



The Role of Crab Bank System in Securing Fisheries Livelihood and Resources Conservation and Management

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In the implementation of the community-based fisheries resources management (CBRM) approach under the Integrated Coastal Resources Management (ICRM) projects implemented by SEAFDEC and its collaborating partners in Thailand (ICRM-PD), Malaysia (ICRM-PL) and Cambodia (ICRM-SV), the Crab Bank System has inspired the local people to ensure that the crab resources are protected and conserved in a sustainable manner (Etoh, 2008). The local people in ICRM project sites considered the Crab Bank System as means to sustain and conserve the crab resources in their fishing areas. The promotion of the Crab Bank System has also enhanced the awareness of the local fishers on the need to manage their crab resources to improve their livelihoods. Two major types of Crab Bank System have been promoted in the ICRM projects: the system improved in Chumphon under the ICRM-PD and the Japanese System (**Box 1**), with improvements and innovations introduced and adopted by the local fishers.

In Chumphon Province, Thailand, the fishers observed that the blue swimming crab resources had rapidly declined because of the increasing number of collapsible crab traps. The fishers also tend to catch all sizes of crabs regardless of whether these are non-marketable or gravid or fertilized. Thus, the Crab Bank System was developed and introduced as an activity of the ICRM-PD to increase and enhance the amount of crab recruitment.

Under this system, the fishers operating crab traps donate the small-sized and gravid crabs to the project's crab bank (which is actually a crab floating cage). After the gravid crabs have spawned in the cages, the eggs are released to the sea while the spent crabs are sold to support the crab bank operations. The result of the crab bank system activities has made the local fishers and other stakeholders aware of the importance of coastal and aquatic resources conservation and management.

Under the Japanese Crab Bank System, gravid crabs are marked on their carapace before these are released back to the sea for easy monitoring. An advisory is given to all fishermen in the area that whoever catches these gravid crabs are advised to release them alive back to the sea. If the fishers catch gravid crabs without numbers these should be deposited to the Crab Bank for marking after which these are also released to the sea.

Crab Bank System of ICRM-PD

The crab bank system of the Crab Bank Group in Pakklong, Pathew District was patterned after Thailand's Thung Maha Mangrove Conservation Network which aims to promote gravid mangrove crab conservation in the midst of decreasing mangrove crabs in many areas in Thailand (Thitiphorn, 2007). With technical support from the

Box 1. Japanese Crab Resources Conservation Scheme

- The scheme was developed by the Settsu-Harima Fishermen Cooperative in Hyogo Prefecture, Japan to enhance the dwindling crab resources in the Hyogo Prefecture. A voluntary organization known as the “Gazami Fuyasou Kai” (Swimming Crab Resource Enhancement Association or SCREA) was established in December 1986 in Hyogo Prefecture of Japan with the following justifications, approaches and activities:
- The main objective of SCREA is to enhance the crab resources by protecting the gravid crabs
- Under normal environmental conditions, a crab spawns 3-4 times a year (from May to September)
- A gravid female crab hatches about 1.8 million (between 1 to 3 million) zoea per spawning
- SCREA purchases gravid crabs from fishermen and paints them with red cross-marks on their carapaces and release them back to the sea
- When fishermen catch crabs with red cross-marks they should return the crabs back to the sea
- Female crabs usually molt after hatching a few times, making the red cross-marks disappear, these crabs could therefore be harvested
- Crabs with under 12 cm carapace length and with soft-shells should not be harvested and should be returned to the sea once caught
- Control season is limited for the spawning period of 5 months from May to September
- The expenses for purchasing the gravid crabs are shouldered by the SCREA funds contributed by its members
- Anyone can become a member of SCREA not necessarily those engaged in fisheries but also ordinary people
- Members of SCREA are provided with membership cards
- Annual contribution of each member is 1,000 Yen equivalent to 330 Baht

The major advantage of the SCREA Scheme lies in the high survival rate of gravid crabs and zoea.

Source: Etoh (2007)

Chumphon Marine Fisheries Research and Development Center (CMDEC), the crab bank system was initiated in 2002 by the Crab Bank Group of ICRM-PD. The Group established their own rules and regulations that include some conditions for membership and in order to become members of the Group, the fishers should have at least 300 crab traps per member per boat; should be a member of the fishers group (Pakklong Fishers Group or PFG); should bring at least one gravid crab per day or 30 gravid crabs per month; and the bottom of their crab traps should have a mesh size of 2.5 inches while the mesh size of the top and sides should be 1.25 in. The Crab Bank Group also organized a committee to screen the applicants for the Group. In addition, their regulations also provided that the crab traps should be used only in areas with 3 m water depth but they can use their traps throughout the year. Although some problems were encountered by Group that included conflicts with some members of the community in terms of gear use, but these have been solved through consultations

and more particularly, zoning was established in the project site to address the issue.

From 2002 until 2007, the crab bank of ICRM-PD received a total of 19,475 gravid crabs, which have been regularly deposited in the crab bank (crab floating cages) with the necessary data regularly recorded. The crabs came from the crab trap fishers (members and non-members of the Crab Bank Group). Feeding of the crabs in the crab bank is done by members when they go fishing near the crab bank. After spawning, spent crab spawners are harvested and sold in local markets. The sale is divided into: 50% as common funds which the members of the Group can borrow with interest, 30% for cage maintenance, 10% for crab feeds, and 10% for operating expenses of the crab bank. The successful experience from this crab bank activity has been serving as a model for other coastal provinces in Thailand and even to other countries, as well as promoting a learning process for many students and researchers (Thitiphorn, 2008).

In order to assess the impact of the crab bank system on the crab resources in the ICRM-PD Project area, CMDEC conducted landing surveys on the CPUE of blue swimming crabs by the crab trap fishers. Results showed that the CPUE from 2002 to 2006 was 9.40, 9.45, 14.44, 17.13, and 12.96 kg/trip, respectively, while the average carapace length of male blue swimming crabs were 8.60, 9.17, 9.55, 10.15, and 10.39 cm, respectively. For the female blue swimming crabs, the average lengths were 8.97, 9.56, 10.01, 10.34, and 10.62, respectively (**Table 1**).

In an effort to further conserve the crab resources, the Chumphon Provincial Fisheries Office in August 2003, provided the fishers in its area with 100 traps (with enlarged mesh size of 2.5 in) per person in exchange for their old traps (having mesh size of 1.25 in). The CMDEC which has promoted the use of 2.5 in mesh size crab traps monitored the performance of the enlarged mesh size of the traps. The initial results showed increasing trend in terms of carapace size and volume of catch. When the mesh size used was 1.25 in, the average size of female caught was smaller than the

Table 1. CPUE and average size of blue swimming crabs caught by crab traps in Pakklong Sub-District, Pathew District, Chumphon Province, Thailand

Year	Catching Rate (kg/trip)	Average Carapace Length (cm)		Total Catch (mt/year)
		Male	Female	
2002	9.40	8.60	8.97	41.72
2003	9.45	9.17	9.56	44.34
2004	14.44	9.55	10.01	78.88
2005	17.13	10.15	10.34	98.33
2006	12.96	10.39	10.62	67.47

first mature size (9.74 cm) by more than 63% while that of the male crabs it was 17% smaller than first mature size (6.50 cm). When the enlarged mesh size was used, the average size of the female crabs was smaller than the first mature size by almost 52% while for the male crabs the average length dropped to about 4% (Jinda *et al*, 2004).

However, the crab bank method originally adopted by the Crab Bank Group of the ICRM-PD was not applicable during the southeast monsoon when big waves make it difficult for the Group to manage the crab bank. Thus, the Group having learned the Japanese method when their leader went on a study tour in Japan adopted the Japanese method of conserving crab resources by marking the carapace of the caught gravid crabs before these are released back to the sea.

Generally, through the crab bank method, a sense of ownership has been developed since the fishers themselves are managing the activity, giving the opportunity to improve their livelihoods and source of income. The Crab Bank System has also offered job opportunities to the other members of the community through post-harvest and processing, i.e. producing crab meat for sale. The initiative of the Group to implement mesh size control on crab traps was considered a means of mitigating the possible over-exploitation of the crab resources in the project site since the PFG considered it necessary to address the sustainability of the resources in order to enhance the livelihoods of the local people who are dependent on such resources.

Crab Bank Scheme of Bang Saphan Bay Pilot Project

The Bang Saphan Bay Pilot Project (BSBPP) in Bang Saphan Bay, Prachuab Khiri Khan Province in Thailand has been promoting the community-based coastal fishery resources management project for more than 10 years through the initiative of the Department of Fisheries (DOF) of Thailand. Following the successful experience of the Crab Bank Group of ICRM-PD, BSBPP also introduced the Crab Bank System in 2005 following the ICRM-PD model, by constructing cages for stocking gravid crabs. After few attempts however, the system was discontinued due to problems such as daily feeding, maintenance of cages, etc. and unfavorable sea conditions considering that the coastline of Bang Saphan is very much exposed to the open sea (Etoh, 2007). Confronted by such circumstance, BSBPP adopted the batch system using hatching tanks where gravid crabs in the last stage of spawning (with black colored eggs) are kept in plastic tanks (100 liters) until the eggs are hatched after which the zoea are released to the sea. The spent crab spawners are sold by the fishermen who caught the crabs.

Blue Swimming Crab Conservation (Crab Condominium) Project in Chonburi Province, Thailand

The blue swimming crab (*Portunus pelagicus*) is a commercially important aquatic species in Thailand particularly in Chonburi Province. However, the yield of this species has drastically decreased due to over harvesting. In addition to being severely exploited, the stock has suffered from habitat degradation and non-selectivity of fishing gears, which tend to remove most of the size classes from the population. Chonburi Province plays a key role in the tourism industry of Thailand, as it is where the most popular Pattaya City is located and where among the attractions is the fresh and tasty sea food including the blue swimming crabs. A papaya salad known as “Som-Tam” for example, which is prepared using young crabs is a popular delicacy. Crabs are also supplied to local and international markets. Significant decrease in crab population has already affected the supply of crabs to local and foreign markets, and increased the price considerably, and has significantly affected the local livelihood and income of fishers. Concerned stakeholders therefore took action to ensure the sustainable utilization of Chonburi’s crab resources, applying innovative technology together with local knowledge. Thus, the Crab Bank System of ICRM-PD was introduced with some innovations in the coastal areas of Chonburi to promote sustainable crab fishery and protect the spawners from being over-exploited. Adopting the concept of local-based fishery management, crab spawners caught from fishing grounds are placed in submerged resting cages (called Crab Condominium or Crab Condo) until the eggs are released (each spawner could release 700,000 to 1.4 million fertilized eggs), after which they are either sold to consumers or released back to the sea.

Crab Condo has been successfully established by the Rimalae and Srirachanakorn communities in Sriracha Municipality in 2006 as part of the initial implementation of the Chonburi Coastal Strategy. Later the system was also adopted in nearby Bangsarae and Bangohra Municipalities. This project involves the establishment of convenient floating containers with submerged resting cages where gravid crabs collected from fishermen are placed in separate baskets which are vertically stacked like condominium. Responsible teams consisting of fishers and members of communities’ committees are assigned to maintain the cages and feed the gravid crabs, and to return them back to the owners or marketing after the crabs have released the zoea as well as to educate and provide advice to other interested stakeholders supported by municipal officers.

Evaluation of the impact of the project in Sriracha Bay in terms of increased blue swimming crab population is being



Crab Condo installed in Sriracha Bay

done through regular environmental monitoring by relevant research institutes and the public, such as the Chonburi Fishery Association, local academe and a consultant from the Integrated Coastal Management (ICM) project who has been providing the technical advice. Information dissemination and capacity building for project members are conducted through training, study tours to existing crab condos, and exchange forums. In collaboration with the Sriracha Fisheries Research Station of Kasetsart University, sea water quality monitoring is regularly undertaken to assess and evaluate potential impacts of the activity on the quality of water in Sriracha Bay.

An assessment of sea crab yield was also undertaken to evaluate the impact of the project on the blue swimming crab population. However, there were no scientific surveys conducted before in the project area that can serve as baseline for assessment. Thus, information from fishers in three municipalities has been considered valuable information in the assessment of the crab stocks. The fishers have reported an increase in crab catch in 2007 compared with that of 2006. In Bangohra Municipality for example, one of the big fishing ports in Chonburi Province with specific market for crabs, crab catch was around 40 kg/boat/day in April 2006, while catch in April 2007 was around 100 kg/boat/day (the same as the catch in the peak month in November 2006). Considering the high cost of scientific study/assessment, an evaluation of the Crab Condo project of Sriracha Municipality was done through a systematic survey of the changes in crab catch in the project area through questionnaires.

The Crab Condo project has promoted awareness and recognition of responsible fishing and resource conservation. It has also enhanced eco-tourism in Koh Loy Public Park near the Sriracha Bay by including crab releasing activities in the Crab Condo among the various attractions. The Crab Condo project has also effectively transferred the knowledge to the youths through experiential learning and information dissemination, and the best practice on Generosity Approach

among community teams considering that the Crab Condo Project is managed by the members of the fishers group of the Municipality who serve in the project voluntarily and without extra compensation.

Crab Bank System of ICRM-PL

Two main common species of swimming crabs (blue and red) are found in Malaysian waters having high demand at all levels of the fish market chain. Results of a survey conducted in the ICRM-PL project site in Pulau Langkawi, Malaysia showed that about 3,500 kg of swimming crabs are landed predominately by gill netters. The crab resources became a candidate for resource conservation in order to avoid over-exploitation. During the study tour of the KEN (Kumpulan Ekonomi Nelayan or Fishermen's Economic Group) members to the ICRM-PD Project site in Thailand, their interest on the crab bank system was mooted. Specifically, the serious commitment of the local fishers from Pathew District on the conservation of the crab resources served as an inspiration for the KEN members and boosted their decision to carry out a similar scheme in the ICRM-PL Project site. Steps were therefore initiated by KEN in Kuala Teriang to obtain a suitable site from the Langkawi Development Authority (LADA) to introduce the crab cage system.

Having been unsuccessful in obtaining a site for the crab bank, KEN initiated the Japanese model of crab bank system, which was also successfully introduced in the ICRM-PD Project in Chumphon, Thailand. Considering that this model does not require any cages, it could be cost effective. However, this system requires the voluntary commitment by the members specifically in releasing the gravid crabs caught back to the sea after marking the carapace (Krishnasamy, 2008).

A workshop on Crab Bank System for the crab fishers was therefore organized to disseminate the concept, procedures, methodologies and recording in logbooks as well as the appropriate way to release the crabs back to the sea. The Crab Bank Sub-group was also organized and a signboard to promote the activities was made.

The Crab Bank System introduced to the fishers in Kuala Teriang, Langkawi (i.e. the crab trap and gill net fishers) aims to: (1) make the crab fishers (stakeholders) aware of the voluntary scheme of releasing gravid crabs caught alive back to the sea after marking the carapace; (2) preserve and sustain the crab resources as well as minimize their extinction by taking necessary steps on resource utilization at an optimum level; (3) encourage and impart awareness to the fishing communities and the public on the steps to conserve, protect and rehabilitate the crab resources; (4)

promote teamwork, cooperation and responsibilities towards the importance of crab resources conservation within the fishing industry; and (5) promote the KPSP as the front-liner and initiator of the management and conservation of crab resources to the fishing communities and industries.

After the workshop, the Crab Bank Sub-group agreed to abide by the conditions on recording the number of every gravid crab caught in a logbook provided to each member, and follow up and counterchecking efforts by the District Fisheries Extension Officer. Meanwhile, KEN was restructured into the Fishery Resources Management Community or KPSP (Komuniti Pengurusan Sumber Perikanan) to take full charge of the community-based fisheries resources management (CBRM) functions specifically in strengthening the livelihoods of the fishing communities.

Thus, the crab trap and gill net fishers of the KPSP Kuala Teriang became the participating members of the Crab bank Sub-Group. However, when the logbooks were inspected in December 2007 only three (3) participants provided the necessary data, many did not record for some reasons such as loss of their log books although according to some members, they released gravid crabs but never recorded. Nevertheless, after the introduction of the system, the fishers have reported that the crab landings have since then increased slightly and the system appeared to be more practical, applicable and acceptable for implementation.

It was understood that the participation of the members was not active and they seemed not willing to use traps because the gears either drifted or were stolen. A new group consisting of 10 members using traps and gill-nets volunteered to take part in the project. Thus, the Department of Fisheries (DOF) Malaysia agreed to continue promoting the program under its ongoing fisheries extension activities through dialogues, study tours, short-term training sessions, and onsite demonstrations with the fishing communities especially the crab fishers.

The DOF also agreed to conduct monitoring, collection and analysis of the catch data with the collaboration of the Fisheries Research Institutes throughout the country. DOF has also made initiatives to produce leaflets and pamphlets on crab bank system to promote the system and conducted a number of awareness programs for the stakeholders and the public on the conservation of the crab resources.

The crab bank activities have been evaluated from time to time in accordance to the needs and the convenience of the stakeholders and the responsible authorities, to make the crab bank approach acceptable and its implementation successful. The DOF is also identifying other suitable

Gravid crab caught by gill net near the ICRM-PL Project site (right); and Marked gravid crab to be released to the sea (below)



KPSP groups or individuals especially the crab fishers to introduce the Crab Bank System in their areas as part of their conservation effort.

Rewards and appreciation to the crab fishers in the form of certificates and prizes have been given by the DOF as form of encouragement to the crab fishers. The adoption of the Crab Bank System could also serve as a platform for the involvement of dignitaries and corporate bodies at the local level, which ultimately would benefit the local fisheries communities. The DOF recognized that along with the experience from Thailand and Japan, the implementation of a Crab Bank System which is simple and cost effective, could contribute to the conservation and protection of the dwindling crab resources. It could also create awareness and responsibility among the fishers in contributing to the enhancement of the resources, through voluntarily participation by the stakeholders for the benefit of the fishing industry.

Crab Bank System of ICRM-SV

For the establishment of a crab bank system at the ICRM-SV Project site in Sihanoukville, Cambodia, a consultation with concerned stakeholders was held where three possible crab bank approaches were discussed: the Japanese model, Chumphon model and Langkawi model. It was then decided to employ the Chumphon model, which involves the stocking of gravid crab in a cage during the calm seasons until the eggs are hatched, while during the monsoon seasons gravid

crabs are released directly into the sea after being marked on their carapace. The Crab Bank Group was established and responsibilities and roles were also developed. The position of the cages for hatching gravid crab was also sited.

Showing keen interest in the implementation of the Crab Bank System in Cambodia, its Fisheries Administration (FiA) introduced the system along the coast line in Cambodia, i.e. in Stung Hao and Pery Nup. The Stung Hao Crab Bank was initiated in March 2008 based on the model in Chumphon, Thailand. The cages were installed at the top of a jetty which makes easy access for feeding and stocking.

The members of the Crab Bank Group of ICRM-SV constructed the cages and initiated the stocking of gravid crabs in May 2008 with 10 crabs released in a cage and 8 crabs were sold after hatching in June 2008. The number of gravid crabs collected was relatively small, and as reported by the crab banks in Stung Hao and Pery Nup, the total number of gravid crabs collected in May and June has noticeably reduced (Chanthana, 2008).

It was suspected that the small number of gravid crabs collected was due to the number of bank cages installed in Prey Sangke where crab gill net fishing is predominant and where majority of the members of the Crab Bank Group come from. The survival rate of gravid crabs caught in the gill-net is extremely low compared with those caught by crab traps. Since most of the members are engaged in crab gill-net fishing, the FiA has encouraged more crab trap fishermen to join the crab bank systems implemented in the coastal areas of Cambodia.

Way Forward

The blue swimming crab (*Portunus pelagicus*) is economically important not only in Thailand, Malaysia and Cambodia but also in the other countries in Southeast Asia. The considerably high demand of the crabs in the market (local and foreign) has driven many fishers to catch crabs by any means without considering sustainability. This has led to over-exploitation of the blue swimming crab resources in many areas in the Southeast Asian region. Considering that many fishers depend on this resource for their livelihoods, it has become necessary to conserve such

Table 2. Comparison of three crab bank systems

Assessment/System	ICRM system (Chumphon)	Batch system (BSBPP)	SCREA system (Japan)
Survival rate of gravid crabs	Low (about 50%)	High as stocked only in few days	High (in the natural environment)
Survival rate of zoea	High (in the natural environment)	Relatively low (in aerated tanks)	High (in the natural environment)
Target gravid crabs	All gravid crabs	Only matured crabs before hatching	All gravid and potentially gravid crabs (marked)
Operational season	During the calm seas season	All seasons	Spawning seasons
Cost of investment and operation			
• Initial investment	High (cages, etc.)	High (shed, plastic tanks, aerators, etc.)	NIL
• Labor	High (daily maintenance at sea)	Medium (daily maintenance on land)	Marginal (only marking)
• Feeds	High (one month at maximum)	Negligible (a few days at maximum)	NIL
• Fuel	High (daily maintenance at sea)	Negligible (combined with fishing)	Negligible (may rely on fishing trips)
• Maintenance	High (repair of cages)	Negligible (repair of aerators, etc.)	NIL
Income for Fisher Members	NIL (although indirectly there is in from of loans)	Sale of spent spawner crabs after hatching	Sale of gravid crabs
Institutional Support	Marginal	Needed to some extent	Need to some extent (e.g. promotional activities)
Organization	Needs strong leadership and coordinator	Needs strong leadership and coordinator	Need strong public awareness
Fund raising	Not necessary	Not necessary	Rely on fishermen as well as public contributions
Sustainability	Subject to leadership	Subject to leadership	Subject to public awareness
Visibility of impacts	High	High	Low

Source: Etoh (2007)

resources and through the Crab Bank System initiated by concerned fishers groups as exemplified in the crab bank activities of the ICRM-PD Project (Thailand), ICRM-PL Project (Malaysia) and ICRM-SV Project (Cambodia).

The Crab Bank System promoted through the SEAFDEC ICRM project has enhanced the awareness of fishers on the need to manage the resources to improve their livelihoods. It has also made the stakeholders aware of the importance of coastal and aquatic resources conservation and management. Since management of the crab bank system has been carried out by the fishers themselves, it has created a sense of ownership and therefore promoted sustainability. Through intensive promotion, the experience from the system could be effectively transferred to the youths specifically the students through experimental learning and information dissemination during conducted study tours.

The other countries in the region could therefore adapt the system or scheme already developed by the ICRM projects or the Japanese scheme. Etoh (2007) has made a comparison of three systems (Table 2) which could serve as basis for any country in their efforts to promote the Crab Bank System for the protection and conservation of their respective crab resources as well as enhancement of the livelihoods of the poor fishers and increasing their incomes, thus ultimately achieving poverty alleviation and food security in the fisheries communities.

References

- Chantana, Yos. 2008. Integrated Coastal Resources Management in Sihanoukville (ICRM-SV), Cambodia. In: Proceedings of the Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL, 21-23 October 2008, Langkawi, Malaysia. Training Department, Southeast Asian Fisheries Development Center, Bangkok, Thailand. December 2008; 59-66
- Etoh, Seiichi. 2007. Optional Approaches for the Crab Bank Scheme. In: Proceedings of the Regional Seminar on Integrated Coastal Resources Management in Southeast Asia: Lessons Learned through the Integrated Coastal Resources Management in Pathew District, Chumphon Province (ICRM-PD). Training Department, Southeast Asian Fisheries Development Center, Bangkok, Thailand, TD/RP/108, LBCFM-PD No. 49. September 2007; 121-125
- Etoh, Seiichi. 2008. Fostering the Integrated Coastal Resources Management Approach in Southeast Asia. In: Fish for the People Vol. 6 Number 1 (2008). Southeast Asian Fisheries Development Center, Bangkok, Thailand; 10-17
- Jinda Petchkamnerd, Thawon Rootjanarat, Iiraporn Ratthanaphron and Khunruthai Chaikew. 2004. Fishing Gear Replacement Project: Changing mesh size at bottom side of Crab Trap in Pakklong Sub-district, Chumphon Province. Department of Fisheries. TD/RES/86. LBCFM-PD No. 29; 12 p
- Krishnasamy A/L Arunasalam. 2008. Establishment and management of Crab Bank System: An experience in Kuala Teriang, Pulau Langkawi, Malaysia. In: Proceedings of the Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL, 21-23 October 2008, Langkawi, Malaysia. Training Department, Southeast Asian Fisheries Development Center, Bangkok, Thailand. December 2008; 99-102
- Thitiphorn Suppanirun. 2007. Crab Bank. In: Proceedings of the Regional Seminar on Integrated Coastal Resources Management in Southeast Asia: Lessons Learned through the Integrated Coastal Resources Management in Pathew District, Chumphon Province (ICRM-PD). Training Department, Southeast Asian Fisheries Development Center, Bangkok, Thailand, TD/RP/108, LBCFM-PD No. 49. September 2007; 127-131
- Thitiphorn Suppanirun. 2008. Integrated Coastal Resources Management in Pathew District (ICRM-PD), Chumphon Province, Thailand. In: Proceedings of the Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL, 21-23 October 2008, Langkawi, Malaysia. Training Department, Southeast Asian Fisheries Development Center, Bangkok, Thailand. December 2008; 49-58

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