



Stakeholders' perception on the status of blue swimming crabs *Portunus pelagicus* (Linnaeus, 1758) and performance of lying-in hatchery concept in San Miguel Bay, Philippines

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Abstract. Harmonizing initiatives and efforts in a participatory management is fundamental in attaining the sustainable benefits from the resources. This study determined the perception of stakeholders on the status of swimming crabs (*Portunus pelagicus*) and performance of lying-in hatchery concept in San Miguel Bay. Primary data on stakeholders (fishers, traders/processors and community members) perception was generated through a key informant interview in Tinambac, Camarines Sur and was analyzed using descriptive statistics. Common perception showed that due to illegal fishing (i.e. trawl) and high fishing pressure, a significant decline in the volume and size of crab catch are being perceived. Furthermore, despite the efforts of the Local Government Unit, the indiscriminate use of illegal fishing methods such as trawl, blast and cyanide fishing are still rampant. Although there are already ordinances prohibiting and banning the use of these deleterious methods of fishing, there is still a need to effectively monitor and implement the laws. If left unabated these will bring more damage to the coastal environment and seriously deplete the aquatic and marine resources. Having been aware of the situation, majority of the stakeholders are willing to support the lying-in hatchery concept mostly by providing berried crabs to the facility. Remarkably, they hope that crab population will still be revived with the help of this management concept. Hence, greater chance of success of this management intervention will be realized with the active participation and broader support of the stakeholders.

Key Words: management, fishing, coastal resources, community, over-exploitation.

Introduction. Crabs are considered one of the most significant invertebrates which contribute to global food supply (Ingles 2004). The Philippine Fisheries Profile in 2009 published by the Bureau of Fisheries and Aquatic Resources (BFAR 2009) shows that crab rank fourth in terms of value among the products that are exported by the country. In Bicol Region one of its major fishery resources is crab fisheries and plays a significant role in the supply of the commodity. At the national level, Bicol region ranks 2nd in mudcrab (*Scylla serrata*) and 3rd in blue crab (*Portunus pelagicus*) production volume. Production which is generally from the wild is predominantly from Camarines Sur, Masbate and Sorsogon.

In San Miguel Bay, the estimated annual production of crabs is 524.90 metric tons with an indication of overexploitation and declining catch rates (Nieves et al 2013). Ingles (2004) reported that fluctuation trend of crab production over the years. In fact, the experience of swimming crab fishery in the Philippines indicates dwindling trend since it started in the early 1990's for export and commercial purposes (Ingles & Flores 2000). These realities recognized the importance of lying-in hatchery concept which is considered environmental and social-friendly management option (Nieves et al 2013). Lying-in hatchery is a simple concept wherein egg-bearing *P. pelagicus* is being held in a container and monitored until it hatches. Newly hatch zoeae are being released in a designated area in San Miguel Bay for *P. pelagicus* stock repopulation (Macale et al 2017).

People in the community received many benefits from marine resources however current situations indicate high level of degradation (DENR et al 2001). The inability of

the stakeholders to become involved in any management interventions will surely contribute to the depletion of resources which will in turn result to the loss of livelihood. Although marine resources are considered a common property with an open access system, protection and management must be initiated with the support and cooperation of the stakeholders. Their perception and knowledge is an essential part of strengthening fisheries management.

The objective of this study was to determine the perception of the stakeholders on the status of *P. pelagicus* and performance of lying-in hatchery concept (Nieves et al 2013) in San Miguel Bay.

Material and Method. A survey interview was carried out in coordination with the Municipal Agricultural Office of Tinambac, Camarines Sur, to obtain the stakeholders' perception on the status of *P. pelagicus* and the performance of lying-in concept as a stock enhancement approach. A key informant interview of stakeholders was undertaken along the area of established lying-in hatchery project. Sixty-seven respondents were identified which include fishers, traders, crab meat processors, and community members of Brgy. Sogod, Bagacay in Tinambac, Camarines Sur. The guide-questions are composed of the following parts: (a) socio-demographic profile, (b) fishing and/or related activities, (c) benefits from coastal resources, and (d) perception on the established lying-in hatchery. Descriptive statistics was used in computing the result of the survey interview.

Results and Discussion

Fishers. A total of 30 male crab fishers were interviewed with ages ranging from 19 to 63 years old with an average fishing experience of 25 years. Majority are married (90%) and non-members (83%) of any existing organization despite of non-government organizations and government agencies available. They are generally poorly educated where mostly (50%) have only an elementary education and thus have little access to livelihood opportunities. In a typical fishing household, most members do not proceed in their education beyond the elementary grades. Thus, the prospects of fishers for employment in sectors other than fishing are severely limited (Luna et al 2004). Fishing remains the main source of income which is the way of life in the San Miguel Bay. Their primary occupation is crab fishing with seasonal supplemental source of income such as non-crab fishing (73%), sari-sari store business (13%), construction worker (7%), fish vendor (3%) and hog raising (3%) which may compensate for meager incomes from crab fishing. If these supplemental sources of income are substantially profitable, fishers would fish less which may in turn reduce excessive fishing effort and contribute to the replenishment of the resources in the Bay.

Table 1
Stakeholders' common perception on the status of *Portunus pelagicus* and performance of lying-in hatchery concept in San Miguel Bay

Perceptions	Fishers (n=30)	Crab traders (n=7)	Community members (n=30)	Mean
1. Significant decline in the volume of crab catch which is due to illegal fishing (i.e. trawl) and over population of fishers	97%	100%	86%	94%
2. Smaller sizes of crabs today than before	77%	43%	48%	56%
3. Willingness to support the lying in concept in the area mostly by means of providing berried crabs to the facility	93%	100%	100%	98%
4. Belief that lying-in hatchery concept will help enhance the crab population in San Miguel Bay	87%	100%	93%	93%

Occurrence of crabs is whole year round with peak and lean season of June-September and October-December, respectively. Most of the fishers go fishing for 20 days (43%) and 30 days (37%) a month, indicative of the intense extraction rate and pressure on the resource which may in turn result to a depleted resources. The observed (97%) significant decline in the volume of crab catch is mostly due to illegal fishing (80%) (i.e. trawl). In fact, average catch of crab per day before was about 11-30 kg compared to only 1-10 kg catch at present. *P. pelagicus* (77%) and *Charybdis* (*Charybdis*) *feriata* (23%) are commonly caught with sizes smaller than before. Certainly, the capture of smaller and/or undersized crabs is a potential factor of growth overfishing.

Surprisingly, majority (Table 1) of the fishers (93%) are very much willing to support the lying-in hatchery concept in the area mostly by means of providing berried crabs (73%) to the facility. They (87%) think that this concept will help enhance the crab population in San Miguel Bay.

Crab traders. A total of seven crab traders were interviewed, majority are males (71%). All are married with ages ranging from 42 to 55 years old having an equal proportion (29%) of elementary, high school and college graduate. Mean number of year as traders and residency in the community is 8 and 40 years, respectively. Majority of them (71%) are non-organization members. They are either part time (43%) or full time (57%) traders. They operate from January to December (43%) while some are shifting to krill/tiny shrimp trading (14%) during lean season of crabs which are generally influenced by the monsoon seasons. Higher volumes of crabs are traded during the months of May to November which primarily coincides with the southwest monsoon season. Crab traders (100%) also noticed significant decrease in crab population and volume of crabs traded. In fact, trading of crabs recorded to as high as 2 tons in the past, which is considerably much higher than today. Possible reasons of such decline are climate change and over-population of fishers which resulted to overfishing. This finding affirms previous assessments (Nieves et al 2013) which indicate that the crab resources in the Bay are heavily exploited or over-fished with catch rates significantly declining. Ingles & Flores (2000) also reported that fishing effort of swimming crabs has been well above sustainable levels since 1999.

Most of the traders (57%) still believe that the abundance of crab could still be revived. They (86%) are aware of the existing lying-in hatchery concept facility in the area and got the information from the community, local government unit (LGU), and BFAR. Remarkably, crab traders (Table 1) are all willing to support this stock enhancement strategy by providing berried crabs to the facility.

Community members. A total of 30 community members were interviewed with ages ranging from 16 to 72 years of age. This group is dominated mostly by married females which are primarily housewives. In terms of educational attainment, 7% of them are college graduate while the rest are elementary graduate (30%), high school graduate (40%) and college undergraduate (23%). Residency in the community ranges from 4 to 69 years and mostly (69%) have no membership in any organizations. They (85%) also observed a significant change in the population of the crab in terms of volume of catch and sizes. They also suspect that illegal fishing have caused such changes. According to them, despite the efforts of the LGU, the indiscriminate use of illegal fishing such as trawl fishing, blast and cyanide fishing are still rampant. Although there are already ordinances prohibiting and banning the use of these deleterious methods of fishing, there is still a need to effectively monitor and implement the laws. If left unabated these will bring more damage to the coastal environment and seriously deplete the aquatic and marine resources.

In terms of their awareness on the lying-in hatchery concept in the area, 90% are aware that there is an existing lying-in the area and got the information from the community or from the other residence in the area. All (Table 1) of them are willing to support the lying-in hatchery concept in the area by means of cooperation with the activities and providing berried crabs.

Conclusions. The stakeholders have a high awareness on the current situation of San Miguel Bay. They observed a significant change in the population of crabs in terms of volume of catch and sizes which are all declining, making them willing to support the lying-in hatchery concept in the area mostly by providing berried crabs to the facility. Remarkably, they envision a better future and hoping that crab population will still revive with the help of this stock enhancement approach. A greater chance of success for this management intervention will be achieved given the active participation and broader support of the stakeholders.

Acknowledgements. The authors would like to thank LGU-Tinambac, BFAR-V, and Bicol University Tabaco Campus for the support of this study.

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Received: 22 November 2018. Accepted: 22 March 2019. Published online: 29 March 2019.

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How to cite this article:

Macale A. M. B., Nieves P. M., 2019 Stakeholders' perception on the status of blue swimming crabs *Portunus pelagicus* (Linnaeus, 1758) and performance of lying-in hatchery concept in San Miguel Bay, Philippines. AACL Bioflux 12(2):413-416.

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