

Subsistence Fisheries and Local Opinion Towards Conservation Value of Peat Swamp Forest in Thailand

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Abstract: Tropical peat swamp forests are unique ecosystems of Southeast Asia were playing important functional roles in regulating hydrology, biological resources and maintaining environmental stability. Thailand possesses approximately 55,500 ha but only 15% of peat swamp forests historical distribution remains intact. This study aims to assess the quantity of fisheries utilization and resource use within these forests, as a step towards the guideline establishing for their sustainable conservation. The results revealed that total population living around and within peat swamp forest approximates 370,000 of which not >1% engages in fishing. The main income, averaging 3,210 USD per household is derived from rubber, vegetables and orchards. A fishery is a supplementary occupation, involving catching fish mainly during the rainy season and aquaculture during the dry season. However, among extractable annual natural resource consumption, wild-caught fishing provides a significant contribution of about 3,880 ton with a value of 5.6 million USD. The most common edible fish species are snake-head, walking catfish, climbing perch, gourami and swamp eel. The main barriers to adoption of resource conservation measures are undocumented land tenure; poverty and unawareness generally lead to over-exploitation of resources. Encroachment, wildfire, development projects, destructive fishing, wildlife hunting and wood scavenging have accelerated the deterioration in their ecosystems. Sharing of environmental knowledge across communities and networks, improve local quality of life and strengthening law enforcement in resource conservation are critical required.

Key words: Wetland, rural livelihood, protected area, habitat disturbance, ecosystems

INTRODUCTION

Peat swamp forests, multifunctional tropical moist evergreen forests are an important component of the world's wetlands covering over 20 million ha in South East Asia (Rieley *et al.*, 1996). These endowment resources have played an essential role for well-being of poor inhabitants, particularly security of food, housing, medicine and energy, as well as global environmental balance. Peat swamp forests and people have been associated with a long history of human civilization. Globally, these common pool resources are under pressure and deteriorate from inappropriate management lead to large-scale, vicious cycle of habitat and biodiversity loss and then increase of local poverty problem (Parish *et al.*, 2008). Conflict of resource use for socioeconomic development and conservation sound are classic issues worldwide. Natural resource depletion and environmental degradation associated

with economic production and consumption activities (Konstadakopulos, 2008; Andrew-Essien and Bisong, 2009). Therefore, how best to share resources use and protection of the environment? Similarly, the peat swamp forests are gradually deteriorating and decreasing in the area rapidly in Thailand (ICEM, 2003).

Critically change of this invaluable resource has derived from depleting and reducing in size of forest areas while growing of local households living amidst the bounties of nature. Peat swamp forests in Thailand had an area of 64,555 ha in 1985 (Phlengkklai *et al.*, 1991) and then falling to 55,525 ha in 1991 (Chukwamdee *et al.*, 1999) whereas the up-to-date information about the year 2010 can not avail. Wild-caught fish and other aquatic animals are of great importance for food and income of the locals in remote communities. Additionally, flood plain and peat swamp fisheries have been supporting the livelihoods of rural poor over centuries are now under serious threat from over fishing and habitat loss resulting from

urbanization (Chesoh and Samphantharaga, 2004). This study is aimed to present information on the fishing situation in peat swamp forest of Southern Thailand and to assess the fishing status of the fishers and their livelihoods in remaining peat swamp forest and then to propose enhancing guidelines for optimal management.

MATERIALS AND METHODS

Study site and data source: All of study sites are located in Southern Thailand. About 5 major primary and secondary peat swamp forests from different size were selected for data collection comprise:

- Large-size
 - Pru Toh Daeng of Narathiwat Province
 - Pru Kuan Kreng of Nakhon Si Thammarat Province
- Medium-size
 - Pru Ba Cho of Narathiwat Province
- Small-size
 - Pru Chana of Songkhla Province Pru Nong Jik of Pattani Province (Fig. 1)

Secondary data of official authorities were also collected and examined.

Study design statistical analysis: A cross-sectional survey and quantitative-qualitative mixed methods approach (Reichardt and Cook, 1979; Creswell, 2003) had been conducted from January, 2006 to December, 2009. Structured questionnaires (demographic information,

fishing activity, opinion on fishing regulations and conservation measure) were used as informant interviews. Researchers selected 350 households and 20 community leaders of 5 villages in 5 peat swamp forests and were taken in depth interview annually. Annual focus group discussion comprised of 10 participants of community leaders, local scholars and activists together with informal small group discussion were employed in acquiring in depth information for analysis and finding confirmation. In addition, bimonthly coffee shop citizen dialogs and consultative group meeting were, also included for data collection (Maxwell *et al.*, 2002). Moreover, the relevant documents were reviewed. Descriptive statistics were calculated, such as percent and frequency for categorical variables and mean with standard deviation or median with range of continuous variables.

RESULTS AND DISCUSSION

General description of peat swamp forest: It has been found that 5 sample sites of peat swamp forests in this study cover about 51,915 ha whereas all Thailand possesses about 55,500 ha and are located mostly (99%) in the South, only a small area (1%) located in Trad and Rayong Provinces of the East. From all sample sites, Toh Daeng is the largest peat swamp forest and remaining primary peat swamp forest or virgin jungle (Table 1).

All peat swamp forests are characterized by low-lying coastal flat land where is routinely flooded during the monsoon season. The peat soils are acidic soils and typically poor nutrient content because of deposition of excessive organic substances. However, a large number

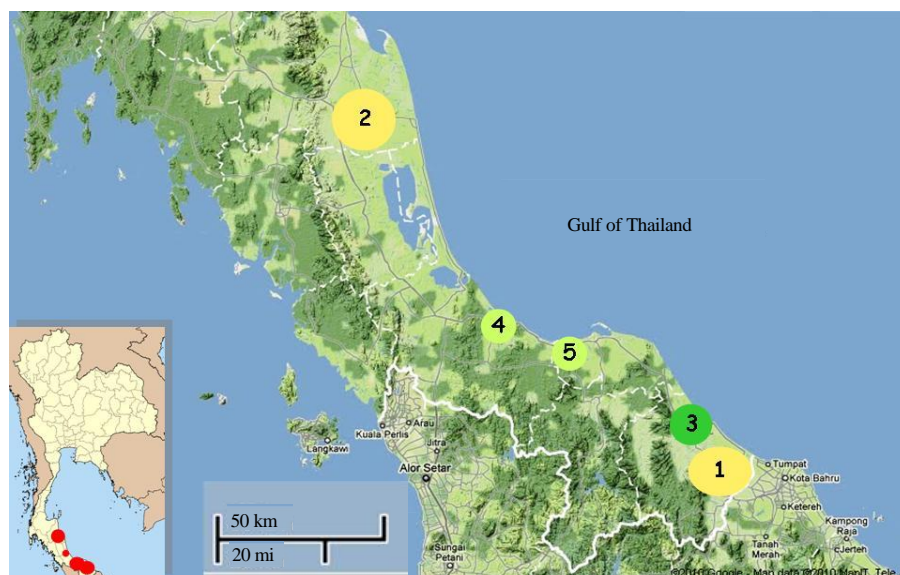


Fig. 1: Map of 5 major peat swamp forest locations for data collection (<http://maps.google.co.th/>)

Table 1: General description of 5 sample sites of peat swamp forests

Peat swamp forest	Area (ha)	Location (district and province)	Characteristics
Pru Toh Daeng	28,270	Muang, Tak Bai, Su-Ngai Kolok, Su-Ngai Padi, Ra-Ngae and Joh-i-rong of Narathiwat	Primary peat swamp forest, wildlife sanctuary; home of over 400 species of plants and 200 animal species; popular tourist destination and surrounding communities
Pru Kuan Kreng	18,950	Cha-oat, Hua Sia Ronpiboon, Chien Yai and Chalearn Prakiat of Nakhon Si Thammarat	Secondary peat swamp forest, non-hunting area, riverine, marsh, swamp grass, Cajuput (<i>Melaleuca leucadendron</i>), paddy and plantation, amidst and surrounding communities
Pru Ba Cho	2,710	Ba Cho and Yi-Ngo of Narathiwat	Secondary peat swamp forest, protected area; marsh and swamp grass, Cajuput tree (<i>Melaleuca leucadendron</i>)
Pru Chana	1,210	Chana of Songkhla	paddy fields, oil palm; surrounding communities
Pru Nong Jik	775	Nong Jik of Pattani	Secondary swamp forest, Cajuput tree (<i>Melaleuca leucadendron</i>), grass lands; surrounding communities, some are private land
Total	51,915	15 districts 5 provinces	Secondary swamp forest, non-hunting area; Cajuput tree (<i>Melaleuca leucadendron</i>), fish and shrimp farms
			Encroachment and wildfire are critical problems

of tree and grass species found and the Cajuput tree (*Melaleuca leucadendron*) is major plant species that grows well in such infertile wood lands. The productiveness of sample area varies on the type of the forest, size and abundance of intrinsic resources. Although, all peat swamp forests are protected area, almost (85%) are secondary (succession) forest and community's surroundings with land encroachment for agricultural purposes: Paddy, fish pond, rubber and oil-palm plantations, livestock grazing and settlements. Encroachment into the natural habitat by the locals and business men and wildfire are major critical problems.

Demographic and socioeconomic aspects of the fishers:

Of the (total) 350 respondents, 85% of informants were male with average 45.7 ± 21.5 years of age. The moderate number of members in households was 5 (2-12). Most of the respondents (85%) in Narathiwat, Pattani and Songkhla Provinces were Muslim whereas Buddhists (98%) were the majority group of Pru Kuan Kreng. About 77.3% had a primary educational level followed by higher education (15.2%) and illiterate (7.5%). Inhabitants living surrounds and amidst peat swamp forests in these study areas are multicultural communities among Islam and Buddha faith.

The most common occupation (61%) was agriculture (plantation and livestock), employee (27%), local traders and handicraft makers (5.2%), full-time fishing and non-timber forest product extractors (5%), company officers (1%) and government sector (0.8%). Only respondents living in Pru Kuan Kreng presented high number of full-time fishers (20%). Therefore, most of fishers in all peat swamp forests are part-time fishers but trapping about 23 years of average fishing experience.

Almost 45% of informants showed the estimated monthly income, each household could earn about 201-300 USD, 38% was >300 USD, 15% was about

100-200 USD and 2% were <100 USD per capita. This low income group mostly found from respondents living in Pru Kuan Kreng (82%) and Pru Ba Cho (12%). The main annual income, averaging 3,210 USD per household, derives from rubber plantation, livestock, vegetables and commercial fruit gardens. In contrast, over 43% of informants presented the estimated monthly household expenditure about 90-200 USD, about 30% was 201-300 USD and 16% was 301-380 USD. More than half of respondents (55%) had a debt. Among them, 45% got a loan from the relatives and 55% got loan from commercial bank, local saving cooperation and village funds. Almost 87% of respondents have been settled in their community for >25 years and 85% were the indigenous residents. Only 15% were emigrating from the other region of Thailand.

Fishing activities and post-harvest management:

Total population living around and within peat swamp forest approximates 372,000 or about 74,400 households of which not >1% are full-time fishers. However, approximates 11,255 households (15%) were engaged in fishing and fishing-related activities supporting their livelihood. Major of fisher households inhabits in Pru Kuan Kreng (75%) followed by Pru Toh Daeng (20%), Pru BA Cho (4%) and others (1%). A fishery is a supplementary occupation, involving catching fish mainly during the rainy season and aquaculture during the dry season. However, among extractable annual natural resource consumption, fishing provides a significant contribution of about 3,880 ton with a value of 5.6 million USD. These significant quantity occurred in Pru Kuan Kreng (70%) followed by Pru Toh Daeng (20%), Pru Ba Cho (7%) and others (3%).

Generally, fishing period took place from October to March about 6 days per week and from May to September about year-round about 3-4 days per week but more frequently during raining season. About 7 major fishing

gears were used: Trap (sitting, lying, eel and hole trap), gill net, set bag net, hook, scoop net and harpoon. Traditional fishing gear utilizing local material construction and labor is infrequently found. The most common edible fish species are snake-head, giant snakehead, walking catfish, climbing perch, swamp eel, gourami, catfish, cyprinid, grey feather back fish and swamp shellfish. Most of them (70%) of the total were sold in the local market or to middle men, 20% of households consumption, 7% of traditional fish processing and 3% were stocked in farm raising or distributed to neighbors. In addition, these marketable fish, particularly hybrid walking catfish, snakehead, giant snakehead and Siam Gourami were introduced for traditional fish processing, especially salted fish and dried salted fish while cyprinid used for the fermented fish product. Sales of farming fish were relatively stable during the year but sales of wild capture fish showed peaks during migration upstream period of annual floods, wet season (August to December) and downstream period of the flood recession or dry season (February to April). However, exotic species made up about 25% by weight of sales, mainly comprising hybrid catfish (*Clarias macrocephalus* x *C. gariepinus*) and Nile tilapia (*Oreochromis niloticus*). The estimated per capita of annual fish consumption of peat swamp forest household was 30.8 kg.

Fishery product showed a significant contribution of extractable benefit from the peat swam forest services; followed by construction and fuel wood, mixed timbers, wooden roofing, rattan, honey, medicinal plant, vegetation and mushroom for cooking, singing and ornamental birds, wild pig, frog, turtle, ornamental plants and resin. Wooden roofing (sago) is a common peat forest product in Pru Toh Daeng and less common in Pru Kuan Kreng but high economic value of Cajuput tree (*Melaleuca leucadendron*) and bamboo. These activities can be undertaken on a sustainable basis with proper management. However, all sample peat swamp forest in this study, such extraction engages at an excessive level of resources carrying capacity and appearing on a first-come, first-serve basis or in an uncontrolled style. Inadequate of these unsustainable resource harvesting is commonly found, the fishers use of destructive fishing techniques, such as too small mesh size of fishing nets or poisons, large-scale cutting of rattans and fuel woods.

Opinion on fishing regulation and conservation measure:

An analysis of conflicts related to natural resource use showed high intensity and commonly found in all stakeholders (local inhabitants, forest land encroaches and government authorities) of all sample areas. All

sample sites are crucial for biodiversity conservation by land use change and resulting habitat loss and threatened species. Most of the informants (88%), accepted that they were informed about peat swamp resource conservation measures. And over 80% of them requested for rehabilitating peat swamp forest sources and environments for increasing fisheries production and raised the questions of deterioration of biodiversity problems. Only 12% stated that peat swamp forests are belonging to the God, all natural resources are God's endowments. Therefore, researchers can use these resources as much as possible. Some opinions on fishing regulations and conservation measures were presented as follows:

- Over 96% of respondents were satisfied with the benefits and services from peat swamp forests for supporting their families well being
- Over 75% of respondents were satisfied with the present amount of fish population to be caught
- About 91% of respondents accepted that the now-a-days number of fishers and non-timber forest product harvesters increasing whereas fish population decreasing
- About 97% of respondents accepted that peat swamp resources and environmental quality decreasing and deteriorating
- Over 95% of respondents were satisfied on forest rehabilitation and a fish releasing program of official authorities
- About 78% of respondents rejected the periodic fishing closure measure in some areas of peat swamp forest
- Over 90% of respondents agreed with prohibits use of any poisonous or explosive substances, electric current and set bag net fishing
- Over 95% of respondents accepted that occurring of peat swamps forests problems because of weakness of law enforcement
- Over 85% of respondents were satisfied and trusted that land encroachment can be solved by having clear land ownership and establishing of forest zoning
- Over 85% of respondents were satisfied with community participation and being the peat swamp forest audit committee for peat swamp forest management

An undocumented land tenure (no clear ownership), annual wildfire, land invasion into heartland forest, lack of conservation zoning determination and available water use are classic issues (linkage between poverty and

deforestation) found particularly in Pru Kuan Kreng, followed by Pru BA Chou, Pru Toh Daeng, Pru Nong Jik and Pru Chana. Whereas logging was banned in Thailand since 1989, illegal logging has occurred in virtually all peat swamp forest areas. Some flora and fauna resources are serious ecological decline, especially endangered fish species, such as squarehead catfish (*Chaca bankanensis*), Malay combtail fish (*Belontia hasselti*) and Asian narrow-headed softshell turtle (*Chitra chitra*). This over-exploitation is caused mainly by encroachment, development projects, destructive fishing and wildlife hunting and wildfires.

The results indicated that lower income household's depends significantly on peat swamp resources for their very survival. Ability of peat swamps resources to continuing to support their livelihood depends on the law enforcement flexibility of authority officers. However, protected areas are only effective when they stop habitat loss within their boundaries and are connected via corridors to other wild areas (Radeloff *et al.*, 2010). Therefore, to block deforestation base on local participation and sharing of environmental knowledge across communities together with network creation will be the best alternative to sustain peat swamp forest resources. Moreover, cooperation among central government and local administration authorized organizations that peat swamp located together with strengthening of law enforcement are also necessary. For more accurate annual estimates of wild-caught fish, it is necessary to collect data more intensively during the peak periods but monthly sampling during another period throughout the year is adequate.

CONCLUSION

Peat swamp forests in Thailand provide goods and services essential to the locals and planetary well-being base for agricultural purpose, fishing and extraction of non-timber forest products for daily livelihood. Encroachment, wildfire and habitat disturbances are the critical issues of Pru Kuan Kreng and Pru Ba Cho resource management. Poverty and lack of awareness generally lead to over exploitation. Unequal distribution of benefits and costs, devolution of decision-making away from local users, are common major issues. Therefore, strengthening capacity of local individuals with environmental knowledge, training and community participation are key success of sustainable conservation initiatives. This study reveals that clear land ownership, establishing of forest zoning and community-based resource management are key determinants in generating a better peat swamp forest sustainable management. Moreover, management

of such resources should be considered based on principle of optimal sustainable yield with minimum environmental disturbance.

Researchers strongly recommend that transparency of local participation in every step of management, creation and sharing of environmental knowledge across communities and networks, improvement of local well-being and strengthening law enforcement in natural resource conservation are essential for effective peatswamp forest resources utilization and management.

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