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Preserving Blue Swimming Crab (*Portunus pelagicus*): Its Conservation using Trap Modifications in Betahwalang, Demak

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ABSTRACT

Blue swimming Crab (*Portunus pelagicus*) is found in large numbers in the Betahwalang waters, and they are mainly caught using traps. Betahwalang fishing communities have realised the importance of preserving this commodity of blue swimming crab (*Portunus pelagicus*) by enlarging crab conservation zone in the territorial waters of betahwalang. However, many fishermen catch blue swimming crab and sell them. The capture of small crab egg-laying females cannot be avoided because the mouth traps folding reaches 29 cm. Modifications are made to reduce the capture of spawn female crabs by changing the shape of the mouth traps from a rectangular into a circular shape with a certain diameter. This research uses an experimental fishing method. Data is analysed using SPSS 16.0. The results indicate catching Blue Swimming Crabs using modified funnel and different baits (pony fish essence) is effective in landing a big catch. The catch was relatively bigger. This research also shows a positive link between modified trap and use of different baits to catch Blue Swimming Crabs.

Keywords: Betahwalang, Demak, traps modification

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INTRODUCTION

Blue swimming crab is an expensive source of sea food and which fetches an expensive price. Most fishermen in Betahwalang use 3 fishing gear, i.e. trap, mini trawl *arad* and gill net. The most commonly used fishing gear in Betahwalang village is trap, because it is easy to be operated and the catch is

of good quality. Based on the information from Betahwalang Village (2015), traps account for 62.26% of all fishing gears used by 159 fishermen in Betahwalang village. This high figure indicates controls should be put in place to reduce impacts of over fishing impacts and for sustainability of fisheries resources. Fishermen here have realised the importance of preserving blue swimming crab (*Portunus pelagicus*) which can be seen from the existence of blue swimming crab conservation zone in the village to rear caught small and young blue swimming crab and the spawn blue swimming crab. In that area, fishermen are forbidden from catching them early using *arad*.

The funnel of the trap is modified to increase the catch. In addition, the use of bait also affects the haul' in the case of blue swimming crab (*Portunus pelagicus*), it is driven by its sense of smell rather than sight. The blue swimming crab catching activity here implies there are some spawn female blue swimming crabs that are caught and not returned to the sea. The modification to reduce catching spawn female blue swimming crabs is created by changing the form of funnel from rectangle to circle with certain diameter which was modified to fit the shell length based on previous research. Additionally, pony fish and Tetraodontidae was used as a bait (with added essence) to lure the attention of blue swimming crab (*Portunus pelagicus*) into the trap.

The purposes of this research are to analyse the effects of using (1) different funnels on the catch (2) of different bait on the catch. Additionally, it aims to find out the relation between the two factors (funnel and bait) towards the catch.

MATERIAL AND METHODS

Description and location of study site

This study is based on experimental fishing method. According to Natsir (2003), experiment relates to observing in artificial condition where the condition is created and managed by the researcher. In this study, an experimental method was used to improve the trap and bait used to catch blue swimming crab (*Portunus pelagicus*).

This study was conducted in Demak Regency (S 6° 43' 26'' - S 7° 09' 43'' and E 110° 27' 58'' – E 110° 48' 47''). Demak Regency borders with Kudus Regency, Grobogan Regency, Semarang, Jepara Regency and Java Sea. Four of 14 sub-districts in Demak Regency are in located along the coastal areas of Java Sea; they are Wedung, Bonang, Karang Tengah, and Sayung (Maritime and Fisheries Offices of Demak [MFOD], 2012). According to information obtained from Betahwalang Village (2015), Betahwalang village is in 0.75 to 1.70 MASL. Most of the people in Betahwalang are fishermen. The Betahwalang village borders northside of Wedung sub-district, southside of Serangan village, east side of Tridonorejo village, Purworejo village, and westside of Java Sea.

Trap

The trap used in this research is a modified version of the current one used by the

fishermen here (Figure 1). The height of the trap is 18 cm while the dimension of its top is 44 x 30 cm. The funnel of the modified trap is round with a diameter of 13 cm. A total of 40 modified traps were used in this experiment, with rectangular funnel and square funnel.

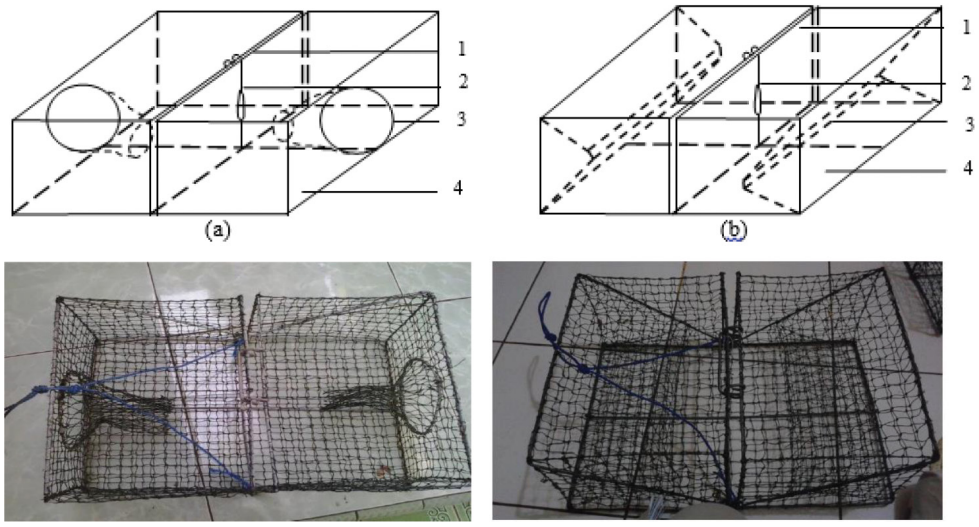

Figure 1. The Design of Traps (a) Modified Funnel (b) Rectangular Funnel
Description: (1) The Trap Door (2) The Hook (3) The Funnel (4) The Base of the Trap.

Bait

Four kinds of bait were used in this research Pony fish and Tetraodontidae were used as bait (with added essence) as they are cheap and easily available. The baits were dried to make them durable.

The study location is the regular fishing site of blue swimming crab - Semarang and Jepara. The trip to the *fishing ground* takes about 3 hours. The traps are set alternately. The traps are positioned along the coastline; this is intended to catch blue swimming crab of the same size. Assembling the trap is done by applying long line system. Immersing time is four hours; this is based on previous research where each bait has smell durability of about 5 hours. When the hauling is completed, the caught blue swimming crabs are soon separated based on the trap and the bait used.

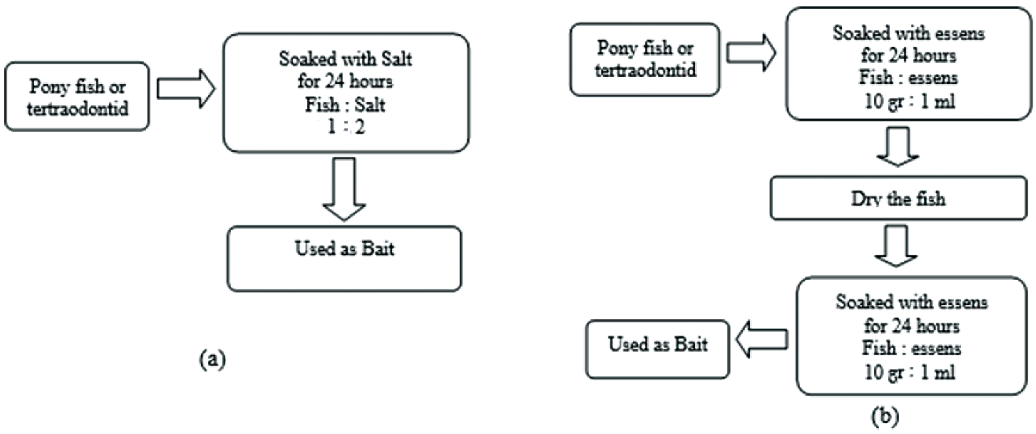

Figure 2. Flowchart of Bait Treatment (A) Salting (B) Adding Essence

RESULTS AND DISCUSSION

Fishery Condition of Betahwalang Village

According to Betahwalang Village (2014), the production of blue swimming crab in Betahwalang village in 2014 was 19 Quintal or 1.9 Ton.

The trap and mini trawl and net are the most widely used tools to catch blue swimming crab (*Portunus pelagicus*). The fishermen of Betahwalang usually have more than one fishing gear.

Large boats (LOA>6m) are more commonly used fleet. A total of 404 large boats compared with 202 small boats are used. They are used to catch fish not only in high seas, but also in estuaries (usually small boats are used here).

The fishermen in Betahwalang village are divided into skipper and worker fishermen. Skipper fishermen are those who provide fishing unit and equipment for fishing, while the workers do the actual catching. Skipper fishermen in Betahwalang do not always have workers because there are other fishermen who do the catching themselves. Besides, the existence of skipper fishermen can increase for years because of the workers' ability to have their own catching fleet.

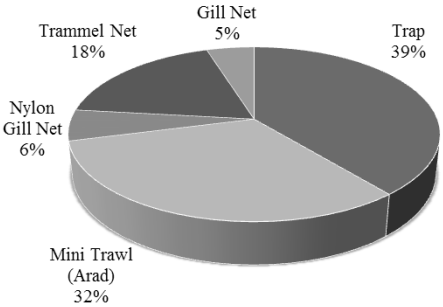

Figure 3. Fishing Gears in Betahwalang Village (2014)

Blue Swimming Crab (*Portunus pelagicus*) haul

Salt pony fish is the most common bait, whether used in rectangular funnel or circular funnel. The weight of salted pony fish baits are about 7000 gr in rectangular funnel trap and 4000 gr in circular funnel trap. The essence of pufferfish used as bait is less than salted puffer fish and salted pony fish bait.

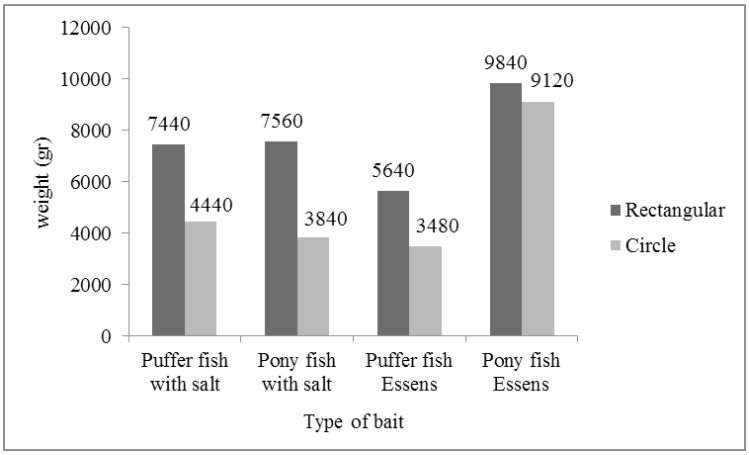

Figure 4. Blue swimming crab catch (gr)

Effects of Different Funnel on Blue Swimming Crab catch (*Portunus pelagicus*)

It has been found that rectangular funnel trap is more effective compared with the circular one. In this experiment, about 254 crabs were caught using rectangular funnel trap while 174 crabs were caught using circular funnel trap. Therefore, the crabs can be caught using rectangular or circular funnel trap.

The way the blue swimming crabs get into the rectangular funnel trap shows that blue swimming crabs are adapting to the new modified trap (circular funnel). The trap is more effective when a bait is used to lure the blue swimming crabs .

In this research, the length and weight of spawn blue swimming crabs were determined and compared with previous research by the same authors. A previous research was undertaken on February shows that the gonad of blue swimming crabs are mature, about 12 cm. Therefore, catching blue swimming crabs using circular funnel trap can reduce the amount of spawn blue swimming crabs due to the modified shape of the funnel.

Attracting the haul using suitable bait is important to increase the catch (Mahulette, 2005). Therefore , it can be concluded it is not only the trap which lures the blue swimming crabs but also additional factor:

the bait. This means both baits and traps are vital in increasing the haul.

The blue swimming crabs enter the trap because they are attracted by the funnel construction of modified trap. Iskandar (2013) mentions that crustacean and reef fish are trapped because of the smell of bait and the trap as a shelter. Miller (1990) *in* Septiyaningsih and Adi (2013) report successful catch is determined by trap construction, soaking time, and the bait used.

This research shows rectangular funnel trap is less effective in luring blue swimming crab than the circular funnel trap. Therefore, the modified trap is useful in reducing the number of spawn blue swimming crab. Based on Table 1, it can be seen that more spawn blue swimming crabs get trapped in the rectangular funnel. A total16 spawn blue swimming crabs are caught, 13 of them by rectangular funnel trap. The number of spawn blue swimming crabs caught by circular funnel trap is less than the number caught by rectangular funnel trap. This shows that limiting the entrance access can affect the size of spawn blue swimming crab caught. Miller (1990) in Septiyaningsih and Adi (2013), reported an effective trap is influenced by its construction, soaking time and bait.

The blue swimming crabs caught in both traps are between 9 and 17 cm in length. The length of the carapace is between 11 and 12.5 cm which is 34% - 11.6-12 cm and 22% in length - 12.1-12.5 cm. The length of most caught blue swimming crabs corresponds with data of PerMen KP No.1 (Ministry of Maritime and Fisheries Affairs [MMFA], 2015) which has imposed that only blue swimming craps that minimum length 10 cm and weighing 55gr can be caught . Male and female blue swimming crabs (*Portunus pelagicus*) reach sexual maturity if the length of their carapace is 70 mm to 90 mm, or it is one year old. Therefore, catching blue swimming crabs (*Portunus pelagicus*) below 90 mm in length are forbidden in South Australia waters which only allows haul of blue swimming crabs (*Portunus pelagicus*) which is 110 mm length or aged between 14 and 18 months to extend their life (Svare, & Chesire, 2005).

Table 1
Percentage of caught spawn blue swimming crab

Construction of Funnel Traps	Spawning		Not Spawning	
	∑	%	∑	%
Rectangle	13	3.04%	240	56.07%
Circle	3	0.70%	172	40.19%
Total	16	3.74%	412	96.26%

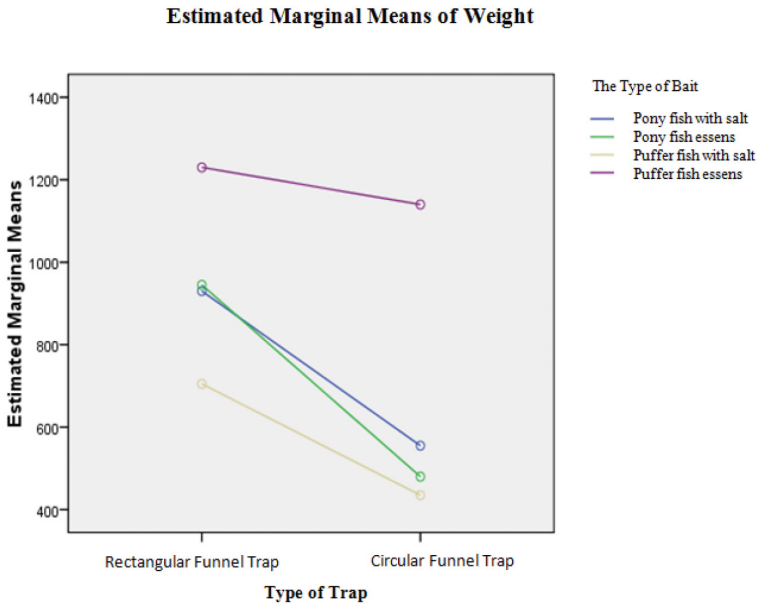

Figure 5. Interaction chart of different funnel in traps with different bait

Figure 6. Map of fishing ground on research

The Effect of Different Traps on Blue Swimming Crab (*Portunus pelagicus*)

Adding essence to the bait (pony fish and Tetraodontidae) is not always effective in increasing hauls compared with using to salty bait. Using Tetraodontidae essence in a rectangular or circular funnel trap provides less catch than using salty Tetraodontidae (the fresh Tetraodontidae is soaked with salt in proportion 1:2 for fish and salt). The essence of Tetraodontidae obtained by drying fresh Tetraodontidae.

In the drying process, the Tetraodontidae which is thicker than pony fish entails longer drying process. During this drying process, most of the meat of Tetraodontidae is lost. The meat is shrunk up to 60% of its original weight, so the smell of Tetraodontidae essence is weaker than that of the pony fish. The protein content in Tetraodontidae is higher than in the pony fish, as discovered by Pratama et al. (2014). The nutritional content in Tetraodontidae is as follows: 80.02% water, 1.15% dust, 0.11% fat, 18.54% protein and 0.18% of carbohydrate. Susanto (2006) found that pony fish has good chemical content, and its protein level is 17.22 % compared with fresh fish. However, the protein content of dried Tetraodontidae is 15.31%. According to Pratama et al. (2014), the proximate analysis of Tetraodontidae skin is as follows: 65.27% of water, 1.27% dust, 0.27% fat, 15.31% protein and 7.87% carbohydrate. Compared with the protein content in the pony fish, the protein level in Tetraodontidae skin is less.

The catching activity is also influenced byoceanography factors, such as wind, stream, and temperature of the surface waters. The oceanography factors affect the distributional chemistry and the bait. The smell of the bait drifts across carried by the stream gto lure the blue swimming crabs. According to Grasso and Basil (2002) in Septiyaningsih and Adi (2013), *Crustacea* (*decapoda*) can smell the bait which due to turbulence and the chemical and mechanical sensor.

Interaction between Type of Traps and Bait

Based on Figure 5, there is a link between blue swimming crab caught using salty pony fish and essence of pony fish as a bait. This means the shape of the funnel plays a role, namely rectangular funnel and circular funnel traps whose baits are salty pony fish and essence of pony fish respectively. The blue swimming crabs are lured into both traps using essence of 82 pony fish in rectangular funnel trap weighing 9840g and 76 fish in circular funnel trap weighing 9120g. It shows that using essence of pony fish in rectangular funnel trap or circular funnel trap affects the number and weight of the haul, in this case blue swimming crab. Using essence of pony fish increases the haul compared with other baits.

Based on the result, it is found weight distribution of caught blue swimming crab is normal, i.e. 0.167 > 0.05. The homogeneity test shows data is homogenous as 0,420 > 0,05.

Based on the data of normality and homogeneity test, the next test is *two-way anova*. Results show that the different construction of the funnel affects the haul, in this case the blue swimming crab. The test result shows that 0,015 < 0,05 so, H_1 is accepted and therefore, there are effects toward the haul caught blue swimming crab based on different funnel construction and different bait.

CONCLUSION

The use of trap with different funnel size and shape affects the haul. In this study, the use of circular funnel trap allows the caught small blue swimming crab to be returned to its conservation area, while reducing the number of spawn blue swimming crab caught. Different bait affects the haul due different treatments of fresh bait.

There is a positive link between different funnel constructions of traps and different baits used on the catch, in this case t blue swimming crab. Baits can increase the haul, and in other words, bait and traps play a role in .

Thus, it is better for fishermen to use circular funnel trap in order to avoid catching spawn blue swimming crab. Therefore, fishermen must pay a close attention to their trap and baits because they affect the haul. Future research should focus on how pony fish and Tetraodontidae can be used as a bait increase haul.

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