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Assessment of blue swimming crab (*Portunus pelagicus*) fishery and sustainability in Mantatao Island, Calape, Bohol

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Abstract

The blue swimming crab (BSC) fishery is a vital source of livelihood for coastal communities throughout Bohol. This study aims to determine the status of blue swimming crab fishery, analyze the market flow, and identify the problems or challenges impacting the BSC industry. A descriptive survey method of research was used in the study with the aid of survey-questionnaires validated with personal interviews and focus group discussion. The study was conducted in Mantatao Island, Calape, Bohol for two months from November to December 2022. A total of 12 crab fishers and 1 crab trader were surveyed. Results revealed that the crab fishers in Mantatao Island employed two types of fishing methods; the traditional handpicking and spearfishing. Results also indicated that there was a decline in BSC catch coupled with a low average daily catch of 0.91 kg on November and 0.82 kg on December. The BSC products of the crab fishers are primarily distributed locally to different channels, including crab trader, local and nearby wet markets, and end consumers. Challenges identified include declining catch rates attributed to a lack of awareness among industry players regarding existing BSC fishery regulations. Despite the stability of BSC fishery in Mantatao Island, the industry faces sustainability threats. Addressing these challenges is crucial for ensuring the long term viability of the BSC fishery and supporting the livelihoods of local fishers.

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Introduction

Blue swimming crab (*Portunus pelagicus*), known locally in the Philippines as; "*alimasag"* in Luzon, "*kasag"* in Western Visayas, "*lambay*" in Central Visayas is a large species of crab found in nearshore marine and estuarine waters. Blue swimming crab (BSC) is one of the most important commercial crab species in the Philippines (Germano, 1994) and the blue swimming crab fishery is a significant sub-sector of the crustacean fishery in the Philippines (BFAR, 2013). Blue swimming crab is also considered as a major export commodity of the country. About 77% of production of the BSC from the Philippines is exported (Ingles, 2004). The Philippines is the fourth largest producer of blue swimming crab and the second largest exporter of this species to the U.S. In 2022, exports to the U.S. were valued at USD93 million (Seafood Watch, 2022).

The increasing global demand for the blue swimming crab and its wide distribution throughout the Indo-West Pacific makes it an important species to a number of countries (Lai *et al.*, 2010; FAO, 2013). This increase in export demand has caused a boom-and-bust trend in various areas in the Philippines (Ingles, 2004). Due to high prices in export trade, fishers entered the fishery without any management restrictions that lead to increased exploitation of blue swimming crab caused a decline in catch (FAO, 2021). In Bohol, the blue swimming crab fishery is considered as a major source of livelihood (ECOFISH, 2015), however, like in some parts of the country such as in Western Visayas (de la Cruz *et al.*, 2015); Leyte and Samar (Germano *et al.*, 2003); Guimaras Strait and Visayan Sea (Ingles and Flores, 2000); Bantayan Island, Cebu (Ingles, 1996); Ragay Gulf, northern Bicol (Ingles and Braum, 1989), and Leyte and vicinity coasts (Batoy *et al.*, 1980), blue swimming crab production is also seemed to be heavily exploited. Statistics has already shown that this species is heavily fished (PSA, 2016), where the production of blue swimming crab in Bohol decreased from 359.74 Metric Tons (MT) in 2014 to 299.67 MT in 2016.

Despite of the commercial value of blue swimming crab, there is limited information about its sustainability. Studies on blue swimming crab deal mainly with its biology, reproduction, and larval ecology (Batoy *et al.*, 1980; Germano and Melgo, 2003), and only a few on the fishery (Nieves *et al.*, 2013; Corpuz and Mananghaya, 2017). Hence, conducting a study that will determine the current status of the blue swimming crab fishery will be a significant contribution to the industry. Generally, this study aims to provide basic information on the status of the blue swimming crab fishery in Mantatao Island in the municipality of Calape, Bohol through looking into the fishing and trading practices for blue swimming crab in the identified area. Results of this study may be used in formulating policies, local legislations and fisheries management plans to manage effectively the blue swimming crab industry in the locality.

The main objective of this study is to present current scientific information on the status of the blue swimming crab fishery in Mantatao Island, Calape, Bohol. Specifically, this study aims to determine the following:

1. The volume of production of blue swimming crab in Mantatao Island, Calape, Bohol.
2. The fishing methods and fishing practices adapted by the blue swimming crab fishers in Mantatao Island, Calape, Bohol.
3. The market flow of blue swimming crab in Mantatao Island, Calape, Bohol.
4. The problems and challenges impacting the sustainability of blue swimming crab industry in Mantatao Island, Calape, Bohol.

Materials and methods

Research design

This study used the descriptive survey method of research which employs the collection of data that are both qualitative and quantitative in nature. For the qualitative data, the study required the collection of the data on the crabbing and trading practices of the respondents. For the quantitative data, the study required the collection of the data on the

demographic profile of the respondents, volume of catch, and the buying and selling prices of blue swimming crab. The data gathered were validated through a focus group discussion.

Research locale

This study was conducted in the municipality of Calape, in the province of Bohol, particularly in Mantatao Island. This island barangay is one of the fisheries and aquatic products sources of the municipality and is known to have a vast intertidal area and rich in marine biodiversity including the blue swimming crab.

Respondents of the study

The respondents of the study were the blue swimming crab fishers and traders in Mantatao Island, Calape, Bohol. The population of the blue swimming crab fishers and traders in the barangay were determined through acquiring data from the Barangay Fisheries and Aquatic Resources Management Council (BFARMC). A total of 12 crab fishers and 1 crab trader were surveyed in the study.

Sampling technique

Two variants of data collection were used to gather data in the study: Key Informant Interview (KII) aided with survey-questionnaires and focused group discussion (FGD) with the crab fishers and crab buyers.

To determine the volume of production of blue swimming crab in Mantatao Island, data on the catch of the crab fishers were gathered daily through the assistance of data enumerators.

Research instrument

Self-structured survey-questionnaire was used in the study. The survey-questionnaire was divided into two sections: demographic profile (name, age, gender, address, civil status and socio-economic status of the respondents) and the activities that the identified respondents engaged in (crabbing and trading activities).

Data gathering procedures

Data were gathered through personal interviews with the respondents with the aid of survey-questionnaires. Data gathered include crabbing and trading practices of the industry players, problems and challenges encountered, and existing management measures and regulations imposed in the area.

To determine the volume of production of blue swimming crab, the researchers sought assistance of data enumerators where they recorded daily the volume of catch of the identified crab fishers, source (fishing grounds), type of fishing gear or method used, and number of hours spent fishing. Data collection was done daily for two months, from November to December 2022. The data were tabulated and collated monthly.

Data analyses

The results of the study were subjected to different simple statistical treatments: frequency, percentage and mean. Statistical treatments adopted from de la Cruz *et al.* (2015) were employed to derive metrics specific to fisheries research, such as average daily catch, catch per unit effort (CPUE), and monthly production.

The average daily catch for each month was computed. The average daily catch is the ratio of the total catch (kg) to the number of fishers within the day. The average daily catch was computed as:

Ave. daily catch = $\Sigma dc/d$

Where:

Σdc = summation of daily catch of the monitored crab fishers

d = number of fishing days

The catch per unit effort (CPUE) was computed for a fishing gear or method per day.

The CPUE for spearfishing and handpicking was computed as:

CPUE = average daily catch (kg)/number of hours spent fishing

The monthly production for each fishing method in Mantatao Island was derived from:

Monthly production:

$M_i = (A_1 * F_i)$

Where:

M_i = monthly yield of the fishing method

A_i = average daily catch for the month

F_i = average number of fishing days within the month

Results and discussion

Fishing practices

There are two types of fishing methods that are adapted by the crab fishers to catch blue swimming crabs in Mantatao Island, Calape, Bohol. The crab fishers utilized the simplest form of gathering blue swimming crab, namely handpicking and spearfishing. The results revealed that 66.67% of the crab fishers are employing manual handpicking of blue swimming crab and 33.33% are employing spearfishing.

Handpicking

Handpicking is a method of gathering or collection of fish and other aquatic species by hand. In Mantatao Island, the fishing grounds for handpicking of blue swimming crab is in the intertidal area around the island with depths range from 1-3m, about 500m to 3km from the shoreline, requiring 5-30 mins. Travel time using motorized or non-motorized boats. The crab fishers in the island handpick blue swimming crabs during night time for 2 to 6 hours. The fishing season spans the whole year, although the months of August to December and January to July are regarded as the seasons when blue swimming crabs are highly abundant and least abundant, respectively.

Spearfishing

Spearfishing is a fishing method that involves wounding or impaling fish and other aquatic species with the use of sharp pointed objects such as a spear. The fishing grounds off Mantatao Island for spearfishing are about 1-5 km from the shoreline, ranging from 3-5 m in depth. Spearfishing for blue swimming crab is likewise done during night time for 3-5 hours, and all-year round. Spearfishing for BSC is also abundant from August to December and less abundant from January to July.

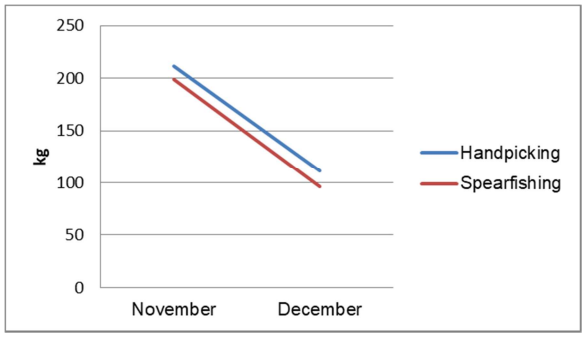

Fig. 1. The estimated monthly production of blue swimming crab (kg) in Mantatao Island from November to December 2022

Estimated monthly production

Fig. 1 shows the estimated monthly production of blue swimming crab in Mantatao Island. Results indicated that handpicking has a relatively stable monthly production of 211.20 kg on November to 199.20 kg on December. On the other hand, the production for spearfishing on November was 111.60 kg. However, on December the production for spearfishing gradually decreased to 96 kg.

In general, the estimated monthly production of blue swimming crab in Mantatao Island was 322.80 kg in the month of November and 295.20 kg in the month of December.

Estimated average daily catch and CPUE

The average daily catch of the two (2) methods for blue swimming crab fishing in Mantatao Island was recorded. Table 1 shows the average daily catch for handpicking from November to December. The average daily catch for handpicking of blue swimming crab on the months of November and December were 0.88 kg and 0.83 kg, respectively. Moreover, the average daily catch for spearfishing of blue swimming crab on the months of November and December were 0.93 kg and 0.8 kg, respectively.

Table 1. The average daily catch and catch per unit effort (CPUE) of the two fishing methods used in Mantatao Island from November to December 2022

Fishing method	Fishing ground	November			December		
		Average daily catch (kg)	Hours spent fishing	CPUE (kg/hr)	Average daily catch(kg)	Hours spent fishing	CPUE (kg/hr)
Handpicking	Mantatao island intertidal area	0.88	4.5	0.2	0.83	4	0.21
Spearfishing	Mantatao island intertidal area	0.93	4.25	0.22	0.8	4	0.2
Total		1.81	8.75	0.45	1.63	8	0.41
Mean		0.91	4.38	0.21	0.82	4	0.21

In general, the average daily catch of the crab fishers in Mantatao Island was 0.91 kg on November and 0.82 kg on December. According to the crab fishers in Mantatao Island, their present daily catch significantly declined compared to their catch in the previous years. This result is supported by the study conducted by ECOFISH (2015), which found out that crab catchers harvest an average of 3 kilos of blue swimming crab per day, which is lower compared to previous data of 7.4 kilos per day in 1998 to 4 kilos per day in 1999 (Ingles and Flores, 2000).

The computed CPUE by fishing method is shown in Table 1. The results revealed that the two (2) fishing methods have stable and almost identical computed CPUE. The CPUE for handpicking were 0.2 kg hr^{-1} and 0.21 kg hr^{-1} on November and December. On the other hand, the CPUE for spearfishing were 0.22 kg hr^{-1} and 0.2 kg hr^{-1} on November and December.

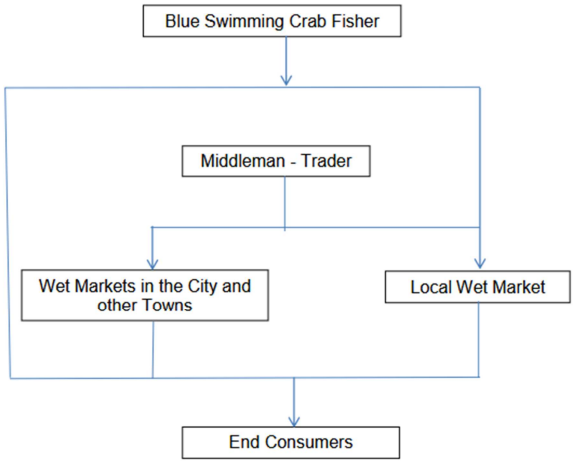

Fig. 2. The market flow of blue swimming crab (*Portunus pelagicus*) in Mantatao Island

Blue swimming crab marketing flow

Fig. 2 shows the market flow of blue swimming crab caught in Mantatao Island, Calape, Bohol. The crab fishers using manual handpicking indicated that their catch were sold as fresh (live) to traders (middleman), local wet market, and end consumers (direct buyers). Moreover, crab fishers using spearfishing revealed that their catches were sold directly to the local wet market or end consumers. In Mantatao Island, one (1) trader of blue swimming crab has been identified. The crab trader sold the blue swimming crab to local wet market and other wet markets from neighbouring towns and in Tagbilaran City, Bohol.

Generally, the blue swimming crab caught by the crab fishers in Mantatao Island are sold to a trader, local wet market, wet markets in nearby towns and in the city, and end consumers. This is consistent to the study that was conducted by Nieves *et al.* (2013), that the distribution of commercially important crab species including blue swimming crab, in Sorsogon Bay and San Miguel Bay started from fishers onto broker, bidders, buyers, retailers, dealers, wholesalers, fish vendors, processors, and traders and finally went to the consumers.

Problems and challenges

The blue swimming crab industry in Mantatao Island, Calape, Bohol is facing problems and challenges. One of the problems identified include the steady decline of catch relative to previous years. It was noted that the steady decline of catch is associated with sustainability threats including lack of awareness of industry players on the existing policies regulating blue swimming crab fishery, existence of illegal fishing including blast fishing, prevalence of catching

and trading of undersized crabs and berried female crabs, and inadequate support such as projects and programs to augment the production of blue swimming crab. The challenges include lack of stock assessment and enhancement programs, lack of research and monitoring, and insufficient management precaution in protecting the wild stocks of blue swimming crab in the locality.

Conclusion

The blue swimming crab fishery in Mantatao Island has long been a stable and significant industry, providing livelihoods to local fishers. However, the sector is now facing serious challenges, particularly a noticeable and steady decline in crab catches, which is also attributed by lower CPUE despite of low number of crab catchers. This trend indicates that the blue swimming crab stocks in the fishing grounds around Mantatao Island are either overexploited or experiencing overfishing pressure.

Recommendations

Based on the results of the study, the following are recommended:

1. To establish a more robust baseline information regarding the status of blue swimming crab fishery in Mantatao island and in the town of Calape in general, a comprehensive whole-year round assessment should be conducted.
2. The Local Government Unit (LGU) of Calape in collaboration with Bureau of Fisheries and Aquatic Resources (BFAR) Region VII should initiate stock assessment and enhancement programs to replenish and sustain the blue swimming crab population in Mantatao Island.
3. LGU- Calape in cooperation with BFAR and academic institutions should conduct information campaigns regarding the National Blue Swimming Crab Management Plan and the Joint DA-DILG Administrative Order No. 1 series of 2014 to provide awareness and impose proper discipline on harvesting and trading practices of blue swimming crab in Mantatao Island.
4. To allow wildstock of blue swimming to reproduce before being sold in the market, projects such as establishment of holding cage for berried female crabs should be established in Mantatao Island.
5. An Ecosystem Approach to Fisheries Management (EAFM) Plan for enhancing biodiversity and supporting the sustainability of blue swimming crab industry in Mantatao Island, Calape, Bohol, should be initiated and implemented with strategic focus. The plan should aim to balance ecological sustainability and economic growth by protecting marine ecosystems while promoting sustainable small-scale fisheries practices.

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