

Stakeholders Perception on Crab Lying-in Hatchery Technology as Resource Enhancement Strategy for Swimming Crabs in Selected Coastal Municipalities in Bicol

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Abstract

This paper provides an analysis of the stakeholder's perception about the crab-lying in technology as a resource enhancement strategy for swimming crabs. The study was implemented in collaboration with regional State Universities and Colleges. Data collection was carried out from a randomly selected 58 key informant-respondents. The interview consists of four major aspects, which include knowledge, attitude, practices and perception. All data were analyzed using descriptive statistics. Result obtained showed 72.41% and 53.50% of the informants have limited knowledge about crab lying-in technology and swimming crab fisheries management, respectively. Those who have knowledge are limited to the fisheries regulatory measures like mesh-size restriction (30%) and fishery law enforcement (12.50%); aquaculture (20%); close season (20%) and crab lying-in technology (17.50%). This could be attributed to the inadequate information dissemination. Blue crab (*Portunus pelagicus*); Christian crab (*Charybdis feriata*) and mangrove crab (*Scylla serrata*) are the most important species known. A decline in production coupled by smaller harvest sizes was noted, indicating signs of overfishing. Interestingly, stakeholders expressed positivity and willingness to support and participate in the protection of crab fishery and its ecosystems. A conflict between the protection of crab fishery and its ecosystems and waste management attitude and practices as an important factor influencing the possibility of potential risk to marine's resources including crab fisheries due to pollution and environmental contamination was noted. At home and community, improper waste disposal was common. Despite this, stakeholders' perception is inclined to positively support in the resources management initiatives of the government and the crab lying-in technology is seen as a useful tool for resource enhancement. It should be noted however that difference in community knowledge, attitudes, and practices plays a significant role in influencing success or failure of these resource enhancement initiatives. In conclusion, the stakeholder's positive outlook, willingness to support the crab lying-in technology as a resource enhancement strategy can make a difference. It is recommended that massive information, education and communication campaign about the technology and ecologically solid waste management be implemented.

Keywords: *lying-in hatchery technology, swimming crabs, resource enhancement, swimming crab fisheries management*

Introduction

Fishing is one of the largest extractive methods of wildlife in the world with demand exceeding the supply. As a matter of fact, in 2017, the Philippines ranked 9th among the top fish producing countries in the world with its total production of 4.125 million metric tons of fish, crustaceans, molluscs, and aquatic plants (including seaweeds). This production constitutes 2.01% of the total world production of 205.56 million metric tons (Philippine Fisheries Profile

2018). In terms of value, aquaculture production of fish, crustaceans and molluscs has amounted to over 1.834 billion dollars. The fishing industry also contributed to the national economy to about 1.2% and 1.3% of the country's Gross Domestic Products (GDP) in 2018 at current and constant 2000 prices, respectively. This translates to some P214.869 billion for current prices and P122.02 billion for constant prices of the country's GDP of P17,426 billion (current prices) and P9,207 billion (constant prices). The

industry also accounted for 13.3% (P214.869 billion) and 16.4% (P122.02 billion) of the Gross Value Added (GVA) in Agriculture, Hunting, Forestry and Fishing Group of P1,618 billion and P746 billion at current and constant prices, respectively, the largest share next to agricultural crops (Philippine Fisheries Profile 2018). Despite the huge economic contribution of the industry, many of the known rich fishing grounds in the country suffers from overexploitation (Olaño, 2017, de la Cruz, et al., 2015, Armada 2004, and Ingles & Flores, 2000). In addition Barut et al., (1997) also reported that the increasing demand for fish due to rapid population growth and increasing exports has substantially increased fishing pressure, resulting in declining catch rates in many traditional fishing grounds. Among the fishery experiencing the same predicament is the swimming crab fisheries which include Blue Swimming Crab (*Portunus pelagicus*), Mangrove crab (*Scylla serrata*) and Christian crabs (*Charybdis feriata*). It is a high-value delicacy and an export commodity of the country, and supplies 9.53 percent of the United States of America's demand for crab meat (PCAARRD, 2017). In 2011, the country produced some 29,272 metric tons (mt) of blue swimming crab (BSC) valued at around P1.85 billion according to the Bureau of Agricultural Statistics (BAS). However the production of the blue swimming crabs has been steadily declining, mainly due to overexploitation and habitat losses. For instance, in San Miguel Bay, Nieves et al., (2013) reported that swimming crabs showed that *P. pelagicus* and *C. feriatus* are overexploited ($E > 0.50$) with E optima from the Y' -PR (Yield-per-Recruit) indicating an exploitation rate of *C. feriatus* (35%) and *P. pelagicus* (10%) exceeded beyond the optimum exploitation ($E_{0.5}$). This clearly implies excessive fishing effort resulting to an overfished fishery. The LC_{50} , the population length at which 50% of the population is harvested (the other 50% remains): $LC_{50} = 9.62$ cm for *C. feriatus* and 10.53 cm for the *P. pelagicus*, is higher compared to the size at first maturity of 8.3 cm and 10.50 cm for *C. feriata* and *P. pelagicus*, respectively (Nieves, et al, 2013). A similar situation in Sorsogon Bay (SB) was reported by Nieves et al., (2013) where natural mortality (M) value of 2.54, fishing mortality (F) of 2.08 per year and an exploitation rate ($E_{cur} = 0.45$) higher than the optimum exploitation rate ($E=50$) of 0.393, indicating more highly exploited stock. The problems besetting crab fishers in SB and SMB are quite similar with the exception of Red Tide in SB. Common in these fishing grounds are the recurring problems associated with declining fishery resources and overfishing including the inevitable climate change.

About 50% of the blue swimming crab wild stock in the country comes from Visayan Sea and Guimaras Strait (Ingles 2004). Other fishing grounds that contribute to the aggregate annual production of BSC includes the Asid Gulf, Bohol Sea, Samar Sea, Carigara Bay, Sorsogon Bay, northern part of Ragay Gulf, Tayabas Bay, Malampaya Sound, Panguil Bay, and the waters of Tawi-Tawi in Mindanao (Ingles 2004). Recorded BSC landings increased from 25,000 MT in 1992 to 40,000 MT in 2004 (Ingles 2004). However, production declined from 31,509 MT in 2008 to 28,170 MT in 2010 (BFAR 2012) which could be attributed to high commercial exploitation, ghost fishing and recruitment overfishing (Ingles and Flores 2000).

Gleaning from these findings, it is imperative that management and conservation measure must be instituted to replenish the wild stock and sustain the crabbing industry. In response to this, two options were explored: (1) no taking of egg-bearing (gravid) swimming crabs and (2) egg-bearing swimming crabs should be held in an improvised spawning tank and allowed to hatch with the larvae returned to the fishing ground or Marine Protected Areas (MPA) to grow naturally. The first option was unacceptable among fisher because it will reduce their income for a day of fishing. On the other hand, the second option was meet by the same problem where fisher demand payment for the every crab stocked in the improvised tank or cages to spawn. It should be noted that a female *C. feriata* with CW 8.3 cm to 15 cm produce about 1,513,660 to 6,357,133. Should only 25% of these eggs are allowed to spawn, hatched and grow to adult crab, some 378,415-1,589,283 will be produced for the benefit of a substantial number of fishers. It is at this point that "lying-in hatchery technology" was conceptualized. The technology works in a simple way, where the wild-caught egg-bearing swimming crabs are held to spawn in a container and the larvae released in the fishing ground or in marine protected areas (MPA's) and the spent breeders are return back to the fisher for their own disposal. The technology is inexpensive, it makes use of 50-liter plastic containers provided with aeration and filtered seawater. The set-up is simple and easy and the method is practical and supportive to the Philippine Blue Swimming Crab Management Plan. It should be noted that spawn and release practice is seen as a sound resource conservation practice worth verifying and if done correctly enhancement could play a role in the restoration of crab fisheries (Hines, 2018). To this end, it is imperative that the technology must be socially acceptable to various stakeholders (i.e. fishers,

traders, community and local government units); to collaboratively address the declining swimming crab stocks and helps sustain the crabbing industry. On this note, the study seeks to evaluate the stakeholders' perception about the crab lying-in hatchery technology" as a resource enhancement strategy for swimming crabs. Specifically, it aims to (1) determine the stakeholders knowledge about the swimming crab fisheries management program and crab lying-in technology, (2) evaluate the stakeholders attitude towards protection of the crab fishery, participation and support to management and conservation of the crab fishery, (3) determine the existing practices concerning waste and waste disposal that contribute to aquatic pollution and resource sustainability and (4) determine the stakeholders perspectives about swimming crab lying-in technology. It is hoped that the present work clarify important issue and concerns about the lying-in technology as a resource enhancement strategy for swimming crabs.

Materials and Methods

The study commenced with an orientation and an inception meeting that features the project objectives, activities, targets, and arrangements was conducted last September 10-11, 2018, at Carolyn-A Hotel and Restaurant, Tabaco City. On-site orientation and technical training was also conducted in Mercedes, Camarines Norte on March 18-21, 2019, and Tinambac, Camarines Sur on June 25, 2019, participated in by representatives from partner institutions and project cooperator. These activities were supplemented by online coaching.

The study used qualitative research method and implemented in a participatory approach. Respondents were selected in collaboration with the Regional State University and Colleges (SUCs) and local government units (LGUs). Data collection tools used include key informant ((KI) interview and focus group discussion (FGD).

The identification and selection key informant was facilitated the regional SUCs and LGUs partners. Selection of key informants was based on their extensive knowledge about the subject swimming crab. A total of 58 key informant-respondents participated broken-down as follows; 36% fishers, 22% traders, 21% LGU officials, 12% vendors, 5% academe and 4% community members.

The interview guide centered on four major guiding points which include: (1) knowledge; (2) attitude; (3) practices, and (4) perception about resource enhancement and crab lying-in technology. The preliminaries questions were for the interviewee's profile. The first sets of guide questions focused on the knowledge about the swimming crab fisheries, management and conservation program including the crab lying-in project. The second set, is about the attitude which articulate on the protection of the fishery, participation in management and conservation of the resource, and the possible mean to support and contribute to biodiversity conservation and the crab fishery. The third set of questions delved on the practices at household and community level concerning waste and waste disposal that contribute to aquatic pollution and resource sustainability. The last set was devoted to the questions about the informants' perspectives about crab lying-in and the future prospects of swimming crab fisheries. Prior to the interview, the key informants were given orientation about the project and are aware of its objectives together with the researchers' requested permission to conduct the interviews.

Data collection was implemented using KI interview and FGD. SUCs partner staff involved in the study administered the interview in their respective areas such as Mercedes Camarines Norte, Tinambac, Camarines Sur, Magallanes Sorsogon and Poblacion, Masbate. All datasets were analyzed using descriptive statistics.

Results and Discussions

Knowledge on Swimming Crab Fisheries Management and Crab Lying-in Technology

Local people surroundings the fishing ground has an established knowledge system, which play a vital role that determines the success of the fisheries management. Knowledge, attitudes, and management practices by the community significantly affect the effectiveness resource management and conservation. In the present study knowledge about swimming crab fisheries management (SCFM) and crab lying-in technology (CLT) can be the first take steps for fishers, individuals and community to prevent resources depletion and improve environmental quality. Moreover, the promotion of awareness among stakeholders is therefore a critical step towards

resource enhancement and industry sustainability.

Result obtained reveals that 72.41% of the key informants in the study area had a prevailing negative knowledge about crab lying-in technology. However, it is interesting to note that 86.21% and 93.10% of the stakeholders' area willing to learn the technology and to support the project as well, respectively. Among the study sites, only Mercedes (30 %) and Tinambac (31.25%) had a good knowledge about the technology. The low level of awareness among stakeholders could be attributed to the inadequate information, education and communication (IEC) campaign among concern agencies or a matter which stakeholders take for granted. Perhaps it is high time that government should take advantage of using social media to reach out a broader spectrum of audience and stakeholders in disseminating information and monitoring.

As vital sources of information, BFAR and LGUs each posted a 25.00% rating as source of information, while the academe, NGO's and traders each share a 12.50% rating. It is worth noting that stakeholders admit that the information on SCFM and CLT came from the information campaign conducted by the Bureau of Fisheries and Aquatic Resources (BFAR) in collaboration with their respective local government units (LGUs). It is also important to note that these efforts by BFAR and the LGUs have contributed to the awareness of the local fishers. Similar observation was noted by de la Cruz et al. (2015) and Cabrales et al. (2015) in Samar and Leyte.

Along knowledge on swimming crab fisheries management, only 46.55% are aware or have knowledge whereas 53.50% have no knowledge at all. Incidentally, those who have knowledge are limited to the regulatory measures such as mesh-size restriction (30%) and fishery law enforcement (12.50%); aquaculture (20%); and resource management measures such as close season (20%) and crab lying-in technology (17.50%). In the case of Magallanes, Sorsogon and Poblacion Masbate, knowledge on SCFM is confined to gear restrictions and close season. It could be inferred from this findings that measures that directly affect their fishing activities and livelihood is most important than the resource management and conservation. Unfortunately, fishing without regulation will eventually result in the collapse of the nature crab population in the wild.

The commercially important crab species and the fishing gears used in the study area and the average catch volume and average size at harvest are presented in Figures 1a, 1b, 1c and 1d. Blue crab (*Portunus pelagicus*);

Christian crab (*Charybdis feriata*) and mangrove crab (*Scylla serrata*) constitute the majority of the swimming crabs known to stakeholders. These are commonly harvested using crab gill net (CGN), crab trap (CT) and crab pot (CP). Crabbers in Leyte and Samar use crab pots, crab lift nets, and bottom-set gill nets in fishing (De la Cruz et al. 2015 and Cabrales et al. 2015). In term of catch volume before and today (Figure 7a and b), result obtained showed significant changes where in the past, higher proportion (57%) of the fishers catch an average of 10 kg and above, whereas, today, only 28% are harvesting the same volume of catch. Equally important is the knowledge that the average size at harvest is getting smaller; 10-15cm in carapace length. In San Miguel Bay, Nieves, et al., (2013) also reported the length at first harvest for Blue crabs and Christian crabs at 10.53 cm and 9.62cm, respectively. The observed decline in catch and small-size harvest clearly indicates signs of overfishing.

The observed changes in the crab fishery in the last five years in terms of production and catch volume are shown in Figures 1c and 1d. Majority (75.86%) of the stakeholders are on the opinion that there was a significant change in the crab population and 86.21% believed the sad realities of reduced catch volume in the last five years. In Eastern Visayas, dela Cruz et al. (2015) noted a decline in Blue swimming crab (BSC) catch but market demand for the product was consistently high. In another study, Hines and Zohar (2018) reported that crab stocks from Asia have been severely depleted because of decades of intense fishing coupled with the lack of management of the fishery.

Along the root-causes of the observed changes points to the following: (1) increase in the number of fishers (29.57%), overfishing (22.61%) and the catching of berried crabs (12.17%), illegal fishing (10.43%) and climate change (9.57%). With the exception of climate change, majority are human-induced factors. In the context of the study, awareness is the first step to change.

Stakeholder's Attitude towards Swimming Crab Fisheries Management and Conservation

An inquiry relative to the attitudes of stakeholders towards SCFM was carried out to identify the negative attitude which can later be replaced with something of equal or greater value. Of utmost concerns is the need to protect crab stocks and the fishery, including its ecosystems which obtained a predominantly positive attitude expressed by 56.90% of and 36.21% of stakeholders strongly agree and agree respectively

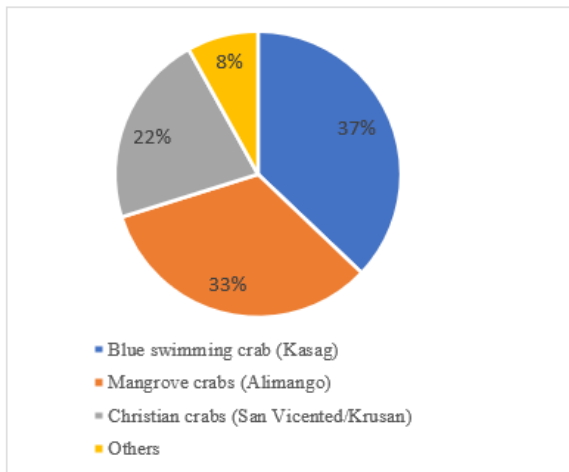


Fig 1a Commercial important swimming crab species in the study area

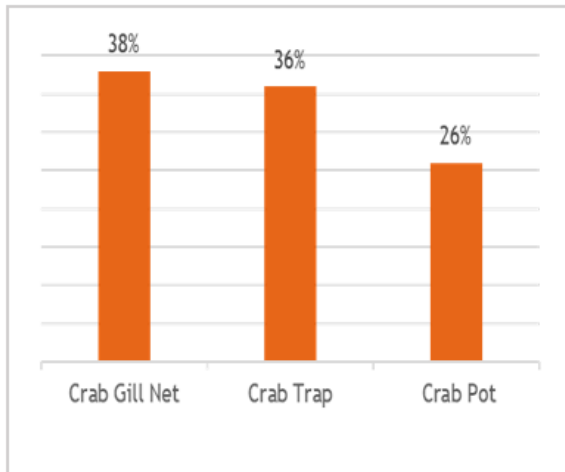


Fig 1b Swimming crab harvesting gears used in the study area

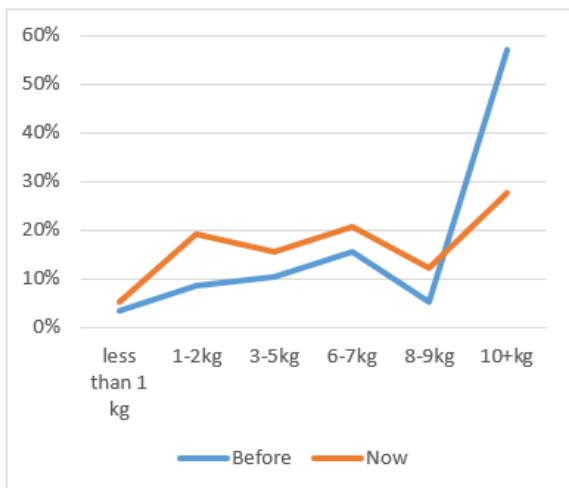


Fig 1c Average catch volume of crabs observed

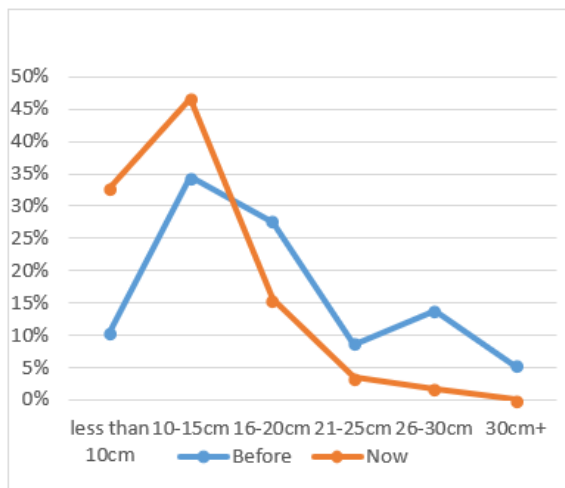


Fig 1d Average harvest size before vs. today

(Table 1). In essence is about protecting the livelihood by protecting the resource-base because sustaining livelihood is of paramount importance for economic reasons and food security. According to Pomeroy (2013), livelihoods and poverty reduction are critical and the link between healthy, well-managed and productive marine and coastal ecosystems and livelihoods is well established.

On the other hand, the willingness to participate (WTP) in LGUs and National Government Agency's (NGAs) programs in the protection of crab fishery and its ecosystems by promoting sustainable use of resources reflects popular local views and aspirations, thereby constituting legitimacy of a positive attitude towards resources recovery. With local stakeholders WTP, the adverse impacts of human-induced factors (i.e. illegal, unregulated and unreported fishing) can be

minimized through habitat protection, management and conservation as well as adoption of the ecosystem-based approach to fisheries management can be fully implemented. Unfortunately, the study found that there were gaps between WTP and attitudes. This is reflected in the context of volunteerism whereby calling the attention of law enforcer in case of on-going illegal fishing. Result obtained showed that 19% of the stakeholder will always respond to the situation while 45% will do it only "sometimes". Sadly, the remaining 36% about the lying-in as a resource enhancement strategy for swimming crabs never responded to the situation (Table 1). This could be the reason why we have weak enforcement of our fisheries and environmental laws (Oceana Policy Brief).

Table 1 Stakeholders Attitude towards SCFM

Inquiry	Tinambac		Mercedes		Magallanes		Poblacion Masbate		All	
	F	%	F	%	F	%	F	%	F	%
<i>Do you feel there is a need to protect crab stocks/fishery and its ecosystems because it affects us in terms of livelihood resource</i>										
Strongly agree	16	50.00	12	60.00	3	100	2	66.67	33	56.9
Agree	13	40.63	7	35.00	0	0	1	33.33	21	36.21
Neutral	3	9.38	1	5.00	0	0	0	0	4	6.9
Sub-total	32	100	20	100	3	100	3	100	58	100
<i>Are you willing to help participate in the protection of crab fishery and its ecosystems by promoting sustainable use of resources?</i>										
Strongly agree	15	46.88	15	75.00	1	33.33	3	100	34	58.62
Agree	15	46.88	5	25.00	2	66.67	0	0	22	37.93
Neutral	1	3.13	0	0.00	0	0	0	0	1	1.72
Strongly disagree	1	3.13	0	0.00	0	0	0	0	1	1.72
Sub-total	32	100	20	100	3	100	3	100	58	100
<i>I will support and participate in local and national government efforts/programs in protecting the crab fishery and biodiversity</i>										
Strongly agree	14	45.16	15	71.43	2	66.67	2	66.67	33	56.9
Agree	12	38.71	1	4.76	1	33.33	1	33.33	15	25.86
Neutral	4	12.9	5	23.81	0	0	0	0	9	15.52
Disagree	1	3.23	0	0	0	0	0	0	1	1.72
Sub-total	31	100	21	100	3	100	3	100	58	100
<i>On illegal activities affecting the crab fishery in our area, I immediately call the attention of our local enforcers</i>										
Never	10	31.00	8	4.00	1	33.00	2	67.00	21	36.00
Sometimes	15	47.00	9	45.00	2	67.00	0	0.00	26	45.00
Always	7	22.00	3	15.00	0	0.00	1	33.00	11	19.00
Sub-total	32	100	20	100	3	100	3	100	58	100

Stakeholders Practices on Waste and Waste Disposal

According to Sapuay (2018), solid waste management remains the most pressing environmental challenge in the country. Moreover, while most people are aware of the negative impacts of mismanaged wastes on the environment, their negative attitude coupled with insufficient environmental knowledge among individuals usually corresponds to poor practices towards maintaining good environmental conditions (Licy et al., 2013). The stakeholders waste and waste disposal practices are presented in Table 2. Result showed that plastics, straws, tin cans, plastic bottles and other plastic materials are common household wastes used in the study area. Among the users, 48% and 47% of the stakeholders used it *sometimes* and *always*, respectively, and a few (5%) claimed to have never used plastics. According to Ramos (2020) of Manila Bulletin, Filipinos throw away a daunting figure of more than 17.5 billion of plastics every year, mostly of which end up in the ocean. This in effect, impacts thousands of marine species including turtles, whales, birds, and seals die from plastic wastes every year as they often mistake them for food. Marine resources including crab fisheries within the study area may be subject to potential risk

due to pollution and contamination from wastes disposed by local communities and from other sources.

Along proper disposal of waste, improper waste disposal involving households and the community was noted. Results obtained showed that 53% of the stakeholders *sometimes* throw while 9% *always* dispose anywhere especially when no garbage bin is around. The good news is that 38% of the stakeholders “never” dispose it anywhere.

Considering that most of these wastes end up in the ocean the possibility of environmental contamination that will impacts thousands of marine species are inevitable. Having said this, advocacy that promotes ecological solid waste management (R.A. 9003) is of paramount importance. In the present study, the connection between managing waste and the protection and biodiversity conservation of swimming crabs was articulated both at the household and community levels. Finding reveals that both at the household and community levels, put less premium on advocacy or participation in activities that involve conservation and protection of crab fishery and biodiversity.

Table 2 Stakeholders Waste and Waste Disposal Practices

Inquiry	Tinambac		Mercedes		Magallanes		Poblacion		All	
	F	%	F	%	F	%	F	%	F	%
<i>I use plastic straws, tin cans, plastic bottles and other plastic materials</i>										
Never	0	0	3	15	0	0	0	0	3	5
Sometimes	15	47	13	65	0	0	0	0	28	48
Always	17	53	4	20	3	1	3	1	27	47
Sub-total	32	100	20	100	3	100	3	100	58	100
<i>I throw my garbage such as plastics, straws, candy wrappers, plastic bottles, etc. anywhere especially when I cannot see garbage bin nearby.</i>										
Never	10	31	7	35	2	67	3	1	22	38
Sometimes	20	63	10	50	1	33	0	0	31	53
Always	2	6	3	15	0	0	0	0	5	9
Sub-total	32	100	20	100	3	100	3	100	58	100
<i>In our home, I am contributing to the conservation and protection of crab fishery and biodiversity by practicing proper waste management</i>										
Never	26	81	11	55	3	100	2	67	42	72
Sometimes	6	19	9	45	0	0	1	33	16	28
Sub-total	32	100	20	100	3	100	3	100	58	100
<i>In our community, I am advocating and participating in activities that involve conservation and protection of crab fishery and biodiversity.</i>										
Never	19	59	9	45	2	67	3	1	33	57
Sometimes	13	41	11	55	1	33	0	0	25	43
Sub-total	32	100	20	100	3	100	3	100	58	100

Stakeholder’s Perception about Crab Lying-in Technology for Swimming Crabs.

The stakeholders’ perception about swimming crab future and crab lying-in technology is presented in Table 3. Findings showed that majority of the stakeholders are predominantly positive that the swimming crab population can still be enhanced. The proposition of prohibiting the catching of gravid crabs (egg-bearing) appears to offers a new direction in management to bring crabs fisheries back to the level that existed before the overharvest began. However, it cannot be denied that that difference in community knowledge, attitudes, and practices is a significant factor influencing success or failure of the management initiatives.

Meanwhile, a greater percentage of stakeholders consider crab lying-in technology as a better option in enhancing the crab population. On the contrary, although marine fisheries enhancement is not a “quick fix”, it can be a useful tool for resource management when conditions warrant its use, and if the time and care needed are taken to develop an effective program (Hines and Zohar, 2018). However, the allure of a quick fix has often prompted stakeholders to skip or ignore several elements required for enhancement programs to succeed, which leads to major failures of such efforts (Hines and Zohar, 2018).

On the basis of the stakeholders’ positive perspective and outlook, a brighter prospect can be expected in the future. The driving force for these prospects can be gleaned from the stakeholders is willingness to support, participate, learn the technology and accept change. A change in individuals and community knowledge, attitudes, and practices can make a difference. It is therefore important that the stakeholders’ willingness to change for better be given value so that it can be translated into actions and advocacies that produce tangible results.

Conclusions and Recommendations

One of the most critical factors in resource sustainability is the protection of nature and its ecosystems. We cannot simply hope that Mother Earth will provide us with adequate protection (Adegboyega, 2020). As steward of the environment it is our responsibility to maintain the healthy, integrity and sustainability of the environment and its ecosystem. To this end, the swimming crab fisheries are only one of the many resources that nature provides us for our economic needs and food security. It is therefore imperative that we should do something about while the resources can still be managed to recover.

The stakeholders' perception about swimming crab fisheries management and the crab lying-in technology as a resources enhancement strategy provided vital information regarding their knowledge and awareness, attitudes, practices and perceptions. Along knowledge, a significant proportion of stakeholders have limited knowledge about crab lying-in technology and swimming crab fisheries management. However, they are also aware of certain, fisheries regulatory measures like mesh-size restriction, fishery law enforcement, aquaculture, close season and crab lying-in technology. This could be attributed to the inadequate information dissemination but still consider BFAR and LGUs as an important source of information. Stakeholders are also aware of declining swimming crab fisheries characterized by low production and smaller harvest sizes indicating signs of overfishing.

Stakeholders are also willing to learn, support and participate in the protection of crab fishery and its ecosystems. Relative to this is the proposition of by prohibiting the catching of gravid crabs (egg-bearing) and support to the crab lying-in technology project.

A conflicting attitude and practices in terms of waste management as an important factor affecting that inevitably impacts thousands of marine species was noted. At household and community level, improper waste disposal of plastics and similar materials was common. Despite this, stakeholders' perception is predominantly positive. The crab lying-in technology was seen as a useful tool for resource enhancement. However, difference in community

knowledge, attitudes, and practices is a significant factor influencing success or failure of these resource enhancement initiatives.

In conclusion, the stakeholder's positive outlook couple by the stakeholder's willingness and support, the crab lying-in technology as a resource enhancement strategy can make a difference. It is recommended that massive information, education and communication campaign about the technology and ecologically solid waste management be implemented. Finally, a change in individuals and community knowledge, attitudes, and practices is of paramount importance.

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Table 3 Perception of respondent-stakeholder about SCFM and CLT

Inquiry	Tinambac		Mercedes		Magallanes		Poblacion		All	
	F	%	F	%	F	%	F	%	F	%
<i>Can crab population be still enhance?</i>										
Yes	25	78	13	65	3	100	3	100	44	76
No	5	16	1	5	0	0	0	0	6	10
No idea	2	6	6	30	0	0	0	0	8	14
Sub-Total	32	100	20	100	3	100	3	100%	58	100
<i>Does prohibiting catching of gravid crabs enhance crab population in the wild?</i>										
Yes	30	94	17	85	3	100	3	100	53	91
No	1	3	0	0	0	0	0	0	1	2
No Idea	1	3	3	15	0	0	0	0	4	7
Sub-Total	32	100%	20	100	3	100	3	100	58	100
<i>Is crab lying-in hatchery a better way to enhance crab population in the wild?</i>										
Yes	21	66	15	75	2	67	2	67	40	69
No	0	0	2	10	0	0	0	0	2	3
No Idea	11	34	3	15	1	33	1	33	16	28
Sub-Total	32	100	20	100	3	100	3	100	58	100

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