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Habitat Preferences of Blue Swimming Crab (*Portunus pelagicus*)

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Abstract

Andi Ivo Asphama, Faisal Amir, Asmi Citra Malina, and Yushinta Fujaya. 2015. Habitat Preferences of Blue Swimming Crab (*Portunus pelagicus*). *Aquacultura Indonesiana, 16 (1): 10-15*. The purpose of this study was to analyze the habitat preferences of the blue swimm-crabs. There are some variations on the carapace of blue swimming crabs (*Portunus pelagicus*) from Makassar Strait. Crabs were grouping based on the colors, sex and patterns. The type of substrate, depth, and salinity were measured. The results of PCA analysis showed that each population occupies a different base substrates (P<0.01). The type of substrate was also positively correlate with depths and salinities. Informations on preferences to different kind of habitats will help the management of the aquaculture of blue swimming crabs in the future.

Keywords: Aquaculture ; Crab; Habitat; *Portunus pelagicus;* Substrate

Introduction

Blue Swimming Crab (*Portunus pelagicus*) is one of the most important commodities in the world's fisheries. The crabs are valuable seafood products both in for domestic and the exports. Many countries exploited the crabs to support their economy (Svane and Hooper, 2004; Sawusdee and Songrak, 2009; Ehsan *et al.*, 2010; Mehanna *et al.*, 2013; Nieves *et al.*, 2013; Gadhavi *et al.*, 2013). In Indonesia, this commodity has been overexploited to supply global demands that continues to increase from year to year (Mehanna *et al.*, 2013; Nieves *et al.*, 2013; Gadhavi *et al.*, 2013). This phenomenon is shown by the decline of total catch both quality and quantity. Over exploitation not only threatens the sustainability of the resources but also threaten the livelihoods.

Consider its contribution to the economy and the liveli hood of those who depend on crabs fishery, the effort to develop a sustainable resource management needs to be done.

Cultivation is a recognized way to help solve the needs of blue swimming crabs. Wild crabs were domesticated to provide the need of the seed, they can quickly adapt to new environments. Blue Swimming crab lives in a wide range of inshore and continental shelf areas, including sandy, muddy or algal and seagrass habitats, from the intertidal zone to at least 50 m depth (FAO, 2014). But, now it is known that the blue swimming crabs actually consists of several species that may occupy different habitats. Lai *et al.*, 2010 were proposed a revision that portunid crab that was currently known as *Portunus pelagicus* apparently was consisted of four species, *P. pelagicus* (Linnaeus, 1758), *P. segins*, *P. reticulatus*, and *P. armatus*. Each of them has variation on the color of the carapace and morphological characteristics. Some fishermen from Barru Regency also reported that the crabs with a different colors of carapace were caught in different areas.

In this study, we observe the habitat preferences of different types of blue swimming crabs from Barru regency, Macassar Strait. The information obtained will become the basis for the development of blue swimming crabs cultivation in ponds.

Materials and Methods

Three sampling stations along the coast Barru (Figure 1) was determined based on the depth and the type of substrates. The gears used to catch the crabs were fish traps (rakkang) and gillnet. The sampling were done in July- November 2013 for eight times during days and nights.

There were 768 *Portunus pelagicus* collected. Samples were then grouped by substrate type and the depth of capture areas. The crabs were sexed and grouped by similar size (refers to Lai *et al.*, 2010).

Hydrometer was used to analyze the type of substrate (Gee and Bauder, 1986). Linkages between groups and habitat were analyze dusing *Canonical Correspondence Analysis* (CCA) and Principal Component Analysis (PCA) using the program Xlstat 13.5.

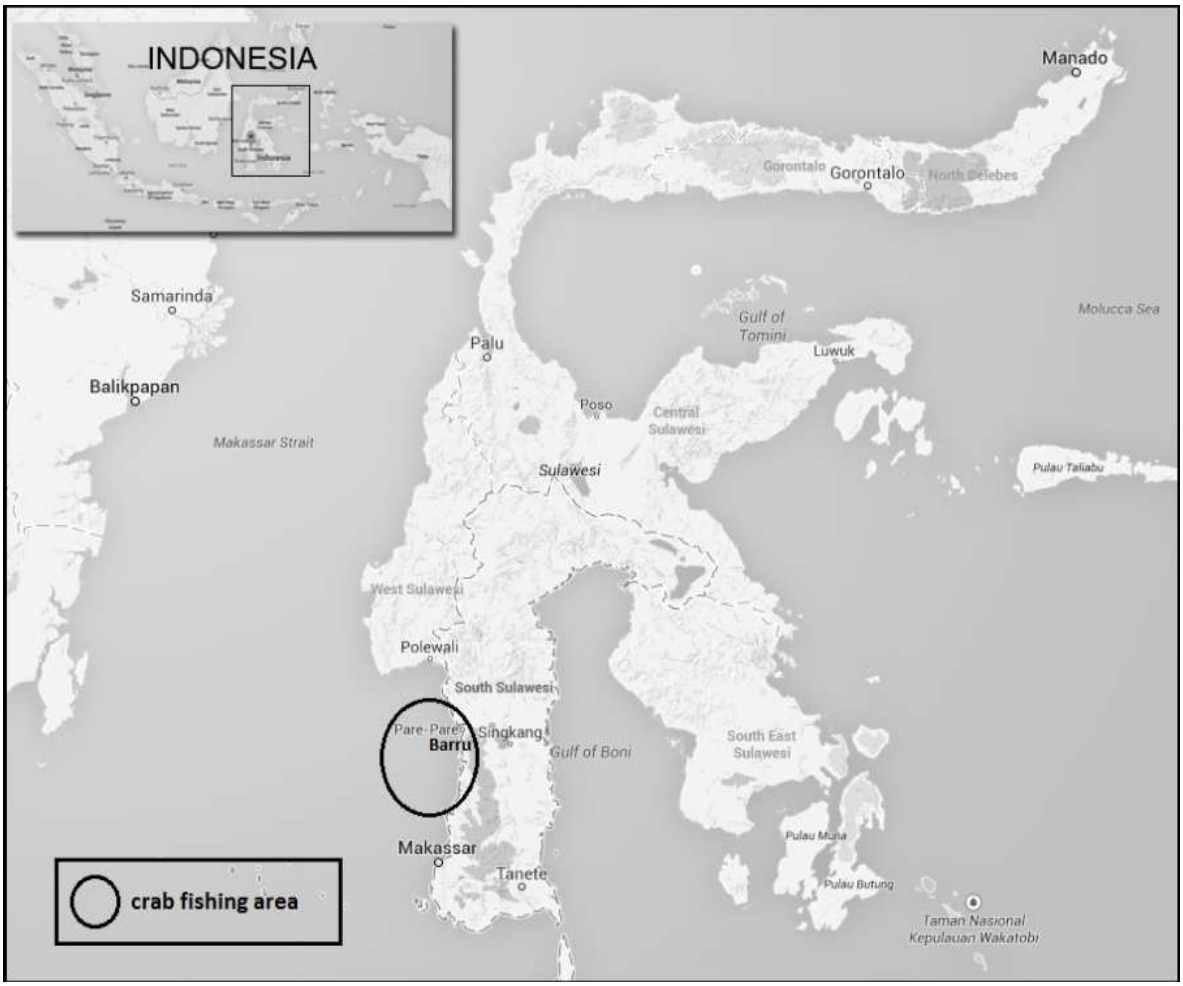

Figure 1. Map of area where crabs were collected.

Results and Discussions

The dominant sex of crab's caught in this study were females about 64% and 36% of male. The size of crabs caught at in deeper water with muddy substrate tends to be bigger than the crab caught at shallow depth with a sandy to sandy mud substrate (Table 1).

There were three groups of blue swimming crab captured based on morphological variations such as carapace colors, spot patterns, cheliped shapes and number of spine on the cheliped merus, both male and female (Table 2). In this study, at least three groups of crabs has significantly different morphology. Further study needs to be done to analyze this findings.

The three groups tend to occupy different substrates, depths, and salinities. The male population of M1 and M3 groups occupy deeper than M2 while the female population of the F1 and F3 occupy lower than F2.

Shape differences on of the *P. pelagicus* were first reported by Bryars and Adams (1999), one type was widely distributed in Australia and the other type was found only around Darwin of Australia. In 2010, Lai *et al.* (2010) revised the portunid crab sistematic based on the morphometric and DNA analysis. They were proposed a revision that portunid crab that was currently known as *Portunus pelagicus* apparently was consisted of 4 species, *P. pelagicus*, *P. segins*, *P. reticulatus*, and *P. armatus*.

Based on the habitat observations, the crab occupies all types of substrates, but there was a tendency of different population groups prefer certain types of substrates. M1 population group (100%), F1 (59%), F2 (44%) and F3 (66%) were found in muddy substrate, M3 tend to prefer sandy substrate to sandy silt, 42% of the population groups M3 found in sandy mud substrates and 35% in the sandy substrate (Figure 2).

Table 1. Results of the analysis of the type of substrate using Hydrometer method (Gee and Bauder, 1986), depth, salinity and catches on each station.

Station	Texture (*Hydrometer*)	Depth (M)	Salinity (‰)	Caught					
				Group Males (M)			Group Female (F)		
				M1	M2	M3	F1	F2	F3
1A	Sandy	1 – 2	34	0	18	27	0	22	18
1B	Sandy	3 – 7	33,5	0	17	18	14	17	4
2A	Muddy sand	8 – 10	29	0	10	41	0	39	24
2B	Muddy sand	11 – 15	29.5	0	12	13	21	11	4
3A	Muddy	16 – 25	32	3	26	24	42	40	53
3B	Muddy	>30	31	3	8	5	8	20	46

Table 2. Morphological characteristics of each group of blue swimming crabs caught from the Barru waters, Macassart Strait

Morphological	Male			Female		
	M1	M2	M3	F1	F2	F3
Carapace colors	Body color is light blue	Body color is purple	Body color is purple greenish	Body color is greenish	Body color is brownish	Body color is light greenish
Spot Pattern	White spot pattern on carapace is small and fills the entire carapace	Large white spots scatter on carapace with medium density	Pattern of white spots on carapace are rarely	Without spot	Dark spots each one at the left and right of the carapace	Faintly visible white spots on the carapace

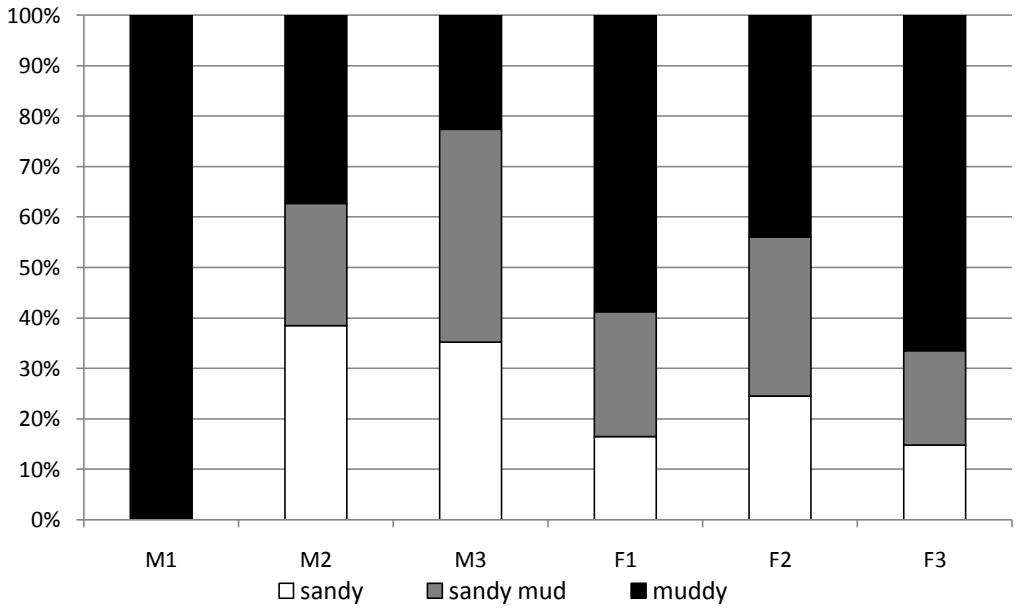

Figure 2. Percentage of crabs that occupy different substrates in different population groups

The type of substrates found in this study were correlated with depth and salinity. The sandy bottom substrate was examined at the depth of 1 to 7 m, sandy mud substrate at 8-15 m and the muddy substrate at the depth of over 16 m. The deeper the water the lower the salinity. The salinity measured in this study was 29-34‰.

Principal Component Analysis (PCA) showed a tendency of each population occupies a different substrate, for a population of M2 and M3 on the sandy bottom substrate, F1 and F2 populations on sandy mud bottom substrate, whereas the F3 and M1 populations tend to muddy bottom substrate (Figure 3).

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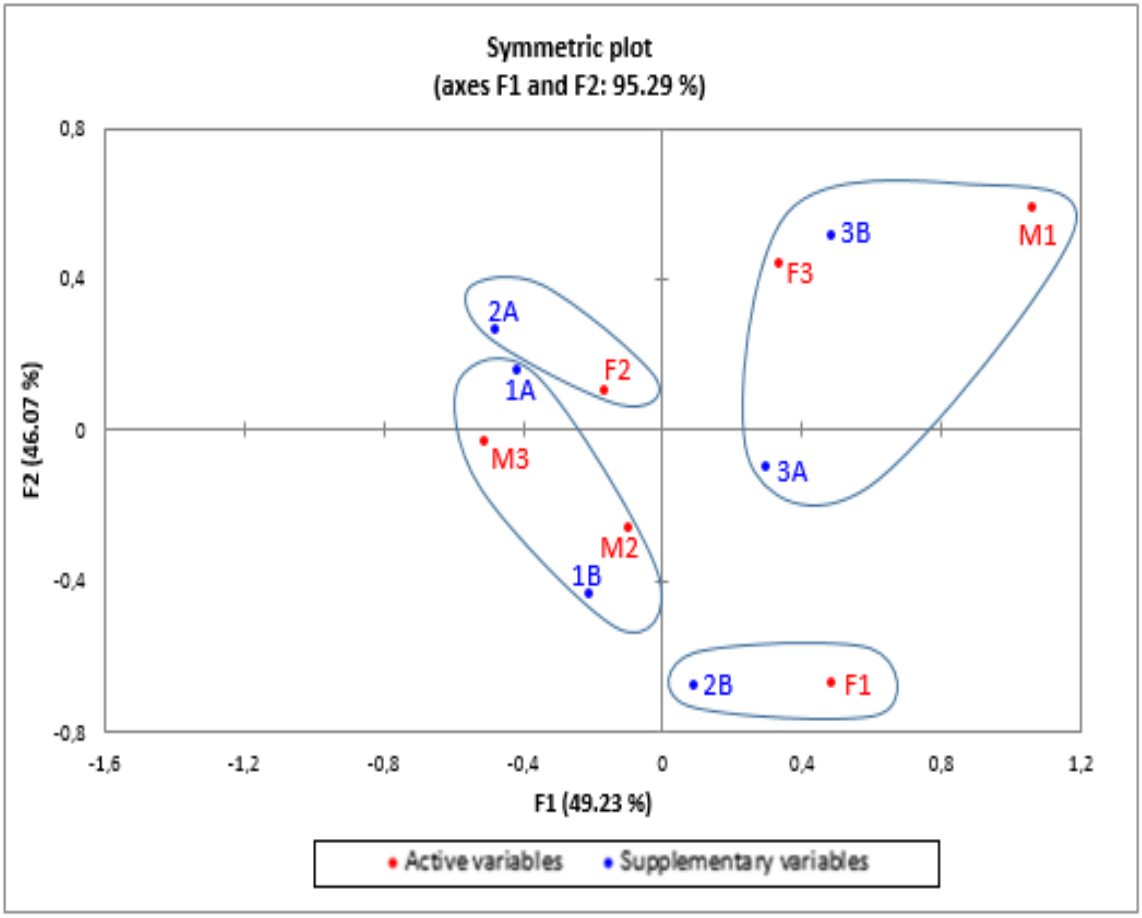

Figure 3. Crab population distribution, based on catch station (PCA analysis).
Males : M1, M2, M3.
Females : F1, F2, F3.
1A and 1B : sandy substrate;
2A and 2B : muddy sand substrate;
3A and 3B : muddy substrate.

Canonical Correspondence Analysis (CCA) showed linkage groups of the population based on the substrate with a depth and salinity parameters (eigen cumulative 99.6%) (Figure 4). CCA analysis figured two groups of population. Group I consists of a population of M1 and M3 were found on the substrate of sandy mud and muddy. The depth of this group were characterized by high and low salinity. Group II consists of M2 populations on sandy bottom substrate and muddy sand which characterized by shallow depth and high salinity. Whereas in females, Group I consisted of F2 populations found on muddy bottom substrate. This group were characterized by higher depth and lower salinity. Group II consist of F1 and F3 populations, which were found in the sandy substrate and sandy mud substrate, characterized by a lower depth and higher salinity.

The results of this study support previous studies done by Moosa *et al.*, 1980 and Nontji, 1987) that crabs live in diverse habitats such as sandy beach with sandy bottom, muddy sand, and muddy. However, each species of crabs prefer certain types of substrates. Ng (1998) found that *Portunus pelagicus* found on muddy sand substrate to muddy. *Portunus segnis* found in sand or mud substrate with a depth of up to 55 m (Galil *et al.*, 2002), and *Portunus reticulates* on muddys and substrate (Hamsa, 1978).

Female crabs in this study prefer the depth of over 16 m with a muddy bottom substrate. They probably be there for the spawning season. This shown from the size distribution of crabs caught in this study were greater at the deeper than the shallow waters. The knowledge of the different habitats for different population groups will be in handy for the

development of blue swimming crab aquaculture in the future.

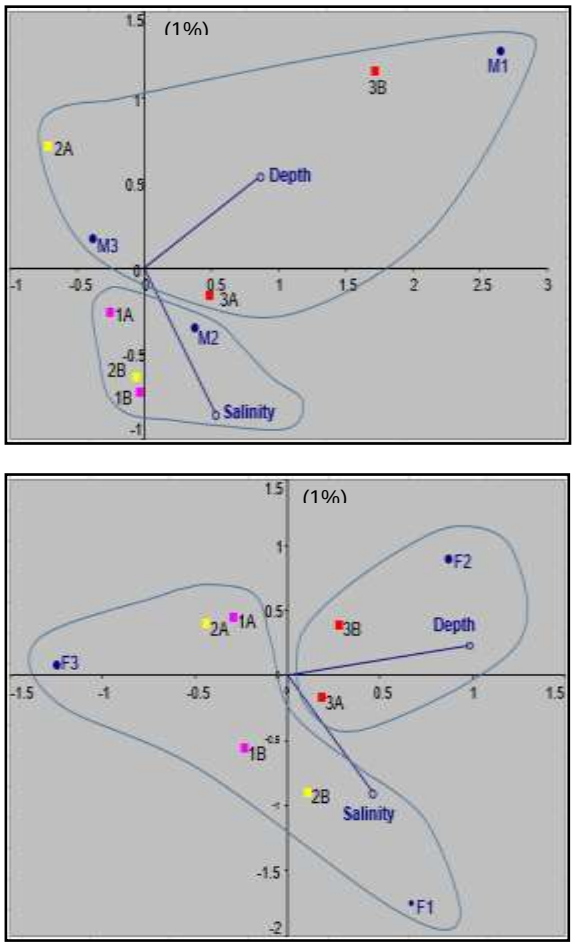

Figure 4. CCA analysis results for the group Males (M1, M2 and M3) (above), group Females (F1, F2 and F3) (below) based station / substrates with depth parameters and salinity.

Conclusion

In conclusion, different group of population and sex prefer different substrate and depth. The difference in the color and pattern on the carapace thought to be different species or varieties and they occupy different habitats. Preferences of the different habitats for different population groups.

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