



*Strengthening local capacity
in the economic analysis
of environmental issues*

The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries (i.e., Cambodia, China, Indonesia, Lao PDR, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, and Vietnam.) It aims to strengthen local capacity for the economic analysis of environmental issues so that researchers can provide sound advice to policy makers.

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How to Make Shrimp Fishing More Sustainable: A Study from Thailand

Southern Songkhla Lake lies on the eastern coast of Southern Thailand. Many fishermen in the area rely on catching shrimp for their livelihood. However, the lake has seen dramatic reductions in shrimp catches in recent years. This is primarily due to poor water quality and overfishing. A new EEPSEA study has looked at what kind of shrimp management practices might make fishing in the lake more sustainable. The study is the work of a team led by Kunlayanee Pornpinatepong from Thailand's Prince of Songkla University.

The study analyzed fishermen's responses under high and low fish stocks that arise due to seasonal changes in the salinity of the lake. It found that a co-management policy led to better results than imposed external regulation. This was true both in terms of reducing extraction levels and ensuring resource sustainability.



A summary of EEPSEA Research Report No. 2013-RR2: 'Response of Fishermen to Fishing Control Policies in Southern Songkhla Lake, Thailand: A Field Experiment' by Kunlayanee Pornpinatepong, Pathomwat Chantarasap, Juntip Seneerattanaprayul, Wittawat Hemtanon and Papitchaya Saelim. Comments should be sent to Kunlayanee Pornpinatepong, Department of Economics, Prince of Songkla University, Hat Yai, Songkhla, Thailand 90112.
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The study also found that there was significantly less violation of environmental regulations when individual transferable quotas (ITQs) were used as compared to the use of individual quotas (IQs). The ITQs provided more flexibility for fishermen who wanted to increase their extraction while still following conservation guidelines. Therefore, ITQ implementation is recommended but with appropriate penalties for fishing violations.

Southern Songkhla Lake

Southern Songkhla Lake is the southernmost of the three lakes that make up the Songkhla Lake lagoon system. This system covers an area of about 180 km² with brackish to salty water. It connects to the Gulf of Thailand at Songkhla Town.

Overfishing can be partly blamed for the recent steep decline in shrimp production at the lake. Overfishing in the lake can be observed in the increase in the use of standing traps from 8,500 units in 1997 to 23,150 in 2010 - an overall increase of 120% per year. Over 40% of the families around the lake mainly rely on fishing for their livelihood. Therefore, they are directly affected when overfishing reduces fishing production.

For more than 20 years, there have been attempts to use regulations to control the exploitation of the aquatic resources in the lake. These regulations have involved both prohibiting the use of destructive fishing equipment and imposing restrictions on how allowable fishing traps could be used. However, the regulations have not been effective due to poor enforcement.

Finding a solution to the overfishing challenge

When it comes to creating workable conservation regulations, shrimp fishery in Southern Lake presents two important characteristics. First, it is physically or legally impractical for one person to maintain exclusive use over the fishery area. Second, the catch taken by one fisherman affects the current productivity of other fishermen as well as the future productivity of all fishermen because of its negative effects on the shrimp stock.

If a natural resource such as Southern Lake is open to all, each user will exploit it as much as he can because any self-restraint on his part will merely make more resources available for others to exploit. This kind of issue is known as a collective action problem.

To get much-needed information on what kind of conservation approach might work, the study conducted a series of field experiments to see how fishermen would respond to four possible management policy options: external regulations with either ITQs or IQs, and co-management with either ITQs or IQs. Co-management refers to a management model that involves fishermen in the decision-making process. The ITQ system offers fishermen the opportunity to trade their own quotas, which gives them greater flexibility to increase or reduce their extraction levels.

The analysis examined fishermen's responses under high and low fish stocks that arise due to seasonal salinity in the lake.

Using 'experimental games' to observe response to policy changes

The study's field experiments comprised of a series of 'experimental games'. These involved 205 shrimp fishers who use standing traps in Southern Songkhla Lake. These fishermen were selected as target respondents as standing traps are the most prevalent fishing device used in the lake.

To choose an appropriate sample of participants, seven fishing villages from the four districts around Southern Lake were selected as representative communities: Pak-ro, Pa-khat, Sathing-mo, KoYo, Ku-tao, Bang-riang, and Khuan-so. The experimental sample was then randomly selected from the households of fishermen who owned more than ten fishing traps and who had more than two years experience fishing with traps.

The experimental games were conducted in two phases. Players were divided into groups of five to participate. No rules were imposed during the first phase, which consisted of 10 rounds. In every round, each player had to decide on a level of extraction ranging from 1 to 8 units. Their decisions generated points, which were converted to monetary units that each player received.

To highlight the dilemma of common-pool resources and the trade-off between individual and social benefits in Southern Lake (i.e., the fact that individual payoffs depended not only on individual decisions but also on the group decisions and the stock of shrimp), the share of shrimp received by each fisherman was divided into two clusters. If the sum of the level of extraction of the group was more than 10 in low salinity condition and more than 20 in high salinity conditions, the shrimp share was deemed to be low due to overfishing.

The shrimp share was high if the sum of the levels of extraction of the group as a whole was less than 10 in low salinity conditions and less than 20 in high salinity conditions.

Simulating external regulation options

Following the first 10 rounds, the groups played a second phase of another 10 rounds. One set of groups continued playing under the same assumptions and rules as in the first phase. This enabled the researchers to see what would happen if no attempt was made to regulate the long-term use of the fishery resource in the lake.

Two sets of groups played using rules that simulated the situation under external government regulation. Each fisherman was allotted an extraction quota of two units under the low salinity situation and four units under high salinity conditions. One group of players was allowed to sell their quotas to other fishermen or to the government to simulate the situation with ITQs. Another group of players was not allowed to sell their quotas to simulate the situation with IQs.

Simulating government monitoring

To simulate the real-life situation where government rules are not enforced across the board, imperfect monitoring was simulated using 10 balls: nine white and one red. During each round of the game, each player

blindly picked a ball from a box and the one who picked the red ball was inspected. If the individual inspected was found to have violated the rules, he would have to pay a fine.

Simulating co-management option

Two other sets of groups played using rules that simulated the situation under co-management. Under these rules, the group received extraction quotas of 10 units per group under the low salinity situation and 20 units per group under the high salinity situation. Before starting the second phase, group discussions took place which covered how the initial quotas would be distributed; the penalty system for individuals who violated the rules of extraction for their group; and how the quotas received could be transferred if the fishermen wished to do so (this was omitted in the case of IQ).

After the group discussion, the group members made their private decisions about their level of catch extraction. The total extraction level was then announced and everyone was told what his payoffs would be. The moderator then had another minute to talk to the group to confirm their rules of extraction. The group is then given an additional minute to discuss any adjustments they felt necessary in the rules of extraction after which the next round would begin. The game would then proceed in this way until all rounds had been played and the game was finished.

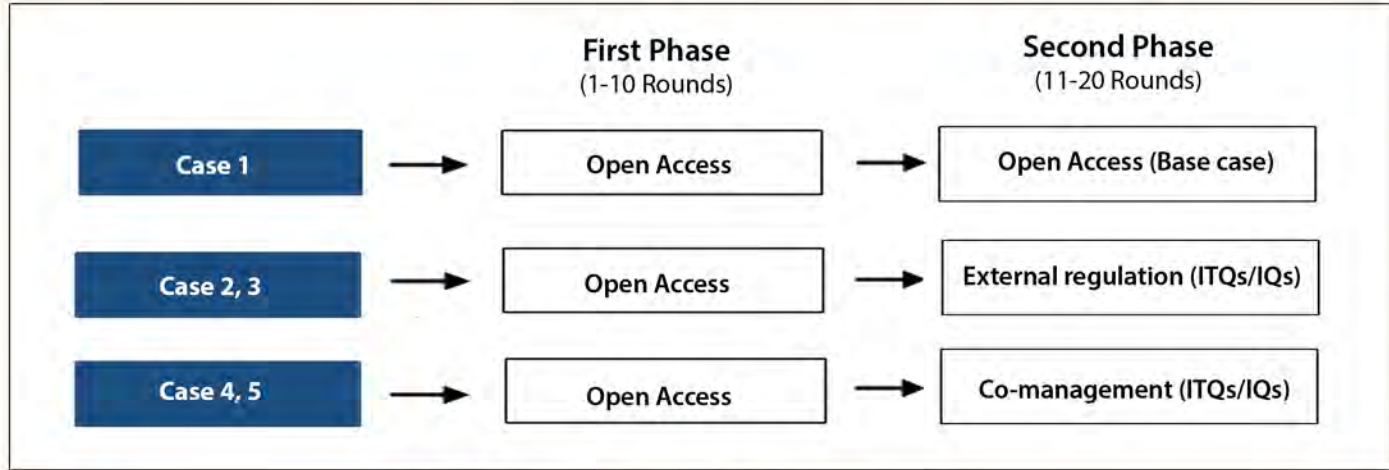


Figure 1. Dynamic component of the experiments

Co-management the best option

The study found that higher fish stocks encouraged fishermen to increase their extraction levels. As expected, the study also showed that co-management has many positive benefits over external regulation. The co-management game phase gave the lowest extraction levels compared to the other options, with the extractions often achieving optimal levels in either high or low stock conditions. Co-management also allowed for community participation in designing fishing rules, which also created stronger social sanctions against violators. Co-management is therefore recommended as the best option for fishing control in Southern Songkhla Lake.

However, the study highlights that the co-management process is more complex to manage than external regulation as it requires greater cooperation among fishermen. It also places some burden on the community, such as the opportunity cost of time used for community management. While most of the fishermen in the study also thought that it is the best system, they felt that it would be very difficult to implement because of the potential resistance from those who wish to fish freely. Therefore, in order to apply the co-management option to a real situation such as in Southern Songkla Lake, there must be solid support from government agencies, particularly during the initial stages of implementation.

The study also found that the external regulation option was better than status quo as it would at least reduce the overall extraction and improve sustainability when compared to the open access situation. However, in order to be an effective

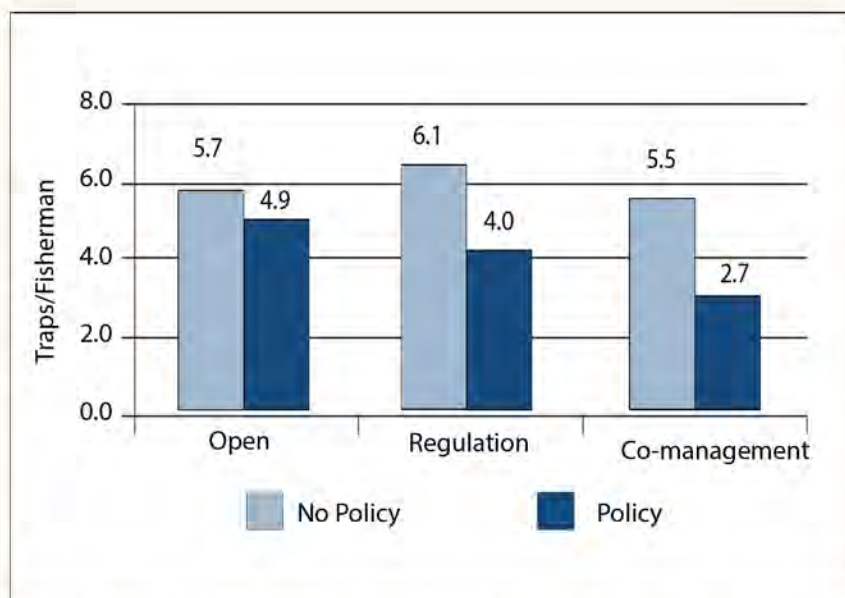


Figure 2. Average extractions for each management option compared with open access

control measure, external regulation would require strict monitoring, particularly during the high-salinity, high-stock season. In addition, an appropriate fine system would have to be specified. It would have to be set at a level that would be high enough for effective fishing control.

Which are best: ITQs or IQs?

When comparing tradable and non-tradable quotas, the study recommends ITQs for either the external regulation or co-management option. Analysis confirmed that there were significantly less regulatory violations under the ITQ scenarios. ITQs also provided more flexibility for the fishermen who wanted to increase their extraction levels.

However, the study cautions that the level of any fines for regulatory violations need to be carefully specified and that these should not be lower than the value of the quotas traded in the market. It also recommends that, in order to apply a quota system for Songkhla Lake,

further studies are required. These should examine various factors, especially the distribution of quotas at the initial stage of implementation. The study concludes that any potential new system needs to be fair to everyone in the community.

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