The Social Sciences 9 (5): 340-350, 2014
ISSN: 1818-5800

Participatory Community Assessments for Fishing Measure Establishment Around Estuarine Riverin Southern Thailand

[1]Amphorn Sakset and [2]Sarawuth Chesoh
[1]Department of Fisheries, Surat Thani Inland Fisheries Research and Development Center,
Box 3, 84130 Surat Thani Phun Phin District, Surat Thani Province,
[1]Faculty of Science and Technology, Prince of Songkla University,
Pattani Campus, 94000 Songkla, Thailand

Astract: In data poorof subsistence fisheries and open access of resource use, a community-based management and knowledge sharing between resource users and authorized agents are key successful to collaborate to establish a development plan. This study aimed to evaluate fishers attitudes of the fisheries resource situation and to recommend the practical fisheries management around the Pak Phanang River Basin of Nakhon Si Thammarat Province in Southern, Thailand. In-depth interviews by using semi structured questionnaire 102 fishers households and participatory rural appraisal towards 7 communities along the Pak Phanang River were used to collect the data from January to May, 2011. The findings showed that temporal change in fishing pattern and decline in key fisheries species and habitat loss including water quality deterioration, increased aquatic weed growth and fish mortality more occurs, those affected the fishers income. The fishers were highly appreciative the good cooperation of the authorities for fisheries management. Similarly, they agreed onsome conservation measures, particularly fishing prohibited regulation during the spawning season in spawning grounds and illegal gears ban but disagreed with controlling the quantity of fish caught, ruling on the number of fishers and fishing period setting. Moreover, the fishers mainly requested taking more participating role in fisheries reconstructing predominantly in decision making of the planning process. Finally, institutional establishing for cooperation among stakeholders on fishing regulation, including seasonally water quality monitor, fish restocking and enhancement programs on the socio economics of fisher households were strongly recommended.

Key words: Social assessment, fishers perceptions, community acceptance, traditional fishing, institutional, role, Pak Phanang River

INTRODUCTION

At present, fisheries managers recognize that fisheries resources cannot be sustained by managing biophysical aspects alone. Community attitudes and their opinions towards fisheries resource utilization measures should be considered as well (Hab-erl *et al*., 2009; Ban *et al*., 2009; Pinto *et al*., 2010). Fish stocks are limited and biological production constrains the potential yield from fisheries whereas human fish consumptive demands are unlimited. However, the important implications and predict changes in the biophysical health of fisheries resource systems are even applied for effective fisheries management (Kim and Zhang, 2011). The fishers feedbacks, such as their perceptions and recommendations have played the important roles and need to be considered in the current fisheries development plan. Bunce and Pomeroy (2003) stated that fisheries management is about human management, not fish management. Therefore, regulations should be directed towards the actions of all stakeholders. Moreover, those involving should be aware because all regulation measures could affect the livelihood of the fishers well-being including food security and family income. Consistently, community-based management, a bottom up approach of organization for resources management has been advocated worldwide, as the key to successful fisheries management to overcome over exploitation of fishing. A participatory community assessment involves discussions with key stakeholders, including local fisheries staff, researchers and members of the fishing community, as a critical first step in documenting and evaluating the existing informal fisheries management systems operating in the community.

Corresponding Author: Sarawuth Chesoh, Faculty of Science and Technology, Prince of Songkla University, Pattani Campus, 94000 Songkla, Thailand

Scientifically acquired information is also actual useful and important during resource capacity analysis but Participatory Rural Appraisal (PRA) focuses on resource assessment from the perspective of local fishers who directly are resource users.

In coastal and estuarine river basin of Thailand, fishers have reported that the present catch is lower than in the past and that the fish being caught are smaller. Moreover, the proportion of higher valued commercial species in the overall catch has decreased, resulting in a drop in fisher household income (Chesoh and Lim, 2008). The Pak Phanang River Basin (PPRB) is located in the Southern East coast of Thailand. Since, operation of the water gate over the river, slowdown of water circulation which accelerated the rate of sediment deposition, declination of fish species and fish production, lower production of Nipa Palm and spread of Malaria in this area were appeared (Prabnarong and Kaewrat, 2006). The aims of this study were to evaluate fishers attitudes of the fisheries resource situation and to recommend the practical fisheries management in the PPRB based on the findings of community assessment. Thus, the findings will benefit for collaboration both improving general in land fisheries development plan and reforming the barrage fishery of the river Basin.

MATERIALS AND METHODS

Study location: The Pak Phanang River Basin (PPRB) is located along the South Eastern seashore of Thailand (Fig. 1). The river originates from several streams in the central mountain region of the South. The total length of this river is approximately 147 km, covering 3,185 km^2 of its basin and down stream into the Gulf of Thailand, serving as water supply for over 700,000 inhabitants.

Since, >80,000 ha of the area are paddy fields, the Uthokvibhajaprasidsluice gate was constructed in 1999 in Hu Long of Pak Phanang District of Nakhon Si Thammarat Province, as a Royal Initiated Project where far from the river's mouth approximately 8 km. This project has been an effort to provide fresh water for agricultural purposes and to prevent saltwater intrusion into the farming areas.

Methods and data analysis: An in-depth, semi-structured interview for the head household's fishers was conducted by questionnaires including their demographic characteristics, perception of current fisheries management and their suggestions for future fishing measures. This study employed the purposive sampling technique for data collection on 102 respondents living around the PPRB; 35 of down stream, 48 of middle stream and 19 of up stream households (Fig. 1). Moreover, Participatory Rural Appraisal (PRA) towards 7 communities including community meeting, group discussion and informal observation was applied for data collecting in the whole picture of a geographic area, occupations, wealthy status, traditions, fisheries resources situation, fishing activities, problems and solutions, as well as suggestions for future management. And the snowball technique was chosen to select key informants focus group discussion.

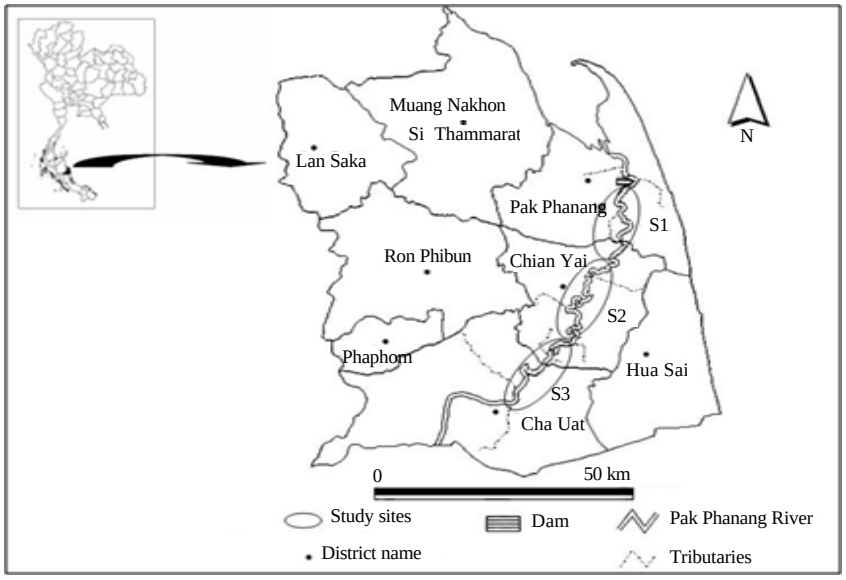

Fig. 1: Location of the Pak Phanang River Basin (PPRB)

Descriptive statistical analysis was also used; frequency distribution and percentage were used to describe the various indicators of demographic characteristics and PRA data. A Weighted Average Index (WAI) was used to determine fishers perceptions and opinions on fisheries management (Miah *et al*., 1993). The index was computed using Eq. 1 and classified the levels of WAI as Table 1-5. Inferential statistical analysis; Chi-square test and F-test were also used to compare significant different data between study sites (the down stream, mid stream and up stream):

$$WAI = \Sigma(f_i * w_i) / \Sigma fi \quad (1)$$

Where:
WAI = Weighted Average Index of attitude
f_i = Frequency
w_i = Weight applied

Table 1: The values of WAI assigned to frequency of the fisheries management information received by fishers

Mostly every week	Mostly every month	A few times per month	A few times per year	Non knowledge
1	0.75	0.50	0.25	0

Table 2: The values of WAI assigned to participation levels in fisheries management

Fully active participation	Active participation	Medium participation	Low participation	No participation
1.00	0.75	0.50	0.25	0

Table 3: The values of WAI assigned to fishers perception of the performance of fisheries management agencies, measures, other stakeholders and fisheries management issues

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
2	1	0	-1	-2

Table 4: The values of WAI assigned to opinions on activities to maintain aquatic resources and fisheries implementations

High	Low	No
1	0.5	0

Table 5: The values of WAI assigned to opinions on future fisheries management

Agree	Neutral	Disagree
1	0	-1

RESULTS AND DISCUSSION

Demographic characteristics: Table 6 shows one half of fishers were middle age, 36-50 years old (50%), followed by older than 50 years old (43.1%). This indicates that few new generations replace the old one because of lack of fisheries production in the area and properly getting better job opportunities in the other places. Furthermore, the older fishers in PPRB might not be willing to change their occupation and might not be receptive to new programs. As stated by Bunce and Pomeroy (2003), age can be a predictor of receptivity to new ideas.

The majority of respondents were male (73.5%) and have played vital role in fishing at all study sites. This could be an important indicator of likely participation in management. Therefore, it should be a top priority to involve these people in any fisheries management activity. The rest of the respondents were female (26.5%) who spoke of their husbands or fathers. There are also fish product processors in the households. Bunce and

Table 6: Demographic characteristics of the respondents within the PPRB, 2011

	Down stream		Mid stream		Up stream		Total	
Items	N = 35	%	N = 48	%	N = 19	%	N = 102	%
Age (years)								
<36	2	5.7	2	4.2	3	15.8	7	6.9
36-50	20	57.1	25	52.1	6	31.6	51	50.0
>50	13	37.1	21	43.8	10	52.6	44	43.1
Average (F-test, Sig. = 0.41)	48		51		51		50	
Gender					16	84.2		
Male	24	68.6	35	72.9	3	15.8	75	73.5
Female	11	31.4	13	27.1	16	84.2	27	26.5
x^2-test	Sig. = 0.46							
Education								
Primary school	28	80.0	40	83.3	12	63.2	80	78.4
Secondary school	6	17.1	6	10.4	6	31.6	17	16.7
University	1	2.9	3	6.3	1	5.3	5	4.9
x^2-test	Sig. = 0.30							
Occupations								
Fishing	25	52.1	19	39.6	4	8.3	48	47.1
Agriculture	5	14.3	20	41.7	11	57.9	36	35.3
Trading	2	5.7	0	0.0	2	10.5	4	3.9
Others	3	8.6	9	18.8	2	10.5	14	13.7
Monthly incomes (Baths)								
<3,500	4	12.1	3	6.3	3	15.8	10	10.0
3,501-7,000	20	60.6	34	70.8	8	42.1	62	62.0
7,001-10,500	6	18.2	5	10.4	5	26.3	16	16.0
10,501-14,000	2	6.1	4	8.3	1	5.3	7	7.0
>14,000	1	3.0	2	4.2	2	10.5	5	5.0
Average (F-test, Sig. = 0.50)	6,652		6,271		7,526		6,635	

Table 7: Sources of the fisheries management information for the fishers within the PPRB, 2011

	Down stream		Mid stream		Up stream			Average	
Sources	WAI	AL	WAI	AL	WAI	AL	F-test	WAI	AL
Village leaders	0.58	MM	0.61	MM	0.54	MM	0.72	0.58	MM
Village committees	0.00	NK	0.61	MM	0.54	MM	0.00	0.38	FM
Fish traders	0.00	NK	0.01	FY	0.03	FY	0.31	0.01	FY
DOF officers	0.17	FY	0.03	FY	0.36	FM	0.00	0.19	FY
Local radio station	0.00	NK	0.01	FY	0.32	FM	0.00	0.11	FY
Posters	0.00	NK	0.01	FY	0.07	FY	0.02	0.03	FY
Televisions	0.37	FM	0.07	FY	0.08	FY	0.00	0.17	FY
News papers	0.00	NK	0.07	FY	0.00	NK	0.02	0.02	FY
Others, e.g., friends and cousins	0.17	FY	0.10	FY	0.08	FY	0.36	0.12	FY

WAI = Weighted Average Index; AL = Assessment Level; NK = Non Knowledge; FY = A Few times per Year; FM = A Few times per Month; MM = Mostly every Month; MW = Mostly every Week

Pomeroy (2003) stated that gender can be an important indicator for participation. If women are not directly engaged in fisheries activities, it may be more difficult to actively involve them in management.

Most of the fishers (78.4%) got a primary school education only. Since, education is also a predictor of receptivity to new ideas, it may not be easy to introduce new programs to the fishers, so fisheries management programs and promotions involving them should be developed based on visual images rather than text (Swearingen, 2009).

The main sources of family income for fishers (52.9%) in the area, apart from fishing were agriculture and employment. Only 47.1% of fishers depended on fisheries income. For an occupation to be considered a primary source of income >80% of the people should rely on it; thus in PPRB, fishing is a minor or supplementary source income. This indicates that the fishers livelihoods have low reliance on fisheries resources, most likely due to limitations of the resources. Since the sluice's operation, brackish water and marine fish species can no longer migrate into up stream of the Pak Phanang River. This is the main cause of the negative effects on fish catches and family incomes. Consequently, many fishers have given up fishing as their main occupation to engage in other occupations.

Income and the material type of fishers households are indicators of the relative social status within a community and are often used as an indicator of economic status or wealth (Rutstein and Johnson, 2004). Half of entire households (50.1%) had an annual income approximate 663.5 US$ per capita (roughly 30 Thai Baht are equal to 1 US$) below the income per capita (2,936.4 US$ per capita in 2011) and poverty line (960.8 US$ per capita in 2011) of Nakhon Si Thammarat Province. However, total income was not only generated by fishing. Looking at mainfisheries income only the majority (54.3%) was found to be below the poverty line, indicating that full-time fishers in this area are in the poorer part of its population. Moreover, the main house construction materials of fishers, especially floor and wall were mostly lumbers, further indicating their lack of wealth. Income levels and main construction material types can, also be indicators of management effectiveness in the area. If a management program has a positive impact, the gains in incomes should be reflected in the construction materials used, shifting toward higher quality and price levels, e.g., from wood to concrete foundation walls (Bunce and Pomeroy, 2003).

The demographic results were consistent to those studies of Tipkonglart *et al.* (2001) who reported that the majority of fishers were males, middle age or older and primary school of educational attainment. In addition, fishing was a supplementary occupation or secondary source of household incomes for the sluice construction. Similarly Paphavasit *et al.* (2008), reported that in the past 10 years (1997-2007), the people in Pak Phanang River Basin have left the fishing occupation due to decreasing in productivity caused by environmental and resource degradation. They have changed to be general employee occupations because it does not require the capital.

Fishers perceptions of current fisheries management: Based on the interviewing, most respondents (93.1%) received the information on fisheries management in terms of resource conservation and restoration, fishing measures and community fisheries management but 6.9% did not. The interviewees mostly received fisheries management information form village leaders and village committees, especially from interviewees at the mid stream site received the information from village leaders and committees mostly every month. However, the interviewees received the information only a few times per year from public media, such as newspaper and television (Table 7).

Concerning participation, the research results indicated that as stakeholders, the fishers about 92.5% participated in fisheries management while only 7.5% did not. However, the fishers did not fully active participate in decision making and implementation in fisheries

Table 8: WAI of fishers participation in fisheries management within the PPRB, 2011

	Down stream		Mid stream		Up stream			Average	
Levels of participation	WAI	AL	WAI	AL	WAI	AL	F-test	WAI	AL
Participation in decision-making	0.12	LP	0.00	NP	0.00	NP	0.00	0.04	LP
Participation in implementation	0.13	LP	0.00	NP	0.00	NP	0.00	0.04	LP
Participation in benefit sharing	0.93	FP	0.99	FP	1.00	FP	0.01	0.97	FP
Others (fish restocking)	0.97	FP	0.99	FP	0.97	FP	0.52	0.98	FP

WAI = Weighted Average Index; AL = Assessment Level; FP = Fully active Participation; AP = Active Participation; MP = Medium Participation; LP = Little Participation; NP = No Participation

Table 9: Weighted average index of fishers appreciation of fisheries management agencies within the PPRB, 2011

	Down stream		Mid stream		Up stream			Average	
Organizations	WAI	AL	WAI	AL	WAI	AL	F-test	WAI	AL
DOF	1.54	AS	1.79	AS	1.95	AS	0.03	1.74	AS
PCD	0.51	A	0.50	A	0.37	A	0.82	0.48	A
RID	0.31	A	0.08	A	1.05	AS	0.05	0.34	A
CORIN	0.26	A	0.15	A	-0.16	D	0.06	0.13	A
NGOs	0.00	ND	-0.02	D	-0.11	D	0.08	-0.03	D
TAOs	1.14	AS	1.10	AS	1.37	AS	0.55	1.17	AS
Community/fisher groups	1.23	AS	1.02	AS	1.53	AS	0.12	1.19	AS

DOF = Department of Fisheries; TAOs = Tambon Administrative Organizations; PCD = Pollution Control Department; RID = Royal Irrigation Department; CORIN = Coastal Resource Institute; NGOs = Non-Government Organizations; WAI = Weighted Average Index; AL = Assessment Level; AS = Strongly Agree; A = Agree; ND = Neither agree nor Disagree; D = Disagree; DS = Strongly Disagree

management, they only fully active participated in releasing fishes to the river but did not manage it afterwards, particularly interviewees at the mid stream and down stream sites lowly participated in decision-making and interviewers at the down stream site lowly participated in implementation but they did fully participate in earning the benefits of the resources (Table 8). These might imply that the stakeholders do not feel ownership over the resources and management process or they might have no chance and knowledge to involve in fisheries management.

Moreover, there was no formal fisher groups involved in fisheries management at the time. However in some regions along the river, fishers, villagers and village committees set up the informal groups to conduct some fisheries management activities but it has not been much successful because the practices exercised are not consistent and there is a lack of awareness and knowledge to fight against. Examples of the fisher groups, one called Pracha Utid group is set up to manage fisheries resources at the down stream site (i.e., promoting protected area, controlling illegal gears, participating in restocking programs and removing aquatic weeds), chaffer fish prices with middlemen and to negotiate with the Royal Irrigation Department (RID) about the suitable timing of the sluice operation. The members of this group were fishers active in both marine and freshwater areas. Fisheries groups at the mid stream sites are set up as representatives for establishing protected areas and controlling illegal gears, e.g., infront of the temples and in some section of the river and its tributaries and a fishery group is fish processing groups in order to collect fish produce (such as fish paste and dried fish) for middlemen and to bargain prices. Also, a fishery group at the up stream site was set up for taking care protected areas in the villages. However, only few interviewees at mid and up stream sites are members of fishery group. This might because the main occupation of most respondents is in agriculture and hired labor and they perceived fishing as less important.

According to the investigation in the perception of fisheries management agencies, the respondents greatly appreciated the Department of Fisheries (DOF) and the Tambon Administrative Organizations (TAOs), as well as the fisher groups or communities (Table 9). The DOF was seen, as the primary responsible organization in the fisheries management of the area, through increasing fish production by restocking, regulating fishing activities and promoting aquaculture. These activities have led to improvements in fishers livelihoods. The respondents also recorded their strong support for local groups (TAOs, fisher groups and communities) because they felt these groups could negotiate with the RID about opening the gates in a timely manner, bargain with middlemen and understood the problems well and could solve them appropriately. The respondents were also appreciative of the Pollution Control Department (PCD), the RID and the Coastal Resource Institute (CORIN) as their activities could contribute to enhancing fisheries resources and the environment (i.e., through the PCD monitoring water quality, the RID removing knotweeds and the CORIN promoting protected areas).

Also, regarding to the fishers perception of other stakeholders (Table 10), the interviewees responded

Table 10: Weighted average index of respondents' perception of other stakeholders within the PPRB, 2011

	Down stream		Mid stream		Up stream			Average	
Stakeholders/issues	WAI	AL	WAI	AL	WAI	AL	F-test	WAI	AL
Farmers/chemicals, water usage	-0.60	D	-1.21	DS	-0.53	D	0.03	-0.87	D
Fish traders/price	0.69	A	0.58	A	0.63	A	0.86	0.63	A
Consumers/price	0.89	A	0.90	A	0.89	A	0.99	0.89	A
RID/gate operation	-0.17	D	0.33	A	1.32	AS	0.01	0.34	A
CORIN/license, protected areas	0.23	A	0.10	A	0.00	ND	0.48	0.13	A
PCD/water monitoring	0.46	A	0.65	A	0.16	A	0.20	0.49	A
DOF/restocking	1.89	AS	1.79	AS	1.68	AS	0.20	1.80	AS

RID = Royal Irrigation Department; CORIN = Coastal Resource Institute; PCD = Pollution Control Department; DOF = Department of Fisheries; WAI = Weighted Average Index; AL = Assessment Level; AS = Strongly Agree; A = Agree; ND = Neither agree nor Disagree; D = Disagree; DS = Strongly Disagree

Table 11: Weighted average index of perception of fisheries management regulations within the PPRB, 2011

	Down stream		Mid stream		Up stream			Average	
Measures	WAI	AL	WAI	AL	WAI	AL	F-test	WAI	AL
Ban on fishing in protected areas	1.06	AS	1.77	AS	1.79	AS	0.00	1.53	AS
Ban on fishing during spawning season	0.91	A	0.60	A	0.58	A	0.43	0.71	A
Temporary ban during spawning season	0.80	A	0.50	A	0.53	A	0.50	0.61	A
Gear and fishing method restrictions (mesh size, electricity, explosives, etc.)	1.94	AS	1.94	AS	2.00	AS	0.55	1.95	AS
Legal penalty provisions	0.86	A	0.56	A	0.58	A	0.33	0.67	A
Fishing license fees	-0.11	D	0.10	A	0.00	ND	0.64	0.01	A
Restocking fishes	1.94	AS	1.98	AS	1.94	AS	0.52	1.96	AS

Table 12: Weighted average index of fishers appreciation of fisheries management efficacy issues in this area within the PPRB, 2011

	Down stream		Mid stream		Up stream			Average	
Issues of fisheries management	WAI	AL	WAI	AL	WAI	AL	F-test	WAI	AL
Fishing in this area helps improve your life	1.83	AS	1.94	AS	2.00	AS	0.07	1.91	AS
Total quantity of fish catch in this area is increasing	1.89	AS	1.90	AS	1.84	AS	0.86	1.88	AS
Species quantity of fish catch in this area is increasing	1.86	AS	1.88	AS	1.84	AS	0.94	1.86	AS
Number of fishers is increasing	1.26	AS	1.06	AS	0.74	A	0.21	1.07	AS
Fisheries in this area is sustainable	1.83	AS	1.83	AS	1.74	AS	0.73	1.81	AS
Fisheries in this area should be restored	1.83	AS	1.88	AS	2.00	AS	0.28	1.88	AS
Requirement of fish catch increases every year	1.89	AS	1.94	AS	1.84	AS	0.54	1.90	AS
Fisheries management should be cooperative between local people and government agencies?	1.60	AS	1.12	AS	1.00	A	0.08	1.22	AS
Get more benefit by applying co-management for fisheries	1.46	AS	1.54	AS	1.53	AS	0.88	1.51	AS
Protected areas are beneficial for fisheries resource sustainability	1.20	AS	1.40	AS	1.63	AS	0.25	1.37	AS

WAI = Weighted Average Index; AL = Assessment Level; AS = Strongly Agree; A = Agree; ND = Neither agree Nor disagree; D = Disagree; DS = Strongly Disagree

positively to all other stakeholders, except for farmers who the fishers considered used chemicals in agriculture which sometimes were washed into the river, causing fish deaths. The respondents at the down stream site had a negative perception of the RID because when RID officials had opened the gates unannounced, the strong water current had damaged their fishing gear and in particular their gill nets.

In terms of fisheries regulations in the area following the Fisheries Act B.E. 2490 (1947) include fishing bans in protected areas, closed seasons and areas for spawning, periods of closed seasons for spawning, restrictions on fishing gears and methods, the penalty provisions of the law to maintain sustainability of fisheries in the area. The respondents were high perception on fishing bans in protected areas, fishing gear and method restrictions and restocking fishes (Table 11) but the respondents were not willing to pay the license fees, especially the fishers at the down stream site because they had suffered losses in their fishing income and because most of the fish they caught were for sale. Furthermore, the WAI shows that the respondents perceptions at the down stream site on fishing bans in protected areas were lower than the respondents at the mid stream and up stream sites. This could have been because the main income source of the most respondents down stream siteis fishing. Fishing bans in the protected area negatively affect their catch and income.

The investigation of the fishers perception of the outcomes of fisheries management found that their expectations were high (Table 12). The fishers stated that restocking having protected areas and participatory or

Table 13: Weighted average index of fishers opinions on potential activities to maintain aquatic resources in the future within the PPRB, 2011

	Down stream		Mid stream		Up stream			Average	
Activities	WAI	AL	WAI	AL	WAI	AL	F-test	WAI	AL
Fishing only for catch of right size	0.99	H	0.96	H	0.95	H	0.58	0.97	H
No fishing in protected areas	0.69	H	0.71	H	0.61	H	0.58	0.68	H
No fishing in spawning season	0.51	H	0.35	L	0.24	L	0.02	0.39	L
No use of illegal fishing gears	0.96	H	0.81	H	0.74	H	0.04	0.85	H
No fishing of aquatic animals during spawning time	0.66	H	0.32	L	0.16	L	0.00	0.41	L
Releasing fishes to the river	0.83	H	0.74	H	0.71	H	0.19	0.77	H
No discharge of fuel or litter	0.39	H	0.23	L	0.11	L	0.01	0.26	L
Helping government staff take care of fisheries resources	0.57	H	0.50	L	0.47	L	0.14	0.52	H

WAI = Weighted Average Index; AL = Assessment Level; H = High; L = Low; N = No

Table 14: Weighted average index of fishers' opinions on future fisheries management measures within the PPRB, 2011

	Down stream		Mid stream		Up stream			Average	
Future fisheries management measures	WAI	AL	WAI	AL	WAI	AL	F-test	WAI	AL
Setting appropriate fishing gears	0.57	A	0.79	A	1.00	A	0.05	0.75	A
Setting appropriate amount of fishing gears	0.43	A	0.79	A	1.00	A	0.01	0.71	A
Controlling number of fishers	-0.54	D	0.02	A	-0.11	D	0.00	-0.20	D
Controlling fish catches	-0.69	D	-0.33	D	-0.21	D	0.06	-0.43	D
Setting allowed time for fishing	-0.43	D	-0.38	D	-0.37	D	0.95	-0.39	D
Setting aquaculture areas	0.69	A	0.92	A	0.79	A	0.06	0.81	A
Providing aquatic animal species for aquaculture	0.74	A	0.90	A	0.79	A	0.26	0.82	A
Supporting villagers in fisheries management participation (Co-management)	0.83	A	0.75	A	0.95	A	0.17	0.81	A
Establishing more protected areas	0.80	A	0.88	A	0.84	A	0.66	0.84	A

WAI = Weighted Average Index; AL = Assessment Level; A = Agree; N = Neutral; D = Disagree

cooperative management involving the government and the local people could result in increased fish catches and fisher numbers and sustainable development, finally leading to improvements in fishers livelihoods. Moreover, fishers expect cooperative action among government agencies and local groups, especially between the DOF and local groups (TAOs or community or fisher groups). Consequently, the local fishers and other stakeholders should be involved in fisheries management, sharing ideas equally in management at all levels such as planning and decision making. Besides, the fishers particularly at the down and mid stream sites preferred setting up the sluice's operation jointly and/or being informed of its operation times. This would be very helpful to them in terms of choosing fishing times and gears during the periods when the sluices were opened.

Fishers suggestions for future fisheries management: Based on the interviewing, the fishers suggested that fisheries management should be undertaken with strong cooperation between the government and local stakeholders working as partners, especially among the DOF and fisher groups. Restocking fish species, fishing rule enforcement, inspecting protected areas, environmental monitoring, aquaculture promoting and encouraging involvement should be vigorously continued by fisheries management agencies in cooperation with local fishers. The respondents expect some activities and measures in the future, such as no fishing during the spawning season or within spawning grounds and controls over discharging fuel and wastes (Table 13).

However, the respondents disagreed with any future measures (i.e., controlling the quantity of fish catches, number of fishers and time for fishing) and would not participate or cooperate in their implementation. They thought that these measures would affect their fish catches and income. In addition, the WAI of respondents opinions on those measures differed between study sites. The WAI at the down stream site was lower than at the other sites. This might have been because most respondents at that site depend on fishing. They were apprehensive that those proposed measures would affect their livelihood (Table 14). Also, the respondents highly expect to some future fisheries implementations, such as continuously releasing fishes and strong enforcement against illegal fishing methods (Table 15).

Finally for improved fisheries management, a strong participatory program among official organizations and major local stakeholder groups should be designed to ensure that fisheries resources maintenance is harmonized with sustainable use with low or no impact on the environment. Developing strong collaboration among the various stakeholders in the area is the best alternative policy for the future successful and sustainable fisheries management (Pomeroy and Pido, 1995; Doma and Yakupitiyage, 2011). Thus, successful inland fisheries management should promote capacity building in knowledge and awareness of the sustainable use of the resources among all social groups, establishing efficient participatory actions for fisheries and environmental activities.

Table 15: WAI of fishers opinions on potential future fisheries implementations within the PPRB, 2011

	Down stream		Mid stream		Up stream			Average	
Implementations	WAI	AL	WAI	AL	WAI	AL	F-test	WAI	AL
Setting the price of fish catch	0.23	L	0.08	L	0.16	L	0.05	0.15	L
Helping fishers with capital	0.16	L	0.07	L	0.18	L	0.11	0.12	L
Releasing fishes	0.74	H	0.71	H	0.76	H	0.68	0.73	H
Strong enforcement against illegal fishing methods	0.61	H	0.64	H	0.74	H	0.48	0.65	H
Severe punishment of offenders	0.30	L	0.26	L	0.32	L	0.72	0.28	L
Increasing punishment of offenders	0.23	L	0.21	L	0.29	L	0.52	0.23	L
Promoting aquaculture	0.47	L	0.63	H	0.63	H	0.13	0.57	H
Training and orienting in caretaking of resources	0.53	H	0.54	H	0.47	L	0.47	0.52	H
Establishing protected areas	0.47	L	0.50	L	0.53	H	0.69	0.50	L

WAI = Weighted Average Index; AL = Assessment Level; H = High; L = Low; N = No

Participatory Rural Appraisal (PRA): Based on the PRA, the results showed general status that the geography of the study area was generally lowland and mostly consisted of rubber plantation, palm tree, paddy field, annual crops and peat swamp forest. Almost villagers migrated from other regions to settle and to work in agriculture. The main occupations of communities were gardening, planting, rice farming, employing, handicraft making and livestock rearing. The supplementary occupations were fishing, small trading, government service and aquaculture. The majority status of households were moderately and rare wealthy. Traditions concern dealing with southern Thai Buddhist festivals including Thai new year festival, Pulling the Buddha festival, the festival of the 10th Lunar month and Kathina ceremony. Gender roles, the men had the role more than women in general, especially labor use of occupations. The main problems of communities wereutilized land, property and fishes decline and sedimentation after sluice operation, particularly at the down stream and mid stream sites. To solve these problems, community suggested that government should clearly characterize between national park and utilization areas, as well as should commit the property document to solve the land property problem. Also, more oftentimes opening of the Uthokvibhajaprasid Sluice, fish restocking, canal dredging and illegal fishing controlling should be done to mitigate fisheries resource problems with the community's participation.

Referring fisheries activities, the vehicle types used for fishing in the study area were mostly paddle boats and motorized boats. Types of fishing gears used were gill nets, traps, cast nets, hooks, spears, lift net and coop. The most popular gears used were gill net, trap and cast net, depending on the area and season. The fishers normally employed fishing gears throughout the seasons and tended to increase activities during the rainy season. The fishing gears used were similar to that in the study of Tipkonglart *et al*. (2001) and Assava-Aree (2004). The normal species caught were giant river prawn, the bronze featherback fish and common snakehead fish, depending on the sections of the river.

Concerning the number of fish caught, fishers complained that this had dramatically decreased, since the sluice activation leading to a decline in fishing income and thus, forcing fishers to leave their traditional occupation, especially fishers at the down stream and mid stream sites. These sites are located near the sluice site and most directly affected by the sluice operation. However, the fisheries groups at the up stream sites were more distant from the dam site, thus suffered less direct impact than the aforementioned groups. The leaving of fishers related to study of Tipkonglart *et al*. (2001) reporting that the number of fishers had considerably decreased due to the decline in livestock reproduction after closing the sluice and that they changed from their major occupation of fishing of supplementary fishing as the profitability of fishing dwindled. Since the sluice construction, the number of active fishers has shrunk from 1,388 persons in 2001 (Tipkonglart *et al*., 2001) over 587 in 2004 (Assava-Aree, 2004) to just 199 in 2007 (Sakset, 2011). This indicates the weakens fisheries resources and decrease importance, as well as unsuccessful management. Bunce and Pomeroy (2003) mention that increase in number and/or percentage of people working in fisheries over time indicate that the importance of the resources is also increasing.

In views offishing factors, the informants said that most variations of fishing around the year depended on the seasons, sluice operation and fishing experience. The sluice operation usually relates to seasons; it is normally closed during the dry, early rainy seasons to retain fresh water and opened during the heavy rainy season to resolve flooding. The fish catch was rich during the rainy seasons and poor during the dry season. The experience would also influence the fish catch success. Fishers more skilled in using fishing gears and better acquainted to fishing grounds, often make a richer fish catch. In terms of fish utilizations, the fishers fish mainly for home consumption. If a surplus remains, they sell fresh fish or process it to other products, mostly fish paste and dried fish for own consumption and selling what remains.

Focus on fisheries problems and solutions, the informants thought that the main threats to fisheries resources in the area were related to 2 aspects. The 1st aspect concerned environmental problems, such as deteriorating water quality and the proliferation of aquatic weeds. The 2nd related to biological problems like fish decline and sometimes fish deaths. These problems were also mentioned by who reported that the aquatic animal abundance was drastically reduced in terms of fish catch because of the lack of water flow from the sea into the Pak Phanang River, especially at the down stream and mid stream sites, aquatic weeds blocking the water ways and stagnant and smelly water in various areas, as well as pollution from chemicals and shrimp farming.

Summarizing the results of informants opinions of fisheries resource conditions, they complained that the fish stock had been in severe decline, since the sluice began operating, especially brackish water species such as mangrove crab and mullet fish. This decline had affected their fisheries income. The respondents at the down stream and mid stream sites complained that their income from fishing had decreased sharply following the sluice's construction while the respondents at the up stream site had felt little impact, may be because this site is far the sluice's affection and the respondents have other main income sources, such as agriculture and gardening. Although the decline affects their livelihood, most of them break even in their fishing activities, at least at the household consumption level. However, the opinions of informants at the mid stream and up stream sites on the whole picture indicate that the aquatic environment and animal status were both slightly good whereas it was bad at the down stream site.

To solve these problems, the villagers have suggested as a possible solution that the DOF should release fish stock at up stream and after the rainy season to increase fish survival and that the RID open the gate more frequently to allow water flow gradually to prevent fish death, as well as the Pollution Control Department (PCD) has been monitoring the water quality. However, the informants answered that there was no agency to solve the problems in the area consistently and that there should be established a responsible agency for comprehensive solutions.

In terms of fisheries management, the informants perceived that DOF is the major organization for fisheries resources management within the area that increases fish production by means of restocking fishes, regulating fishing gear, restricting fishing seasons and areas, prohibiting destructive fishing methods and promoting aquaculture. The informants were aware of these regulations and they had received this information from government officials, village leaders and friends. Moreover, the fishers appreciated the value of their fisheries resources and wished them to be sustainable used. To maintain the resources, the respondents suggested that restocking should be the top priority, followed by removing knotweeds and addressing poor water quality.

Also, referring fisheries management problems and solutions in the area, the informants pointed out to 2 main aspects; the 1st problem was the weak implementation of authoritative agencies, especially controlling illegal gears from outside fishers and the 2nd problem was the poor participation of local stakeholders in fisheries management. The stakeholders or villagers do not fully participate in decision making. They only participated in releasing fish fry into the river and did not manage more after releasing. Although, DOF has promoted co-management and decentralization of fisheries resources management all over the country, the policies are still not effective in Pak Phanang River Basin. To solve these problems, people suggested that collaborative groups among official agencies should be established and local stakeholders should be involved more consistently in fisheries management.

CONCLUSION

The current fisheries management in the PPRB is still in the hand of government agencies. It can be viewed, as the centralized approach. The fishers and stakeholders are less involved in management. Moreover, there is a lack of information integration and lack of collaboration among those agencies and stakeholders affecting ineffective management. In general, effective management not only depends on the capacity and working strategies of the organizations but also depends on the communities capacity and participations. The fishers have positive attitudes towards authorized agencies, fisheries measures, laws and implementations and they are willing to participate in fisheries management. Thus, the government agencies should allow them to find solutions to the problems in their own area and let them take part in management plans and implementations in the aquatic resources. This would be beneficial for fisheries management. Therefore in the management of fisheries resources in the future, the government agencies and local people should closely collaborate.

RECOMMENDATIONS

Furthermore based on the findings, the following practical activities in the area are recommended to achieve

the sustainable use of the fisheries resources in terms of ecological integrity, social equity and management efficiency.

Management programs on fisheries resources: According to fisheries resource degradation, fishers perceptions and opinions on fisheries resources and the environment should be regularly assessed to provide useful data to be used in decision-making in fisheries resources management. Such information can help fisheries managers better understand the current conditions of the fisheries resources, the aquatic environment and fishers. The managers can provide effective activities and guidelines in the management systems. Loading of chemical fertilizers and pesticides from farming areas is one of the major causes of fish deaths in the study area. Controlling and minimizing the usage of these materials should be encouraged and organic fertilizers and pesticides should be promoted. People's awareness of the environment should be increased through information campaigns. Also, regular monitoring of water quality should be carried out in the interests of good public health. The responsible agencies for this activity should be the DOF, the PCD, the Department of Agricultural Extension (DOAE) and communities or fisher groups and farmers. Moreover, restocking programs of aquatic animals or fishes (both commercially important and rare species) should be continuously conducted in order to increase fish production and diversity and the fishing income of fishers. The species introduced in the area should be based on fishers request and suitable for the aquatic environmental conditions, such as giant freshwater prawn and Nile Tilapia. This practice should be undertaken by the DOF and fisher group or the TAOs.

Enhancement programs on the socio-economics of fishers: Due to the fish catch decline and the subsequent low fishing income, aquaculture in ponds and cages should be promoted to provide a good source of income for fishers to alleviate the poverty of fishers and to decrease the pressure on natural resources in the area. Some examples of species which should be cultured are giant freshwater prawn, tilapia and climbing perch. In addition, other income sources such as handicrafts and alternative fish processing that can add value to their products should be promoted in order to increase fishers income. Responsible agencies for such activities should be the DOF, the Community Development Department (CDD) and the fishers themselves.

Institution establishment: An institution of cooperation among users (such as fishers groups and communities) and government organizations (such as the DOF and the RID) should be established. Also, the participation of local people/fishers/stakeholders and local authorities should come with the empowerment to contribute to the process of planning and decision-making in natural resources management. The institution can build inter relationships with various sectors of the resource usages and can better implement the existing policies.

ACKNOWLEDGEMENTS

Researchers gratefully acknowledge financial support from Department of Fisheries of Thailand, Ministry of Agriculture and co-operatives and all informants.

REFERENCES

Assava-Aree, A., 2004. Fishing effort in Pak Phanang river and its tributary. Technical Paper No.22/2004, National Institute of Coastal Aquaculture, Department of Fisheries of Thailand.

Ban, N.C., G.J. Hansen, M. Jones and A.C. Vincent, 2009. Systematic marine conservation planning in data-poor regions: Socioeconomic data is essential. Marine Policy, 33: 794-800.

Bunce, L. and B. Pomeroy, 2003. Socioeconomic monitoring guidelines for coastal managers in Southeast Asia. World Commission on Protected Area and Australian Institute of Marine Science, Townsville, Australia, pp: 85.

Chesoh, S. and A. Lim, 2008. Forecasting fish catches in the Songkhla Lake basin. Sci. Asia, 34: 335-340.

Doma, D. and A. Yakupitiyage, 2011. A policy alternative for lagoon management: Case study of Sre Ambel coastal marine fisheries, Cambodia. J. Coastal Conserv., 15: 23-35.

Hab-erl, H., V. Gaube, R. Diaz-Delgado, K. Krauze and A. Neuner *et al*., 2009. Towards an integrated model of socioeconomic biodiversity drivers, pressures and impacts. A feasibility study based on three European long-term socio-ecological research platforms. Ecol. Econ., 68: 1797-1812.

Kim, D.H. and C.I. Zhang, 2011. Developing socioeconomic indicators for an ecosystem-based fisheries management approach: An application to the Korean large purse seine fishery. Fisher. Res., 112: 134-139.

Miah, A.Q., MA.B.K. Miya and H.R. Simpson, 1993. Applied Statistics: A Course Handbook for Human Settlements Planning. Asian Institute of Technology, Bangkok, Thailand, ISBN: 9789748209685, Pages: 384.

Paphavasit, N., S. Siriboon, A. Piumsomboon, P. Sojisukorn and A. Sivayapram, 2008. Stability assessment of the estuary ecosystems, Pak Panang Bay, Nakhon Si Thammarat province. Ministry of Natural Resources and Environment and Chulalongkorn University, Bangkok.

Pinto, R., J. Patricio, J.M. Neto, F. Salas and J.C. Marques, 2010. Assessing estuarine quality under the ecosystem services scope: Ecological and socioeconomic aspects. Ecol. Complexity, 7: 389-402.

Pomeroy, R.S. and M.D. Pido, 1995. Initiatives towards fisheries co-management in the Philippines: The case of San Miguel bay. Marine Policy, 19: 213-226.

Prabnarong, P. and J. Kaewrat, 2006. The Uthokawiphatphasit Watergate: A man-made change in Pak Phanang River Basin. WJST, 3: 131-143.

Rutstein, S. and K. Johnson, 2004. The DHS wealth index. DHS Comparative Reports No. 6. Calverton, ORC Macr, Maryland, USA.

Sakset, A., 2011. Biophysical and Socio-economic assessment for fisheries management in the freshwater fishing area in Pak Phanang River Basin, Nakhon Si Thammarat Province. Ph.D. Thesis, Asian Institute of Technology, Pathumthani.

Swearingen, M.K., 2009. Teacher-efficacy and cultural receptivity as predictors of burnout in novice urban teachers after one year of teaching. Ph.D. Thesis, Florida State University, Tallahassee, FL.

Tipkonglart, N., S. Khwanmoung and S. Thipayawong, 2001. Surveying on fisheries status in Pak Phanang River. Extension Paper No. 1/2001, Department of Fisheries of Thailand, Nakhorn Si Thammarat.