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SQUID EGGS ATTACHMENT AND FISH ASSOCIATION ON THE SQUID ATTRACTOR AGGREGATING DEVICE

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ABSTRACT

Indonesia reveals incommensurate movement between fishing and reproduction as well as growth of sea fishery commodities. This point can lead to overfishing problem so in order to solve it the enrichment program is required significantly, for instance, through aggregating device program. Research was done on October 2012 by drowning two shapes of aggregating device: quadrangular and cylindrical into Bangka Island's waters. The monitoring result after nine months shows that cylindrical aggregating device is more effective to attach the squid eggs than quadrangular one because it is covered and protected well. The other sea creatures found in the same location with the squid aggregating device are lutjanus lutjanus (kind of fish), softcoral, gastropoda dan krustace.

Keywords : Aggregating device, squid, squid egg, fish, macrobenthic

INTRODUCTION

Indonesia is the second highest exporter of squid as the non-fish commodities after shrimp. Squid prices in the market is high and stable enough. When fresh squids are abundant, those can be processed into typical products such as dried squid, salted squid, snacks, etc with a higher selling price as well. Though squid commodities can be cultivated but until now those still depend on fishing result in the sea.

Number of fleets and modernization of fishing gears are not accompanied by the enrichment program of squid stocks in nature. Pollution, fishing with chemical elements, sedimentation, and land conversion as development pressure have become some causes for the high rate degradation of squid spawning and rearing habitat in coastal areas. According to Baskoro et al based on their research in 2011, one of the effective and efficient technologies to develop the enrichment program of squid stocks in the future and squid breeding program design is squid attractor aggregating device. The research aims to observe the success of this kind of aggregating device which has been sunk as an area of squid eggs attachment, fish habitat and macrobenthos.

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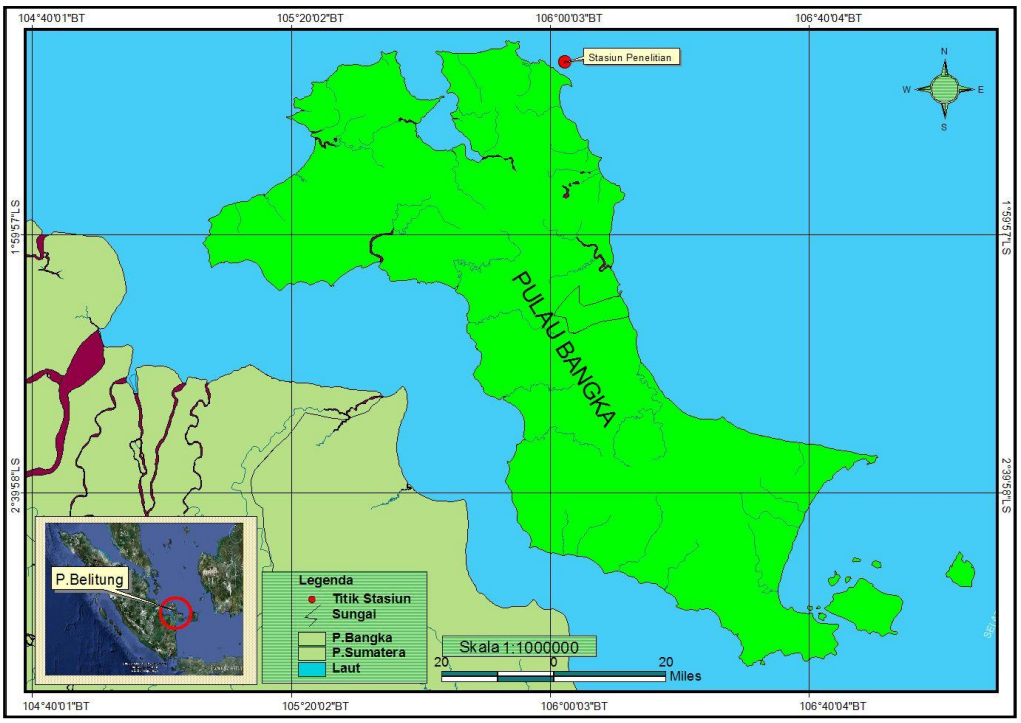
MATERIAL AND METHOD

1. Time and Place

Research was done in Tuing waters of Riau Silip sub-district, Bangka Island in Bangka Belitung Province for nine months from October 2012 to June 2013. Geographically, it is located on 01° 35,4' S dan 106° 01,8' E. The program is divided into three phases as follows:



(1) making the "aggregating device", (2) drowning, dan (3) monitoring.

Figure 1. Research Location Map

2. MATERIALS AND EQUIPMENTS

The main material of this research is modified squid attractor aggregating device consisted of two shapes such as quadrangular aggregating device made of wood with the size of 75 x 50 x 35 cm^3 and cylindrical one which is made of used-drum. Each of them will be given six pieces of attractors from organic material and drowned in order to provide better place for squids laying the eggs. The modification design can be seen in Figure 2, and 3.

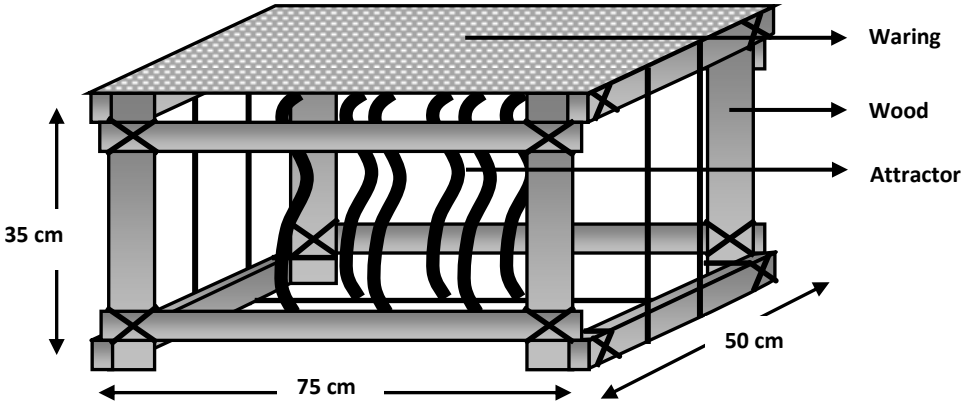


Figure 2. "Waring" cover box design for the first phase

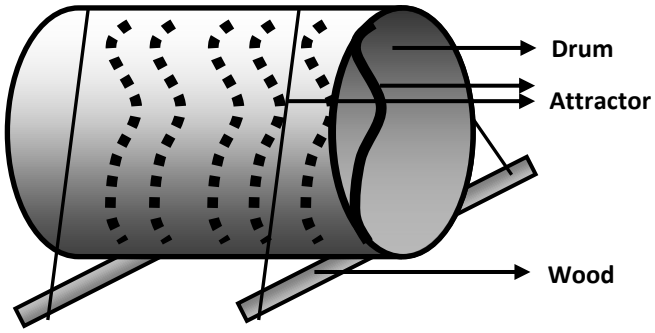


Figure 3. Cylindrical aggregating device design made of the used-drum

1. Squid Attractor aggregating device Drowning

Drowning location consists of two points in which each point has six units of squid attractor aggregating device with three units of each type so the total of the aggregating device is 12 units. The second point is in the area of marine waters with the assumption that between waters condition and the point of drowning is equal. The process was done on October 15, 2012. Aggregating device order at each point is drawn in Figure 4.

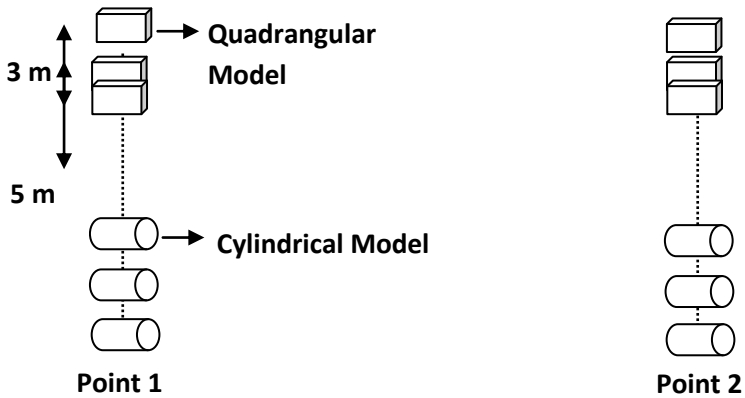


Figure 4. Pattern of squid attractor aggregating device order in territorial waters

2. Monitoring dan Analysing data

Data of squid eggs attachment was monitored three times, taken from the number and type of squid eggs attached to each unit of aggregating device per drowning point spot. To identify the type of squid eggs, researcher applied the Norman of 2003 and Roper of 1984. Meanwhile, the calculation of squid egg capsules monitored about five times on 18 November, 8 December 2012, 30 March 2013, 20 April and 25 Mei 2013 has the same time with fish monitoring through Underwater Visual Census (UVC) method with radial transect (Hill, J. & C. Wilkinson: 2004). Samples of squid wet preparat were analyzed directly in the Zoological Museum of National Institute of Sciences (LIPI) Cibinong - Bogor. In addition, to identify fishes, the book entitled "Indonesian Reef Fishec" Volume 1, 2, and 3 by Kuiter, H. Rudi & T. Tonozuka: 2003; and the book entitled "Marine Fishes of South - East Asia" by Gerry Allen in 1999 were used. For the analysis of attachment of squid eggs on two types of aggregating device, t-test was applied to find out the difference between two types of aggregating device.

RESULT AND DISSCUSION

1. The Attachment of Squid Eggs

Squid attractor aggregating devices that have sunk are attached by a kind of squid eggs namely Bangka squid (Loligo chinensis). No other squid eggs from other species is found during the monitoring process attached to the squid attractor aggregating devices.

Table 1. The result of squid egg capsules attached to squid attractor aggregating device

Shape of Aggregating device	Squid Egg Capsules (Number)					
	1		2		3*	
Quadrangular	0	0	0	0	-	139
	0	0	0	0	-	135
	0	0	0	0	-	6
Cylindrical	37	0	159	78	-	-
	890	218	138	230	-	-
	757	276	37	66	-	-
Total	**1684**	**494**	**334**	**374**	**-**	**280**

Remarks : 1, 2, 3 = Time for monitoring

* = only three aggregating devices are left. Others are drifted on the wave of West season in the waters of Bangka Island.

Fish identification on squid attractor aggregating device yields 16 species of fish consisted of 10 families. For consumption, there are 7 species as presented in Table 2.

Table 2. Fishes found in drowning area of aggregating device.

No	Spesies	Family	Monitoring				
			1	2	3	4	5
1	*Synodus macrops*	Synodontidae				√	√
2	*Sorsogana tuberculata*	Platycephalidae			√		
3	*Epinephelus bleekery*	Serranidae	√			√	
4	*Cromileptes altivelis*	Serranidae					
5	*Cephalopolis boenack*	Serranidae					√
6	*Apogon cavitensis*	Apogonidae					
7	*Cheilodipterus parazonatus*	Apogonidae	√	√		√	√
8	*Selaroides leptolepis*	Carangidae				√	√
9	*Scolopsis monogramma*	Nemipteridae					√
10	*Pentapodus paradiseus*	Nemipteridae					√
11	*Lutjanus lutjanus*	Lutjanidae	√	√		√	√
12	*Lutjanus biguttatus*	Lutjanidae					√
13	*Upenesus tragula*	Mullidae			√	√	√
14	*Parupeneus pleurostigma*	Mullidae				√	√
15	*Siganus canaliculatus*	Siganidae				√	√
16	*Arothron stellanus*	Tetraodontidae	√	√			

Not only fish but also softcoral *Cerianthus* sp (Collin and Arnesson: 1995) such as gastropod of the Olividae family (Dharma: 1988), and crustacea like shrimp and crab were attached to quadrangular squid attractor aggregating device in the fifth monitoring at a depth of 3 metres.

Based on the monitoring results, cylindrical attractor aggregating device is preferred by squid as a place of the attachment with the percentage of 95.55% to the quadrangular one which is only 4.45%.

On the first and second monitoring, squid eggs were only found at cylindrical aggregating device. Cylindrical aggregating device is proper for the squids because the condition of aggregating device itself is more closed than the quadrangular one which is covered at the top only (Figure 4). According to Norman (2006), squid is a nocturnal animal which attaches the eggs in places that are considered safe. It means that the darker the place, the more protected the squid eggs especially from the current.

In addition, t-test analysis yields P-value in the amount of 0.008224 for the difference between the quadrangular aggregating device with a lid on and the cylindrical one. This diversity provides significant influence to the attachment of squid eggs with the P-value about <0,01.

Squids usually migrate in a schooling way. Their daily migrations are also influenced by the presence of predators and food spread. The adults generally migrate to spawning areas by schooling. For examples: Ommastrephid genus spawns in the offshore areas, while Loligonidae spawns near the coast (in shore). At the migration time to areas near the coast to spawn, the male squid of Loligo genus has been there before the females. Squid will leave polluted aquatic environment and find a better one (Sauer et al: 1999). Vertically, Loligo chinensis lives from coastal waters to a depth of 170 meters. This kind of squid is scattered in

western waters of Pacific Ocean, South and East China Sea, Japan, Arafuru Sea, northeastern part of the waters of Australia and New South Wales (Roper et al: 1984). Unfortunately, many Loligo chinensis have been catched by fishermen from Thailand, Hong Kong, and China (Norman: 2003).

Squids migrate horizontally in order to feed ground and find spawn area. The result of the squid migration of *Todarodes* pasificus in the waters of Japan shows that this squid migrate looking for food sources by following the distribution pattern of sea surface temperature to the Japanese Northern waters, while squids do migration to spawn by following the distribution pattern of chlorophyll-a to the Japanese Southern Water (Choi et al., 2008).

Of the presence of fishes found during monitoring, *Lutjanus Lutjanus* (big-eye snapper) is an indicator fish on squid attractor aggregating device located in Tuing waters of Bangka Island but typically scattered in the offshore coral reefs of western indo Pacific waters with a maximum depth of 90 meters (Allen: 1999). Kuiter et al (2003) states that these fish live in groups with a body length up to 30 cm, but in Indonesia the size is only up tp 20 cm. Based on the monitoring results, the fourth and fifth step indicates more for the number of fish species than the first, second, and third one. The area where squid attractor aggregating device is drowned has become a new habitat along with the increasing time.

CONCLUSION

In general, the cylindrical shape of attractor aggregating device is more effective to attach the squid eggs than the quadrangular one. t-test has shown significant result as well. Not only squid eggs but also 16 species of fish consisted of 10 families are found in the aggregating device. One of them is *Lutjanus lutjanus* as an indicator species of fish.

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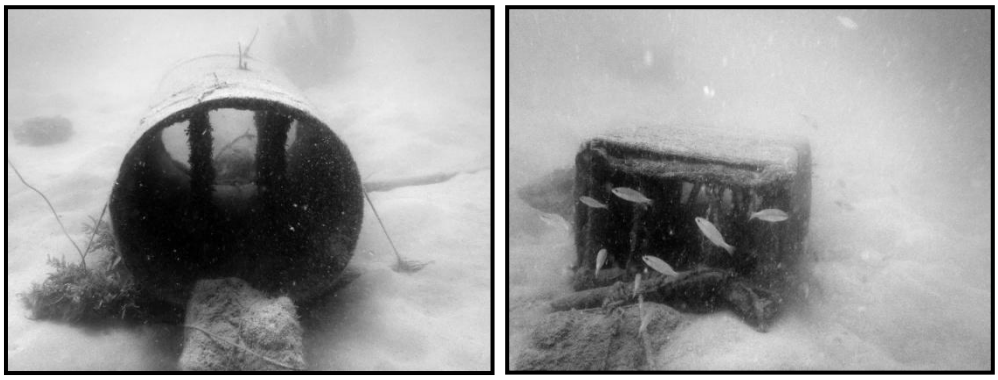
Appendix 1

Designing and drowning process of squid attractor aggregating device in Tuing waters

Designing and making cylindrical (left) and quadrangular (right) squid attractor aggregating device

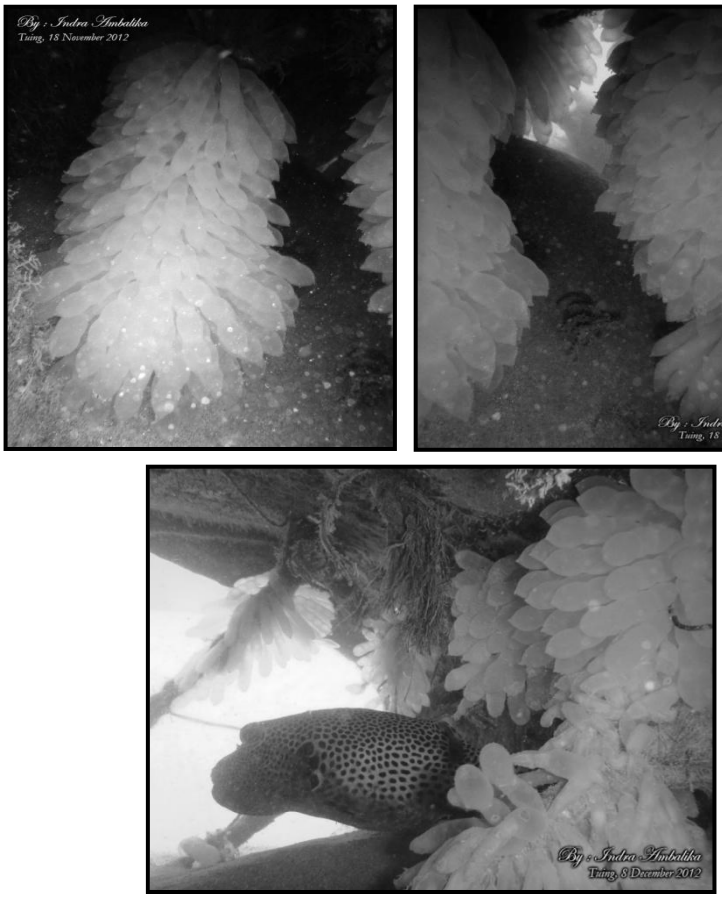
Drowning squid attractor aggregating device



Two types of squid attractor aggregating device: cylindrical aggregating device (right) and quadrangular aggregating device (left)

Appendix 2

Picture of squid eggs attached at squid attractor aggregating device



Squid eggs of *Loligo chinensis* found at cylindrical squid attractor aggregating device