Promoting Integrated Coastal Management (ICM) in selected seagrass areas in the coast of Satun province, Thailand
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Promoting Integrated Coastal Management (ICM) in selected seagrass areas in the coast of Satun province, Thailand

Local Public Building, Ban Bagan Yai, Moo 2, Ko Sarai Sub-district, Maung District, Satun
Report on promoting Integrated Coastal Management (ICM) in selected seagrass areas in the coast of Satun province, Thailand

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Acronyms used

BOBLME Bay of Bengal Large Marine Ecosystem
DMCR Department of Marine and Coastal Resources
DOF Department of Fisheries
FAD Fish Aggregating Device
ICM Integrated Coastal Management
NGO Non-Governmental Organisation
SMFS Satun Marine Fisheries Station
USA United States of America
1. Introduction

The project Promoting Integrated Coastal Management (ICM) in Selected Seagrass Areas on the coast of Satun province was implemented at Ban Bagan Yai, Moo 1 and 2, Ko Sarai Sub-district, Maung District. The project was supported by the Bay of Bengal Large Marine Ecosystem (BOBLME) Project. In BOBLME Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together to lay the foundations for a coordinated programme of action designed to improve the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries.

The project was implemented under the BOBLME Project Component 2.1 Community-based integrated coastal management. Under this component BOBLME supports stock-taking/lesson learning of information and experience for promotion of community-based, fisheries and habitat management; co-management; and alternative livelihoods among fisher communities in the region.

Seagrass beds are known to contribute to and support the coastal and marine fisheries by providing nursery grounds, shelters, plant biomass, and temporary habitats for many coastal and marine fish species and other living resources. This fact is also recognized by the local fishers. Hence there is a need for participation of fisher communities in a co-management approach for the conserving and management of seagrass beds, which support and sustain fishery resources.

The Department of Fisheries, Thailand undertook three levels of consultations with different stakeholders to ensure protection of a well-defined area of the seagrass bed through community involvement and action.

The outputs and outcomes of the project, following three consultations at Moo 1 and 3, Koh Sarai sub district, Satun province, on Integrated coastal management through co-management of seagrass beds are

- Detailed stakeholders consultations with researchers, practical demonstrations including action research approach
- The demonstration and capacity building programme - 2 stages
- Final consultation to evaluate the process and ensure continuation and spread of the initiative

This is the consolidated report on the process and outcome of the above consultations. The co-management process has been adopted and guidelines prepared for continuation and spread to other areas.

The overall outcome is a framework for promotion of integrated coastal zone management through micro level co-management initiatives, and the conservation of seagrass habitats in the Andaman.

The Department of Fisheries initiated work on Integrated Coastal Management at the project site, Moo 1 and 2, Koh Sarai sub district, Satun province in 2011. Participatory consultations with the local fisher community identified depletion of fish resources for small scale fishers as a major problem. The fishers recognized the importance of conserving and managing the local seagrass beds to help protect fishery resources. It was appropriate to step up the process to a model co-management initiative covering an area of 1,120 Rai (179 ha) for protected marine habitat and resources. This project was a co-management exercise to extend the solution to the issues by focusing on the collaboration of all stakeholders for protecting the seagrass bed. The results will be applied to other areas on the Andaman coast by government agencies and fisher communities. The project had three activities including a training workshop to engage with stakeholders for project planning and implementation as well as to identify and confirm issues for management. The second activity was the government consultation on seagrass bed management after placing boundary buoys and evaluation of the result. The third activity, a crab bank for rehabilitation of the swimming crab
resources in the seagrass beds. The details of these activities are presented in this report. The Satun Marine Fisheries Station was the responsible agency for the implementation of the project and evaluation of the results. The project was a lesson learning exercise for subsequent dissemination to other areas.

2. Workshop and training on seagrass management and community participation

The Workshop and Training on Seagrass Management and Community Participation 17-18 June 2013 was held at a local public building, Ban Bagan Yai, Moo 2, Ko Sarai Sub-district, Maung District, Satun (List of participants in Appendix II).

2.1. Opening the workshop and training course

Mr. Amnuay Kongprom, Chief of Satun Marine Station

The Director of the Marine Fisheries Research and Technological Development Institute, thanked for the honour to chair the workshop and welcomed, on behalf of the workshop and training committee, all participants to "Seagrass Management and Community Participation" at Public Building, Ban Bagan Yai, Moo 2, Ko Sarai Sub-district, Muang District, Satun.

He stated that the Department of Fisheries (DOF) and fishing communities at Ko Sarai Sub-district, Muang District, Satun, especially fishing community in Moos 1, 2 and 3, had found that the key problems of the community was declining fish resources. They thought that conservation and management of seagrass beds to protect marine fish resources under the collaboration between DOF and the BOBLME Project would lead to increased fish catches. This would be achieved through participation of the community and collaboration between all stakeholders to protect the seagrass beds. In addition the results from the initial implementation project would be extended to other coastal areas in the future.

DOF invited all stakeholders, who have a significant role and are involved in the project to attend the workshop. The training was intended to contribute to: (1) the transfer of knowledge and to raise awareness of the conservation and management of seagrass in the community, (2) to provide stakeholders with project planning and installation of buoys to demarcate conservation areas. The participants included representatives of fishers, other stakeholders and government officers, a total of 50 people. After his introductory speech the Director invited the Director Praulai Nootmorn, to give the opening speech.

Praulai Nootmorn, Director of the Marine Fisheries Research and Technological Development Institute

Ms Praulai Nootmorn welcomed all participants. She was delighted to be invited to chair the opening ceremony of the workshop and training course "Seagrass Management and Community Participation"

It is well known that seagrass ecosystems are very important. There are spawning, nursery grounds and habitats for many species of fish, shrimp, squid, crab and shellfish. This habitat is also a rich source of aquatic animals and economically important fish species. Further, seagrass beds are an important food source for dugongs and sea turtles and a major source of livelihood of the coastal community. Seagrass ecosystems are the first to be affected by land use and developments caused by both human and natural causes. Most fishing communities are settled near the coastline. Agricultural development and aquaculture have significant impacts on the seagrass beds. It had recently been found that the areas covered by seagrass had declined. The consequences are declining aquatic resources for small-scale fisheries.
DOF acknowledged the importance of conservation and management of seagrass beds. It had concluded a partnership with the BOBLME Project on Seagrass Management and Community Participation. The focus was on collaboration between stakeholders to protect seagrass beds to increase fish production in this area for small-scale fishers. In addition, the results from the initial implementation would be extended to other coastal areas in the future.

It would require the collaboration of all sectors such as NGOs, local government, provincial fishery officer, other government agencies, and especially all the local fishers in the area, to achieve the project’s objectives. Ms Praulai thanked all participants for taking valuable time to attend and declared the workshop on “Seagrass Management and Community Participation” open.

2.2. Presentation of present knowledge and stakeholder comments

Mr. Amnat Siriphet, Fishery Biologist, Andaman Sea Fisheries Research and Development Centre

Lectured about the changes in Thai fisheries during the last two decades. Many people believe that the marine catches have declined; they think that fish farming, such as shrimp culture, fish cages (grouper and cobia), is the solution. However, fish farming has exposed new problems of fish feed and fish diseases have emerged at Phuket and Phang-Nga Bay. Fish and shrimp disease problems have made damages totalling several million baht and have caused businesses to collapse. Some parties have released sewage and chlorinated water from shrimp ponds into mangrove areas, which may cause death of aquatic animal. This is one negative impact with declining fish production as result. Shrimp farmers have invested heavily in shrimp culture, building roads, providing electricity, feed, and labour. But they have also faced problems with shortage of fish and shrimp seed. Mr Amnat Siriphet proposed the alternative idea of “sea farming”. This practice will protect and manage the juveniles of fish and shrimp in their habitats in mangroves, coral reefs and seagrass beds. Sea farming has been implemented for more than 10 years in Japan, USA and France.

DOF and other agencies consider that Ko Sarai has a high abundance and high diversity of aquatic animal, seagrass beds in good condition and is suitable for sea farming. The Department should help to propose activities through which fishers can increase the production of fish, and catch bigger sizes of fish. Seagrass habitats are important for juvenile of fish, after leaves of seagrass rot, the water current will bring rotted leaves outside the seagrass beds as food for fish. The barnacles at the base of the seagrass, small algae, and juveniles of shrimp in the seagrass bed will aggregate fish or other aquatic animal to feed them and make them stay in the area. It is thus very fortunate to have seagrass beds close to the village. There is no need to create an artificial reef or FAD as an artificial habitat for aquatic animals like in other villages. Mr. Amnat Siriphet stated that DOF is determined to install buoys around the protected zone. DOF might extend the area but administrative measures would not be initiated on this occasion. After the buoys have been installed, DOF will collect data on catches around the area. The team of Satun Marine Fisheries will survey and collect data from the fishing village of all the fishing gears every month. Then, the data will be analysed and information provided to fishers in the village. There would be two further issues:

1. How to expand the area of seagrass beds?
2. How to be able to catch the migrating fish that move through the seagrass beds.

Mr. Wichai Chiae, Fisher and leader of village at Moo2

Mr. Wichai Chiae explained that normally local fishers already have seagrass conservation zones. The fishing zone was delimited, and intrusive gear were not used in the existing fishery. He understood that the seagrass bed is allocated for small-scale fishers. Fishers in the village have raised the question why DOF and Department of Marine and Coastal Resources (DMCR) focused on the issue of the installation of buoys in the conservation zone. They were worried about what will happen after buoys have been installed. The villagers did not agree to close the fishery in certain demarcated
areas. The villagers are fishing with small boats; they can’t go far from the shoreline and need to fish in this area. They are afraid that they can’t fish after zoning.

Mr. Amnat Siriphet, Fishery biologist, Andaman Sea Fisheries Research and Development Centre

Mr. Amnat Siriphet explained that the meeting focused on the role of seagrass beds for the aggregation of aquatic animals from other areas and that rotting leaves of seagrass is a food source for shellfish and juvenile of fish, which would become a prey to other fish species. Another issue is how to manage the seagrass beds, so that fishers can catch more fish. In this regard, DOF cannot unilaterally decide on closed areas. They should reach an agreement with fishers and all relevant agencies. Improved fisheries will strengthen communities and can be achieved through active participation and brainstorming. He also reiterated the importance of demarcating the seagrass area to prevent poaching and to monitor the development of the seagrass area. There would be no regulations prohibiting fisheries and it would be up to the community to manage the fish resources close to their village. The role of DOF and DMCR are to assist with consultations based on the needs of local fishers.

Mr. Anuphong Damkrabi, Fisher and leader of village at Moo1

There is a conservation seagrass area for the seagrass beds in Moo1. But the buoys were damaged and lost. Local fishers need to install buoys again around the boundaries of the seagrass conservation area. Because fishers from other areas come and fish, they can’t observe the conservation area. The fishers have discussed the use of gear and agreed to ban trawl, pushnet, poison, and prod net. But this agreement has not been implemented yet.

Mr. Amnuay Kongprom, Chief of Satun Marine Station

If the fishers in Moo2 do not accept and agree but fishers in Moo1 agree the project would be implemented in the area of Moo1. And we will determine the seagrass conservation boundary and install the buoys tomorrow at Moo1.

Mr. Witthaya Khunsan, Fishery officer, Department of Marine and Coastal Resources

The seagrass bed area between Moo 1 and Moo 2, including Tanjung Uma and Bagan Yai, is 1,120 rai (179 ha). This area has a high abundance of seagrass species, *Enhalus acoroides*, and 7-8 dugongs. They feed and stay there. In order to manage such areas as permanent habitat and feeding area for dugongs, we should be prepared to install buoys to indicate the conservation zone. The Marine and Coastal Conservation Center VI has installed 24 buoys along the seagrass bed and coastal coral reef in Moo1, Tanjung Uma in 2010. At present the buoys in this area have been damaged and lost and the coordinates are unclear. The procedure for installation of buoys is as follows:

**Public hearing with fisher community:** a meeting should be arranged if we propose a conservation area, to understand the real needs and coordinates of the area, before buoys are installed. The procedure should be a survey of fish and aquatic resources at the location. Then, we will determine the geography and oceanography, such as depth of sea water, the sea floor, water tides during monsoon season, etc. Finally we set the coordinates together with the fisher community.

**Before Installation:** The buoys are constructed with 45 cm diameter, then, construction of the buoy base, a cube made of concrete size 40X40 cm and with reinforcing steel with a loop for leash rope.
Fibre rope size 25-30 mm and length should be longer than 2 times the water depth per one set of buoy.

Tie the buoy with fibre rope and secure the end of rope by knitting

**Installation:**

Work with a group of local fishers in the conservation area, then survey the coordinates where the buoys will be installed.

Record the coordinates and measurement of water depth.

*Appendix I* shows pictures of all activities.

### 3. The placement coordinates of buoys in the sea grass base

Brainstorming and work together with local fishers to determine where to place buoys in seagrass beds at Moo 1, Ko Sarai sub-district, Maung district, Satun province in Figures 1, 2 and Table 1 show spot of coordinates.

![Figure 1 Map of Ko Sarai sub-district, Muang district, Satun province](image)
Figure 2 The position of buoys installation in the seagrass bed in Moo 1, Ko Sarai sub-district, Muang district, Satun province (red spot as the present install and green spot as the previous install)
4. Meeting for the review of the seagrass bed after placing buoys

A meeting for the consideration of the seagrass beds after placing boundary buoys was held on 23 November 2013 at a local public building, Moo 1, Ko Sarai Sub-district, Maung District, Satun province (List of participants in Appendix II).

Opening

Mr. Amnuay Kongprom, Chief of Satun Marine Station

Mr. Amnuay Kongprom invited Ms. Praulai Nootmorn, Director of the Marine Fisheries Research and Technological Development Institute to conduct the meeting. Dr Praulai Nootmorn convened the meeting on the seagrass conservation after installation of buoys to demarcate boundaries of the conservation area.

4.1. Agenda item 1

The Chairman informed the meeting that Ms. Praulai was the project coordinator of BOBLME and requested her to convene the meeting.

Ms Praulai welcomed the opportunity to visit the area again. After some delay, the project is being implemented. Buoys were deployed in the area of Moo 1. The chief of Satun Marine Station will inform all of you about what has happened since laying the buoy. The meeting was convened to discuss this and the following.

- Do you wish to expand the area by placing buoys? This may be part of the project and could be supported.
- We should have rules to prohibit certain types of fishing gear in the area of seagrass beds demarcated by the buoys, in order to maintain an area for spawning and for juveniles.
- Do you have any other profession in addition to fishing?
- Do you have any ideas on how to restore the resources in the village? There are many resources such as crab and squid and sea cucumber resources in the area. If the villages are interested the project can provide the equipment to exploit the resources. Artificial reefs are however not suitable to this area, because it is shallow. We should find other tools for management, which are more appropriate.

The Chairman introduced Mr. Wiraphong Wangchamnong, Fishery officer, Fisheries management unit Koh Lipe, Satun Province from Centre of Marine and Coastal Conservation 6.

4.2. Agenda item 2

4.2.1. The result after installation of buoys demarcating the boundaries of seagrass beds

After the training at Moo2 in June this year, the fishers didn’t agree to deploy the buoys because they were worried about the terms for resource use in and around the seagrass beds. He informed the meeting that there was still funds available in the project if the fishers would change their mind.

It was concluded that the station has received the cooperation of the fishing community for the project. This meeting aimed to understand the impact of placing buoys as demarcation of seagrass beds.
Buoys had been installed at Moo 1, Tanjung Uma, in line with the Department of Marine and Coastal Resource’s procedures in the past. However, some of the buoys had been lost. The details of the operation were: placement of 15 buoys (diameter 40 cm), fixed with concrete cube sized 40x40 cm with the fibre ropes 25-30 mm per buoy, length approximately two times the depth of water. Coordinates were recorded and water depth measured:

Table 1 The position and coordinated spot of buoys installation in the seagrass bed in Moo 1, Ko Sarai sub-district, Muang district, Satun province

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<th>Spot</th>
<th>Latitude</th>
<th>Longitude</th>
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<td>2</td>
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Remark: Spot 1-15 is the present installation. Spot 16-31 is the previous installation.
4.2.2. Catch records of the fisheries in July, August and October.

After the placement of buoys, Satun Marine Fisheries Station (SMFS) was assigned to collect and monitor fish catches in the area and nearby seagrass beds. Data was collected for 9 fishing gears, namely: mullet gillnet, swimming crab gillnet, threadfin gillnet, pomfret gillnet, sillago gillnet, shrimp gillnet, crab trap and fish trap at Bans Tunyong Uma moo 1, Bagan Yai Moo 2, Raya Todnuk Moo 4, Sarai sub-district, Muang district, Satun province. Staff of SMFS visited the area to advise, explain the procedures and train 24 fishers how to record data at Moo 1, 2 and 4. Then, Staff of SMFS collected the records. All fishing data had been analysed with regard to catch per unit effort from each gear (kg/day) and reported catch composition by gear in percentage from total weight record.

The number of households in Moo 1 were 80 and they have 45 fishing boats. Fisher in Moo 1 deploy 10 mullet gillnetters, 45-50 swimming crab gillnetters, 15 shrimp gillnetters, 5-10 sillago gillnetters, 10 squid traps, 10 swimming crab traps, 5 fish traps, 20 octopus traps and 10 bamboo strip traps. Moo 2 has 51 households and 50 fishing boats, 5-6 mullet gillnetters, 50-55 swimming crab gillnetters, 5 cuttlefish gillnetters, 8-10 swimming crab traps, 10 fish traps and 5 bamboo strip traps. Moo 4 has 66 households and 56 fishing boats, 56 swimming crab gillnetters, 6-8 swimming crab gillnetters, 20 pomfret gillnetters, 25 fish gillnetters, 10 threadfin gillnetters, 2 mullet gillnetters, 30 octopus traps and 3 hook and line.

Swimming crab gillnet fishery in July 2014 was operated through 1-2 day/trips around Ko PraoAoo, the front of Ban Bakan Yai, Ko Takaeng, Ko Pulaako and adjacent areas. The catch rate was 3.13 kg/day. Crab was the main component of the catch with 96.20 %, while mantis shrimp, melo melo (a gastropod), cuttle fish and flatfish species made up 3.80 %. In August, catch rate was 4.11 kg/day that is higher than in July. Crab was the main component with 88.74 % swimming crab and three-spot swimming crab, while cuttle fish, fish, mantis shrimp and melo melo made up 3.80 %. In October, the catch rate was 2.60 kg/day, that is less than in July and August. Crab was the main catch with 84 %, swimming crab and three-spot swimming crab, while mantis shrimp and melo melo made up 16 % of the catches.

Mullet gillnet in July was conducted through 1 day/trips around Ko PraoAoo, the front of Ban Bakan Yai, Ko Tarutao. The catch rate was 8.93 kg/day. Mullet was the main component of the catch with 80.60 %, and other fish made up 19.40 %. In August, the catch rate was 11.33 kg/day, higher than in July. Mullet made up 73.53 %, of the catches and other fish 26.47 %. In October, the catch rate was 16.67 kg/day, that is higher than in July and August. Mullet contributed 30 %, followed by threadfin fish 30% and Scomberoides 40%.

Shrimp gillnet was carried out with 1day/trips in July around Ko Lepi and Ko Takaeng. The catch rate was 4.07 kg/day. Shrimp was the main component with 93.44 %, while mantis shrimp and other marine aquatic species made up 6.56 %. In August, the catch rate was 1.17 kg/day, which is less than in July. Shrimp was the main component with 92.68 %, while mantis shrimp and crab made up 7.32 %.

Swimming crab trap were used in 1-2 day/trips in July around Ko PraoAoo, Ko KomPe and the front of Ban Bakan Yai. The catch rate was 2.99 kg/day. Swimming crab was the only component with 100 %. In August, the catch rate was 2.22 kg/day. All catch consisted of swimming crab. In October, the catch rate was 3.66 kg/day, which is higher than in July and August. Swimming crab constituted 100 %.
Pomfret gillnet in August was operated with 1 day/trips around Ko Lepi. The catch rate was 10.00 kg/day. Pomfret was the main composition with 90 %, followed by threadfin fish with 10.00 %.

Sillago gillnet was operated in October during 1 day/trips around Tanyong Uma bay. The catch rate was 6.33 kg/day. Sillago was the main catch with 100 %.

Fish Traps were used in October during 5 day/trips in the front of Ban Bakan Yai and Ko Praaoao. The catch rate was 2.50 kg/day. Catch composition was grouper 64% and snapper 36%.

4.3. Agenda item 3: Issues to consider

4.3.1. Action plan for the fisheries management in the seagrass bed.

The Chairman presented and proposed potential fisheries management measures in the seagrass beds.

The closure or expansion of the conservation zone, which mainly is used in large areas, such as a ban on trawl and push nets in an area of 3 kilometres. At present, Satun province extends to 5.4 kilometers, and it will continue to develop as the conservation area covers the east coast of Ko Tarutao. The proposed measure will be an all-year ban on trawls, purse seine, anchovy cast net with more than 2 lamp-rails, baby trawl with outer board, except anchovy cast net with 2 lamp-rails and anchovy purse seine, will be banned during July to October. The proposed conservation zone and measures have been sent to Department of Fisheries. In our case the area is small and the following measures are appropriate:

- Seasonal and area closure
- Zoning such as shell bank for protected brood stock (we should demarcate the area using buoy).
- Enlarge mesh-size of fishing gear used in the seagrass beds
- Prohibition of some fishing gear

Mr. Anan Hemna said that the placement of buoys around the conservation area of seagrass was a good approach. But we got some problem from illegal fishing gear such as poison and fishing gear using small mesh-size (crab trap). This problem happened a long time ago, our fishers have solved the problem by installation of artificial reefs. He also thought the conservation should be watched and monitored. They lacked a boat for this and he proposed DOF to help with a boat for monitoring. If fishers get the boat, they can monitor the area more frequently and this problem will be solved.

Mr. Wiraphong Wangchamnong thanked DOF for focusing on the issue of control. The village headman and village chief were authorities of the State and have the authority to patrol the area. The chief has the power to cover the entire district. The headman has the authority to patrol only in areas of their own village. Regarding the patrol boat, he will seek to procure a long-tail boat with Honda engine according to the request from the patrol unit.

Mr. Anan Hemna, fisherman, said that illegal fishing practices, poison and light luring boat, operated around Ko Sarai occurs frequently and that no arrests have been made.

Mr. Anuphong Damkrabi, headman village of Moo1, said the rules of the community do not allow some fishing gear operated in seagrass beds, such as crab gillnet, poison, trawl and push net.

Mr. Adun Chanabandit, Ko Sarai's agent network, thanked the staff of SMFS who cares and are willing to help local people in rehabilitation of fisheries resources. He was very pleased and thanked all participants. Important feedback had been provided by the meeting on how to find a way to cooperate. Cooperation and coordination between the villagers and the government would prevent the use of destructive fishing gear and methods, such as poison and crab gillnet with small mesh-size. The local fishers were ready to follow the action plan and the rules. He proposed that the government should carry out research on the subject of fishing gear before rules or regulations are formulated.
Mr. Amnauy Kongprom said that rules defined by a community result in better enforcement. The fishers should identify the types of gear they thought should be banned. The fishers from Moo 1 proposed to ban some fishing gear that operated in seagrass bed, such as crab trap, beach seine, trawl, and push net. And they suggested to have a patrol boat with Honda or Yamaha engine.

The meeting agreed

4.3.2. Fisheries rehabilitation and increased fish productivity in seagrass beds.
The Chairman asked why there was a need to restore fish resources. The simple answer was that resources were dwindling and catches declining. If present catch rates are compared to the past, it is evident that the sizes of fish which is caught is smaller than before. Also the size at maturity of fish was less than the previous recorded. This is evidence that fishing has deteriorated. Earlier, we used to catch shark or some big fish such as sea bream and grouper. But these cannot be caught anymore, the only catch is of small fish. Now they fish on new resources, not utilized earlier, such as Gobiidae, ridged swimming crab, and some shells. Fisher now use more time fishing and venture further than before, which has been documented. The reasons for the decline are humans and the environment, such as over fishing. We should catch and use fish resources in the sustainable manner. That can be achieved through

- Breeding and release of fish. But this approach is expensive and there are many restrictions before and after release.
- Squid bank, this approach is done in the villages with high abundance of squid. The squid trap should operate as well.
- The crab banks, gravid spawner: this way to restore the blue swimming crab resource is very successful. It is simple, easy, and low cost. Then we have to take into account the resources available in the village as well. In Moo 1, fisher has caught fish and crab mainly by crab trap and crab gillnets, and this area could establish a crab bank. Fishers can do this themselves. Another activity that can be done in Ko Sarai is a shellfish bank, because there are many areas with shellfish.
- Artificial reef (1.5 x1.5x1.5 m of concrete cube) installation is another approach but there are many limitations, such as the water depth, which should not be less than 6 meters (Fisheries of Department) and not less than 10 meters (Marine Department) and artificial reefs should not be installed in the national park.
- Public artificial reef (coconut leaves and concrete base), this is used frequently and the rules aren’t as complicated as for installation of artificial reef. The village can do it itself following the rules of the community. The position of public artificial reefs shall not impede marine traffic.

The meeting was asked to choose methods and approaches for rehabilitation of the fisheries. If the meeting agrees it should appoint who will be responsible for the implementation. The village headman Moo1, regards aquatic marine fish bank as a good approach. It could be tried for 1-2 years and then reviewed – if not beneficial it could be stopped. BOBLME Project could contribute with funding and implementation could be done by the fishers themselves. There would also be funds available if Moo 2 is interest implement rehabilitation measures.

Director Praulai stated that they would deploy buoys on the boundaries of the seagrass bed to demarcate the conservation area. One would expect that both small and large aquatic animals will come to dwell in this area. Ko Sarai is an area with high productivity. Most of the fishing gears catch crabs. One should catch the gravid crab alive and let them release egg in the small hatchery. Then, we will release crab larvae back into the sea. The young crab growing up in this area, it will not migrate far. The area has a rare species of sea cucumbers, which can be used to make medicines. The sea cucumbers should also be conserved.
Mr. Anuphong Damkrabi, headman village of Moo1, said that fisher have a need and are ready to make a crab bank behind the village office. They appointed a committee to be responsible for the crab bank at Moo 1, Tambon Ko Sarai, Muang district, Satun province already. Members of the committee are:
Mr. Wichai Chiae, village headman at Moo 2, said he agreed with the buoys demarcating the seagrass bed. Normally fisher from Moo 2 do not fish in that area. In addition, the shellfish fishing ground are outside of the buoy boundary. At present, the fishers in Moo 2 do not feel the need to place buoys, but if fishers would demand buoys he would send a letter to DOF.

Director Praulai, stated that this meeting would be followed by a visit of officials from SMFS to further discuss the conservation issues. We already have a budget, which should be utilized and benefit this area. The meeting concluded that:

- Fishers at Tanjung Uma Moo 2, are not ready to install buoys demarcating the seagrass bed.
- Fishers at Tanjung Uma Moo1 proposed to restore and enhance aquatic productivity in seagrass beds by establishing a crab bank. It formed a committee for the implementation.

4.3.3. The action plan for increasing revenue of the fishing community.
Mr. Amnauy Kongprom said that the fisher community buyer and Ecotourism in the village had done some progress but it could be expanded further. Because the village is an island, the transportation may be difficult and he asked for the meeting’s opinion.

Mr. Adun Chanabandit, Ko Sarai’s agent network, said that he agreed with the crab bank. It creates income for the villagers. He wanted to establish crab banks in all sub-districts. He thinks 90% of the Ko Sarai fishers use crab resources for income and proposed a centre of community knowledge in Moo2. He stated they would organize releasing of crabs during Mother’s and Father’s Days every year. He wanted SMFS to observe how the locals do it now, at this level, there is nothing that can be expanded somewhat and report that the Baan Kan Moo 2, crab bank, cucumber house and shellfish cooperative. All these activities are a selling point to visitors. At present, visitors who go to Ban Ba Kan Yai are interested in local resources that are available, such as coral reefs and seagrass. The community needs to carry out seagrass re-plantation, because the mortality of seagrass is high. Villagers noted that in areas with sea grass, shellfish are very abundant and notice that eggs stuck to the blades of seagrass. The community itself has a lack of knowledge and equipment to carry out any improvements and need government assistance. If the government helps, the agent network can help with publicity, including distribution of brochures to visitors in different places. In the case of Moo 1 would have set off crab bank activities to help strengthen the community income as well.

Director. Praulai said SMFS will send staff to review these proposals, seagrass re-plantation and support in a brochure to promotion.
The meeting agreed that fishers at Ban TanYongUma Moo1 proposed a crab bank to strengthen the community income. In case of home stay they would request SMFS to support with a brochure to promote tourism.

5. **The establishment of crab bank at Ban TanYungUma Moo 1, Ko Sarai sub-district, Muang district, Satun province.**

In the meeting for the consideration of demarcating seagrass beds with buoys on 23 November 2013 at local public building, Moo 1, Ko Sarai Sub-district, Maung District, Satun province, all participants had agreed and accepted to establish a crab bank. The objective was to increase productivity in the crab fishing grounds at Ban Tanyung Uma and to enhance local fisher participation in the management and conservation of marine aquatic resources of the community.

A committee to be responsible for the crab bank at Moo 1, Tambon Ko Sarai, Muang district, Satun province had been established. Members are:

1. Mr. Anuphong Damkrabi Chair committee
2. Mr. Anut Devalai Vice chair committee
3. Mr. Ishak Longsalam Treasurer
4. Mr. Dahot Usama Secretary
5. Mr. Chon Hemra Committee
6. Mr. Dahot Usama Committee
7. Mr. Umat Chaidi Committee
8. Mr. Mat Usama Committee
9. Mr. YaYa Usama Committee

Build crab bank during 29-30 January 2014 by representatives of fisher and staff of SMFS as cooperation action using the project budget 26,343 ThB.
Crab bank established at Ban TanYungUma Moo 1, Ko Sarai sub-district, Muang district, Satun Province

So far 35 gravid spawners have been brought to the crab bank from January to April and 10 gravid spawners from October to December.

Data of the crab resource is still being collected.

6. Results of project implementation

Management actions plan of seagrass communities in Moo 1 and Moo 2 at Ko Sarai sub-district. The 3 sub-activities included a workshop to engage with stakeholders. The workshop aims were to give a better understanding among stakeholders as well as demarcation of seagrass beds with buoys. Monitoring and record of data on fisheries has been established in the area. Finally, the activities increased the fish productivity and income of the fisher in the community. The lessons from the project will be extended to other areas.

Important results were:

1. Strengthened knowledge and understanding of conservation in the seagrass beds. Local fisher will gain more awareness on seagrass bed conservation.
2. A group of local fishers was established, which implemented a crab bank and realized that seagrass beds are important as habitat and food sources for fish. Local fisher will take advantage in seagrass bed. There must be an increase in the abundance of seagrass bed. So they will set up a crab bank.
3. The integration of a community to carry out activities. The two groups together will carry out seagrass ecosystems improvements, such as the seeds of sea grasses, re-plantation of
seagrass, shellfish collection. Also a group of fishermen has gained knowledge of business operations
4. The project implementation created a knowledge centre in the community, on seagrass re-plantation and crab banks.
5. The measures relating to the conservation of seagrass. There is a community agreement to ban certain types of fishing gear, which are seen by the community to destroy the marine resources. The agreement prohibits the fishing in seagrass beds with crab trap, net with prod, beach seine, trawl, push net, poison, and includes other illegal fishing gears.
6. The project strengthened the cooperation and improved understanding between communities, local administrator agency and government.
7. The community participation in fisheries management by surveillance serves to forward communications to report wrongdoing to the government agencies who are directly responsible.
8. The community can understand and evaluate the success of the project.
Appendix I  Activities pictures during the workshop and training on seagrass management and community participation
Report on promoting Integrated Coastal Management (ICM) in selected seagrass areas in the coast of Satun province, Thailand
Appendix II  List of participants

List of participants WS 1

1. Mrs Praulai Nootmorn  Director of Marine Fisheries Research and Technological Development Institute
2. Mr Amnat Siriphet  Fishery biologist Andaman Sea Fisheries Research and Development center
3. Mr Thonadon Chanthakhwan  Fishery biologist, Satun Provincial Fisheries Office
4. Mr Wiraphong Wangchamnong  Fishery officer, Fishery management unit Koh Lipe, Satun Province
5. Mr Witthaya Khunsan  Fishery officer, Department of Marine and Coastal Resources
6. Mr Anan To Iat  Fisherman
7. Mr Asan Chi Ae  Fisherman
8. Mr Mo-a-mat Ting Wang  Fisherman
9. Mr Yen Damkrabi  Fisherman
10. Mr A Lat Urama  Fisherman
11. Mr Inyat Kaewasalam  Fisherman
12. Mr Lomli Panglema  Fisherman
13. Mr Wichai Chiae  Fisherman
14. Mr Anuphong Damkrabi  Fisherman
15. Mr Sakda Baiden  Fisherman
16. Mr Amda Phengchan  Fisherman
17. Mr Mi Sae-a-Lam  Fisherman
18. Mrs Badae Tolat  Fisherman
19. Mrs Ranguan Suwalam  Fisherman
20. Mrs Barom Kaewasalam  Fisherman
21. Mr Ana Manlangu  Fisherman
22. Mr Hamin Panglema  Fisherman
23. Mrs Kanya Yibilang  Fisherman
24. Mrs Saenap Hemna  Fisherman
25. Mrs Wanna Benmat  Fisherman
26. Mrs Nopia Sando  Fisherman
27. Mrs Yaowani Nokkasem  Fisherman
28. Mr Mala Damkrabi  Fisherman
29. Ms Wanli Ting Wang  Fisherman
30. Mr Apdonrochet Sando  Fisherman
31. Mr Aset Tingwang  Fisherman
32. Mr Det Sando  Fisherman
33. Mr Sa-at Suwalam  Fisherman
34. Mr Ishak Longsalam  Fisherman
35. Mr Mayhom Chiae  Fisherman
36. Mr Sakriya Salimin  Fisherman
37. Mr Dahot Usama  Fisherman
38. Mr Anat Dewalai  Fisherman
39. Mr Somchai Matnoen  Fisherman
40. Ms Mariyam Chiae  Fisherman
41. Mrs Taria Chiae  Fisherman
42. Mrs Sukanya Chiae  Fisherman
43. Mrs Ampha Nonah  Fisherman
Report on promoting Integrated Coastal Management (ICM) in selected seagrass areas in the coast of Satun province, Thailand

44. Mrs Kochom Phengchan Fisherman
45. Ms Yara Ting Wang Fisherman
46. Mr Somkhuang Suwankun Fisherman
47. Mr Thawatchai Wantem Fisherman
48. Mr Anuwat Buta Fisherman
49. Mr Winit Manlangu Fisherman
50. Mr Niwat Manlangu Fisherman
51. Mr Yop Dewalai Fisherman
52. M. Kochep Thungyo Fisherman
53. Mr Wirayut Damkrabi Fisherman

List of participants WS 2
1. Mrs Praulai Nootmorn Director of Marine Fisheries Research and Technological Development Institute
2. Mr Amnauy Kongprom Fishery biologist, Senior Professional level, Satun Marine Fisheries Station
3. Mr Sonthaya Boonsuk Fishery biologist, Senior Professional level, Satun Marine Fisheries Station
4. Mr Wiraphong Wangchannon Fishery officer, Fishery management unit Koh Lipe, Satun Province
5. Mr Witthaya Khunsan Fishery officer, Department of Marine and Coastal Resources
6. Mr Somsak Mueanchan Fishery biologist, Satun Marine Fisheries Station
7. Mr Incha Langchi Fishery officer, Satun Marine Fisheries Station
8. Mrs Sopha Sisuk Assistant Fisheries, Satun Marine Fisheries Station
9. Mrs Netnapha Yotsawat Assistant Fisheries, Satun Marine Fisheries Station
10. Mr Adun Chanabandit Koh Sarai’s agent network
11. Mr Anuphong Damkrabi headman
12. Mr Wichai Chiae headman
13. Ms Kewali Pandika fisherman
14. Mr Cha Usama fisherman
15. Mr Amron Manla-ngu fisherman
16. Mr Yaya Usama fisherman
17. Mr Wirat Sarapan fisherman
18. Mr Min Longsalam fisherman
19. Mr On Manla-ngu fisherman
20. Mr Anis Manla-ngu fisherman
21. Mr Dara Usama fisherman
22. Mrs Limon Hemna fisherman
23. Mrs Haria Damkrabi fisherman
24. Mr Dahot Usama fisherman
25. Mr Anan Hemna fisherman
26. Mr Mat Usama fisherman
27. Mr Chamnan Sakhonwiset fisherman
28. Mr Mamart Danden fisherman
29. Mr Umat Chaidi fisherman
30. Mr Yod Damkrabi fisherman
31. Mr Ishak Longsalam fisherman
32. Mr Chon Hemra fisherman
33. Mr Udom Pang Le Ma fisherman
34. Mr Set A San fisherman
35. Mrs Chena Chongrak fisherman
36. Mrs Chanchira Chaidi  fisherman
37. Mrs Tiromah Thungyo  fisherman
38. Mr Lomli Panglema  fisherman
39. Mr Ren Yaman  fisherman
40. Mr Ben Damkrabi  fisherman
41. Mr Samphan Chamnanruea fisherman
42. Mr Yop Dewalai  fisherman
43. Mr Kochem Danden  fisherman
44. Mr Rofek Damkrabi  fisherman
45. Mr Bakak Sando  fisherman
46. Mr Nirut Prapyawa  fisherman
47. Mrs Rosinah Alamart  fisherman
48. Mr Donlah Manla-ngu  fisherman
Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project to lay the foundations for a coordinated programme of action designed to better the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries.

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