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**Conflict Between Commercial Fisheries and Small Scale
Fisheries : A Case Study of Squid Trap
Fisheries in the Gulf of Thailand**

by

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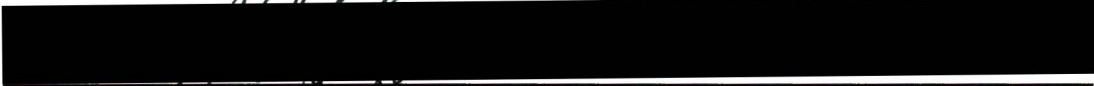
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ABSTRACT

Fisheries represent one of Thailand's most important activities, contributing about two to three percent to the Gross National Product (GNP) annually, and account for eleven percent of agriculture GNP. Thailand boasts one of the ten largest fishing industries in the world. Small scale fisheries are still an important source of rural employment and food in Thailand. They account for three-quarter of the nation's fishermen, and they provide one-quarters of the total fish landings. Small scale fishermen in Thailand are increasingly facing the problem of limited fishery resources, which has led to conflicts among the resource users. The conflicts between small scale fishermen and commercial fishermen have had a major impact on the local economy and society. Conflict between squid trap fishermen and trawlers in the Gulf of Thailand is one problem that has existed for many years without amelioration. The conflict arises from the destruction of squid traps by trawlers.

This study reviews the fishing industries in Thailand, the nature of the conflict between squid trap fishermen and trawlers, and investigates the characteristics of squid trap fishermen. It concentrates on acquiring information on the perceptions of squid trap fishermen toward the conflict and


their suggestions as to how to resolve this problem.

The study is based on the concepts and guidelines developed in environmental perception and attitude research. The research is designed to collect the data from the squid trap fishermen by questionnaire survey. It presents the results of 104 respondents in the selected study area. The responses of squid trap fishermen from three provinces in east coast Thailand are compared. The findings illustrate the seriousness of the conflict between squid trap fishermen and trawlers, and indicate the need for the amelioration of this problem.

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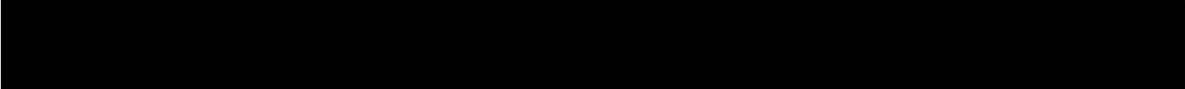

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CONVERSION UNITS

Currency Equivalents

Canadian \$ 1	=	Baht	22.0
Thai Baht 1	=	CAN \$	0.045

Area Equivalents

1 rai	=	0.16 hectares
1 hectare	=	6.25 rai

GLOSSARY OF THAI TERMS

Amphoe	=	District
Ban (muban)	=	Village
Changwat	=	Province
Kamnan	=	Tambon leader
Phuyaiban	=	Village leader
Tambon	=	Subdistrict

CHAPTER 1

INTRODUCTION

1.1 Nature of the Problem

Marine and coastal resources include all renewable and non-renewable resources situated in marine and coastal areas, such as water, lands, minerals, animal and plant species, and people. The marine and coastal waters, together with bordering coastal lands, support a variety of important economic activities including: shipping and ports, oil and gas development, fisheries, coastal aquaculture, coastal forestry, coastal agriculture, mining industry, tourism, transportation and communication, and coastal community activities (CIDA, 1987; Brahtz, 1972). It is anticipated that coastal states will increasingly look to the resources of their coastal areas, territorial seas, archipelagic seas and exclusive economic zones (EEZ) for enhanced economic development and employment opportunities in the future (Burbridge et al., 1988).

In coastal zone areas, the multiplicity of uses, coupled with increasing numbers of users, has generated a number of important issues at local, national and international levels.

These issues have arisen as a result of the many different ways in which coastal resources are used and because so much of the world's population lives, works and plays in or near coastal areas (Schaefer, 1972; Burbridge, 1982). Conflicts over environmental protection, pollution, urban development, and the utilization of resources for the satisfaction of basic human needs, including fisheries have developed. It is now widely acknowledged that coastal area management and planning is required for all coastal states as means of ameliorating these conflicts (Burbridge et al., 1988).

Fish are a promising weapon in the fight to meet the food requirements of a growing world population (CIDA, 1986). Becker (1986) states that fisheries are crucial to virtually all coastal states, particularly the developing countries, because of their contribution to gross domestic product (GDP), foreign exchange earnings, domestic nutrition needs, employment, a wide range of ancillary industries, and a way of life for many communities. In 1986, the total world production of fish was approximately 91 million tons (FAO, 1988). This figure is approaching the maximum possible world catch, which estimates suggest probably does not exceed 100 million mt (metric ton) per year (McHugh, 1984). However, Schaefer (1965) estimates that the sea can yield as much as 200 million tons without any great change in fishing gear and methods. Almost 90 percent of world catch comes from the sea, but from well within 200 miles of the shore.

In 1982, the new regime concerning the resources of the world's oceans, was embodied in the United Nations Convention on the Law of the Sea. This resulted in global acceptance of the Coastal States' authority to extend their sovereignty over offshore resources in exclusive 200-mile economic zones. The new legal definition of the 200-mile exclusive economic zones (EEZ) has had a major impact on the world's fisheries, presenting coastal states, especially developing countries, with an opportunity to reap large economic benefits from the fishing industry. However, in order to realize these benefits the management and development of fisheries resources within the states' jurisdiction is urgently required (FAO, 1984).

In most developing countries, fisheries typically consist of two sectors. The first is small scale fisheries that use low-level technology, generate low incomes and produce fish for local human consumption. The second sector is the large scale fishery (or commercial fishery) that is capital-intensive, producing higher incomes for a relatively small number of people, and products for export or industrial use (Pollnac and Sutinen, 1979). The large scale commercial fisheries have received the attention of governments and private industry for a long time. Such fisheries have been variously studied, managed and abused. Interest in small scale and other supplemental fisheries has lagged, and development of such fisheries has been slow, often seemingly thwarted by groups who should be most supportive of them

(Robins, 1979; Peterson and Smith, 1982; Panayotou, 1985; Bailey, 1987).

Small scale fisheries are important to the developing nations because they enable the poorer people not only to catch food for their own consumption but to sell the excess catch and thus earn some income. They are labour intensive, and this is important in developing countries where unemployment is often high and pay scales very low. The economic impact of small scale fisheries is much higher than would be surmised from the size or value of the catch alone (ADB, 1985; Panayotou, 1985; Peterson and Smith, 1982). The small scale fisheries are also important in that they make additional food available. The products, both fresh and processed, can be used for domestic consumption and can be exported.

Fisheries contribute about two to three percent to Thailand's Gross National Product (GNP) annually, and account for eleven percent of agricultural GNP (TDRI, 1987). Thailand boasts one of the ten largest fishing industries in the world and the fifth largest in Asia with a fleet of over 20,000 modern vessels and a catch of about 2 million tons annually (FAO, 1988; DOF, 1987). However, Thailand's fishery management capabilities continue to lag far behind the industry's exploitation capabilities. Moreover, the rapid development of the Thai trawl fishery has led to many problems such as overfishing in the Gulf of Thailand, deterioration of

the fishery resource, and increasing conflicts between small scale and commercial fishermen (ADB, 1985).

Small scale fisheries are still an important source of rural employment and food in Thailand. They account for three-quarters of the nation's fishermen, and they provide one-quarter of the total fish landings (DOF, 1987; Panayotou and Jetanavanich, 1987). There are 1,563 fishing villages and more than 90,000 fishing households scattered along the coast throughout the twenty-three coastal provinces in Thailand, making the small scale fishermen population up to 300,000 (Adulavidhaya et al., 1982; Panayotou et al., 1985). Most of them are isolated both geographically and socially. Small scale fisheries are widely practised in the coastal areas of Thailand, because they can be operated by near-shore fishing, coastal aquaculture and mariculture. The small scale fishermen use various types of traditional fishing gear. Their fishing range, however, is limited to fishing grounds in the vicinity of their homebases. Most of the catch is sold to the market in fresh or simple processed form through middle men.

Small scale fishermen in Thailand are increasingly facing the problem of limited fishery resources (Rientrairut, 1985), which has led to the conflicts among the resources users. Conflicts over fishery resources' exploitation are largely of two types. Conflict between small scale fisheries and commercial fisheries, and conflict among small scale

fisheries. Conflicts among small scale fishermen generally have a minor impact on the local economy and society. Disputes can usually be resolved on their own or by local negotiators. On the other hand, the conflicts between small scale fishermen and commercial fishermen tend to be a national problem, and have a major impact on the local economy and society. These are much more difficult to solve because many people with very different interests are involved together with several different government agencies. In Thailand, these conflicts have, for the most part, simply been ignored and the losers, usually small scale fishermen who have less financial and political support, have had to bear the damages through loss of their catch.

Conflict between squid trap fishermen and trawlers is one problem that has existed for many years without amelioration (DOF, 1990). Squid trap fishing uses a kind of stationary fishing gear operated by large numbers of small scale fishermen along Thailand's east coast and some areas of the southern coast (SEAFDEC, 1986; Jittrapong and Pramokchutima, 1986; Supongpan et al., 1988; Boonkerd and Rajaniyom, 1990). The conflict arises from the destruction of squid traps by trawlers. Recently, both the number of small scale fishermen engaged in squid trap fishing and the number of trawlers has expanded. This has lead to increasing numbers of disputes between the two groups.

Most small scale fishermen in Thailand are poor and have

low levels of education. This has meant that the government has had to take responsibility for solving problems, either directly or indirectly, in order to maintain fairness and social order for resources' allocation. In order for the government to develop appropriate policies there is a need to acquire greater knowledge about the nature of the conflict from the perspective of the small scale fishermen.

1.2 Purpose and Scope of Study

The purpose of this study is to investigate the impacts of commercial trawl fisheries on small scale squid trap fishermen, and to examine possible ways of resolving these conflicts through more effective management strategies. The specific study objectives are:

- 1) To review the literature on coastal zone management and fisheries regulation with an emphasis on Thailand;
- 2) To describe the resource conflicts that exist within Thailand's coastal zone with an emphasis on marine fisheries;
- 3) To investigate the impacts of trawl fisheries on squid trap fishermen from the perspective of the squid trap fishermen in the south eastern provinces of Thailand, by survey methods.

1.3 Outline of Thesis

This thesis consists of five chapters. Chapter 2 describes the marine fisheries in Southeast Asia and Thailand's marine fisheries. The management and development of marine fisheries in Thailand are presented and the problems of marine fisheries, especially the conflicts between commercial fisheries and small scale fisheries. It also describes the status of coastal zone management in Thailand. Chapter 3 presents the methodology adopted for this research, describes the study area, and outlines the data collection procedures. Chapter 4 presents the results of the data analysis. In chapter 5 the implications and conclusions of the research are set out.

CHAPTER 2

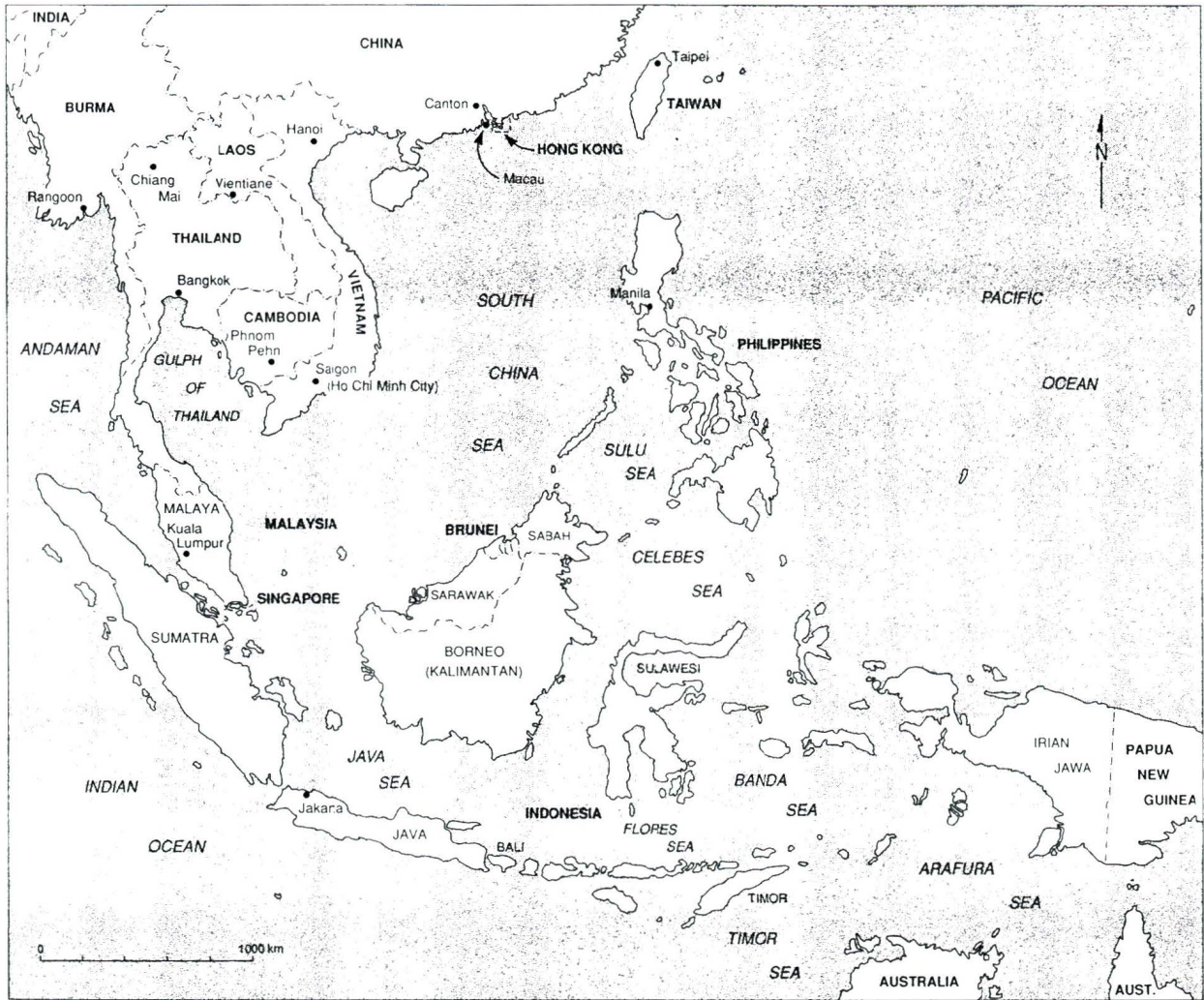
BACKGROUND

This chapter reviews the literature on marine fisheries in Southeast Asia. It also examines fisheries regulations with an emphasis on Thailand, and describes the fisheries resource conflicts that exist within Thailand's coastal zone. This review sets the context for the study.

2.1 Marine Fisheries in Southeast Asia

The coastal waters in Southeast Asia constitute one of the most productive areas for commercial fisheries among the world's oceans (Chikuni, 1987). The total annual catch from the region has increased steadily throughout the years and has now reached about 6 million mt. This accounts for about 10 percent of the world total marine catch and is ranked as the fourth largest among the FAO fishing areas of the world (FAO, 1986; 1987). The Southeast Asian waters are situated entirely in the tropical zone, and are composed of several major seas and straits (see Figure 2.1). They consist of the Andaman Sea in the west, the Strait of Malacca, the Gulf of Thailand, the South China Sea, the Java Sea, the Arafura Sea, the other

Figure 2.1 Map of Southeast Asian Countries



Indonesian waters, the Indian Ocean along the Indonesia archipelago in the south, the other Philippine waters, the Pacific Ocean along the Philippines to Indonesia coasts in the east and the Formosa Strait in the north, which connects the region to the East China Sea further north. The coastal countries bordering the region are Brunei, Burma, Indonesia, Cambodia, Malaysia, the Philippines, Singapore, Thailand, Vietnam, Hong Kong, Macau, the Peoples Republic of China and Taiwan.

Although all nations in the region have traditionally harvested marine resources in their coastal waters, the history and the current status of fisheries varies greatly from country to country. For instance, trawl fishing was first initiated in Thailand in the early 1960s, followed by Malaysia and Indonesia, while in the Philippines fishing for pelagic fish developed faster (Nagalaksana, 1987; Martosubroto, 1987; Malig and Montemayor, 1987). In Cambodia and Vietnam, on the other hand, marine fishing has not developed well in recent years, due mostly to political disturbances. In Burma and Brunei, marine fishing has not been particularly intensive until recently (Chullasorn and Martosubroto, 1986).

Bathometric conditions divide the region roughly into two parts, namely shallow and flat areas in the west where wide continental shelves have been well developed and deep sea areas in the east with narrow continental shelves and steep

slopes. The climatic and oceanographic conditions of the region are generally governed by the tropical monsoon regime. The waters are also strongly influenced by the inflow from the neighbouring seas and oceans in accordance with the change in monsoons. These are the distinctions in the environmental characteristics of the region that determine the species and ecological features of the resources. The region specific features of the resources are the multispecies nature of the fish community; the fast growing and early maturing of the individual fish with relatively short life span; and the multiple or almost all year-round prolonged spawning (ADB, 1985; Chullasorn and Martosubroto, 1986).

The region is also characterized by an abundant distribution of coral reefs, especially in the western-most and eastern parts. Mangrove forests are numerous where there is a substantial discharge of fresh water. These environments also play an important role in enhancing the productivity of the coastal waters, providing favourable conditions for spawning and nursing of many fish and shrimp resources (Marr, 1976). Marine fish in this region comprise 46 groups of pelagic fish, 39 groups and 36 species of demersal fish, 8 groups and 13 species of shrimps and 8 groups and 6 species of squid and cuttlefish (Chullasorn and Martosubroto, 1986). An estimate of the potential yield of marine catch in this region (not including Burma, Hong Kong, and Macau) is presented in Table 2.1.

Table 2.1 : Estimate of Potential Yield in Southeast Asian Waters (in mt)

Species Group	Potential Yield	Current Catch	Possible Increase
Demersal	820,000	685,000	140,000
Coastal Pelagic Fish	3,230,000	2,150,000	1,080,000
Oceanic Pelagic Fish	360,000	201,000	160,000
Other Fish	1,740,000	1,584,000	160,000
Fish Total	6,150,000	4,620,000	1,530,000
Crustacea	540,000	488,000	50,000
Cephalopods	600,000	179,000	420,000
Shellfish	290,000	261,000	30,000
Other Animals	190,000	173,000	20,000
Total	7,770,000	5,721,000	2,050,000

Source : Chikuni, 1987.

The estimated total potential yield is about 7.8 million mt which is about 36 percent more than the current total catch. This can be regarded as a fairly conservative estimate. Assuming that an additional 20 percent is the upper limit, the total potential yield would fall in the range of 7.8 to 8.9 million mt. However, the actual catch of demersal fish in Thailand has already surpassed the estimated potential yield (see Table 2.6). It shows that the potential yield in this region is higher than the estimation made in Table 2.1.

Table 2.2 : Marine Catch of Selected Southeast Asian Countries, 1983-1987

Countries	1983 mt	1984 mt	1985 mt	1986 mt	1987 mt
Brunei	2,949	2,092	2,846	2,629	2,548
Cambodia	5,100	5,500	6,000	6,500	6,500
Indonesia	1,672,355	1,728,214	1,764,395	1,849,976	1,967,900
Laos*	-	-	-	-	-
Malaysia	725,498	660,866	622,396	607,044	598,573
Philippines	1,318,235	1,333,588	1,330,892	1,377,815	1,425,961
Singapore	19,099	25,042	22,762	20,279	15,096
Thailand	2,104,577	1,973,027	2,057,661	2,348,272	2,000,350
Vietnam	552,608	553,029	576,860	582,077	620,404
Total	6,400,421	6,281,358	6,383,812	6,794,592	6,637,332

Source : FAO, 1989.

* Laos is a landlocked country, there is no marine catch.

Average annual production of fish in the region is an estimated 6500 kt (see Table 2.2). Indonesia and Thailand each accounts for 25 percent of total landings and the

Philippines for 22 percent. Marine fish account for 83 percent of production. Some countries in the region are net importers of fish, though imports are less than 3 percent of total regional production, and are restricted mainly to processed fish products. Imports are a significant source of fish in Singapore, Hong Kong and Malaysia, and only Thailand is a net exporter of fish. About 62 percent of Southeast Asian's catch is consumed directly, while 35 percent is used for industrial products such as fishmeal and oil for animal feed (Becker, 1986; Smith, 1987).

The Southeast Asian region has a population of over 300 million and is a major consumer of fish products. Nearly all of the fish consumed is caught in the waters of the region, and a small proportion is also exported. Production growth is expected to slow as many of the fisheries in the region approach the limits of biological production. This suggests that any further growth in demand may not be easily accommodated at present prices (Smith, 1987).

Southeast Asia has traditionally been dependent on fishing as a major source of food. The region has some 112,000 km of coastline and highly productive freshwater resources, both of which have for generations supported a large amount of artisanal fishing for direct consumption. Recorded commercial production has increased relatively quickly, with a rate of growth in recorded fish landings of 3.5 percent a year over the period 1970 to 1983 for the region

as a whole (FAO, 1986, 1987). However, the rate of growth has slowed in recent years, possibly because stocks of many fish species are approaching full exploitation (Table 2.3).

Many of the Southeast Asian fisheries show signs of both economic and biological over-exploitation. Economic overfishing occurs when the marginal costs of an additional unit of fishing effort are higher than the marginal revenues (Anderson, 1977a). In such circumstances the economy loses with each additional unit of fishing effort even though the total catch may still increase. The loss is caused by a misallocation of capital and labour as they produce lower economic yields in fisheries than in alternative production activities. The misallocation of capital and labour arises from the common property characteristics of the fishery resources and is often accentuated by government policies, strong increases in the demand for fish and other economic factors external to the fisheries sector (Meany, 1987; Willmann, 1987).

In single species fisheries, biological overfishing occurs when the marginal yield of an additional unit of fishing effort is negative. However, in the tropical multispecies fisheries of the region, biological overfishing may occur even though total catch is still increasing because the decline in yield (or complete extinction) of one or several species may be compensated through higher yields of other species. Often average sizes and average prices of

Table 2.3 : Catch by Southeast Asian Countries, 1983-1987
(in mt)

Countries	1983 mt	1984 mt	1985 mt	1986 mt	1987 mt
Brunei (i)	3,055	2,226	2,986	2,758	2,652
(ii)	2,949	2,092	2,846	2,629	2,548
Burma	587,550 444,680	609,740 465,730	643,759 496,950	686,515 535,158	685,858 540,873
Cambodia	63,750 5,100	65,000 5,500	68,000 6,000	70,000 6,500	70,000 6,500
Hong Kong	188,814 181,714	199,672 193,172	198,196 192,396	213,557 207,814	228,094 221,594
Indonesia	2,204,815 1,672,355	2,276,393 1,728,214	2,344,710 1,764,395	2,457,085 1,849,976	2,609,700 1,967,900
Laos*	20,000 -	20,000 -	20,000 -	20,000 -	20,000 -
Macau	8,200 8,200	11,800 11,800	12,400 12,400	8,042 8,042	3,517 3,517
Malaysia	740,689 725,498	664,667 660,866	631,685 622,396	616,280 607,044	607,528 598,573
Philip- pines	1,976,141 1,318,235	1,933,706 1,333,588	1,864,990 1,330,892	1,916,347 1,377,815	1,988,718 1,425,961
Singapore	19,549 19,099	25,468 25,042	23,032 22,762	20,497 20,279	15,310 15,096
Thailand	2,260,024 2,104,577	2,134,846 1,973,027	2,225,114 2,057,661	2,536,335 2,348,272	2,165,100 2,000,350
Vietnam	757,138 552,608	776,308 553,029	808,010 576,860	824,743 582,077	871,404 620,404
Total (i)	8,829,725	8,719,826	8,842,882	9,351,662	9,267,881
(ii)	7,035,015	6,952,060	7,085,558	7,545,606	7,403,316

Source : FAO, 1989.

(i) Catch of marine fish and inland fish.

(ii) Catch of marine fish alone.

* Laos is a landlocked country, there is no marine catch.

these other species are lower so that the total value of the catch decreases (Willmann, 1987). This causes the losses in income, employment opportunities and supply of fisheries products to domestic and international markets affecting both the fishing industry and society as a whole in the long run (Bailey, 1987).

Fisheries management objectives can be classified into three groups (Waugh, 1984; Anderson, 1977). Firstly, there are those objectives which are concerned with the attainment of some level of physical yield from the fishery. The most usual version is that of maximizing the sustainable yield (MSY). This objective has played a useful role in the development of fisheries science, but has now generally lost ground (Larkin, 1977 in Waugh, 1984: 101). In part this has occurred because of the need to measure the returns from the fishery in economic, not physical, terms. But in part the rejection of the maximum sustainable yield principle has resulted from a fundamental dissatisfaction with the biological theory on which it is based. Sustainable yield is an equilibrium concept and there is considerable doubt that such an equilibrium can be maintained in an ecosystem over long periods of time (Anderson, 1977a; Munro and Scott, 1984; Waugh, 1984).

Secondly, the injection of economics into fisheries research led to the consideration of maximum economic yield (MEY) as a possible objective of management. Here benefits

are measured in value terms and economic costs are taken explicitly into account. The specific objective can be stated as the maximization of the discounted net benefits over time. It should be noted that such an objective is not dependent on any particular biological model but can be adapted to any model under consideration. In practice the concept of economic yield has been defined too narrowly in the fisheries literature, failing to take account of regional benefits, benefits from recreational fishing or some other legitimate economic gain. Fisheries scientists have, therefore, not always appreciated the broader aspects of the concept of economic yield (Waugh, 1984).

Thirdly, as a reaction against maximum economic yield (MEY), the objective of optimum sustainable yield (OSY) has, more recently, been proposed. This is a concept which attempts to embody economic, biological, social, legal and political elements into an objective function. The term optimum sustainable yield is not capable of precise definition, but is thought of in the fisheries literature as an improvement over maximum net economic yield (Waugh, 1984).

Arguments that the fisheries management objectives need to be generalized have been prolific. Many researchers argue that a whole range of objectives are important including maximum economic yield, maximum employment, provision of part-time employment, maintenance of the resource, provision of the maximum level of protein, increasing food supply and

improvements in the distribution of income (Rothschild, 1972; Royce, 1987; Anderson, 1977; McHugh, 1984; FAO, 1984; 1986; Becker, 1986).

In Southeast Asia, the fishing industry can generally be divided into small-scale and large-scale subsectors. Each country has its own system of classification, usually based on the type or size of boat employed, fishing gear used and the distant of fishing (Panayotou, 1985; Rientrairut, 1985). However, Bailey (1987) states that the physical dimensions are not the most important distinguishing characteristic separating these two subsectors. More important are the fundamental differences in values and goals that distinguish these two classes of fishermen.

The large scale subsector is dominated by individual entrepreneurs who own one or perhaps a few trawlers and purse seiners; private corporations and state enterprises which operate boats that generally are far larger and more powerful in terms of fleet size, employment, or fishing effort. The Southeast Asian entrepreneurs share common goals of profitability and capital accumulation under the open access conditions of fishery resources.

Prior to the 1960's, the fisheries of Southeast Asia were exclusively small-scale in nature and were oriented to supplying local domestic markets. Despite the growth in commercial fisheries, small-scale fishermen continue to account for roughly 80 percent of those directly employed, and

harvest the largest amount of the fish consumed in Southeast Asia (Peterson and Smith, 1982; CIDA, 1986). Most small-scale fishermen are restricted to operating in coastal waters near their home community by the size of their boat and the design of their fishing gear. Although the productive capacity of individual small-scale fishing units is quite limited, the large number of units involved frequently results in high levels of fishing effort.

Unlike the case of commercial fishermen, high levels of fishing effort within the small-scale subsector are not attributable to a combination of mechanized fishing power and profit-seeking behaviour, but rather to the sheer numbers of individuals seeking a living from the sea. Moreover, their numbers continue to grow because of both natural population increase and the entry of landless agricultural workers and others seeking a means of earning a living. The open access nature of fishery resources and the low capital requirements necessary to invest in a simple small-scale fishing unit present few barriers to the entry of additional small-scale fishermen (Bailey, 1982; 1987).

Small-scale fishermen are no less rational economically than their commercial counterparts. Traditional fishing technologies are inextricably linked to the values of local fishing communities and these in turn shape a wide range of social and economic relationships. Profitability and capital accumulation are only two goals among many. Many researchers

observe that non-economic factors often shape the social relations of production among small-scale fishermen (Emmerson, 1980; Pollnac and Sutinen, 1979; Robins, 1979; Bailey, 1987).

Competition for a dwindling resource base has led to serious gear conflict, especially between small-scale fishermen and trawlers. Trawlers not only compete effectively against small-scale fishermen but, because of their active mode of operation, they frequently damage or destroy more passive small-scale gear. This is a particularly serious problem at night, a time favoured by trawler operators, as this is when shrimp are most active and easily caught. As well, trawlers operating illegally in coastal waters are less likely to be apprehended at night (Panayotou, 1985).

Fishermen in Malaysia claim that the introduction of trawlers has led to the elimination of demersal trap fisheries (Bailey, 1987). Destruction of small-scale gear by commercial trawlers has also been reported in the Philippines, Indonesia and Thailand. Damage or destruction of small-scale fishing gear caused by trawlers results in serious economic losses and is a continuous threat to the life and livelihood of many small-scale fishermen. This, in turn, may contribute to broader problems of social unrest.

Bailey (1987) notes that in the Southeast Asian context, tensions within the fisheries sector are particularly volatile because technological advantages are not only a matter of economic class but are also frequently related to ethnic

divisions within the region. For instance, in Malaysia the possibility that tensions within the fisheries sector might erupt into widespread social unrest must be considered where commercial-oriented ethnic Chinese entrepreneurs operate in direct competition with Malay small-scale fishermen.

Apart from overfishing and excessive fishing effort, the Southeast Asian countries are facing the stress and degradation from inappropriate marine resources exploitation. Which can be counted from depletion of fish stock, deforestation of mangroves, damage of fish habitat and water pollution (CIDA, 1988).

2.2 Thailand's Marine Fisheries

Thailand has two coasts. One curves around the scooped outshore of the Gulf of Thailand and has a length of 1,870 km. The other lines the shore of the Andaman Sea of the Indian Ocean and has a length of 800 km extending northwards from the Malaysian border to the Burmese border. The Gulf of Thailand, which is typical of the Sunda Shelf, is an integral part of the Asian continent and South China Sea. It is relatively shallow, with a mean depth of approximately 45 metres and a maximum depth of approximately 80 metres (TDRI, 1987). Only a few decades ago tropical areas in general were considered to have a very low productivity (Marr, 1976). In fact, the tropics can be very productive, Chullasorn and Martosubrato (1986) state that the waters in Southeast Asia constitute one

of the most productive areas for commercial fisheries in the world oceans. The total annual catch from the region has increased steadily throughout the years and has reached about 6-7 million tons recently, which accounts for about 10 percent of the world's total marine production (FAO, 1989).

Productivity is high in the continental shelf areas, although low in the surface waters of the deep areas. Enrichment is brought about by vertical mixing in the shelf areas, river discharge, and upwelling. In the South China Sea, vertical mixing over the continental shelf is the main mechanism for nutrient replenishment in the surface layers, followed by river discharge and upwelling, in that order (TDRI, 1987; FAO, 1982). Thus, production of fish (and crustacea and mollusca) is high in the shelf areas. In general, this production is spread over a very large number of relatively short-lived species. Unlike fisheries in the higher latitudes, which are based upon one, or at most, a few long-lived species which tend to accumulate on the fishing grounds, fisheries in the tropics, and especially in the South China Sea, are based upon large numbers of short-lived species. It is not uncommon to take as many as 200 species in a single trawl haul, a factor which has major implications for fishery development and management. The Indo-Malay region is noted for its large proliferation of fish species, which number some 2,500 (Marr, 1976).

The marine fishing grounds exploited by Thai fishermen

are the Gulf of Thailand, the South China Sea, the Andaman Sea, the Bay of Bengal and the Indian Ocean (Rientrairut, 1983). Marine fish resources can be broadly divided into two basic groups: demersal or bottom dwelling fish and pelagic fish, which live in the water column. The demersal group can be further divided into those living on soft level seafloor (which can be captured by trawls) and those living on hard, rocky or coralline (untrawlable) seafloor. The pelagic group divides into the neritic type, living over the continental shelf and oceanic types, such as the large tuna, flying fish and marlin. In practical terms, however, the distinction between pelagic and demersal types inhabiting shallow water areas such as the Gulf of Thailand tends to become blurred as many species living in the water column can be captured by high opening trawl nets, which are commonly used by Thai fishermen (ADB, 1985; Rientrairut, 1983).

The major pelagic species in Thailand are chub mackerel (Rastrellinger kanagurta), Indo-pacific mackerel (Scomberomorus guttatus), sardine (Dussumieria elopsoides), anchovies (Stolephorus commersonii, Stolephorus indicus), long-tail tuna (Thunnus tonggol), squid (Loligo formosana) and cuttlefish (Sepia pharaonis, Sepioteuthis lessoniana) which are taken by gillnets, and/or purse seines. The major demersal species are round scad (Decapterus maruadsi), threadfin-bream (Nemipterus hexodon), croaker (Otolithes ruber), big-eye snapper (Lutjanus lineolatus) and hard-tail

scad (Megalaspis cordyla) which are taken by pair trawls and otter trawls (Nagalaksana, 1988).

The types of human settlements along the coast in Thailand can be classified into five categories: fishing villages; fishing and farming villages; farming villages; urban and industrial communities; and migratory communities (Adulavidhaya et al., 1982). The fishing villages type is the most common along the Thai coasts. Fishing villages are located in estuaries and along the shores. These villages are generally settled in clusters. The size of fishing villages varies from very small, composed of 20-30 households, to very large, composed of several hundred households. Panayotou et al. (1985) suggest that there is a total number of 90,200 fishing households in 1,563 fishing villages, covering twenty-three coastal provinces, bringing the fishing-dependent population up to 800,000. People in fishing villages are usually engaged in small scale fisheries with simple technology. These villages are generally self-sufficient (TDRI, 1986).

Fishing and farming village type is mainly scattered along the east coast and the southern provinces. People in these communities engage in rice farming as a supplementary occupation. The standard living of these people is relatively better than those living on fishing alone (Rientrairut, 1985). But rice production is rarely sufficient for household consumption due to increasing salinity of the soil, population

growth and lack of primary interest in rice cultivation. In addition to rice farming, coconut plantations also provide supplementary income.

The coastal farming communities are located in the inner part of the Gulf of Thailand. This area includes the estuaries and delta of four rivers. The major occupations of these villages are salt farming, shrimp and fish farming, and coconut plantation. This type of settlement is generally in a scatter pattern with each homestead on the farm land.

Most of the coastal urban and industrial communities are provincial administration centres. Recently these provinces have been initially industrialized, for example Chonburi province and neighbouring Rayong and Chachoengsao have become the focus of the Eastern Seaboard development plan including a major new port, heavy industry zone, oil refineries, petrochemical industry, marine product industry and numerous housing estates. The rate of urbanization and industrialization in Chonburi province and neighbouring provinces is increasing rapidly (ONEB, 1986). In addition, many coastal provinces have rapidly developed due to the booming of tourism.

The migratory communities are mainly located in some southern provinces on the Indian Ocean coast. They are ethnic minority called "Chao Le" (sea Dyak or sea gypsy). These people have no permanent settlement, wandering from place to place, from island to island, in order to find fishing

locations. It is estimated that the population of sea Dyaks in Thailand to be about 2,300 or 400 households. They live in small endogamous groups with a unique culture (Adulavidhaya et al., 1982).

2.2.1 Commercial Fisheries

Prior to 1960, the fishing industry in Thailand consisted virtually of small-scale fishing households. While more than 80 percent of inland fishermen were actually farmers, 50 percent of coastal fishing households had more than one main source of income. Typically, they operated within their family unit and rarely hired outside help. They used small and uncomplicated gear which produced relatively low yields (Rientrairut, 1983).

A great expansion in marine fisheries occurred in Thailand in the early 1960s through the use of the German-type otter-board trawl which was introduced under the Thai-German Project in 1961. As a result, a sharp 24-fold increase in the number of trawlers during the first three introductory years was observed (Nagalaksana, 1988). Accordingly, the average annual marine production rose significantly from 146,589 tons during 1950-1960 to 323,374 tons in 1963 (Rientrairut, 1983), and jumped to 1,538,016 tons in 1973 (DOF, 1987) with 89,777 people engaged in marine fishery in 1985 (TDRI, 1987). The fishing fleet has rapidly expanded not only in terms of the number of fishing vessels but also in the size and the

catching capacity. In 1982, there were approximately 19,556 powered fishing boats registered in Thailand (Panayotou and Jetanavanich, 1987), and they gradually declined to about 16,054 commercial fishing boats in 1987 (Table 2.4).

Following the introduction of trawl gear in 1961, the trawl fleet grew rapidly with little or no restriction on the entry of additional vessels or on the total catch. In the Gulf of Thailand fishery, this led to overcapitalization and, subsequently, to biological overfishing. The excess resources used over and above the minimum required to harvest a certain amount of fish are generally referred to as "overcapitalization", which in turn implies that resources are being used in the fishery which could be used more productively (generating higher returns) somewhere else in the economy (Aquero, 1987; Marr, 1976). Overcapitalization and, thus, economic waste is inevitable in a fishery in which there is unlimited entry due to the common property characteristic of fishery resources.

The German-Thai project was successful in four ways. First, the otter-trawler was extremely effective at catching demersal fish. Second, traditionally sea-going Thai people could easily take up this new technique. Third, the Thai fishery business entrepreneurs also sought the opportunity to develop and expand the fishing fleet due to the ready availability of venture capital. Fourth, there was no proper fisheries management to regulate and to implement. Therefore,

Table 2.4 : Number of Commercial Fishing Boats Registered by Type of Fishing Method in Thailand, 1983-1987

Type of Fishing Method	1983	1984	1985	1986	1987
Trawl					
Otter board trawl	7,796	7,769	6,968	6,226	6,129
Pair trawl	1,266	1,166	1,218	1,084	1,164
Beam trawl	328	196	139	97	50
Total	9,390	9,131	8,325	7,407	7,343
Purse seine					
Thai purse seine	40	469	582	568	644
Chinese purse seine	18	16	17	17	14
Anchovy purse seine	97	155	197	143	117
Luring purse seine	691	321	237	268	399
Total	846	961	1,033	996	1,174
Gill net					
King mackerel drift gill net	264	265	269	329	365
Pomfret gill net	8	21	18	9	17
Mackerel encircling gill net	144	245	227	203	223
Mackerel gill net	83	71	179	153	181
Crab gill net	1,071	879	679	1,334	985
Sadinellas gill net	59	31	31	13	22
Mullet gill net	59	17	25	23	16
Threadfin gill net	24	13	15	24	6
Shrimp gill net	2,900	2,052	2,901	2,974	3,294
Others gill net	559	418	401	795	606
Total	5,171	4,012	4,745	5,858	5,715
Push net	1,236	960	759	664	624
Squid cast net	524	532	663	654	794
Others net	165	364	362	287	351
Long line	54	46	63	51	53
Total	17,386	16,006	15,968	15,916	16,054

Source : DOF, 1989.

Table 2.5 : Number of Commercial Fishing Boats Registered by Size and Fishing Method in Thailand, 1987

Type of Fishing Method	Size of Boat (Length)				Total
	<14 m	14-18 m	18-25 m	>25 m	
Trawl					
Otter board trawl	2,742	1,878	1,365	144	6,129
Pair trawl	31	477	652	4	1,164
Beam trawl	48	2	-	-	50
Total	2,821	2,357	2,017	148	7,343
Purse seine					
Thai purse seine	25	162	449	8	644
Chinese purse seine	-	8	6	-	14
Anchovy purse seine	33	24	60	-	117
Luring purse seine	16	64	317	2	399
Total	74	258	832	10	1,174
Gill net					
King mackerel drift gill net	61	163	140	1	365
Pomfret gill net	3	12	2	-	17
Mackerel encircling gill net	98	36	89	-	223
Mackerel gill net	181	-	-	-	181
Crab gill net	977	8	-	-	985
Sadinellas gill net	18	3	1	-	22
Mullet gill net	16	-	-	-	16
Threadfin gill net	6	-	-	-	6
Shrimp gill net	3,285	9	-	-	3,294
Others gill net	581	24	1	-	606
Total	5,226	255	233	1	5,715
Push net	594	27	3	-	624
Squid cast net	653	126	15	-	794
Others net	335	11	5	-	351
Long line	14	22	17	-	53
Total	9,717	3,056	3,122	159	16,054

Source : DOF, 1989.

overcapitalization and biological overfishing occurred inevitably.

The fishery resources in the Gulf of Thailand have been heavily exploited since the introduction of the otter-board trawl. The potential yield or maximum sustainable yield (MSY) of demersal fish in the Gulf of Thailand is approximately 750,000 tons per annum while that of the pelagic fish is about 400,000 tons per annum and 250,000 tons from Andaman sea (TDRI, 1987). The annual marine catch of Thailand was 2,055,225 tons in 1983, which reflects the overfishing. The level of exploitation and maximum sustainable yield (MSY) in Thai landings are presented in Table 2.6.

Table 2.6 : Level of Exploitation and Maximum Sustainable Yield (MSY) of Demersal and Pelagic Fish in Thai Landings (in mt)

Fishing Ground	Resources	Exploitation Level		Estimated MSY
		1982	1983	
The gulf	Pelagic	466,480	616,800	400,000
	Demersal	1,170,946	1,136,434	750,000
West Coast	Pelagic	101,122	93,954	100,000
	Demersal	211,133	208,037	200,000
Total		1,949,681	2,055,225	1,450,000

Source : TDRI, 1987.

Even though the fishing in the Gulf has been overfished since 1966-1967 (Rientrairut, 1983), the total catch attributed to the fishery in the Gulf of Thailand has reached a plateau and has not declined. ADB (1985) points out that there are probably two factors accounting for this: landings taken outside of Thai territorial waters are included in the catches, and the total catch is being maintained as a result of changes in the species composition and size structure of stocks. The latter case is believed to result largely from the inability of relatively slow growing, large predatory species to withstand heavy fishing pressures. Consequently, predation on small species is reduced. Other complex and dynamic changes also occur in exploited communities which all tend to shift the community towards small, short-lived, rapidly-growing species, low in the food chain. As a general case, this leads to a reduction in the value of the total catch.

The decline in catch per unit of effort and in biomass of fish stock in the Gulf of Thailand is mainly due to the excess fishing effort of the trawl fishery. Meemeskul (1987) mentions that during the early period only small-size trawlers (less than 14 m in length) and medium-size trawlers (14-18 m in length) were fishing intensively in the inshore waters within a depth of 50 m. Since the early 1970s, a significant number of registered large-size trawlers (18-25 m and more than 25 m in length) has entered the inshore waters due, in

part, to the increased demand for fish. The declaration of 200 mile Exclusive Economic Zones by neighbouring States, since the late 1970s and early 1980s, has forced the large-size trawlers to return to their home-waters, leading to increased excessive fishing effort in the Gulf of Thailand.

The excess fishing allows less fish to escape from the catch and leave them to grow to reach adult or maximum size. The proportion of trash fish in the trawl catch in the past decade has risen to nearly 70 percent without much variation among years (Table 2.7). Trash fish generally refers to those fish whose maximum size is small, juveniles of large-size fish and large-size fish for which there is little market demand. These trash fish are used for duck food, catfish food and for production of fish meal (Marr, 1976). Meemeskul (1987) states that with the improvement of infrastructure within the country, it is becoming possible to process some of the unpopular fish into products for human consumption. Thus, trash fish in recent years has been made up of mostly low valued small-size fish.

Table 2.7 : Catch and Composition of Thai Trawlers, 1974, 1977 and 1985

Type of fishing gear	Total catch (1,000 tons)	Composition (%)			
		Edible fish	Trash fish	Shrimp & crab	Cephalopod & mollusc
<u>1974</u>					
Otter trawler					
< 14 m.	122.5	13.0	59.3	23.3	4.4
14-18 m.	348.7	14.8	59.3	23.3	4.1
18-25 m.	241.0	23.9	69.7	2.8	3.6
> 25 m.	120.8	25.4	70.5	0.5	3.6
Pair trawler					
< 14 m.	3.6	19.8	56.3	12.7	11.2
14-18 m.	69.1	20.1	56.3	1.3	22.3
> 18 m.	88.9	24.3	60.6	0.6	14.5
<u>1977</u>					
Otter trawler					
< 14 m.	210.4	11.9	58.1	20.8	9.3
14-18 m.	362.1	12.6	71.6	9.6	6.2
18-25 m.	293.3	18.5	72.2	2.6	6.7
> 25 m.	121.0	31.6	59.5	4.2	4.7
Pair trawler					
< 14 m.	7.7	7.7	86.5	2.8	3.0
14-18 m.	72.6	20.9	55.1	1.5	22.5
> 25 m.	142.0	22.3	62.6	0.6	14.5
<u>1985</u>					
Otter trawler					
< 14 m.	184.0	10.3	57.3	23.4	9.0
14-18 m.	287.8	13.3	69.5	9.2	8.0
18-25 m.	258.8	17.9	73.1	2.2	6.8
> 25 m.	90.1	17.4	74.4	2.3	5.9
Pair trawler					
< 14 m.	2.2	17.0	67.1	5.0	10.9
14-18 m.	84.3	16.4	71.8	0.9	10.9
> 18 m.	94.0	16.8	73.7	0.6	8.9

Source : Boonchuwong and Lawapong, 1988.

Table 2.8 : Catch, Fishing Effort and Composition of Catch by Type and Size of Vessels, 1985.

Type of Fishing Gear	Fishing Effort/month		Total Catch (kg)	Composition (%)				
	No. of Days	No. of Hours		Edible Fish	Trash Fish	Shrimp	Cephalopod*	Other
Otter trawl								
< 14 m.	17	202	6,291	20	53	18	6	3
14-18 m.	20	317	16,313	19	65	8	6	3
18-25 m.	22	352	34,811	23	67	2	6	2
> 25 m.	27	361	68,330	19	74	1	6	1
Pair trawl								
< 14 m.	15	155	9,266	53	6	24	10	6
14-18 m.	21	251	37,284	19	68	1	11	2
> 18 m.	23	291	45,239	23	67	1	9	1
Thai purse seine								
< 14 m.	17	-	33,821	79	0	2	17	2
> 14 m.	16	-	47,543	83	3	2	12	1
Luring purse seine								
18-25 m.	18	-	50,111	73	17	1	7	1
Mackerel encircling gill net								
> 14 m.	17	-	13,157	94	4	0	0	2
King mackerel drift gill net								
> 14 m.	17	-	8,201	91	8	0	0	1

Source ; Boonchuwong and Lawapong, 1988.

* Cephalopod includes squid, cuttle fish and octopus.

Trash fish make up between 60 and 70 percent of the catch landed by trawlers, whereas edible fish account for about 20 to 30 percent. On the other hand, pelagic fishing gears such as purse seine and gill nets, land more edible fish ranging from 70 to 90 percent whereas the amount of trash fish landed is as low as 10 to 20 percent (Boonchuwong and Lawapong, 1988). Table 2.8 presents the composition of catch by

different type of fishing gear.

The trends in fisheries production in Thailand are presented in various forms. Agencies in the Ministry of Agriculture and Cooperatives (MOAC) are more concerned with simple aggregation of tons of fish caught because their development targets and service fees are based on quantities of production. The Fisheries Marketing Organization and Cold Storage Organization (state enterprises in MOAC) are charging their service fees on tonnages of fish handled, therefore their interests in fisheries statistics are mainly in quantity aspects (Isarangkura and Davivongs, 1987).

The simple aggregative numbers of marine fisheries production in tonnage between 1983 and 1987 are presented in Table 2.9. The trash fish group consistently dominates during the period, followed by the other foodfish group and shellfish. High valued shrimp and prawn rank fourth and are followed by the squid and cuttlefish group. Table 2.10 presents the aggregative value of marine production of Thailand between 1983 and 1987.

Table 2.9 : Marine fisheries Production of Thailand, 1983-1987
(in mt)

Fisheries	1983	1984	1985	1986	1987
Pelagic Fish					
Indo-Pacific mackerel	79,803	129,094	121,107	113,497	119,182
Indian mackerel	53,247	33,436	36,970	41,891	39,876
Other pelagic fish	379,553	410,109	430,027	414,693	470,531
Total	512,603	572,639	588,104	570,081	629,589
Demersal Fish					
High valued species	90,110	88,526	97,478	131,545	152,726
Low valued species	75,798	95,278	108,436	121,068	129,428
Trash fish	803,337	757,637	776,421	976,236	1,105,654
Total	969,245	941,441	982,335	1,228,849	1,387,808
Shrimp and Prawn	160,981	137,336	127,643	141,174	151,636
Sergistid shrimp	21,153	18,810	18,818	19,359	20,055
Crabs	28,563	27,046	26,829	35,606	40,401
Shellfish	115,582	153,595	183,523	164,323	217,758
Squid and cuttlefish	132,044	129,269	116,035	134,915	132,538
Others	180,968	11,693	33,282	77,256	42,172
Total	2,099,986	1,973,019	2,057,751	2,352,204	2,601,929

Source : DOF, 1989.

Christy (1987a) points out that the customary of fisheries output is a simple aggregative of the catches or landings of individual species or groups of species. This simple aggregation assumes that each individual species is of equal importance or value. In fact, there is a wide range in the importance of the many different species of fish that are caught. Attempts to combine the different species without taking account of the differences in relative importance can

be misleading, particularly in the tropical zone where there are changes in the composition of the species in the catches. The simple aggregation of catches of fish in total tons does not provide an appropriate measure of fisheries output. It measures only the physical quantities that are produced without regard to their importance to the economy. The simple aggregate could mislead policy-makers into thinking that the fishing industry is continuing to grow, whereas real output is declining.

Simple numbers of marine fisheries wholesale prices during 1983 to 1987 are presented in Table 2.11. Wholesale prices in Table 2.11 are used in the compilation. The simple numbers in Table 2.11 show that the shrimp and prawn group is the most high valued, follow by the squid and cuttlefish group. The trash fish group is among the least important group in the simple series. By applying these prices to the production figures, the commodities can be aggregated in terms of their relative economic importance. As shown in Tables 2.9, 2.10 and 2.11, the value of catch of demersal fish group in 1985 was 5,493 million baht. However, it dropped to 4,467 million baht in 1987. This is due to the fact that the decline in catches of high valued species was more important than the very large increase in a low valued species. This indicates that the composition of the catch has shifted to the lower valued species. That is the increases in catches have been greater for the lower priced species than for the higher

priced species. As fisheries develop, initial efforts will tend to focus on the high priced species producing the greatest profits. But as the yields of these stocks reach the maximum levels, fishing effort will tend to move to the lower priced species (Christy, 1987a).

Table 2.10 : Value of Marine Production of Thailand, 1983-1987
(Value : 1,000 baht)

Fisheries	1983	1984	1985	1986	1987
Pelagic fish					
Indo-Pacific mackerel	855,488	1,312,746	1,042,302	1,138,597	1,413,458
Indian mackerel	497,859	313,582	324,817	357,326	316,462
Other pelagic fish	2,546,328	2,555,562	2,866,580	3,471,825	3,629,411
Total	3,899,675	4,181,890	4,233,699	4,967,748	5,359,331
Demersal fish					
High valued species	2,722,128	2,741,863	3,852,383	1,181,124	1,458,162
Low valued species	450,240	535,030	564,777	690,423	751,083
Trash fish	1,622,741	1,555,038	1,640,784	2,104,857	2,258,379
Total	4,795,109	4,831,931	5,493,731	3,976,404	4,467,624
Shrimp and Prawn					
Sergistid shrimp	4,783,387	4,179,320	4,568,020	5,130,014	7,530,934
	71,920	56,430	56,454	58,790	80,766
Crabs					
Shellfish	545,958	612,710	675,351	906,455	995,932
	384,999	394,545	582,354	454,008	934,292
Squid and cuttlefish					
Others	2,686,869	2,276,875	2,456,863	3,344,469	3,689,284
	68,205	7,665	19,951	42,229	24,997
Total	15,236,122	14,541,366	15,650,636	18,883,117	23,083,160

Source : DOF, 1989.

Table 2.11 : Marine Fisheries Wholesale Prices in Thailand, 1983-1987.
(Prices are Baht/kg.)

Fisheries	1983	1984	1985	1986	1987
Pelagic fish					
Indo-Pacific mackerel	10.72	10.17	8.61	10.03	11.86
Indian mackerel	9.35	9.38	8.79	8.53	7.94
Other pelagic fish (i)	6.71	6.23	6.67	8.38	7.71
Demersal fish					
High valued species (ii)	30.21	30.97	39.52	8.98	9.55
Low valued species (iii)	5.94	5.62	5.21	5.70	5.80
Trash fish (iv)	2.02	2.05	2.11	2.16	2.04
Shrimp and Prawn (iv)					
Sergistid shrimp	29.71	30.43	35.79	36.34	49.66
	3.40	3.00	3.00	3.04	4.03
Crabs (iv)					
Shellfish (iv)	19.11	22.65	25.17	25.46	24.65
	3.33	2.57	3.17	2.76	4.29
Squid and Cuttlefish (iv)					
Others (iv)	20.35	17.61	21.17	24.79	27.84
	0.38	0.66	0.60	0.55	0.59

Source : DOF, 1989.

- (i) Combination of 15 pelagic species.
- (ii) Combination of 20 high valued demersal species.
- (iii) Combination of various low valued demersal species.
- (iv) Combination of various species.

Although the Thai government, through its own survey cruises (Rientrairut, 1983), has good information on overfishing situations, there are no restrictive measures that limit entry into the fishery. It was not until 1978 that the government instructed the Department of Fisheries and Harbor Department to establish a new licensing scheme which aimed to freeze the number of fishing vessels (particularly trawl

fishing and push net) and to reduce it thereafter because these fishing gears caused severe damage to the early stage of valuable fish stock (DOF, 1985). However, this policy was not implemented until 1984. The reasons likely hinge on the political implications, the trade-offs between the improvement of biological and economic performance, and the social objectives of maintaining employment opportunities and food supply.

In 1984, under the provision of a new licensing scheme, no licenses were issued to any new entry trawl fishing vessels. The currently active trawl fishing vessels have to renew their license every year. Failure to do so results in loss of the license which mean they have to leave the fishing industry or change to another kind of fishing gear. The license for trawl fishing gear can not be transfered, and can not be passed on to an heir. However, the Department of Fisheries is not empowered to register the fishing vessels because this authority is under the Harbor Department. Therefore, the old trawl fishing vessel still can be replaced by newly constructed trawl fishing vessels if the owner has a trawl fishing gear license.

Table 2.12 : Declaration of Exclusive Economic Zones

Countries	Date	Area (sq. miles)	Coastline (miles)
India	15 Jan. 1977	-	-
Burma	9 Apr. 1977	148,600	1,230
Vietnam	12 May 1977	210,600	1,247
Cambodia	15 Jan. 1978	16,200	210
Philippines	11 Jun. 1978	551,400	6,997
Indonesia	21 Mar. 1980	1,577,300	19,784
Malaysia	25 Apr. 1980	138,700	1,853
Singapore	15 Sept. 1980	100	28
Thailand	23 Feb. 1981	94,700	1,468

Source : Gro-Thong, 1988.

Table 2.13 : Thai Trawlers Arrested by Neighbouring Countries

Countries	1981		1982		1983		1984		1985		1986		1987	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Malaysia	18	96	3	70	9	99	6	44	43	367	53	357	82	879
Vietnam	24	155	3	-	38	238	21	101	39	366	7	135	28	472
Burma	10	20	5	98	33	378	4	30	16	148	24	412	35	379
India	15	254	3	9	2	35	2	-	2	-	12	233	4	67
Indonesia	4	75	4	87	2	31	1	19	4	19	-	-	3	69
Cambodia	5	-	9	-	10	12	-	-	-	-	-	-	7	70
Bangladesh	-	-	-	-	1	18	-	-	1	18	1	22	1	27
Total	76	600	27	264	95	811	34	194	105	918	97	1,159	1601	963

Note : a - No. of trawlers.

b - No. of fishermen.

For some trawlers there was no report on the number of fishermen onboard.

Source : Gro-Thong, 1988.

Another impact on Thai fishing industry came after the following coastal states in South-East Asia declared 200 mile exclusive economic zones (EEZ): Burma (1977), Cambodia (1977), Vietnam (1977), the Philippines (1978), Indonesia (1980) and Malaysia (1980) (Kittichaisaree, 1987). The Thai government declared the exclusive economic zone in 1981 (Table 2.12). Approximately 60 percent of the total demersal catch by Thai trawlers are made outside Thai water in the waters of Bangladesh, Myanmar (formerly Burma), India, Indonesia, Cambodia, Malaysia, Singapore and Vietnam. It is estimated that the declaration of the EEZ of the neighbouring countries resulted in Thailand losing about 300,000 sq.km. of fishing grounds and 400,000-600,000 tons of annual fish catch (Nagalaksana, 1988). Each year many Thai fishing vessels are confiscated and fishermen are arrested by neighbouring countries for alleged violation of neighbouring waters (Table 2.13).

The damages to the Thai fishing vessels confiscated so far have been estimated to be about 2-3 billion baht (CN\$100-150 million). Moreover, the government has to pay large sums of money for fines, transportation and miscellaneous expenses to repatriate the fishermen from time to time (TDRI, 1987). As a solution, the government amended the law in 1985 which is stated in section 28 bis. of the Fisheries Act, B.E. 2490 (1947). According to this section, the owner of a fishing vessel has the duty to pay the fines, transportation and

miscellaneous expenses to repatriate their crew which are left abroad resulting from the violation of foreign states' waters.

In addition, the Thai government is promoting joint-fishing ventures with other coastal states, however, this would be only short-term relief and only a few trawlers can participate in this arrangement. Therefore, increased efforts on aquaculture development are called for in the Sixth National Economic and Social Development Plan (1987-1991). Aquaculture is looked upon as the appropriate solution substituting any production loss from marine capture fisheries (ADB, 1985; NESDB, 1987; TDRI, 1987; McDorman and Tasneeyanond, 1987).

2.2.2 Small Scale Fisheries

Small scale fisheries are widely exercised in the coastal area of Thailand, because they can be operated by near-shore fishing, coastal aquaculture, and mariculture. Small scale fishermen are important participants in the fishing industry of Thailand accounting for three-quarters of the total number of fishermen, and they provide one-quarter of the total fish landings (DOF, 1987; Panayotou and Jetanavanich, 1987). Fishing is also an important source of rural employment and income. It is estimated that 5 percent of the total labour force in Southeast Asia depends on fishing for its livelihood (Panayotou, 1985). Panayotou et al. (1985) also report that there are more than 300,000 small scale fishermen scattered

along Thailand's coast.

Although there is no standard definition of small scale fisheries, various classification of fisheries do exist: small-scale versus large-scale; subsistence versus commercial; artisanal versus industrial; and inshore (or municipal) versus offshore. Fisheries may also be classified according to the vessel size; gear type and vessel size; distance from shore; or a combination of the three (Panayotou, 1985). It is not unusual to find that what is considered a small-scale fishery in one country would be classified as a large-scale fishery in another (Emmerson, 1980).

In Thailand, many institutions have attempted to define small scale fisheries as follows:

(a) Kasetsart University (Panayotou, 1978 in Rientrairut, 1985: 2) defines them in terms of current value of fishing assets owned by fishing household of less than 20,000 Baht (1,000 CN\$).

(b) SEAFDEC (Yamamoto, 1981 in Rientrairut, 1985: 2) defines them in terms of fishing boat as a method ranging from without boat, to non-motorized boat, outboard motorized boats to inboard motorized boats less than 8 meters in length.

(c) DOF (Rientrairut, 1985: 2) defines them in terms of horsepower, length of boat, labour employed and type of fishing gear. All fisheries - - that are carried out using small traditional fishing gear, operating fishing on subsistence basis as well as coastal aquaculture using small

cultivation area - - are defined as small scale fisheries. Small fishing gear implies that the fishing gear used with the boats is not greater than 10 meters in length, and that the engine is not greater than 30 HP. Traditional fishing gear implies low efficiency and can be employed within the vicinity of a home base, or in the area close to the coast. Subsistence basis implies low income and fishing labour is mainly family members.

Generally, the income of small scale fishermen in Thailand is composed of fishing income and non-fishing income. Fishing income is derived from three sources: own fishing, fishing labour and fish processing, whereas non-fishing income is derived from farming, hired labour and others (Rientrairut, 1985). Therefore, there is a wide difference in income among the small scale fishermen operating the same type of gear in different fishing grounds or different types of gear in the same fishing ground.

Unlike the commercial fisheries, the exact number of small scale fishing boats in Thailand is unknown. Although commercial fishermen are required to register the boats and to obtain fishing gear licenses for the purposes of tax collection and inventory, small scale fishermen are viewed as a poor group in the fishing industry. Their way of life is to fish on a subsistence basis using low efficiency fishing gears which have a low impact on fishery resources. The government's policy is to waive the tax on them, therefore

some small scale fishing gears are not required to license (DOF, 1989). In addition, there are always some occupational and geographical mobility in and out of fishing industry by small scale fishermen (Panayotou and Panayotou, 1986). These reasons make it difficult to obtain an accurate accounting of small scale fishing gears in Thailand.

Rientrairut (1985) suggests that there are 24 types of small scale fishing gear in Thailand, numbering to about 45,000 units. Most of the gear are seasonal, except a few such as shrimp gillnet, crab gillnet, push net and small beam trawl. The highest number of fishing gear is fish gillnet with about 5,700 units, followed by shrimp gillnet with about 5,200 units. Traditional fishing gear can be classified into four main groups: gillnet, longline, mobile gear and stationary gear (Table 2.14). Among them, mobile gear catches the highest percentage, approximately 40 percent of the total whereas longline contributes the lowest with approximately 2 percent. Annual production of small scale fisheries contributes about 20-30 percent of the total marine production and most of the catch is composed of high value species.

Table 2.14 : List of Small Scale Fishing Gear in Thailand

<u>Gillnet</u>	<u>Mobile gear</u>
1. Swimming crab gillnet	17. Ark shell rake
2. Shrimp gillnet	18. Beam trawl
3. Fish gillnet	19. Acetes trawl
4. Seabass encircling gillnet	20. Push net
	21. Mysis purse seine
	22. Beach seine
<u>Stationary gear</u>	
5. Squid trap	
6. Fish trap	<u>Long line</u>
7. Crab trap	23. Hook
8. Circular net crab trap	24. Squid hook line
9. Bamboo mud crab trap	
10. Crab lift net	
11. Bamboo cylinder trap	
12. Small winged set bag	
13. Big block net	
14. Winged set bag	
15. Net for Malaya lift net	
16. Plotorus brush piles	

Source : Rientrairut, 1985.

In the past, the socio-economic problems faced by small-scale fishermen in Thailand have been largely ignored. This was partly due to a presumption that, sooner or later, small-scale fishermen would be absorbed by the rapidly progressing large-scale fishing sector (either by acquiring advanced technology or by becoming labourers on large trawlers). Otherwise, they would be forced to alternative, more profitable, occupations. Leaving aside the social problems that such a transformation would have generated, the fact is

that the small-scale fishermen, despite their apparently deteriorating standard of living, continue to exist alongside a highly profitable large-scale fishing sector. A number of explanations for this dualistic structure and persisting poverty have been advanced, ranging from the lack of advanced technology to the depletion of fish resources; from a suspected gambling behaviour among fishermen to the alleged exploitation by unscrupulous middlemen; and from the lack of alternative employment opportunities to fishermen's occupational and geographical immobility (Panayotou et al., 1985; Rientrairut, 1985).

Panayotou (1985) suggests that the Southeast Asian governments, including Thailand's, are facing three distinct, but interdependent issues:

- [1] how to attain a sustainable improvement in the socio-economic conditions of small-scale fishing communities;
- [2] how to manage the resource so as to maximize its productivity (or, more appropriately, the net economic or net social benefit from the resource);
and
- [3] how to allocate the country's limited marine fisheries between small-scale fishing communities and commercial fisheries so as to minimize the conflict between them.

In order to solve these problems, many researchers, including Panayotou (1985), ADB (1985), and Rientrairut (1985) conclude that fisheries management can make a dual contribution toward the improvement of income levels of small-scale fishermen:

[1] by limiting entry into the coastal fishery, which would help consolidate any possible gains from fishery development; and

[2] by effectively prohibiting the operation of the large-scale fishery (particularly, trawlers) in the coastal waters, it would enlarge the effective resource base of the small-scale fishery.

In Thailand, the tremendous increase in the number of trawlers over the past two decades, from approximately 5,000 fishing vessels in the 1960's to approximately 20,000 fishing vessels in the 1980's (Nagalaksana, 1988; Panayotou and Jetanavanich, 1987), has caused the government fisheries agency to enact fisheries regulations in order to minimize the impact of commercial fisheries on small-scale fisheries. This has been done by prohibiting trawl nets used with motorized fishing boats within 3,000 m of the shore (TDRI, 1987). However, the trawlers frequently fish in the reserved area for small-scale fisheries due to the lack of budget, manpower and strict enforcement from the government. In addition, many government agencies are involved in these matters and there is no clear cut authority for the corresponding agencies.

2.2.3 Institutional Arrangements

Many coastal ecosystems are linked because of the flow of energy and mineral resources among them, their physical interdependence, their similarities in physical tolerance, and the movement of organisms between the systems at different stages in their life cycles (Brahtz, 1972). Thus, many activities share the use of coastal areas, including agriculture, fishing, fish farming, mariculture, port, industry, tourism, waste disposal, and mining (Burbridge et al., 1988). The coastal area management and planning (CAMP) is a means of developing and controlling the use of coastal resources. A fundamental concept of CAMP is that options for renewable resources development should be maintained and that development should result in uses which are both sustainable and, where feasible, form part of a multiple-use strategy (Burbridge, 1982; Burbridge et al., 1989).

Chantawarangkul (1989) reports that coastal area management and planning (CAMP) in Thailand did not exist before 1980, however various activities in planning and managing coastal resources and environment have been developed and implemented by individually concerned agencies for several decades. The government has used sectoral planning to manage fisheries, mangrove swamp, mineral resource, tourism, harbours and ports development, and oil and gas drilling since 1962. These sectoral plans comprise the National Development Plans which incorporate economic growth as its central theme and

attach high priority in the area of regional development.

Coastal area management is identified as a priority programme in the Sixth National Development Plan (1987-1991). The relevant objectives for governmental actions under the Sixth Plan are to develop management policy, planning and a strategy for coastal development for sustainable use of coastal resources, to support and promote research, inventory and development impacts, and to develop a management plan and strategy for specific coastal resources and specific conservation areas. Fisheries resources are specifically addressed in the agriculture sector under the Sixth Plan but are clearly intended to be the major consideration in coastal resource management programs.

In Thailand, the government structure relating to coastal and fisheries resources is very complicated. Several of the concerned agencies are located in the Ministry of Agriculture and Cooperatives, including the Department of Fisheries, Department of Forestry and Fish Marketing Organization. Also involved are the Ministry of Commerce Affairs and the National Economic and Social Development Board (NESDB), as well as such diverse bodies as the Board of Trade, Harbour Department, and Marine Police.

There is no single national agency responsible for coastal management or which has jurisdiction over both marine and land areas. Each resource is under the authority of the corresponding department. For example, fishery resources are

protected and managed by the Department of Fisheries (DOF) while the Royal Forestry Department has responsibility for the mangrove areas. Ports and shore facilities are under the power of the Harbour Department. The country uses sectoral planning to manage various coastal resources or activities. It is routinely used for managing fisheries, forest, tourism, ports and harbour development, and land use. Inter-sectoral linkage and cooperation are always concerned but rarely practised. It is only when a conflict of interests occurs that interdepartment cooperation comes into action. This lack of integration in development planning and management is the problem related to the current bias toward sectoral development.

The National Economic and Social Development Board (NESDB) organizes and implements the fisheries development plan every five years. The five-year plans can be briefly summarized as follows (Rientrairut, 1983; TDRI, 1987; NESDB, 1986). In the First National Economic and Social Development Plan (1961-1966), fisheries development was an integral part of the agriculture sectors. Government priorities for fishery development were to encourage deep sea fishing through the improvement of fishing gear and techniques, and to promote the freshwater fisheries and fish farming. The Second National Economic and Social Development Plan (1967-1971) was continually emphasized on marine fisheries development. The fisheries production target was set at 860,000 tons, of which

100,000 tons derived from freshwater fish production and 760,000 tons from marine fish production. With the Third National Plan (1972-1976), fisheries development placed increased effort into aquaculture development, with special emphasis on coastal aquaculture. The target was to increase fisheries production by 7 percent between 1971 and 1976. In order to meet growing domestic demand and to provide a surplus for export, the Plan emphasized deep sea fishing and coastal shrimp farming.

The Fourth National Plan (1977-1981) marked a shift in direction for national development planning, from economic growth oriented towards a more equitable economic and social order in Thailand. In fisheries development, the Plan aimed at an increase in production rate of 3.4 percent per annum. The Fifth National Plan (1982-1986) was similar to its predecessor, except for an additional item on the promotion of deep-sea fisheries and joint ventures between the neighbouring countries. This policy was extended to the Sixth Plan (1987-1991) with the inclusion of the fishery products for export.

The Department of Fisheries (DOF) under the Ministry of Agriculture and Cooperatives (MOAC) is responsible for the development of the fishery industry and all matters pertaining to administration, planning, enforcement of fishery laws and regulations, training, research, extension and compilation of fishery statistics (TDRI, 1987).

Marr (1976:35) states that:

A very interesting feature of the fisheries administration of Thailand is that many institutions and organizations have an interlocking of directors and members of the board. Therefore, a relatively small number of people deal with most of the problems which have to be decided or discussed by these organizations.

Apart from the National Economic and Social Development Plans which was mentioned earlier, the national fisheries policy stated by the DOF is **"to provide sufficient amount of fish to supply both domestic consumption and export market through sound fishery management and effective administration."** (Rientrairut, 1983; Nagalaksana, 1988). It may be broken down as follows:

- [1] the conservation of the country's fisheries resources through sound fishery management in order to ensure consistent, maximum and sustained harvest;
- [2] the development of aquaculture techniques, in both marine and freshwater for the supply of cheaper animal protein to people and the increase of export for earning foreign exchange;
- [3] the development of the country's deep sea fisheries by exploiting its under-utilized pelagic resources;
- [4] the acceleration of the fish production from inland resources;
- [5] the raising of the standard of living of the small-scale fisheries and fish farmers.

Achievement of these policies, however, requires strengthening of the Department of Fisheries, to enable it to take a leadership role in the development of the sector and to manage the fisheries resource more effectively through increased enforcement of existing regulations, improved data collection and statistical analysis, stock assessment, and basic research on fisheries biology and fish population dynamics (ADB, 1985).

The Fish Marketing Organization (FMO) is a state enterprise under the Ministry of Agriculture and Cooperatives (MOAC). Its role is to provide and operate the fish landing facilities in the commercial fishing ports, the fish wholesale market, the market for fishery merchandise and fishery industry. The sale of fishery merchandise is conducted by means of auction sale at the major fishing ports. It also promotes the welfare or the occupation of fishermen, improves fishing villages, finances landing place construction in small scale fishing villages and constructs ports on behalf of municipal authorities (FMO, 1980). The FMO facilities generally operate effectively, at least in terms of their ability to transfer fish rapidly from boat to truck. However, the standards of hygiene and maintenance are poor (ADB, 1985).

The Harbor Department which is under the Ministry of Transportation, is empowered to license vessel operators and to register all kinds of vessels such as commercial vessels, transportation vessels including fishing vessels. This

regulation, by which fishing vessels are registered by the Harbor Department and fishing gears are licensed by the Department of Fisheries, creates a loophole whereby registered fishing boats can operate without a license for fishing gear. This issue is currently under negotiation between the two agencies. The outcome is likely to be the joint operation in registering fishing vessels by DOF and the Harbor Department. DOF will determine type, size and number of fishing vessels whereas the Harbor Department will inspect the construction and safety.

The other government agencies involved in the fishing industry are Ministry of Commerce Affairs and the Board of Trade which are empowered to regulate the import and export of fish commodities, control the price of domestic fish trading and regulate all the matters of fishery business. Furthermore, the Marine Police is authorized to assist the fishery officer for enforcement.

2.2.4 Thailand's Fisheries Law and Regulation

The first fisheries law in Thailand was enacted in B.E. 2444 (1901). At that time, the fisheries resource in Thailand was abundant, both inland and marine, because the Thai people used simple traditional fishing gear to catch mainly freshwater fish whereas marine fisheries were not developed. The main purpose of the Fisheries Act, B.E. 2444 (1901) was to collect a tax from fishermen. However, it also included

fisheries conservation by prohibiting fishing during the spawning season of freshwater fish. This Act was used for 46 years, and then repealed and replaced by three pieces of legislation: the Fisheries Act, B.E. 2490 (1947); the Act Governing the Right to Fish in Thai Fisheries Waters, B.E. 2482 (1939); and the Thai Vessels Act, B.E. 2481 (1938).

These Acts are now dated, and it appears necessary to make changes in them so that Department of Fisheries and other government agencies have the instruments required to regulate fisheries effectively. Several commentators, notably the FAO (Moore, 1978a, 1978b in ADB, 1985: 125), have suggested that rewriting the Acts would be preferable to piecemeal amendment, mainly due to the very significant changes in fishing activities which have occurred in the 44 years since the present Fisheries Act was enacted. Neighbouring countries have already updated their fisheries laws. Malaysia enacted a new Fisheries Act in 1985 (Act 317: Fisheries Act, 1985) and Japan revised its fisheries law in 1975 (Law no. 63: the Fisheries Law, 1975).

So far, the Acts have not been rewritten, but have been revised from time to time. As a matter of fact, under Thai's constitution law B.E. 2521 (1978) section 125, a newly drafted Act can only be presented to the parliament by the cabinet or members of parliament. Therefore there is no incentive for high ranking staff of DOF to rewrite the Act because making new law has to go through the process of drafting by the

committee and presentation to parliament by the Minister of MOAC which takes years to complete. In addition, the present Fisheries Act, B.E. 2490 (1947) empowers the Director-General of DOF and Minister of MOAC to regulate and enforce the activities of individuals or corporations involved in fisheries by means of administrative power (i.e. issue Ministerial Regulations, Departmental Regulations, Royal Decrees, etc.) which are believed adequate to cope with the present fisheries situation in Thailand.

Fisheries Act, B.E. 2490 (1947) is composed of six chapters or 73 sections which include fisheries management and conservation, aquaculture, registration and application for permission, collection and fixation of fisheries tax, fisheries statistics as well as the provision of penalties. Some important provisions of fisheries management and conservation are summarized as follows.

(1) Provision by legislative power

These provisions are articulately coded in the Act and can be repealed or amended only by the parliamentary process which is quite difficult and time-consuming. Examples of these provisions include: no person shall use poisonous substance, or do any act that stupefies the aquatic animals (section 19); no person shall use an electric current in fisheries, or use explosives in fisheries in any other way (section 20); no person shall have in his possession for

commercial purpose aquatic animals which he knows that have been taken in contravention of the section 19 or section 20 (section 20 bis.); etc.

(2) Provision by administrative power

The Minister of MOAC or Director-General of DOF which is empowered by the provisions of the Act to impose some fisheries regulations. These regulations are easier to amend and have been revised from time to time. The power given to the Minister is coded in section 32:

"The minister or provincial governor in his jurisdiction and with the approval of the minister, is empowered to make notification determining

- (1) the size of mesh and dimension of every kind of fishing implement, and size, kind, number and parts of fishing implement, which is permitted in fisheries;**
- (2) any kind of fishing implement which is absolutely forbidden to be used in fisheries;**
- (3) the distance between each stationary gear;**
- (4) the methods of using every kind of fishing implement;**
- (5) the spawning and breeding seasons, fishing implement and methods of fishing in any fisheries during the given seasons;**
- (6) the kind, size and maximum number of aquatic animals the fishing of which is permissible;**
- (7) certain kinds of aquatic animals the fishing of which is absolutely forbidden."**

Since 1947, there have been many regulations imposed by the provision of section 32 such as: prohibiting of fishing any kind of turtles, tortoises and their eggs (14 Apr. 1947); prohibiting the use of trawl nets of various types (such as

trawler, push net, shrimp push net) used with motorized fishing boats within 3,000 meters from the shore line and within a radius of 400 meters from stationary gear licensed by DOF (20 July 1972); prohibiting of clam dredges used with motorized vessels within 3,000 meters from the shore line (18 Feb. 1974); closed areas for three months every year during spawning and nurturing season of Indian mackerel in three southern provinces (28 Nov. 1984); etc.

Concerning provision of fishing gear, section 4 states that:

"To fish" means to catch, to trap, to injure, to kill, or to take aquatic animals in fishery waters with any fishing implement or by any method.

"Fishing implement" means machinery, instrument, accessories, component parts, arms, stakes, or vessels which are used in fishing operation.

"Vessel" means a water craft of every description.

"License" means license issued by competent official to a licensee to use fishing implement.

"Licensee" means a person who holds concession, permit or license, or a person who obtains permission to do any thing according to this Act.

"Stationary gear" means fishing implement which is used in the manner of pegging down, tying, stretching, pulling, sinking or by any other means which will make the fishing implement stationary during the time of fishing.

"License fishing implement" means fishing implement the name, description and method of operation of which are specified in the Ministerial Regulation.

"Non-licensed fishing implement" means fishing implement which is not specified in the Ministerial Regulation.

By Thai's fisheries law, all kinds of fishing gear fall into two categories, license fishing implement and non-license fishing implement. License fishing implements are specified in the Ministerial Regulation no.1 (1947) revised and added by Ministerial Regulation no.17 (1978) which are listed in Table 2.15 determining annual fee.

Table 2.15: Rate of Fishery Tax on License Fishing Implements

Names of Fishing Implements	Rate of Fishery Tax (Annual Fee)
Simple lift net (4 types)	20 baht/unit
Stownet (Set bag net)	20 baht/unit
Bag of barm	15 baht/unit
White board catching	10 baht/unit
Cast net more than 4 m. in length	10 baht/unit
Scoop net more than 3.5 m. in width	10 baht/unit
Long line more than 40 m. in length	5 baht/unit
Barrage	1 baht/unit
Push net	150 baht/unit
Net, Gill net, Purse seine and Trawler	
(i) gill net/purse seine mesh size more than 7 cm.	1 baht/meter
(ii) gill net/purse seine mesh size less than 7 cm.	2 baht/meter
(iii) trawl net	5 baht/meter
(iv) other nets	
- the width from 1 to 4 meters	0.50 baht/meter
- the width from 4 to 8 meters	1 baht/meter
- the width from 8 to 24 meters	2 baht/meter
- the width more than 24 meters	3 baht/meter

Source : DOF, 1989.

Licensed fishing implements can be used only by the entitled person. Section 28 states **"any person is entitled to use licensed fishing implement only when the license specifying his name has been issued and the fishery tax under Act has been paid."**

Non-license fishing implement (such as hook, line, trap, spear, etc.) is not specified in the Ministerial Regulation listed in Table 15. Therefore, employing non-license fishing implements does not require getting a license and paying the tax.

Stationary gear (such as lift net, stownet, stake trap net, bag of barm, barrage, etc.) can be set only in the leasable fisheries or reserved fisheries (not in public fisheries). Section 31 states that **"no person shall erect, peg down or build a stationary gear in public fisheries, nor shall he do so in other fisheries without permission from the competent official."** Section 61 states **"whoever violates section 31 shall be punished with fine not exceeding two thousand baht or with imprisonment not exceeding one month, or both."** Trap is also viewed as a stationary gear therefore it falls under provision of section 31 and section 61 as well.

The Act and its supporting regulations are mainly enforced by the Provincial and District Administrations, with, on occasion, assistance from the Marine Police and the Royal Thai Navy. Enforcement faces numerous problems, particularly in the marine capture sector, due to the independent nature of

most fishermen, exacerbated by lack of patrol craft and the small penalties usually imposed. For example, the fine for fishing with unlicensed gear is set at three times the annual license fee listed in Table 15 which is stated in section 64 **"whoever uses fishing implement without license required by this Act under section 28 shall be punished with fine three times the amount of the tax when the offender has already paid the imposed fine within fifteen days, the case shall be final."**

Although many fisheries officers attempt to enforce the regulations, often through patrols using rented boats, the inability to enforce the regulations has led to a lack of respect for the law. Although most fishermen profess knowledge of regulations, they often ignore them. It is also believed that the combination of development and enforcement functions within one office is counter-productive, and that fisheries officers face considerable personal risk if they are seen to show undue enthusiasm for enforcement (ADB, 1985).

2.3 Conflict Between Squid Trap Fishermen and Trawlers

Christy (1973) points out that another characteristic of fisheries that creates special difficulties for management lies in the frequently complex interrelationships among different kinds of fishing effort. They can be mentioned as (a) the intermixture of species; (b) predator-prey and competitive relationships; (c) conflicts between different

kinds of fishing gear.

The intermixture of species occurs on many grounds throughout the world and is often of such a nature that fishing gears cannot select out the desired species. Ecological interrelationships between species are also important and present difficulties for management. In several situations, closely related species compete for the same biological niche, they occupy the same waters and feed on the same materials. In these case, the fishing of one species may lead to its replacement by the other. Conflicts between different kinds of fishing gear, however, are already known to be of considerable importance in a number of areas. These conflicts occur when sweeping gear, such as trawls, are used in the same area as stationary gear, such as lobster or crab pots or longlines (Christy, 1973).

In Thailand, 24 different types of fishing gear are used by small scale fishermen. The traditional fishing gear can be classified into four main groups: gillnet, longline, mobile gear and stationary gear (SEAFDEC, 1986). Some conflicts among these small scale fishermen are inevitable. However, they are generally seen as minor and not serious. Since most small scale fishermen reside in the same village or landing spot, they can communicate and solve many of the problems on their own. Although, the nature of the conflict has both gainers and losers, the losers can either bear the damages or claim compensation.

The types of fishing gear used by commercial fisheries in Thailand can be classified as trawl, purse seine, drift net or gill net, long line, push net and cast net (DOF, 1987). The conflict among commercial fisheries arises from the competition to capture more fish. Under the common property characteristic of fishery resources, everyone has free access to the resource on a first come first served basis. Another problem is the damage to fishing gear by other fishing vessels or by other different fishing gears. Apparently, there are very few such cases because commercial fishermen tend to avoid conflict that causes serious damage to both sides.

The conflicts between small scale fishermen and commercial fishermen are more serious and have major impacts on the livelihood of small scale fishermen. They can not be easily solved because they involve many aspects ranging from fishermen to fisheries law. Formerly, small scale fishermen only fished near shore using non-motorized power boats, whereas the commercial fishermen fished offshore. Legislation prohibiting operations of motorized fishing boats within 3 km from the shore line was imposed on 20 July 1972 for two reasons: to preserve the nursery grounds for early stages of aquatic animals, and to reserve the fishing grounds for local small scale fishermen. Recently, however, commercial fishermen have been fishing in these reserve areas due to the decline of fish stocks in the Gulf of Thailand coupled with the overcrowding of fishing vessels in Thailand's territorial

waters.

The conflict between squid trap fishermen and trawlers is serious because the trawlers sweep all of the traps (stationary gear) set by squid trap fishermen which damages the traps and the squid trap fishermen lose their catches. They have to make new traps to replace the loses which increases their costs and also impacts on local forests by the cutting down of trees to make the traps. In Chumporn province in southern Thailand, armed fighting occurred between squid trap fishermen and trawlers in March 1990 due to the conflict of fishing [Chumporn provincial fisheries office (document no. cp 0007/9635, 27 Apr. 1990)]. The Chumporn provincial fisheries office organized a meeting between squid trap fishermen and trawlers in order to minimize the conflict. However, there is no final result. Squid trap fishermen accuse the trawlers of violating the regulation prohibiting trawl fishing within 3,000 m. from the shore line, and using slings to damage the traps. Trawlers accuse squid trap fishermen of violating the provision of section 31 and setting trap disorderly beyond 3,000 m. from shore line which are difficult to avoid.

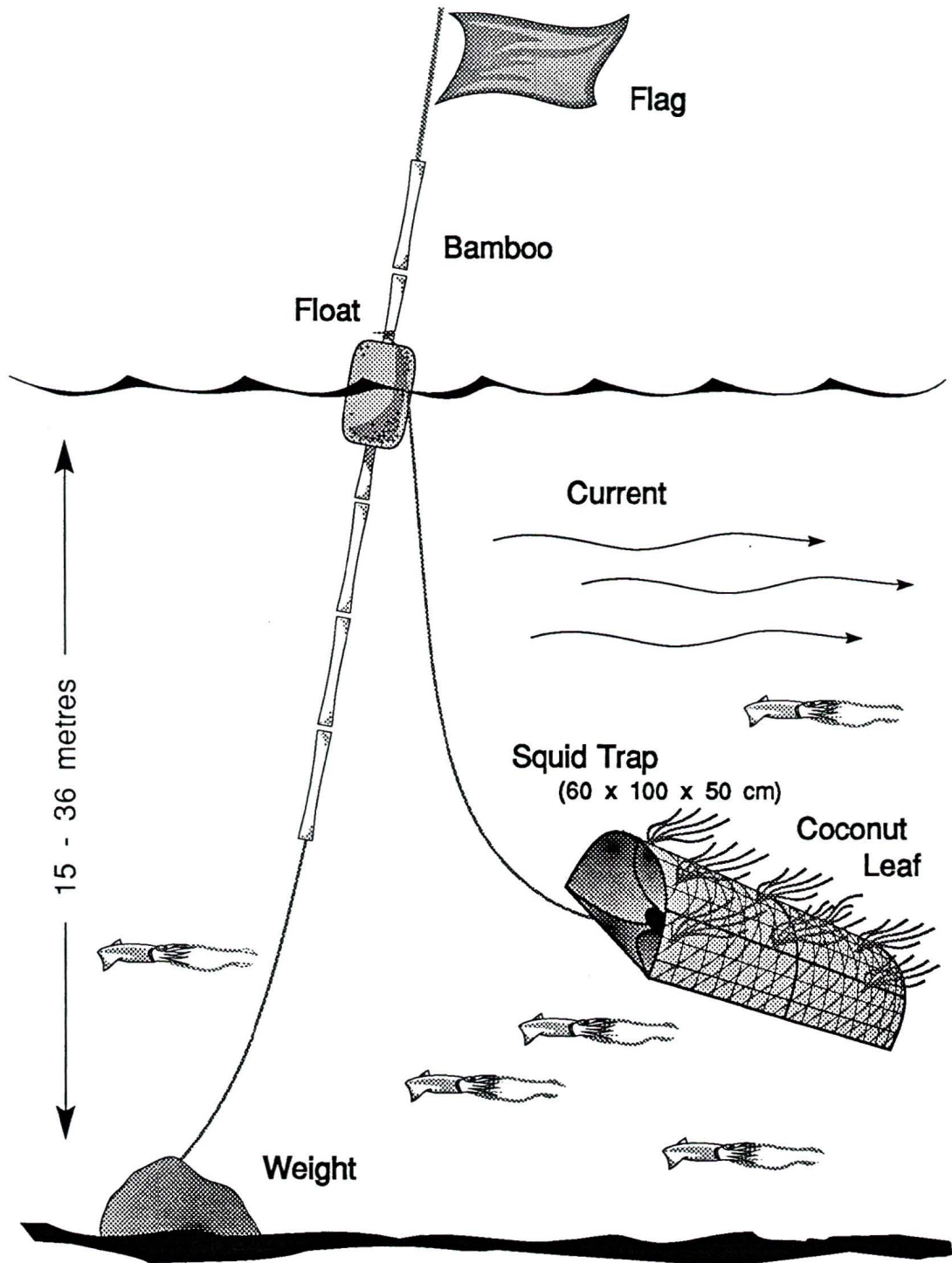
Along the east coast, many researchers (Jittrapong and Pramokchutima, 1986; Supongpan et al., 1988; Boonkerd and Rajaniyom, 1990) report that there is increasing conflict between squid trap fishermen and trawlers. Often squid traps are totally wiped out by otter board trawls and pair trawls.

Squid trap fishermen have complained to local fisheries officers and policemen but this conflict has yet to be resolved.

The squid trap has become one of the favourite small scale fishing gear in Thai waters during the past ten years (Boonkerd and Rajaniyom, 1990). It was invented by Thai fishermen during 1977-1978. The targeted species are bigfin reef squid (*Sepioteuthis lessoniana*) and cuttlefish (*Sepia* spp.). The number of squid trap fishermen in seven selected provinces and their estimated catch is presented in Table 16. Catch by squid trap is composed of 90 percent bigfin reef squid and 10 percent of cuttlefish.

The squid trap fishing method is different from fish trap (Figure 2.2). There are two shapes of squid traps, box shape and semi-cylindrical shape. Squid traps are made from small strips of wood covered with netting. Making squid trap frames (W 55-80 cm.x L 100-120 cm.x H 45-60 cm.), usually uses small tree or wood 16-18 pieces with the length of 170 cm. and a diameter of 1.3-2.5 cm. The frame is covered by polyethylene net of mesh size 5 cm. The cost of making squid trap varies from 60 baht to 120 baht. To set squid trap in the sea, a bamboo pole with a diameter of 4-8 cm. and a length of 7-8 m. is used as a buoy. The trap is tied to the bamboo pole by rope, and the bamboo pole is anchored to a stone or sand bag.

Figure 2.2 Illustration of Squid Trap



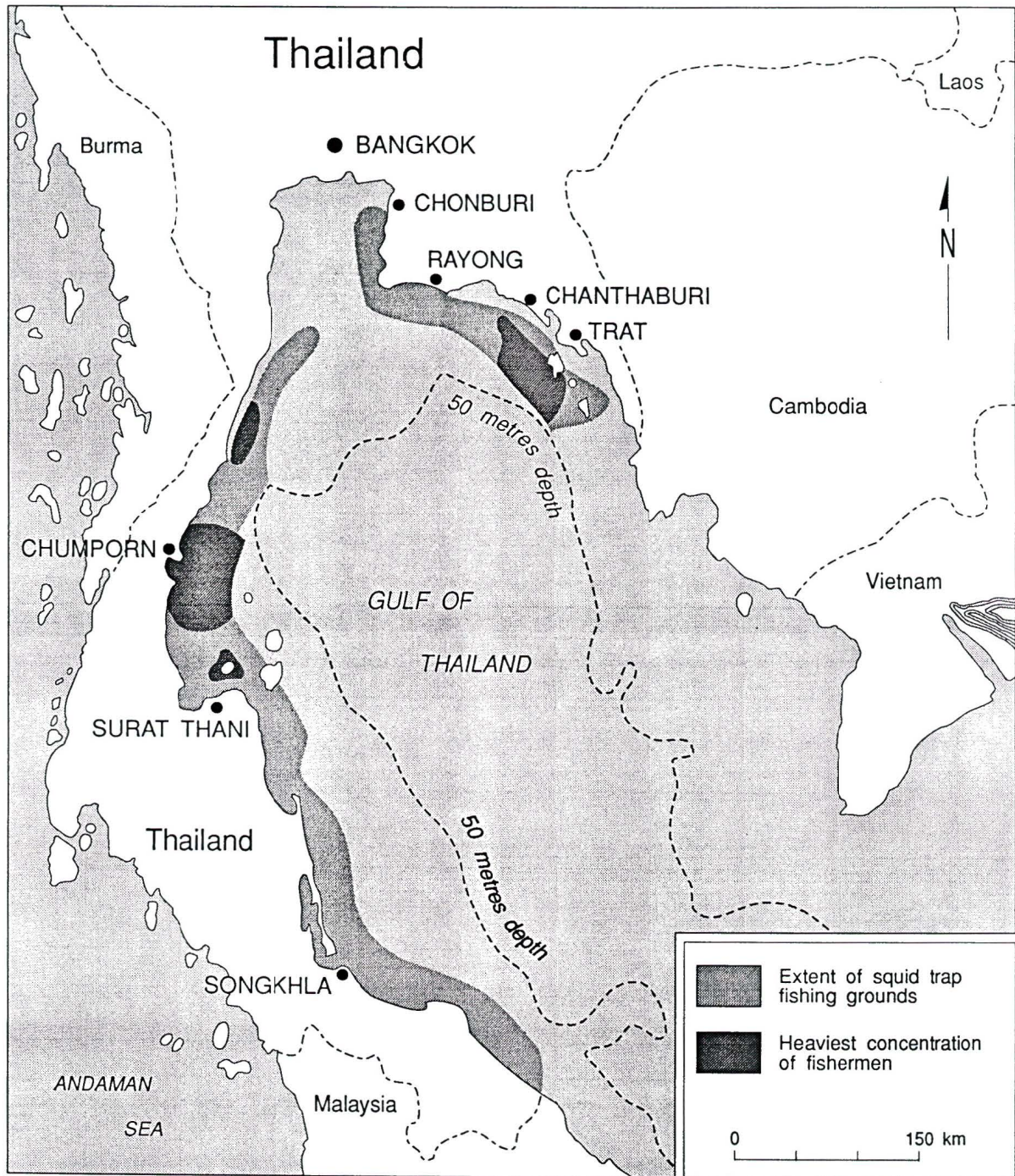


Figure 2.3 Main Squid Fishing Grounds

(Source : Supongpan et al., 1988)

Figure 2.3 shows Thailand's main squid fishing grounds. Squid trap fishermen are concentrated along the coast of Chanthaburi province and Trat province in the east, whereas in the south they are concentrated along the coast of Chumporn, Prachuab-kirikhan and Suratthani provinces.

Table 2.16 : Number of Squid Trap Fishermen and Catch in Selected District and Province in Thailand, 1986

Province & District	No. of fishermen	No. of Trap /Fisherman	Catch/fishermen /day (kg)	Total catch /day (kg)
<u>Trat</u>				
Muang	550	30-100	20	3,000
Klong Yai	30	30-100	30	900
Laem Ngob	200	50	150	1,500
<u>Chanthaburi</u>				
Laem Sing	12	500	200	2,400
Tha Mai	50	20	30	3,000
<u>Rayong</u>				
Ban Chang	16	10	13	200
<u>Chonburi</u>				
Muang	15	10	2	30
Sattaheep	8	30	5	800
Bang Lamung	7	30	50	350
<u>Prachuab-khirikhan</u>				
Bang Sapan	96	40-80	-	-
Bang Sapan Noi	42	50	35	1,200
Thab Sakae	40	20	3	160
<u>Chumporn</u>				
Muang	120	50-200	120	3,000
Lang Suan	100	150-200	-	2,900
Pa Tiw	109	60-80	60	100
La Mae	141	30-150	45	500
Sawee	3	60	-	183
<u>Surat-thani</u>				
Chaiya	1	80	-	-
Tha Chana	120	50-150	5	400
Total	1,660			20,623 +

Notes : Estimated total catch = 20,623 kg. x 20 days x 8 months
 = 3,300 tons.
 Bigfin reef squid (90%) = 3,000 tons.
 Cuttlefish (10%) = 300 tons.

Source : Supongpan et al., 1988.

Table 2.17: Catch of Squid and Cuttlefish in Thailand,
1983-1987

Species	1983 mt	1984 mt	1985 mt	1986 mt	1987 mt
Squid	76,489	66,340	63,996	71,344	75,420
Cuttlefish	47,319	56,352	42,814	51,625	45,695
Octopus	8,236	6,549	9,225	11,946	11,423
Others	-	28	-	-	-
Total	132,044	129,269	116,035	134,915	132,538

Source: DOF, 1989a, 1989b.

Table 2.18: Catch of Squid and Cuttlefish by Species and Type
of Fishing Gears in Thailand, 1985 and 1987
(in mt)

Fishing Method	Squid		Cuttlefish		Octopus	
	1985	1987	1985	1987	1985	1987
Otter board trawl	21,584	32,065	32,779	29,387	8,129	9,701
Pair trawl	10,644	15,247	6,107	7,971	1,052	1,500
Beam trawl	-	-	23	4	-	-
Purse sein	2,203	1,687	-	29	1	-
Anchovy purse seine	1,561	144	-	-	-	-
Push net	371	585	378	658	43	220
Bamboo stake trap	37	57	12	19	-	-
Gill net	7	-	570	780	-	2
Squid cast net	2,857	3,274	-	128	-	-
Squid light luring	23,762	21,030	840	1,068	-	-
Hook	27	-	24	-	-	-
Squid hook	943	1,002	-	-	-	-
Squid trap	-	-	2,081	6,020	-	-
Total	63,996	75,420	42,814	45,695	9,225	11,423

Source : DOF, 1987, 1989.

Table 2.17 shows the production of squid and cuttlefish during 1983-1987. The highest squid production occurred in 1986 with amount of 134,915 tons. Table 2.18 shows the catch of squid by different type of gears.

2.4 Summary

This chapter has provided an overview of fishery resources in Thailand. It has identified and described the nature of the conflict between commercial fisheries and small scale fisheries, with particular referring to squid trap fishing. This suggests a need for detailed case studies of the conflict among fishermen. The rest of this thesis presents a case study of conflict between squid trap fishermen and trawlers along the eastern coast of Thailand. The following chapter outlines the research methodology and describes the study area.

CHAPTER 3

CONCEPTUAL FRAMEWORK AND RESEARCH DESIGN

This chapter outlines the conceptual framework adopted for the study and describes the research design and data collection procedures. It also explains the selection of the study area, describes its regional fisheries resource, and reviews local characteristics.

3.1 Environmental Perception and Attitude Research

Mitchell (1989) describes the emerging area of study which is rooted in the man-environment research tradition. This area of study is the patterns of belief, preference and behaviour of humans toward the environment. As Burton (1971: 1 in Mitchell 1989) has observed, "the social role of attitude and perception studies is to provide an input into the planning process and to serve as a vehicle for public participation in decision making". However, Saarinen (1976: 8 in Mitchell, 1989) describes the lack of an agreed upon name, body of theory or well-developed methodology in this research area which is approached by the other researchers. This has been supported by the comment of Lowenthal (1972b:

333 in Mitchell, 1989: 100)

the field as a whole remains essentially unorganized and disjointed. Work in environmental perception and behaviour falls short of realizing its full potential because it lacks commonly accepted definitions, objectives and mechanisms for applying research results to the needs of environment planning and decision making. Above all, studies in this field now require a more systematically organized theoretical base.

More critical assessment of theories and methodologies for this research area is progressing due to the persistent, vigorous and enterprising research by geographers. As geographers have investigated perceptions, attitudes and behaviour, they gradually become aware of the necessity to become better informed about basic issues. The behavioral work will only advance if attention is giving to operational definitions, relationships between verbal and overt behaviour, measuring procedures and research paradigms.

The definition of the terms 'perceptions' and 'attitudes' needs to be clarified. An individual's perception is governed by past experiences plus present outlook conditioned by values, moods, social circumstances and expectation. Attitudes are perhaps harder to define than perceptions, they may be broken into effective, cognitive and behavioral components. The investigator normally can not measure them directly. The usual way to infer them is from either observing behaviour or listening to what people say. Since observation often is not possible, or else raises substantial ethical problems, the analyst normally relies upon interviews

or other means to obtain information about stated preferences or beliefs. The major task then is to ascertain how useful such statements are in reflecting actual perceptions and attitudes and in predicting future behaviour.

The complexity of environmental perceptions, attitudes and behaviour reinforces the argument of Webb et al. (1966 in Mitchell, 1989) that multiple methods are required to ensure reliable and valid data. Such a situation necessitates use of a variety of measurement techniques that can cross check each other. Many researchers (Winkle, 1971; Tuan, 1973; and O'Riordan, 1973 in Mitchell, 1989: 104) criticize research in this field as having over-relied upon questionnaire surveys or mail questionnaires. However, Saarinen (1971; 1974 in Mitchell, 1989: 104-105) argues that if the advent of perception and attitude studies accomplishes nothing more than teaching a healthy respect for the limitations of questionnaires, its accomplishments will not be trivial. Nevertheless, it is easy to criticize and more difficult to offer constructive alternatives. Furthermore, questionnaire surveys have numerous strengths, including a rapid and effective way of collecting large amounts of data at relatively low expense.

Environment perceptions and attitudes vary not only across cultures and through time. They also may differ among various groups within a community, region or country. Research has revealed that significant differences may occur

among individuals and groups of the lay public, among resource managers, and between the public and resource managers.

Perception and attitude studies of the general public may be pursued with a number of interests in mind: to identify problems, opportunities or alternative strategies, to determine how well perceptions relate to reality, or to ascertain how stable perceptions and attitudes are. All of these aspects sensitize the resource manager to the concerns of the general public, and also indicate opportunities for information and education programmes. Numerous studies have attempted to determine the way in which individuals perceive resource management issues or problems, as well as to examine the range of strategies which are recognized by members of the general public. Examples of these studies are: energy conservation of residents in Edmonton and Calgary, Alberta (Jackson, 1980) and public awareness of environmental problems in Calcutta (Karan, 1980).

As well, perceptions and attitudes may vary among resource managers whether they be elected officials or technical managers. Maggiotto and Bowen (1982 in Mitchell, 1989: 112) have suggested that a major factor in accounting for a legislator's policy position is the way in which he or she perceives and defines issues. They believe that perception and attitudes are basic conditioners of action. Thus more attention should be given to perceptions, instead of political party affiliation, constituency pressures, interest

groups and colleagues' cues. Marshall (1966, in Mitchell, 1989: 114) noted that selectivity in recruitment by agencies plus self-selection into professionals tended to ensure that an individual identified with an organization as well as its values and goals. Tarbet (1973 in Mitchell, 1989: 114) and Thomas (1976 in Mitchell, 1989: 114) indicated the aspects of professional and agency indoctrination that experts bring different professional biases to bear when analyzing resource problems. Their viewpoints, especially for value-laden issues, are not sacrosanct.

Kamieniecki (1982 in Mitchell, 1989: 114), and Staudt and Harris (1985 in Mitchell, 1989) suggest that the general public and resource managers do not always have different perceptions concerning issues, problems and appropriate solutions. There will be areas of convergence and divergence which are useful for the resource manager to be aware of. Perception and attitude studies often can help to pinpoint these.

The existence of varying perceptions and attitudes suggests that citizen involvement or public participation has the potential to make the resource allocation process more effective and equitable. Lowenthal (1966 in Mitchell, 1989: 116) suggests that public views can be used in reaching actual decisions, smoothing the managerial path and altering public opinion. White (1966 in Mitchell, 1989: 117) believes that resources are culturally defined. Any managerial choice

therefore 'presumes a view of resource together with preferences in outcome and methods'. He goes on to suggest that attitudes affect decisions in three ways. First, there are the beliefs of people sharing the decision. Second, there are their views as to what others want. Third, there are their views as to what others should want.

Perception and attitude studies may make several contributions to resource management (White, 1984 in Mitchell, 1989: 122). Images, or perceptions of reality, are important and should be appreciated by resource managers. Investigations of perceptions and attitudes can facilitate public involvement. Experts do not always sense what the general public desires, especially in situations involving fundamental values. Surveys of public viewpoints can also provide basic information which the managers can consider when making decisions. However, such information represent only one of numerous aspects to be considered when making decisions (Mitchell, 1989).

3.2 Research Design

The size of the small scale fishermen population, together with the need for management and conservation of marine fisheries, requires that strong emphasis be placed on regulatory mechanisms that are backed by extensive information and research. However, in small scale fishery research or management the existing data, as well as the ongoing data

collection do not provide adequate information about particular groups of small scale fishermen or particular species of fish, in this case squid trap fisheries. Therefore, a survey using questionnaires and indepth interviews must be conducted to obtain this information.

The size and distribution of the squid trap fishermen population makes a complete census of all fishermen impractical. Therefore, a survey must be conducted to collect data from a sample. The collection of data on small scale fisheries requires careful attention to survey design and analysis. Fishermen are widely dispersed spatially and temporally along the coast. They take their boats to go fishing and land everywhere from piers, jetties, docks, open beaches, and even at their houses. They fish day and night, anytime throughout the year, and there is no central location from which to contact them. Furthermore, since Thailand does not license or register small scale fishermen, there is no list of small scale fishermen from which to select a sample for data collection purposes.

Previous studies have used either a survey of fishermen at home (household survey) or a survey of fishermen at the fishing location (creel census or intercept survey). These efforts have covered small geographical areas, been seasonal, or have addressed specific small scale fisheries (Rientrairut, 1985; Panayotou, 1985). However, these surveys have not collected the type information of interest to this study.

According to Deuel (1980a; 1980b), there are three main types of fishermen survey:

a) Sample survey is the collection of information from a subset of the defined group under study, such as a subset of all fishermen, or fishermen who fish for a certain species. Sample surveys may be conducted of the entire population or a selected part of the population to obtain information on the group under study.

b) National or regional surveys, are sample surveys of the entire population of the country or a given region to obtain information from a subset of the defined group of participants in an activity such as all fishermen in Thailand or in one province.

c) Special surveys are surveys that are unique in terms of the population covered, the timing, or the geographical area, which obtain information from members of a subset of the population who participate in activity. An example of a special survey could be all fishermen who fish from charter boats, or who fish for a particular species in a specific geographical area.

In this study, a special survey has been conducted to collect data from a sample of squid trap fishermen in the east coast of Thailand by using a survey of fishermen at home (household survey) and a survey of fishermen at landing location (intercept survey).

3.2.1 Methodologies for Special Surveys

The information that can be collected in special surveys is not necessarily different from that obtained in other surveys. In small scale fisheries, data collected may include social, economic, or demographic characteristics of fishermen as well as information on total catch, catch by species, fishing effort, and participation.

The use of a special survey to obtain information on small scale fisheries must examine several factors. First, it should be determined if the desired information is directly available or can be derived from other data sources. Another approach would be to obtain the desired information from an existing or planned survey by either adding questions or administering an additional questionnaire. If these options are not available, then a detailed examination must be made of the specific information desired and how it will be used. Knowledge of those who participate in the activity, the possible survey methodologies with advantages and disadvantages of each, the cost of the survey, and the frequency of data collection must be considered in designing a special survey.

Basic approaches to data collection in special survey are the same as those for other surveys, and include interviews with fishermen in households and intercept or creel census interviews of fishermen at the fishing location. If the respondents are required to recall and report information over

time, the length of the recall period and the type of information to be recall must be considered as factors in the validity of the information collected.

There are several types of special surveys, and knowledge of those who participate in the activity being surveyed and the objectives of the survey are major factors in determining the survey approach. First, a complete enumeration may be used when all members of the defined group under study are known in advance, are readily accessible, and are not large in number. In a complete enumeration, information is collected from all members of the group, such as all crab gill net fishermen or all squid trap fishermen.

If the size of the defined group is large, a sample survey may be conducted rather than a complete enumeration. The sample may be selected in a special survey by using non-probability sampling or probability sampling. In non-probability sampling, selection of the sample is not based on statistical sampling procedures or principles of chance; a member of the defined group does not have a known probability of being selected in the sample. Thus, the data collected from the sample should not be related to the total population. In probability sampling, selection of the sample is based on the principles of chance; every member of the defined group has a known, usually equal, probability of being selected. Information collected from the sample may therefore be related to all members of the defined group.

Non-probability sample surveys do not require, but are better used with advance knowledge of the population being measured. These surveys are more often used to collect information on "averages" such as the average age or size of fish, average catch per trip or average expenditure per trip. When totals are required, such as total catch for all fishermen or total expenditures, a probability sample survey is required. Probability sample surveys usually do require some knowledge of the population. They are conducted by using some random sampling, such as simple random sampling, stratified random sampling, or cluster sampling.

One of the first decision in designing any survey is to select the mechanism by which the data are to be collected. This research selected the personal interview survey as survey mechanism. The factors of selecting the survey mechanism include the purpose of the survey, the definition of the sampling frame, the required sample size, the types of questions to be asked, the likelihood of obtaining accurate answers, the length of the survey, the spatial distribution of the sample, the education level of respondents, ethical considerations, labour availability, and time and budget constraints. The personal interview survey involves a face-to-face interview with a respondent, usually in the respondent's home or work place (Sheskin, 1985).

3.2.2 Questionnaire Survey

The importance of using the proper approach for obtaining data from fishermen is an important concern. The fishermen are often the only people who can supply certain information, since much of their work is conducted away from shore and not easily observed. This separation from land-based society has given them a worldwide reputation for secrecy and deception. Their cooperation in providing data is essential. It was therefore necessary in this research to determine the attitudes, beliefs and values that fishermen held concerning some of the questions that they were being asked. Attention was focused on an economic questionnaire which included catch and effort questions, since data concerning income is often the most difficult to elicit.

Pollnac and Sutinen (1979) state that the most effective situation for obtaining attitudes of fishermen is in small, natural, interacting groups, when fishermen gather together to discuss football games, women, etc. In small groups, fishermen feel they have the support of their companions and are more likely to speak their minds. When spoken to individually, they may acquiesce to what they think the interviewer wants to hear. In Thailand, the fishermen are often afraid that the information is going to be used for taxes. Therefore, the researcher has to assure the fishermen that the data will be used to support them not against them.

The development of the questionnaire for this study

followed the general principals provided by Sheskin (1985) and Backstrom and Hursh-Cesar (1981), and was supplemented by the guidelines presented in Pollnac and Sutinen (1979). To help ensure the reliability of the instrument, the questionnaire has been compared with previous studies (Jittrapong and Pramokchutima, 1986; Supongpan et al., 1988; and Boonkerd and Rajaniyom, 1990) particularly with regard to questions about catch, fishing effort and income. These studies have focused on collecting information about fishing method and developing estimates of squid catch. They have not examined the nature of the conflict between squid trap fishing and trawl fisheries.

Before developing the formal questionnaire, a reconnaissance of squid trap fishing locations along the east and southern coasts of Thailand was conducted in June 1990. This was made possible by the Department of Fisheries with the assistance of Chumporn provincial fisheries officers, and the staff of Suratthani Fisheries Center in the south. The same assistance was obtained from Rayong provincial fisheries officers, and the staff of Chanthaburi Brackishwater Fisheries Station in the east. During this general survey, informal talks were held with squid trap fishermen, trawl vessel operators, owners of piers, middle men and provincial fisheries officers. The background information collected helped in shaping the questionnaire to its final form. A copy of the questionnaire used in this study is presented in

Appendix 1.

The final form of the questionnaire consists of three sections. The first section was designed to elicit information about the socio-economic characteristics of the fishermen. The second part focuses on fishing characteristics including fishing effort, catch, and income. The last section investigates the nature of the conflict with commercial trawlers from the perspective of squid trap fishermen. The following section describes the study area.

3.3 The Study Area

This research was conducted in three provinces of southeastern Thailand, namely Rayong, Chanthaburi and Trat. The coastal areas in Rayong are generally sandy beaches, the significant beaches are Haad Mae Rum Pung, Haad Suan Son and Haad Mae Pim (Haad is Thai for beach). Mangrove forests are located along the coasts and alluvial plains near the mouths of rivers and canals in Chanthaburi and Trat. Destruction of the mangrove forests due to urbanization and industrial expansion is a major problem in Thailand (TDRI, 1986). The mangrove areas in this region have been converted into other forms of land-use such as prawn farms, coconut plantations, paddy fields, tourist resorts and industrial estates (FAO, 1982). The existing mangrove areas in these three provinces are presented in Table 3.1. Apart from the beaches and mangrove, there are several islands of various sizes such as

Ko Samet and Ko Mun in Rayong, Ko Chang and Ko Kut in Trat, etc., scattered along the coast (Ko is Thai for island).

Table 3.1 Existing Areas of Mangrove Forests

Province	1975 (rai)	1979 (rai)	1986 (rai)	1989 (rai)
Rayong	34,375	28,800	15,112	10,987
Chanthaburi	163,125	150,400	90,668	54,350
Trat	66,250	61,500	55,112	53,987

Source : Office of Agricultural Economic, 1990.

In this region, where suitable environmental conditions exist, coral reefs can be found scattered along the coastlines and around the islands from Ko Si Chang in Chonburi to Ko Kut in Trat. The corals found in these areas have been formed in the not too-distant past. Due to evolutionary processes and oceanographic changes in the Gulf of Thailand, coral skeletons do not deposit on top of each other at the same location throughout. Thus, it is called "coral community" rather than "coral reef" for this situation. Corals in the Gulf of Thailand are found mainly in the form of coral communities on sandy and rocky substratum. The significant coral communities in the Gulf of Thailand can be found at Ko Lan, Ko Sak and Ko Khrok in the vicinity of Pattaya, Samaesan, and also around the small islands in Rayong and Trat province. Marten and

Polovina (1982 in ADB, 1985: 103) state that the yields of fish from tropical ecosystems are dependent not only on primary productivity but also on factors such as habitat and depth. Therefore, coral communities are important for providing a habitat for aquatic animals in the Gulf of Thailand.

The coral communities in Rayong cover a wide distance located in two Amphoes, namely Amphoe Muang Rayong and Amphoe Klaeng which include coral communities off islands such as Ko Samet, Ko Saket, Ko Chan, Hin Kan Na, Ko Kham, Ko Kudi, Ko Man, etc. The corals found at these islands are scattered around the islands with a reef width between 30-90 m, no further than 75 m from the shore. The species composition of corals found depend on the topography and circulation of water which is mostly affected by the southwest monsoon. In the leeward areas, the massive corals of Porites lutea, Favia sp., Montastrea sp., etc. are found, while in highly circulated or turbulent water areas the staghorn corals and Pavona decussata are found. In addition, there are many coral species found around these islands such as Acropora sp., Montipora sp., Pocillopora sp., Goniopora sp., etc.

The coral communities in Trat province are found in Amphoe Laem Ngob. There are about 18 islands where corals exist. Ko Chang is the biggest island in the east and the second largest in the Gulf of Thailand (after Ko Samui). There is a coral community of 40 m width existing about 40 m

from the shoreline of Ko Chang. Most corals are of family Favudae, Pavona sp., Porites lutea and Galaxea fasciculasis. The other islands are found the massive and branching corals such as Porites lutea, Galaxea sp., Favites sp., Favia sp., Fungia spp., Polyphyllia talpina, Herpolitha sp., Herpetoglossa sp., etc.

The Department of Fisheries has constructed artificial reefs at the depth of 4-18 m along the coast of the Gulf of Thailand and Andaman Sea since 1978 (Pramokchutima and Vadhanakul, 1987). The artificial reefs are made of used tires, cylindrical shaped concrete, cubical shaped concrete and tetrahedron shaped concrete. These units are designed with openings in their sides which allow water to flow through them. The construction of the first artificial reef began in 1978 at Rayong, with a reef composed of 70 cubical shaped concrete (a width of 0.5 m) formed the modules and 400 used tires tied into a quadropod modules of 8 tires each. These modules were dropped into the sea over an area of 1,200 sq.m in 18 m depth of water. Each subsequent year, the new reefs were constructed and added to the former artificial reef modules. There are now 9 artificial reefs placed at Rayong, Chanthaburi and Trat.

The artificial reefs are placed on sandy bottom of the sea near fishing villages in 4-8 m depth, and the reefs are arranged in 3 different types. Type 1 is arranged in a long row to obstruct all kind of nets except traps and hand-lines,

type 2 is arranged for obstruction of the trawlers and push netters and type 3 is arranged for providing a shelter for the juvenile fish where small scale fishermen from nearby fishing villages can fish in this area.

ADB (1985) states that the artificial reef program could be expected to make a major contribution to improving the productivity and living standards of coastal fishing villages in Thailand. The reef would serve as aggregation devices for adult demersal and pelagic species as well as providing habitat for juvenile fish, thus allowing a greater percentage to reach reproductive and market size before being captured. By allowing more juvenile forms to survive to market or reproductive size, the absolute quantities of high-value food fish captured by small scale hand-line, gillnet and trap fishermen should increase. Furthermore, a series of artificial reefs carefully placed within three kilometers of shore in combination with numerous randomly placed individual "patch" reefs or trawling obstacles, would discourage inshore trawling without the need for enforcement or recurrent administrative costs.

These three provinces were selected for the study area because they contain some of the main squid trap fishing areas in Thailand. As well, conflicts between squid trap fishermen and trawlers has been reported in this region for many years without amelioration. Before examining the villages selected, a brief overview of each province is provided.

Rayong Province

Rayong province is about 185 km from Bangkok, with a total land area about 3,552 sq.km. or 2,220,000 rai. Rayong is divided into six Amphoes (Districts), namely Maung Rayong, Ban Chang, Klaeng, Ban Khai, Pluak Daeng and Wang chan which comprise 51 Tambon or 338 villages. In 1987 this province had a population of 427,880. There were 87,281 households of which about 62,800 were agricultural households.

With an abundance of sea produce and many varieties of tropical fruits, Rayong is a noted destination for visitors both Thais and foreigners. Its beautiful beaches, clear sea water, plus other attractions such as forest hills and waterfalls, make it a popular destination for tourists. Ko Samet National Park in Rayong is one of Thailand's 14 marine parks. The island, 6 km long and 3 km wide, possesses white sand beaches flanked by coral reefs. Due to the booming of tourism, many fishing villages along the beaches in Rayong have been replaced by tourist resorts and condominiums.

The Eastern Seaboard Region (ESB); which covers three coastal provinces, namely Chachoengsao, Chonburi and Rayong; is designated as an urban and industrial development center. Its main asset is natural gas from the Gulf of Thailand which comes ashore at Map-Ta-Put in Rayong province. The gas separation plant at Map-Ta-Put has been in operation since 1984. The strategy in promoting ESB is to expedite import substitution by establishing the petrochemical industry in

Thailand taking advantage of the availability of offshore natural gas. The development scheme which is under implementation will propel ESB into one of the fastest growing areas of the country, aside from Bangkok (TDRI, 1986).

Three Amphoes (Ban Chang, Maung Rayong and Klaeng) are located along the coast, which is about 100 km long. In 1985, there were 2,499 marine fishery households and 1,305 fishing boats of which were 151 non-powered boats and 1,154 power boats. Total landing of marine fish in 1987 was 202,050 tons (DOF, 1989).

Chanthaburi Province

Chanthaburi province is located east of Rayong province with total land area about 6,052 sq.km. It is divided into 6 Amphoes (Districts) namely Muang Chanthaburi, Tha Mai, Klung, Laem Sing, Ma kham and Pong Nam Ron. In 1987 this province had a population of 422,531 or 87,623 households. Chanthaburi is a seaside town with an abundance of terrestrial and aquatic resources. Many kinds of gemstones are mined and cut in Chanthaburi including blue saffire, ruby and topaz. Chanthaburi is also an important fruit growing area for rambutans and durians. It is also noted for its seafood and natural beauty, and boasts several mountain ranges covering a large area of rain forest. The important beaches are Laem Sadet-Chao Lao, Laem Sing and Khung Wiman. There are also historical ruins such as Tuk Daeng and Kuk Kee Kai in Amphoe

Laem Sing. Tuk Daeng was constructed in 1893 as a fortress for French soldiers, and later used as soldiers' barracks. Kuk Kee Kai was a brick fortress, built by French soldiers in 1893 to be used as a prison during the period of French occupation in Chanthaburi.

Three Amphoes (Tha Mai, Laem Sing and Khlung) are located along the coast. The length of Chanthaburi's coastline is 80.20 km. In 1985, there were 3,635 marine fishery households and 2,729 fishing boats of which were 485 non-powered boats and 2,244 power boats. Total landing of marine fish in 1987 was 24,623 tons. (DOF, 1989).

Trat Province

Trat province is located at the most southeast end of Thailand adjacent to Cambodia. This province has a total land area of 2,819 sq.km. or 1,761,875 rai. It is divided into 5 Amphoes (Districts), namely Muang Trat, Klong Yai, Khao Saming, Boa Rai and Laem Ngob which comprise of 34 Tambols or 205 villages. Trat has a population of 174,056 which are 89,686 males and 84,370 females. There are 37,966 households of which are about 23,293 agricultural households. Trat has many beautiful beaches, the popular beaches are Ao Thammachat and Ao Tan Koo. The islands with natural and beautiful tourist attraction are Ko Chang, Ko kut and Ko Raet.

Three Amphoes (Laem Ngob, Maung Trat and Klong Yai) are located along the coast. The length of Trat coastline is

165.60 km. In 1985, there were 3,676 marine fishery households and 3,038 fishing boats of which were 201 non-powered boats and 2,837 power boats. Total landing of marine fish in 1987 was 23,990 tons (DOF, 1989). However, Trat is located along the border of Cambodia which is still having political problems.

Table 3.2 Number of Fishery Household by Type of Fisheries and Fishery Employee Household by Provinces in 1985

Type of Fisheries	Rayong	Chanthaburi	Trat
Fishery employee household	1,056	254	722
Capture fishery household	1,398	2,474	2,898
Coastal aquaculture only	38	535	38
Capture fishery and coastal aquaculture	7	372	18
Total	2,499	3,635	3,676

Source : DOF, 1989.

3.3.1 East Coast Fisheries

Fisheries are an important coastal resource in this region. Although considered as a renewable resource, it is presently in the stage of deterioration due to excessive

utilization coupled with mangrove deforestation. Fisheries resources in this region are therefore classified as follows: a) pelagic fisheries; b) demersal fisheries; c) invertebrate fisheries; and d) coastal aquaculture (ONEB, 1986).

a) Pelagic fisheries

Pelagic fish are recognized as very important for marine fisheries. Along the east coast and the inner Gulf of Thailand, most pelagic fish are distributed at a depth of 5 to 50 m. There are about 17 species of important pelagic fish in Thailand. Spawning grounds and seasons vary from species to species. Important fishing equipment for pelagic fisheries are thai purse seines, anchovy purse seines, mackerel encircling gill nets and king mackerel gill nets (SEAFDEC, 1986). The fishing ground depends on the gear selected. Each type of fishing gear is suitable for operation at species areas and at different depths. Their operation depends on the preference of the local fishermen. In the nearshore of Chanthaburi and Trat waters, the mackerel encircling gill net is operated. The anchovy purse seine is popular along Rayong to Trat; and the coastal water king mackerel gill net is used in the offshore of all three provinces.

b) Demersal fisheries

Most economic demersal fish are distributed all around the Gulf of Thailand. The major fishing equipment for

demersal fisheries are the otter board trawl and pair trawl. Catches in the east coast from Rayong to Trat in 1982 were about 14.8 percent of the total demersal catch in Thailand (DOF, 1987). Dominant species in these areas are threadfin bream, lizard fish and big-eyes. Apart from economic demersal fish, trash fish, which are considered in a group of uneconomic demersal fish, are also important regarding the quantity of production. The total catch in the east coast from Rayong to Trat ranged between 23 to 33 percent of total trash fish in Thailand. The increasing catch of trash fish, especially in the east coast from Rayong to Trat shows that small fish are being caught, resulting in a reduction of good fish in the future. Boonchuwong and Lawapong (1988) report that in 1985 the monthly catch by otter trawler was between 6,291-68,330 tons depending on the boat size. Most are trash fish which are about 53-74 percent of total catch and increasing with boat size, whereas edible fish comprise between 19-23 percent. The price of trash fish ranges from 2 to 4 baht/kg.

c) Invertebrate fisheries

The economic invertebrate fisheries are marine shrimp, cephalopod and crab. The marine shrimp is Thailand's most economically important invertebrate. The value of the total catch of marine shrimp in 1982 was about 5,320 million baht or over 37 percent of the value of the total marine catch, the

highest of marine species. Most marine shrimps found in Gulf of Thailand are of the family Penaeidae, called "Penaeid shrimps". There are 42 species which can be classified by size into 2 groups; large shrimps and small shrimps. Most marine shrimps are distributed in the whole Gulf of Thailand at depths less than 50 m around the coast and are abundant at depths less than 20 m, especially in river mouths and around islands near estuaries. Along the east coast, the catch rate is in the range 1.0-9.6 kg/hour, somewhat lower than the other areas (DOF, 1984).

There are 25 species of cephalopods of which 12 species are economically important. These are squid (4 species, Loligo spp.), cuttlefish (6 species, Sepia spp.) and octopus (2 species, Octopus spp.). For the eastern coastal zone, the distribution of cephalopods varies in different areas at depths between 10 to 50 m and is abundant at depths between 10 to 30 m (Supongpan et al., 1988). In the coastal waters of Chonburi and Trat cuttlefish are most abundant whereas squid are greater in abundance along the coast of Rayong and Chanthaburi. The total catch of cephalopods in this area is about 33 percent of the total catch of the whole country (DOF, 1987). The wholesale price of squid ranges from 35 to 45 baht/kg depending on the season and size, whereas the retail price in the market is between 70 to 80 baht/kg (Jittrapong and Pramokchutima, 1986; Supongpan et al., 1988)

d) Coastal aquaculture

Coastal aquaculture occurs in brackish water along the coastal area at the mouth of the rivers and canals, including intertidal zones and mangrove areas. It has developed due to the growing food demand and reduced fishing area resulting from the declaration of 200 mile exclusive economic zones by neighbouring countries. In eastern coast, there are 4 fisheries stations working on aquaculture development at Rayong, Chanthaburi and Trat. The economically important aquaculture species are green mussel, oyster, marine shrimp, horse mussel, sea bass and grouper (DOF, 1987).

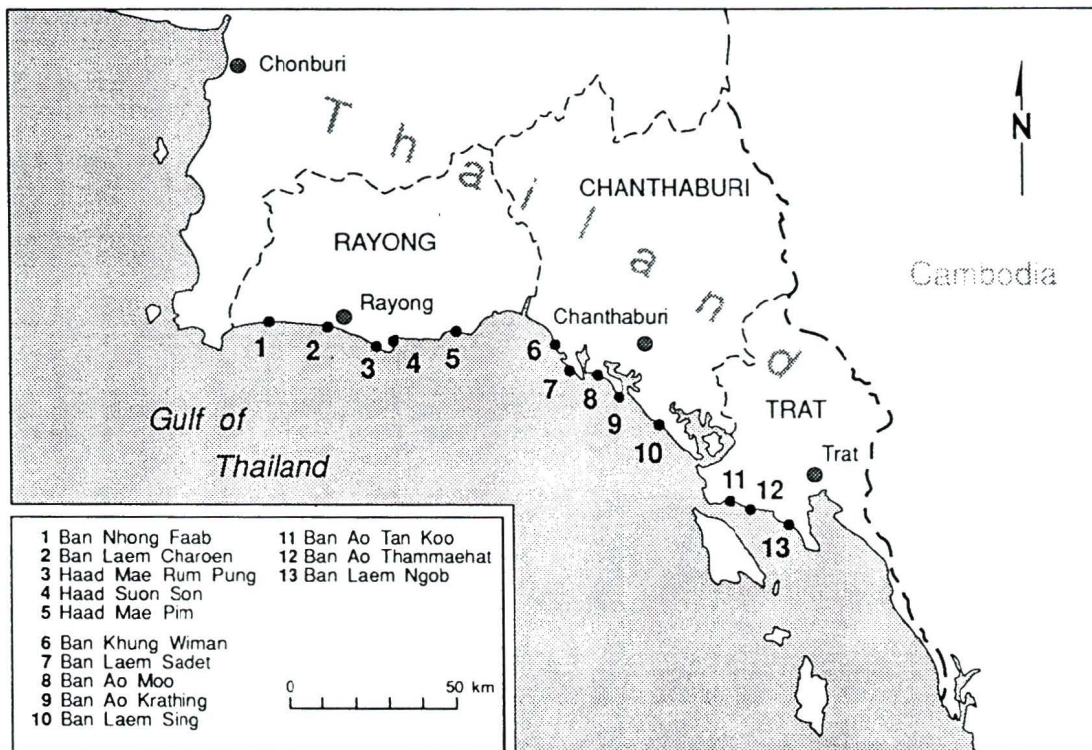
3.3.2 Villages Selection

There are about 150 fishing villages or 9,810 fishery households scattered along the coast of the three provinces. To conduct a survey all of squid trap fishermen in the three provinces was impractical due to time, budget and personnel constraints. A sample of 35 squid trap fishermen in each province was selected which made a total sample of 105 squid trap fishermen. In each province, between three and five villages were selected for the survey with the aid of provincial fisheries officers. The factors considered by researcher and provincial fisheries officers in selecting the villages were, firstly their location by the sea and accessibility by road. However, some of the villages selected were not easy to access due to poor road conditions.

Fortunately the researcher had use of a four wheel drive vehicle provided by the Department of Fisheries. Secondly, the villages selected had to have large number of squid trap fishermen. And thirdly, the villages were selected based on their relative location. An effort was made to select villages along the entire coastline of each province (see Figure 3.1). It should be noted that many of the squid trap fishermen residing in these villages are not considered residents of that village. This is due to the fact that some fishermen live in villages far from the sea and must build a temporary hut or shack in the coastal village in order that they can easily go fishing.

Figure 3.1 shows the location of the villages selected for the field survey. In Rayong province, three Amphoes (districts) located along the coast were selected for the survey namely Amphoe Ban Chang, Amphoe Muang Rayong and Amphoe Klaeng. Five villages selected were Ban Nhong Faab, Laem Charoen, Haad Mea Rum Pung, Haad Suan Son and Haad Mea Pim. In Chanthaburi province, there are three Amphoes located along the coast, namely Amphoe Tha Mai, Amphoe Laem Sing and Amphoe Khlung. However, only Amphoes Tha mai and Laem Sing were selected for the survey because the fishing villages in Amphoe Khlung are located in mangrove forests, are very difficult to gain access to other than by boat. The five villages selected were Ban Khung Wiman, Ban Laem Sadet, Ban Ao Moo, Ban Ao

Figure 3.1 Study Area Villages



Krathing and Ban Haad Laem Sing. In Trat province, there are three Amphoes located along the coast namely Amphoe Laem Ngob, Amphoe Muang Trat and Amphoe Khlong Yai. However, only Amphoes Laem Ngob and Muang Trat were selected for this study because there were few squid trap fishermen in Amphoe Klong Yai. Furthermore, due to the security concerns caused by the political problems in Cambodia which Amphoe Klong Yai borders on. The selection of villages in Amphoe Klong Yai was abandoned. Three villages selected were Ban Ao Thammachat, Ban Ao Tan Koo and Ban Laem Ngob.

The survey was conducted between July and August 1990. The survey was smoothly conducted due to the assistance of the Department of Fisheries. In Rayong province, the information on squid trap fishing and the location of squid fishing villages was obtain from Rayong Marine Fisheries Center and Rayong Provincial Fisheries Office. In Chanthaburi province, the survey was fully cooperated by the staff of Chanthaburi Brackishwater Fisheries Station and Khung Krabain Bay Fisheries Development Center. In Trat province, assistance was obtained from Trat Brackishwater Fisheries Station and Trat Provincial Fisheries Office. The cooperation obtained from these agencies consisted of providing information about squid trap fishing in the area and providing guides to the villages.

The respondents were interviewed at home, on the beach or at the landing spot. The questionnaire was comprised of 64

questions in Thai. The response rate to the survey was one hundred percent. Every squid trap fishermen contacted was willing to be interviewed, since they sought ways to solve their problems in many directions. They wanted to speak out and let the public to know the seriousness of their problem. Therefore, their willing participation in interviews were an act of raising the public awareness in a larger scale.

3.4 Summary

This chapter has presented the conceptual framework adopted in this study, and set out the research design. It has also described the study area, the fisheries resources of the east coast, and the three provinces and villages selected for field survey. The following chapter presents the results of the study.

CHAPTER 4

RESULTS

This chapter presents and discusses the results obtained from the analysis of the questionnaire survey data.

4.1 Questionnaire Analysis

The questionnaire used in this study was designed to obtain information about the nature of squid trap fishing along Thailand's eastern coast, the perceptions of squid trap fishermen concerning the impact of trawl fishing on their livelihoods, and suggestions about the ways in which the conflict between small scale and commercial trawl fisheries could be resolved.

4.1.1 Total Sample

a) Socio-economic characteristics

The first part of the analysis consists of summarizing the socio-economic characteristics of the respondents in the three provinces. This provides an overview of the respondents in terms of their education, age, marital status, etc.,.

A summary of the socio-economic characteristics of the respondents is presented in Table 4.1. In Thai society as a whole men are generally regarded as the head of the household, and this is a predominant feature in small scale fishing communities. This is attributed to the patriarchal nature of fishing occupations (Rientrairut, 1985). In this survey, all the respondents are heads of the fishing household and are male. Their average age is approximately thirty-six years, the youngest is twenty-two years old and the oldest is sixty years old. They have a mean education level of four years, the lowest is two years and the highest is ten years. About eighty percent of the respondents have completed grade four. This is lower than the Thai government's compulsory school requirement of grade six, but is typical of the situation existing in many rural villages in Thailand (see, for example, Filipchuk, 1991). The majority of individuals interviewed are married (96.2 percent). The average length of residence in their villages is twenty-six years.

Other socio-economic characteristics are their previous occupations and period of practising squid trap fishing. Prior to engaging in squid trap fishing, their previous occupations were trawl crew (15.4 percent), farmers (26.0 percent), fishermen (38.5 percent) and employees (20.2 percent). The average period of practising squid trap fishing is six years, the minimum is one year and maximum is twenty-five years.

Table 4.1 Socio-Economic Characteristics of Squid Trap Fishermen : Total Sample

<u>Characteristics</u>	<u>Sample N=104</u>
Gender	male 104 (100.00%)
Provinces	Rayong n=35 (33.65%)
	Chanthaburi n=35 (33.65%)
	Trat n=34 (32.69%)
Average Age	35.84 sd. 7.87 (22-60 years)
Marital status	married 100 (96.2%)
Average Education (Years)	4.31 sd. 0.87 (completed grade 4=80.8%)
Average length of Residence (Years)	26.28 sd. 14.13 (2-55 years)
Previous Occupation	trawl crew 15.4% farmer 26.0% fisherman 38.5% employee 20.2%
Own the House or Land	own 49.0%
Land Certificate	Chanode 8.7% N.S. 3 26.9% Others 13.5% No Land 51.0%
Period of Practising Squid Trap Fishing (Years)	6.22 sd. 3.77 (1-25 years)

Table 4.2 Previous Occupation of Respondents

<u>Occupation</u>	<u>Frequency</u>	<u>Percent</u>
trawl crew	25	24.0
farmer	27	26.0
fishermen	40	38.5
employee	21	20.2
	-----	-----
	104	100.0

Table 4.3 Land Tenure Certificate Held

<u>Certificate</u>	<u>Frequency</u>	<u>Percent</u>
Chanode Thedin	9	8.7
N.S. 3	28	26.9
Others	14	13.5
No Land Tenure	53	51.0
	-----	-----
	104	100.0

Table 4.4 Period of Practising Squid Trap Fishing

<u>Year</u>	<u>Frequency</u>	<u>Percent</u>
1	4	3.8
2	5	4.8
3	10	9.6
4	20	19.2
5	20	19.2
6	7	6.7
7	9	8.7
8	5	4.8
9	1	1.0
10	16	15.4
11	2	1.9
12	1	1.0
15	2	1.9
20	1	1.0
25	1	1.0
	-----	-----
	104	100.0
Total sample 104	Mean 6.22	sd. 3.77

As stated in Chapter 3, some squid trap fishermen are not considered to be residents of the village, as they have simply built a temporary hut or shack along the coast (crown land) and they do not own a house or land in the village. Only forty-nine percent of the respondents own houses or land in the villages. The types of land certificate held are Chanode Thedin (8.7 percent), NS.3 (26.9 percent), other land certificates (13.5 percent). The Chanode Thedin is similar to fee-simple ownership in North America. Chanode is the legal possession documented in an unrestricted title deed. Before a Chanode can be issued by the Department of Lands, the land must be cadastrally surveyed and its boundaries marked. Chanode designates ownership and possessory rights, and can be sold, transferred and legally mortgaged. The NS.3 is a tax certificate issued on the verification that use is being made of the land, but its issuance is limited to land where title deeds can eventually be given. The holder has the rights of inheritance and transfer, though the latter is not clear (Chuntanaparb and Wood, 1986: 85; Feder et al., 1988).

b) Fishing Characteristics

The second part of the analysis summarizes the characteristics of squid trap fishing. This concerns the size of boat used, the location of the fishing grounds, catch, fishing effort, and income. The information obtained from the respondents pertains to their fishing effort between 1989 and

1990. However, since the majority of small scale fishermen do not keep records, the information collected is based on their recall. Some of information can be double checked by estimating of daily, monthly and yearly catch, and comparing it with previous studies.

Approximately seventy-eight percent of the respondents have done other types of fishing before, while about twenty-two percent have never engaged in any other types of fishing before. The types of fishing employed are trawl crew (24.0 percent), push net (16.3 percent), gill net (26.9 percent), trap (5.8 percent) and hand-line fishing (4.8 percent) (see Table 4.5).

Table 4.5 Done Other Types of Fishing Before

	<u>Frequency</u>	<u>Percent</u>
Yes	81	77.9
No	23	22.1
	-----	-----
	104	100.0

If yes, what types of fishing gear employed before

	<u>Frequency</u>	<u>Percent</u>
trawl crew	25	30.9
push net	17	21.0
gill net	28	34.6
trap	6	7.4
hand-line fishing	5	6.2
	-----	-----
	81	100.0

Table 4.6 Squid Trap Fishing Characteristics

<u>Boat size</u> (m) No. (%)	<u>No. of Traps Set</u> Mean (sd)	<u>Catch</u> (kg/day) Mean (sd)	<u>Annual Income</u> (baht/year) Mean (sd)	<u>Distance from Trap to Shore (km)</u> Mean (sd)
< 6.01 24 (23.1%)	30-150 55.83 (23.20)	10-40 22.42 (7.56)	20,000-50,000 41791.67 (22149.65)	5-30 13.00 (5.60)
6.01-8.00 61 (58.6%)	40-200 84.34 (36.85)	15-70 33.30 (13.91)	20,000-240,000 69168.85 (43414.50)	8-40 18.08 (6.41)
8.01-12.00 19 (18.3%)	50-160 106.32 (37.00)	20-80 43.16 (16.00)	23,000-250,000 105368.42 (62664.19)	6-30 19.00 (5.78)

<u>Boat size</u> (m) No. (%)	<u>Cost of Boat</u> (TBH) Mean (sd)	<u>Fishing Effort-1</u> (month/year) Mean (sd)	<u>Fishing Effort-2</u> (day/month) Mean (sd)
< 6.01 24 (23.1%)	30,000-120,000 39500.00 (17594.47)	5-12 9.63 (2.02)	15-25 19.96 (3.83)
6.01-8.00 61 (58.6%)	25,000-150,000 68606.56 (28909.79)	4-12 8.82 (2.52)	10-25 17.62 (3.80)
8.01-12.00 19 (18.3%)	60,000-300,000 141947.37 (65725.42)	6-12 9.95 (2.20)	10-25 17.53 (3.73)

One of the main differences amongst the fishermen is the size of boat used. Table 4.6 summarizes fishing characteristics for three boat categories. The average size of squid trap fishing boats is 7.5 meters, the smallest boat is 5 meters and the biggest boat is 12 meters. Boonkerd and Rajaniyom (1990) report that the size of squid trap fishing boats varies from 6 to 13 meters and that the engines used varies from 5 to 85 HP. The average cost of the respondents' boat is 75,288 baht (3,422 CN\$), the lowest cost is 25,000 baht (1,136 CN\$) and the highest cost is 300,000 baht (13,636 CN\$). About ninety-eight percent of respondents have their own fishing boat and the rest rent boats (Table 4.7).

Table 4.7 Boat Owned

	<u>Frequency</u>	<u>Percent</u>
owned	102	98.1
rented	2	1.9
	-----	-----
	104	100.0

Roughly sixty percent of the squid trap fishermen employ a crew. The number of crew varies from one to three, depending on the size of boat and the number of traps set. Payment for the crew can be daily, share of the catch (normally 10 percent of the catch), or is family help (Table 4.8).

Table 4.8 Number of Employed Crew

<u>No. of Crew</u>	<u>Frequency</u>	<u>Percent</u>
0 (no crew)	35	33.7
1	41	39.3
2	27	26.0
3	1	1.0
	-----	-----
	104	100.0

Payment for Crew

	<u>Frequency</u>	<u>Percent</u>
daily hiring	5	7.3
share by percentage	49	71.0
family help	15	21.7
	-----	-----
	69	100.0

The number of traps set by the respondents varies from 30 to 200 traps. Boonkerd and Rajaniyom (1990) report that there are two ways of harvesting squid. The first is to harvest squid after the traps have been set for 6 to 24 hours. The traps are left in the sea for the next harvesting unless they are moved to other areas that provide better catch. This method is widely practiced in the east coast region (Rayong, Chanthaburi and Trat). This way is suitable for small fishing boats (5-8 m) which carry a small number of traps (40-60 traps for 6 meters boat), and which go fishing near the shore. Squid can be harvested once or twice daily, either once in the morning and landing in the afternoon, or twice in the morning and afternoon and landing before dark. Every day the fishermen carry a full load of traps on their boats to replace lost traps, the number of traps carried depending on the size

of boats.

The second method consists of harvesting the squid and also collecting the traps back to the boat. This method has been practiced by fishermen in southern Thailand who recently converted from other fishing gear such as gill net, push net, purse seine, and also trawl net to squid trap fishing due to the decline of income generated from their former fishing gear. Their boats which have been converted to squid trap fishing are large (10-14 m) and can be loaded with 70 to 200 traps. They can also stay at the sea for one to eight nights. Traps are set before dawn and the harvesting of squid begin in the afternoon until dark. Traps are set during the daytime because the catch obtained at night is usually lower. This method is modified in order to avoid lost traps. However, Boonkerd and Rajaniyom (1990) state that both methods can not avoid damage from trawl fishing because all of them operate at the same time of day.

Squid traps are either made by fishermen with the help of their families, or purchased from squid trap makers. Approximately sixty-six percent of the respondents make their own traps, about fifteen percent of respondents buy all of their traps, and about eighteen percent use a combination of buying and making the traps. The cost of making traps varies from 35 to 110 baht (1.59 to 5 CN\$), average cost is 64 baht (2.9 CN\$). Cost of buying trap varies from 45 to 120 baht (2.05 to 5.45 CN\$), average cost is 82.57 baht (3.8 CN\$).

Table 4.9 Making Traps

<u>No. of Trap</u>	<u>Frequency</u>	<u>Percent</u>
30	9	10.2
40	11	12.5
50	19	21.8
60	14	16.1
70	12	13.7
80	8	9.2
90	2	2.3
100	4	4.6
120	1	1.4
150	6	6.9
160	1	1.4
	-----	-----
	87	100.0

Table 4.10 Buying trap

<u>No. of trap</u>	<u>Frequency</u>	<u>Percent</u>
10	1	2.9
20	1	2.9
30	7	20.0
40	2	5.7
50	7	20.0
60	4	11.4
80	1	2.9
100	4	11.4
150	5	14.3
160	1	2.9
200	2	5.7
	-----	-----
	35	100.0

Table 4.11 Cost of Traps

	Mean	sd.
a) Making	64.47	31.51
b) Purchase	82.57	19.72

Squid trap fishermen can go fishing all year round. Some have observed that they can catch more squid during the period of full moon. Jittrapong and Pramokchutima (1986); Supongpan et al. (1988); Boonkerd and Rajaniyom (1990) also report that squid trap fishermen in east coast of Thailand catch more squid during the period of full moon. However, most of the respondents indicated that they go fishing almost every day provided there is no heavy rainstorm during the monsoon season. Monthly fishing in a year varies from four to twelve months, with the average being approximately nine months. The number of days spent fishing in a month varied from ten to twenty-five days, with the average being approximately eighteen days.

The catch of squid per day ranges from ten to eighty kilograms, with the average catch per day being approximately thirty-three kilograms. This is lower than the average catch of forty kilograms by fishermen in Pattani province (southern Thailand) reported by Boonkerd and Rajaniyom (1990). The catch from each trap varies from none to twenty-five squid. The average catch is between 1 and 8 squid per trap with sizes of 10 to 25 cm or 195 to 385 grams (Boonkerd and Rajaniyom, 1990). Almost one hundred percent of the squid caught are still alive, ninety percent of the catch is *Sepioteuthis lessoniana* and ten percent is *Sepia pharaonis* (Jittrapong and Pramokchutima, 1986).

Most of the squid caught is sold to middlemen, although

some is used for the respondents' household consumption. This varies from one to thirty kilograms per month, average monthly consumption of squid by the respondents is approximately nine kilograms per month. In one month, the sale of squid by individual fishermen varies from 120 to 1,200 kilograms. The average sale of squid per month by individual fisherman is approximately 400 kilograms. The price of squid sold to middlemen varies from 30 to 43 baht per kilogram (1.36 to 1.95 CN\$ per kg) depending on area and season. In 1986 and 1987, the wholesale price of squid sold in the market was between 70 to 90 baht per kilogram (3.18 to 4.09 CN\$ per kg) (DOF, 1989).

Table 4.12 Squid for Household Consumption

<u>No. of Squid (kg/month)</u>	<u>Frequency</u>	<u>Percent</u>
0 (no consumption)	20	19.2
1	1	1.0
2	3	2.9
4	1	1.0
5	15	14.4
10	37	35.6
12	1	1.0
15	12	11.5
20	12	11.5
30	2	1.9
	-----	-----
	104	100.0
Total sample 104	Mean 9.12	sd. 6.90

Table 4.13 Amount of Squid Sold per Month

<u>Amount of squid (kg/month)</u>	<u>Frequency</u>	<u>Percent</u>
120-300	44	42.3
>300-600	49	47.1
>600-900	5	4.8
>900-1200	6	5.8
	-----	-----
	104	100.0
Total sample 104	Mean 409.47	sd. 214.72

Table 4.14 Price of Squid Sold to Middleman

<u>Price (baht/kg)</u>	<u>Frequency</u>	<u>Percent</u>
30	1	1.0
35	31	29.8
36	3	2.9
37	17	16.3
38	21	20.2
40	29	27.9
42	1	1.0
43	1	1.0
	-----	-----
	104	100.0

The average annual income of the fishermen is approximately 69,000 baht (3,136 CN\$). There is, however, a very wide range in incomes from 20,000 to 250,000 baht (909 to 11,364 CN\$) (see Table 4.22). The majority of respondents (48.1 percent) have annual incomes between 20,000 and 50,000 baht (909 to 2,273 CN\$), about 36.5 percent has annual income between 50,001 and 100,000 baht (2,273 to 4,545 CN\$), about 10 percent has annual income between 100,001 and 150,000 baht (2,273 to 6,818 CN\$) and about 5 percent has annual income

between 150,001 and 250,000 baht (6,818 to 11,364 CN\$). Panayotou et al. (1985) estimate the average monthly income per coastal fishing household in Trat province to be 6,313 baht per month (annually 75,756 baht or 3,443 CN\$). However, any comparisons must be regarded with caution due to the differences in time, the units of analysis, and in sampling techniques between the surveys. In addition, it is not known to what extent the reported household incomes correspond to operating profits (Panayotou et al., 1985).

Table 4.15 Annual Income of Respondents

<u>Annual income (baht)</u>	<u>Frequency</u>	<u>Percent</u>
20,000-50,000	50	48.1
> 50,000-100,000	38	36.5
>100,000-150,000	11	10.6
>150,000-200,000	2	1.9
>200,000-250,000	3	2.9
	-----	-----
	104	100.0
Total sample 104	Mean 69464.42	sd. 48062.71

The majority of individuals earn their income from squid trap fishing (77.9 percent) and the rest (22.1 percent) from a combination of squid trap fishing and other sources such as other types of fishing, agriculture, and trade. The reliance on small scale fishing is largely due to the fact that most respondents go fishing every day. This makes it difficult for them to earn supplementary income from other sources. In addition, many of them do not own land which eliminates the

possibilities of earning supplementary income from agriculture. Employment opportunities are also limited due to the isolation of their villages' location. A summary of the main and secondary sources of income is presented in Table 4.16.

Table 4.16 Income Sources

<u>Main Sources</u>	<u>Frequency</u>	<u>Percent</u>
Only squid trap fishing	81	77.9
Squid trap fishing and others	23	22.1
	-----	-----
	104	100.0
 <u>Supplementary Sources</u>		
Other fisheries	19	82.6
Agriculture	1	4.3
Trade	3	13.0
	-----	-----
	23	100.0

It has been common practice in this region for squid trap fishermen to receive advance money from middlemen (usually they are the pier owners) with which to prepare their fishing boats, buy traps, gas, ice and cover other expenses. Roughly eighty percent of the respondents borrow money from middlemen. As part of the arrangement, the fishermen agree to land at that pier and sell squid to the pier owner who lends them the money. After each trip the borrowed money is deducted from the sale of the catch. It is common for small scale fishermen to borrow money from middlemen rather than from financial institutions, as the latter require loan guarantees which many

cannot meet as they do not own land. As well, the latter are also inconvenient owing to the need for frequent trips from their villages to the town whenever they need money.

Table 4.17 Borrowing Money from Middleman

	<u>Frequency</u>	<u>Percent</u>
Yes	83	79.8
No	21	20.2
	-----	-----
	104	100.0

Purposes of Expenses

	<u>Frequency</u>	<u>Percent</u>
gas	2	2.4
gear	2	2.4
both gas and gear	78	94.0
other expenses	1	1.2
	-----	-----
	83	100.0

The main problem affecting the incomes of squid trap fishermen is the loss of their traps due to trawl fishing. Many of them have lost all of their traps in one day, which means that they have to replace the traps over and over again. Usually the traps can last about three to four months (Boonkerd and Rajaniyom, 1990). This problem has detrimentally affected their incomes owing to the cost of making new traps, and also because of lost catch. It also has had an impact on other resources, especially forest resources, due to the use of trees for making new traps. Some squid trap fishermen use large plastic bags full of sand as the weight,

which are lost in the sea, and which also contributes to the deterioration of the beach.

Most of the trap loss has been caused by trawl fishing by both otter board trawlers and pair trawlers (61.5 percent). Some of the respondents (38.5 percent) indicated that their losses were caused by both trawl fishing and purse seine. The amount of lost traps per year is presented in Table 4.18. The majority of respondents (47.1 percent) indicated that they have lost between 500 and 1,000 traps a year. Again, their numbers are estimates based on recall. It is likely that some fishermen have exaggerated the number of traps lost.

Table 4.18 Number of Traps Loss

<u>No. of lost trap/year</u>	<u>Frequency</u>	<u>Percent</u>
200-500	13	12.5
> 500-1000	49	47.1
>1000-1500	18	17.3
>1500-2000	12	11.5
>2000-2500	1	1.0
>2500-3000	8	7.7
>3000-3500	2	1.9
>3500-4000	1	1.0
	-----	-----
	104	100.0
Total sample 104	Mean 1257.02	sd. 824.91

Table 4.19 Causes of the Lost

	<u>Frequency</u>	<u>Percent</u>
trawlers	64	61.5
both trawlers and purse seiners	40	38.5
	-----	-----
	104	100.0

The distance from the shore to the traps varies from 5 kilometres to 40 kilometres. The traps are placed in a row, the gap between each trap ranges from 40 to 400 meters (average between 100 and 200 meters) depending upon the number of traps. If 180 to 200 traps are set the gap would be between 50 to 60 meters. Traps can be set either parallel to the shore or perpendicular to the shore. The former are easier to adjust the rope of trap because of same depth. Boonkerd and Rajaniyom (1990) estimate that squid trap fishing with 60 traps, a 100 meters gap between each trap, and 3 rows of 20 traps would cover an area of 0.38 square kilometres (1,900 m x 200 m). One of the consequences of the growth of squid trap fishing is that the area set with traps is quite extensive.

Boonkerd and Rajaniyom (1990) and Jittrapong and Pramokchutima (1986) suggest that at the beginning of squid trap fishing twenty years ago, fishermen set their traps at around six meters depth. Since then the squid fishing area has been expanded to between 14 to 25 meters depth, with some traps being set at 40 meters depth. The distance to shore indicated by the respondents is estimated from the time and speed of their fishing boat. However, factors such as the direction of boat, engine horse power, the load, and the wind and current speed could affect the accuracy of the distance indicated. Boonkerd and Rajaniyom (1990) estimate that the one hour range for a squid fishing boat speed is between 10

and 15 kilometres. The distance of trap from shore indicated by respondents varies from 1 to 3 hours boat speed. The average distance of traps from the shore is about seventeen kilometres, minimum is five kilometres and maximum is forty kilometres (see Table 4.6).

About forty percent of respondents set their traps in the same area and about sixty percent move their traps around (see Table 4.20). The reasons for changing the area of fishing are to find places yielding a better catch, and to avoid crowding by other squid trap fishermen. However, the respondents are still setting their traps in the vicinity of their villages because they have to harvest squid and come back in one day.

Table 4.20 Set Trap in the Same Area

	<u>Frequency</u>	<u>Percent</u>
Yes	41	39.4
No	63	60.6
	-----	-----
	104	100.0

All but one of the respondents indicated that they have problems with other fishermen. The respondent who indicated that he had no problem with other fishermen, did so because he perceived the loss of traps to be a characteristic of squid trap fishing. He is also a new entry to squid trap fisheries, and the loss of traps caused by trawl fishing seems normal to him. About sixty-eight percent indicate the conflict with trawl fishing (both otter board trawler and pair trawler) and

about thirty-two percent indicate the conflict with both trawl fishing and purse seine.

Table 4.21 Conflict with Other Fishermen

	<u>Frequency</u>	<u>Percent</u>
Yes	103	99.0
No	1	1.0
	-----	-----
	104	100.0

What is caused the conflict

	<u>Frequency</u>	<u>Percent</u>
Trawl fishing	70	68.0
Both trawls and purse seine	33	32.0

About thirty-four percent of respondents indicate that they have higher incomes than last season, about thirty-nine percent indicate having lower income than last season and about twenty-seven percent feel that they have the same income compared to last season. Among the group having higher incomes, the reasons include setting more traps (37.1 percent), catching more squid (45.7 percent), the squid caught are bigger, higher price (8.6 percent) and they have lost fewer traps (8.6 percent). Among the group having lower incomes than last season, the reasons are: they set fewer traps (17.1 percent), catch fewer squid (7.3 percent), lower price (26.8), lost more trap (46.3 percent) and high operating cost (2.4 percent). The reason for this disparity is explored

in greater detail in section 4.1.2.

Table 4.22 Income of This Season Compared to Last Season

	<u>Frequency</u>	<u>Percent</u>
higher	35	33.7
the same	28	26.9
lower	41	39.4
	-----	-----
	104	100.0

Reasons for higher incomes

	<u>Frequency</u>	<u>Percent</u>
set more trap	13	37.1
catch more squid	16	45.7
bigger size caused higher price	3	8.6
lost less trap	3	8.6
	-----	-----
	35	100.0

Reasons for lower incomes

	<u>Frequency</u>	<u>Percent</u>
set less trap	7	17.1
catch fewer squid	3	7.3
lower price	11	26.8
lost more trap	19	46.3
high cost	1	2.4
	-----	-----
	41	100.0

With regard to squid stocks in this region, about forty-five percent of respondents believe that there are more squid than last season which they have observed from the weight of the catch and the large size of the squid. Many believe that the large number of lost traps on the sea bottom provide more

spawning and nurturing places which help enhance the squid stock. About twenty-four percent of the respondents believe that there are fewer squid than last season, because they have observed a decline in their catch, and squid caught are smaller (Table 4.23).

Table 4.23 The Abundance of Squid Stock

	<u>Frequency</u>	<u>Percent</u>
higher than last season	47	45.2
the same as last season	33	31.7
lower than last season	24	23.1
	-----	-----
	104	100.0

c) Analysis of Conflict with Trawlers

All the respondents indicated that trawlers have had an impact on their livelihoods and incomes, and most considered the conflict to be serious. The seriousness indicated by respondents was based on the number of lost traps and they indicated that more of their traps have been lost recently compared to the past. Many of them have frequently lost all of their traps in one day. Some of respondents indicated that nowadays trawlers have the intention to fish in squid traps set areas because trawlers have recently discovered that traps attract more fish. The response of the respondents ranges from complaining to the Kamnan and Phuyaiban (head of the village); complain to police; complain to Department of

Fisheries; complain to others such as local radio broadcast station, local politicians and the Department of Public Administration. Most, however, do nothing (63.5 percent). This is likely that most of them have low education and low incomes to make their case.

Table 4.24 Conflict with Trawlers

a) Impact of trawlers on income

	<u>Frequency</u>	<u>Percent</u>
Yes	104	100.0
No	0	0.0
	-----	-----
	104	100.0

b) Seriousness of conflict

	<u>Frequency</u>	<u>Percent</u>
Yes	101	97.1
No	3	2.9
	-----	-----
	104	100.0

c) Complain to whom

	<u>Frequency</u>	<u>Percent</u>
Kamnan, Phuyaiban	4	3.8
police	1	1.0
Department of Fisheries	11	10.6
others	22	21.2
do nothing	66	63.5
	-----	-----
	104	100.0

However, about forty-four percent of them have formed a fishermen group to fight or make their case (Table 4.25). With the group, they have more confidence in being able to solve the problem through negotiation with trawlers. About seventy-four percent formed groups with fishermen in the same village, about nine percent formed group with fishermen in other villages and about three percent formed groups with friends or relatives. These groups were temporarily joined together only to discuss their problem and were not well organized due to a lack of leadership and direction in the group. About eighty-four percent indicated that they want to have a group and committee. However, forming a fishermen's group is not an easy task. It needs strong support and cooperation from members and outsiders. While four percent suggested the local Kamnan or Phuyaiban, about seventy-five percent of the respondents thought that the Department of Fisheries should take responsibility for organizing a fishermen group.

Table 4.25 Form Group to Fight or Make the Case

	<u>Frequency</u>	<u>Percent</u>
Yes	46	44.2
No	58	55.8
	-----	-----
	104	100.0

People in the group

	<u>Frequency</u>	<u>Percent</u>
people same village	34	73.9
people other villages	9	8.7
friends	3	2.9
	-----	-----
	46	100.0

Table 4.26 Group and Committee should be Form in the Future

	<u>Frequency</u>	<u>Percent</u>
Yes	87	83.7
No	2	1.9
no comment	15	14.4
	-----	-----
	104	100.0

Who should response for organizing group and committee

	<u>Frequency</u>	<u>Percent</u>
Kamnan, Phuyaiban	4	3.8
monk	1	1.0
Department of Fisheries	78	75.0
others	1	1.0
no comment	20	19.2
	-----	-----
	104	100.0

About forty-three percent indicated that the best way of resolving the conflict would be to have a closed area or zone for squid trap fishermen and other small scale fishermen expanded from three kilometres to twenty or twenty-five kilometres. About two percent wanted to have a closed season for six months during the peak squid fishing season in this region from November to April. About two percent wanted to have a combination of closed season and area during the full moon of every month because fishermen catch more squid during full moon. About twenty percent have realized that the most realistic way of solving the problem is to form a group to negotiate with trawlers. About fifteen percent wanted help from Department of Fisheries to arrange the meeting with trawlers to explore other ways of solving the problem. About two percent wanted compensation from trawlers for the loss of traps and catch. About fifteen percent had no idea of how to solve the problem.

Most respondents indicated that they would be willing to pay a fisheries tax to the Department of Fisheries in order to have the same fishing rights as trawlers. As stated in Chapter 2, most of small scale fishermen including squid trap fishermen are not required to pay the fisheries tax. Some respondents indicated that trawlers have alleged squid trap fishermen have no rights to fish beyond reserved area (3 kilometers from shore) because squid trap fishermen do not pay fisheries tax. Owing to this reason, respondents anticipated

that if they pay fisheries tax, trawlers would recognize their rights to fish and avoid damaging their traps.

Table 4.27 Suggestions for Solving the Problem

	<u>Frequency</u>	<u>Percent</u>
zoning, closed area	45	43.3
closed season	2	1.9
full moon	2	1.9
form group negotiate	21	20.2
DOF help	16	15.4
compensation	2	1.9
no idea	16	15.4
	-----	-----
	104	100.0

Most respondents (92.3 percent) indicated that the existing regulation can not help solve their problem because their fishing area is beyond the reserved area. This is why they want the Government (DOF) to consider expanding the reserved area to twenty or twenty-five kilometres from the shore which would benefit both squid trap fishermen and other small scale fishermen as a whole. Recently, many other small scale fishermen have experienced a decline in their catch within the three kilometres reserved area which they believe is caused by the destruction of mangrove forests and fish habitat in this region. Pramokchutima and Vadhanakul (1987) report that there are many requests from small scale fishermen in this region for more artificial reefs, to help enhance the fisheries resources. The reefs could also help obstruct the

trawlers from fishing nearshore.

Although there has been a conflict with trawlers for many years, most of the respondents (85.6 percent) indicated that they want to continue squid trap fishing (table 4.28). This is because that squid trap fishing can be done with a relatively low cost and high return compared to other small scale fishing gears. Many respondents indicated that if they did not lose their traps, they could earn two or three times more than their present incomes. Additionally, squid trap fishing is more easily undertaken compared to other small scale fishing gears which requires more the skill and experience.

Table 4.28 Want to Change to Other Fishing Gears

	<u>Frequency</u>	<u>Percent</u>
Yes	9	8.7
No	89	85.6
May be	6	5.8
	-----	-----
	104	100.0

It is possible to develop a rough estimate of the cost of lost traps and the loss of catch by squid trap fishermen in this region. The average number of traps lost is 1,257 traps per year (Table 4.18) and the average cost of traps is 64 baht per trap (Table 4.11). The cost of lost traps is about 80,448 baht per year (3,657 CN\$). If these lost traps caught at

least 1 kilogram per trap per year, the loss of catch would be 1,257 kilograms per year. Given the average price of squid of 35 baht per kilogram (Table 4.14), the loss of catch would be 43,995 baht per year (2,000 CN\$) (Table 4.29).

Table 4.29 Simple Estimation Cost of Loss (average)

a) Cost of lost traps

Average lost traps	1,257	traps/year
Cost of trap	64	baht/trap

Total	80,448	baht/year

b) Lost of catch

Catch of squid (1 kg/trap)	1,257	kg/individual
Price of squid	35	baht/kg

Total	43,995	baht/year

4.1.2 Province Comparison

The three provinces selected for this study are similar in terms of their environmental and cultural composition, and the way of life of the people. It was considered important, however, to determine whether the responses differed between the three provinces. Tables 4.30 and 4.31 provide a comparison of the respondents socio-economic characteristics in the three provinces. There are some significant differences between them. The significant difference in income is likely due to the fact that respondents in Trat province rely more on supplementary sources than those in

Rayong and Chanthaburi, who earn their incomes mainly from squid trap fishing.

**Table 4.30 Socio-Economic Characteristics
: Province Comparison**

<u>Characteristic</u>	<u>Chi Square</u>	<u>D.F.</u>	<u>Significance</u>
Previous Occupation	12.27455	6	.0561
Own House & Land	4.14795	2	.1257
Done Fishing Before	3.88844	2	.1431
Squid Trap Main Income Source	7.95243	2	.0188*

* Significance Level at $\alpha = .05$

**Table 4.31 Characteristics of Respondents
: Province Comparison**

Characteristics	Rayong (n=35) Mean (sd)	Chanthaburi (n=35) Mean (sd)	Trat (n=34) Mean (sd)
Average age	34.1 (7.5)	37.4 (8.2)	36.1 (7.7)
Average Education	4.5 (0.8)	4.0 (0.2)	4.4 (1.3)
Practice Squid Trap Fishing (year)	5.9 (2.8)	7.6 (4.9)	5.2 (2.8)
Size of the Boat (m)	6.4 (62.2)	7.9 (100.8)	8.1 (146.9)
Cost of the Boat (TBH)	39085.7 (9082.5)	96542.9 (50144.7)	90676.5 (53620.3)
No. of Trap Set (per individual)	62.9 (22.9)	104.3 (45.7)	78.1 (28.5)
Cost of Making Trap (TBH/trap)	82.3 (7.3)	37.9 (32.4)	73.5 (23.1)
Fishing Effort-1 (month/year)	9.7 (1.9)	10.0 (2.3)	7.9 (2.4)
Fishing Effort-2 (day/month)	20.4 (3.6)	17.0 (3.5)	17.0 (3.6)
Catch of Squid (kg/day)	21.0 (6.7)	39.1 (14.6)	37.8 (13.7)
Squid for Their Consumption (kg/month)	8.4 (5.0)	8.8 (8.7)	10.2 (6.6)
Sale of Squid (kg/month)	275.1 (86.8)	456.0 (204.1)	499.9 (251.9)

Table 4.31 (Continue)

Annual Income (TBH/year)	48694.3 (25665.6)	83771.5 (52596.2)	76117.6 (54414.7)
No. of Lost Trap (trap/year)	922.9 (340.5)	1390.0 (712.9)	1464.1 (1140.0)
Distance from Shore to Trap (km)	12.5 (5.2)	19.2 (6.2)	19.7 (5.4)
Distance from Village to Trap (km)	13.3 (5.2)	20.3 (6.5)	20.9 (5.1)

Significance Level at $\alpha = .01$ _____
 $\alpha = .05$ *****

It is common for young people living along the coast in Thailand to engage in fisheries, either as crew on commercial fishing boats (trawlers and purse seiners) or as small scale fishermen after they quit school. After a period of time, most of them will quit their crew jobs and have their own fishing boat and practice small scale fisheries in the vicinity of their villages. Only a few of them engage in agriculture, trade, or other occupations. This is supported by the fact that there is no significant difference between the group of respondents who practiced fishing before. However, there is a significant difference amongst the group of respondents who practiced fishing before because they have engaged in many different types of fishing activities such as trawl crew, push net, gill net, trap and hand-line fishing.

Regarding ownership of their house or land, there is no significant difference among the respondents of the three provinces. The respondents who do not own houses or land tend to be non-residents of the village, new arrivals, temporary residents, or young fishermen who live with their parents. The respondents who own houses or land have usually been residents for many years, mostly since birth.

The comparison of the residents in each of the provinces, reveals several significant differences exist (see Table 4.31). The average education of respondents in Rayong is significant difference from respondents in Chanthaburi but there is no significant difference between Rayong and Trat.

Concerning the period of practicing squid trap fishing, there is a significant difference between fishermen in Chanthaburi and Trat but there is no significant difference between Rayong and Trat. One respondent at Ban khung Wiman in Chanthaburi claimed that he was the first person to practice the squid trap fishing by modifying the fish trap around twenty-five years ago. Later it has become popular fishing gear in this region. This is shown by the period of practicing squid trap fishing which is longer in Chanthaburi than the other two provinces.

With regard to the fishing boats, there are significant differences in boat size between Rayong and Chanthaburi, and between Rayong and Trat. The average boat size in Rayong is smaller than in the other two provinces. This is also reflected in the fact that the cost of fishing boats in Rayong is significantly lower than that in Chanthaburi and Trat.

The number of traps set by individual respondents is significantly different between the three provinces. Respondents in Chanthaburi set the most traps followed by Rayong and Trat respectively. Most of the respondents indicated that the main factor affecting the size of catch was not the number of traps set, but rather how many their traps were wiped out by trawl fishing. Respondents who set fewer traps may have more catch than respondents who set more traps and lost most of the traps. However, respondents who set more traps thought that they would have better chance of catching

more squid than set less traps if most of their traps are not wiped out. Many respondents believe that the trawlers and purse seiners prefer fishing in areas having large number of squid traps because the traps (also work as fish aggregation device or fish attractor) will attract fish schools. Trawlers have a major impact on squid trap fishing because they sweep all the squid traps, whereas the purse seines have a small impact because their fishing method is different. While the trap also can destroy the trawl net, the trawler uses the sling to cut down the trap in order to prevent the trap from getting into the trawl net.

There is no significant difference in terms of making traps. Most of the respondents make their own traps because purchasing traps is expensive. Some squid trap fishermen's families make traps for sale, either as finished traps or the trap frames. The cost of making traps varies from province to province depending on the materials available. The price of polyethylene net used to cover the traps and styrene foam is about the same in the three provinces. The variable price is the cost of the bamboo pole for the float and wood used for the trap frames. The respondents in Chanthaburi have lower costs for making traps because their villages are surrounded by forested mountains where they can easily cut down the trees. However, the forest is a reserved area thus they cut down the trees illegally.

The respondents in Chanthaburi and Rayong go fishing

roughly ten months in a year. Significant differences exist between Chanthaburi and Trat, and between Rayong and Trat, which can be related to the difference in supplementary income sources of respondents from Trat province. They probably spend time for the other supplementary sources of income, therefore their time spent squid trap fishing is roughly eight months in a year. The number of days spent for squid trap fishing in a month is significantly different between Rayong and Chanthaburi, and between Rayong and Trat. The respondents in Rayong spend about twenty days in a month squid trap fishing which is longer than the roughly seventeen days in a month of respondents in Chanthaburi and Trat. The time off from squid trap fishing is probably spent in making traps, fishing boat maintenance, illness, holidays. Heavy rainstorms during monsoon season add to the number of days off.

The amount of squid caught in a day is significantly different between respondents in Rayong and Chanthaburi, and between Rayong and Trat. Respondents in Rayong have an average catch of about twenty-one kilograms per day which is lower than the catch of about thirty-eight kilograms per day in Chanthaburi and Trat. As discussed earlier the reasons vary from the number of traps set and/or lost, to the abundance of squid stock in the areas. There is no significant difference in terms of squid used for household consumption among these three provinces. Most indicated that the price of squid is higher than that for other fisheries

products, second only to the price of shrimp or prawns due to the demand for exporting. Rather than using squid for their own consumption they are better off selling the squid for cash and consuming fish or shellfish which have lower prices and which they can catch easily from the sea near their villages.

The sale of squid per month is significantly different between Rayong and Chanthaburi, and between Rayong and Trat. The average squid sale of Rayong respondents is about 275 kilograms a month which is well below the sale of about 456 kilograms and 500 kilograms per month in Chanthaburi and Trat respectively. This is related to the low average catch in Rayong compared to the other two provinces.

The number of lost traps is significantly different between Rayong and Chanthaburi, and between Rayong and Trat. The average number of traps lost per year in Rayong is about 922, in Chanthaburi 1,390 and in Trat 1,464. This is also related to the relationship between the number of traps set and the number of traps lost indicated earlier. Respondents in Rayong set fewer traps than the others therefore the number of traps lost is also lower.

The distance from traps to shore is significantly different between Rayong and Chanthaburi, and between Rayong and Trat. Many respondents indicated that squid stocks have moved further from the shore during the past ten years. This is probably due to the decline in nutrients in near shore areas caused by mangrove destruction and other forms of

environmental degradation. Formerly, squid trap fishing was practiced near shore. Nowadays the respondents have to set their traps further from the shore in order to catch more and larger squid. The average distance from traps to shore in Rayong is about 12.5 kilometers, in Chanthaburi is about 19.2 kilometers and in Trat is about 19.7 kilometers. This is another factor affecting the catch of squid in Rayong, as the traps are set closer to shore than in the other two provinces resulting in a lower average catch. Another reason is that the average size of fishing boat in Rayong is smaller than that in Chanthaburi and Trat, thus it is more difficult for them to set their traps further offshore.

There is significantly different between Rayong and Chanthaburi, and between Rayong and Trat in the distance from traps to their village. The squid trap fishermen go fishing daily and collect their catch in the morning and come back in the afternoon. They have to set their traps not too far from the villages on average between one to three hours range by their fishing boats. The average distance from their traps to village in Rayong is about 13.1 kilometers, in Chanthaburi is about 20.3 kilometers and in Trat is about 20.9 kilometers.

Another concern is whether the respondents always set their trap in the same area or not. Table 4.32 shows that there is a significant difference among respondents in three provinces because they tend to change the location of traps set, depending on the catch and to avoid crowding. Comparing

the annual income between this season and last season, there is no significant difference because the number of respondents who have higher income are about the same as respondents who have lower income than last season. The abundance of squid stock this season compared to last season is also no significant difference because the number of respondents who catch more squid are about the same as respondents who catch less squid than last season. There is significantly difference in terms of forming group to fight or make a case solving the conflict between squid trap fishermen and trawlers, many of respondents have not formed group to solve the problem.

The majority of respondents thought that the conflict with trawlers is having a serious impact on their incomes and livelihoods, there is no significant difference between the

Table 4.32 Fishing Characteristics : Province Comparison

<u>Characteristic</u>	<u>Chi Square</u>	<u>D.F.</u>	<u>Significance</u>
Set trap Same Area	42.98391	2	.0000**
Income This Season Compared to Last	2.71839	4	.6060
Squid This Season Compared to Last	3.46210	4	.4837
Form Group to Fight	13.30343	2	.0013**

** Significance Level at $\alpha = .05$

**Table 4.33 Perspective of Conflict from Squid Trap Fishermen
: Province Comparison (Frequency)**

	Rayong	Chanthaburi	Trat
No. of Lost traps per year			
200-500	4	1	8
501-1,000	22	20	11
1,001-2,000	9	14	7
2,001-4,000	-	4	12
Cause of Traps Loss			
Trawlers	23	19	22
Trawlers & Purse Seiners	12	16	12
Others	-	-	-
Seriousness of Conflict			
Yes	35	33	33
No	-	2	1
Complaints Lodged			
Phuyaiban/Kamnan	-	-	4
Police	-	1	-
DOF	1	1	9
Others	2	10	10
Do Nothing	32	23	11
Solution to Problem			
Closed Area	19	10	16
Closed Season	-	2	-
Full Moon	-	2	-
Form Group	4	6	11
Compensation	-	2	-
DOF	3	8	5
No Idea	9	5	2
Change to Other Fishing Gear			
Yes	6	1	2
No	29	30	30
May be	4	-	2

three provinces. The respondents indicated that they can not solve this problem on their own, and that the help from outsiders particularly government agencies would be preferable and realistic. Some respondents indicated that they have complained to local Phuyaibans and Kamnans, police, Department of Fisheries, Department of Public Administration, local radio broadcast station, local politicians and others. However, there is still no final resolution of this conflict. This is probably because only a few respondents have taken action. Most respondents indicated that they have done nothing to try and solve the problem.

Suggestions for solving the conflict from the respondents' perspective are numerous such as closed area, closed season, prohibiting trawl fishing during full moon, asking compensation from trawlers, forming a group, and getting help from the Department of Fisheries. Most of the respondents suggested closed areas with little difference in this regard between the three provinces. Forming groups was the second suggestion favoured by the respondents, followed by the suggestion of getting help from the Department of Fisheries.

4.2 Summary

This chapter has summarized the data and information collected from the survey of squid trap fishermen in the provinces of Rayong, Chanthaburi and Trat. The analysis has provided an overview of squid trap fishing characteristics and the perceptions of fishermen about the conflict between them and trawlers. The following chapter summarizes the findings and presents the conclusions of the study.

CHAPTER 5

SUMMARY AND CONCLUSIONS

5.1 Summary

Marine fisheries in Thailand consist of two sectors, commercial fisheries and small scale fisheries. Thai marine fisheries have experienced rapid growth in recent years due to high fishing efficiency in the commercial fisheries sector and increased fishing effort. The increase in fishing effort has led to fisheries resource depletion in the Gulf of Thailand, especially of demersal species that are caught by trawlers. Over fishing in the Gulf of Thailand has occurred since 1973. Catch per unit of effort per hour by trawl steadily decreased owing to the large number of trawlers, as well as to the attempt to use the small cod-end mesh size so that more trash fish are caught. In addition, many trawlers that had been fishing in foreign waters have returned to fish in the Gulf owing to the declaration of Exclusive Economic Zone by neighbouring countries.

In the Gulf and along the coast of Thailand, a large number of small scale fishermen continue to fish using traditional fishing gear. These people are generally

considered to be subsistence fishermen as their fishing efforts generate low incomes for their households. Although small scale fisheries have long been an important source of income in rural communities, the economic well-being of these people is now threatened by low catch arising from fishery resource depletion and competition with commercial fishermen. The competition for a dwindling resource base has led to serious gear conflicts, especially between small scale fishermen and trawlers. Trawlers not only compete effectively against small scale fishermen, but because of their active mode of operation, they frequently damage or destroy more passive small scale gear. This results in substantial economic losses and represents a threat to the livelihoods of many small scale fishermen. This, in turn, may contribute to broader problems of social unrest such as armed fighting because of the anger among fishermen.

This study set out to describe the resource conflicts that exist within Thailand's coastal zones with an emphasis on marine fisheries, and to investigate the impacts of trawl fisheries on squid trap fishermen in the Gulf of Thailand. The field component of this study consisted of a questionnaire survey administered to 104 squid trap fishermen in three eastern provinces, namely Rayong, Chanthaburi and Trat.

The results from this study indicate that there are many similarities in socio-economic and fishing characteristics among squid trap fishermen in the three provinces. Most of

them have been practicing trap fishing for several years, and use small fishing boats between six to eight meters. On average, about eighty traps are set by each fisherman, with catch averaging roughly thirty kilograms per day. The respondents reported a wide range in their annual incomes. One of the main factors affecting income was the loss of traps caused by trawl fishing.

The comparison of fishermen between the provinces indicates that squid trap fishermen in Rayong province have many differences in fishing characteristics compared to Chanthaburi and Trat. Squid trap fishermen in Rayong use smaller boats and set fewer traps than fishermen in the other two provinces. They also set their traps closer to shore than do the others. The average distance from traps to shore in Rayong was about thirteen kilometers whereas in Chanthaburi and Trat it was about twenty kilometers. As well, annual incomes in Rayong was lower than in the other two provinces.

The majority of squid trap fishermen in the study area have experienced problems with trawlers. Trawlers, both otter board trawls and pair trawls, caused the most destruction of squid traps, followed by purse seiners. This destruction has detrimentally affected their incomes owing to the cost of making new traps, and also because of lost catch. Although this conflict has existed for many years, it is believed that the seriousness of the conflict is now increasing owing to greater numbers of trawlers fishing in the areas where squid

traps are set. One of the reasons for this is that the limited fishery resource that is available is attracted to the traps to feed on squid. Many squid trap fishermen indicated that they often lose all their traps in one day.

Most fishermen have low educations and low incomes. This has meant that the majority of them have little idea as to what can be done to reduce conflict with trawlers. Some of them have formed temporary groups to discuss this problem, and some have complained to the local police, heads of villages, the Department of Fisheries, local politicians, local radio broadcast stations, and others. However, the conflict has not been resolved due, in part, to the many different interests and institutions involved. Squid trap fishermen have given some suggestions as to how to solve their problem. The majority of them want the government, in this case the Department of Fisheries, to consider expanding the reserved area from the present three kilometers limit, to twenty or twenty-five kilometers from shore. However, this suggestion would be difficult to implement because trawlers and other commercial fishermen would not agree. As well, it is unrealistic to expect the Department of Fisheries to be able to enforce such a law given. Others have suggested negotiating with trawlers by forming a group, a closed season during the peak squid fishing season, compensation from trawlers, or any other way of solving the problem that could be negotiated by the Department of Fisheries.

As the final inquiry, the question was asked whether they wanted to change to other fishing techniques or other occupations, if this problem can not be solved. Most of the squid trap fishermen answered that they want to continue to practice squid trap fishing because squid trap fishing can be operated with low cost and high return compared to other occupations. As well, squid stocks are still abundant compared to other fisheries resources in this region.

5.2 Conclusions

Environmental perception and attitude studies have made several contributions to natural resource management. By improving their understanding of how the various actors may be affected by resource allocations, managers have a better basis for decision-making. In the context of the conflict between trawlers and squid trap fishermen, there is a need to acquire greater knowledge about the nature of this conflict from the perspective of both the small scale fishermen and the trawlers. This study has attempted to provide part of the needed information.

Conflicts over resource exploitation can largely be resolved by three types of institutional mechanisms: political, judicial and market. Political mechanisms involve the different ways in which elected representatives in association with their bureaucracies deal with problems, and range from Cabinets, legislative committees, government

departments, interdepartmental committees, intergovernmental agreements to task forces. The judicial mechanisms incorporate the various hierarchies of courts that interpret and apply the law. Market mechanisms use prices to guide decisions. Depending upon the circumstances, one or all of these institutional mechanisms may be used in a given situation.

The judicial mechanism by the various hierarchies of courts can not easily resolve the conflict between squid trap fishermen and trawlers that has been described in this case study. The procedures of courts' inquiry needs strong support of evidence and witnesses. The damage to squid traps caused by trawlers usually occurs when squid trap owners are away from the fishing areas. It can occur when squid trap owners are in the area, but the trawlers use sacks to cover their fishing vessel's registration number and name. This practice has generated a great deal of anger among squid trap fishermen, and has led to armed fighting in southern Thailand. While squid trap fishermen lack the evidence and witnesses to pursue their case in the courts, it is also the case that some squid trap fishermen violate the law by not placing visible signs in the fishing areas at night. Although, the judicial mechanism may be appropriate for solving individual cases, it can not resolve the conflict as a whole. The most effective way of solving this conflict is to use political mechanisms through government agencies.

Environmental mediation is viewed as an appropriate process that has the most potential for developing a realistic solution to this problem. This concept is also pertinent to policy making, whether it is referred to as bargaining, conflict management, dispute resolution, negotiation, or environmental mediation. Conflict can be positive if it forces individuals and groups to re-examine values, objectives, assumptions and strategies. If handled constructively, conflict can help to broaden the range of options to be considered and can contribute to solutions in which all participants believe they have gained.

In the short term, the Department of Fisheries can act as mediator in order to help small scale fishermen and organize meetings with groups of trawlers. In the questionnaire survey, most squid trap fishermen expressed a desire to have the reserved area moved beyond three kilometres. Failing this, they wanted the trawl operators to try to avoid damaging the squid traps. In order to bring this message to trawl operators many of them have recognized the importance of forming a group to bargain and negotiate with the commercial trawlers. The trawlers want squid trap fishermen to set their traps in an orderly manners, and in certain areas with visible signs or lamps. They also want them to leave more space between the rows of traps so that they can avoid damaging them. This suggests that both sides are trying to make compromises and to seek a solution to the conflict. Continued

meetings will likely help to broaden the range of options to be considered, and can contribute to solutions to the satisfaction of both parties.

In Thailand, some forms of exclusive fishing rights exist in Fisheries Act B.E. 2490 (1947). These are viewed as property rights which are protected by law, and they eliminate the common property rights in fisheries. In Fisheries Act B.E. 2490 (1947), section 10 states "**Leasable fisheries are fisheries in which exclusive rights to fish and to cultivate aquatic animals should be granted to a person by means of tendering.....**". Section 11 addresses "**No person other than licensee shall fish or cultivate aquatic animals in leasable fisheries.....**". Section 12 codes "**Reserved fisheries are fisheries in which a person has been permitted to fish or to cultivate aquatic animals.....**". Section 13 codes "**No person other than the licensee shall fish aquatic animals in reserved fisheries...**". The leasable fisheries are usually tendered to fishermen who employ stationary fishing gears such as the bamboo stake trap, set bag net, etc. The reserved fisheries are given to fishermen who cultivate oysters, mussels, blood cockle, etc. The licensee has to pay a fisheries tax before using their rights. These forms of fishing rights could be applied to the squid trap fishery so that squid trap fishermen would have the right to fish in areas which exclude other fishermen. However, this remedy will only be effective if they can be protected by

enforcement. The capability to enforce such laws in Thailand is currently quite limited.

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APPENDIX I**Squid Trap Fishermen Questionnaire****1.0 Household Characteristics**

- 1.1 Name.....
- 1.2 Age.....Year
- 1.3 Education.....Year
- 1.4 Marital Status
-a) Single
-b) Married
-c) Divorced
- 1.5 Number of children at home.....
- 1.6 Length of time in this village.....Year
- If less than 5 years, where did you live previously
-
- 1.7 Previous occupation.....
- 1.8 Do you own the house or land where you live now ?
-a) Yes
-b) No
- If yes, what kind of your land certificate.....
- 1.9 Do you have any piece of land in this area ?
-a) Yes
-b) No

2.0 Fishing Characteristics

- 2.1 How long have you been practicing squid trap fishing ?.....Year
- 2.2 Have you done other type of fishing before ?
-a) Yes
-b) No

- If yes, what type of fishing gear.....

- 2.3 Is your boat
a) Owned
b) Rented
- 2.4 If rented, who do you rent your boat from ?
a) people in the same village
b) people from another village
c) owner of the pier
d) others.....
- 2.5 How large is your boat ?.....m.
- 2.6 How much did your boat cost ?.....TBH.
- 2.7 How much does it cost to maintain your boat per year?
TBH.
- 2.8 How many crew do you employ.....
- 2.9 Do you pay your crew by
a) Salary
b) Share of the catch
c) Others.....
- 2.10 How many trap do you set per trip.....
- 2.11 How many of these traps that you
a) Make.....traps
b) Buy.....traps
- 2.12 How much does it cost to make the trap.....TBH./trap
- 2.13 How much does it cost to buy the trap.....TBH./trap
- 2.14 How many months do you fish in one year.....months
 How many days do you fish in one month.....days
- 2.15 How many kilograms do you get squid in one day....kg
- 2.16 Do you sell squid to
a) sell directly to market by your own
b) sell to middle man
c) others.....
- 2.17 The squid
 a) your own consumptionkg./month
 b) sell.....kg./month

- 2.18 How much do you sell squid.....TBH/kg
- 2.19 Do you borrow money from the middle man ?
.....a) Yes
.....b) No
- 2.20 How much money do you borrow ?.....
- 2.21 Can you borrow as much as you want ?
.....a) Yes
.....b) No
If no, why not.....
- 2.22 How much money do you make for profit....TBH/year
- 2.23 Is squid trap fishing your only source of income ?
.....a) Yes
.....b) No
If no, what are your other income sources.....
- 2.24 How many traps are lost per year.....traps
- 2.25 What are the causes of losing trap
.....a) trawler
.....b) purse seine
.....c) both
.....d) others.....
- 2.26 How far from shore do you set your trap.....km
How far from village do you set your trap.....km
- 2.27 Do you usually fish for squid in the same area ?
.....a) Yes
.....b) No
- 2.28 Do you have any conflicts with other fishermen ?
.....a) Yes
.....b) No
If yes, what.....
- 2.29 The income from squid trap fishing in this season
compared to last is
.....a) Higher
.....b) The same
.....c) Lower

If higher or lower, why is this case.....
.....

2.30 The production of squid in this season compared to last is

-a) Higher
-b) The same
-c) Lower

If higher or lower, why is the case.....

3.0 Perceptions of resource conflicts

3.1 Is there any problem with trawlers ?

-a) Yes
-b) No

3.2 Is the conflict between trawlers and squid trap fishermen a serious problem ?

-a) Yes
-b) No

3.3 Are you doing anything ?

- a)complain to Kamnan, Phuyaiban(head of the village)
- b)complain to police
- c)complain to Department of Fisheries
- d)complain to politician
- e)others.....

3.4 Do you form the group to fight or make your case?

-a) Yes
-b) No

If yes, who is in the group.....

3.5 How do you think this problem can be solved.....

.....
.....
.....
.....

- 3.6 If the government enforces restrictions within 3 km will that solve the problem ?
-a) Yes
 -b) No
- If no, why not.....
- 3.7 Do you think the committee should be formed in the village to manage the fisheries resource in your area ?
-a) Yes
 -b) No
 -c) no comment
- 3.8 Who do you think should be responsible for organizing the committee ?
-a) Kamnan, Phuyaiban(Head of village)
 -b) The monk in the village
 -c) Department of Fisheries
 -d) Department of Cooperatives Strengthen
 -e) Department of Public Administration
 -f) Others.....
 -g) no idea
- 3.9 Do you want to change to better fishing gear or another occupations ?
-a) Yes
 -b) No
 -c) Maybe

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