

Community-based Stock Enhancement of Abalone, *Haliotis asinina* in Sagay Marine Reserve: Achievements, Limitations and Directions

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Abstract

The Sagay Marine Reserve (SMR) under the National Integrated Protected Area System (NIPAS) is one of the many reef areas in the Visayan Sea in the central part of the Philippine archipelago. The SMR covers 32,000 ha or 59% of coastal waters north of the mainland Sagay City. Donkey's ear abalone is one of the most sought mollusks traded by small-scale fishers in Molocaboc Island located within the SMR. High buying prices in local and international markets compared with other fish catch motivated fishers to target abalone and caused its overfishing. SEAFDEC/AQD, with support from the Government of Japan Trust Fund (JTF), conducted a community-based stock enhancement through a tri-party collaboration between the fisherfolks of Molocaboc Island, the Sagay local government at the village and city levels, and SEAFDEC/AQD. The study showed that the decision and implementation of stock enhancement and the definition of its objectives and relevance involves the strong engagement with stakeholders. For over a period of eight years (2007-2014), we learned that stock enhancement necessarily involve high financial investments and enormous transaction cost over a long period of time which are often not affordable to local governments of coastal communities in Southeast Asia. Thus, community-based collaborations may help achieve enhancement and restocking goals.

Introduction

Under the JTF Program, SEAFDEC/AQD pursued a collaborative project on stock enhancement (SE) of threatened species in SMR. SE initiatives showed that while releases have the potential to yield substantial benefits, the actual outcomes, in terms of yields, distribution of benefits and institutional sustainability, are often different from those initially expected. These were attributed to the complexity of the environments into which enhancements is introduced, involving the dynamic interactions between the 1) biological characteristics of the resource, 2) the technical intervention of enhancement, and crucially, 3) the people who use and manage it (Garaway, *et al.* 2006; Bell, *et al.* 2006). The involvement of people as a major factor affecting SE outcomes distinguishes SE from aquaculture (Garaway, *et al.* 2006). Thus, this study explored some community-based fisheries management options following the updated responsible approach to SE (Lorenzen, *et al.* 2010) to sustain enhanced abalone stocks.



Activities and Results

Socioeconomic Baseline Survey

The study was started in 2007 by conducting some social preparation measures for stakeholders to facilitate the implementation of community-based SE (Salayo, *et al.* 2015). For a start, a socioeconomic baseline assessment survey of the primary stakeholders was conducted in February 2007 to determine level of awareness, capacity and training needs of stakeholders who will collaborate and implement a community-based SE. The survey of fishery stakeholders in Sagay showed low levels of

Establishment of Collaboration

Social preparation measures also include establishing collaboration with fishery stakeholders in SMR such as fishers and their households as primary stakeholders, local government units (LGU) who are law-mandated to manage coastal fisheries (Republic Act 8550), traders who significantly influence fish markets, and research/academic institutions such as SEAFDEC/AQD that can introduce science-based interventions through resource enhancement. There is no active fisherfolk organization in the study site when the SE project started in 2007. Thus, after conducting relevant IEC activities, about 60 fisherfolks signed up to be members of the Molocaboc Barangay Fisheries and Aquatic Resources Management

Information Dissemination

Guided by the outcomes of the baseline survey, periodic information, education and communications strategies (IEC) were conducted. On-site lectures on the biology, life-cycle and aquaculture-based production of abalone juveniles were among the first IEC activities held. IEC is a continuing activity throughout the duration of the project and their content aims to address the varying needs and issues arising in the

Demonstration of Community-Based Stock Enhancement

This tri-party collaboration implemented a community-based SE of abalone by conducting periodic releases of tagged hatchery-bred abalone juveniles in the 4,000 sq m coral patch, mainly *Porites sp.*, in the intertidal flats of Brgy Molocaboc. A total of 14,020 diet-tagged hatchery-bred abalone juveniles with 2.5 mean SL have been released periodically in 12 batches from June 2011 to September 2014. Since the first release of tagged hatchery-bred juveniles in June 2011, SEAFDEC/AQD researchers together with fishers conduct monthly monitoring by taking samples to evaluate indicators of growth of released abalones as well as wild stocks that

awareness as only 17% of the respondents reported being aware about SE as a fisheries management option for reversing the depletion of threatened species. Fishers also reported that similar with most fish species, the catch of abalone continue to decline from 5 kg per 4-hour fishing trip before 1995 to only 1 kg during the 2007 survey. Hence, fishing households expect to directly benefit from SE projects through improved catch and higher income.

Council (BFARMC) in November 2009 in accordance with the Fisheries Administrative Order 196 of the Bureau of Fisheries and Aquatic Resources (BFAR). The stakeholders agreed to form a tri-party collaboration to identify, implement and assess strategies for managing enhanced stocks of abalone. The tri-party collaborators include: (1) the fishers organized as BFARMC who participate mainly by protecting the enhanced stocks; (2) the LGU provide oversight through its Protected Area Management Board of Sagay Marine Reserve (PAMB-SMR) and together with abalone traders who provide logistical support; and (3) SEAFDEC/AQD that provide technical expertise in the biological and social aspects of SE.

implementation of the project. For example, lectures for school children were periodically conducted since children often glean for abalone and other species during low tide to obtain food and supplement household income. The project also participates in the local *Sinigayan Festival* to improve awareness and cooperation in abalone SE.

were able to recover due to protection of the SE demonstration site. Starting August 2012 when data monitoring showed abundance of >6cm size, partial harvests were periodically being done to increase appreciation of SE and provide sustainable operating funds for the project. A cumulative total of 2,247 pieces of abalones > 6 cm SL (148kg) were harvested. Total sales proceed from August 2012 to December 2014 amounted to PhP 42,738 and was allocated by BFARMC as follows: spent for organizational operating expenses (48%), petty cash for demo-site maintenance (6%), small loans for members (20%) and bank deposits (26%).



1-a

Fig. 1-a. The community-based stock enhancement demonstration site in a 4,000 sq m coral patch (*Porites sp.*) in Brgy. Molocaboc, Sagay City, Philippines



1-b



1-c

Fig. 1-b. Gleaning is not allowed (*Bawal manginhas*) in the release site called by fisherfolks as “*Semilyahan*” or breeding area
Fig. 1-c. Periodic releases of diet-tagged hatchery-bred abalone juvenile attached to plastic pipes were participated by various stakeholders

Enhancement of Participatory Governance

Since the formation of the Molocaboc BFARMC in November 2009, the officers and members have been collaborating with the LGU at the Barangay and City level. Participatory governance was demonstrated when, arising from IEC discussions on the correlation of abalone sizes and spawning, the >6cm SL catch-size regulation was endorsed by a *Barangay* Councilor who also signed-up to be a BFARMC member; and it became a *Barangay* Ordinance in

Social and Biological Impact Assessment

In November 2014, an assessment survey interview of 80 BFARMC members and 80 non-members in Brgy Molocaboc was conducted. Results showed that 94% of the 160 respondents expressed awareness about SE in general. Awareness about the SEAFDEC/AQD-initiated SE of abalone is at 98%. Seventy-three percent reported participating in community-based SE, majority of which are the BFARMC members or 96% of the 80 members surveyed. Awareness of

Lessons Learned

Table 1 lists the lessons learned from a community-based SE project according to its various component activities. Social preparation encompasses a wide range of activities involving as much people and stakeholders in the community. Hence SE is costly, especially because the opportunity cost of fishers or foregone income to attend meetings were accounted by the project.

June 2010. In September 2012, the Sagay City Environment and Natural Resources Office that manage the SMR endorsed to PAMB-SMR the up-scaling of the catch size regulation into a city-wide ordinance. The voluntary participation of the fisherfolk members of the BFARMC in maintaining and securing the community-based SE demo-site, and in the protection of the coral habitat is most invaluable demonstration of participatory governance.

the abalone catch size regulation is high at 93%; and 96% agree to it, including those few who have only been made aware during the interview. Biological impact assessment is yet to be conducted as appropriate. Although, monthly monitoring of growth of abalone samples indicate that the released abalone juveniles matured and established in the demonstration area. Fishers reported higher number of abalones or spill-overs gleaned in areas outside the release site.

SE is also characterized by long investment and gestation period before benefits could be realized. Since SE is not often the first choice among the fisheries management tools, there is dearth of SE-specific IEC tools to guide information campaign and impact evaluation.

Table 1. Component activities in community-based stock enhancement (SE), lessons learned and recommendations

Component Activities	Lessons from Implementation Experience	Recommendation
1. Baseline survey, establish collaboration	High cost, long investment and gestation period	Tri-party collaboration, i.e. fisher's organization, LGU and technical agency
2. Information dissemination	High cost; need for SE-specific IEC tools	Develop IEC tools
3. Enhance participatory governance	Variable participation; "political & electoral disruptions"	Develop variety of strategies involving many stakeholder groups
4. Demonstrate & monitor stock enhancement	High cost; critical protection & monitoring; sustainable seed supply	Motivate collaboration & voluntary work; link with or establish hatchery
5. Social and biological impact assessment	Lack of SE-specific techniques	Further research to develop assessment tools
6. External factors (market, consumer preferences)	Price decline; export price dependency	Product promotion in local markets to reduce export- dependency; dry-processing

In terms of inclusive organizational strengthening and engagement of fisherfolks in coastal resource management, the Molocaboc BFARMC has since then been known to be in the frontline in SE and other fishery-related activities in the locality and collaborates with the LGU in fisheries management. The success of the BFARMC provided directions for the formation of sub-groups of fishers in 2014, namely, the Matabas Small Fisherfolks Association (MASFA) and the Molocaboc Sea Ranchers Association (MOSRA). However, participation of fishers in SE activities remained variable. This suggests that even if the released abalones successfully established in the release site and there are already economic

benefits from regulated partial harvest, the social aspects of SE remain a challenge.

In addition, markets situations, price movements and consumer preferences are some external factors that influence the success or failure of SE as a fishery management option that may provide sustainable income to fishing households. Local buying price of live abalone was PhP 350/kg at the start of the project in 2007 when harvest was scarce. However, local buying prices declined to as low as PhP 120/kg live in 2014 due to a number of market factors, local and international.

Recommendations and Way Forward

Table 1 above also summarizes the recommendation according to the key activities and limitations encountered by this project. In view of the high cost and long investment period in SE, fishery enhancement projects are generally government-funded. This study therefore concludes that SE can be accomplished through a tri-party collaboration involving the fishers who are the direct fishery resource users, the LGU who are the resource managers, and a research organization that provide technical advice in resource management. In all of these collective activities, the participation of stakeholders is a key factor leading to a successful SE initiative. Furthermore, the cooperation of fishery stakeholders in protecting the released stocks distinguishes SE as a fishery production process vs. aquaculture which involves rearing of aquatic animals in controlled enclosed environment.

The market for abalone seems export-dependent as most harvest are intended for northeast Asian who consume and prefer abalones. Filipinos do not generally consume abalones, hence, local campaigns are need to increase domestic demand and consumption.

However, while aquaculture technologies at SEAFDEC/AQD enabled the production of hatchery-bred seeds for release to enhance natural stocks, the present project accomplishments are limited by access to sufficient abalone seeds for release. Under the GOJ-TF6, the tri-party collaboration will continue to support the project and the Sagay City LGU agreed to fund the construction of a pilot hatchery in the Molocaboc; the BFARMC will run the daily operations of the hatchery; and with technical support from SEAFDEC/AQD.

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