THE PERFORMANCE OF TRADITIONAL AND SYNTHETIC TRAPS SET ON AMBON BAY

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***Abstrak** : Hasil tangkapan bubu dianalisa untuk menguji apakah bubu termasuk alat yang ramah lingkungan. Pengamatan dilakukan terhadap bubu tradional dan bubu sintetik yang dioperasikan pada perairan sekitar terumbu karang Desa Rumah Tiga Teluk Ambon. Dari 260 ikan hasil tangkapan bubu, jumlah tangkapan dan keragaman hasil tangkapan dianalisa dengan menggunakan Student t-test dan menunjukkan hasil yang sama untuk kedua jenis bubu. Demikian pula dengan proporsi by-catchnya. Dari 13 family ikan yang tertangkap, jenis ikan yang dominan merupakan ikan yang bernilai ekonomis penting (Plotosus sp and Parupeneus indicus) dan rata-rata porporsi by-catch kedua bubu kurang dari 50%. Sebagai alat tangkap yang multispecies, bubu dapat dikatakan sebagai alat yang ramah lingkungan sepanjang daerah penangkapannya tidak dilakukan di daerah pembesaran ikan.*

***Keywords**: Traps; Catch diversity; By-catch proportion; Eco-friendly fishing gear*

INTRODUCTION

Fishing technology by using traps has been known all over the fishing areas in the world in the scale of traditional up to industrial. In the traditional scale of trap fisheries, fishing operation covers coastal area using small boats or cannoe, on the other hand, ships are occupied in the industrial trap fisheries. Fish trap (or "bubu") is a fishing gear which is constructed to invite fish to get in whithout willingness to escape. The shape of trap can be varied, however, the function is similar that fish entering the trap by primarily motivated for refuge (Dalzell and Aini, 1992). Tradisional trap generally made from natural materials such as bamboo, rattan and mangrove sticks, which is twisted and shaped like cylinder, arrow head and box. Number of entrance can be one or two. Synthetic trap can be made from net materials, wire mesh and welded mesh. The frame of iron, chrom or alumunium form mostly rectangular trap with single entrance.

In the aspect of trap construction, size of entrance and mesh size of the body are the most important factors to distinguish the size of fish caught (Robichaud *et al*, 1999; Jeong *et al*, 2000). More non-target catch means the diversity of catch is high. More small fish catch means the gear is not selective. High diversity and non selective fishing gear are chategorised as non eco-friendly fishing gear (Monintja *et al*, 2002). Therefore, the variables of fish number and fish size indicate the characteristic of fishing gear, whether it is a sound fishing gear or not. The question arrised: which mesh size catch adult of big fish and

produce low diversity of catch. The result of Sheaves (1996) showed that the using of small mesh size produce catch with low diversity while Dalzell and Aini (1992) caught high diversity of fish by using big mesh size. The condition also showed by Matrutty *et al* (2006) and Hutubessy and Mosse (2007). Those results may not be concluded that small mesh size of traps will produce better catch. It is therefore, to answer the above question, 2 kinds of traps were experimented, one is tradisional trap made from bamboo and the other is a synthetic trap with small mesh size of net. The objectives of this research are

a. To measure the diversity of fish caught by traps as the criteria of eco-friendly fishing gear
b. To analyse the effect of different traps to the number and size of the catch
c. To estimate the by-catch production as an indicator of echo-friendly fishing gear.

METHODOLOGY

Two traps with specification in Table 1 were applied in this study. During two months observation from December 2007 to January 2008 with 10 replications, traps were set in the area of Rumah Tiga waters in 5 to 10 meters depth with 5 to 20 meters distance between traps. Setting and hauling were conducted in the morning with 2 to 3 days elaps.

Two cannoes were apllied to carry the traps for the process of setting and hauling. The catch were put in the cool box to keep it fresh for subsequent treatment such as identification (following Allen and Swainston, 1988) and measurement the Total Length (cm) and the weight (gr).

Due to each kind of trap was representated singlely, while both constructions were different, especially the size of entrance, the appropriate data analyzing used is a Student t-test with hipothesis: Number of catch has no different between synthetic and tradisional traps. This analysis was also applied for the value of diversity and proportion of by-catch.

In order to fit into the criteria of eco-friendly fishing gear following Monintja *et al* (2002), Shannon Index was applied to analyse the diversity of catch.

$$\mathbf{Hi = - \sum pi \ln ni/N}$$

where ni : number of individual spesies i

N : total number of individual fish from all spesies

pi : ni/N

Diversity index analysis was continued by by-catch proportion analysis. Although the diversity is low but the majority of fish is included as non-targeted

species, it is therefore, trap is unlikely chategorised as eco-friendly fishing gear. Proportion of by-catch is the ratio of non-targeted and the whole catch showed in percent (%).

RESULT AND DISCUSSION

Study Site description

A Rumah Tiga waters is located at the outer part of Ambon Bay. Two river mouths which are Wailela and Wailete rivers are situated on this site. The coastal area is mostly covered by sandy beach with sea grass bed at the shallow part and coral reef at the deeper area. This site may be stated as estuarine waters where many young fishes spend as a nursery area. Fishing provides most of the animal protein consumed, fish less than 10 cm long are marketable.

This study site is a moderate-exploitation site where quite number of traps can be seen around the area. Gillnets were also set by the fishers in this area. Fishers also employ hand lines and spear guns near the study area. All fisheries in Ambon Bay are totally unregulated.

Catch Composition

The total catch of this study was 260 individuals of fish which represented 16 species and 13 families (Table 2). Synthetic trap caught 178 fish from 16 species while tradisional trap caught 82 fish from 13 species. The catch of synthetic trap was dominated by 80 individuals catfish (*Plotosus sp*), followed by 15 individuals of toadfish (*Arothron manilensis)*, 11 individuals scorpion fish (*Synanceja sp*) and sweetlips *Diagramma pictum*. Traditional trap caught 21 individuals goatfish (*Parupeneus indicus*), followed by banner fish (*Heniochus acuminatus*) and 8 individuals of acanthurids (*Acanthurus sp*).

The composition of edible fish such as goatfish, surgeonfish, sweet lips, rabbit fish, catfish, scad, parrot fish and emperor were 69.1% and 52.4% for synthetic and traditional traps, respectively. In total, 63.8% of edible fish composed the catch of traps. The rest were included as by-catch (36.2%) which consisted of poison fish (scorpion fish, puffer fish and toad fish), ornament fish (butterfly fish and banner fish).

Comparing to the fish resources around the study site, fish captured by traps depent on the abundance of fishes in surrounding areas (Ferry and Kohler, 1987; Koslow *et al*, 1988). Inventarisation of sea grass bed fishes done by Anonymous (2007) at the Tiram Cape (close to Rumah Tiga waters), colected 61 species of fish.

Four species from that study were caught by the traps during 10 times of observation. Bigger fish may travel further from its habitats to seek food and refuge. The Student t-test showed no difference between number of fish caught by neither synthetic nor the tradisional traps (t = 1.0826; P = 0.153). This indicates that both traps provided similar attractiveness to fish finding refuge. The successful of trap fishery does not depent on the type of traps, however, it depends on the fish assemblages at the fishing ground. Therefore, trap fisheries seem to be an appropriate approach in assessing demersal fish stock in a particular area.

Catch Diversity

Diversity indeces of the catch during the observation could be seen on Table 3. The lowest value of diversity (Hi = 0.26331) occurred in the catch of synthetic trap, while the highest (Hi = 1.58109) was in the catch of traditional trap. The value of diversity for each catch varied between low diversity (Hi < 1) and intermediate diversity (1 < Hi < 2). Which of these two kinds of trap is sound? The Student t-test showed that both constructions have no difference in diversity (t = 0.743; P = 0.473). Small mesh size of the synthetic trap allows fish entering the trap through the mouth of entrance funnel, it does not mean that bigger mesh size of traditional trap allow fish came in through the net as well. In the same site and the same fish assemblages, both traps showed similar performance though the construction was different.

In the criteria of eco-friendly fishing gear, both traps are included in this criteria due to its cacth during 10 trips showed no high diversity (Monintja *et al*, 2002). Futhermore, by-catch analysis will strengthen this result. By-catch of traps during this study includes all fishes which has no economical important value such as poison fish, ornament fish and non-fish (Stewart and Ferrell, 2003). This proportion did not include fish below the minimum legal size of fish (juveniles) due to the minimum legal size has not been established yet. In this study, proportion of by-catch varied between 0 to 100% with average of 48.12% for synthetic trap and 40.18% for traditional trap. The Student t-test showed no difference proportion of by-catch between both traps (t = 0.684; P = 0.511). For the mean time, both traps could be chategorised as sound fishing gear. However, if there is a law of minimum legal size of fish, this chategory will change and needs further research in size selectivity of traps. In The New South Wales trap

fisheries, the proportion of by-catch was between 41 to 68% for legal size of traps (Broadhurst, 2008). This by-catch has to be released to the sea water in good condition. This is a good illustration and example for trap fisheries in Indonesia in order to achieve sustanainable fisheries.

Catch size

This study has documented the sizes of important species captured in the trap (highlighted species in Table 4). This finding shows that both trap caught more small fish than bigger size. Related to the study site, it seems that this study site is likely to be a nursery area for some species. More juveniles were traped such as emperor and parrot fish.

Due to trap is complex multispecies fishing gear, any changes in trap mesh and entrance size will reduce small fish for certain species but will negatively impact to other species (Stewart and Ferrell, 2003). It was mentioned before that the minimum legal size of fish has not been established yet, however, when it was established, it will be many kind of minimum legal sizes of fish which is highly varied. For example, in Australian fisheries, emperor and parrot fish have the minimum of legal size is 30 cm (Anonymous, 1997). For some snappers, this size varied between 25 to 40 cm, and some groupers are about 40 cm. If the trap was constructed to be selective for emperor and parrot fish, it will be not selective for groupers.

It is therefore, to be an eco-friendly fishing gear, trap must be sited in the deeper areas. It is generally known that mostly larger adult demersal fishes inhabit deeper bottom part of the reef while the young fishes prefer shallow waters (Williams and Hatcher, 1993). In overall, this study concluded that trap is multispecies gear but has little impact to the ecosystem and fish population. To avoid small size of fish captured, trap has to be set in the deeper areas.

REFERENCES

Anonymoys, 1997. Guidance for line fishing. Department of Primary Industry, Queensland. 48 pages.

Anonymous. 2007. Inventarisasi sumberdaya laut Teluk Ambon. Laporan Tahunan. UPT. Koservasi Hasil Laut LIPI Ambon. Hal 54-57

Allen, G and Swainston. 1988. Marine fishes of Western Australia. A Field guide for anglers and divers. Western Austrlian Museum, Victoria. 292 pages.

Broadhurst, M. 2008. Estimating and maximizing the survival of key species released by recreational fishers in NSW. Saltwater and Freshwater trust. Application for

funds. Recreational fishing trust, NSW Australia. 5 pages.

Ferry, R.E. and C.C. Kohler. 1987. Effects of traps on fish population inhabiting a fringing coral reef. North American Jurnal of Fisheries Management 7: 580-588

Hutubessy, B.G. and J.W. Mosse. 2007. An Experimental fishing operation of collapsible trap for small scale reef fishing. Journal of Fisferies Science, UGM. Vol. IX No. 2 : 267-273

Jeong, E.C., C.D. Park, S.W. Park, J.H. Lee and T. Tokai. 2000. Size selectivity of trap for red queen crab Chionoecetes japonicas with the extended SELECT model. Fish.Sci 66: 494-501

Koslow, J.A., F. Hanley and R. Wicklund. 1988. Effects on fishing on reef fishes communities at Pedro Bank and Port Royal Cays, Jamaica. Mar.Ecol.Prog.Ser 43: 201-212

Matrutty, D.D.P., S. Siahainenia and A. Tupamahu. 2005. Fishing technology with portable trap bubu in coral reef area of Pulau Tiga, Western Ambon Island. Abstract of International Workshop of Eco-friendly coral reef fisheriy. Ambon. P. 22

Monintja, D., S. Mardjani dan Sarminanto. 2002. Metode seleksi teknologi penangkapan ikan yang ramah lingkungan dan berkelanjutan di kawasan terumbu karang. Konferensi Nasional III 2002. Pengelolaan Sumberdaya Pesisir dan Laut Indonesia. Prosiding. Bali.

Robichaud, D., W. Hunte and H.A. Oxenford. 1999. Effect of increase mesh size on catch and fishing power of coral reef fish traps. Fisheries Research 39: 275-294

Sheaves, M.J. 1995. Habitat-specific distribution of some fishes in a tropical estuary. Mar.Fish Water Res. 47: 827-830

Stewart, J. and D.J. Ferrell. 2003. Mesh selectivity in the New South wales demersal trap fishery. Fisheries Research 59: 379-392

Williams, D.Mc. and A.T. Hatcher. 1993. Structure of fish communities on outer slope of inshore, midshelf and outer reefs of the Great Barrier Reef. Mar.Res.Prog.Ser. 10: 239-250

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Table 1. The specification of tradisional and synthetic traps

No	Dimension	Size	
		Synthetic trap	Tradisional trap
1	Length	2 m	m
2	Width	1 m	1 m
3	Height	80 cm	45 cm
4	Entrance funnel		
	• Mouth 1	35x20x50 cm	27x30x45 cm
	• Mouth 2	25x20x20 cm	4x12x23 cm
	• Mouth 3	20x20x20 cm	
5	Mesh size	1 inci	3 inci
6	Outlet pannel	25x25 cm	17x17 cm
7	Materials	Iron frame Net	rattan

Tabel 2. The catch of tradisional (TT) and synthetic traps (ST) during the observation from December 2007 to January 2008 at the Rumah Tiga waters, Ambon Bay

No	Species	Common name	∑ fish	
			ST	TT
1	Family Mulidae			
	Parupeneus barberinus	Dash-dot goatfish	2	21
	Parupeneus indicus	Indian goatfish	8	6
2	Family acanthuridae			
	Acanthurus sp	Surgeonfish	9	8
3	Family scorpaenidae			
	Synanceja sp	Scorpion fish	11	3
4	Family haemulidae			
	Diagramma pictum	Sweet lips	11	4
5	Family ostraciidae			
	Rhyncostracion nasus	Box fish	2	5
6	Family siganidae	Rabbit fish	8	3
	Siganus canaliculatus			
7	Family tetraontidae	Narrow-lined toad fish	15	6
	Arthron manilensis	Pufferfish	4	3
	Canthigaster sp			
8	Family Plotosidae	Catfish	80	0
	Plotosus sp			
9	Family chaetodontidae	Butterfly fish	9	1
	Chaetodon rafflesi	Banner fish	9	16
	Heniochus acuminatus			
10	Family carangidae	Oxeeye scad	1	0
	Selar boops			
11	Family scaridae	Parrot fish	1	1
	Scarus sp			

12	Family aulostomidae *Aulostomus chinensis*	Flutemouth	5	5
13	Family Lethrinidae *Lethrinus variegatus*	Emperor	3	0
		Number of fish	178	82
		Number of Species	16	13
		Number of Family	13	10

Table 3. Diversity indeces of catch of synthetic and traditional traps during 10 trips of fishing

Trip	Synthetic trap	Traditional trap
1	0.69314718	1.201367
2	1.0239288	0.6615632
3	0.9368883	0.9433484
4	0.6931472	0.6365142
5	0.5982696	0.6615632
6	0.673011.	0.69315
7	1.24068	1.03972
8	1.56742	1.06709
9	**0.26331**	**1.58109**
10	0.60017	1.04379

Table 4. Maximum and minimum size of fish caught by sdynthetic and traditional traps in Rumah Tiga Waters, Ambon Bay

		Synthetic trap		Traditional trap	
No	**Species**	TL max	TL min	TL max	TL min
1	*Acanthurus sp*	-	-	11	-
2	*Aulostomus chinensis*	25	17	16	-
3	*Arothron manilensisi*	29	-	29	-
4	*Chanthigaster sp*	11	8	39	9.8
5	*Chaetodon rafflesii*	12	5	15	-
6	*Diagramma pictum*	12	5	14	5
7	*Lethrinus variegates*	11.5	10	-	-
8	*Plotosus sp*	18	15	-	-
9	*Heniochus cuminatus*	11.5	-	21	-
10	*Parupeneus barberinus*	16.5	14	-	-
11	*Parupeneus imdicus*	27	12.5	28	14-6
12	*Rhyncostraction nasus*	22	-	21	14
13	*Scarus sp*	9.4	-	27.4	-
14	*Siganus canaliculatus*	17.9	-	21	14
15	*Selar boops*	22	-	-	-
16	*Sinanceja sp*	21	12.5	29	22