Original Research Article

Distribution of Blue Swim Crab (*Portunuspelagicus*) Catching Areas Using Foldable Traps in the Coastal Waters of Barru Regency, Indonesia

ABSTRACT

The utilization of blue swim crab resources poses a significant challenge that requires appropriate solutions, thus necessitating effective resource management. Uncontrolled fishing conditions can lead to economic overfishing if proper management is not implemented. Moreover, fishermen compete to increase their fishing efforts, leading to the need for capturing in more distant areas. Therefore, rehabilitation and management actions need to be promptly executed. This study aims to analyze blue swim crab catching areas based on distance from the coast, crab weight, carapace width, size of adult crabs, and the size of crabs eligible for capture in the coastal waters of Barru Regency. The research was conducted over 8 months, from May to December 2022, in the blue swim crab fishing grounds in the waters of Barru Regency, South Sulawesi Province. The data collection method employed in this study was a combination of survey and observation methods. The collected data were descriptively analyzed using tables, graphs, and figures, with the assistance of software such as SPSS and Microsoft Excel.The research results indicate that: (1) The composition of the caught blue swim crabs by gender shows that 285 (51.8%) were male crabs and 265 (48.2%) were female crabs; (2) The average weight and carapace width of the caught crabs fluctuated based on the distance and depth of the fishing areas; (3) A higher number of adult-sized crabs were caught in the crab catching areas at a distance of 3-5 nautical miles from the coast; (4) The percentage of adult crabs was larger compared to crabs eligible for capture, indicating symptoms of overfishing; (5) All the crabs caught during the study were of mature size, both female and male crabs. Specifically, 88.9% for male crabs and 94.3% for female crabs. The criteria used to determine eligibility for capture were carapace width above 11 cm.

Keywords: Catching Areas, distance and depth, Blue Swim Crab

1. INTRODUCTION

The Blue Swim Crab (*Portunuspelagicus*) is a fisheries resource that holds significant economic value and has penetrated export markets. Countries such as Singapore, Hong Kong, Japan, Malaysia, Taiwan, and the United States are the destinations for its exports. The crab's entry into the export market has led to higher prices in both domestic and international markets. This situation has driven fishermen to exploit this species extensively, often without considering the sustainability of the blue swim crab population.

Utilizing blue swim crab resources poses a substantial challenge that requires precise solutions, hence demanding appropriate management. According to Fauzi and Anna (2002),

sustainability is a key concept in fisheries development that aims to improve resource conditions and the well-being of fishing communities.

Uncontrolled fishing conditions can lead to economic overfishing if proper management is not implemented. Furthermore, fishermen compete to increase their fishing efforts, leading to the need for capturing in more distant areas. To ensure the sustainable use of blue swim crab resources and maintain their availability for continuous utilization, immediate actions for rehabilitation and management are imperative.

This study aims to analyze the blue swim crab catching areas based on distance from the coast, crab weight, carapace width, size of adult crabs, and the size of crabs eligible for capture in the coastal waters of Barru Regency.

2. MATERIAL AND METHODS

2.1 Location, Tools and Materials

This research was conducted over a period of 8 months, starting from May to December 2022. Data collection took place in the blue swim crab fishing grounds within Barru Regency's coastal waters, South Sulawesi Province. The study encompassed ten (10) coordinate points or research stations (Fig 1).

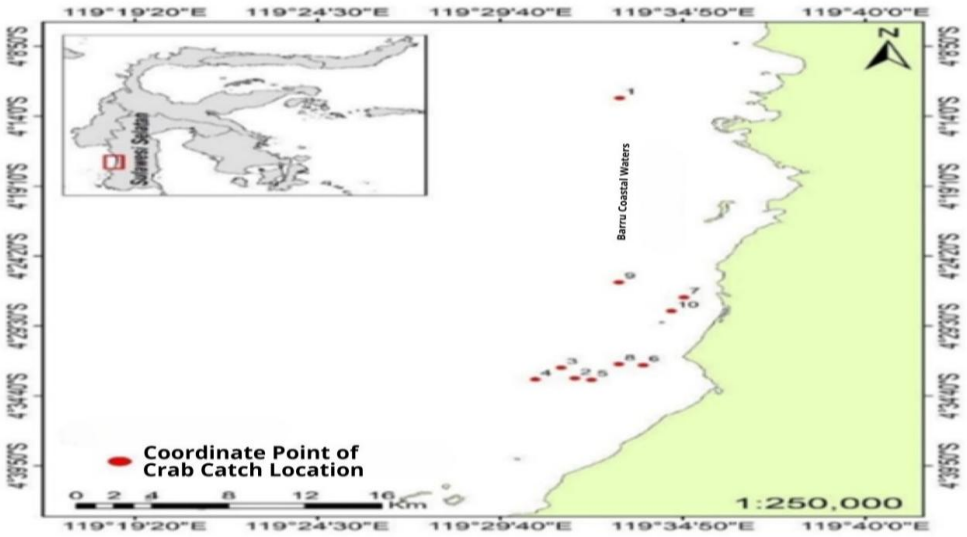

Fig 1. Coordinate points or research stations

This research utilized the following tools and materials is Foldable traps (*bubu-lipat*), Digital cameram, Slidingdigital caliper, Digital scale, Writing instruments, Blue swim crabs

2.3.Data Collection Method

The data collection method employed in this study encompassed survey and observation techniques. The required data consisted of both primary and secondary data. Primary data refers to measurements taken directly in the field during the research. Data collection was conducted in two locations: on land and at sea during the operation of the trapping equipment.

On land, primary data was collected through direct interviews with fishermen who owned the trapping equipment. Questionnaires were distributed, covering information about the trapping equipment (identifying all types/names of equipment used to catch blue swim crabs, equipment dimensions, images, and technical constructions).

At sea, primary data collection involved closely observing the operation of the foldable trap equipment at ten (10) coordinate points, with a total of 400 units of foldable traps used. The determination of the distance of the catching areas was carried out using a GPS sounder, measured vertically from the nearest coastline point to the catching area. The depth of the catching areas was measured using a GPS sounder. The duration of each foldable trap operation was recorded, from setting (deployment of the trap) to hauling (retrieving the trap). The crab catch results at each catching area station were weighed using an electronic scale (in grams). The carapace width of the crabs was measured using a sliding caliper (in millimeters).

Secondary data consisted of a time series of data spanning five years, including blue swim crab production figures obtained from various institutions such as the Barru Regency Department of Marine Affairs and Fisheries and the Barru Regency Central Statistics Bureau.

2.4. Data Analysis

The data, including the distance of catching areas, crab size, and crab weight at each station, will be subjected to descriptive analysis in the form of tables, graphs, and figures using software such as SPSS and Microsoft Excel.

3. RESULTS AND DISCUSSION

3.1. BarruBlue Swim Crab Fisheries Condition in Barru Regency

Barru Regency holds a significant potential in marine and fisheries resources. The region engages in cage culture of milkfish and red tilapia in Mallusetasi Subdistrict, pearl oyster farming on Panikiang Island, and seaweed, blue swim crab, and sea cucumber cultivation in Tanete Rilau, Barru, SoppengRiaja, and Mallusetasi Subdistricts.

The production of blue swim crabs in Barru Regency over a period of 5 years (2017-2021) has exhibited fluctuating trends. To analyze the production trends of blue swim crabs, secondary data from the Barru Regency Department of Marine Affairs and Fisheries was utilized. This information is presented in Fig 2.

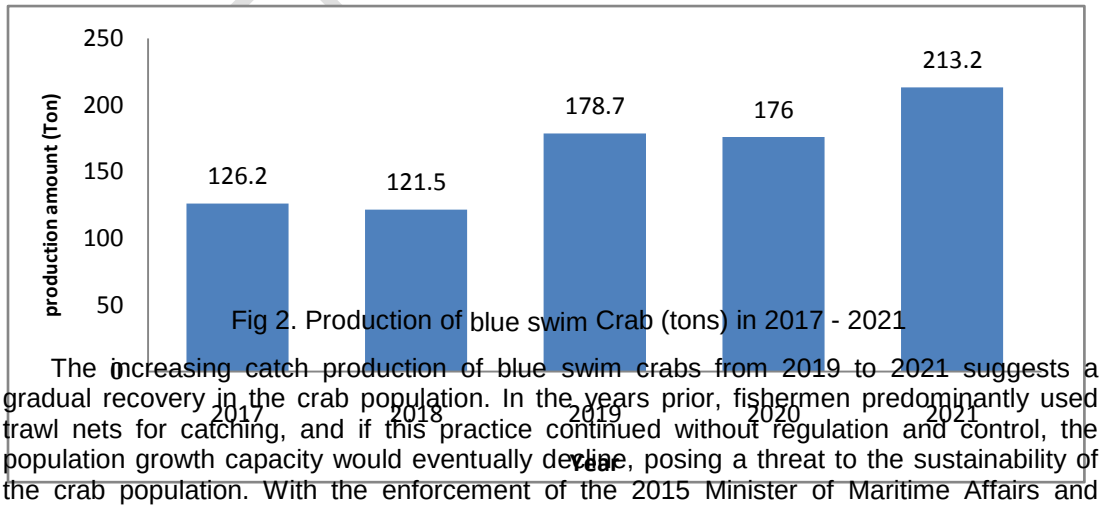

Fig 2. Production of blue swim Crab (tons) in 2017 - 2021

The increasing catch production of blue swim crabs from 2019 to 2021 suggests a gradual recovery in the crab population. In the years prior, fishermen predominantly used trawl nets for catching, and if this practice continued without regulation and control, the population growth capacity would eventually decline, posing a threat to the sustainability of the crab population. With the enforcement of the 2015 Minister of Maritime Affairs and Fisheries Regulation that prohibits the use of trawl nets, including for catching demersal fish like blue swim crabs, fishermen have shifted towards using crab traps (*bubu-kepiting*)

recommended by the government. These traps are considered environmentally friendly fishing gear

3.2 Foldable Trap Equipment

The fishing gear employed for catching crabs in Barru Regency is the foldable trap (locally known as "rakkang"), as depicted in Fig 3. The equipment specifications can be found in Table 1.

Fig. 3the foldable trap

Table 1. Technical specificationsFolding Crab Trap

No.	Specifications	Folding Crab Trap
1.	Material: -Frame -Frame Diameter -Net Material -Mouth/Opening	 Bamboo Ø0.35 cm PEmultifilament PEmultifilament
2.	Width Dimension	38cm
3.	Length Dimension	47cm
4.	Shape	Round

3.3 Composition of Captured Crab Gender

The number of captured crabs at the ten (10) designated stations during the study was 550 individuals, as presented in Table 2

Table 2. Research stations, distance from the coast, and crab gender

Stas.	"Coordinates"	Distance (mill)	Male(individuals)	Female(individuals)	Quantity (individuals)
1	04°12'39"LS.- 119°33'03"BT	4,16	35	24	59
2	04°33'22"LS.- 119°31'47"BT	3,85	38	14	52

3	04°32'35"LS- 119°31'24"BT	4,03	45	40	85
4	04°33'27"LS.- 119°30'40"BT	5,08	27	39	66
5	04°33'29"LS.- 119°32'15"BT	3,42	43	38	81
6	04°32'24"LS.- 119°33'43"BT	1,62	21	29	50
7	04°27'23"LS.- 119°34'52"BT	1,02	15	14	29
8	04°32'19"LS.- 119°33'02"BT	2,36	27	27	54
9	04°26'16"LS.- 119°33'02"BT	2,99	19	14	33
10	04°28'24"LS.- 119°34'31"BT	1,58	15	26	41
Total			285	265	550
Percentage (%)			51,8	48,2	100

Source: Field Data 2022

Table 2 indicates that the composition of captured crab gender can be observed as follows: there were 285 male crabs (51.8%) and 265 female crabs (48.2%) captured. Several studies that have been conducted (Kangas, 1997; Kumar et al., 2000) also demonstrate a dominance of captured male crabs compared to female crabs. The quantity of male and female crabs captured depends on the presence and activity of crabs in the capture area. This is due to the changing environmental conditions. Fluctuations in salinity and temperature in a water body affect the activity and presence of organisms (Gunarso, 1985).

Male crabs prefer waters with lower salinity, leading to their distribution around shallow coastal waters. On the other hand, female crabs prefer waters with higher salinity, especially for spawning, and thus they spread to deeper waters. This condition aligns with the operational area of the folding crab trap, which is mainly used in relatively shallow waters.

3.4. Captured Crab Habitat Conditions

The relationship between distance and depth of the crab capture area in Figure 4 indicates a non-linear correlation. As the distance from the coast increases, the water depth of the capture area does not necessarily follow the same trend. Based on this data, it can be inferred that the topography of the capture area, designated as research stations, has highly variable water depths.

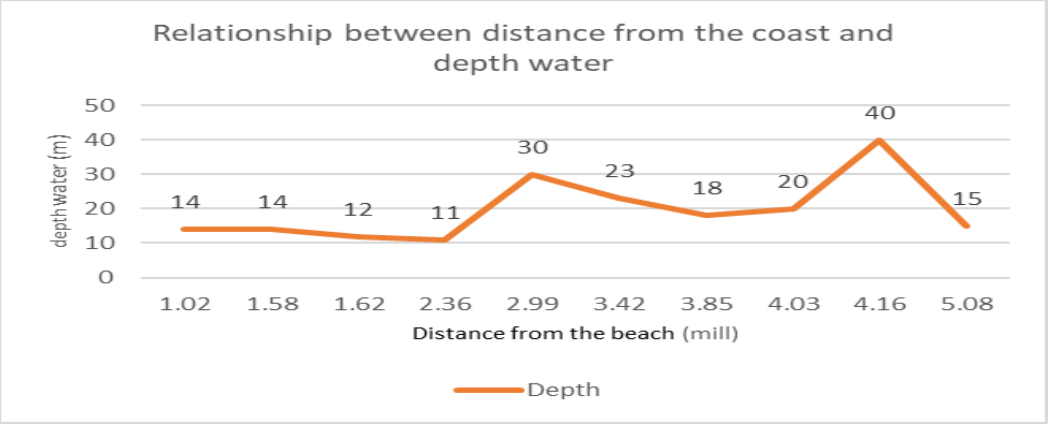

Fig 4. Capture Area Depth and Distance from the Coast

Fig 4 shows that the highest number of captured crabs occurred at a distance of 4.03 millimeters from the coast, with a total of 85 individuals, while the lowest number of captured crabs occurred at a distance of 1.02 millimeters from the coast, totaling 29 individuals.

Based on this data, it is suggested that the optimal crab capture area for setting up folding crab traps is at a distance above 3 nautical miles from the coast, towards offshore waters.

3.5. Weight and Carapace Width of Captured Crabs

The average carapace width (Table 3) indicates that the widest female crabs were captured at a distance of 2.99 nautical miles, measuring 11.16 cm, and the widest male crabs were captured at a distance of 1.02 nautical miles, measuring 10.39 cm. The lowest average carapace width for both male and female crabs was recorded at a distance of 2.36 nautical miles (M: 9.28 cm and F: 9.27 cm).

The highest average weight for captured male crabs was recorded at a distance of 5.08 nautical miles, weighing 80.08 grams, and the lowest weight was recorded at a distance of 2.36 nautical miles, weighing 51.63 grams. The highest average weight for captured female crabs was observed at a distance of 2.99 nautical miles, weighing 88.93 grams, and the lowest weight was recorded at a distance of 2.36 nautical miles, weighing 47.93 grams.

Based on the above data, it can be observed that there are variations in the capture area based on distance from the coast for the highest crab weight, while the lowest average weight has consistent capture areas based on distance from the coast. The distribution of captured crab sizes, both male and female, reflects a significant range of sizes.

Table 3. Average Carapace Width and Average Weight of Captured Crabs.

Distance from the beach (mill)	Average *CW* Male	Average *CW* Female	Average W Male	Average W Female
1,02	10,39	10,06	77,93	63,14
1,58	10,22	10,07	68,60	63,31
1,62	10,05	10,31	75,93	74,05
2,36	9,28	9,27	51,63	47,93
2,99	9,59	11,16	55,79	88,93
3,42	9,40	10,42	56,56	72,53
3,85	9,79	10,34	66,87	72,56
4,03	10,10	10,23	73,51	69,00
4,16	10,04	10,36	71,79	72,89
5,08	10,19	10,35	80,08	74,96

Desc: CW:Carapace Width;W;Weight

3.6. Sexual Maturity Size and Catchability of Crabs

According to Table4, the percentage of captured mature-sized crabs during the study is 55%, while the percentage of immature-sized crabs is 45%. Meanwhile, the percentage of crabs considered catchable size is 41%, and those not suitable for capture are 59%.Crabs reach sexual maturity at a carapace length of around 37 mm, which allows them the opportunity to reproduce. Those with economic value typically have carapace widths between 95 – 228 mm (Bellchambers and Lesang, 2005).

Male and female Blue Swim Crabs generally achieve sexual maturity at a carapace width of 7 to 9 cm. Crabs of this size are usually about one year old. Female crabs with external eggs are fully protected and must be released back into the water as soon as possible (Kumar *et al*., 2000; FishSA, 2000; Mfcrab, 2002).

Table 4. Composition of Sexual Maturity Size and Catchability of Crabs.

Description	**Unit(individuals)**

		1		2		3		4		5		6		7		8		9		10	
Parameter	CW	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
A	≥9 cm	25	31	22	20	40	19	23	18	15	27	15	13	10	9	9	6	12	12	15	15
I	< 9 cm	20	13	24	12	31	19	16	9	28	11	14	8	5	5	18	21	13	2	6	11
C	≥11cm	19	23	15	18	31	29	17	14	10	21	11	10	7	7	3	2	5	12	3	8
UFC	<11cm	26	21	32	14	40	28	22	13	33	17	18	11	8	7	24	25	14	2	12	18

Desc:M:Male;F:Famel;A:Adult;I:Immature;CW:Carapace Width;C:Catchable; UPC:Unsitable for Capture

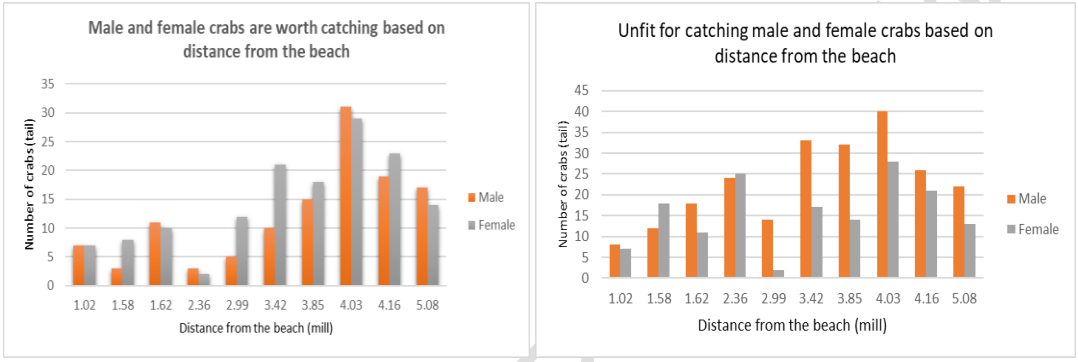

Fig 5. Capturable and Non-capturable Crabs

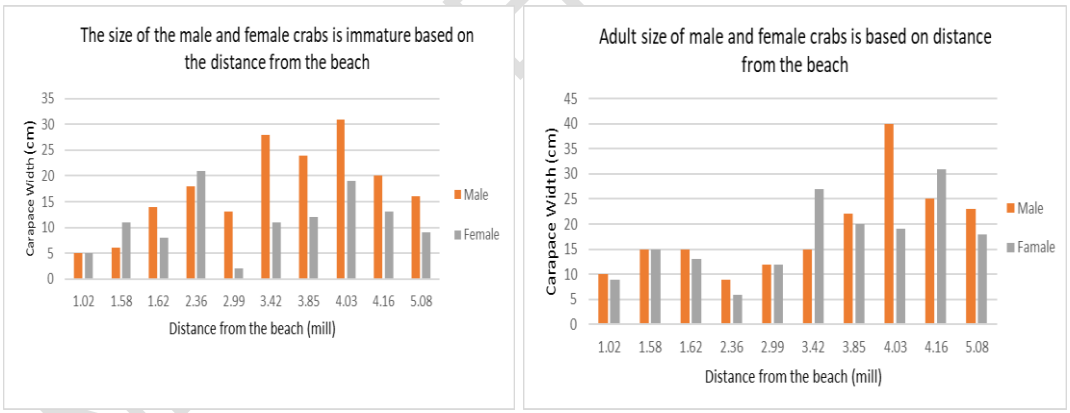

Fig 6. Adult and immature crab sizes

A larger number of catchable-sized crabs were captured in the capture area at distances of 3 to 5 nautical miles from the coast. Conversely, at distances of 1 to 2.99 nautical miles, fewer catchable-sized crabs were captured (Fig 5). Meanwhile, a greater number of adult-sized crabs were captured in the crab capture area at distances of 3 to 5 nautical miles from the coast (Fig 6).

4. CONCLUSIONS

1. The sex composition of the crabs caught was 285 male crabs (51.8%) and 265 female crabs (48.2%).

2. The average weight and average width of the crab carapace caught fluctuated based on the distance and depth of the waters of the fishing area.
3. The number of adult-sized crabs is more caught in the crab fishing area at a distance of 3-5 nautical miles from the coast
4. The percentage of mature crabs is greater than that of worthy crabs, an indicator of overfishing
5. The crabs caught during the study were all at maturity, both female and male crabs. While 88.9% for the male crab and 94.3% for the female crab. The criterion used for determining the worth of catching is the carapace width of the crab which is above 11cm.

References

Adam, Jaya I, Sondita MFA. 2006. Eastern in-shore bioeconomic models [Dissertation]. Bogor: Graduate School of IPB, Bogor.

Adam, Firman and Anwar. 2016. The Model of Management of the Crab Fishery in Increasing Fishermen's Income in Pangkep Regency. Journal of Tropical Galung 5(3) December 2016, pp. 203-209.

Bellchambers, L.M; Lestang, S.De. 2005. Selectivity of different gear types for sampling the blue swimmer crab, PortunuspelagicusL,Fisheries Research73 (1–2):21-27

Coleman. N. 1991. Encyclopedia of marine animals. Angus &Obertson, AnvInprint of Harper Colling Publishers. Australia, 324 pp.

Fatmawati. 2009. Relative Abundance and Size Structure of Crab in Mangrove Areas, Tekolabbua District, Pangkep Regency. Thesis majoring in Fisheries, Faculty of Marine Sciences and Fisheries, Hasanuddin University, Makassar.

Fauzi A, Anna S. 2002. Assessment of the Depreciation of Fishery Resources as a consideration for the Determination of Fisheries Development Policy. Coastal and Ocean Journal. 4(2): 36-49.

Ihsan, Eko Sri Wiyono, Sugeng Hari Wisudo, John Haluanl.. 2014. Season And Patterns of Catching Swim Crab (*Portunuspelagicus*)in Pangkep Waters Regency. Journal of Marine Fisheries Vol 5. No.2 November 2014. Pages 193-200.

Mirzads. 2009. Packaging Pasteurized Crab Meat in Cans. http://mirzads.wordpress.com/2009/02/12/packaging-pasteurized-crab-meat-in-cans/. (Access March 22, 2022)

Nakamura K and Supriyatna. 1990, Organogenesis dirungmethamorphosis in the swim crab, portunustrituberculatus, Nippon Suisan Gakkaishi, 56 (10): 1.561-1.564.

Nontji, A. 1993. Archipelago Sea. Djembatan Press, Jakarta.

Prasetyo, G.D., A.D.P. Fitri, and T. Yulianto. 2014. Analysis of the Catchment Area for Blue swim crab (P. pelagicus) based on differences in water depth with Arad nets (Mini Trawl) in Demak Waters. Journal of Fisheries Resources Utilization Management and Technology. 3(3): 257-266.

Susanto, N. 2010. Differences between blue swim Crab and Crab. http://blog.unila.ac.id/gnugroho/category/bahan-ajar/karsinologi/. (Access 22 March 2022).