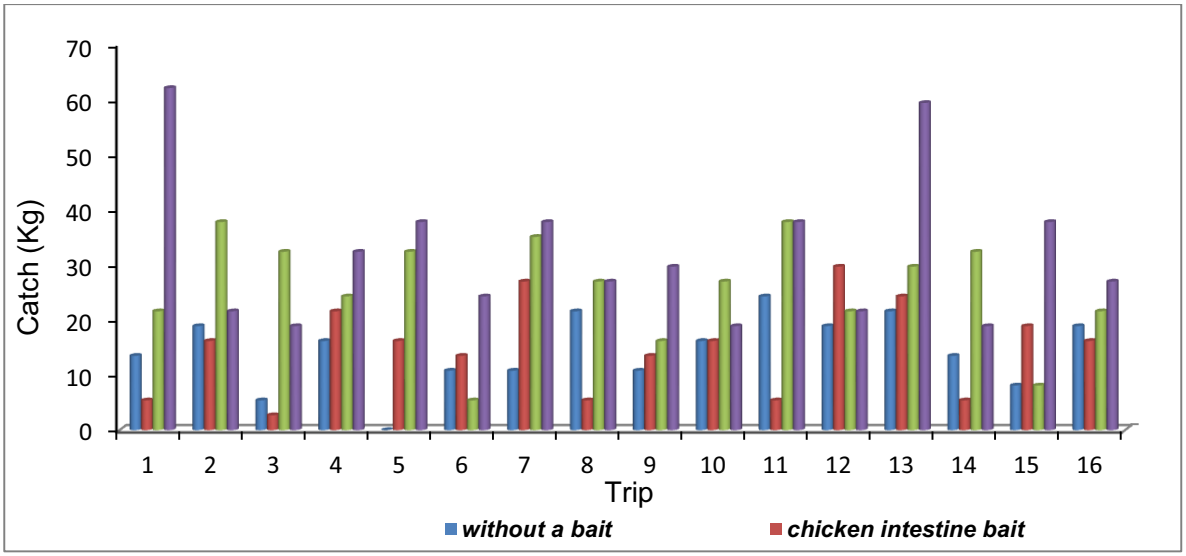


Figure 4. Distribution of Fish Catch by Type of Bait/Trip

The high catches on white ceramic plate baits are suspected because fish are stimulated based on t he sense of sight and the lateral line. Fish caught in white ceramic plate baits caused by the glow of the lig ht produced by the bait and the shape of the object from the bait, because the fish always want to know a f oreign object; this stimulates the fish to get into the fishing traps. The above assumption is based on the o pinion of Gunarso, that the eligible baits are to stimulate the senses of vision in the fish resulting from the glow of light, movement, the form produced by the baits. Gunarso in Kantun et al (2014) suggests that go od bait in any fishing operation should have a contrasting color to the color of the waters. As the fish has t he ability to distinguish colors, it is usually more interested in objects that have contrasting or glossy whit e colors [7].

The catch of fish using intestine of village chicken and rough fish as baits is due to the fact that fi sh are stimulated based on the sense of smell and taste. Fish caught on both bats are affected by the smell, color, shape of the object produced by the bait so as to attract the fish to get into the traps. Research on ch emical stimuli has been done by several experts, among others Tester, et al. in Labaro et al. [8], who tried tried to attract the attention of fish by using anise (fennel) in bait and other substitutes containing cumin, k anfer, musk oil and fanily as odors in long-line fishery, however the results of the experiment were not ye t satisfactory and could not be applied to commercial fisheries [9]. Moreover, Arendege et al. and Watem et al. found that the use of extracted baits in the Traps gives a significantly better catch than the non-extra cted baits [9] [10].

The catch of fish on the fishing traps without baits is not due to the sensation of sight or sense of s mell but to the fact that the traps are taken as place to hide and take shelter, the resting place when the fish migrate. Gunarso in Yudha stated that fishing traps can serve as a place to hide or shelter for fish [11].

The result of F test (Table 2) using randomized block design can be seen that in the treatment using baits, the value of F_{count} is 13,017 with significance value (sig) is 0.000 smaller than □/alpha 0.05, so it ca n be concluded that the treatment with different types of baits has a significant influence on the catch fro m the fishing traps. Similarly, the results of Reppie and Bab, et al. found that different types of bait on *pa ralon* traps have a very real influence on reef fish catches in Lembeh Strait [12]. Furthermore, in the furth er test (Table 3) it can be seen that the traps catch without using bait has no significant influence on the tr aps catch using village chicken intestine but it has a significant influence on the traps catch using rough fi sh baits and white ceramic plates bait.

The traps catch using chicken intestine bait has no significant influence on the catch without bait bu t has a real influence on the traps catch using rough fish and white ceramic plate baits instead. Further test results also show that the traps catch between rough fish and white ceramic plates has no significant influ ence. The difference of catch is assumed due to the attraction of the fish species to the different types of b aits. The above assumptions are consistent with those proposed by Gunarso that the bait on fishing operati on is useful for attracting fish or other organisms meant to be caught [7]. The eligible bait stimulates the s ense of sight, the sense of smell and taste in the fish as a result of the motion, color, shape and odor of the bait provided. Furthermore, the catch of fish on the fishing traps is due to the fact that the fish enter into t he traps for shelter and hiding which eventually trapped them from getting out.

Table 2. F test results on the number of catches (kg/trip) from ground Fish Trap with Different Types of bait.

SD	JKT	db	JK	F	Sig.
Intercept	41.441	1	41.441	329.145	.000
Umpan	4.917	3	1.639	13.017	.000
Hari	2.166	15	.144	1.147	.346
Eror	5.666	45	.126		
Total	54.190	64			

Table 3. Advanced Test Results (Tukey HSD)

	Umpan	N	Subset	
			1	2
Tukey HSD[a,b]	Tanpa Umpan	16	.5313	
	Usus Ayam	16	.5500	
	Ikan Rucah	16		.9500
	Piring Keramik	16		1.1875
	Sig.		.999	.245

3.4. ***Composition of Type of Catch Result***

The catch with a large number of species is then grouped in a family of reef fish amounting to 8 f amilies (Figure 5). The catch result and composition of the reef fish during the research can be seen in Fig ure 8. The highest catch is found in fish species of *Achanturidae* family and fish species from *Labridae* fa mily with 16% composition which is major fish species in coral reef ecosystem, while the lowest catch is in the fish type of *Letrinidae* family with the composition of 8% which is the type of important economic fish or fish species for consumption.

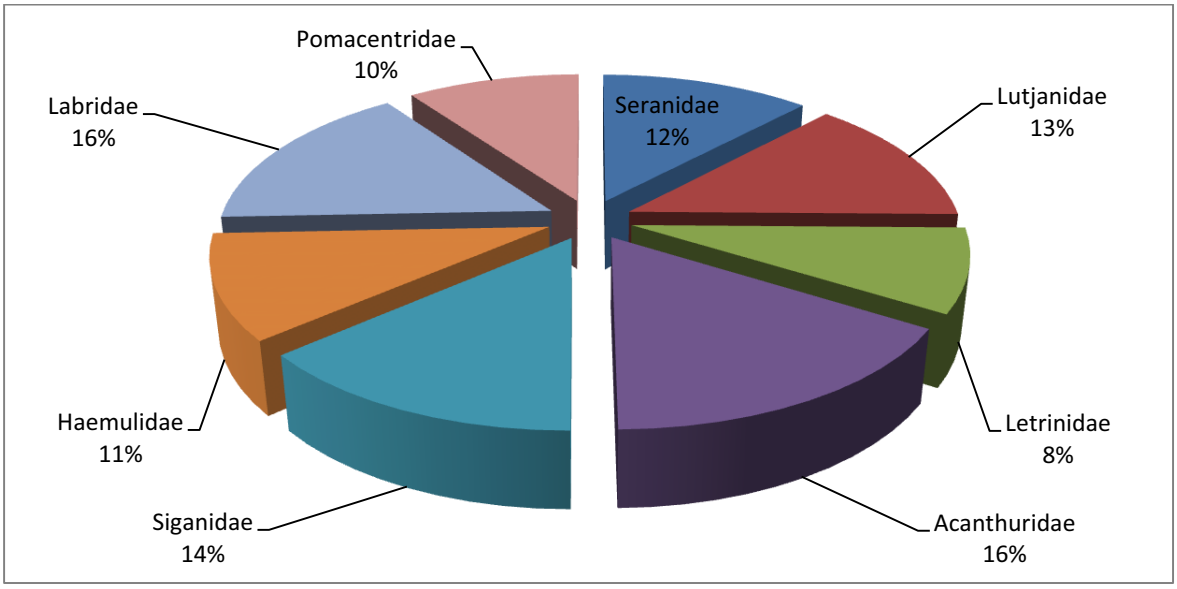


Figure 5. Composition of Catch Result from Fishing traps Per Family Fish During Research

4. Conclusion

The results of the research showed that the use of different types of baits had a significant influen ce on the fishing traps with the highest production found in the white ceramic plate bait type and the lowe st production found with no-bait treatment, with the number of catches from the fishing traps during the r esearch was 1,390.5 kg spreading on traps with ceramic plate was 513 kg, with rough fish was 410.4 kg, with village chicken's intestines was 237.6 kg and without baits was 229.5 kg with the composition of hi ghest catch was found in fish species of *Achanturidae and Labridae* family with a composition of 16% w hich is a major fish species in coral reef ecosystems and the composition of the lowest catch was in the fis h species of *Letrinidae* family with the composition of 8% which is an important economic fish or type of fish for consumption.

References

[1] Department of Marine and Fisheries of North Maluku Province, (2015). *Data Potensi Perikanan Mala ku Utara* (Data of North Maluku Fishery Potential). Maluku.

[2] Saanin. H., (1984). *Taksonomi dan Kunci Identifikasi Ikan* (Taxonomy and Key Identification of Fish) . I and II Edition. Binacipta Publisher. Bogor.

[3] Sudjana, (1982). *Metode Statistik* (Statistical Method). 5th Edition. Tarsito Publisher. Bandung.

[4] Nontji, A., (1987). *Laut Nusantara*. Djambatan. Jakarta.

[5] Rahardjo, S and Sanusi, H. S, (1978). *Oseanografi Perikanan* (Fisheries Oceanographic). Department of Education and Culture. Jakarta.

[6] Riyanto, M., Ari Purbayanto., and Budy Wiryawan., (2011). *Efektivitas Penangkapan Ikan Kerapu M acan (Epinephelus fuscoguttatus) Dengan Bubu Menggunakan Umpan Buatan* (The Effectiv eness of Fishing of Tiger Grouper with Traps using Artificial Baits). HARPODON BORNE O Journal, Volume 4 Number 1, April 2011. ISSN: 2087-121X. Pages 21-32.

[7] Kantun, W., Harianti and Sahrul Harijo., (2014). Respon Ikan Demersal Dengan Jenis Umpan Berbed a Terhadap Hasil Tangkapan Pada Perikanan Rawai Dasar (Demersal Fish Response with Di fferent Bait Types of The Catch on The Basic Longline Fishery). Balik Diwa Journal, Volum e 5 Number 1 January-June 2014. Pages 30-35.

[8] Bab. W., Ivor L. Labaro and Emil Reppie. (2014). *Pengaruh Beberapa Jenis Umpan Pada Bubu Para lon Terhadap Hasil Tangkapan Ikan Karang Di Selat Lembeh* (The Influence of Some Types of Baits On Reef Fish Catch from Paralon traps in Lembeh Strait). Journal of Science and Te chnology of Capture Fisheries, June 2014, ISSN 2337-4306, Volume 1 Number 5, Pages: 16 0-164.

[9] Arendege, J. C., Emil Reppie and Ivor L. Labaro. (2015). *Pengaruh Ekstrak Goldenfish Pada Umpan Bubu Dasar Terhadap Hasil Tangkapan Ikan-Ikan Karang* (The Influence of Goldenfish Ext ract On Reef Fish Catch from fishing traps). Journal of Science and Technology of Capture F isheries Volume 2 Number 2, December 2015. ISSN 2337-4306. Pages 78-82.

[10] Watem, T. M., Henry J. Kumajas and Fanny Silooy. (2015). *Pengaruh Penambahan Ekstrak Minyak Tenggiri Pada Umpan Bubu Terhadap Hasil Tangkapan Ranjungan Di Perairan Malalayan g, Kota Manado* (The Influence of Addition of Mackerel Extract on Traps Baits on the Catch of Crabs in Malalayang Waters, Manado City) . Journal of Science and Technology of Captu re Fisheries, ISSN 2337-4306, Volume 2 Number 1 June 2015, Pages: 23-27.

[11] Yudha I. G., (2011). *Kajian Penggunaan Kamuflase Buatan Pada bubu Karang Untuk Mengurangi Kerusakan Terumbu Karang* (Study of the Use of Artificial Baits in Coral Traps to Reduce D amage to Coral Reefs). Mitra Bahari Journal, Volume 5 No. 2, May-August 2011. ISSN : 02 16-484, Pages 70-80.

[12] Reppie, E. (2010). *Pengaruh Minyak Cumi Pada Umpan Bubu Dasar Terhadap Hasil Tangkapan Ik an-Ikan Karang* (Influence of Squid Oil on fishing traps of Reef Fish Catches). Journal of Fis heries and Tropical Marine Vol. VI-3, December 2010. Pages: 141-144.