

## Property Rights in Thai Fisheries

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### ABSTRACT

*Lack of well-defined property right in Thai fisheries resulted in an overfishing in the Gulf of Thailand. Department of Fisheries put effort on controlling the number of fishing vessels targeting at the buy back scheme, nevertheless not successful. Thai fisheries were dualistic. Eighty percent of catches were from commercial scale fisheries while the rest were from small-scale coastal fisheries. On the contrary eighty percent of fishing vessels were small-scale while twenty percent were commercial scale. Fishery resource degradation pushed a number of fishing vessels outside Thai fishing grounds. Those still fished in Thai waters, realizing the problems, were developing schemes for resource rehabilitation and joint efforts on fishery management. This paper reviewed the success and failure of adopting property right in Thai fisheries, commercial as well as small-scale coastal fisheries.*

### Thai fisheries

Thai fisheries started from stationary gears such as bamboo stake trap to catch Indo-Pacific mackerel which was the main marine fish food for the Thais. In 1925 Chinese purse seine was introduced. Main catches were pelagic fish. In 1959 Thai fisheries adopted otter board trawling, catching demersal species. The catch per unit effort was 298 kg/hr in 1961. The high profitability led to rapid development in otter board trawling. Number of vessels increased. Nevertheless in the later half of 1960s, catch per unit effort began to decrease. It had been observed that to maintain the fishery resources in the Gulf of Thailand, number of fishing vessels had to be reduced. In 1968 some of Thai trawlers began fishing outside Thai waters. In 1972 Thailand was being one of the top ten fishing nations for the first time, while catch per unit effort for trawling reduced to 63 kg/hr. The Gulf of Thailand had been overfished. Catches of main species had been higher than the over their maximum sustainable yield. During 1970s marine catches fluctuated around two million ton a year, about one-third were from non-Thai waters. Recently fishery resources in the Gulf of Thailand have been degraded. Catch per unit effort reduced to 29 kg/hr. Trawlers of over 18 meter long usually fish in non-Thai fishing grounds.

Panayotou and Jetanavanich (1987) used time series data during 1963 – 1982 to estimate the maximum sustainable yield (MSY) and maximum economic yield (MEY) for fisheries in the Gulf of Thailand. At maximum sustainable yield in the fixed price Gordon-Schaefer model, the fishing effort was estimated to be 15.2 million standard fishing hours with a catch of 958 thousand metric ton. The revenue would be €19 million at a cost of €7 million, thus a profit of €12 million annually. At maximum economic yield, the fishing effort should be 11.8 million standard fishing hours at a catch of 900 thousand metric ton. The revenue would be €105 million at a cost of €1, thus a profit of €104 million. Nevertheless the actual catch in

1982 was one million ton; greater than both the catches at MSY and MEY while the actual fishing effort was higher being 19.2 million standard fishing hours, with revenue of €124 million and a cost of €94 million, thus lower profit of €30 million. Compared to MEY the fishing effort was 62.71% greater, while the catch was only 11.1% higher than at MEY. The revenue was 18.07% higher but the cost was 84.59% higher, resulting in a 44.16% lower profit. (Details are in Table 1.)

**Table 1 Overfishing in the Gulf of Thailand**

Item	Effort mill.st.hr.	Catch th.ton	Revenue mill.EU\$	Cost mill.EU\$	Profit mill.EU\$
1963-1982 MSY	15.7	958	119	77	42
1963-1982 MEY	11.8	900	105	51	54
1982 ACTUAL	19.2	1000	124	94	30
<i>(%Change of ACTUAL compared to MEY)</i>	<b>62.71</b>	<b>11.11</b>	<b>18.07</b>	<b>84.59</b>	<b>-44.16</b>
1971-95 MSY	34.76	993	133	48	84
1971-95 MEY	28.74	960	128	40	89
1995 Actual	56.62	896	120	79	41
<i>(%Change of ACTUAL compared to MEY)</i>	<b>97.01</b>	<b>-6.67</b>	<b>-6.71</b>	<b>98.99</b>	<b>-54.00</b>

Source: Calculated from Panayotou and Jetanavanich (1987) and Boonchuwongse and Dechboon (2003)

Later Boonchuwongse and Dechboon (2003) used the time series data during 1971 – 1975 employing Gordon-Schaefer fixed price model to re-estimated MSY and MEY. Relying on the new data set, at MSY the fishing effort was 34.76 million standard fishing hours with a catch of 993 thousand ton. The revenue was €133 million at a cost of €48 million, thus a profit of €84 million. At MEY the fishing effort would be 28.74 million standard fishing hour with a catch of 960 thousand metric ton. The MEY revenue was €128 million and a cost of €40 million, thus a profit of €89 million. The MSY and MEY efforts were higher compared to the 1963 – 1983 estimation. In 1995 the actual fishing effort was 56.62 million standard fishing hours with a catch of 896 thousand ton. The 1995 revenue was lower being €120 million at a higher cost of €79, thus lower profit of €41 million. Compared to MEY the effort was 97.01% higher while the catch was 6.67% lower. The revenue was 6.71% lower and the cost was 98.99% higher while the profit was 54.00% lower, indicating overfishing in the Gulf of Thailand with a worsen situation and the previous one.

In 2000s realizing the overfishing in the Gulf of Thailand, Department of Fisheries put the effort on fishing capacity reduction, with the emphasis on vessel buy back program.

### **Thai marine fishing units, crews, households and employees**

For fishing capacity reduction, it is necessary to know the numbers of fishing units, crews, households and employees. One of the problems in Thai fishery management lied in the lack of information on these numbers since not all the vessels were registered. Department of Fisheries attempted on getting total registration for several times. Nevertheless due to lack of effective control, there were unregistered fishing vessels. Recent attempts included the establishment of provincial fishery committee targeting at controlling number of vessels and the construction of new vessels.

Lymer, Funge-Smith, Khemakorn, Naruepon and Ubolratana (2008) estimated the total fishing units to be 71,484. 83% of them were small-scale fisheries without boat (5%), with non-powered boat (4%), with outboard engine boat (66%), less than 5 GT vessel (5) and 5 – 10 GT vessel (3%). The rest 17% were large scale fisheries with 5% 10 – 50 GT, 6% 20 -50 GT, 1% 50 -100 GT, and the rest were 200 – 500 GT (59 units) and over (2 units). These large scale fisheries fish in non-Thai waters, while small scale fisheries using 1 – 3 crews per unit fish in the Gulf of Thailand and along Andaman coastlines. In term of household, 93% were small scale; only 7% were large scale. Nevertheless, in term of employee, 56% were small scale while 44% were large scale. (Table 2)

The first three groups in small-scale fisheries mainly used manual collective and simple fishing gears along the coastlines. Most of the outboard engine fishing vessels used gill net. For 5 GT and 5 -10 GT, most of them were trawlers, push netters, and anchovy fisheries. Recently most of large scale fishing vessels did not fish in the Gulf of Thailand due to the unprofitability as fishery resources had been degraded. For employees, the first three groups in small scale fisheries were owner operators.

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**Table 2 Thai marine fishing units, crews, households and employees**

<b>Item</b>	<b>Vessels</b>	<b>Crews/vessel</b>	<b>Households</b>	<b>Employees</b>
w/o boat	3,763	1	3,550	4,962
Non-powered	2,876	1	2,559	3,282
Outboard engine	47,457	2	41,225	71,386
< 5 GT	3,336	2	3,249	6,170
5-10 GT	2,709	3	2,760	8,429
<b>Total small-scale</b>	<b>60,141</b>		<b>53,343</b>	<b>94,229</b>
10-20 GT	3,378	7	1,994	9,957
20-50 GT	4,667	10	1,340	12,597
50-100 GT	2,799	13	517	10,682
100-200 GT	438	22		
200-500 GT	59			
>500 GT	2	26	607	40,675
<b>Total large-scale</b>	<b>11,343</b>		<b>4,458</b>	<b>73,911</b>
<b>TOTAL</b>	<b>71,484</b>		<b>57,801</b>	<b>168,140</b>

Source: Lymer, Funge-Smith, Khemakorn, Naruepon and Ubolratana (2008)

Tokrisna, Kaoian and Kraimark (2006) estimated the cost and returns from otter board trawlers, pair trawlers, beam trawlers, and push netters in the Gulf of Thailand. For otter board trawlers, the return was lowest for small vessels of less than 14 meter long being 3% or €94/year/vessel. Some of 14 – 18 meter long vessel fished in neighboring country's fishing grounds. Larger vessels fished outside Thai waters. For pair trawlers, due to high fishing costs the rates of return were lower being 10% for 14-18 meter long vessels and 18% for 14-18 meter long vessels. Nevertheless it was as high as 76% for large vessels of longer than 25 meter which fished outside Thai waters. (Table 3)

For pair trawlers, the large fishing vessels of longer than 25 meter long got the highest rate of return (76%). They fished in non-Thai fishing grounds. Those of small size i.e 14-18 meter long had a 18% rate of return while those 18 – 25 meter long received the lowest rate of return of 10%. The investment was highest for this fishing gear. Most of them did not fish in the Gulf of Thailand.

Due to low rate of return, many small otter boars trawlers switched to beam trawlers targeting for small shrimp along the coastlines. Receiving a better price for shrimp, they could survive. Small beam trawler of less than 14 meter long got a 16% rate of return while that 14 – 18 meter long got 15%. Nevertheless the large beam trawler of longer than 25% could not be very profitable with a low rate of return at only 1%.

**Table 3 Investment, catch, revenue, cost and rate of return for Thai fishing vessels in 2005**

Item	Hull €/vessel	Engine €/vessel	Initial investmen t €/vessel	Catch ton/yr/vesse l	Revenue €/yr/vessel	Cost €/yr/vessel	Profit €/yr/vessel	Rate of return %
<b>Otter board trawler</b>								
<14 m	11,380	1,879	13,259	77	23,437	22,843	594	3
14-18 m	22,174	3,286	25,460	177	60,898	43,818	17,081	39
18-25 m	67,095	10,484	77,579	381	81,416	59,293	22,123	37
>25 m	117,920	25,000	142,920	n/a	103,928	77,780	26,148	34
<b>Pair trawler</b>								
14-18 m	69,729	7,408	77,137	228	102,566	87,114	15,452	18
18-25 m	181,766	22,457	204,224	497	156,768	141,997	14,771	10
>25 m	256,197	50,000	306,197	n/a	664,400	377,019	287,381	76
<b>Beam trawler</b>								
<14 m	12,011	2,188	14,199	16	10,837	9,354	1,483	16
14-18 m	18,933	1,969	20,903	35	31,770	27,613	4,156	15
18-25 m	41,985	3,400	45,385	31	69,336	68,866	470	1
<b>Push netter</b>								
<14 m	7,473	1,222	8,694	32	13,336	12,259	1,077	9
14-18 m	13,077	2,337	15,413	73	23,099	20,416	2,683	13
18-25 m	74,762	18,811	93,573	88	54,664	51,483	3,182	6

Source: Calculated from Tokrisna, Kaoian and Kraimark (2006)

For push netter the most profitable one was the 18 – 25 meter long vessel, with a 17% rate of return while small (less than 14 meter long) push netter had 9% and large (longer than 25 meter) push netter had only 6%. This engine fish gear was not allowed within three km from shoreline. Department of Fisheries, considering its being destructive gear did not allow any new registration and preferred to ban this gear. Nevertheless, strong push netter group did not agree to cooperate. There were still a number of push netters along the coastlines. It was observed that once they could make profit, fishing vessel would be enlarged.

Fisheries in the Gulf of Thailand were not profitable. Fishing vessels of larger than 18 meter long sought to fish in non-Thai waters where fishery resources were more abundant. Small fishing vessels would rather shift to other gear or even other non-fishing occupation. Constraints were the investment cost and skill in non-fishing occupation. Department of Fisheries put effort on training and providing low interest rate loan to encourage the moving out of fishing.

### **Thai fisheries management**

Due to ineffective control on vessel registration, Thai fisheries could be considered an open access fisheries leading to rapid increase in fishing effort when resources were abundant and finally overfishing and fishery resource degradation. Main attempts on fishery management had been on renewal resource abundance rather than effective control on fishing effort. Measures included construction of artificial reefs, closed season and closed areas, gear restriction, limited new entry for specific gears, and development of community based/co-management among the coastal fishing villages.

Construction of artificial reefs was intended to limit trawlers and push netters fishing in coastal areas. They also served as fish attractive device to increase coastal fish abundance for small scale coastal fisheries. Closed seasons and closed areas were an effective measures in renewing the abundance of Indo-Pacific chub mackerel which was main marine fish consumed by the Thais. Nevertheless the measures had to be repeated annually. Important gear restriction was ban of trawlers and push netters within three km from shoreline. Nevertheless due to the long coastlines and limited budget and personnel on monitoring and enforcement, this measure had not been very effective. There were also other gear restrictions such as mesh size control, restriction on light luring fishing gears, prohibition on dynamite fishing, and restriction on the size of clam dredge. Limited entry aimed at control on number of trawler and push netter. Due to lack of efficient registration, this measure seemed not to be effective. Community-based/co-management was adopted to strengthen capacity of fishery management among coastal fishing villages, targeting at a better management for small scale fisheries.

Schemes on fishing vessel registration had not been effective. Not all fishing vessels registered. This could be the problem in implementing vessel buy back program. License fees on fishing were low, not reflecting the societal fishing cost. The ineffective control on fishing effort resulted in inadequate property right in Thai fisheries. Those with access to investment could enter fisheries and exploit resource abundance, without any effective control, which

finally led to over fishing and resource degradation. Fisheries in the Gulf of Thailand were the evidence.

Overfishing and degraded fishery resources were the problems. Property right had not been properly defined in Thai fisheries. Inadequate personnel, equipment and budget constrained effective monitoring, control and enforcement. Fishers themselves had not effectively participated in fishery management enjoying reaping out the benefits from fishery resources while they were abundant. Once resources were degraded, large scale fisheries moved to fish in non-Thai fishing grounds where resources were still abundant, continuing making profit from fisheries. Those, mainly small scale fisheries, without this alternative suffered from fishery resource degradation in the Gulf of Thailand.

Thai government, through Department of Fisheries in 2000s put effort on vessel buy back program. The failures in other countries adopting this measure slowed down the plan implementation. Large amount of government budget was also a constraint. Thai fisheries were multi-species and multi-gear. Department of Fisheries preferred vessel buy back program than individual transferrable quota scheme. They considered difficulties in controlling catch volume due to the absence of the vessel log book of multi-species and multi-gear fisheries. Beside landings were scattered. There were over three hundred landing points, public and private, along the coastlines.

Nevertheless in implementing vessel buy back program there was a question on the efficiency on limited entry licensing following the buy back program. Without this effective control, the number of vessels could not be reduced as targeted thus failure in renewal fishery resource abundance. Most of the large scale fishing vessels had been fishing outside Thai waters. If the fishing effort was reduced by the buy back program, the improved resource condition might bring some these vessels back to the Gulf of Thailand. The government had to find effective measures in controlling such fishing effort. During the period of resource degradation, fishers, small scale and large scale, realizing the problem, showed their willingness in collaboration for effective fishery management. For implementation of the buy back program collaboration from the fishers should be sought for better control on limited entry. Realizing their proper right, Thai fishers tended to collaborate.

For coastal small scale fisheries, attempts had been on community-based/co- management. The key was on strengthening fishery management capacity among local community organization. Pilot project had been introduced targeting at dissemination of the success of this scheme among coastal fishing villages.<sup>1</sup>

### **The vessel buy back program**

Department of Fisheries proposed a buy back program targeting at trawlers and push netters since these were non-selective destructive gears in Thai fisheries. As estimated by Department of Fisheries half decrease in number of trawlers and push netters could increase the return by 74%, an estimated increase of €8 million. Nevertheless management criteria

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<sup>1</sup> Details in Tokrisna (2008).

were the effective control in reducing number of fishing vessels, zoning and improved data base for effective control.

### *Effective control in reducing number of fishing vessels*

For effective control on the number of fishing vessels, necessary step was to register all vessels such that unlicensed vessels were to be registered. There should be rigid penalty on the violators including termination on those without registration. Building new vessels should be regulated to control fishing effort. It was proposed that there should be provincial fishery committee in regulation on building fishing vessel to ensure that the effort would not be increased. During the period of development of fisheries in non-Thai fishing grounds, a number of fishing vessels were built for this purpose. Strict control should be implemented. It was also important to classify the fishing vessels in non-Thai fishing grounds from those fishing in Thai waters especially in the Gulf of Thailand. For effective control there should a regulation such that the vessels fishing outside Thai waters could not return to fish in the country.

Licensing system should then be revised for effective control on fishing effort. Licensing fees as well as fees on fishing gears should be revised to reflect the societal cost of fishing in Thai waters.

Effective control on fishing capacity including vessel size, engine power, and mesh size was required for this buy back program in protection against the problems on capital stuffing. Nevertheless government agencies had never been effective on these controls; another question on effectiveness of the high cost buy back program.

To reduce the fishing effort through this buy back program, Department of Fisheries gave priority on trawlers and push netters, on voluntary basis. Training program on alternative non-fishing occupation was planned as well as providing low interest rate loan for small and medium enterprises to assist the retired fishers starting their new occupations.

Financing on the buy back program was expected from tax on fishery export, government budget, a shift from artificial reef program, and licensing fees.

So far this vessel buy back program had been on the stage of preparation, thus had not been implemented. It should be noticed that at present degraded fishery resources and high fishing cost especially fuel cost (not less than half of the total cost), it was not paid for a number of fishing vessels, mainly trawlers, to fish. A number of them turned to other fishing gears adapting their vessels. Those with alternative income earning did not go out fishing. High fishing costs and degraded resources had reduced a number of fishing effort in the Gulf of Thailand, without the vessel buy back program.

### *Zoning*

To renew fishery resource abundance through reducing in fishing capacity, in favor for small scale coastal fisheries who suffered most from resource degradation, zoning was proposed.

The fishing ground would be divided by the distance from shore. Within three kilometers from shore trawlers and push netters would be banned. This regulation had existed but was not adequately effective before the buy back program. Added to this was allowance for single trawlers at the distance at 3 – 6 km from shore, targeting for small scale trawlers. Beyond 6 km from shore all vessels would be allowed. Nevertheless it should be noted that without effective control, a number of large trawler which currently fished outside Thai waters could come back in the Gulf of Thailand upon renewal fishery abundance.

Collaboration should be sought from fishers themselves, large scale or small scale, to protect their fishing right via effective monitoring and collaboration with relevant government agencies on enforcement and control.

#### *Data base and enforcement*

For better control on fishing effort, stock assessment should be undertaken. Information on existing resource condition would be necessary in getting collaboration from the fishers as well as relevant agencies for effective fishery management in Thailand.

Limited manpower in government agencies constrained effective fishery management. Nevertheless once fishing right had been defined, fishermen should be willing to collaborate in protection on their right, thus improve the fishery resource condition. In Thailand there had been several fisherman associations including Thai Fishery Association, Association of Thai Fisheries outside Thai Waters, and Association of Thai Fisheries in Thai Waters, Association of Thai Fishing Vessel Construction, and Association of Thai Seafood Export. Collaboration from these associations would increase effectiveness of Thai fishery management. Collaborations between the public and private agencies should be established for the joint effort on sustainable fisheries in Thailand.

For small scale coastal fisheries, with multi-species and multi-gear fishing, indigenous knowledge on fishery resources should be valued. Fisher folk collaboration could improve local fishery management thus uplifting the living condition of the coastal poor.

Another important criterion was the effective and responsible government agencies in fishery management.

#### **Conclusion**

Lack of well defined property right in Thai fisheries led to excessive fishing effort, overfishing, and fishery resource degradation. To solve the problem Department of Fisheries proposed vessel buy back program to reducing fishing capacity of trawlers and push netters. Half decrease in fishing effort of these vessels could double the returns. Nevertheless there was a need of compensation to the retired fishermen, provision of alternative job opportunities as well as improvement in fishery management capacity among controlling government agencies; otherwise the scheme might fail in improving condition of Thai fisheries.

## References

- Boonchuwongse, P. and W. Dechboon. 2003. Socioeconomic Assessment of Marine Fisheries of Thailand. p.577 – 628. In G. Silvestre, L. Garces, I. Stobutzki, M. Ahmed., R.A. Valmonte-Santos, C. Lachica-Alino, P. Munro, V. Christensen and D. Pauly (eds.). *Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries*. World Fish Center Conference Proceedings 67, 1,120 p.
- Lymer D., S. Funge-Smith, P. Khemakorn, S. Naruepon & S. Ubolratana. 2008. *A Review and Synthesis of Capture Fisheries Data in Thailand: Large versus Small Scale Fisheries*. Food and Agriculture Organization of the United Nations. Regional Office for Asia and the Pacific. RAP Publication 2008/17. 51 p.
- Panayotou, T. and S. Jetanavanich. 1987. *The Economics of Management of Thai Fisheries*. International Center for Living Aquatic Resources Management. ICLARM Studies and Reviews 14. 82 p.
- Tokrisna, R., S. Kaoian and T. Kraimark. 2007. *Strengthening the Capacity in Fisheries Information Gathering for Management (Thailand): Analysis of Employment Opportunities and Mobility in Supporting Fishing Capacity Reduction*. A Report submitted to Department of Fisheries, Ministry of Agriculture and Cooperatives, Thailand. 98 p.
- Tokrisna, R. 2008. *Fisheries Co-management: an Effective Coastal Fishery Management in Thailand*. Presented in XVIII EAFE Conference , Fishery Governance and Cost of Enforcement. Alghero, Italy. 23 – 24 June 2008. 12 p.