

Comparison of catching efficiency of two Indonesian traditional traps, *Ayunan* and *Tamba*

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Abstract

The catching efficiency of traditional traps: *Ayunan* and *Tamba* were tested in Sungai Batang River, South Kalimantan of Indonesia. Trials consisted of 320-trap hauls/type using 1-day submersion time of 24 hr. The baited traps sampling accounted for 82 specimens assigned to 5 species of 5 families. There was a large variability in number of catch between prawns and fish species collected ($T=2.318$, $P<0.05$). The prawns catch was represented by only the species *Macrobrachium rosenbergii* with total of 53 and 1,015 g weight. The prawns weight of *Tamba* was significantly higher than that of *Ayunan* ($T=3.453$, $P<0.01$). The fish catch composed of *Mystus gulio* 79%, *Osteochilus hasselti* 10%, *Hypostomus plecostomus* 7%, and *Macragnathus aculeatus* 3%, with total weight ranged from 35 to 560 g. A clear difference was found in catching efficiency. Comparative fishing trials showed that *Tamba* collected specimens were 1.8 times higher than *Ayunan* ($T=2.223$, $P<0.05$). Catch per unit effort for *Tamba* ranged from 58.13 to 80.00, and for *Ayunan* ranged from 5.31 to 7.19. The gear modifications and various treatments (e.g. bait odor, light) are necessary to be taken to increase their relative catching efficiency.

Keywords: Baited trap, catching efficiency, *Ayunan*, rectangular trap, *Tamba*, stage trap, Sungai Batang

INTRODUCTION

In some areas of Indonesia, local wisdom in fisheries management system such as Awig-awig in West Nusa Tenggara, Sasi in Maluku, Mane'e in North Sulawesi and Panglima Laot in Aceh, has long been maintained, legitimated by law and popularized from time to time. The ways of catching the fish in certain areas are also controlled by these systems in order to protect and prevent environmental damage and biodiversity loss.

Also, the natives in South Kalimantan Province still maintain the local wisdom in catching fish hereditarily. They create various types of fishing gears that are uniquely and eco-friendly using bamboo, wood, rattan, etc. Much attention has been given by some researchers to explore the habitat characteristics, type of aquatic species, and fishing activities in South Kalimantan (Prasetyo *et al.* 2005, Rupawan 2007, Ansyari *et al.* 2008, Yunita 2010, Ahmadi 2012, Ahmadi and Rizani 2013).

Fishing is one of the primary sources of livelihood in the Sungai Batang Village of South Kalimantan. Fishing activities in the river are done not only by local people but also by outsiders, and are open throughout the year regardless of seasonal periods. The result of these activities is that some types of fish are becoming harder to find and the size of fish is becoming smaller resulting a decline in the number of catch. These situations are further exacerbated with the use of electric and potassium that is considered threatens life of fish and other aquatic species, since they are often operated close to the spawning areas and nursery grounds. The local government through Fisheries Service of Banjar District kept promoting and socializing responsible fishing programs and help in a range of activities such as fishing workshops, surveys, fisheries extension, and other relevant events. At the same time, the Faculty of Fishery, Lambung Mangkurat University, South Kalimantan also pays great attention to improve traditional fishing methods to be more eco-friendly through gear modification, skills of gear placement and fish behavioral assessment.

Ayunan (rectangular trap) and *Tamba* (stage trap) are two traditional baited traps commonly used in South Kalimantan including Sungai Batang village to harvest the giant freshwater prawns (*Macrobrachium rosenbergii*, De Man 1879) from the rivers. Prior to this study, *Ayunan* and *Tamba* were considered less effective in practical. Either prawns or fish that already entered the *Ayunan* easily went out of the trap as it has open mouth and exit door on the top. Similar was found in the *Tamba* that only caught small shrimps due to the narrow entrance and placed in vertical position. For this reason, we modified *Ayunan* by attaching a trammel net inside the trap as well as *Tamba* with gear placement to increase their relative efficiencies.

METHODOLOGY

Study site: The field experiments were carried out from 26 August to 12 September 2008 at Sungai Batang Village about 7 km from Martapura City or 45 km from Banjarmasin City, South Kalimantan Province of Indonesia (Figure 1), 03°35'305" South 114°81'561" East (under the equatorial line) determined by the Nokia Lumia 2200 GPS (Nokia Co.Jp. Japan). Aquatic plants such as *Eichornia crassipes* and *Ipomoea aquatica* were abundantly found in this river. The depth of river reached 8-10 m and has strong enough current at the bottom. The width of river was about 50 m and water condition was turbid. The surface water temperature ranged from 28 to 30°C throughout the trials.

Typical trap and experimental design: Ten *Ayunan* and ten *Tamba* were tested simultaneously in the river. The objective of this experiment was to compare the catching efficiency of *Ayunan* and *Tamba*. *Ayunan* (rectangular trap) was framed with beam of wood (2x3 cm) and covered with bamboo chip and rattan in a rectangular-shape: 46 cm long, 38 cm high and 38 cm wide. The size of entrance was 38 cm wide and 38 cm high. A small trap door on the top allowed for putting and removal of the snail (*Achanita* sp.) bait (Figure 2A).

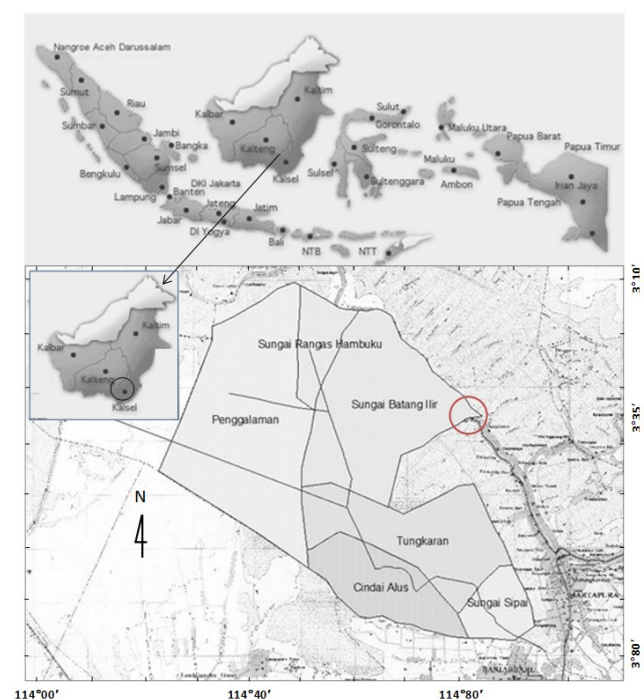


Figure 1: Map showing the location of trapping experiments for *Ayunan* and *Tamba* in Sungai Batang River, South Kalimantan (see the circled site). Source: Fisheries Service of Banjar District.

Trammel net were placed at the back of the gear, in front of the bait. Trammel net consisted of an inner panel of 25.4 mm stretched mesh between two 76.2 mm stretched mesh panels. Prawns/fishes swam through the larger mesh and encounter the smaller mesh where they become entangled in temporary "pocket" in the net. The size of *Ayunan* was similar to that of *Tamba* used in this study. In addition, *Ayunan* are originally adopted from Pemangkih Village of Hulu Sungai Tengah District, South Kalimantan Province.

Tamba (stage trap) was made of bamboo in a heart-shape: 38 cm long, 46 cm wide and 38 cm high with the gap between bamboo chip 1.5 cm and 5 cm wide opening of the entrance slit. A small trap door on the left or right side allowed for removal of the catches (Figure 2B). The

snail (*Achanita* sp.) was used as bait and placed inside the trap. For its operation, *Tamba* was placed horizontally and moored at the two poles are planted in the bottom and tied with the rope 2 m long to prevent the trap lost. Such installation allowed for prawns easily get in the *Tamba* and prevented them to escape.

Both *Ayunan* and *Tamba* were set randomly in the Sungai Batang riverbank using a boat began afternoon at 4 pm, and traps were retrieved the next day at 4 pm. On each sampling date, each trap was lowered to the river bottom at 4-5 m depth and was separated from the others by approximately 3 m, which was considered sufficient to the river circumstances. Each trap in the groups was used repeatedly over 16 day operations. The trials consisted of 320-trap hauls/gear type using 1-day submersion time of 24 h. The baited traps were standardized to a catch per unit effort (CPUE) of total catch (g) per 16-daytrip. After retrieval, the catches were counted, identified for species, and measured for weight. For additional information, the trap cost per unit was about US\$ 2.5.

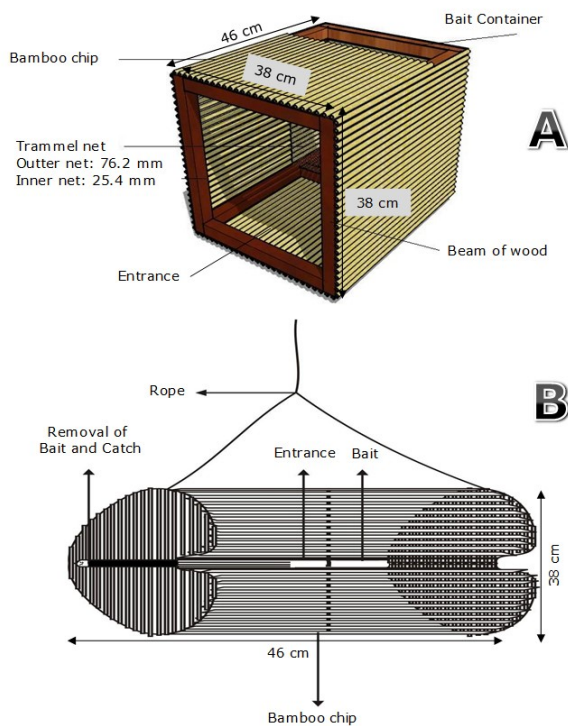


Figure 2: The baited traps (A: *Ayunan* dan B: *Tamba*) used during the trapping experiments in Sungai Batang River, South Kalimantan. The Snail (*Achanita* sp.) used as a bait.

Statistical analysis: The experimentation design used in this study was a randomized block design (RBD). The data that analyzed were the number of catches and the amount of catch weight of *Ayunan* and *Tamba*. Data were

analyzed by testing the normality by the Lilliefors test (Nasoetion and Barizi 1980). Since the data obtained from some groups did not meet the assumptions of normality, we proceeded to a non-parametric analysis of the Mann-Whitney test (Conover 1980). The Mann-Whitney test was used to establish whether or not significant difference occurred between the catches of *Ayunan* and *Tamba* or between the numbers of prawn and fish collected. All statistical analyses were considered significant at 5% ($P < 0.05$).

RESULTS AND DISCUSSIONS

A total of 82 specimens assigned to 5 species of 5 families were collected throughout the study periods as shown in Table 1. There was a large variability in number of catch between prawn and fish species collected (The Mann-Whitney test, $T=2.318$, $P < 0.05$). The prawn catch was represented by only the species *M. rosenbergii* with total of 53 and 1,015 g weight. It was consisted of 18 (85 g) caught by *Ayunan* and 35 (930 g) by *Tamba* respectively. Hence, the prawns weight of *Tamba* was significantly higher than that of *Ayunan* ($T=3.453$, $P < 0.01$). The fish catch composed of *Mystus gulio* (Hamilton 1822) 79%, *Osteochilus hasselti* (Valenciennes 1842) 10%, *Hypostomus plecostomus* (Linnaeus 1758) 7%, and *Macragnathus aculeatus* (Block 1786) 3%, with total weight ranged from 35 to 560 g. There were no significant differences in the fish catch between *Ayunan* and *Tamba* ($T=1.548$, $P > 0.05$). However, the fish weight of *Tamba* was significantly higher than that of *Ayunan* ($T=1.737$, $P < 0.05$).

Table 1: The catch species composition sampled from Sungai Batang River using *Ayunan* and *Tamba* traps over 16-day sampling periods

Group/ Local name	English name	Scientific name	Family	Total catch	Total Weight (g)
Crustacean:					
1. Udang Galah	Giant freshwater prawn	<i>Macrobrachium rossenbergii</i>	Palaemonidae	53	1,015
Fish:					
1. Lundu	Long whiskers catfish	<i>Mystus gulio</i>	Bagridae	23	270
2. Puyau	Hard-lipped barb	<i>Osteochilus hasselti</i>	Cyprinidae	3	35
3. Sapu- sapu	Cleaningser- Fish	<i>Hypostomus plecostomus</i>	Loricariidae	2	560
4. Tilan	Lesser spiny eel	<i>Macragnathus aculeatus</i>	Mastacembelidae	1	510

The comparative fishing trials showed that *Tamba* collected specimen were 1.8 times higher than *Ayunan* (The Mann-Whitney test, $T=2.223$, $P<0.05$). In regard to total weight of catches, *Tamba* were also significantly higher than *Ayunan* at the most ($T=3.832$, $P<0.01$). CPUE for *Tamba* was ranged from 58.13 to 80.00 and for *Ayunan* was ranged from 5.31 to 7.19 (Table 2). On the other word, *Tamba* clearly outperformed *Ayunan* when considering both number and weight of catches, which was the *Tamba* catch almost two times larger than *Ayunan*. This because *Tamba* has the narrow entrance resulting in the catches was difficult to get out. While the addition of trammel nets inside *Ayunan* was found to be ineffective in increasing the number of catch. The mesh size of trammel nets used was quite small to entangle the larger species, the only small ones caught (Table 2). The open mouth of *Ayunan* may also allow the species easily escaped from the trap with or without contact with the trammel net. Hence, the results were still unsatisfactory. Prior to this study, Nina (2005) from Lambung Mangkurat University, South Kalimantan examined the catching efficiency of *Tamba* by installing *rumpon* (fish aggregation device) *i.e.* coconut leaves around the trap, and had some success in catching *M. rosenbergii*.

Table 2: Comparison of number and weight of catches between *Ayunan* and *Tamba* over 16-day sampling periods. The results showed that *Tamba* collected more specimens than *Ayunan*

Exp	<i>Ayunan</i>						<i>Tamba</i>					
	Number of catch			Weight (g)			Number of catch			Weight (g)		
	Prawns	Fish	Total	Prawns	Fish	Total	Prawns	Fish	Total	Prawns	Fish	Total
1	0	0	0	0	0	0	5	1	6	130	20	150
2	1	0	1	12	0	12	3	2	5	70	300	370
3	3	0	3	15	0	15	5	2	7	95	20	115
4	0	0	0	0	0	0	0	2	2	0	20	20
5	0	0	0	0	0	0	2	1	3	20	10	30
6	0	0	0	0	0	0	1	0	1	10	0	10
7	1	0	1	5	0	5	2	1	3	80	20	100
8	0	0	0	0	0	0	1	0	1	10	0	10
9	0	0	0	0	0	0	1	0	1	15	0	15
10	0	1	1	0	10	10	1	3	4	5	70	75
11	0	1	1	0	15	15	1	0	1	100	0	100
12	4	2	6	15	35	50	5	0	5	210	0	210
13	0	0	0	0	0	0	1	3	4	5	530	535
14	1	5	6	3	5	8	3	1	4	115	10	125
15	4	1	5	15	20	35	3	0	3	15	0	15
16	4	1	5	20	30	50	1	2	3	50	280	330
Total	18	11	29	85	115	200	35	18	53	930	1280	2210
CPUE				5.31	7.19	12.50				58.13	80.00	138.13

The constraint faced during the study was unpredictable weather that may influence to the catch rates of both traps. Table 2 clearly shows that *Ayunan* with empty catch occurred on almost the half of sampling periods. At that time, the river water was subsided and the animals likely moved to the deeper water. The highest catch obtained was on the 12th and 14th days coinciding with the rise of a river after the rain coming. For *Tamba* the highest catch occurred on the 3rd day where water conditions were extremely turbid and may force the animals out for searching the food.

Tamba and *Tempirai* (stage trap) were basically similar in the shape, but different in their operation. *Tamba* were placed horizontally with two stakes where prawns as the main target, while *Tempirai* were set in an upright position with a stake where fish most commonly targeted. The placement of *Tamba* demonstrated in this study was recognized best practice for catching *M. rosenbergii* because it follows the motion of prawn's body. Such trap placement was also reported by other study (Erma 2003). In practical, *Ayunan* operated in Sungai Batang River of Banjar District (4-5 m deep for 24 h) was deeper with longer soaking time than *Ayunan* that deployed in Pamangkih River of Hulu Sungai Tengah District (1 m deep for 12 h) reported by Saragih (2005). Unfortunately, the catch rates obtained were beyond the expectation. The placement of our trap was considering that species target has been rarely found in the shallow water as the impact of irresponsible fishing (the use of electric and potassium). Moreover, none of *Ayunan* used was associated with *rumpon*; the only bait treatment was applied.

By considering the results of trapping experiments and technical problems being faced, we made recommendations for improving the existing trapping gears, such as installing a *hinjap* (one-way valve) made of elastic rattan on the mouth of *Ayunan*, selecting which mesh sizes and twine thickness of trammel nets are the most effective for catching prawns to be installed inside *Ayunan*, putting the slackness mesh on the floor of *Ayunan* allows prawns entangled over the net while they follow the bait odor trail. The capture mechanism is similar to the baited nets for the Kona crab *Ranina ranina* in Hawaii Sea (Onizuka 1972), the trap nets '*Sangbaw*' for the red frog crab *R. ranina* in Central Tawi-Tawi, Philippines (Tahil 1983), the lift nets '*Tangkal*' for mud crab *Scylla* sp. in Indonesia (Cholik and Hanafi 1992), the tangle nets for crawfish *Palinurus elephas* in off the coast of Cornwall (Hepper 1977) and for spanner crabs *R. ranina* in Australia (Sumpton *et al.* 1995), the lift nets for the blue swimming crab *Portunus pelagicus* in Japan (Vazquez Archdale *et al.* 2010) or the crab lift nets '*Banda*' for the mud crab *Scylla* sp. in India (Mohapatra *et al.* 2011). The use of '*mince teabag*' baits containing local ingredients is also a promising option. A '*teabag*' baiting method has been effective in the cod longline fishery (Anon 2005) and crab pot fishery such as the Green crab *Carcinus maenas* (Behrens Yamada *et al.* 2006), Japanese shore swimming crab *Charybdis japonica*, and the blue swimming crab *Portunus pelagicus* (Vazquez Archdale *et al.* 2008). Lastly, the use of underwater lamps inside the *Ayunan* and *Tamba* may provide a great challenge for us (Ahmadi 2012 and 2014, Ahmadi and Rizani 2013) since

there are no reports on the phototactic response in *M. Rossenbergii* and its application in this region, so far. By doing these suggestions, it meant that more detailed data will be needed to analyze the factors leading to this variation, and the results are still open for discussion. In other hand, with some level modifications to fit local conditions, management interventions for prawns' fisheries may be replicated in different regions.

CONCLUSION

The results of trapping experiments in Sungai Batang River demonstrated that *Tamba* were more effective in catching species than *Ayunan*. Comparative fishing trials showed that *Tamba* collected specimens were 1.8 times higher than *Ayunan*. CPUE for *Tamba* was ranged from 58.13 to 80.00, and for *Ayunan* was ranged from 5.31 to 7.19. The addition of trammel nets inside the *Ayunan* was found to be ineffective in increasing the number of catch at the most. Therefore, gear modifications and various treatments are necessary to be taken to increase their relative catching efficiency.

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