FISHING EFFORT REGULATIONS IN THE COASTAL FISHERIES OF THAILAND

by

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ABSTRACT

Over the last three decades, fish production in Thailand has expanded in a very rapid and substantial manner; annual output now exceeds 3 million tons compared with some 300,000 tons in the nineteen sixties. This phenomenal increase can be attributed mainly to the development of otter board trawling operations in the Gulf of Thailand. The demersal resources are now clearly overfished and in need of efficient management and conservation. The paper describes in some detail the legal measures taken by the Thai government to limit and control entry to the fisheries through licensing and other schemes and the steps taken to prohibit the use of certain types of fishing gears and methods and to designate protected areas and species. Attention is drawn to the difficulties often encountered in implementing and enforcing management regulations, mainly because of the lack of sufficient inspectors and of adequate monitoring and enforcement infrastructures. Other major issues in fisheries development are also examined, including means of encouraging marine fishermen to transfer to other occupations, for example, aquaculture, and the diversification of economic activities in fisheries communities through the promotion of processing for export and involvement in the rapidly expanding tourism sector.

1. Introduction

The Thai fishing industry as a whole is very complex. It involves a large number of species, a variety of fishing gears and both tropical capture fisheries and aquaculture, which in total yield over 2.5 million metric tons (mt) per year. Commercial marine capture fisheries in the Gulf of Thailand contribute most to this production.

Both the marine fishing and fish processing industries have contributed to an increase in the supply of fisheries products both for domestic consumption and export. Total fisheries production in 1990 was 2,786,400 mt, of which 84.8% came from marine capture fisheries, 10.6% from coastal and freshwater aquaculture and 4.6% from inland capture fisheries. Of this, approximately 25% was utilized for domestic consumption, 41% was converted to fishmeal, and 34% was frozen, canned, dried or processed into other fisheries products. The processed fisheries products, totalling approximately 904,973 mt and valued at 61.1 billion Baht (equivalent to 2.45 billion US$), were exported to countries in Asia, Europe and North America. The introduction of otter board trawl fisheries in 1960 was largely influential in a 46 fold increase by quantity in exports of Thai fisheries products, representing a 92 fold increase in terms of current values.

The steadily mounting demand for fish, for domestic consumption as well as for export, has both directly and indirectly resulted in an increase in the efficiency of fishing, particularly in the number and size of fishing boats and gear. Improvements in post-harvest
technology have also played a key role in minimizing losses in marine landings caused by inefficient handling and processing. Up to 1960, the total annual marine catch remained more or less stable at around 150,000 mt. There was then a spectacular increase in landings which reached 1.5 million mt by 1972 and 1973.

Notwithstanding certain annual fluctuations the marine catch has continued to rise and now represents 90% of the total fisheries production despite remarkable increases in aquaculture production in the meantime. Increases in marine landings since 1982 arose mainly from greater pelagic catches in the Gulf of Thailand and catches by Thai trawlers from outside Thai waters., resulting from bilateral fishing agreements. The relative decline in marine landings in 1984 and 1988 was the direct result of decreased fishing effort caused by the enforcement of EEZ by the neighbouring countries. In 1991, the total fisheries production was estimated at 3.06 million mt, of which 2.65 million mt came from marine capture fisheries, 0.30 million mt from coastal aquaculture, 0.17 million mt from inland capture fisheries and 0.10 million mt from freshwater aquaculture.

The phenomenal increase in marine landings over the last three decades can almost exclusively be attributed to the rapid development of otter board trawling on a commercial scale in the Gulf of Thailand. Since 1972, Thailand has been constantly ranked among the world’s top ten major fishing nations and several thousand trawlers have been operating along the entire coast of Thailand and in neighbouring countries both in the Indian and Pacific Oceans. Three types of trawlers are operated in Thai fisheries, namely, otter board trawlers, pair trawlers and beam trawlers. Most of the demersal fishes are caught by either otter board trawl or pair trawl, while the latter also catch pelagic species by mid-water trawl; beam trawlers fish mainly for shrimp in the inshore waters. A large majority of these are otter board trawlers of less than 14 m in length. As such trawlers normally fish in inshore waters shallower than 50 meters, it can be assumed that the most intense trawl fishing is concentrated within the inshore areas along the coastline. Only 189 otter board trawlers (i.e., only 2% of the total otter board trawler fleet in 1984) were of 25 meters or more in length, which are capable of operating further offshore or in deeper waters.

The present level of exploitation of demersal fisheries resources in the inshore waters of the Gulf of Thailand up to 50 meters depth is higher than the estimated Maximum Sustainable Yield (MSY) for this area (about 750,000 mt per year). It is clear that this overfishing is brought about by the intensive trawl fishing in the area and that it is the root cause of the current difficult fishery situation. The current situation is clearly reflected in the index of abundance or catch per unit effort which has measurably decreased in recent times. At the same time, the amount of trash fish in the demersal catches has proportionately increased significantly. Immediate action is therefore needed to tackle these problems and to conserve the resources through such measures as reduced fishing effort and intensity, and by further promoting cooperation between fishermen, the Fishery Association of Thailand and the Department of Fisheries. Fisheries management practices to conserve marine resources in Thai waters also need to be further improved and existing fishery regulations more strictly enforced.

This paper analyses the measures taken by the Government of Thailand to: (i) control and limit entry into fisheries; (ii) encourage exit of fishermen from fisheries into alternative livelihood practices; and (iii) promote economic diversification of fishing communities in order to reduce their dependency on fishing for their livelihood.
2. Limiting Entry into Fisheries

The marine capture fisheries of Thailand presently face many problems arising from enforcements of EEZ resulting in a reorientation/re-alignment of normal fishing grounds and a resultant decrease in available marine resources. In addition, the excessive fishing effort and the types of fishing gear used by trawlers often cause conflicts with the local fishermen because of encroachment into their traditional fishing grounds and the destruction and interference it causes to the small-scale and fixed fishing gear. The Government of Thailand in 1977 therefore requested the Food and Agriculture Organization of the United Nations for assistance to assess the expected impacts of the establishment of EEZ on fishing and the fishery industry in Thailand; advise on the policy options open to the Government, including possible cooperation and joint fishery ventures with neighbouring coastal states; and suggest mid- and long-term proposals that would help in maintaining or increasing fish production in the country. Subsequently, the Thai Cabinet adopted a resolution on 5 September 1978 to take measures to control and reduce the number of fishing trawlers and push nets.

The Cabinet Resolution and the thereby adopted Fisheries Act of Thailand has had considerable influence in bringing about improvements in the fisheries management practices and rationalization of fishing efforts in Thailand. Several specific rules and regulations to limit entry into both demersal and pelagic fisheries have since been declared with different objectives and results, both positive and negative.

Fishing Licences

Operation of a fishing gear in Thai waters requires a licence from the Department of Fisheries and a navigation certificate from the Harbour Department; the licence was originally issued automatically on a routine basis on payment of a nominal fee, and only some small-scale fishing gear and certain types of small fishing boats were exempted from such a requirement. Issuance of fishing licences has since been tightened subject to a closer scrutiny on a case by case basis.

The basic objective of a Ministry regulation issued in March 1990 is to reduce gradually the number of trawlers and push nets and thereby bring down demersal catches to the optimum sustainable level. This will necessitate cutting down the total number of trawlers operating in Thai waters from 6,576 units in 1978 to 3,200 units in the Gulf of Thailand and 300 units along the Andaman Sea coastline. Push nets are to be gradually phased out as they invariably operate in shallow waters and catch very small fish.

The licensing regulations of the Ministry are based on strategies recommended by the FAO Mission as follows:

1. The number of trawlers and push nets are to be regulated by controlling the entry of new boats into these fisheries as follows:

   (a) new fishing licences for all types of trawlers and push nets are not to be issued;

   (b) fishing licences for other types of fisheries should not be permitted to be transferred or utilized to operate trawlers and push nets; and

   (c) only the licences and navigation certificates of the holders of the licence/ certificate for the preceding year are to be renewed and transfer of these licences to another

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person cannot be allowed or negotiated under any circumstances, except as in instances of family inheritance.

2. The number of currently operating trawlers and push nets are to be reduced by various measures as follows.

(a) Transfer of licences issued for trawling and push net fisheries to other types of fishing should be encouraged;

(b) Diversification and alternative utilization of vessels used in such fisheries for tourism, cargo transport, passenger carriers, etc., should be promoted; and

(c) Licences of vessels which become involved in trespassing and encroachment into the jurisdictional waters of other countries are to be forfeited and not be reissued.

This regulation was not implemented until 30 September 1982 because of various administrative problems. In the meantime, the number of fishing licences issued rose further from 8,002 units in 1978 (6,576 units of trawlers and 1,426 units of push nets) to 12,683 units in 1980 (10,421 units of trawlers and 2,262 units of push nets) until the adoption of the Ministry regulations that year. This increased still further to 13,374 units in 1982 (11,475 units of trawlers and 1,899 units of push nets) after the Department of Fisheries invited the still unlicensed and unregistered trawlers and push nets to obtain a licence. Subsequently, the number of licences decreased to 7,481 units during the six years up to 1988 (6,950 units of trawlers and 531 units of push nets) as a result of strict enforcement of the Ministry regulations. The Department of Fisheries once again started issuing new fishing licences in 1989 for various reasons. Firstly, 917 fishing vessels were seized by various neighbouring countries during the 1981-1989 period for various reasons, but mainly for charges of encroachment. Secondly, a large number of new fishing vessels were constructed during 1985-1989 to replace aging vessels, as well as to undertake joint fishing operations with some neighbouring countries under bilateral agreements. This increased the number of registered trawlers and push nets to a maximum of 15,020 units in 1989 (13,113 units of trawlers and 1,907 units of push nets), but these numbers again decreased to 14,784 units by 1990 (12,905 units of trawlers and 1,879 units of push nets).

The effectiveness of the Ministry regulations became evident and apparent during the 1981-1988 period, as the number of registered trawlers and push nets gradually decreased from 10,421 and 2,262 units respectively in 1980 to 6,950 and 531 units in 1988. However, the total number of registered trawlers and push nets have since increased once again to accommodate demands for expansion of fisheries into the EEZ of other countries through bilateral agreements.

**Fisheries Management**

Under the 1947 Fisheries Act, a series of Ministerial rules and regulations concerning the conservation of marine resources have been issued in five groups as follows.

**Group I:** Prohibition of the use of certain types of fishing gear during the spawning and breeding seasons of some commercially important species:

1. Ministerial regulation of 28 November 1984:
A conservation area of approximately 26,400 km² was declared in the Gulf of Thailand to protect several commercially exploited species of demersal and pelagic fish during their spawning and breeding seasons from 15 February to 15 May. This regulation prohibited fishing by all types and sizes of trawlers (with the exception of beam trawlers), all types of purse seiners (except for anchovy purse seiners operating in the day time during 15 February to 31 March only) and gillnets with less than 4.7 cm mesh size, along the coastline of Prachuap Khirikhan, Chumphon and Surat Thani provinces, as well as Khanom district in Nakhon Si Thammarat province in the Gulf of Thailand.

This regulation is a rearranged version incorporating relevant sections of two previous Ministerial regulations to ban fisheries for Rastrelliger spp. (Pla Too and Pla Lung) during the spawning season and the Ministerial regulation of 3 March 1983 for closing the spawning and nursery grounds of demersal and pelagic fish. The new regulations, in particular, clearly limited and delineated the areas closed to fishing. In the case of the demersal and pelagic fisheries, the new regulation lifted the ban on the operation of beam trawlers for shrimp and anchovy purse seiners operating during the day time, in order to alleviate the hardships of the affected fishermen during the closed season. Further, anchovy does not spawn in that area during that period. The ban of beam trawlers was more a result of the increasing demand for shrimp for export.

These measures were necessitated because of a drastic drop in average annual landings of Rastrelliger spp from 100,505 mt in 1971 to 31,204 mt in 1977. The demersal fish catches decreased dramatically from 297.6 kg per hour in 1961 to 49.2 kg per hour in 1982. The regulation were meant to reduce the overall fishing effort for these species particularly during the crucial spawning and breeding period. To begin with, these measures yielded quite encouraging results. The total annual catch of Rastrelliger spp. gradually increased from 25,000 to 100,000 mt.

In the case of the demersal resources, the catch rate increased from 45.7 to 50.1 kg per hour during 1983-84, i.e., during the first year of enforcement of the Ministerial regulations. However, the catch rate showed a decrease once again since 1984 to 22.78 kg per hour in 1991, mainly because of beam trawling for shrimp, which is exempt from the above ban.

ii. Ministerial regulation of 11 April 1985:

Conservation measures for protecting the breeding species in their spawning and nursery grounds were extended to the Andaman Sea and an area approximately 1,800 km² at Phanganga and Krabi was declared as a zone of conservation through selectively controlled fishing by closed seasons and/or prohibition of selected fishing gear during 15 April to 15 June. The same rules regarding the types of prohibited fishing gear as applied in the Gulf of Thailand and laid out in the afore-mentioned Ministry regulation, were also extended to the conservation zone in the Andaman Sea.

iii. Ministry regulation of 11 July 1983:

This regulation prohibited catching of gravid females of serrated mud crabs and blue swimming crabs during October/December, when they are spawning. It could not, however, be effectively enforced so far for practical reasons, as these crabs are mostly caught by trawlers and soon become weak and die before they could be released back to the sea.

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iv. Ministerial regulation of 26 June 1975:

As another conservation measure, operation of trawlers and push nets was prohibited in an area of approximately 54 km² off Chonburi province during the September/February period, as the large number of small islands in that area provide shelter to the juveniles and adults of many marine organisms. Further, analysis of the landings from area showed that 80% of the total catch were small fish.

**Group II:** Prohibition of certain types of fishing gear in some areas:

i. Ministerial regulation of 24 January 1985:

Fishing by all types of purse seine nets using light lures was prohibited off the coast of Trat province in the Gulf of Thailand, as they were found to predominantly attract small fish.

ii. Ministerial regulation of 20 July 1972:

This regulation prohibited fishing by trawlers and push nets within a distance of 3,000 m from the shoreline and within a perimeter of 400 m of any stationary fishing gear in the Gulf of Thailand. This regulation served the purpose of maintaining the productivity of these near-shore waters as the catches from these areas were found to drop below their potential yield. Moreover, 80% of the total catch consisted of small fish, at least half of which were the juveniles of economically important species.

iii. Ministerial regulation of 18 February 1974:

Use of any kind of shellfish rack within a distance of 3,000 m from the shoreline was prohibited along the entire coastline of Thailand, both on the Gulf and the Andaman Sea side, as this type of fishing destroyed the nursery grounds of young shellfish, as reflected in the drastic drop in shellfish catch per unit effort.

iv. Ministerial regulation of 1 August 1979:

This regulation prohibited fishing operations using all types of trawlers and push nets within a distance of 3,000 m from the shoreline and within the perimeter of 400 m from a stationary fishing gear in Andaman Sea. This was essentially an extension of the identical Ministerial regulation of the Gulf of Thailand to the Andaman Sea area.

Enforcement of regulations under Group I and II above (with the specific exception of the Ministerial regulation of 28 November 1984 and 11 April 1985) is generally lax and inefficient, mainly because of socio-economic considerations. For example, most of the fishermen engaged in push net fishery are poor and this fishery is the major, if not often the only, source of their livelihood. Any consideration of banning this fishery, therefore, involved concerns regarding alternative means of livelihood for these fishermen. The owners of the trawlers were also sometimes such influential persons that they could afford to disregard the implications of the Ministerial regulations.
Group III: Protected areas:

The protected areas are those adjacent to temples and monasteries or any other area designated as such by the governors of provinces. All such areas are considered as fish sanctuaries, where fishing of any sort is not permitted, as follows.

i. Ministry regulation of 17 March 1969:

An area of approximately 38 km² in Phuket province adjacent to the Phuket Marine Biological Center of the Department of Fisheries was established as a protected area and nature reserve (a) to preserve the virgin flora and fauna in its original condition for scientific research and observation; (b) to secure the adjacent shoreline against deforestation, slash-and-burn cultivation or any other alterations that could affect the ecological conditions of the coastal zone. Fishing and collection of any sort is also not permitted in the protected waters and the intertidal zone except for scientific specimens for purposes of research. Attempts are also being made to prevent any industrial activity in the area in order to keep any pollution of the protected area to the bare minimum.

ii. Ministerial regulations of 27 February and 15 May 1989:

Selected areas around Khai, Charakhay, Thalao, Khalok and Hin Phae Islands off the coast of Chumphon province in the Gulf of Thailand and coral reefs at Patong Bay of Phuket province along the Andaman Sea coastline were declared as protected areas for the conservation of coral reefs.

iii. Ministerial regulation of 9 May 1991:

A marine turtle nesting area of approximately 1.6 km² at Kra Island off Trat province in the Gulf of Thailand was established as a protected area to shelter the turtles during the breeding season.

In accordance with the resolutions of the United Nations to establish a network of "Islands for Science", an area of approximately 1,490 km² (260 km² of land and 1,230 km² of water body) off Satun province along the Andaman Sea coast, including the islands of Tarutao, Adang and Rawi, was declared as the "Tarutao National Park".

In addition to the above, another 13 marine national parks are presently being administered by the Royal Forestry Department. This has caused conflicts of interest from time to time, as some traditional fishing grounds are included within this park zone. Plans are now underway to clearly delineate and separate such areas to be administered under the Fisheries Act of 1947 as a protected area.

Group IV: Protection of Endangered and Threatened Species:


These regulations prohibited the catching of sea turtles, collection of their eggs and export of sea turtle shells in a processed or unprocessed form. Sea turtle meat and eggs are favourite food of Thai people, especially the fishermen. Turtle shells are also widely popular as souvenirs and ornaments, and are exported to be processed into numerous artefacts and
eye-glass frames. The conservation measures became essential to protect their dwindling populations from further depletion.

ii. Ministerial regulation of 9 August 1961

Catching of dugong in the Gulf of Thailand and Andaman Sea was prohibited by this regulation, as this species was fast becoming endangered in Thai waters. Dugong meat is a favourite food of many fishermen.

iii. Ministerial regulations of 10 January 1978 and 18 December 1991

Collection of corals both in the Gulf of Thailand and Andaman Sea, and their export out of Thailand was prohibited by this regulation. Corals, as well as the ornaments and other artefacts made from them are very popular among local and foreign tourists. Corals were being collected in such excessive quantities that affected and diminished the utility and effectiveness of this habitat as a spawning/breeding ground and shelter for a large number of marine organisms.

The implementation of these regulations have not been very effective so far for many reasons. Firstly, many turtles and dugong are incidentally caught in the trawl nets and gill nets, and die during the fishing operation or soon after. Secondly, many nesting beaches of marine turtles are being developed as tourist resorts and are thus lost to nesting.

**Group V:** Ban on the use of poisons and stupefying chemicals, explosives and electric stunning:

Such destructive fishing methods are being increasingly used by very poor fishermen because of their devastating effects and ease of use, as well as the larger quantity of fish caught at low cost compared with other small-scale fishing gears. However, the damage caused to the habitat and the local fisheries is beyond description, particularly because it wipes out all organisms in the vicinity, including eggs, fingerlings and juveniles.

This regulation is very difficult to enforce because of insufficient numbers of officials in the field to spot check and control along the entire coastline of the country. The extreme poverty of the subsistence fishermen engaged in these operations also need to be given special consideration, particularly as this is often their only or main source of livelihood.

**Group VI:** Prohibition and restrictions on certain types and sizes of fishing gear:

i. Ministerial regulation of 14 February 1983:

The night-time operation of purse seine nets using light lures and a mesh size of less than 2.5 cm is banned in the Gulf of Thailand, as the luring lamps are found to attract a high amount of small fish, as compared to traditional fishing methods.

ii. Ministerial regulation of 5 November 1981:

A minimum mesh size limit of 3.2 cm was set for all types of fishing gear using light lures to catch squids in the Gulf of Thailand, as the luring light was found to attract an extremely high quantity of small squids and the total annual catch of squids from the Gulf showed a clearly discernable decrease in recent years.
iii. Ministerial regulation of 23 April 1985

This regulation controlled the size of the boats, and the number and dimensions of the racks used for collecting short-necked clam in Thai waters, as small-size clams were often caught and also exported which affected their long-term productivity as well as market value.

The enforcement of the above regulations has not been very effective so far as they apply to a very extensive area spread over the entire coastline of Thailand, the number of officials in the field to inspect and enforce the regulations are too few and the laws of the country require that the fishermen need to be caught in the actual act of illegal fishing or violating the regulations for the charge to be upheld in a court of law.

It can thus be concluded that the more effective management of marine resources on a long term basis will require efficient implementation and enforcement of all current regulations in the field through a suitably competent machinery. In particular there is a need for more officials in the field, better infrastructure facilities to accomplish effective enforcement, and delegation of sufficient authority to enforce the regulations to provincial authorities, say, an appointed committee for the purpose, rather than only to the provincial Fishery Officers.

3. Control of Encroachment by Thai Fishing Vessels in Areas outside Thai Waters

Thailand lost access to about 777,000 km$^2$ of fishing grounds as a direct result of the adoption of EEZ, resulting in a reduction in marine landings of some 200,000 mt each year. This situation and the consequent reorientation of fishing rights in the open waters have created fishing conflicts with some of these countries. As a result, many Thai fishing vessels and fishermen are arrested every year for alleged intrusions into neighbouring waters. During the 1981-1992 period 1,503 Thai fishing vessels were arrested by other countries (Malaysia 598, Vietnam 444, Myanmar 303, India 61, Indonesia 55, Cambodia 36 and Bangladesh 6).

The energy crisis of 1974-75 and related factors also had a significant influence in reducing fishing efforts. The price of diesel oil gradually increased from 1.60 Baht per litre to 7.39 Baht by 1981. Because of these factors and generally depressed fisheries, many fishing boats did not fish over some periods.

In order to increase the availability of fish and marine products, as well as to reduce conflicts between mechanised and small-scale fisheries in the inshore areas until the fishery control regulations could be more effectively enforced, the Department of Fisheries has allocated special funds since 1987 for the construction of artificial reefs to serve as spawning grounds and shelter for reef fish. These artificial reefs also serve to control and exclude the operation of trawlers and push-nets in the area, thereby virtually securing fishing grounds of more than 360 km$^2$ for the exclusive use of small-scale fisheries.

Mention should also be made of the impact of natural phenomena on the coastal fisheries, for example Typhoon Gray in 1988, Typhoon Angela and Typhoon Forest in 1993. Some 400 fishing boats and 680 fishermen were lost and 448 fishing boats damaged during Typhoon Gray.
4. **Encouraging the Exit of Fishermen from Fisheries into Alternative Livelihoods**

In order to reduce excessive fishing effort and conflicts between trawl fishermen and coastal small-scale fishermen, the Department of Fisheries has focused attention on developing and increasing coastal aquaculture as a means especially to encourage the transfer of fishermen from marine capture fisheries. The overall fisheries development policy laid special emphasis on coastal aquaculture development in the third to the sixth National Economic and Social Development Plans, 1972-1986. Bilateral assistance came from Australia, Canada, Denmark, Japan, Netherlands, Sweden, UK, and USA. The Government of Japan provided technical assistance to improve coastal aquaculture. Both the private and public sectors in Thailand also offered soft loans to help the fish farmers.

The 1985 Marine Fishery Census showed that 25,133 fishery households (44% of a total of 57,551 families) received loans. Most of these loans (46%) came from private sources usually arranged through a middleman. The Bank of Agriculture and Cooperative were the major source of loans from the public sector. Multilateral funding came from ADB and UNDP, while BOBP provided technical support for cage culture and oyster-farming in Phangnga and Ranong Provinces.

As a result of these policies, a remarkable increase in coastal aquaculture production was achieved both in terms of quantity and value during the 1977-1990 period. Aquaculture production increased from 2,200 mt (valued at approximately US$ 2.5 million) in 1977 to 193,200 mt (valued at some US$ 590 million) in 1990. The number of fishermen engaged in coastal aquaculture increased from 15,499 in 1985 to 37,482 in 1990. Most of this increase in aquaculture production was due to a rapid expansion of shrimp culture, both in terms of area and yield per hectare. In sharp contrast, the number of fishermen engaged in marine capture fisheries decreased during the same period from 124,007 in 1985 to 110,823 in 1990. Traditional fishermen from villages along the coast nowadays tend to shift to other better-paying jobs, rather than work as the crew of trawlers or other fishing boats, and they are being replaced by an influx of "new generation fishermen" from the economically backward areas of northern Thailand. As a result, more than half of the crew of the commercial fishing boats at present are from northern Thailand. But for this influx, the decrease in the number of fishermen engaged in open-water fisheries would have been more dramatic.

5. **Promoting Economic Diversification in Fishing Communities**

Improved infrastructure facilities for fish landing, cold storage, fish processing and marketing are essential for increasing the flow of marine fish products to supply both domestic and export markets. Recent developments in post-harvest technology for better handling of catches on board have resulted in an increase in the value of the fish. At the same time, qualitative utilization of the catch has also shown an improvement from ordinary animal feed and fish meal, to surimi for human consumption and improved quality of fish meal. The development of industries for the production of frozen, processed and canned seafood, both for the local market and export, has played a key role in promoting socio-economic well-being among the fishing communities by providing alternative employment opportunities and improvement of living standards of the fisherfolk and their families, particularly the womenfolk who have access to good employment opportunities in the industry.

As a result of such developments in both fishing and post-harvest technologies, marine production increased gradually and eventually exceeded the domestic demand by 1974. The objectives of the fisheries policies of the Thai government has since shifted to lay greater
emphasis on increasing exports of fishery products to earn foreign exchange. As part of broad strategy to achieve this objective, skilled technicians and experts have provided advice and training on post-harvest technology, export of fish and fish products were allowed free of export duties, while restricting the import of such products from other countries; and duties on imported processing plant equipment were reduced. The number of freezing and cold storage plants, canneries and processing plants steadily increased and the export of fishery products rose from 242,243 mt valued at approximately US$ 207 million in 1976 to 904,973 mt valued at US$ 2,265 million in 1990. The development of the fish canning industry has been particularly remarkable, its exports achieving a 50% share of the US market and a major share of the German and UK markets for canned tuna. This development of the fishery industry and exports has contributed considerably to improvements in the standard of living and economic conditions of the fisherfolk because of the employment opportunities and increased incomes it has generated. The labour force employed in the fish processing sector increased from about 40,000-50,000 in 1985 to 88,000-100,000 at present. Additionally a number of fishermen's families are employed in small-scale fish processing activities operating as cottage industries in coastal villages.

Lastly, two decades of tourism and related infrastructure development in the vicinity of fishing villages have provided incentives to the fishermen to shift to tourism support activities such as boat tours, sale of seafood delicacies etc.; this has contributed to a large extent to increases in income several-fold greater than they would have otherwise derived through fishing. The cost of seafood has very significantly risen mainly because of the demand from the tourism sector. Income from the tourism sector increased at an average rate of 27.5% every year (valued at US$ 36,000 million) during 1987-1991.

6. Conclusions

Although a large number of fishery regulations were adopted under the Fisheries Act of 1947, most of them could not be effectively enforced, because of many practical reasons. Perhaps the most significant achievement in this area has been the apparent influence the various fisheries management measures have had in limiting entry into fisheries. The various measures taken to restrict or ban fishing in the spawning and nursery seasons of commercially important pelagic and demersal fishes during the breeding season have also been generally successful in conserving the species, as shown, for example, by the increase in the average annual landings of Rastrelliger spp. in the Gulf of Thailand from a low of 25,000 mts to 100,000 mts since 1986. The catch rate of demersal resources also showed a slight increase but has since decreased again, as the fishermen have now found ways and means of getting round the regulations. It remains essential to establish more protected areas and fish sanctuaries for threatened species, and conserve critical coastal marine habitats, through appropriate and enforceable control measures.
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<tr>
<td>All types of trawlers and push nets</td>
<td>8,002</td>
<td>10,670</td>
<td>12,683</td>
<td>8,741</td>
<td>13,374</td>
<td>10,626</td>
<td>10,091</td>
<td>9,084</td>
<td>8,071</td>
<td>8,267</td>
<td>7,481</td>
<td>15,020</td>
<td>14,784</td>
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