

Blue Swimming Crab Stock Enhancement in the Philippines

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Introduction

The blue swimming crab, *Portunus pelagicus*, is an important fishery commodity that contributes significantly to the global food supply. According to FAO (2018), global capture production has been increasing reaching 212 571 tons in 2014. The rapid development of blue swimming crab fisheries is mainly driven by the increasing demand in the international market.

In the Philippines, blue swimming crabs, locally known as kasag, alimasag or lambay, is a cosmopolitan species in coastal waters. Major fishing grounds include the Visayan Sea, Guimaras Strait, Panay Gulf, San Miguel Bay, Tayabas Bay, Ragay Gulf, Samar Sea, Carigara Bay, Bohol Sea, Malampaya Sound, Pangil Bay, and Tawi-Tawi among others (Ingles, 2004). It is one of the top export product of the country and is valued for its meat quality. In 2017, the catch volume of blue swimming crab amounted to 31,327 metric tons, 9.56 higher than the production of the in 2016, with an estimated value of PhP 4.3 billion (PSA, 2017). The fishery contributes less than 1% (0.7%) in the total volume of fisheries production in 2017 (PSA, 2017).

The exploitation of blue swimming crab resources started in the 1980s by the commercial sector following the introduction and popularity of bottom trawls (Ingles, 2004). This commodity was only once a preferred by-catch mostly from finfish fishery. Blue swimming crab has become an important fishery in the 1990s driven by the increasing demand in the international market for pasteurized crab meat (The World Bank, 2012). This has increased the number of crab picking and processing plants and increased fishing pressure on the resource. A steady decline in catch size and volume has been observed over the years. To ensure proper management and protection of this dwindling resource, a Joint DA-DILG Administrative Order No. 1 Series of 2014 on the Regulation for the Conservation of Blue Swimming Crab was passed.

Along with proper management of the resource, stock enhancement has been recognized and viewed as one of the possible approaches to restore the population of blue swimming crab to a sustainable level.

The pioneer hatchery for blue swimming crab started in Guiuan, Samar, which was operated by the Bureau of Fisheries and Aquatic Resources Region 8 (BFAR 8) in 2009. PACPI contributed to the operational expenses and provided technical staff who were trained to work under the project. PACPI later started its hatchery in Tigbauan, Iloilo, in 2013. The hatchery was able to produce and reseed juvenile crabs mostly in Northern Iloilo; however, the production was unstable with survival rates of 0.1% to 13.8% from zoea to crab instar. Due to high mortality rates, the rearing period was reduced from 28 days (crab instar 10 stage) to 21 days (crab instar 4 stage), in 2014, to reduce costs and prevent further mortalities of crab juveniles. Longer rearing resulted in high mortality rates, which was generally due to cannibalism during molting. The hatchery failed to achieve production targets despite the modifications in the hatchery protocol, which led to the closure of the hatchery in 2015.

The blue swimming crab hatchery was transferred to Escalante, Negros Occidental in April 2016 further refining the hatchery protocol developed in Iloilo. Another hatchery was established in Ubay, Bohol in September 2017.

In addition to the production of hatchery-bred juveniles, holding cages (also called lying-in cages) for berried crabs were adopted by cooking and picking stations. PACPI is also piloting the use of thai-style hatching tanks to save the eggs of berried crabs.

The aim of the stock enhancement initiatives is to increase the wild stock of blue swimming crab to a sustainable level and to lessen the negative impact brought about by the continued harvesting of berried crabs.

Negros Hatchery

PACPI started operating the blue hatchery in 2016 at the Rapid hatchery in Escalante, Negros Occidental. The project is a collaboration with the Provincial Government of Negros to conduct mass production of blue swimming crab juveniles and dispersal activities in the region. The hatchery protocol established in Iloilo was adopted with some modifications. The rearing period is 21 days, harvesting at crab instar 4 stage (approximately 4 mm carapace width). The average monthly production is around 115,000 pieces of crab instar 4 with an average survival of 37% from zoea to crab instar 4 (Figure 1).

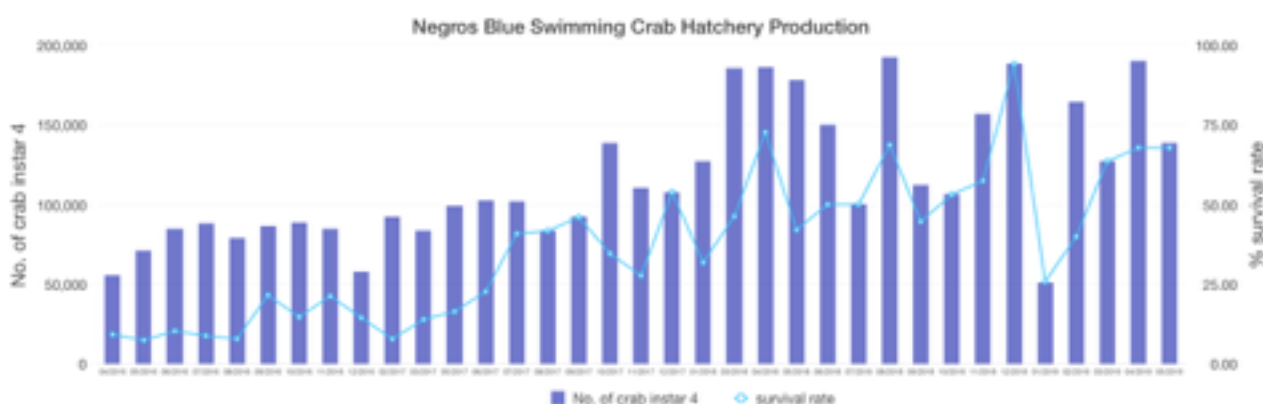


Figure 1. Negros hatchery production of blue swimming crab juveniles, 2016-2019

Reseeding of crab juveniles produced from the hatchery was done in seagrass and mangrove areas in Northern Negros and Sicogon Island, Carles, Iloilo (Figure 2). To date, the areas covered by the stock enhancement include 19 villages in 11 towns.

The hatchery is equipped with an enclosed set-up to keep a warm rearing temperature. Five (5) fiberglass tanks of 5-ton capacity are being used for rearing the crabs from larvae to crab instar. Also, 2 tanks of 10-ton capacity each for algae and rotifer culture are being used. The hatchery is already operational producing milkfish and shrimp fries before the inclusion of blue swimming crab, as such other



Figure 2. reseeded areas of crab juveniles produced from the hatchery in Escalante, Negros Occidental

necessary hatchery facilities and set-up, i.e., water source, filter, tanks, are already in place. A hatchery manager and two laborers run the hatchery for blue swimming crab and facilitate the dispersal activities.



Figure 3. Enclosed set-up made from plastic roofing to maintain a warm rearing temperature



Figure 4. Blue swimming crab rearing tanks made of fiber glass



Figure 5. Rearing set-up for blue swimming crab



Figure 6. Concrete tanks for algae culture

Expansion of blue swimming crab hatchery in Ubay, Bohol

In August 2017, PACPI collaborated with the Bureau of Fisheries and Aquatic Resources Region 7 (BFAR 7) to conduct seed production of blue swimming crab at BFAR's Multi-Species Hatchery in Sinandigan, Ubay, Bohol. The hatchery uses the same production methodology as that of Negros hatchery with some modifications to address the problem of the lack of freshwater sources in the area. The average monthly production of crab instar 4 is 68,000, with an average survival of 10% from zoea to crab instar 4 (Figure 7). Reseeding of crab juveniles was done in marine protected areas with seagrass beds in 15 villages of 6 towns in Bohol (Figure 8).

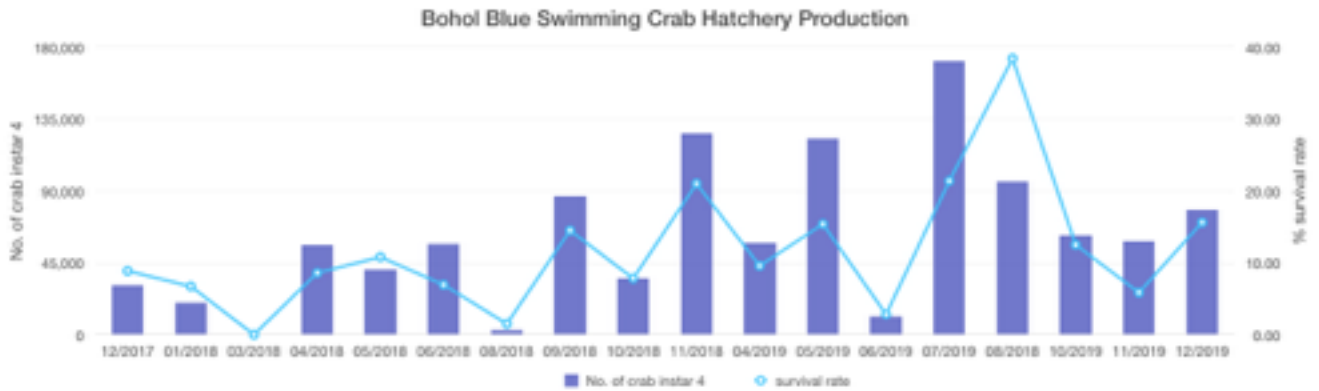


Figure 7. Bohol hatchery production of crab instar 4, 2017-2019



Figure 8. Reseeding areas of crab juveniles produced from the hatchery in Ubay, Bohol

The blue swimming crab hatchery in Ubay is an enclosed set-up with five rearing tanks of 9-ton capacity. Located adjacent to the enclosed set-up are six 9-ton tanks: one for tilapia culture, three for chlorinated water, and two extra tanks for the rearing of crab instar in case needed. Tilapia water and chlorinated water are used to refill the rearing tanks. The culture of artemia is done in two 400-litre fiberglass tanks. The hatchery has designated tanks for the culture of algae and rotifer for the use of all cultured species including blue swimming crab. In total for the whole hatchery, there are forty 9-ton tanks and ten 20-ton tanks for algae; and ten 20-ton tanks for rotifer. A hatchery manager and one (1) technician run the blue swimming crab hatchery. Dispersal activities and IEC activities is being done together with BFAR 7.



Figure 9. Blue swimming crab hatchery set-up in the multi-species hatchery of BFAR 7, Ubay, Bohol

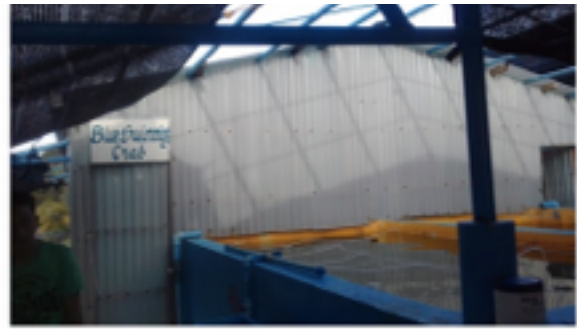


Figure 10. Enclosed set-up for rearing blue swimming crab in the multi-species hatchery of BFAR 7, Ubay, Bohol



Figure 11. Concrete rearing tanks of 9-ton capacity



Figure 12. Concrete 9-ton tanks for the culture of tilapia and chlorinated water

Other ongoing stock enhancement efforts for blue swimming crab

The province of Iloilo is planning to establish a blue swimming crab hatchery in Concepcion, Iloilo, as inspired by the success of the hatchery in Negros. They are targeting to produce crab juveniles to be used to enhance the declining blue swimming crab stocks in the province.

The produced crab juveniles are to be used to enhance the declining blue swimming crab stocks in the province. PACPI is expected to support the hatchery through the provision of a hatchery technician and laborers. The construction of the hatchery is expected to commence this year.

The blue swimming crab hatchery in Guiuan Samar still operates, though there are some limitations due to the damage caused by typhoon Haiyan. BFAR 8 allocated the rehabilitation of the hatchery, and repair is expected to commence this year. Continuous seed production and stock enhancement activities are being conducted within the region out of the crab juveniles produced from the hatchery despite the limitations in the hatchery facilities. The production ranged from 5 000 to 11 000 crab juveniles per run.

The Department of Science and Technology-Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD) has a National R&D Program on Blue Swimming Crabs, which aims to refine existing technologies on hatchery and grow-out culture and develop nursery culture of blue swimming crabs for sustainability and industry competitiveness. Updates, particularly on the refined hatchery technologies, have been solicited and being anticipated from the agency.

In addition to the stock enhancement efforts using hatchery-bred juveniles, lying-in cages or holding pens/cages where berried crabs are made to spawn before selling or cooking, are being adopted in some areas in Negros Occidental, Bantayan Island, Cebu, Bohol, and Bicol. This method is a cheaper alternative to crab hatcheries. Industry players usually picking stations or consolidators operate the holding cages. Another technology piloted by PACPI starting in September 2019 is the use of thai-style hatching tanks which is aimed to save the eggs of berried crabs. The methodology involves scabbing off eggs from berried crabs, hatching the eggs in tanks with flow-through water system and release of zoea or larvae to the wild.

Effectiveness of stock enhancement for blue swimming crab

Partnership with the local government (i.e., Negros hatchery) and government agencies (i.e., BFAR) for the stock enhancement of blue swimming crab in the Philippines has so far been inclusive and cost-effective. The seagrass beds and mangrove areas near blue swimming crab fishing grounds are the usual reseeding sites.

The challenge on the effectiveness of the stock enhancement initiatives is the lack of scientific studies that can support the claim that hatchery-bred crab juveniles contribute to the spawning stock biomass of blue swimming crab, even at least in dispersal areas. Only anecdotal claims are available such as testimonies from coastal communities of increased sightings of crab juveniles in seagrass and mangrove areas.

To determine the impact of the use of thai-style hatching tanks, PACPI is monitoring the abundance of zoea and megalopa in the water column and is assessing the abundance of crab juveniles in intertidal zones.

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