



Surat Thani Blue Swimming Crab FIP Review (Year 4)

Thai Frozen Food Association

US3020

4th Year Annual Review



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Submitted by

MRAG



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Acronyms

Item	Definition
ALDFG	Abandoned, Lost, Discarded Fishing Gear
BSC	Blue Swimming Crab
COVID	Coronavirus 19 Pandemic
CPUE	Catch Per Unit Effort
CSA	Consequence Spatial Analysis
DMCR	Department of Marine and Coastal Resources
EIA	Environmental Impact Assessment
ETP	Endangered, Threatened and Protected Species
FAO	Food and Agriculture Organisation of the United Nations
FIP	Fishery Improvement Project
FMC	Fisheries Management Committee
FMP	Fisheries Management Plan
HCR	Harvest Control Rules
IUCN	International Union for Conservation of Nature
IRI	Index of Relative Importance
LRP	Limit Reference Point
MCS	Monitoring, Control and Surveillance
MECC	Maritime Enforcement Coordinating Centre
MLS	Minimum Landing Size
MNRE	Ministry of Natural Resources and Environment
MOAC	Ministry of Agriculture and Cooperatives
MSC	Marine Stewardship Council
MSY	Maximum Sustainable Yield
NPOA	National Plan of Action
PIPO	Port-In, Port-Out
PRI	Point of Recruitment Impairment
PSA	Productivity and Susceptibility Analysis
RBF	Risk Based Framework

Item	Definition
SMP	Shellfish Management Plan
SPR	Spawning Potential Ratio
TAC	Total Allowable Catch
VMS	Vessel Monitoring System
YPR	Yield-Per-Recruit

1 Introduction

In 2020, MRAG undertook the independent third annual review for the Blue Swimming Crab (BSC) Fisheries Improvement Project (FIP) in Surat Thani. This review involved a desk-based study and remote stakeholder consultation due to restrictions on international travel from the COVID-19 pandemic. The results of this review identified several milestones that had been completed but also some that were still incomplete and behind schedule. In addition, despite some milestones being completed there was not always an increase in scoring against the corresponding Performance Indicators (PI) to above SG80. As a result, in 2020, there were still 6 PI's that score SG <60, 14 that score SG60-79 and 8 that score SG≥80.

The Thai Frozen Food Association (TFFA) requested that another review of the fishery was undertaken following the fourth year of the FIP to review any updated outputs and progress since the last review and provide a summary of the FIP against the Marine Stewardship Council (MSC) standard.

1.1 Aims and objectives

A FIP should be reviewed annually, in line with best practice, in order to assess progress against an Action Plan. The Surat Thani BSC FIP is committed to conducting annual reviews to ensure that all actions and gaps are documented and independently verified, and the Action Plan can be adjusted to be appropriate for the coming year. The aim of this review is three-fold:

- Review progress and milestones in a range of studies initiated from or related to the Action Plan.
- Critically review and update the FIP Action Plan if needed.
- Provide an assessment against the MSC Certification to determine current scoring.

For this fourth annual review, FIP participants submitted documents which provide an update on several milestones. These additional documents have been reviewed in this report to firstly determine whether milestone have been completed and to determine whether any progress corresponds to an increase in scoring against MSC Performance Indicators. For this review, only a desk-based study was conducted with no stakeholder consultation.

1.2 Scope

The scope of the BSC FIP is described in Table 1.

Table 1: Scope of the FIP

Target species scientific name and common name	Thai blue swimming crab (<i>Portunus pelagicus</i>)
Fishery location	FAO Area 71 (Pacific, Western Central) Thailand Surat Thani Province
Gear type(s)	Bottom Gillnet Pot/Trap

Catch quantity (weight)	Estimated Total FIP Landings 12,000 metric tons Estimated Total Fishery Landings 23,000 metric tons
Vessel type(s) and size(s)	Small-scale vessels (<9.9 GT) Medium-scale vessels (10-29.9 GT) Large-scale vessels (>30 GT)
Number of vessels	1,300 small-scale vessels; 1,000 gillnet and 300 trap 6 large-scale trap vessels in Surat Thani The number of large-scale gillnet vessels in Surat Thani is unknown but there are 65 gillnet vessels operating in the Gulf of Thailand. Important note: vessels can register in other provinces and still operate in Surat Thani waters. It is currently unclear the exact number of vessels that will fall within the Unit of Certification.
Management authority	Department of Fisheries, Thailand

1.3 Summary of the third Annual Review 2020

Following the Three-Year FIP review undertaken by MRAG in 2020 there were several issues that were highlighted across the three Principles of the MSC that might currently prohibit the fishery from successfully passing a full MSC assessment. The main issues were:

Principle 1- Stock status

1. Stock status as although the stock is above PRI, overfishing is thought to be occurring and it was unlikely that the stock was fluctuating around MSY.
2. A stock rebuilding timeframe had not been specified and monitoring was insufficient to determine the effectiveness. There was also concern that the focus of the rebuilding strategy was via stock enhancement methods through crab banks. While this can be a good tool, crab banks should only form part of a formal rebuilding plan.
3. Although some harvest strategies exist these were not thought to be sufficient and there was an absence of available or understood Harvest Control Rules (HCR).
4. Lack of information on all other fishery removals from vessels outside the Unit of Certification.
5. Unclear if stock assessments are subject to peer review or take uncertainty into account.

Principle 2- Environmental impacts

1. Further evidence was required to ensure no impact on secondary species and if management measures are required.
2. More quantitative information was required to determine impacts on ETP species, especially in regards to ghost gear. The impacts should also be disaggregated by vessel size for both trap and gillnet fisheries.
3. Further quantitative evidence is needed to ensure no habitat impacts and that management measures are effective.
4. There was insufficient information to determine whether the UoA is likely to disrupt key elements of the ecosystem. Further research is required on the impacts of the fishery on the ecosystem as a whole rather than focusing on the crab banks.
5. The potential cumulative impacts of ghost gear came to light in 2020 and further information is sought to determine the cumulative direct and indirect impacts of both gear types on the ecosystem.

Principle 3- Management

1. A fisheries management plan still needs to be formalised and implemented. This was currently still in draft form during the Three-Year FIP review.
2. There is a concern that while research and monitoring are highlighting serious issues in the fishery (such as overfishing and catching of juveniles), management measures to mitigate these are yet to be introduced and tested.
3. Although Monitoring, Control and Surveillance (MCS) mechanisms exist it is unknown if sanctions are an effective deterrence and known issues with Minimum Landings Size (MLS) might suggest systematic non-compliance. Further research is needed to understand whether fishers feel that the sanctions are an effective deterrence and the frequency of violations.
4. It is not clear whether mechanisms are in place to evaluate the fishery specific management system and no formal management plan is in place.

From the Three-Year FIP review, it was also identified that the assessment had so far largely focused on the small-scale vessels operating close to shore as the presence of medium and large-scale vessels was uncertain. Although some of the information that was provided for the Three-Year FIP review included data disaggregated by vessel size, some data (such as catch data) combined the small and large-scale vessels together. It was recommended that for proceeding reviews it would be important to understand catch by vessel category to determine whether vessel size makes a difference on the impact to non-target species. This is necessary to understand as currently this assessment consist of only 1 Unit of Assessment (UoA). If different vessel sizes have different impacts, for example on non-target species or habitat (due to different spatial fishing footprint of artisanal and commercial vessels) then this assessment might need to be split into different UoAs.

2 Review of Progress

This section of the report provides details on the progress made towards specific MSC Performance Indicators based on various activities and milestones outlined in the FIP Action Plan. This review is based on updated information provided by the client in 2021. No stakeholder consultation was undertaken for this review. Table 2 provides an overview of the progress of each milestone with further explanation provided under Section 2.1 – Section 2.5.

Table 2 Review of progress against activities and milestones in 2021.

Result	Related Action on FisheryProgress	Related MSC Performance Indicator	Status in 2021
1.1 Literature review on BSC stock status (MS1)	Establish status of BSC stock in Surat Thani using existing information	1.1.1	Milestone 1 is complete and no further action is required.
2.1 Genetic analysis study final report (MS2) 2.2. BSC stock boundary/ biological management unit defined (MS3) 2.3 Map of spawning and nursery grounds of BSC in Surat Thani (MS4)	Identify stock boundary or biological management unit for BSC in Surat Thani	1.1.1	Milestones 2, 3 and 4 are complete. However, it would be beneficial to receive data on the effectiveness of the fisheries refugia around Koh Sed on juvenile BSC over time.
4.1a Establishment of BSC banks (MS5) 4.2a Evaluation of BSC banks (MS6) 4.3a Best practice guide for crab banks (MS7)	Establishment of community BSC banks in Surat Thani	1.1.2	Milestone 5 is complete and no further action is required. Milestone 6 is incomplete. Milestone 7 is complete and no further action is required.
4.1b Report from survival rate study (MS8)	Study of survival rate from BSC bank operations	1.1.2	Milestone 8 is incomplete.

Result	Related Action on FisheryProgress	Related MSC Performance Indicator	Status in 2021
4.2b Report from migration behaviour study (MS9)			Milestone 9 is complete and no further action is required.
4.1c Release plan document. (MS10) 4.2.c Report on release evaluation (MS11)	Release young BSC in Surat Thani for stock enhancement	1.1.2	Milestone 10 is complete and no further action is required. Milestone 11 is incomplete.
5.1 Report or other communication presenting recommendations on FMP to the DoF (MS12)	Ensure draft Fisheries Management Plan (FMP) management measures are appropriate for Surat Thani BSC stock rebuilding	1.1.2	Milestone 12 is incomplete. It is suggested that Milestone 12 be updated to reflect the incorporation of the BSC FMP into the National FMP, rather than focus on providing recommendations.
6.1 Final report on mariculture impacts (MS13)	Determine the impact of shellfish farms on BSC stocks in Surat Thani	1.1.2	Milestone 13 is incomplete.
7.1 Finalised and agreed Shellfish Management Plan (SMP) document (MS14)	Development of a Shellfish Management Plan for Surat Thani	1.1.2	Depends on the outcome of Milestone 13.
9.1 Meeting Reports. (MS15)	Education and outreach of destructive fishing techniques	1.2.1	Milestone 15 is complete and no further action is required.
10.1 Report on science-based MLS. (MS16) 10.2 Material used for communicating new MLS to fishers (MS17)	Implement a minimum landing size (MLS) for BSC in Surat Thani	1.2.1	Milestone 16 is complete and no further action is required. Milestone 17 is incomplete.
11.1a Advocacy and policy brief (MS18)	Develop appropriate harvest control rules (HCRs) and tools	1.2.2	Milestone 18 is incomplete.

Result	Related Action on FisheryProgress	Related MSC Performance Indicator	Status in 2021
11.1b Report of LB-SPR analysis (MS19) 11.2b Agreed reference points (MS20)	Develop biological reference points for the Surat Thani BSC stock	1.2.2	Milestone 19 is complete and no further action is required. Milestone 20 is incomplete.
13.1a Updated report on BSC biology & life history. (MS21)	Review of reproductive biology of BSC in Thailand	1.2.3	Milestone 21 is complete however, additional data collection would be beneficial.
13.1b Updated report on BSC habitat and distribution. (MS22) 13.2b Map of BSC distribution in Thailand. (MS23)	Review of habitat and distribution of BSC in Thailand	1.2.3	Milestone 22 and Milestone 23 are complete and no further action is required.
13.1c Report from impact assessment study (MS24) 13.2c: Map of BSC broodstock area, spawning group, nursery ground. (MS25) 13.3c: Map of BSC distribution by size and relationship with habitat. (MS26) 13.4c Map of fishing gear and fishing ground distribution. (MS27)	Impact assessment of BSC fishery in Surat Thani	1.2.3	Milestone 24 is incomplete. Milestone 25 is complete and no further action is required. Milestone 26 is complete and no further action is required. Milestone 27 is complete and no further action is required.
14.1 A reference list on BSC. (MS28)	Review and collate existing data on BSC	1.2.3	Milestone 28 is complete. Additional references should be added for the duration of the FIP.
15.1 Research reports/ publications (MS29)	Review environmental impacts of inland agriculture on Surat Thani BSC stock	1.2.3	Milestone 29 is complete and no further action is required.

Result	Related Action on FisheryProgress	Related MSC Performance Indicator	Status in 2021
16.1 Stock assessment report (MS30)	Stock assessment of BSC in Surat Thani	1.2.4	Milestone 30 is complete. Routine stock assessments should continue to be conducted to monitor stock status over time.
17.1 RBF workshop(s) report. (MS31)	Improve understanding of bycatch species outcome status	2.1.1 2.2.1 2.3.1 2.4.1 2.5.1	Milestone 31 is complete and no further action is required.
18.1 Milestones are to be confirmed when the task specification is agreed (MS32)	Development of a management strategy for bycatch species (as required)	2.1.2 2.2.2 2.3.2	More information is required to determine whether Milestone 32 is needed.
19.1 Final report of bycatch study. (MS33)	Analysis of BSC fishery bycatch status (national level)	2.1.3 2.2.3 2.3.3	Milestone 33 is complete. Routine data collection is recommended to ensure that species composition and risk does not change over time.
19.1b Final report of fishery bycatch analysis (MS33b)	Analysis of BSC fishery bycatch status (fishery level)	2.1.3 2.2.3 2.3.3	Milestone 33b is complete. Routine data collection is recommended to ensure that species composition and risk does not change over time. This should include heatmaps for the most vulnerable species to determine whether management of hotspots is required.

Result	Related Action on FisheryProgress	Related MSC Performance Indicator	Status in 2021
27.1 Milestones are to be confirmed when the task specification is agreed (MS34)	Development of a management strategy for habitats (as required)	2.4.2	It is unclear whether Milestone 34 is needed.
28.1 Report of habitat review(MS35)	Habitat biotype mapping	2.4.3	Milestone 35 is complete and no further action is required.
29.1 Report of habitat study (MS36)	Determine risk from BSC fishing on habitats	2.4.3	Milestone 36 is incomplete.
30.1 Report of habitat restoration projects (the success) (MS37)	Determine success of habitat restoration projects within Surat Thani	2.4.3	Milestone 37 is incomplete.
32.1 Milestones are to be confirmed when the task specification is agreed (MS38)	Development of a management strategy for minimising damage to the ecosystem (as required)	2.5.2	It is unclear if Milestone 38 is needed.
33.1 Report on review of ecosystem dynamics. (MS39)	Determine the main dynamics of ecosystem structure and function in the Surat Thani region	2.5.3	Milestone 39 is complete and no further action is required.
34.1 Action Plan development schedule (MS40) 34.2 Finalised National Action Plan (MS41)	Develop National Action Plan for seagrass habitat conservation	2.5.3	Milestone 40 and 41 are no longer required and can be removed from the Action Plan.
35.1 Updated scoring justification for PI 3.1.1. (MS42)	Review (amended) Royal Ordinance 2015	3.1.1	Milestone 42 is complete and no further action is required.

Result	Related Action on FisheryProgress	Related MSC Performance Indicator	Status in 2021
36.1a Written agreement from at least two research institutes and government agencies (MS43)	Establish a Network System of BSC Fishery Information	3.1.2	Milestone 43 is incomplete.
36.1b Report from 1st advisory committee meeting. (MS45)	Establish a management advisory committee	3.1.2	Milestone 45 is complete and no further action is required.
39.1 Draft FMP (MS47)	Develop Fishery Management Plan (FMP)	3.2.1	Milestone 47a is incomplete.
40.1 Report of desk review on Working Group outputs. (MS48)	Review of Working Group meeting reports	3.2.2	Milestone 48 is complete but additional Working Group meeting reports should be made available throughout the FIP.
41.1 Report of desk review of FMC terms of reference and outputs. (MS49a) 41.2 Include fisher representatives in FMC (MS49b)	Review Fisheries Management Committee (FMC) terms of reference and outputs	3.2.2	Millstone 49a and 49b are complete. Outputs from FMC meetings should continue to be made available throughout the FIP.
42.1 Report of 1st community action group meeting. (MS50)	Formation of a community action group	3.2.2	Milestone 50 is complete. Meeting reports should continue to be made available throughout the FIP.
43.1 List and contact details of fisher volunteers. (MS51a) 43.2 Roles and responsibilities of fisher volunteers. (MS51b)	Identify "fisher volunteers" to champion management of the BSC fishery	3.2.3	Milestones 51a and 51b are complete and no further action is required.
43.1b Review data on MCS (inspections, violations, prosecutions) (MS51c)	Identify "fisher volunteers" to champion management of the BSC fishery	3.2.3	Milestone 51c is complete. Further information should continue to be provided throughout the FIP.

Result	Related Action on FisheryProgress	Related MSC Performance Indicator	Status in 2021
45.1 Updated score and justification for PI 3.2.5 (MS52)	Review monitoring and evaluation of management system	3.2.4	Milestone 52 is incomplete.
46.1 Communication plan. (MS53)	Communication Plan	Additional	Milestone 53 is incomplete.
47.1 Socio-economic study final report. (MS54)	Socio-economic study of BSC fishers	Additional	Milestone 54 is complete and no further action is required.
48.1 Literature review final report. (MS55)	Value-chain analysis of BSC	Additional	Milestone 55 is complete and no further action is required.

2.1 Principle 1: Stock status and fisheries management

There are a number of activities included in the Action Plan under MSC Principle 1 to improve the stock status of Surat Thani BSC.

2.1.1 Activity 1: Establish status of BSC stock in Surat Thani using existing information

This activity aimed to conduct a literature review of BSC stock status (**Milestone 1**) and was completed in 2018. In 2019, it was suggested that an additional milestone was created to ensure that crab banks are having an effect and the stock is re-building. As a result, Milestone 30 was added for a stock assessment of BSC in Surat Thani. In 2020, there was an updated review of Milestone 1 from the Department of Fisheries (DoF).

No additional information has been provided for the 2021.

Summary: Milestone 1 is complete and no further action is required.

2.1.2 Activity 2: Identify stock boundary or biological management unit for BSC in Surat Thani

Activities under this action included a genetic analysis (**Milestone 2**), identification of BSC stock boundary/biological management unit (**Milestone 3**) and a map of spawning and nursery grounds (**Milestone 4**). These three milestones were completed by the Three-Year FIP review but it was noted in the 2020 review that additional information on sampling methodology would be welcome for Milestone 4.

For the 2021 review, additional information has been provided for Milestone 4. This includes:

- Final Report on the Survey and Completion of the Territory, Resources and Ecosystem in Sed Island in Bandon Bay, Surat Thani Province. This report was provided in the 2020 review however, it was not translated into English and was therefore could not be reviewed.
- Local Consultation Workshops on Fisheries Refugia Boundary and Management Planning in Surat Thani site. This report is new for the 2021 review.

Final Report on the Survey and Completion of the Territory, Resources and Ecosystem in Sed Island in Ban Don Bay, Surat Thani Province

This report is part of the project '**Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand**' and provides reports on the territories, resources and ecosystems in Sed island, Surat Thani Province in order to support the completion of a fisheries refugia. This includes further information on sampling methodology although information on the sampling period is missing. The project defines a fisheries refugia as '*Spatially and geographically defined, marine or coastal areas in which specific management measures are applied to sustain important species [fisheries resources] during critical stages of their life cycle, for their sustainable use¹.*' The aim of the project was to focus management on areas that are known to be important for spawning and nursing of young BSC, educating fishers and also identifying suitable areas to nurse juvenile crabs and to release BSC from crab banks. The results of the study indicate that Sed Island has the potential to be a habitat for juvenile crabs and therefore should be added to the monitoring and evaluation measures in the future.

¹ <https://fisheries-refugia.org/refugia-about/refugia-introduction>

Local Consultation Workshops on Fisheries Refugia Boundary and Management Planning in Surat Thani site

In March 2021, local consultation workshops on fisheries refugia boundary and management planning were undertaken for the Surat Thani site. These meetings were held under the project “Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand” were co-organized by Chumphon Fisheries Research and Development Center and Surat Thani Fisheries Provincial Office. They were conducted in all 7 coastal districts of Surat Thani mainland and reviewed progress to-date and presentation of technical information. On the basis of the technical information presented, tentative fisheries refugia boundaries and management planning were proposed for discussions, and conclusions were made upon mutual agreement in each district. In regards to Surat Thani, a fisheries refugia boundary (approximately 9.75 km²) for BSC was defined around the island of Koh Sed. In terms of management this includes a prohibition of crab traps, crab gillnets below 3 inches mesh size and all type of clam fishing operated in motor vessels in the refugia.

Although Milestone 4 was already completed, this additional information is welcome and provides further evidence to support fisheries management and protection of vulnerable life stages of BSC. Monitoring the effectiveness of the refugia could be established through estimating number of pre-recruits and correlate this with future catches of adult BSC. It would be beneficial to improve the resolution of some of the figures to help identify the areas specified in the associated keys. Currently some of this information is difficult to interpret from the figures provided.

Summary: Milestones 2, 3 and 4 are complete. However, it would be beneficial to receive the data on the effectiveness of the fisheries refugia around Koh Sed on juvenile BSC over time.

2.1.3 Activity 4a: Establishment of community BSC banks in Surat Thani

This activity consisted of an establishment of BSC banks (**Milestone 5**), an evaluation of BSC banks (**Milestone 6**) and a best practice guide for crab banks (**Milestone 7**). Milestone 5 and 7 were completed by the 2020 review, however Milestone 6 was not completed and was thought to be behind schedule. This was because although information was presented during the Three-Year FIP review on evaluation criteria, more detail was needed for this milestone to be completed. This included further information on the indicators used to determine success, timeframes for completion, level of production from each crab bank, number of crabs released, and more detail on how the data were to be collected and by whom. It was identified that more detail was required to establish a causal link between the crab banks and an improvement to the stock as external factors could also be enhancing the stock (e.g., environmental conditions or a reduction in fishing due to COVID).

In 2021, an updated report was provided for Milestone 6 covering the evaluation of the BSC banks. This report provides further detail on the performance indicators selected to evaluate the success of BSC banks and the associated measurement methods. However, one of the indicators states ‘Stock of BSCs in the wild is decreasing’. This could be an error in translation although it should be cross-checked. If the crab banks were having a positive impact, you would expect stocks of BSC in the wild to increase (in conjunction with compliance with management measures). These performance indicators also differ from those presented in the 2020 review. The report also provided detail on the number of individual gravid females entering the crab banks and the number of individual zoea stage BSC released back into the wild. In total, 25,089 females entered the banks and an estimated 12,549,000,000 zoea stage BSC were released in 2020. In regards to the actual evaluation the following activities were carried out:

1. Recording the number of gravid female BSC brought into the crab bank to estimate number of Zoea stage crabs hatched in the bank and released into the wild. This is preliminary information for further BSC resource management.
2. Records of catch from BSC fisheries. This activity provides opportunity for fishers to participate BSC data collection.
3. Collect data from fishers by the relevant agencies. The collected data will be analysed as trends of BSC and other aquatic animal resources. The results will be used as preliminary information in BSC resource management planning

Although data were provided on the number of gravid females that entered the banks and the number of zoea stage BSC released, no results were provided on the number of BSC caught to identify any positive effect on the wild population. In order to ensure that restocking the wild population of BSC from banks is having a positive impact, abundance data on the wild stock is needed.

Milestone 6 should remain open for the duration of the FIP to continue to monitor implementation of the crab banks (e.g., number of banks, number of gravid females entering the bank and the number of zoea released). It is not clear from the report what indicator/s have been selected to measure whether the stock is increasing (e.g., is it biomass or average size). Milestone 6 is more focused on an evaluation of the of banks (e.g., how many, where), but is linked to Milestone 11 which evaluates the effectiveness of them. More detail on analysis and discussion should be included in the milestone report as it currently focusses on results only.

Summary: Milestone 5 is complete and no further action is required. Milestone 6 is almost complete but should remain open for the duration of the FIP. Milestone 7 is complete and no further action is required.

2.1.4 Activity 4b: Study of survival rate from BSC bank operations

This activity consists of a report on the survival rate study (**Milestone 8**) and a report on migration behaviour (**Milestone 9**). In 2020, Milestone 8 was not fully completed as the COVID-19 pandemic prevented a field study from being conducted in Bandon Bay. No further information was provided for Milestone 8 in this review and therefore Milestone 8 remains incomplete and behind schedule.

Summary: Milestone 8 is incomplete. Milestone 9 is complete and no further action is required.

2.1.5 Activity 4c: Release young BSC in Surat Thani for stock enhancement

This activity includes the release plan document for stock enhancement (**Milestone 10**) which was completed in 2019 and a report on the release evaluation (**Milestone 11**). Milestone 11 was found to be behind schedule and incomplete in the 2020 review. Further data were required on the how the catch rates of BSC link back to the crab banks as we all as more biological information on the size of crab at capture. It was stated that it would also be useful to understand the catch per unit effort (CPUE) and how many crabs were released to understand the effectiveness of the crab banks.

Data submitted for the 2020 evaluation provides an indication of catch rates in Surat Thani between 2016-2019 from crab trap and gill nets. For both gear types, the monthly catch rates have increased since 2016. However, the catch rates need to be linked back to the crab banks.

Data on the number of crabs released from banks in 2020 was provided in Milestone 6 and additional information was also provided for Milestone 11 in 2021. This update provides information on a project to assess the support of young BSC released into the wild on catches from fishing in the

eastern region. The project will occur in the Kung Kraben Bay, Chanthaburi Province by comparing of two areas: 1) the area with young BSC released continuously, and 2) another area. The goals of this new project addresses some of the issues raised in the 2020 review, namely by assessing the amount of individual young BSC released during the year in the eastern region, and assessing the trends and changes of catch and catch per unit effort in BSC fishery. However, no timeframes are provided for this project and without any results Milestone 11 is still behind schedule and incomplete.

Summary: Milestone 10 is complete and no further action is required. Milestone 11 is incomplete.

2.1.6 Activity 5: Ensure draft Fisheries Management Plan (FMP) management measures are appropriate for Surat Thani BSC stock rebuilding

This activity consists of providing a report or other communication presenting recommendations on a Fisheries Management Plan (FMP) to the DoF (**Milestone 12**) to ensure that the general FMP being developed is coherent with the specific BSC management plan. This milestone was found to be behind schedule and incomplete in the 2020 review. This was because no FMP had been finalised.

In the 2021, while no recommendations were provided on the specificities of BSC management for the general FMP, the Marine Fisheries Management Plan of Thailand 2020-2022 was submitted. BSC is explicitly mentioned once in the updated FMP in regards to the implementation of FIPs for economically important species. In regards to general management measures there is a focus on controlling fishing effort, reducing catch of juvenile species, healthy habitats and environment and rebuilding fish resources through restocking programmes which are all relevant to BSC. However, one of the key measures that was highlighted in the 2020 review in regards to BSC was in relation to Minimum Landing Size (MLS) which is still outstanding. The FMP is still in the process of approval by the cabinet.

Subsequent milestones indicate that the BSC FMP should now be incorporated into the National FMP (Milestone 47 report). As such, it is suggested that Milestone 12 be updated to reflect the incorporation of the BSC FMP into the National FMP, rather than focus on providing recommendations to ensure that the general FMP being developed is coherent with the specific BSC management plan.

As the National FMP is still in the process of approval, this milestone is incomplete.

Summary: Milestone 12 is incomplete

2.1.7 Activity 6: Determine the impact of shellfish farms on BSC stocks in Surat Thani

This activity included the provision of a report on the mariculture impacts in Surat Thani (**Milestone 13**). This milestone was thought to be incomplete in the 2020 review because the data provided indicated possible areas of overlap of shellfish farms with crabs with inner carapace width of 7.0-8.5 cm. However, other evidence provided in 2020 conflicted with these data and it was suggested that the temperature and salinity of shellfish farms are not suitable to support young or mature BSC. Therefore, in 2020, the DoF indicated that they were going to set up a committee to further study this issue and find a solution to the cross-over areas and review the conflicting information. In addition, MRAG also raised concern regarding potential removal or damage to natural BSC habitat during creation of shellfish farms and whether this is significant or whether the number of farms is likely to increase over time.

No further information was provided in 2021.

Summary: Milestone 13 is incomplete.

2.1.8 Activity 7: Development of a Shellfish Management Plan for Surat Thani (if required)

This activity depends on the outcome of Milestone 13 and whether mariculture impacts are proven. If so, then a shellfish management plan (**Milestone 14**) might be required. As it is not clear whether a management plan is required, Milestone 14 is still on track. However, it is important to note that in 2020 it was stated that it may be important to create a management plan regardless of current impact to help regulate further development of farms in the region that could impact BSC. It is unclear whether an Environmental Impact Assessment (EIA) was undertaken for the shellfish farms and therefore a management plan may be helpful going forwards.

Summary: Depends on the outcome of Milestone 13.

2.1.9 Activity 9: Education and outreach of destructive fishing techniques

This activity includes the provision of meeting reports on the outreach and education of destructive fishing techniques (**Milestone 15**) which was complete in 2019 and further information provided in 2020.

Summary: Milestone 15 is complete and no further action is required.

2.1.10 Activity 10: Implement a minimum landing size (MLS) for BSC in Surat Thani

This activity consists of two parts: a report on the science-based MLS (**Milestone 16**); and material used for communicating MLS to fishers (**Milestone 17**). Milestone 16 was completed in 2018 but Milestone 17 was found to be behind schedule and incomplete in the 2020 review. This was due to the absence of a decision on MLS for BSC or a BSC FMP.

No new information was provided for the 2021 review and the draft FMP has still not yet been finalised. Therefore Milestone 17 is still behind schedule and incomplete.

Summary: Milestone 16 is complete and no further action is required. Milestone 17 is incomplete and behind schedule.

2.1.11 Activity 11a: Develop appropriate harvest control rules (HCRs) and tools

This activity included the development of an advocacy and policy brief on harvest control rules and tools (**Milestone 18**). No documents were provided in the 2020 review in regards to this activity and therefore it was found to be behind schedule and incomplete. In the 2020 review, it was stated that Milestone 18 has been revised and updated to report on a series of research programme projects that will determine an appropriate HCR. The results of this activity are not expected to occur before the development of biological reference points.

No new information was provided for the 2021 review, and therefore Milestone 18 is still behind schedule and incomplete. The recommendation made in the 2019 and 2020 FIP Reviews still stands, that appropriate management actions to reduce fishing mortality to sustainable levels should occur immediately and does not require an approved HCR to be established beforehand.

Summary: Milestone 18 is incomplete and behind schedule.

2.1.12 Activity 11b: Develop biological reference points for the Surat Thani BSC stock

This activity consists of two milestones. The first was to provide a report on the LB-SPR analysis (**Milestone 19**) which was completed in 2020. The next milestone is to provide agreed reference points (**Milestone 20**) which was not completed in the 2020 review and it was stated that no progress had been made on this milestone.

No further information was provided in 2021 on Milestone 20 and therefore it remains behind schedule and incomplete.

Summary: Milestone 19 is complete and no further action is required. Milestone 20 is incomplete and behind schedule.

2.1.13 Activity 13a: Review of reproductive biology of BSC in Thailand

This activity consisted of providing an updated report on BSC biology and life history (**Milestone 21**) which was completed in 2018. A recommendation in 2018 for additional data collection was still outstanding in the 2019 and 2020 review.

Summary: Milestone 21 is complete however, additional data collection would be beneficial.

2.1.14 Activity 13b: Review of habitat and distribution of BSC in Thailand

This activity was completed in 2018 and consisted of an updated report on BSC habitat and distribution (**Milestone 22**) and a map of BSC distribution in Thailand (**Milestone 23**).

Summary: Milestone 22 and Milestone 23 are complete and no further action is required.

2.1.15 Activity 13c: Impact assessment of BSC fishery in Surat Thani

This activity is made up of several milestones. This includes a report on the impact assessment study (**Milestone 24**), a map of the BSC brood stock area, spawning group and nursery ground (**Milestone 25**), a map of the BSC distribution by size and relationship with habitat (**Milestone 26**) and a map of fishing gear and fishing ground distribution (**Milestone 27**). Milestones 25, 26 and 27 were found to have been completed in the 2020 review. An impact assessment report was provided as well as another report on the impact of ghost gear for trap and gillnet fisheries in 2020. This report provided an indication of the frequency of gear loss in both fisheries however, no indication on retrieval rate or the impact of this on BSC was provided and more analysis was requested. Milestone 24 was found in 2020 to be incomplete and a range of information was identified in the Action Plan that had not been provided, namely:

- Type and number of fishing gear for large-scale vessels.
- Catch data – Most is available but currently in a Thai report which needs to be extracted and translated.
- Fishing effort evaluation and prediction model – Not completed
- Estimation of fishing effort to density and size of BSC, including analysis on different fishing effort on BSC biology– Not completed
- Analyse catch per unit effort (CPUE) – Not completed

In the 2021 review, additional information had been provided on BSC CPUE for which fishermen recorded daily BSC catch for 1 year. The results indicated that catches were highly variable across both trap and gillnet fisheries. The reasons for this variability were suggested to be due to seasonal factors such as high rain fall or influenced by the fishing area.

As stated in previous reviews, an in-depth methodology is necessary for the final report, which describes the method of data collection for each of the studies in Milestone 24-27 and a further definition of the variables used.

Apart for more information on CPUE, no further information was provided. In addition, no further information was provided on the impact of ghost gear under Milestone 24 and is therefore thought to still be incomplete. It is recommended to continue collection of catch and effort data to identify temporal and spatial trends in CPUE.

Summary: Milestone 24 is incomplete. Milestone 25 is complete and no further action is required. Milestone 26 is complete and no further action is required. Milestone 27 is complete and no further action is required.

2.1.16 Activity 14: Review and collate existing data on BSC

A reference list was completed in 2018 (**Milestone 28**) but it was recommended that this milestone remains active throughout the course of the FIP to ensure additional information is added as it become available.

In 2021, an updated reference list was provided and therefore Milestone 28 remains completed.

Summary: Milestone 28 is complete. Additional references should be added for the duration of the FIP.

2.1.17 Activity 15: Review environmental impacts of inland agriculture on Surat Thani BSC stock

This activity consisted of research reports and publications on the environmental impacts of inland agriculture on BSC stocks (**Milestone 29**). This was provided in the 2020 review and identified that there was no impact caused to the BSC stock.

Summary: Milestone 29 is complete and no further action is required.

2.1.18 Activity 16: Stock assessment of BSC in Surat Thani

This activity was added for the 2020 review and consisted of providing an updated stock assessment report for BSC in Surat Thani (**Milestone 30**). This milestone was found to be completed in 2020.

Summary: Milestone 30 is complete. Routine stock assessments should continue to be conducted to monitor stock status over time.

2.2 Principle 2: Ecological impacts

There are a number of activities included in the Action Plan under MSC Principle 2 to improve the environmental impacts of Surat Thani BSC fishery.

2.2.1 Activity 17: Improve understanding of bycatch species outcome status

In order to improve the understanding of bycatch species outcomes, and Risk Based Framework (RBF) report was required (**Milestone 31**). This milestone was found to be completed in the 2020 review.

Summary: Milestone 31 is complete and no further action is required.

2.2.2 Activity 18: Development of a management strategy for bycatch species (as required)

It is unknown whether a management strategy for bycatch species (**Milestone 32**) is required as there are not thought to be any direct interactions with primary or ETP species in either the trap or gillnet fishery. Only 2 main secondary species are reported in the trap fishery with all other non-target species categorized as secondary minor. As there are so many minor species it would be important to collect semi-quantitative data to show that minor species have not significantly declined. This would help determine whether further management is needed.

There also does appear to be an issue with ghost gear in both the trap and gillnet fisheries which could cause indirect effects on bycatch species and ETP species such as turtles, cetaceans and dugongs. This is important to study further and perhaps develop management measures.

As no new information was provided for the 2021 review the recommendation from 2020 still stands, that more research is needed to determine whether Milestone 32 is needed.

Summary: More information is required to determine whether Milestone 32 is needed.

2.2.3 Activity 19: Analysis of BSC fishery bycatch status (national level)

A bycatch study report (**Milestone 33**) was previously provided and in 2020 this milestone was found to be complete. However, the recommendation from 2020 still stands, that systematic data collection is still required. Future monitoring is required to ensure species composition does not change and identify the main species that may need special management measures.

Summary: Milestone 33 is complete. Routine data collection is recommended to ensure that species composition and risk does not change over time.

2.2.4 Activity 19b: Analysis of BSC fishery bycatch status (fishery level)

A new milestone was added to look at bycatch at a fishery level (**Milestone 33b**) which was found to be completed in 2020. In addition, several other reports were provided that have been separated for the 2021 review. This includes:

- Milestone 33c- Seahorses in Thai waters
- Milestone 33d- NPOA sharks
- Milestone 33e- Status of ETP species and risk of the fishery on them
- Milestone 33f- PSA report

For the purpose of this review, reports 33c-33f have been included under the review for Milestone 33b. It is preferable however, that separate reports are continued to be produced. Reports 33c and 33d were provided in the 2020 review while updated information was provided in 2021 for 33e and a new report provided for 33f.

The new information provided for 33e includes distribution of ETP species in Surat Thani, impacts of BSC fishery on ETP species and communication materials to rescue ETP species. A report in 2020 found 10 species of threatened and endangered animals in Surat Thani consisting of three turtle species (Hawksbill turtle, green turtle, and Olive ridley sea turtle), five dolphin and/or whale species (Indo-Pacific humpbacked, bottlenose dolphin, finless porpoise, irrawaddy dolphin, and false killer whale) and two species of elasmobranch (whale shark and manta ray). This included 25 sightings of whale shark (*Rhincodon typus*) in Surat Thani waters (between October 2020-June 2021), one of

which was found to be entangled in fishing gear. Although no turtles were observed at sea, a number were recorded nesting or stranded on the coasts of Surat Thani Province. In addition, there was a report of 4 dugongs (*Dugong dugong*) living in the seagrass beds of Bandon Bay during 2020. In February 2021, a survey of ETP species was undertaken again in Surat Thani by officials from Marine and Coastal Resources Research Center. This survey found 3 species of ETP including: 10 Irrawaddy Dolphins (*Orcaella brevirostris*) on the south and the west of Nok Taphao Island; 3-4 Finless porpoises (*Neophocaena phocaenoides*) and 10 Indo-Pacific humpbacked (*Sousa chinensis*) in the waters closed to Don Sak Port, Donsak District. The updated report provided in 2021 also indicated that a health-check was undertaken for Indo-Pacific humpbacked dolphin and found that they are healthy (Body condition score 3/5). However, further information in regards to the details and methodology of this health check were not available and should be provided.

All species of seahorse found in Thai waters are categorised as vulnerable according to the IUCN red list. In Surat Thani, one species of commercially important seahorse has been found, spotted seahorse (*Hippocampus kuda*), especially around the area of Sed island where there is an abundance of seagrass. Areas around Sed island are designated as a fisheries refugia for juvenile BSC and it would be good to understand if this area also overlaps with seahorse habitats, offering some protection. The updated information provided in 2021 also indicated that in 2018 there was a plan to establish a seahorse bank, similar to the crab banks, to help conserve wild populations of seahorse. Training was also conducted with fishers to educate the importance of conserving seahorses caught in fishing nets. The effectiveness of these two programmes is unclear.

In regards to the impacts of the BSC fishery on ETP species, the risk caused to marine animals by fishing gear was considered a major issue, especially near-shore fishing gear including gillnets. A report in 2020 indicated that fishing gears caused 17% of stranded dugong, 28% of stranded dolphins and whales, as well as 35% of stranded turtle in Thailand. In regards to impacts in Surat Thani from the BSC fishery, only fishing grounds of small-scale and medium-scale gears were mapped against ETP distribution as the large-scale vessels operate across provinces and therefore it was difficult to determine their fishing grounds in Surat Thani. It was identified that for small-scale trap vessels operating near shore there was no overlap with ETP distribution but for medium-scale trap vessels there was an intensive area of fishing from Don Sak to Ang Thong Islands, which overlaps with areas of whale and dolphin distribution. In contrast, small-scale gillnet vessels overlapped with areas of sea turtles, dugongs, whale sharks, whales and dolphins in near shore areas of Tha Chana, Chaiya, and Don Sak Districts. However, the medium-scale gillnet vessels did not overlap with ETP distributions but did operate near to areas where sea turtles were found.

Although no ETP species were identified in the catch data provided, the overlap of the fishery and the distribution of ETP species is of concern. There is also concern in regards to the issue of ghost gear and the interaction this may have with ETP species in Surat Thani. The absence of data on large-scale vessels for both trap and gillnet vessels is also concerning as they may overlap with whale and dolphin distributions offshore. Attempts should be made to determine the fishing footprint of large-scale vessels in the Surat Thani area and all management measures from the BSC FMP should be applicable to these vessels. Communication materials have been created to educate local people and promote ETP species protection and rescue in case of accidental catch or strandings. However, in order to ensure that ETP species are not significantly impacted, routine monitoring is required to collect data on ETP interaction. Although not reported in the catch data provided it is not clear whether this is because ETP species are not caught or if this is because interactions are not reported. More data are required to make a judgement on suitable management measures.

In regards to 33f, a catch composition and risk assessment report was provided for BSC in Ban Don Bay. This report conducted sampling for both trap and gillnet gears and identified the index of relative importance (%IRI) to express the contribution of individual species in the catch each month as well as conducting a Productivity Susceptibility Analysis (PSA) on species. The PSA used in the report 33f, uses different criteria to that used under the MSC Risk Based Framework. Sampling was conducted once a month from January to November 2018 across 14 sampling stations. On each sampling day, 3 tier of gill nets and 90 traps were deployed during 05.00 pm and soaked for 12 hours before being recovered. The study found a total of 111 species caught by gillnets and 118 species caught by traps, with similar groups of marine invertebrates caught in both gears. There were 26 and 27 crab species caught by gillnets and traps, respectively. Other marketable aquatic animals caught by both gears included gastropods, bivalves, cephalopods, mantis shrimps and sea cucumbers. The five most commonly caught species by number in gillnets were gastropod *Murex* sp. (26.6%), followed by BSC (22.2%), *Dorippe quadridens* (7.0%), sea urchin *Temnopleurus toreumaticus* (6.5%) and *Macrophthalmus* sp. (4.9%). Meanwhile, three out of the five most common species in traps were *Charybdis affinis* (37.2%), BSC (11.1%), and *D. quadridens* (4.1%), followed by *T. toreumaticus* (1.6%) and hermit crab *Clibanarius infraspinus* (1.6%). In terms of weight, BSC was ranked first for both gears, and contributed over 50% in gillnets and about 27% in traps. However, in terms of %IRI BSC was ranked first in gillnets but ranked second after *C. affinis* in traps. For both gear types catch compositions differed seasonally.

The results of the PSA indicated that BSC was at moderate risk from both gear types, a further 80 species were at moderate risk from gillnets while the majority of species in the trap fishery were at low risk. Although no species were rated as high risk from BSC gillnets or traps in Bandon Bay, there were 10 fish species with high scores (i.e., near the threshold of 3.18) in the gillnet fishery. These included two elasmobranchs (*Himantura imbricate* and *Maculabatis gerrardi*), two bony fishes (*Muraenesox cinereus* and *Hexanematichthys sagor*) and a group of sole species (Family Soleidae and Cynoglossidae). It would helpful to understand where the most vulnerable species occur. This could be demonstrated through creation of heatmaps to show spatial/temporal abundance data. This information could then be reviewed to consider management measures to protect hotspot areas for vulnerable species.

The attributes used under the PSA in report 33f, differ to those used by the MSC and appear to be more precautionary. This could explain the number of moderate/high risk scores. For example, for a high-risk score for average age at maturity under the MSC PSA this is >15 years compared to >4 years in report 33f. It is not clear why this PSA method has been selected in report 33f and whether it is appropriate. It also likely that all species will need to be rescored under a full MSC assessment to comply with the certification criteria.

The updated Milestone 33f report also includes figures and tables within the Annex but some additional information is required to fully interpret their meaning. For example, a supporting key would help to interpret Figure 3 as a standalone figure. On Figure 4 it is unclear which graph relates to trap and which relates to gillnet.

Summary: Milestone 33b is complete. Routine data collection is recommended to ensure that species composition and risk does not change over time. This should include heatmaps for the most vulnerable species to determine whether management of hotspots is required.

2.2.5 Activity 27: Development of a management strategy for habitats (as required)

No new information was provided for the development of a management strategy for habitats (**Milestone 34**). As such the recommendation for Milestone 34 from 2020 still stands and is repeated below:

‘A Consequence Spatial Analysis (CSA) has been undertaken and two main habitat types were identified to fall within the fishing areas: mud and sand (coastal margin <25m depth; inner shelf <100m) and artificial reefs. Additional habitats were identified, including seagrass and natural reef, but were reported to be avoided completely by fishers and therefore were not considered in the assessment. Under the CSA all habitats scored 80 or above, indicating they are resilient to serious impacts from the fishery. Nevertheless, changes in the spatial distribution of the fishery should be monitored closely, especially if fishing effort moves into vulnerable areas of seagrass or coral reef.

Seagrass is an important nursery ground for BSC and there was previous discussion of a NPOA for seagrass. However, if there is already good monitoring of seagrass habitats then this may no longer be required. Currently seagrass habitats are monitored every 4 years across the whole country but important sites are monitored annually. In addition to this, each province must recommend one site to be monitored annually. Most of the damage caused to seagrass habitats is thought to be as a result of coastal development. The Milestone 35 Report provided an overview of the condition of seagrass habitats in Surat Thani and in all areas ranged from moderate to very good according to the most recent assessment.

There is rehabilitation and replanting of seagrass habitats where fishers can become involved in replanting beds. Department of Marine and Coastal Resources also have training for sea rangers who are volunteers to help monitor habitat and endangered species. The Milestone 35 Report provides an overview of the changing conditions of seagrass beds and the likely causes of this.’

Summary: It is unclear whether Milestone 34 is needed.

2.2.6 Activity 28: Habitat biotype mapping

This activity includes a report on habitat biotype mapping (**Milestone 35**) which was completed in the 2020 review during which updated information was provided.

Summary: Milestone 35 is complete and no further action is required.

2.2.7 Activity 29: Determine risk from BSC fishing on habitats

This activity includes a report on the risks from the BSC fishery on habitats (**Milestone 36**) which was found to be incomplete during the 2020 review. This was due to the possible impact of ghost gear on habitats that had not yet been studied and the requirement for more quantitative information. Direct impact on habitats by gear types was thought to be minimal although a further understanding as to why fishers avoid vulnerable areas (e.g., seagrass) would be important.

For the 2021 review, an updated literature review on risk of the BSC fishery on habitats in Surat Thani was provided for Milestone 36. This report identified three critical coastal and marine habitats in the region, namely seagrass, coral reefs and mangroves. In the last survey year (2020) all seagrass beds were thought to be very healthy, slightly healthy or moderately healthy with their statuses all better or the same as the previous survey. In comparison, surveys on coral reefs in the area between 2012-2018 identified that 77.91% of coral reefs were in an extremely damaged condition. The status of mangroves was not provided.

The impact of the three vessels sizes (small, medium and large) for both gear type on habitats was provided in the updated 2021 report. Small and medium-scale crab trap vessels did not show any overlap with mangroves, coral reefs or seagrass beds in Surat Thani and therefore are unlikely to have a significant impact on these vulnerable habitats. For small and medium-scale gillnets the fishing grounds again do not show any overlap with mangroves, coral reefs or seagrass beds and therefore are unlikely to have a significant impact on these vulnerable habitats. The DoF could not identify the fishing grounds for large-scale trap or gillnet vessels which means that impact could not be determined.

No further information was provided in terms of an update to impact of ghost gear (Milestone 36b).

Summary: Milestone 36 is incomplete.

2.2.8 Activity 30: Determine success of habitat restoration projects within Surat Thani

This activity looked at determining the success of habitat restoration project within Surat Thani (**Milestone 37**) which was incomplete in the 2020 review as although details on projects were provided no indication on their relative success was provided.

No further information was provided for the 2021 review.

Summary: Milestone 37 is incomplete.

2.2.9 Activity 32: Development of a management strategy for minimising damage to the ecosystem (as required)

In the 2020 review there was insufficient information to determine whether a management strategy for minimising damage to the ecosystem (**Milestone 38**) was needed.

No further information was provided for the 2021 review and therefore it is still unclear whether this milestone is needed.

Summary: It is unclear if Milestone 38 is needed.

2.2.10 Activity 33: Determine the main dynamics of ecosystem structure and function in the Surat Thani region

Under this activity the main dynamics of the ecosystem in Surat Thani were to be identified (**Milestone 39**) which was completed in 2018.

Summary: Milestone 39 is complete and no further action is required.

2.2.11 Activity 34: Develop National Action Plan for seagrass habitat conservation

The 2020 review identified that **Milestone 40** and **41** were no longer required as the DMCR already monitor and survey seagrass habitats on a regular basis and so no National Plan of Action is required.

Summary: Milestone 40 and 41 are no longer required and can be removed from the Action Plan.

2.3 Principle 3: Governance and management

There are a number of activities included in the Action Plan under MSC Principle 3 to improve the management of Surat Thani BSC fishery.

2.3.1 Activity 35: Review (amended) Royal Ordinance 2015

This activity included updating the scoring Performance Indicator 3.1.1. (**Milestone 42**) which was completed in the 2020 review.

Summary: Milestone 42 is complete and no further action is required.

2.3.2 Activity 36a: Establish a Network System of BSC Fishery Information

This activity consists of establishing a network system of BSC fishery information and providing a written agreement from at least two research institutes and government agencies (**Milestone 43**). However, in 2019 this milestone was revised based on new information to review [and document] recent changes in consultation processes within Thai fisheries. In particular this will document how information and data collected during consultation processes are used or not used and how much influence local recommendations have on policy development. A revised Milestone 43 was not presented at the 2020 review and was therefore found to be incomplete.

No new information was provided in the 2021 review.

Summary: Milestone 43 is incomplete.

2.3.3 Activity 36b: Establish a management advisory committee

Under this activity there was a need to establish and report on the advisory committee meeting (**Milestone 45**) which was completed in 2018.

Summary: Milestone 45 is complete and no further action is required.

2.3.4 Activity 39: Develop Fishery Management Plan (FMP)

A draft FMP (**Milestone 47**) is included within this activity. In the 2020 review, this milestone was incomplete because the FMP was still in draft form and no progress had been made since 2019.

For the 2021 review, an updated draft BSC management plan was provided. An internal discussion within the DoF decided that the BSC FMP could form part of the National Marine FMP and assigned the Marine Fisheries Research and Development Division to develop Blue Swimming Crab Sustainable Management Action Plan under National Marine FMP. The draft BSC FMP was therefore revised to be in line with the National Marine FMP and a public hearing process will be conducted in 2022.

It would be important to ensure that a rebuilding framework is included in the BSC FMP, which is timebound. There is currently a concern that focus seems to be on re-building the stock via stock enhancement methods rather than via management methods. It is important that the crab banks form part of a formal rebuilding plan.

An additional document was also provided in 2021, providing the meeting minutes for two DoF meetings to revise the 2018 draft BSC FMP (**Milestone 47a**).

Summary: Milestone 47a is incomplete.

2.3.5 Activity 40: Review of Working Group meeting reports

This activity includes a desk review on the Working Group outputs (**Milestone 48**) which was completed in 2018. However, it was suggested that this milestone should remain open to maintain transparency in decision making.

An updated report on the Working Group outputs was provided in 2021 review and therefore, Milestone 48 remains complete. In 2021 there were two meetings concerning the implementation of the BSC FIP and the minutes were provided.

Summary: Milestone 48 is complete but additional Working Group meeting reports should be made available throughout the FIP.

2.3.6 Activity 41: Review Fisheries Management Committee (FMC) terms of reference and outputs

This activity consists of two milestones, firstly to report on the Fisheries Management Committee (FMC) terms of reference (**Milestone 49a**) and to include a fisher representative in the FMC (**Milestone 49b**). Both of these milestones were completed by the 2020 review.

Despite being complete, an update was provided for the 2021 review for Milestone 49a. In 2021, there was one meeting of the National Committee on BSC resource management. It was the first meeting that involved representatives from the National Fisheries Association of Thailand and Federation of the Thai Fisherfolk Association. It aimed to introduce the new committee to understand the BSC FIP, management measures and the revised BSC FMP. This meeting followed the retirement of the previous Deputy Director-General.

Summary: Milestone 49a and 49b are complete. Outputs from FMC meetings should continue to be made available throughout the FIP.

2.3.7 Activity 42: Formation of a community action group

Milestone 50, to form a community action group and report on the meeting was completed at the 2019 review. Although completed, the meeting reports should continue to be produced throughout the FIP.

No update was provided for the 2021 review.

Summary: Milestone 50 is complete. Meeting reports should continue to be made available throughout the FIP.

2.3.8 Activity 43: Identify "fisher volunteers" to champion management of the BSC fishery

There are two milestones under this activity, which include a list and contact details for fisher volunteers (**Milestone 51a**) and an outline of their roles and responsibilities (**Milestone 51b**). Both of these milestones were previously completed.

Summary: Milestones 51a and 51b are complete and no further action is required.

2.3.9 Activity 43b: Identify "fisher volunteers" to champion management of the BSC fishery

A review on the Monitoring, Control and Surveillance data (**Milestone 51c**) was completed at the 2020 review. However, it was recommended that this Milestone continue throughout the FIP to understand illegal activity in the fishery and whether management measures are effective.

Additional data were provided for the 2021 review which provided an overview of illegal BSC fishing in Surat Thani during 2020-2021. During this time, there were 9 cases of illegal activity. The most common offence was against Section 71(1) of the Royal Ordinance which states that the Minister can issue a notification if '*fishing gears according to their forms, fishing methods, fishing areas, the size of fishing vessels used in fishing operation and other conditions that are prohibited from fishing operations in fishing grounds*'. Of these cases, eight were closed and a fine paid while one is being considered in court.

Summary: Milestone 51c is complete. Further information should continue to be provided throughout the FIP.

2.3.10 Activity 45: Review monitoring and evaluation of management system

An update of the monitoring and evaluation system and corresponding Performance Indicator score (**Milestone 52**) was not complete and behind schedule in the 2020 review.

No new documents were provided specifically for Milestone 52 for the 2021 review. However, the draft BSC FMP contains a section on monitoring and management performance evaluation. This includes the requirement for two types of evaluations: internal and external. This would meet the requirements under the MSC certification standard.

Summary: Milestone 52 is incomplete until FMP is formalised.

2.4 Other

2.4.1 Activity 46: Communication Plan

No new documents were provided for the communication plan (**Milestone 53**) for the 2021 review. It was stated in the 2020 review that more funding would be required to continue this milestone which is reiterated for the 2021 review.

Summary: Milestone 53 is incomplete.

2.4.2 Activity 47: Socio-economic study of BSC fishers

The milestone under this activity, to develop a socio-economic report (**Milestone 54**) was completed in the 2020 review upon submission of additional data.

Summary: Milestone 54 is complete and no further action is required.

2.4.3 Activity 48: Value-chain analysis of BSC

The milestone under this activity, to produce a literature review on a value-chain analysis (**Milestone 55**) was completed in the 2020 review upon submission of additional data.

Summary: Milestone 55 is complete and no further action is required.

2.4.4 Activity 52: Impact of ghost gear on the fishery from trap and gillnets

For the 2021 review, a new milestone was added to look at the impact of ghost gear from both gear types on the fishery (**Milestone 59**), which was suggested during the 2020 review. As part of the 2020 review it was identified that the direct and indirect effects of ghost gear had not been investigated despite high incidences of abandoned, lost or otherwise discarded fishing gear (ALDFG) for both trap and gillnet.

The new report added in 2021 details a new and on-going project on ghost fishing, migration and survival of BSC in Bandon Bay, Surat Thani. The aim of this project is to assess mortality of aquatic animals caused by ghost fishing and to evaluate the survival rate of BSC upon release and migration in Bandon Bay. The study is composed of a laboratory study and an onsite study in three locations: Hat-Somboon Village, Takrob Village and Nang-gam Bay. The results included in this report for the 6-month experiment in Hat Somboon Village are unclear. This report required further explanation of the analysis and a discussion of the results. The figures provided also require further explanation so that the results can be interpreted. It is also important to consider the habitat impacts of ghost gear caused by drifting gear (most likely nets) which has not been included in this study.

In addition, a literature review was provided on gillnet and trap loss as well as examples of ghost gear management from other similar fisheries. This literature review identified that gillnets specifically are susceptible to loss and the risk of entanglement is high. This report provided a total risk score of 25 for gillnets however, no explanation was provided on how this number was determined or what it means. Traps were also identified as being susceptible to loss but may be easier and more frequently recovered. A total risk score for traps was 16, but again how this number was determined or what it means is unclear. The methodology and meaning behind these scores should be provided.

Summary: Milestone 55 is incomplete.

2.4.5 Activity 53: Impacts of the fishery on the ecosystem

In 2021, a new milestone was added to look at the impacts of the fishery on the ecosystem (**Milestone 60**). A report was provided for this new milestone which provided the results of an ecopath model for Bandon Bay. The information presented in this report however, appears to be a condensed version of the report provided for Milestone 39 and so it is unclear if any new information was included. The 2021 report is missing some key information that is needed to determine whether the BSC fishery has impacts on the ecosystem. This includes an absence of a hypothesis, missing methodology, and no overall result or indication of impact on the fishery. The report needs to include a hypothesis as to what would be the predicted structure of the community if there was an impact from the fishery to help explain the results. In addition, there are definitions missing for the variables used in the mathematical equation under the model inputs and it is unclear what Table 3a is showing and would benefit from further description.

Summary: Milestone 60 is incomplete.

2.5 Other documents

In addition to the documents provided for specific milestones, a Memorandum of Understanding was provided by the TFFA on the traceability protocol of BSC for exporting. This includes exporting from two sources: Thai flag/domestic vessels and imported raw materials. These require different processes and evidence which are described in the document. This includes the use of a fishing info system, licences, marine catch purchasing documents, health certificates, processing statement endorsement, landing declaration etc.

3 Progress against MSC Performance Indicators

Based on the Three-Year FIP annual review conducted in 2020 there were several MSC Performance Indicators that fell below SG<80. In order to understand the progress of the FIP against meeting the MSC standard, these PIs were reevaluated based on the updated information provided in 2021. Table 3 provides a summary of the scoring for 2021.

Table 3 Summary of scores for MSC Performance Indicators in 2020 and 2021.

	Component	PI	Performance Indicator	2020	2021
1	Outcome	1.1.1	Stock status	60-79	60-79
		1.1.2	Stock rebuilding	<60	<60
	Management	1.2.1	Harvest Strategy	<60	<60
		1.2.2	Harvest control rules and tools	<60	<60
		1.2.3	Information and monitoring	60-79	60-79
		1.2.4	Assessment of stock status	60-79	60-79
2	Primary species (managed bycatch)	2.1.1	Outcome	Trap: ≥80	Trap: ≥80
				Gillnet: ≥80	Gillnet: ≥80
		2.1.2	Management	Trap: ≥80	Trap: ≥80
				Gillnet: ≥80	Gillnet: ≥80
		2.1.3	Information	Trap: ≥80	Trap: ≥80
				Gillnet: ≥80	Gillnet: ≥80
	Secondary species (non-managed bycatch)	2.2.1	Outcome	Trap: ≥80	Trap: ≥80
				Gillnet: ≥80	Gillnet: ≥80
		2.2.2	Management	Trap: 60-79	Trap: 60-79
				Gillnet: ≥80	Gillnet: ≥80
		2.2.3	Information	Trap: ≥80	Trap: ≥80
				Gillnet: ≥80	Gillnet: ≥80
	ETP species	2.3.1	Outcome	Trap: 60-79	Trap: 60-79
				Gillnet: 60-79	Gillnet: 60-79
		2.3.2	Management	Trap: 60-79	Trap: 60-79
				Gillnet: 60-79	Gillnet: 60-79
		2.3.3	Information	Trap: 60-79	Trap: 60-79
				Gillnet: 60-79	Gillnet: 60-79
	Habitats	2.4.1	Outcome	Trap: 60-79	Trap: 60-79
				Gillnet: 60-79	Gillnet: 60-79
		2.4.2	Management	Trap: 60-79	Trap: 60-79

	Component	PI	Performance Indicator	2020	2021
				Gillnet: 60-79	Gillnet: 60-79
		2.4.3	Information	Trap: 60-79	Trap: 60-79
				Gillnet: 60-79	Gillnet: 60-79
	Ecosystem	2.5.1	Outcome	<60	<60
		2.5.2	Management	Trap: <60	Trap: <60
				Gillnet: <60	Gillnet: <60
		2.5.3	Information	60-79	60-79
3	Governance and Policy	3.1.1	Legal and customary framework	≥80	≥80
		3.1.2	Consultation, roles and responsibilities	≥80	≥80
		3.1.3	Long term objectives	≥80	≥80
	Fishery specific management system	3.2.1	Fishery specific objectives	60-79	60-79
		3.2.2	Decision making processes	60-79	60-79
		3.2.3	Compliance and enforcement	60-79	60-79
		3.2.5	Management performance evaluation	<60	<60

A summary of the likely scoring category (<60, 60-79, ≥80) for each PI and rationale are provided below based on the updated information provided for the 2021 review (Table 4). Where no new information was provided the previous rationale used in the 2020 review is cited. Where new information was provided this was included in the rationale if relevant but did not always lead to a corresponding change in score. This review was done against v2.01 of the MSC Fisheries Standard and Guidance.

Table 4 Scores and rational against MSC Performance Indicator

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
1	Outcome	1.1.1	Stock status	SG60-79	An updated stock assessment was not provided for the 2021 review and therefore the stock assessment information provided for the 2020 review was used and the same rationale cited. More information was provided in regards to creation of a fisheries refugia around Sed Island however, the impact on the stock status of BSC from this is unclear. A stock assessment of BSC in Surat Thani Province was provided in 2020, using data from 2017-2018 (Milestone 30 Report). A Thompson and Bell Yield Analysis model was used to estimate yield of the stock from changes in the fishing effort to predict fisheries status by comparing the current fishing mortality (F-factor = 1) to the level that produces maximum yield. The results of the assessment indicated that the current fishing level is higher than that required to obtain MSY indicating overfishing is occurring. In 2020, a new length-based spawning potential ratio (LB-SPR) assessment methodology was used to assess the BSC stock in Bandon Bay (Milestone 19 Report). Data were used between 2017-2018. The results indicated that the estimated SPR at 0.37, i.e., 37%. According to Mace and Sissenwine, (1993) and reported in Prince <i>et al.</i> (2020), 20% SPR is “accepted as the ‘replacement level’ below which stocks risk recruitment impairment and so is used as a limit reference point, which stocks should be managed above”. According to this latest advice, the stock is likely to be above PRI. In addition, the estimation of %SPR was based on uncertain estimates of natural mortality (M), which are likely to give a more optimistic outcome. For this reason, while 37%SPR is deemed above the limit reference point, it cannot be certain that the stock is at or fluctuates around the MSY target level.

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					Overall, this is likely to meet SG60-79 as the stock is likely to be above PRI but overfishing is thought to be occurring and so the stock is unlikely to be fluctuating around MSY.
		1.1.2	Stock rebuilding	SG<60	As part of a stock rebuilding programme, crab banks have been established throughout Surat Thani and the Gulf of Thailand under the Department of Fisheries project "Returning the Blue Crab to the Thai Sea". In 2021, information was provided which indicated that 25,089 gravid females entered the banks and an estimated 12.5 billion zoea stage BSC were released in 2020. Although a study has been implemented to record catch of BSC from both fishers and relevant agencies and assess trends and chance of catch per unit effort, the results were not available. It is therefore remains uncertain how crab banks are contributing to stock rebuilding of the wild population. The results of this study would help to improve scoring of this PI. There is a current risk that focus seems to be on re-building the stock via stock enhancement methods rather than via management methods. It is important that the banks form part of a formal rebuilding plan. There is no FMP in place (although a draft has now been finalised) and there are also issues with implementing a minimum landing size (MLS) which increases the risk of undersized crabs being caught. This is currently unlikely to meet SG60 as the rebuilding timeframe has not been specified and it is currently not possible to determine the effectiveness of the crab banks on the wild population. Further development of management measures such as MLS or spatial restriction is needed to control effort and ensure a sustainable fishery that is not dependent on crab banks.
	Management	1.2.1	Harvest Strategy	SG<60	A draft BSC FMP was provided in the 2021 review (Milestone 47 Report) which details specific management measures such as gear size restrictions, allocation of

Principle	Component	Performance Indicator	Current Score	Rationale and Justification
				fishing licences for commercial vessels based on Total Allowable Effort, registering small scale vessels and spatial restrictions. However, this plan has not yet been approved for implementation and a timeframe for this is unclear. A fisheries refugia has also been created around Koh Sed to protect habitats important for early life stages of BSC but the effectiveness of this has not been evaluated. As stated in the 2020 review, some measures exist in this fishery to help maintain the stock status. For example, only small-scale vessels (<9.9 GT) are allowed to fish within coastal waters (<3 nm) and restrictions on gear size and number exists for trap and gillnet vessels of different sizes. For example, crab traps cannot have mesh size smaller than 2.5 inches or more than 300 traps per fishing vessel (Requirement of Fishing Gear, Fishing Methods and Fishing Ground Prohibited for Fishing within Coastal Waters B.E. 2560 (2017)). There are also restrictions on vessels which are 10-29.9 GT (medium scale) and >30 GT (large scale). Medium scale vessels must have a maximum of 3,500 traps per vessel and mesh size no larger than 2.5 inches on the bottom side of the trap. Gillnets cannot exceed 20,000 m. Large scale vessels must have a maximum of 4,500 traps per vessels and mesh size no larger than 2.5 inches on the bottom side of the trap. Gillnets cannot exceed 30,000 m. In addition to fishing gear regulations, the Notification of the Ministry of Agriculture and Cooperatives on Prohibition of Fishing of Berried Female Crabs B.E. 2526 is enforced from October to December every year to protect BSC stock. However, this is not thought to be practical because gillnets are not selective and trap operation does not allow enough time to separate berried BSC and put back to the sea. The fishery is currently open access with no licensing of artisanal vessels, although this is now mentioned in the updated Royal Ordinance and in the draft BSC FMP. There is no fishery wide minimum landing size (MLS) in place to protect juvenile crabs from being caught or an annual quota or Total Allowable Catch (TAC) to limit

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					catches. Some communities have implemented their own MLS (Milestone 17 Report), but this needs to be universally applied to the fishery. There are no technical restrictions on gillnet mesh size, although some coastal villages may apply some mesh size restrictions. The Government is presently supporting a programme of setting up voluntary crab banks. There is anecdotal evidence of other community-based management measures but it is not clear how effective they are or whether they are enforced. Training has been provided to fishers on destructive fishing techniques and included conservation measures (Milestone 15 Report). This is unlikely to meet SG60 as although some harvest strategies exist further management is required. It is also important to understand the level of monitoring and the effectiveness of the crab banks and other management measures.
		1.2.2	Harvest control rules and tools	SG<60	No further information was provided in the 2021 review in regards to the implementation of harvest control rules and therefore the same scoring and rationale cited in the 2020 review are used. A Limit Reference Point (LRP) for this fishery has been defined through the LB-SPR assessment conducted in 2020 (Milestone 19 Report). This uses 20% SPR as an accepted LRP. However, despite this it does not appear that the LRP has been fully adopted across the fishery and no formal or informal HCR in place. For example, it is not clear how the harvest strategy changes with changes in biomass/stock status. This is therefore unlikely to meet SG60, as HCRs are not available or understood.
		1.2.3	Information and monitoring	SG60-79	Some more information was made available in the 2021 review including CPUE across vessel sizes, but an absence of data for large-scale vessels in the fishery was highlighted. This suggests that not all data on removals from the UoA are available

Principle	Component	Performance Indicator	Current Score	Rationale and Justification
				and would raises some concern in regards to traceability of any final product. This would suggest that a score of SG60-79 is still appropriate for this PI. Rationale cited in 2020: There is a range of information available that is thought to be able to support a harvest strategy. This includes a genetic study which indicates the stock boundary units (Milestone 2 and 3 Reports), geographic distribution of stock in Bandon Bay and in the Gulf of Thailand (Milestone 23 and 24-27 Reports), migration of larvae (Milestone 9 Report), a stock assessment (Milestone 30 Report), catch data (Milestone 33b Report), identification of spawning and nursery grounds (Milestone 4 Report) and information on the biology and life history of BSC (Milestone 21-22 Report). This information was provided at the 2020 FIP Review meeting and based on a combination of primary data collection and literature review. There are thought to be 1,300 small scale vessels consisting of 1000 gillnets and 300 traps. The number of larger scale vessels is not entirely known but there are thought to be 4 large-scale trap vessels in Surat Thani and 65 large-scale gillnet vessels operating across the whole Gulf of Thailand. A Figure was provided in the follow up to the 2020 FIP review meeting which was adapted from Sawusdee <i>et al.</i>, (In press). The figure shows the location of different gear types in Bandon Bay. It is unclear whether removals from this fishery are constantly monitored at a good level of accuracy and coverage. In 2021 further maps were provided to show how fishing grounds overlapped with ETP species distributions and habitat cover (excluding large-scale vessels) (Milestone Reports 33e and 36). An important issue to further understand is the ability for vessels to register in one province but fish in others. This may create challenges in monitoring origin of removals from each vessel within the UoC to determine traceability of MSC certified products and in the wider context of UoA to monitor status of stock/management

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					unit. It is necessary for this assessment to be provided with all vessels within the UoC. Currently only large-scale vessels are required to have VMS on board which means that monitoring the fishing location of all vessels may be difficult. As it is important to understand all other fishery removals from vessels outside the UoC this is likely to meet SG60-79.
		1.2.4	Assessment of stock status	SG60-79	No further information on stock assessment was provided for the 2021 review and therefore the score and rationale used in the 2020 review are cited. There have been several assessments made on this fishery including Yield-Per-Recruit (YPR) and Length Based Spawning Potential Ratio (LB SPR). An LB SPR is generally robust and generates stock status in terms of reference points and is length(age)- based. However, it is unclear how it deals with uncertainty which currently prevents it from meeting SG80. It is also unclear if the assessments are subject to peer review. This is therefore likely to meet SG60-79.
2	Primary species	2.1.1	Outcome	Trap: SG≥80 Gillnet: SG≥80	This fishery incorporates two gear types and as such, P2 is assessed separately where required. However, the most vulnerable gear will be used to assess the fishery within the unit of certification (UoC), and not a weighted average method. The impacts of one gear can therefore lead the entire fishery to fail to meet the MSC Standard. No updated catch data were provided for the 2021 review and therefore the data provide for the 2020 review are used. The data that were provided combined small-scale and large-scale vessels and it was not possible to disaggregate by vessel size. It would be important to split catches by vessel size to determine if there is a difference in species composition between different vessels. This might occur due to the different location that the vessels fish (i.e., inshore versus offshore). This applies to primary, secondary and ETP catches.

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					<u>Trap fishery</u> Catch data for the trap fishery was provided in the 2019 FIP Review meeting. The catch data spanned approximately one year (Jan – Nov 2018). There were thought to be no primary species in the trap fishery as none are ‘managed’ according to the MSC Standard. As a result, this is likely to meet SG≥80 by default. <u>Gillnet fishery</u> In the 2020 FIP Review meeting, catch data were provided for the gillnet fishery for 1 year between November 2017 and November 2018 (Milestone 33b Report). There are thought to be no primary species in the gillnet fishery as none are ‘managed’ according to the MSC Standard. As a result, this would score SG≥80 by default.
		2.1.2	Management strategy	Trap: SG≥80 Gillnet: SG≥80	<u>Trap fishery</u> As no primary species are caught in this fishery, management is not necessary and therefore is likely to meet SG≥80 by default. In order to meet SG100, management should be in place regardless of whether bycatch species are currently caught. <u>Gillnet fishery</u> As no primary species are caught in this fishery, management is not necessary and therefore is likely to meet SG≥80 by default. In order to meet SG100, management should be in place regardless of whether bycatch species are currently caught.
		2.1.3	Information	Trap: SG≥80 Gillnet: SG≥80	<u>Trap fishery</u> As no primary species are caught in this fishery, information can be assumed to be sufficient and is therefore likely to meet SG≥80 by default.

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					<u>Gillnet fishery</u> As no primary species are caught in this fishery, information can be assumed to be sufficient and is therefore likely to meet SG≥80 by default.
	Secondary species	2.2.1	Outcome	Trap: SG≥80 Gillnet: SG≥80	For the 2021 review, a new catch composition and risk assessment report was provided which covered both trap and gillnet gear types. However, no additional catch data were provided so the same data provided for the 2020 review is used. <u>Trap fishery</u> Catch data provided from 2018 indicated that all non-target species (118) caught were secondary species. Of these species, two were thought to be main and the rest minor. In the 2019 FIP Review meeting a PSA was conducted to assess the two main secondary species as there was insufficient information to score them against the default assessment tree. The two species assessed were smoothshelled swimming crab (<i>Charybdis affinis</i>) and lattice blaasop (<i>Takifugu oblongus</i>). In the 2021 assessment, an updated PSA report was provided which indicated that lattice blaasop has a low PSA score (same as in 2019) but smoothshelled swimming crab was medium risk (low risk in 2019). The attributes used in the PSA differ to those under the MSC Risk Based Framework and are thought to be more precautionary. This could explain the change in risk score and should be reviewed. This is likely to meet SG≥80 but the results of the PSA should be reviewed. <u>Gillnet fishery</u> In 2020, catch data were provided for the gillnet fishery between November 2017 and November 2018. There were thought to be 112 secondary species caught in this fishery. Of these species, none were identified as main as no species made up more than 5% of the total catch (or 2% for vulnerable species). Therefore, this will by default meet SG≥80. In the updated PSA report provided in 2021, 80 species caught

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					by gillnet were thought to be medium risk, this includes two elasmobranchs (<i>Himantura imbricate</i> and <i>Maculabatis gerrardi</i>), two bony fishes (<i>Muraenesox cinereus</i> and <i>Hexanematichthys sagor</i>) and a group of sole species (Soleidae and Cynoglossidae). <i>Maculabatis gerrardi</i> (whitespotted whipray) is listed as Endangered under the IUCN Red List and therefore is now assessed under ETP species. Although this does not affect the overall score of this PI as minor species are only scored at SG100 it suggests the robust and continual monitoring should take place to ensure no significant impacts on secondary species.
		2.2.2	Management strategy	Trap: SG60-79 Gillnet: SG≥80	<u>Trap fishery</u> Impact on the two main secondary species in this fishery is thought to be at low or medium risk according to the updated PSA undertaken in 2021. However, management for smoothshelled swimming crab and lattice blaasop is unclear. Catch data previously provided for the trap fishery indicates that smoothshelled swimming crab makes up over 28% of the total catch. This suggests that management measures for smoothshelled swimming crab may be required. A further 22 secondary species were assessed as medium risk (most likely minor species). As such this is likely to meet SG60-79. In order to meet SG100, management should be in place for minor species. <u>Gillnet fishery</u> As no main secondary species are caught in this fishery, a management strategy is not necessary and therefore is likely to meet SG≥80 by default. In order to meet SG100, management and monitoring should be in place for minor species. It is suggested that as an endangered species, management and monitoring is introduced for the whitespotted whipray (<i>Maculabatis gerrardi</i>).

Principle	Component	Performance Indicator	Current Score	Rationale and Justification
		2.2.3	Information	For the updated PSA undertaken in 2021, data were obtained from a desk study to inform productivity scores and from observations, field sampling, desk study and expert opinion for susceptibility. In addition, a data quality score was estimated for each species for interpretation of the vulnerability score. A score of 1 indicates best quality based on data for the stock and area of interest that is established and substantial. A score of 5 indicates no data, where no information is available. Data quality scores for the productivity attributes ranged between 1.0-4.0, with an average of 1.8 ± 1.4, implying a relatively high quality of information used (Milestone Report 33f). <u>Trap fishery</u> For the two main species in the trap fishery, smoothshelled swimming crab scored 1.86 data quality score and lattice blaasop scored 2.14. This indicates a relatively high availability of information for productivity score however, the data quality score was not available for susceptibility. A score over 2 does indicate that the information is based on limited coverage and corroboration or other reasons why it could not score 1. Therefore, more data could be collected on these two species to increase the accuracy of the PSA. However, it is thought that this would meet SG≥80 as some quantitative information exists to assess productivity and susceptibility but more species-specific information would be needed to score higher. Some semi-quantitative evidence to show minor species have not significantly declined is needed in order for this to meet SG100. <u>Gillnet fishery</u> As no main secondary species are caught in this fishery, information can be assumed to be sufficient and is therefore likely to meet SG≥80 by default. Some

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					semi-quantitative evidence to show minor species have not significantly declined is needed in order for this to meet SG100.
	ETP species	2.3.1	Outcome	Trap: SG60-79 Gillnet: SG60-79	In the 2021 review, additional information was provided on the distribution of ETP species in Surat Thani and how these overlap with fishing grounds for both trap and gillnet vessels (Milestone Report 33e). In regards to the impacts of the BSC fishery on ETP species, the risk caused to marine animals by fishing gear was considered a major issue, especially near-shore fishing gear including gillnets. However, only the fishing grounds of small and medium scale vessels were mapped as the large-scale vessels operate across provinces and therefore it was difficult to determine their fishing grounds in Surat Thani. <u>Trap fishery</u> It was identified that for small-scale trap vessels operating near shore there was no overlap with ETP distribution but for medium-scale trap vessels there was an intensive area of fishing from Don Sak to Ang Thong Islands, which overlaps with areas of whale and dolphin distribution. However, from the catch data provided for previous reviews no ETP species were recorded. <u>Gillnet fishery</u> In contrast, small-scale gillnet vessels overlapped with areas of sea turtles, dugongs, whale sharks, whales and dolphins in near shore areas of Tha Chana, Chaiya, and Don Sak Districts. However, the medium-scale gillnet vessels did not overlap with ETP distributions but did operate near to areas where sea turtles were found. However, from the catch data provided for previous reviews no ETP species were recorded. Although no ETP species were identified in the catch data provided, the overlap of the fishery and the distribution of ETP species is of concern for some of the fleet.

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					There is also concern in regards to the issue of ghost gear and the interaction this may have with ETP species in Surat Thani. The absence of data on large-scale vessels for both trap and gillnet vessels is also concerning as they may overlap with whale and dolphin distributions offshore. Both trap and gillnet vessels are likely to achieve SG60-79 as more data are required on issues with ghost gear and interactions with large scale vessels.
		2.3.2	Management strategy	Trap: SG60-79 Gillnet: SG60-79	<u>Trap fishery</u> As ETP species are not caught in this fishery it is likely that measures are not needed to manage direct impacts. According to the 2017 pre-assessment there are some measures in place through DMCR that highlight awareness of ETP interactions and some communities have implemented their own measures to reduce interactions with species such as dugong. In the 2021 review, additional information was also provided on the communication materials provided to communities regarding rescuing ETP species (Milestone Report 33e). However, there is possibly a requirement to bring in measures to manage impacts from ghost gear. Stakeholder consultation during the 2020 FIP Review Meeting also indicated issues with strandings for turtles and cetacean species. This is therefore likely to meet SG60-79. <u>Gillnet fishery</u> As ETP species are not caught in this fishery it is likely that measures are not needed to manage direct impacts. According to the 2017 pre-assessment there are some measures in place through DMCR that highlight awareness of ETP interactions and some communities have implemented their own measures to reduce interactions with species such as dugong. In the 2021 review, additional information was also provided on the communication materials provided to communities regarding

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					rescuing ETP species (Milestone Report 33e). However, there is possibly a requirement to bring in measures to manage impacts from ghost gear. Stakeholder consultation during the 2020 FIP Review Meeting also indicated issues with strandings for turtles and cetacean species. This is therefore likely to meet SG60-79 .
		2.3.3	Information	Trap: SG60-79 Gillnet: SG60-79	In the 2021 review, additional information was provided on the distribution of ETP species in Surat Thani and how these overlap with fishing grounds for both trap and gillnet vessels (Milestone Report 33e). However, this report provides no quantitative data from bycatch directly from the fishery such as if species are caught dead or alive or if returned to the sea. A report in 2020 found 10 species of threatened and endangered animals in Surat Thani consisting of three turtle species (Hawksbill turtle, green turtle, and Olive ridley sea turtle), five dolphin and/or whale species (Indo-Pacific humpbacked, bottlenose dolphin, finless porpoise, irrawaddy dolphin, and false killer whale) and two species of elasmobranch (whale shark and manta ray). Although no turtles were observed at sea, a number were recorded nesting or stranded on the coasts of Surat Thani Province. The updated report provided in 2021 also indicated that a health-check was undertaken for the Indo-Pacific humpbacked and found that they are healthy (Body condition score 3/5). However, further information in regards to the details and methodology of this health check were not available and would be good to understand. In Surat Thani, one species of commercially important seahorse has also been found, spotted seahorse (<i>Hippocampus kuda</i>), especially around the area of Sed island where there is an abundance of seagrass. Although there is good information provided on ETP distribution and how these overlap with small and medium scale vessels fishing grounds, there is still an

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					absence of data on possible interactions with ghost gear and also for large scale vessels. Both trap and gillnet vessels are likely to meet SG60-79.
	Habitats	2.4.1	Outcome	Trap: SG60-79 Gillnet: SG60-79	For the 2021 review, an updated literature review on risk of the BSC fishery on habitats in Surat Thani was provided. The impact of small and medium-scale vessels was provided. The DoF could not identify the fishing grounds for large-scale vessels which means that impact could not be determined for this section of the fleet. Milestone Report 36 provides some information on the different fishing grounds of vessels of different sizes . Artisanal gillnet vessels (small-scale) are thought to fish largely over muddy sand. Commercial sized boats (medium and large-scale) fish further offshore around coral and artificial reef. In regards to traps artisanal vessels again fished over muddy sandy habitats whereas commercial vessels preferred further offshore around Phangan and Samui Island. A Consequence Spatial Analysis (CSA) has been conducted as part of the BSC FIP. During the RBF workshop, a participatory mapping exercise was undertaken by each stakeholder group to show the distribution of fishing effort within the region (Milestone 31 Report). Two main habitat types were identified by fishers to fall within fishing areas: mud and sand, and artificial reefs. Results from the CSA indicated that the risk to main habitats from the trap and bottom gillnet fishery were 'low', indicating that they are resilient to serious impacts from the fishery. In the CSA vulnerable habitats such as seagrass and natural reef were excluded as fishers were reported to avoid these areas when fishing. However, only qualitative evidence was provided to support this.

Principle	Component	Performance Indicator	Current Score	Rationale and Justification
				<u>Trap fishery</u> Small and medium-scale crab trap vessels did not show any overlap with mangroves, coral reefs or seagrass beds in Surat Thani and therefore are unlikely to have a significant impact on these vulnerable habitats. <u>Gillnet fishery</u> Small and medium-scale gillnets the fishing grounds do not show any overlap with mangroves, coral reefs or seagrass beds and therefore are unlikely to have a significant impact on these vulnerable habitats. Although this provides evidence that direct habitat impacts on vulnerable habitats is unlikely there is no additional data provided for potential impacts from ghost gear that may drift into vulnerable areas. A report was also provided in 2021 that indicated the status of three critical habitat types in Surat Thai namely: seagrass, coral reef and mangroves. Seagrass in the Surat Thani area ranges from very healthy to moderately healthy and the status of seagrass have all improved since the last review. However, in comparison nearly 78% of coral reefs were found to be in extremely damaged condition and no indication of mangrove health was provided. Again, while no fishing occurs directly in these habitats there is a risk of damage from drifting ghost gear that has not been evaluated. This is likely to meet SG60-79 for both trap and gillnet fisheries but further quantitative evidence is required in regards to ghost gear impacts to obtain higher a score.

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
		2.4.2	Management strategy	Trap: SG60-79 Gillnet: SG60-79	As direct impacts to the main habitat types are thought to be minimal a management strategy may not be necessary. Seagrass habitat, although not utilized by fishers, are monitored regularly by the Department of Marine and Coastal Resources (DMCR) and the DMCR also prohibit fishing in six areas of Surat Thani to conserve coral habitats. The Baan Haad Somboon community have also implemented measures to conserve areas for young crabs, clams and cockles (Milestone 37 Report). Prohibition of certain fishing methods in coastal waters may also help to protect seagrass and mangrove habitats. An area around Koh Sed has also been designated as a fisheries refugia to protect vulnerable BSC life stages in seagrass areas. Based on the measures that exist and the minimal impact to main habitats this is likely to meet SG60-79. There is a lack of quantitative evidence to support that measures are implemented successfully and adhered to as well as a lack of information on the possible habitat effects from ghost gear.
		2.4.3	Information	Trap: SG60-79 Gillnet: SG60-79	Maps of habitat distribution and spatial overlap with fishing ground is available and a report provided on the risk of BSC fishing on habitats which was informed through a literature review (Milestone 36 Report). For the 2021 review, an updated literature review on risk of the BSC fishery on habitats on Surat Thani was also provided (Milestone Report 36). Although the CSA indicated minimal impacts from either gear, demersal gillnets can cause damage to the seafloor when hauled back into the boat and so should be monitored. New information collected could be used to update the CSA and it was stated in the RBF workshop in 2016, that improved knowledge of the encountered habitats, based on scientific surveys, would reduce uncertainty in the habitat impacts of the fishery. It would also be important to understand what monitoring is in place to

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					ensure that risk to habitat does not increase in the future and the impacts from ghost gear. Based on this, this is likely to meet SG60-79 .
	Ecosystem	2.5.1	Outcome	SG<60	In 2021, an updated report was provided (Milestone 60 Report) on an Ecopath model that was used in Bandon Bay. This new report contained the same information, albeit condensed, from the Milestone 39 Report. It was determined that this report is insufficient to identify impacts of the fishery on the ecosystem and therefore this is unlikely to meet SG60. Further research is required on the impacts of the fishery on the ecosystem as a whole rather than focusing on the crab banks.
		2.5.2	Management strategy	Trap: SG<60 Gillnet: SG<60	It is unclear if management measures are in place, or necessary, to mitigate impacts of the fishery on the ecosystem. The main measures in place appears to be the implementation of crab banks which is not an ecosystem management measure. There also do not appear to be measures in place to manage the large bycatch of secondary species for both gear types. As a result, this is unlikely to meet SG60 . Due to the highly diverse nature of the fishery it would be useful to establish some form of long-term monitoring programme to evaluate changes in the ecosystem to determine if the measures in place for BSC, bycatch and habitats work together to maintain ecosystem structure and function.
		2.5.3	Information	SG60-79	Information is available on the non-target species caught in this fishery and the EcoPath model provides some information into the ecosystem dynamics of the Bandon Bay region. However, not all main impacts have been investigated in detail and there is insufficient information to infer main consequences for the ecosystem. It will also be important to understand the catch of non-target species by vessel size as one size category may have more impact than others. More regular monitoring and data collection on the ecosystem to detect an increase in risk is also advised.

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					The potential cumulative impacts of ghost gear has also come to light in 2020 and further information is sought to determine the cumulative direct and indirect impacts of both gear types on the ecosystem. Based on this evidence, this is likely to meet SG60-79 .
3	Governance and Policy	3.1.1	Legal and customary framework	SG≥80	There is considered an effective national legal system to deliver management outcomes consistent with MSC Principles 1 and 2, for commercial fisheries in Thailand. The main laws governing fisheries are: • The new Royal Ordinance on fisheries (No2) B.E 2017 • The Fisheries Act B.E. 2558 (2015)- (“The Act”) • The Act Governing the Right to Fish in Thai Waters B.E. 1939 (“the Thai Waters Act”) • The Thai Vessel Act B.E. 1938 These national regulations define roles and responsibilities of actors in fisheries management and how fisheries should be managed at different levels of governance (e.g. DoF, regional PIPO centres and provincial committees). One of the major advances in the fishery management system are PIPO (Port-In Port-Out) Centres which require all commercial vessels entering and leaving ports to report to the PIPO centre, and inspection occurs on a risk basis. The PIPO centres serve many purposes from fishing, to shipping and labour. This regulation only applies to vessels entering and leaving ports. Different management mechanisms are in place depending on the size of the vessel. This covers both artisanal and commercial vessels and includes requirements for VMS, fisher registration and vessel licence. For the 2021 review an updated Fisheries Management Plan was provided for Thailand for 2020-2022. This FMP applies to all marine capture fisheries taken by

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					both artisanal and commercial vessels in Thai waters as well as marine capture fisheries conducted by Thai vessels in territorial waters and EEZs of other States and high seas. Overall, this is therefore likely to meet SG≥80.
		3.1.2	Consultation, roles and responsibilities	SG≥80	For the 2021 review, an updated report on a Working Group output (Milestone 48 Report) was provided that indicated that in 2021, two working group meetings were held to discuss the management of BSC, follow -up on the progress of activities, develop reports and summaries of implementation and perform other duties as assigned. In 2021 there was also a meeting of the National Committee on Blue Swimming Crab Resource Management (Milestone 49 Report). No further evidence was provided for this PI and therefore the rationale and score provided in 2020 is applicable and cited below. Within the Ministry of Agriculture and Cooperatives (MOAC), the Marine Department is responsible for new vessel registration, vessel permit renewal, vessel lists and issue of seaman books. Management of the marine environment is the responsibility of the Department of Marine and Coastal Resources (DMCR) under the Ministry of Natural Resources and Environment (MNRE). The Maritime Enforcement Coordinating Centre (Thai-MECC) is controlled by the Thai Royal Navy who control security and protection of marine resources. As well as this national level of government, fisheries are also managed at the provincial and local levels. Each province has a provincial fisheries committee appointed by the National Government and act as their representatives. Provinces are divided into a number of districts, headed by district officers falling under the responsibility of the Provincial Governor. These Provincial Fisheries Committees have the power to compile and propose recommendations and approaches to the national committee on the management and conservation of marine resources for consideration in the

Principle	Component	Performance Indicator	Current Score	Rationale and Justification
				preparation of policies. In the case of an emergency they can have the power to issue notifications that take effect immediately, which is later discussed by Ministers. These Provincial Fishing Committees must consist of representatives from local fishing community organisations, as detailed in the Act. The Draft FMP, sets out the responsibilities of those involved in the management of BSC in Surat Thani specifically. Under the Act the participation of stakeholders is a key objective. Consultation is facilitated through the Provincial Fisheries Committees which are made up of representatives of the local community and people with knowledge or operational experience of the field of fisheries or in natural resources. The roles and responsibilities of these Committees are noted above and help to promote the inclusion of local knowledge and advice into policy development. When new legislation or rules are brought out, all fishers are invited to attend meetings to discuss the changes and support is provided to help with the implementation of these new rules. However, although consultation processes are in place to collect information it is not clear how these data are used or not used and how much influence local recommendations have on policy development. The draft FMP explains the decision-making processes specific to BSC and regional areas. There is a National Committee and a National Working Group on Sustainable BSC Resource Management; there is also a Provincial Fisheries Committee among various other relevant groups. In 2020, further information was provided which showed signed MoUs with three universities; Kasetsart University, Walailak University, and Rambhai Barni Rajabhat University, to help provide academic cooperation in regards to the BSC fishery. The Management Advisory Committee was set up to ensure the management system has effective consultation processes that are open to interested and

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					affected parties. The committee was developed at the national level for all Thai BSC fisheries and includes key stakeholders from the BSC fishing community, although in the 2017 they did not attend. Based on the information provided organisations and individuals involved in management are identified and the roles are well defined. There also seems to be a system in place that seeks local knowledge and allows for interested parties to be involved in consultation. This is likely to meet SG≥80.
		3.1.3	Long term objectives	SG≥80	The DoF uses the principle of MSY and the precautionary approach to guide fisheries management plans. The Royal Ordinance 2017, states that ‘The use of best available scientific evidence to achieve long- term economic, social and environmental sustainability, in line with the ecosystem-based approach and precautionary approach, to ensure that fisheries resources are maintained or restored to a level that can produce the maximum sustainable yield’. For the 2021 review an updated Fisheries Management Plan was provided for Thailand for 2020-2022. This FMP applies to all marine capture fisheries taken by both artisanal and commercial vessels in Thai wates as well as marine capture fisheries conducted by Thai vessels in territorial waters and EEZs of other States and high seas. This is therefore likely to meet SG≥80.
	Fishery specific management system	3.2.1	Fishery specific objectives	SG60-79	In 2021, an updated draft of the BSC FMP was provided. It was agreed that this plan should come under the general National Marine Fishery Management Plan 2020-2022. The Marine Fisheries Research and Development Division were assigned the responsibility of developing a BSC Sustainable Management Action Plan under the National Marine FMP. The public hearing process for the new plan will be conducted in 2022 in 8 areas to cover fisheries in 22 coastal provinces.

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					Some management measures exist in general Thai Fisheries law that are consistent with Principles 1 and 2 (such as prohibition of catching berried crabs during a certain season and gear restrictions for BSC) however, until the management plan is formalized this is likely to meet SG60-79 .
		3.2.2	Decision making processes	SG60-79	In the 2021 review, updated information was provided on outputs of the Working Group meetings and the ToRs of the Fisheries Management Committee. In 2021, there were two meetings concerning the implementation of the BSC FIP by the Working Group and meeting minutes were provided. In 2021, there was one meeting of the National Committee on BSC resource management. It was the first meeting that involved representatives from the National Fisheries Association of Thailand and Federation of the Thai Fisherfolk Association. It aimed to introduce the new committee to understand the BSC FIP, management measures and the revised BSC FMP. This meeting followed the retirement of the previous Deputy Director-General. This information has been used to update the scoring for this PI. The Department of Fisheries directive to establish 'Working Group to Implement NPOA on Blue Swimming Crab Resource Management' was initially signed in March 2016 and revised in August 2017 due to re-structuring of Department of Fisheries (Milestone 48 Report). The objectives of the group are to: • Drive NPOA on Blue Swimming Crab Resource Management • Follow-up the progress of activities under the NPOA • Develop progress reports and summary of NPOA implementation to present to the National committee • Perform other duties as assigned The Working Group met twice in 2021 and meeting minutes have been provided. The group are reported to meet between 2-4 times a year but this depends on how

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
					many issues come up. If the issues need smaller group discussion before presenting to the advisory group (or committee group), these are conducted in a working group meeting instead. Reports provided from working group meetings do demonstrate that decision making processes are attempting to respond to issues identified, such as increased mortality, but recommendations such as reduce CPUE are impractical to actually implement. In 2021, it was decided that the BSC FMP should be incorporated into the Marine Fisheries Management Plan 2020-2022. An example was also provided when local people in one community attempted to introduce regulation at the provincial level regarding MLS based on scientific studies. There is a concern that while research and monitoring are highlighting serious issues in the fishery (such as overfishing and catching of juveniles), management measures to mitigate these are yet to be implemented and tested. As such this is likely to meet SG60-79.
		3.2.3	Compliance and enforcement	SG60-79	Additional data were provided for the 2021 review which provided an overview of illegal BSC fishing in Surat Thani during 2020-2021. During this time, there were 9 cases of illegal activity. The most common offence was against Section 71(1) of the Royal Ordinance which states that the Minister can issue a notification if <i>'fishing gears according to their forms, fishing methods, fishing areas, the size of fishing vessels used in fishing operation and other conditions that are prohibited from fishing operations in fishing grounds'</i>. Of these cases, 8 were closed and a fine paid while one is being considered in court. Previous information on the number of allegations, prosecutions and the results of illegal activity were also provided for previous years (2019 and two entries for 2020). Over this time the most common offence related to use of inappropriate gear (e.g., traps with mesh size smaller than 2.5 inches) and fishing in the wrong zones.

Principle	Component	Performance Indicator	Current Score	Rationale and Justification
				Some data were available to determine which vessel size categories were involved in violations in 2019 and in 2020-2021. This information would be important to collect to determine if violations are more associated with vessels of a particular size. Evidence of fines being applied and paid are provided which demonstrates that sanctions are used however, it is unclear if they are thought to be an effective deterrence. In 2020, COVID-19 created difficulties for vessels going out and PIPO centers closed so there was no one to report fishing operations to. There was a reduction in demand due to closure of hotels and restaurants as well as restrictions on exports. The increase catches of BSC also led to reduction in prices and therefore fishers thought it was not worth fishing. Different MCS mechanisms are in place for inshore vessels (<9.9 GT) and offshore vessels (>10 GT). Small inshore vessels need to be registered and will eventually need a fishing license however, this has yet to be implemented. Fisher registration and a paper-based logbook are voluntary for those who want to sell raw material for products to export. For larger offshore vessels, vessel registration, fishing license and fisher registration is required. Paper based and simplified log-books are voluntary for medium trap and gillnet vessels (10-29.9 GT) but larger vessels (>30 GT) are required to have e-logbooks. Currently only large-scale vessels are required to have VMS. In regards to patrolling, vessels go out four times a month and for around 5 days at a time. Before patrol vessels go out, the area is assessed for risk of illegal activity and the patrol areas are rotated. Checks are conducted on vessel license, fishing license, the gear and the people on board.

Principle	Component	Performance Indicator	Current Score	Rationale and Justification
				Local fishing volunteers have also been trained in good practice and monitoring of illegal fishing to help strengthen management (Milestone 51b Report). The authority of the volunteer includes: • Explain, suggest, prevent and suppress the activities that may harm aquatic animal and resources. • Gathering news and information that related to illegal fishery activities. • Incorporate and support government officer. • Participate in aquatic conservation activities. As of 2019, 5 volunteer training courses have been held and were each attended by 80 participants. This indicates that some MCS mechanisms exist at the local level but their effectiveness is unclear. The updated draft BSC FMP (Milestone Report 47) indicates some issues with management measures and law enforcement such as restrictions due to numerous and scattered vessels, unavailability of monitoring staff, lack of surveillance networks with governments and a lack of knowledge amongst fishers on legal matters and conservation. This is likely to meet SG60-79 as although MCS mechanisms exist it is unknown if sanctions are an effective deterrence and known issues with MLS might suggest systematic non-compliance. The most recent BSC FMP also raises some issues with capacity and implementation of management and monitoring. Further research is needed to understand whether fishers feel that the sanctions are an effective deterrence and the frequency of violations.

Principle	Component	Performance Indicator		Current Score	Rationale and Justification
		3.2.4	Management performance evaluation	SG<60	It is not clear whether mechanisms are in place to evaluate the fishery specific management system and no formal management plan is in place. For example, it is necessary to understand who has reviewed stock assessment advice and who determines where the harvest strategy is effective. The updated draft BSC FMP includes a section on monitoring and management performance evaluation. This includes the requirement for two types of evaluations: internal and external. This would meet the requirements under the MSC certification standard. However, as this plan has yet to be implemented, this is unlikely to meet SG60.

4 Conclusions

Several new activities and updates provided in 2021 show good progress of the FIP towards achieving MSC certification. However, despite some progress this has not yet led to increased scoring for Performance Indicators compared with the Three-Year Review in 2020. The main reason for this is that, despite important studies being implemented (e.g., ghost gear), the results are not yet available to influence the scoring against MSC criteria.

The main areas of concern which may prevent the BSC fishery from achieving MSC certification include current overexploitation of the stock, the absence of a management plan, potential impacts of ghost gear and also the reliance on crab banks for stock rebuilding. To address some of these issues, additional milestones were suggested in the 2020 review that would be important to consider to ensure that an increase in scoring can be achieved. The client indicated that all these additional milestones were accepted by the FIP participants but progress has been limited. Two were adopted in 2021 (Milestone 59 and Milestone 60) but for the remaining milestones, no update was provided. This includes:

- Milestone 56: Reduction of overfishing in Surat Thani including removal of juveniles from the system
- Milestone 57: Surat Thani BSC stock assessment review
- Milestone 58: Quantify gear interactions with target species as well as primary, secondary and ETP species.
- Milestone 61: Evidence of decision-making responsiveness
- Milestone 62: Effectiveness of MCS mechanisms

It is important that these suggested milestones are considered in order to ensure that the fishery can meet several MSC Performance Indicators. Details of these are provided in Annex 1 and were included in the Three-Year Review report in 2020. These milestones should be discussed with relevant FIP stakeholders before finalisation.

Under FisheryProgress, FIPs are now having to address social performance in their fisheries and comply with the Human Rights and Social Responsibility Policy². The implementation of this policy will follow a phased approach according to a timeline, which was updated to reflect a six-month delay in some requirements. The policy covers all vessels, fisheries and fisheries observers within the FIP as well as all fishing activities whether conducted from shore, a vessel or elsewhere. The FIP lead is responsible for reporting to FisheryProgress that FIP participants are doing their part to uphold human rights. All FIPs reporting on FisheryProgress must:

- 1.1 Sign the FisheryProgress Human Rights Code of Conduct.
- 1.2 Provide information about the vessels or fishers included in the FIP.
- 1.3 Undertake best efforts to make fishers aware of their rights.
- 1.4 Demonstrate there is a grievance mechanism available to all fishers in the FIP.
- 1.5 Complete a self-evaluation against the FisheryProgress criteria for increased risk of forced labour and human trafficking.

² https://fisheryprogress.org/sites/default/files/FP_SocialPolicy_English_5.7.21.pdf

There are additional requirements if the FIP meets one or more FisheryProgress criteria for increased risk of forced labour and human trafficking (see Requirement 1.5). In this case, the FIP must:

- 2.1 Complete a risk assessment using the Social Responsibility Assessment Tool (SRA).
- 2.2 Create a social workplan to address all red indicators in the risk assessment.
- 2.3 Report publicly on action progress and update indicator scores.

Any FIP may also voluntarily report on their performance and progress on one or more social issues.

The following table (Table 5) highlights the new timeline that all existing FIPs must follow in order to demonstrate social responsibility.

Table 5 Timeline for complying with Human Rights and Social Responsibility Policy

Policy Requirement	Timeline for existing FIPs
Effective November 1 2021	
1.5 Self-evaluation	Next report (November 1 2021- April 30 2022)
2.1 Complete risk assessment	12 months after self-evaluation submitted (November 1 2021-April 30 2022)
2.2 Complete workplan	12 months after self-evaluation submitted (November 1 2022- April 2023)
Effective May 1, 2022	
1.1 Code of conduct	Next report (May 1- October 30 2022)
1.2 Vessel list	Next report (May 1 – October 30 2022)
1.4 Grievance mechanism	Next report (May 1 – October 30 2022)
Effective November 2022	
1.3 Fishers awareness of rights	Next report (November 1 2022-April 30 2023)

Annex 1

The following tables provide information on the additional draft Milestones that were proposed in the 2020 Three Year FIP review. These Milestones should be discussed with relevant FIP stakeholders before finalisation. Each table provides a description of the milestone, an indication of the stakeholder responsible, priority, status, timeframe, cost and related MSC PIs.

Milestone/ Title	Milestone
Title	Reduction of overfishing in Surat Thani including removal of juveniles from the system
Milestone Number	56
Issue	The Surat Thani BSC fishery is currently experiencing overfishing, with fishing mortality (F) above Maximum Sustainable Yield (MSY). There is also a known issue with catching juveniles in this fishery as a fishery-wide minimum landing size (MLS) has yet to be implemented. This additional milestone will contribute towards the stock being consistent with MSY.
Description	This fishery needs to enforce an effective harvest strategy in order to prevent overfishing and to allow the stock to rebuild and be consistent with MSY. This strategy should include restriction on fishing effort (potentially through implementation of artisanal licensing system that is based on MSY, and implementation of minimum landing size limit) and not rely solely on the introduction of crab banks to improve stock status. Monitoring should also be in place to determine the effectiveness of the harvest strategy.
Tasks	Harvest Strategy Document Monitoring Plan
Working group/stakeholder	Universities, Department of Fisheries
Priority	High
Status	Subject to approval
Timeframe	>12 months
Cost	\$\$\$
Related MSC Performance Indicator(s)	PI 1.1.1 PI 1.2.1 PI 1.2.3 PI 2.5.1 PI 2.5.3 PI 3.2.1

Milestone/ Title	Milestone
Title	Surat Thani BSC stock assessment review
Milestone Number	57
Issue	It was unclear how or if the stock assessment for Surat Thani BSC deals with uncertainty and if assessments are subject to peer review.
Description	Robust stock assessments in relation to biological reference points should be conducted routinely to determine if the harvest strategy is effective. As part of this, uncertainty in model parameters should be reviewed, explored and explicitly detailed as to how this is taken into account. The stock assessments should be subject to peer review, ideally both internally and externally. Results of the peer review should be taken into account and the assessment updated if necessary.
Tasks	Routine stock assessment reports including description of how uncertainty is dealt with Peer review report
Working group/stakeholder	Universities, Department of Fisheries
Priority	Medium
Status	Subject to approval
Timeframe	<12 months
Cost	\$
Related MSC Performance Indicator(s)	PI 1.1.1 PI 1.2.1 PI 1.2.3 PI 1.2.4

Milestone/ Title	Milestone
Title	Quantify gear interactions with target species as well as primary, secondary and ETP species.
Milestone Number	58
Issue	Catch data provided for the Surat Thani BSC fishery for the 2020 review were not disaggregated by vessel size. This is an issue as the different fleet segments fish in different areas (inshore vs offshore) and as a result catch composition or interaction with ETP species could vary. This is important to understand if management measures are required. There is also no reference to ETP interactions which is important to explicitly state as cetaceans, dugong and turtle inhabit the area. This additional milestone will better inform the outcome

Milestone/ Title	Milestone
	status of the target, primary, secondary and ETP species and contribute information on the risk posed by the UoA on different parts of the fishery. This will ultimately help inform whether further management is necessary and on which areas this should focus.
Description	Catch data (trap and gillnet) for this fishery should be disaggregated by vessel size (for target and non-target species) and specifically include interactions with ETP species that are known to inhabit the area. If interactions do not occur with ETP species this should be explicitly stated through null reporting. These data should be collected routinely so that any increase in risk to these populations can be detected. If interactions are significant then further management actions may be required.
Tasks	Catch data report for both gear types disaggregated by vessel size
Working group/stakeholder	Department of Fisheries, Universities, Department of Marine and Coastal Resources
Priority	Medium
Status	Subject to approval
Timeframe	>12 months
Cost	\$\$
Related MSC Performance Indicator(s)	PI 1.2.3 PI 2.1.1 PI 2.1.3 PI 2.2.1 PI 2.2.3 PI 2.3.1 PI 2.3.3 PI 2.5.1 PI 2.5.3

Milestone/ Title	Milestone
Title	Impact of ghost gear on the fishery from trap and gillnets
Milestone Number	59
Issue	As part of the 2020 review, the amount of ghost gear was quantified in this fishery which indicated high rates of abandoned, lost or otherwise discarded fishing gear (ALDFG) for both trap and gillnet. The direct and indirect impact of this on the fishery however, was not investigated. High incidences of ALDFG could impact various aspects of the fishery including, target, primary secondary and ETP species as

Milestone/ Title	Milestone
	well as habitat structures and the ecosystem. This additional milestone will better inform the outcome status of the target, primary, secondary and ETP species as well as habitat and ecosystem. This will also contribute information on the risk posed by the UoA on different parts of the fishery. This will ultimately help inform whether further management is necessary and on which areas this should focus.
Description	Initially a literature review should be undertaken to determine current knowledge of impacts based on other reviews or similar fisheries. Following this, further data could be collected to help fill gaps in knowledge. Data are needed to quantify the level of impact (spatial and temporal) of ghost gear on target, primary, secondary and ETP species as well as on habitats and ecosystems. This should include sufficient monitoring to determine an increase in risk and include impacts from both gear types. Depending on the results of investigation a management strategy may be required to mitigate impacts of ghost gear on various parts of the fishery.
Tasks	Literature review report Plan to assess impact of ALDFG from BSC fishery Report on impact of ALDFG from BSC fishery
Working group/stakeholder	Department of Fisheries, Universities, TFFA, Department of Marine and Coastal Resource
Priority	Medium
Status	Subject to approval
Timeframe	>12 months (should take into account seasonal differences)
Cost	\$\$
Related MSC Performance Indicator(s)	PI 1.1.1 PI 1.2.3 PI 2.1.1 PI 2.1.3 PI 2.2.1 PI 2.2.3 PI 2.3.1 PI 2.3.3 PI 2.5.1 PI 2.5.3

Milestone/ Title	Milestone
Title	Impacts of the fishery on the ecosystem
Milestone Number	60
Issue	The results of an Ecopath model were provided for the 2020 review, which investigated the effects of restocking the fishery through crab banks on the ecosystem. While this provided some useful information, the effects of the fishery as a whole have not been investigated. This includes the removal of crabs from the system through fishing, including juveniles, and the large proportion of non-target species that are removed. This additional milestone will better inform the outcome status of the ecosystem and will contribute information on the risk posed by the UoA on the ecosystem. This will ultimately help inform whether further management is necessary and on which areas this should focus.
Description	This milestone can be split into two phases. The first should consist of a literature review, looking at previous work into ecosystem impacts of similar fisheries (i.e., similar gear and ecosystem). It is likely that a second phase would then be required to collect primary data. Depending on the results of the investigation, further management may be required for certain aspects of the fishery. As part of this, routine monitoring should be conducted so that any increase in the level of risk can be detected.
Tasks	Literature review report Plan to assess impacts of fishery on ecosystem Report on impacts on ecosystem from BSC fishery
Working group/stakeholder	Department of Fisheries, Universities, Department of Marine and Coastal Resource
Priority	Medium
Status	Subject to approval
Timeframe	>12 months
Cost	\$\$-\$\$\$
Related MSC Performance Indicator(s)	PI 2.5.1 PI 2.5.3

Milestone/ Title	Milestone
Title	Evidence of decision-making responsiveness
Milestone Number	61
Issue	While evidence indicated that there are decision making processes in place, the effectiveness and transparency of those decisions is unclear. In particular it is unclear how decisions are made in a timely and adaptive manner to take into account relevant research and monitoring. This additional milestone will help to ensure that the processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
Description	Evidence is needed to determine what decisions are being made in response to monitoring, research and evaluation of the fishery and how these decisions are determined. In addition to this, these decisions and decision-making processes need to be transparent (i.e., publicly available). It is also important to provide evidence of how these decisions are monitored to ensure they are having a positive impact on the fishery and are the most suitable.
Tasks	Report describing decision making processes in the fishery and how these have led to management measures and are routinely monitored
Working group/stakeholder	FIP Manager and Department of Fisheries
Priority	Medium
Status	Subject to approval
Timeframe	6-12 months
Cost	\$
Related MSC Performance Indicator(s)	PI 3.2.2

Milestone/ Title	Milestone
Title	Effectiveness of MCS mechanisms
Milestone Number	62
Issue	MCS mechanisms do exist in this fishery but it is unclear the extent to which they are enforced, if sanctions act as an effective deterrence and whether systematic non-compliance is occurring.

Milestone/ Title	Milestone
Description	An effective MCS strategy that is enforced is needed. While some information was provided on the number of allegations, prosecutions and results of illegal activity in the BSC fishery in 2019 and 2020, these data need to be recorded continually over a longer time period. This should include the number of inspections carried out, number of issues of non-compliance and the number of successful prosecutions. The number of violations should decline over time to indicate that compliance has increased. These data should be disaggregated by vessel size and include details of the infringement and the outcome of any subsequent prosecution. This information would also highlight any systematic non-compliance in the fishery if there are repeat violations.
Tasks	Annual report highlighting inspections carried out, number of issues of non-compliance and the number of successful prosecutions
Working group/stakeholder	Department of Coastal and Marine Resources, Department of Fisheries, Fishers
Priority	High
Status	Subject to approval
Timeframe	>12 months
Cost	\$\$
Related MSC Performance Indicator(s)	PI 3.2.3