

Milestone 6&11 Evaluation of BSC banks.

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1. BSC Crab Bank development in Thailand and the results

For national promotion, the crab banks in Thailand were formal beginning in 2019 and developed over five years of progress. Initially, there were small volume crab banks around the GOT and Andaman coastal area, increasing to 565 BSC banks in 2023. During the progression of crab banks, Indicators used to determine the success of the crab bank were the number of gravid females that entered the banks, the number of zoea released, the increase in BSC landings, and the income of fisher, which was collected by interviews with questionnaires from stakeholders in BSC supply chain by the researcher who promotes the crab bank in each area fund by National Research Council of Thailand (NRCT).

The purpose of crab bank operations in Thailand is to serve as a supplemental measure for fishery management. By forcing specific regulations, the landing of BSC in the GOT was going to the recovering phase (figure 1). Let the Committee on Sustainable Management of Blue Swimming Crab Resources in Thailand decide to allow the time frames of crab bank for the next five years (2023-2027) or until the BSC landing constancy at above 50% of top landing in the last time, and low variation (DOF, 2022).

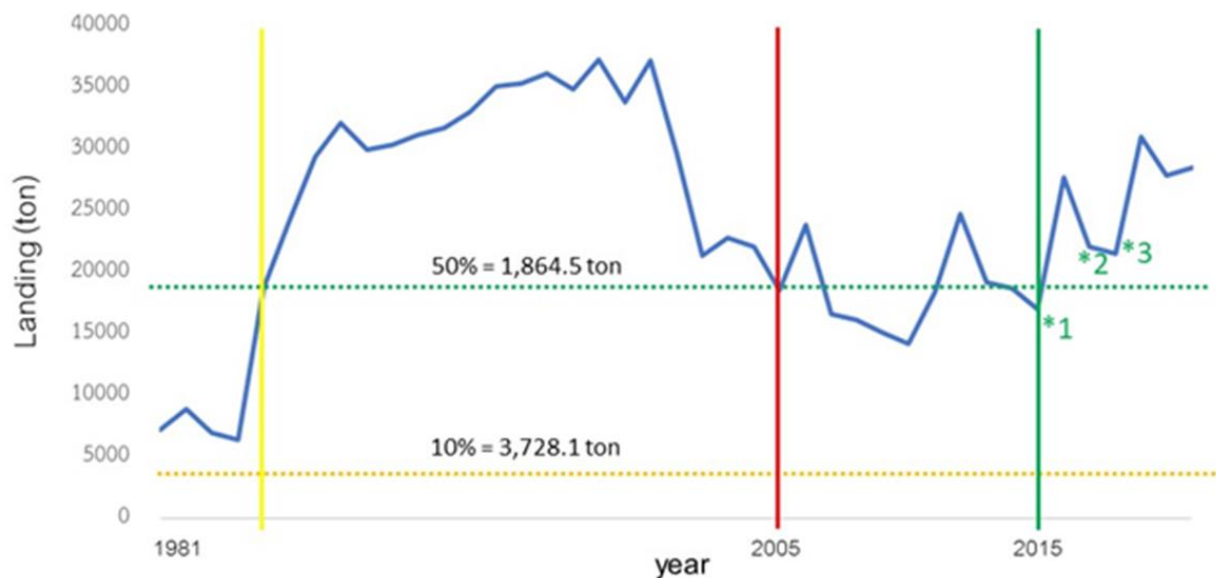


Figure 1 The development of blue swimming crabs yearly landing in the Gulf of Thailand.

*1) Announcement of the Royal Ordinance on Fisheries, 2015.

*2) Announcement of the Ministry of Agriculture and Cooperatives Subject: Determination of fishing gear, Method of fishing, and fishing areas prohibited for fishing in the coastal area, 2018.

*3) BSC Bank operation from 2019 onwards

In Surat Thani province, the increasing number of crab banks resulted from the growth of national promotion. Overall, crab bank numbers in Surat Thani province were 29 crab banks in 2019 and increased to 44 crab banks in 2020-2022. The indicators used to determine the success of the crab bank were the same as the national monitors. The location coordinates of the development of all crab banks in this area are shown in Figure 2.

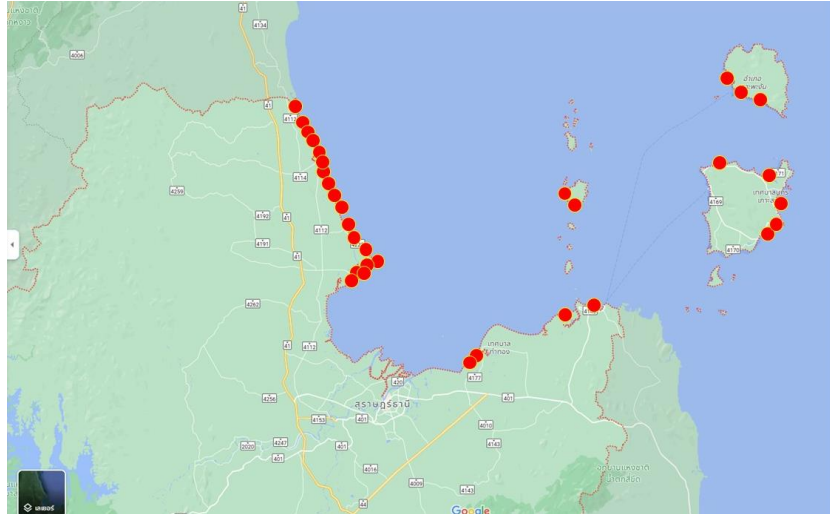


Figure 2 The coordinates of the crab banks in Surat Thani province in 2020-2022.

The BSC stock in the Surat Thani province was rebuilt after several regulations (detailed in Figure 3), and crab banks cooperated procedure. The annual catch of the BSC in the area tends to increase; meanwhile, the CpUE of gill net and trap has been relatively stable for three years (2020-2022) (figure 2). Meanwhile, the LB-SPR calculated using biological and fisheries parameters trended to increase after several regulations, and crab banks were procedure (figure 3).

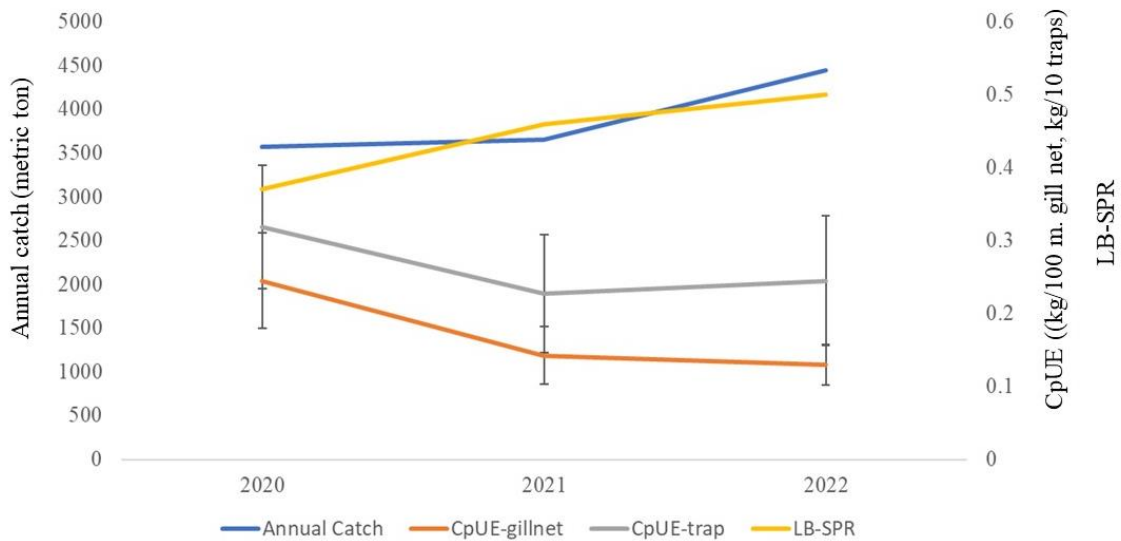


Figure 3 Annual catch, CpUE, and LB-SPR calculated results for the BSC stock in the Surat Thani province.

2. Additional supported study

1) BACI results

The experiments aim to confirm the link between the crab banks and the wild BSC stock. The BACI (Before-After-Control-Impact) experiment design successfully evaluated stock enhancement in many fisheries resources, including crab stocks (Eggleston, et al., 2008), was used in this study. The experiments were conducted in the Eastern Gulf of Thailand, comparing two study sites (fig. 4) with similar environmental characteristics, such as a semi-closed area suitable for water quality and a benthic environment for crab zoea and seagrass area was present. The number of zoea released into both experiment sites is shown in Table 1, and the CpUE (number of crabs/30 traps) among both experiment sites is shown in Table 2. The Randomized Intervention Analysis (RIA) was used to examine and find significant statistics ($P < 0.001$) of the intervention effect.

Although there was a significant difference in CpUE after the intervention, it was observed that the increase in CpUE “before and after” in the “impacted site” was minimal, which could be interpreted that the dependence on the crab bank alone cannot be consequent in a substantial increase of BSC.



Figure 4 Selected experiment sites

Table 1 The released zoea (million) into the experiment sites

Month	control site	Impact site
	Released zoea (million)	
BEFORE		
DEC 2021	579	0
JAN 2021	257	0
FEB 2021	1,029	0
AFTER		
MAR 2021	827	73
APR 2021	350	71
MAY 2021	308	251
JUN 2021	738	243

Table 2 The CpUE from both experiment sites

Month	control site	Impact site
	CpUE (individual/30 trap)	
BEFORE		
DEC 2021	11.50±2.66	0.00±0.00
JAN 2021		
FEB 2021		
AFTER		
MAR 2021	7.75±4.65	0.67±1.12
APR 2021		
MAY 2021		
JUN 2021		

2) Marking & Recapture results

This experiment aims to detect the differentiation of BSC stock size between two periods, such as operated and non-operated crab banks in the same area, Bandon Bay area, Surat Thani Province. The Marking and recapture experiments used in this study followed the procedure and implementation of several previous reports (Bell et al., 2003; Carvalho et al., 2013; Pollock et al., 1990). The experimental procedures and the results are shown in Table 3. The results show that the stock size during the crab bank operations period is more significant than the non-operations period, around 6%.

Table 3 Results of the BSC mark and recapture experiments in the Bandon Bay area, Surat Thani Province.

Details	Crab Bank Operations period	Non- Crab Bank Operations period
1 study period	30 Sep. – 30 Nov. 2021	21 May - 30 June 2022
2. Number of BSC marked and released into the study area (individual)	249	192
3. The external carapace width (ECW) of the marked crab (CM)	< 5 centimeters, 85 crabs > 5 centimeters, 164 crabs	> 9 centimeters, 192 crabs
4. Number of times for field re-sampling (times)	7	10
5. Number of blue swimming crabs recaptured (individual)	4	13
6. Number of crabs caught together with recaptured crabs (individual)	298	953
7. Lincoln-Peterson Index stock size (individual±SD)	26,062±1,885	24,499±16,022

3) GoT BSC annual landing analysis results

This experiment aims to observe the effect of the regulations and activity procedures on the wild BSC stock. The catch-based methods (Froese & Kesner-Reyes, 2002; Kleisner & Pauly, 2011; Froese et al., 2012; Kleisner et al., 2013) used to detect the status of BSC yearly landing from the GoT (Yearly BSC landing data in the Gulf of Thailand from every fishing gear collected from the Fisheries Statistics website, Department of Fisheries, (<https://www4.fisheries.go.th/local/index.php/main/site/strategy-stat>), and Figure 1 shows the development of BSC landing from the GOT for 41 years.

For the discussion, The BSC landing (from the Gulf of Thailand) during 1981-2021 developed through 4 phases: Developing -> Fully exploited -> Overexploited -> Recovering. Currently, the BSC landing (from the Gulf of Thailand) is in the recovery phase with low variation after several regulations and crab banks were implemented in 2015, 2018, and 2019, respectively. Therefore, it may be assumed that wild BSC stock responds to the regulations and rebuilding activity already done.

References

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