

## **Marine resource sustainability, conservation and management in the Coral Triangle and southeast Asia**

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**Sutthacheep M, Ruangthong C, Yeemin T, Samsuvan W, Pongsakun S, Chamchoy C** (2016) Coral reef conservation and management in a Ramsar site in the Gulf of Thailand. Proceedings of the 13<sup>th</sup> International Coral Reef Symposium, Honolulu: 454-463

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# Efforts of small-scale fishers in coral reef conservation: Thailand case illustrations

**Thamasak Yeemin, Wichin Suebpala, Makamas Sutthacheep**

**Abstract** Healthy coral reefs not only provide abundant fishery resources for small-scale fisheries, but also an additional source income for some fishers who operate recreational tourism. Maintaining coral reef health could be an important concern to ensure sustainability of their livelihoods, especially the poor fishers who are risky to poverty and their needs for income and food security are considerably significant. In this study, semi-structured surveys and focus group meetings were conducted to understand the perception of small-scale fishers on importance of coral reefs and their efforts on coral reefs conservation in Ko Samui and Ko Chang. Although the islands have been influenced with tourism development, small-scale fisheries are still existent. Most of the fishers realized that coral reefs are important for sustaining their livelihoods as their primary sources of food production. Besides, during tourism season, they also gain benefits from tourism-related activities such as providing boats for tourists to diving or fishing sites. They all agreed that coral reefs should be conserved and sustainably utilized. Consequently, many environmental conservation activities have been initiated by local communities attempting to protect coral reefs such as reef cleanup activities, coral reef monitoring volunteers etc. For example, the fishers volunteer for immediately making report to authorized staffs when they see any of fishing or tourism practices which are destructive to coral reefs. The Local Tourism Group of Ban Salak Khok in Ko Chang also provide training on safety and coral reef conservation practices for membered fishers. This study could illustrate their livelihoods perception and some efforts of small-scale fishers that could further enhance abundance of fishery resources.

**Keywords:** small-scale fisheries, coral reef, conservation, livelihoods, Thailand

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## **Introduction**

Coral reefs are very significant marine and coastal resources contributing many ecosystem services to human (Hicks et al. 2013; Principe et al. 2011; Millennium Ecosystem Assessment, 2005). Local people along coastal areas or islands mainly rely on corals reefs as their food sources. Besides, it has been known that marine and coastal tourism is one of the fastest growing sectors within the world's tourism industry (Hall 2000), especially, the coral reefs tourism which is growing dramatically and serving as an important source of revenue for many coastal countries (Doiron and Weissenberger 2014). Ko Chang and Ko Samui is one of the popular islands attracting millions of both Thai and foreign tourists generating the revenue of Thailand's national economy. The annual revenue in 2015 revealed that about 3,244.50 and 14,901.84 Million Baht were generated from tourism sectors in Ko Chang and Ko Samui, respectively (Department of Tourism 2016). A total of such revenue contributed about 1% to the national tourism revenue (1,857,010.98 Million Baht). It plays a significant role in economic development, consequently the development of tourism facility have been automatically increased to conform to the growing number of tourists. However, rapid tourism development without appropriate management may cause changes and concerns about the environmental sustainability (UNEP 2009, Bulleri and Chapman 2010), especially the sensitive marine ecosystem like coral reefs which is an important marine resource for both tourism and fishery sectors (Yeemin et al. 2011). Globally, deterioration of coral reefs caused by anthropogenic stressors such as overfishing, land-based pollution, tourism etc., have been well documented (Hughes et al. 2003). Consequently, degraded coral reefs provide less ecosystem services and coastal communities, especially small-scale fishers who are relying on coral reefs, are inevitably affected. Community-based conservation projects have been reported that their conservation efforts help conserve and maintain the function of coral reefs (Kittinger et al. 2013; Velez et al. 2014). Many literatures clearly revealed that local or community perception of conservation is important key for achievement and effectiveness of conservation projects in every stages (e.g. Camargo et al. 2009). Perception of conservation can also be applied to improve conservation projects as well as to comprehend and interpret social impacts, ecological outcomes, conservation governance and social acceptability of environmental management (Bennett, 2016). However, knowing perception and effort of small-scale fishers on coral reefs conservation in Thailand are still limited. In this paper, we describes some perception of small-scale fishers on importance of coral

reefs and their efforts on coral reefs conservation in Ko Samui and Ko Chang, the famous tourism destinations located in the western and the eastern Gulf of Thailand.

## **Materials and methods**

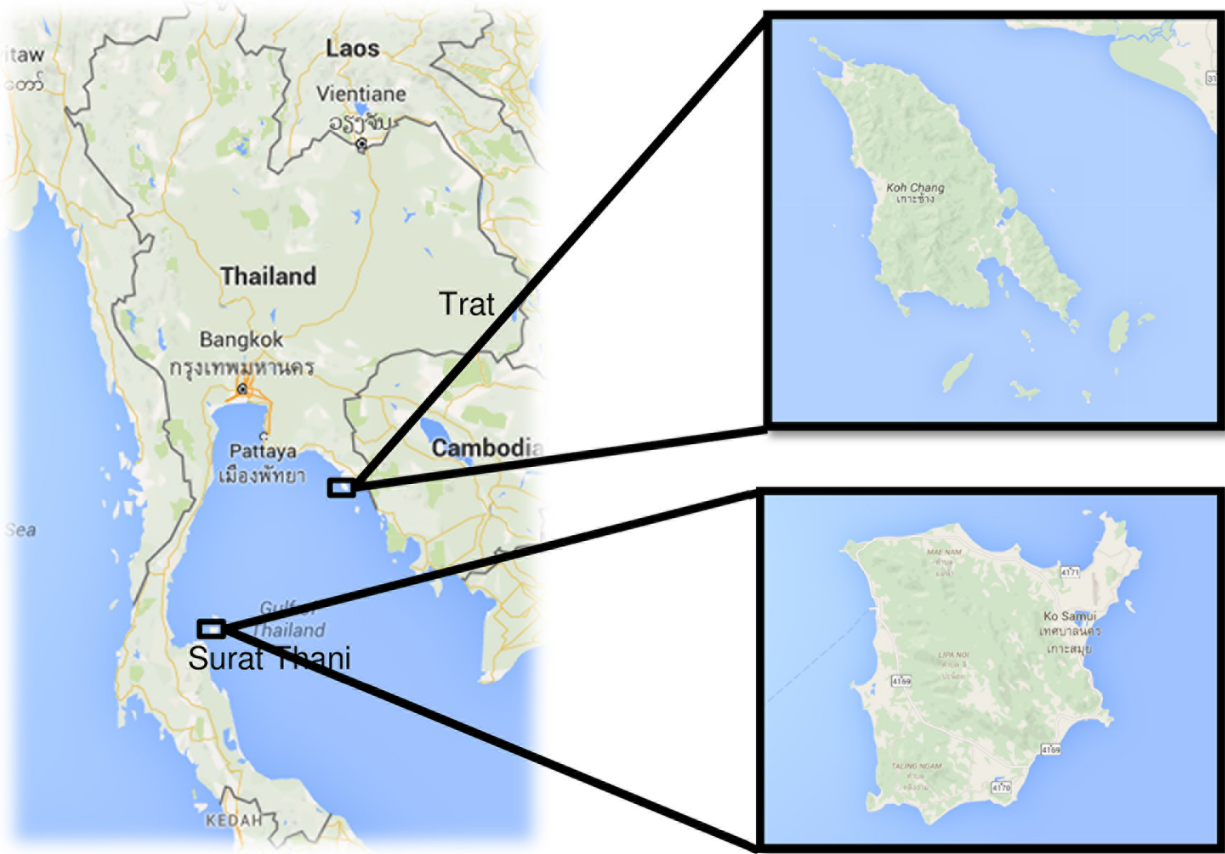
### **Methods**

In this study, literature review, key informant interviews using semi-structured questionnaire with focus group meeting were employed in order to understand small-scale fisher's perception on importance of coral reefs and the efforts on coral reef conservation in Ko Chang and Ko Samui, Thailand. A total of 80 key informants were selected using snowball sampling technique consisting of 35 and 45 small-scale fishers in Ko Chang and Ko Samui respectively. Semi-structured questionnaire was created with three parts including: 1) fishery data, 2) the fishers' perception of coral reefs conservation, and 3) efforts or involvement in coral reef conservation. Furthermore, two focus group meetings were also organized in Ko Chang and Ko Samui to understand overview picture of conservation efforts from experienced small-scale fishers, community leaders, local people, etc.

### **Study sites**

#### *Geographic information*

Ko Chang has a total area of 217 km<sup>2</sup>, geographically located in southern area of Trat Province (11° 56' N 102° 61' E). There are about 60 islands in the area which harbor approximately 16 km<sup>2</sup> of coral reef area (UNEP 2004). Ko Samui is geographically located in the southern Gulf of Thailand (9°30'N 100°00'E), about 20 kilometers off the coast of Surat Thani Province. It is the third largest island of Thailand (after Ko Phuket and Ko Chang), having a total area of 227 km<sup>2</sup>, surrounded by eighteen smaller islands. (Ko Samui Municipality 2013) and approximately 32.49 km<sup>2</sup> of coral reef area (UNEP 2004). With its beautifulness of terrestrial and marine environments as well as cultural livelihoods, a massive number of tourists have been attracted to visit these islands each year contributing to them as popular tourist destinations of Thailand (Fig. 1).



**Fig. 1** Map of the study area (source: Google.com)

### *Population and Tourism*

Based on the official registration in 2015, there were 63,592 residents in Ko Samui, while 7,768 residents were registered in Ko Chang (Department of Provincial Administration 2016). Currently, the economy is influenced by different sectors: agriculture, tourism, commerce and services, and household industry. The majority of agricultural products involve para-rubber plantation, coconuts and fisheries, while tourism, commerce, and services are also important for local and national economy. Both Ko Chang and Ko Samui are popular tourism islands in the Gulf of Thailand. As of 2013, a total of 508,936 tourist visited Ko Samui consisting of 63,211 Thais and 445,725 foreigners. A total of 290,510 (150,713 Thais and 139,797 Foreigners) were found in Ko Chang (Department of Tourism 2016). They are usually overcrowded during high season starting from December to April. Many tourism activities, ranged from the terrestrial to marine environment, are found in Ko Chang and Ko Samui including hiking, trekking, kayaking,

fishing, snorkeling, scuba diving, etc. At present, it can be seen that tourism development in Ko Samui is more developed compared to Ko Chang. Tourism infrastructures including roads, ferries, airport, accommodations and so on are fully provided for accommodating tourists to visit.



**Fig. 2** Diving is popular tourism activities in Ko Chang and Ko Samui

#### *Small-scale fisheries in Ko Chang and Ko Samui*

In Ko Chang, about 270 small-scale fishing boats was recorded; 75% of them were outboard powered boats, 24% of them were inboard powered boats of smaller than 10 meters in length, and 1% of them were non-powered boats (Trat Provincial Fisheries Office, 2012). Fishing communities on the north, east, and south coasts of Ko Chang are still found but the west coast has been influenced by intensive tourism activities. The area was designated as a Marine National Park in 1982, and all fishing activities are prohibited in the park area. However, small-scale fishing activities are still found within the park's boundaries as well as other commercial fishing such as trawling, push net, and dredging. Small-scale fisheries usually use the family members, or occasionally other community members, as crew and usually fish in near shore waters close to their own villages. Residents are involved in many types of small-scale fishing activities, including the coastal gill net, crab trap, hook-and-line, krill scoop net, reef fish trap, king mackerel nets, shrimp trammel net, small trawl net, and squid trap fisheries. Some large-scale fishing vessels using anchovy purse seines and squid cast nets also operate within the protected area (Lunn and Dearden, 2006; Songjitsawat et al. 2009). Because Ko Samui and its vicinities are abundant with coral reefs, pinnacles, and seagrass beds that are important habitats

for fisheries resources where the local fishers do their fishing. As mentioned earlier, before the tourism development was introduced to Ko Samui, fishing in this area had been truly subsistence fisheries. Nowadays, the fisheries in Ko Samui are more commercial than previous. However, almost of the fisheries in this area are still classified as small-scale. However, after the tourism was introduced, it has provided various opportunities to small-scale fishers by involving them into tourism-related activities such as providing boats for tourists to diving or fishing sites, operating homestay and guesthouse, and supplying seafood to restaurants.

## **Results**

### *Current status of small-scale fisheries*

Based on our surveys, approximately 60% of fishing gears were gillnets such as shrimp trammel nets, fish gill nets and crab gill nets, while 35% are traps (crab, squid, and fish traps) and 5% of them were hook and lines, squid falling nets, and krill push nets. Generally, the main target species are shrimp and crab. Fishing takes place mostly within 3-5 km off the coast of Ko Chang. The average income of fishers was in a range of about 257–700 USD/month. About 5% of fisheries products were household consumed; 10% of them were used as baited fish, while another 85% of them were sold to local market and restaurant in Ko Chang. This reflected that fishers tended to sell large proportion of their total catch to serve high demand of seafood especially during peak tourism season. Freshness of fisheries products from small-scale fisheries in Ko Chang have been recognized by tourists making the products become important food sources for both small-and large tourism business in the island.

The interviews with key informants revealed us that around one thousands of small-scale fishing boats were found in Ko Samui; 63% of are outboard powered boats, 35% of them are inboard powered boats of smaller than 10 meters in length, and 2% of them are non-powered boats. Approximately 85.00% of fishing gears are shrimp trammel nets, fish gill nets and crab gill nets, while 15% of them are hook and lines, squid falling net, crab traps, fish traps and long lines. The main target species are shrimp and fish. Fishing takes place mostly within 3-4 km off the coast of Ko Samui. The average income of fishers is about 473–800 USD/month. About 30% of fisheries products were household consumed, while another 70% of them were sold to local market and restaurant in Ko Samui. However, those fisheries products are still insufficient for

local consumption due to the growth of latent population, visitors, and tourists. Besides, some fishers also catch sea urchin and sell sea urchin roe to restaurants or tourists, having an average selling price of 15 – 20 USD/kg. The smaller size of sea urchins are grown in the designed cage about 6-12 months until they reach to desired size.



**Fig. 3** Coral reefs as an important habitat for fisheries and tourism (left), Boat tour business operated by a group of small-scale fishers (right)

#### *Perception of small-scale fishers on importance of coral reefs*

All interviewee in both Ko Chang and Ko Samui responded that they are agreed that coral reefs are important for their livelihoods, mainly as a food source. They further added that some fishers may earn economic benefits from tourism. Some small-scale fishers modified their fishing boat to be used for boat tour business by taking tourists to other islands for fishing and diving. The fishing boats were modified by adding some amenities to support tourism such as roofs or shade, sitting areas, drinks box, lifejackets, fishing lines, diving gears, etc. Some fishers stated that tourism causes a higher demand of seafood consumption so they can directly sell their fisheries products to restaurants with higher price than selling those to middlemen. Also, tourism provides opportunities and employment to local people. These could help improve their livelihood.

All interviewee in both Ko Chang and Ko Samui also responded that coral reefs should be conserved and tourism should be properly managed in order to prevent negative impacts on coral reefs. Without healthy coral reefs, fisheries resources would be depleted, so their livelihoods could be inevitably disturbed.



Small-scale fishers were asked to rate the importance of coral reefs by indicating scores from 1 (low importance) to 3 (high importance) on each services of coral reefs. The data were tabulated and summarized as showed in table 1. We generally observed that the level of importance of coral reef expressed by small-scale fishers in Ko Chang and Ko Samui was quite similar. Most of them focused on the ecosystem services as food source, tourism and recreation, and nursery ground for marine juvenile species. The ecosystem services as construction materials and spiritual and cultural believes were rated as low importance. Fishers stated that use corals as construction materials are now limited by present laws and regulations while the spiritual and cultural believes are being fade out compared to that in the past.

**Table 1** Fisher’s opinion on importance of coral reefs

Ecosystem services of coral reefs		Level of importance	
		Ko Chang	Ko Samui
Provisioning	Food source	H	H
	Fish, invertebrates and corals for aquaria for	M	H
	Ornaments		
	Marine pharmaceutical products	L	L
	Construction materials	L	L
Regulating	Shoreline protection	M	M
	Reduction of coastal erosion rate	M	M
	Beach and shoreline regeneration	M	M
Cultural	Tourism and Recreation	H	H
	Spiritual and cultural believes	L	L
Supporting	Material cycling	M	L
	Nursery ground for marine juvenile species	H	H

Remarks: H= High level, M = Medium level, L = Low level; Number of Respondents = 80.

### *Efforts of small-scale fishers on coral reef conservation*

Most of the small-scale fishers (90%) concerned that depletion of fishery resources is highly related to the degree of coral reefs health and environmental deterioration, which is mainly caused by tourism-related activities. More than 95% of respondents agreed that too many tourists, especially mass tourism, could generate larger impacts on coral reefs. Unskillful divers or snorkeling divers could step on and destroy corals, while boat anchoring may also destruct coral reefs. Another interesting issues raised was that sediments generated from trawling and dredging near coral reefs may affect corals. Besides, some large-scale crab trap fisheries may destroy reefs and some invertebrates, especially when they are retrieving the traps. Other destructive fishing practices such as dynamite fishing, electric fishing, cyanide fishing etc. may also affect coral reef ecosystem.

In regards with those concerns, many environmental conservation activities such as reef cleanup activities, coral reef monitoring volunteers etc. have been initiated by local communities attempting to protect coral reefs. They mentioned that bodies should be cooperated in initiating conservation projects including policy maker, local administration and relevant organizations (91%), followed by tourists (80.1%), local people and fishers (77.7%). At both study sites, there were fishers who are as volunteer for immediately making report to authorized staffs when they see any of illegal fishing or tourism practices which are destructive to coral reefs. Interestingly, the Local Tourism Group of Ban Salak Khok in Ko Chang has been established in order to provide training on safety and coral reef conservation practices for membered fishers who bring tourists for fishing and diving. Governmental organizations, academic institutions, volunteers and NGOs also provide some financial and academic supports to run those activities. In Ko Samui, although positive attitude of small-scale fishers on coral reef conservation was detected, participation of small-scale fishers in coral reef conservation projects was quite low compared to that in Ko Chang. It could be derived from lack of coordinating body and less communication of stakeholders. The coordinating body is needed for involving relevant agencies and small-scale fishers to jointly initiate coral reef conservation activities. Some fishers emphasized the important point on how to build conservation awareness and attitude to people who benefit from coral reefs.

## Discussion

Although Ko Chang and Ko Samui are now influenced with tourism development, poor small-scale fishers who are risky to poverty are still existed. They need more opportunities to sustain their food security as well as to improve their livelihoods. Promoting them to involve in tourism business as their secondary occupation would be another opportunity for improving their livelihoods. However, many considerations should be carefully made for this because the differences of environmental condition, culture, type of tourism, and future changes in each location. Generally fishery-related information are varied through time and locations, for examples, fishing operations, consumption of fisheries production etc.

Large proportion of local consumption of fisheries products in Ko Chang and Ko Samui (About 85% and 70% of catch) may reveal the influence of tourism in these areas as increased number of tourists boost up local demand of seafood. In other hand, the lower proportion of local consumption of fisheries products was generally found in a fishing community where tourism are not predominant. Most fisheries products were sold to middlemen and further distributed to other nearby markets or even Bangkok (Suebpara et al. 2013). In this study, we found that the proportion of household consumption of small-scale fishers in Ko Samui (30%) was higher than that of Ko Chang (5%), reflecting that the household consumption level may depend on household members' food preferences. Besides, the lower proportion of household consumption does not mean that fisheries was not important in terms of food security. Fishes may have diverse sources of protein like pigs or chicken (FAO 2005).

Involvement of small-scale fishers in tourism business may be an opportunity for fishers to gain more income. Although this could have an impact on their fishing effort, most of the them still preferred operating tour boat business rather than fishing because the amount of fish caught was still in uncertainty. However, benefits from tourism business are gained only during the peak of tourism season during 4-5 months a year. Hence, the fishers still consider tourism business as their minor source of income.

The fishers' opinions on the level of importance of coral reef on each type of ecosystem services were quite similar in Ko Chang and Ko Samui. However, with regards to the ecosystem services on provisioning fish, invertebrates and corals for aquaria for ornaments, the fishers in Ko Samui agreed to rank this service as 'High importance' while "Medium importance" was

ranked by the fishers in Ko Chang. This may reflect that collecting the fish, invertebrates, and coral for aquaria for ornaments in Ko Samui is still important for the fishers.

We also learned that availability of financial supports, social cohesion (Mulyila et al. 2012), community leader's vision, and communication and relationship among stakeholders, are important success factors of community-based conservation projects. Besides, academic institutions should also play an important role in providing and integrating advanced researches with indigenous knowledge (Walker-Springett et al. 2016). Overall results revealed the positive outcome of perceptions on coral reef conservation although the efforts and participatory level in coral reef conservation activities were still varied among fishing communities.

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