

CATCHABILITY DIFFERENCE OF GILL NET AND COLLAPSIBLE BAITED POT FOR JAPANESE ROCK CRAB

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ABSTRACT

The objective of this experiment is to know the catchability of gill net and collapsible baited pot on Japanese rock crab. Result shows that gillnet caught more than twenty species other than Japanese rock crab. On the other hands, pot caught 3 species included Japanese rock crab. Catch of Japanese rock crab was male dominated. Proportion of female Japanese rock crab caught by pot reached 1 on carapace width of 40 to 50 mm. On the other side, catch of female Japanese rock crab by gill net reached 1 on carapace width over 50 mm.

KEYWORDS: catchability, male and female, Japanese rock crab, pot, gill net

INTRODUCTION

Japanese rock crab *Charybdis japonica* which called *ishigani* in Japanese, inhabits muddy, sandy and stony shores of Japan from the coast of Choshi to Kyushu and Okinawa, extending its range to Korea, China, and Taiwan (Sakai, 1976). It is caught seasonally and a popular edible species. Capture of female crab is prohibited in many crab fisheries. Japan, Korea, and United States applied the strict regulation to protect female crab from harvesting. This regulation aims to protect female crab for spawning and maintaining the sustainability of crab resources. Female crab has smaller size than male crab in maximum carapace width. Some reports concluded that male and female crab has sex segregation area. For example Suarez & Conde (2002) found that sex ratios of male *Callinectes* spp. and *Arenaeus cribrarius* were significantly different at the foreshore area, but sex ratios of those species were not significantly different in estuarine. Then, to avoid catch of female crabs Korean pot fisherman usually operates pot at the fishing grounds where male crabs mainly occur. In Bering Sea, large portion of area is closed during spawning season to ensure increasing of recruitment (Witherel & Harrington, 1995).

Wide information is available on catchability difference for some commercial crabs such as blue crab *Callinectes* spp. (Suarez & Conde, 2002), swimming crab (Takahashi & Kawaguchi, 2001) and blue swimming crab *Portunus pelagicus* (Xiao & Kumar, 2004). But, the information on sex ratio for Japanese rock crab is poorly documented.

Collapsible baited pot differs from gill net in shape and mesh size. Mesh size of collapsible pot usually is smaller than gill net. During fishing operation, both fishing gear catch male crabs as well as females. To maintain the resource of Japanese rock crab, information on catchability between male and female by collapsible baited pot and gillnet must be available. The objective of this experiment is to know the catchability of pot and gill net for capturing Japanese rock crab.

MATERIALS AND METHODS

Area of Fishing Experiment

The experiment was carried out off Haneda, Tokyo Bay (Figure 1). Catch data of fishing experiment on 24th May 2004, 2nd June and 15th June 2004 were used in the analysis.

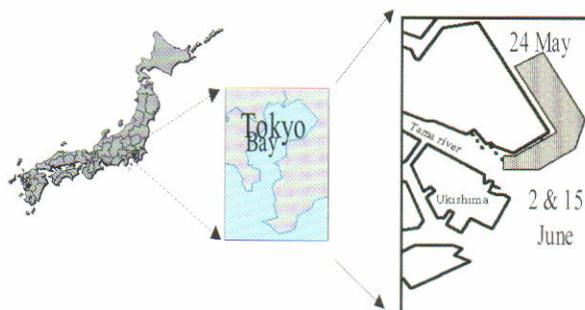


Figure 1. Area of fishing experiment off Haneda in Tokyo Bay.

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Fishing Gear

The fishing experiment used monofilament gill nets and collapsible baited pots. The lengths of the float line and sinker lines of gill net were 19.5 and 20.5 m respectively. Monofilament gillnet consist of 4 mesh sizes i.e. 51, 76, 97, and 121 mm with hanging ratio of 0.4.

Collapsible baited pot used in this experiment was dome shaped pot. It consisted of pot A and B. Length and width of pot A and B were 620 mm and 430 mm respectively. The difference between pot A and B was located at the entrance and pot height. Diameter of entrance for pot A and B was 191 mm and 220 mm respectively. Height of pot A was 210 mm while pot B was 21 mm.

Methods

Gill nets and pots were set parallel to the shore line at a depth of about 4 to 6 m. Both gears were set in the evening and hauled in the next morning. Total of soaking time was approximately 15 hours. Pots were anchored by rope in a long line system. Pot was baited by frozen fish which was cut roughly and put into string bag. The setting of fishing gear is illustrated in Figure 2.

All species caught by gill net and pot were identified. The number and sex of all crabs caught were recorded. Crabs caught by gillnet and pot were measured at CW, CL, and body weight.

RESULTS AND DISCUSSION

Catch Composition of Collapsible Baited Pot and Gill Net

Overall, 810 individuals (belonging to 26 species) were caught during the experiment. Gill nets caught a total of 680 individuals, representing 83.9% of total catch during the experiment. Separately from gill net catch on 24th May 2004, Japanese rock crab constituted the main catch. On 24th May 2004 fishing experiment, gill net caught large number of gizzard shad (Table 1).

Gill net retained more than twenty species other than Japanese rock crab. In contrast, pot catch contains just three species including Japanese rock crab. In pot, species other than crab were Japanese common starfish, and moon shell, which must be incidentally, accidentally caught.

Regarding the main catch of Japanese rock crab, the body size distributions for each fishing gears are illustrated in Figure 3. On 2nd June 2004 fishing experiment, pots retained crabs of carapace width (CW) over 20 mm but gill net caught crab larger than 50 mm carapace width. Furthermore, larger mesh sized gill nets seemed to catch larger crab, but mesh size selectivity is unclear.

Sex Ratio of Crab Caught

Sex ratios of crab caught by pot and gill net experiment were male dominant (Figure 4). However, apart from Japanese rock crab (JRC), catch of swimming crab (SC), and blue swimming crab (BSC) by gill net was very poor while eucrate crab (EC) is not considered as commercial crab. Among all the crabs caught, JRC was the only commercial species caught by pot. Hence, analysis will be emphasized on sex ratio of JRC.

Proportion number of female crab caught by pot A and B was smaller than male crab (Figure 5). Larger proportion number of female crab caught by pot was mostly at carapace width 50 to 60 mm. Proportion retained of female crab by pot A and B decreased for larger carapace width. Proportion retained of female crab caught by pot increased on 15th June 2004 fishing experiment which coincided with spawning season of Japanese rock crab.

Catch of male Japanese rock crab by gill net also showed larger proportion number than female (Figure 5). Numbers of female crab caught by small mesh size of gill net of mesh size 51 mm and 76 mm were mostly higher than those of mesh size of 97 and 121 mm. It is due to female crabs caught by gill net, were mostly small size crab. Higher proportion number of female Japanese rock crab caught by gillnet of mesh size 51 mm was at

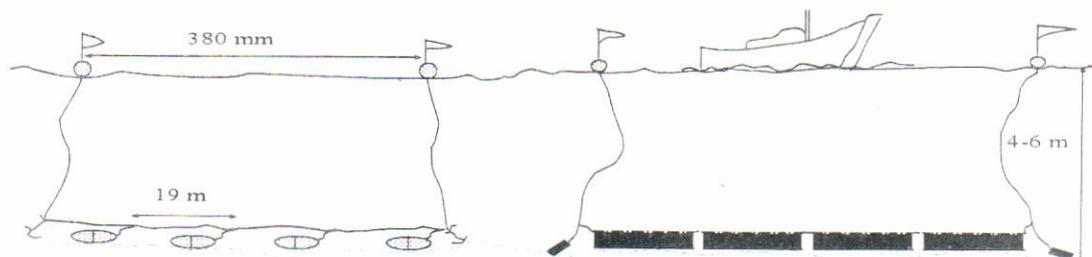


Figure 2. Setting of fishing gear during experiment.

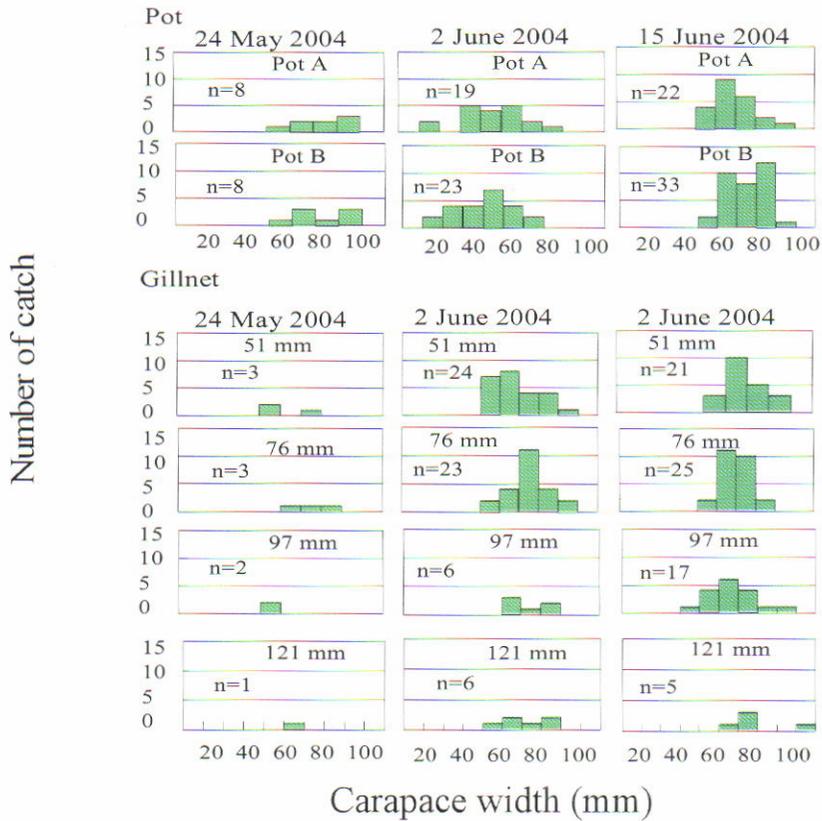


Figure 3. Carapace width distribution of Japanese rock crab caught by gillnets and pots.

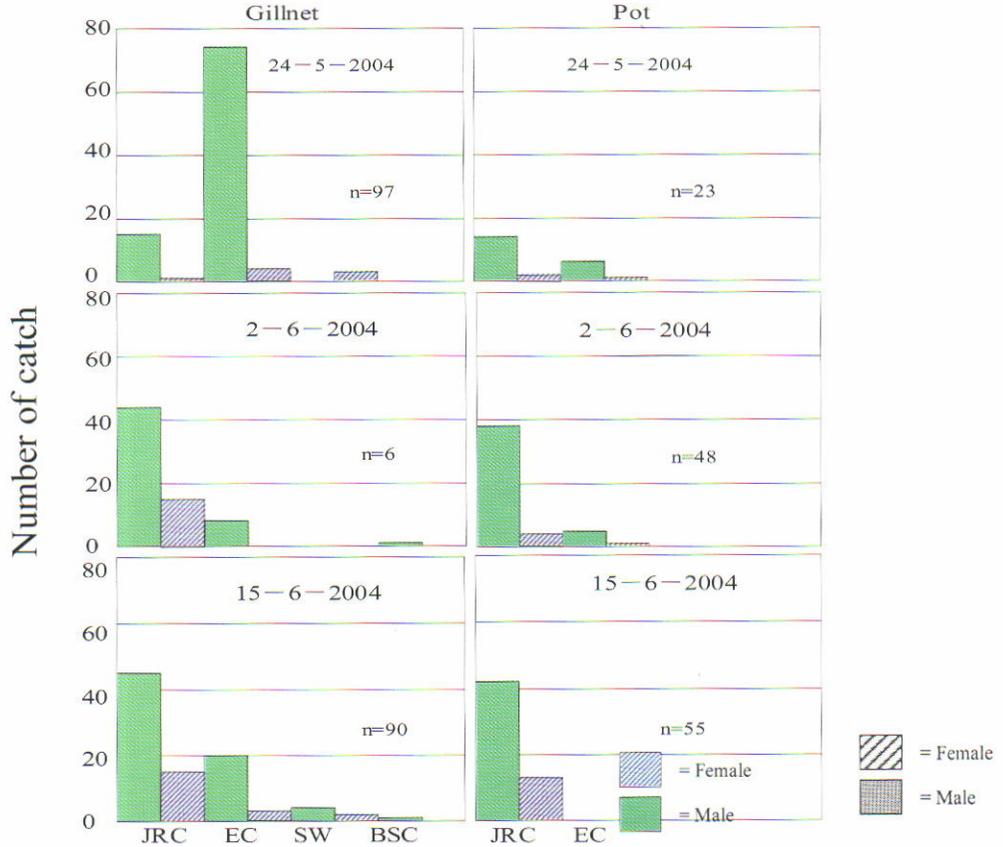


Figure 4. Number of male and female crabs caught during experiment.

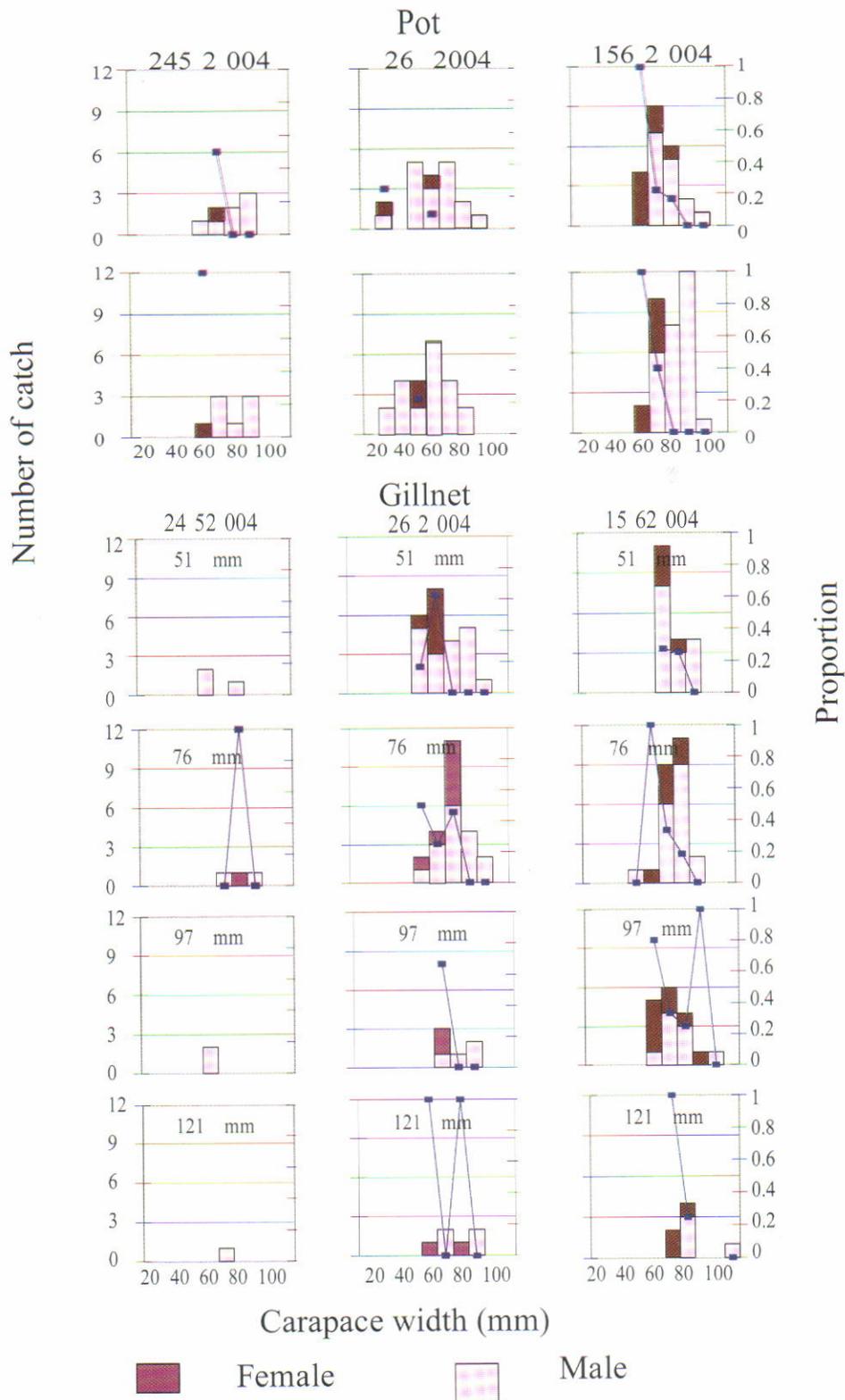


Figure 5. Proportion number of male and female Japanese rock crab caught by pot and gill net.

Table 1. Catch composition of gill net and pot during experiment

Species	24/5		2/6		15/6	
	Gillnet	Pot	Gillnet	Pot	Gillnet	Pot
Fish						
Gizzard shad	182				5	
Anchovy	53				1	
White croakers	42		7		8	
Flathead mullet	7		1		2	
Bairtail flathead	3				2	
Japanese seabass	31				6	
Ponyfish	14				1	
Japanese whiting					1	
Japanese rockfish					3	
Rosy rock fish			1			
Fat greenling			1			
Four striped greenling			1			
Schlegel's black rockfish			1			
Marbled sole			1		1	
Crabs						
Japanese rock crab	9	16	61	42	70	55
Swimming crab	3				6	
Blue swimming crab					1	
Eucrate crab	78	7	8	6	23	
Others						
Mantis shrimp					1	
Rapa whelk	6					
Sea cucumber			17			
Japanese common star fish						3
Moon shell						1

carapace width 60 to 70 mm. Furthermore, number of female Japanese rock crab by gill net was high on 15th June 2004 fishing experiment. Higher proportion number of female Japanese rock crab caught by large mesh size of 97 mm and 121 mm, was mostly small size crab of carapace width 60 to 70 mm. In this experiment, sex ratio of Japanese rock crab caught by gill nets and pot was male dominant. This experiment shows that it is difficult to avoid catch of female crabs. Female Japanese rock crabs with small size were also caught in large mesh size. This situation is due to the capture process of Japanese rock crabs in gill net, that were mainly entangled. On this condition, the size selectivity of gill net become unclear. To avoid catch of female crabs, perhaps it can be done by operating gill net in the fishing ground where male crab are mainly occurred. Some authors reported greater variance of sex ratios by season and area. Thompson (1951) found that male sand crab were 2.5 to 3 times more abundant than female in the Cleveland area than in the northern part of the bay. He suggested some swarming or schooling of crab according to sex occurred. From this experiment it is difficult to conclude that difference in sex ratio of

Japanese rock crab might be due to segregation area.

Catch of Japanese rock crab off Haneda and Tama Estuary River shows male dominance. However, proportion ratio of female caught by gill nets and pot increased on experiment of 15th June 2005. In that, berried crabs were caught by gill net as well as by pot. This result agreed with Potter *et al.* (1983). They noted that proportion of females caught during experiment exceeded that of males which encompass the main spawning period. Vulnerability of crab to fishing gear closely correlated with the emergence of crab (Skinner & Hill, 1986). When ovaries were ripening, females emerged for longer periods. Presumably because their energy demands at this time is required for increasing foraging.

CONCLUSION

1. Pot caught less species than gill net. Therefore, unwanted catch which may less affect on sorting time than gill net.

2. There is tendency that pot caught smaller size Japanese rock crab.
3. Catches of pot and gill net during experiment were male dominated. Ratio between male and female Japanese rock crab caught by pot was higher than gill net. Higher proportion number of female crab caught by pot was mostly at carapace width 50 to 60 mm meanwhile higher proportion number of female Japanese rock crab caught by gill net of mesh size 51 mm was at carapace width 60 to 70 mm. However, larger mesh size of gill net did not show higher proportion for capturing larger carapace width of female Japanese rock crab.

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