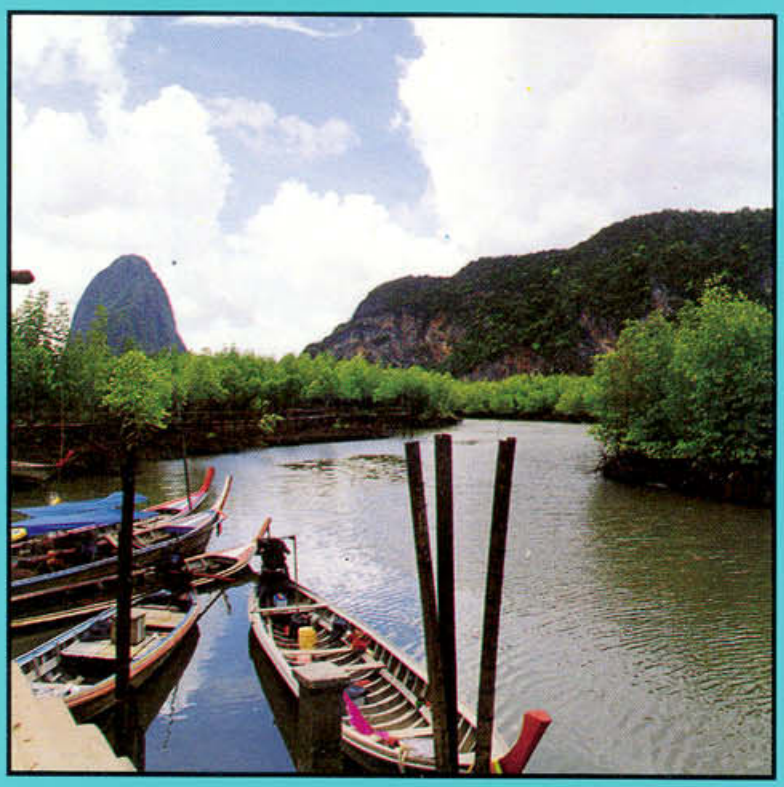
SMALL-SCALE FISHERY IN SOUTHEAST ASIA :
A CASE STUDY IN SOUTHERN THAILAND



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Regional Office for Asia and the Pacific
Bangkok, Thailand

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SMALL-SCALE FISHERY IN SOUTHEAST ASIA:
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Heiko Seilert

and

Suchat Sangchan

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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FOREWORD

The development and rapid expansion of commercial fisheries in the South and Southeast Asian regions in the past four decades have threatened the survival of traditional small-scale fisherfolk to the great extent. In addressing the plight of these fishers at the Indo-Pacific Fishery Commission (IPFC) Symposium on the Development and Management of Small-scale Fisheries in 1980, many governments recognized the importance of coastal small-scale fisheries and many development projects were initiated to develop to develop these fisheries. However, it was also noted that small-scale fisherfolk need more than technological transfer. Improvements of fishing vessels and gear alone could not solve their problems which are multifaceted and thus require multi-disciplinary effort in managing these community fisheries.

A pilot programme as community-based fisheries management was initiated in Phang-nga Bay, southern Thailand, by the FAO Bay of Bengal Programme in 1995. The project aims to introduce the new approach of "partnership in management" with full participation of the public sector, private sector, fishers' communities and NGOs. This participatory approach enable the communities to develop and manage fishery resources and their traditional fisheries in the Bay with some success. However, to ensure its sustainability, more studies are required especially on geo-social and economics in the communities.

The present case study on socio-economics of fishing communities in the Phang-nga Bay was carried out by Dr. Heiko Seilert of the FAO Regional Office for Asia and the Pacific, in collaboration with Mr. Suchat Sangchan of the Andaman Sea Fisheries Development Center of the Thai Department of Fisheries in Phuket. It recognized the complexity involved in managing small-scale fisheries, not only due to the declining coastal resources but more on their socio-economical environment. Lessons learned from these fishing villages would be useful in guiding future management plans for other areas.

As in most research, the outcome generates more questions than answers. The answer on WHY may be available at hand but that on HOW remains our task.

Veravat Hongskul
Senior Fishery Officer
FAO Regional Office for Asia and the Pacific
Bangkok, December 2001

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ABSTRACT

This study of small-scale fishery along the Andaman Sea coast of Thailand can be divided into three sections. The first section, based on the Marine Fishery Census of Thailand, provides the socio-geographic background of fishery, i.e. the numbers of fishing villages, households and fisherfolk. The second section, based on all data collected, provides an in-depth view of the three main types of small-scale fishing gear used along the Andaman Sea coast of Thailand. In the final section, the estimated catch and income data are combined with the socio-geographic data to obtain an overall view of small-scale fishery and to develop management recommendations to support small-scale fisherfolk.

The three types of gear – namely the trammel net, the crab bottom gillnet and the mackerel gillnet – and their respective fishing grounds, use and seasonal restrictions are presented. During 1995-96 qualitative catch data as well as effort, catch per unit effort and income per unit effort for the trammel net (360 units), the crab bottom gillnet (137 units) and the mackerel gillnet (198 units) were collected from six representative villages in the bay of Phang-nga. With more than one thousand samples for some gear over several years, the calculated catch per unit effort and income per unit effort are used as a reliable base for the calculation of the total catch and income generated along the Andaman Sea coast.

The profit per fishing effort for the trammel net was Baht (Bt) 212.5, for the crab bottom gillnet Bt138.4 and for the mackerel gillnet Bt462. The resulting net income per household was Bt33 032, Bt14 947 and Bt25 002 per year, respectively. This is between 8.5 and 25 percent of the average household income in the whole kingdom.

Small-scale fishery along the Andaman Sea coast accounts for 0.7 to 14 percent of the total catch in Thailand as defined by FAO statistics. Five-percent of the total catch comes from the use of the most common small-scale fishing gear, the trammel net, and it is assumed that this is a realistic figure for the catch of small-scale fishery.

Based on these figures, on the description of alternate income-generating activities and on the constraints faced in small-scale fishery, recommendations for small-scale fishery management are presented. It is pointed out that successful management includes diversification of fishing activities, creation of fishing cooperatives, community-based fishery management and a shift from commercial to small-scale fishery – all this in the context of sustainable fishing practices and law enforcement.

Distribution:

FAO Fishery Department
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Contents

1 Introduction

About 90 percent of the world's 30 million fishermen work in Asia (FAO 1998b), roughly 80 percent of them as small-scale or artisanal fishermen (IPFC 1994). Population growth, open access to the sea, and the belief of unlimited fishing resources in the sea have doubled the number of fisherfolk since 1970 (FAO 1998b). On the other hand, fishery resources are limited and are depleting fast in most coastal areas in Asia.

The work and production of most commercial fishery are well documented by national and international organizations. However, the importance of small-scale fishery for national food security and for specific social groups within a region is not fully understood. One reason is that many fisherfolk involved in small-scale fishery offer their products on local markets or consume their catch themselves. This makes it difficult to collect reliable fishery data and assessments probably underestimate the total catch. Also the differentiation between small-scale or artisanal fishery and industrial or commercial fishery differs from one country to another in Southeast Asia. Therefore, comparable data about the catch and value of small-scale fishery in the region are not generally available.

Besides supplying food, small-scale fishery also provides employment for a large group of mainly poor people. Fishing is often the only opportunity for villagers in coastal rural areas to earn some income. A study of small-scale fishery in Southeast Asia should therefore cover social as well as economic aspects.

Population growth has caused a rise in the demand for fish. The increased fishing pressure, particularly in coastal waters, has resulted in already overexploited inshore fish stocks in many parts of Southeast Asia. The consequences for the fisheries as well as for the marine environment have been disastrous. Lower catches further increase the fishing effort and lead to the use of destructive fishing techniques such as fishing with too fine mesh sizes (mosquito nets) or with dynamite, which further accelerates the overexploitation of the aquatic resources and results in the destruction of the marine environment. Finally, in order to make a living, fishermen are forced to turn to other occupations or explore new fishing grounds. Although open access to marine resources is practiced in most areas of the region, migration into other fishing grounds has resulted in conflicts with the folk already fishing there. Migrating fishermen, who use different, mainly destructive, fishing gear, are seen as competitors for local fish stocks. Besides, the higher number of fishermen further increases the fishing pressure on fish stocks and further depletes fishing grounds. Therefore, migration into other fishing grounds is no solution for the problems of overexploited inshore resources.

The alternative is for fishermen to change their occupation. However, in rural areas with a low average income and often no possibility of land ownership, opportunities for alternative income-generating activities are limited. In most cases, fisherfolk have to leave the village. This increases migration pressures on cities and leads to changes in the population structure of rural areas.

The best way to ensure the livelihood of small-scale fisherfolk in rural areas is to establish sustainable fishery management plans that will support the rural poor fisherfolk. For fishery management, the implementation of the FAO Code of Conduct for Responsible Fishery (1995) will provide the necessary legal framework to achieve this goal. However, fishery management also has to recognize the social importance of small-scale fishery. It has to address the problem that the sustainable use of marine resources may no longer generate enough income for all fisherfolk engaged in small-scale fishery. Only if the economics of small-scale fishery is fully understood and its social importance as source of employment and income is fully recognized can proper recommendations for socially equitable and sustainable fishery management be made. This stresses the need for socio-economic studies on small-scale fishery.

This study is a step in this direction. It was carried out in Southern Thailand to review the situation of small-scale fisherfolk along the west coast, with special emphasis on the bay of Phang-nga. With the full picture of the social structure of the area and a thorough description of its main fishery activities, their cost, profit and value as job-providing businesses, this study presents a fishery management plan adapted to the conditions of Thailand's Andaman Sea.

The objectives of the study were to:

- analyse and present the geographic situation of the area;
- analyse the socio-geographic background of small-scale fishery;
- describe the fishery (equipment and gear used, quality and quantity of the catch, catch per unit effort, income per unit effort, and net income of small-scale fishing households);
- estimate total catches for certain types of gear along the Andaman Sea coast;
- estimate total profits made by fisherfolk along the Andaman Sea coast;
- evaluate the social status of fishing activities;
- describe alternative income sources; and
- develop recommendations for a proper fishery management plan in order to achieve sustainable use of near-shore fish stocks.

2 Geographic situation of the west coast of Thailand

The west coast of Thailand stretches along the Andaman Sea with 740 km of coastline (Menasveta 1997) and many islands (Figure 1). The shelf area covers about 126 000 km^2 (Chullasorn 1998). Inshore areas within three kilometres have an average depth of about three metres. Large mangrove forests are the main habitat structure along that coast (Satapoomin 1997). Only a few islands are girdled with coral reefs and protected as national marine parks.

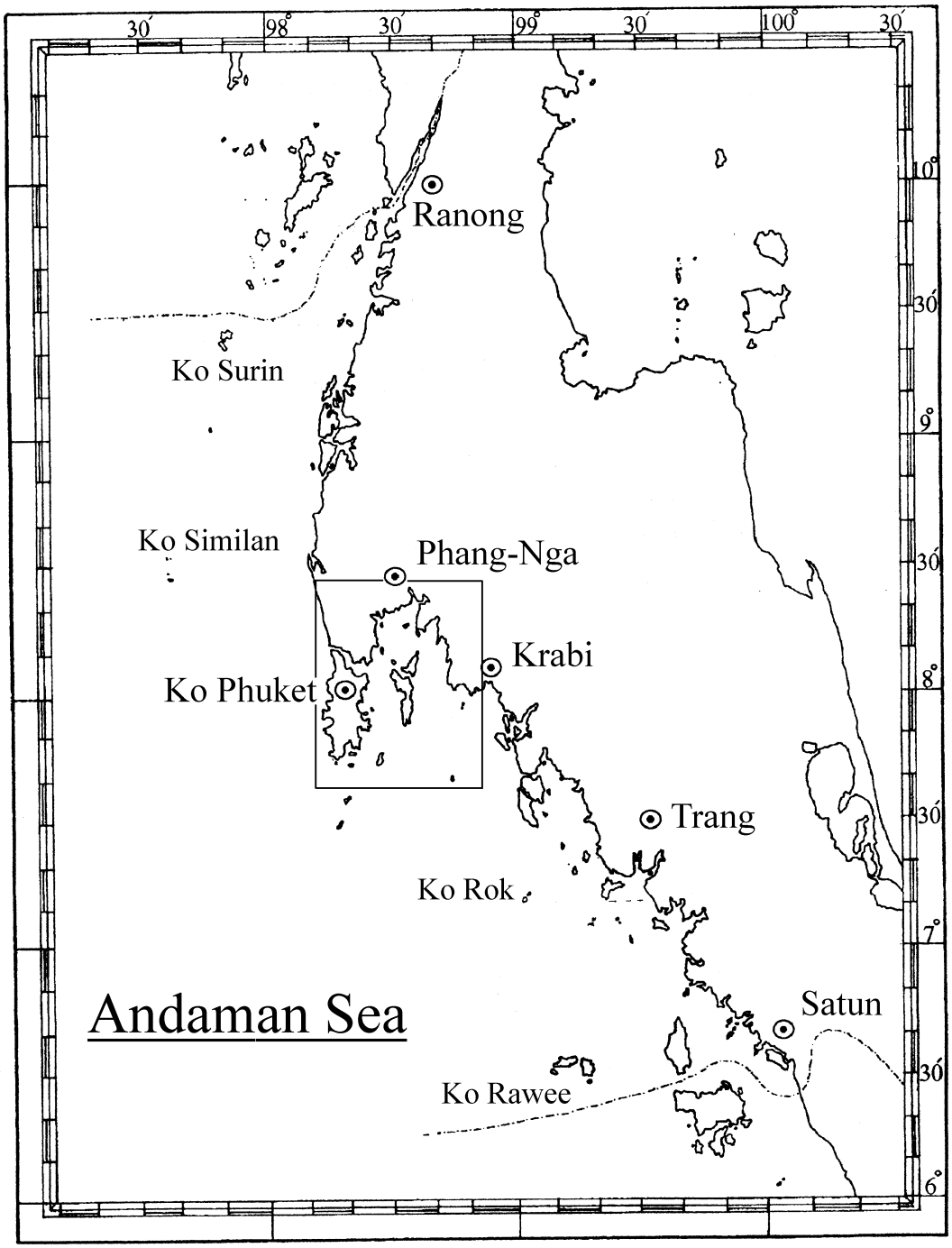

Figure 1: The west coast of Thailand. The square covers the Phang-nga bay, the area investigated.

The sea floor of the inshore areas is dominated by soft bottom substrates composed of mud and sand in variable mixtures. Parts of it are also covered with seagrass. Chansang & Poovachiranon (1994) identified 10 different species of seagrass along the Andaman Sea coast and classified three different types of seagrass beds, species-rich habitats linked with sandy and muddy shallow waters.

The coastal waters are rich in nutrients and two sources for these nutrients have been identified. The northern part, from Ranong to Phuket provinces, is influenced by deep-sea upwelling processes of nutrient-rich deep-sea water, whereas the waters in the southern part are influenced by surface water runoffs transporting nutrient-rich freshwater into the coastal areas (Janecarn & Chullasorn 1997, Limpsaichol *et al.*. 1998, Sundström *et al.*. 1987).

The combination of such habitats, the soft structure of the seafloor and the input of nutrients have created rich and diverse aquatic resources. A recent study on the fish fauna in the mangrove areas and the seagrass beds showed that these habitats were occupied by 280 fish species, 179 of which were restricted to a single habitat (Satapoomin 1997). A large variety of shrimp, such as *Penaeus spp., Metapenaeus spp., Parapeneopsis spp., Metaparapeneopsis spp., Trachypeneopsis spp., Solenocera spp.* and *Heterocarpus spp*., were also found as well as several types of crabs and many mollusc species. These nutrient-rich and diverse environments have led to the development of successful small-scale and commercial fisheries. In 1996 a total of 827 390 tons of fish and shellfish were caught along the Andaman Sea coast, which is about 29 percent of the total marine production of Thailand (FAO 1998a).

The data in the present study were collected in the Phang-nga bay. They were used to calculate the total catch of certain types of gear and the value of small-scale fishery along the coast. The data are used to estimate the socio-economic impact of small-scale fishery along the coast.

The bay of Phang-nga itself covers an area of about 3 000 km^2, with mangrove scattered over 1 900 km^2 (Chantawong *in press*) and 67 islands. About 700 km^2 of nearshore areas in the north have an average depth of less than five metres and the maximum depth in the bay is about 30 metres (Limpsaichol *et al.* 1998). Therefore, most of the bay area can be used for fishing either by small-scale fishermen or by commercial fisheries.

The bay has become the main target for marine research, especially fishery research, because the Phuket Marine Biological Centre and the Andaman Sea Fisheries Development Centre are on Phuket Island. Much fishery data have been collected in this area since 1970. These will be combined with newly collected data from the bay to give a better overview of the small-scale fishery situation along the Andaman Sea coast.

3 Social and geographic background

To analyse the socio-economic situation of small-scale fishermen along the Andaman Sea coast, two types of information are needed, on the social background of the small-scale fishermen and on the wealth derived from small-scale fishing. The number of fishing villages, average size of a fishing village, average size of a fishing household and infrastructure available in each fishing village have to be taken into account when calculating the economic impact of small-scale fishery. With these data, the net income per head and per household can be calculated and further estimates and recommendations made about the socio-economic situation of the small-scale fisherfolk along Thailand's Andaman coast.

Number of fishing villages

As shown in Table 1, there are 621 fishing villages along the Andaman coat. Trang and Phang-Nga provinces have the highest number, 132 villages each. The lowest number of fishing villages was found in Ranong, 59 villages.

Table 1: Number of fishing villages in the six provinces along the Andaman Sea coast (Ruamporn Sirirattrakul, *pers. com*)

Province	**Fishing village [n]**
Ranong	59
Phang-nga	132
Phuket	66
Krabi	116
Trang	132
Satun	116
Total	**621**

Number of fishing households

The number of marine fishing establishments along the Andaman Sea coast according to the data available from the Department of Fisheries and from the National Statistical Office (1997) is given in Tables 2 and 3. Table 2 compares the number of marine fishery establishments and the number of operator households. Altogether, 16 846 establishments and 16 487 operator households were recorded in the six provinces in 1995. The difference was 359 establishments, or 2.1 percent of non-operator households. Three hundred and forty establishments were joint-management establishments, joint investments of two or more households or of joint principal production means such as fishing boats or fishing gear. This means that the difference between the number of establishments and operator households was less than 2 percent. In this study, the number of marine capture fishery establishments will thus be used as the number of fishing households engaged in marine fishery along the Andaman coast.

Table 2: Number of marine capture fishery establishments and of operator households along the Andaman coast (coastal zone 5) 1995 (Department of Fisheries and National Statistical Office 1997)

Province	Marine capture fishery establishments	Operator households
Ranong	2 231	2 205
Phang-nga	3 970	3 848
Phuket	1 094	1 031
Krabi	3 105	3 048
Trang	2 651	2 587
Satun	3 795	3 768
Total	**16 846**	**16 487**

The use of marine capture fishery establishments as fishing households along the Andaman coast may cause further problems because some establishments also work in coastal aquaculture. Table 3 shows the differences between establishments working only in marine capture fishery and establishments also involved in coastal aquaculture. The majority of fishermen engaged in marine capture fishery; only 7 percent or 1 104 establishments were also working in aquaculture. Within this group, 70 percent or 789 establishments had fishing as their main income-providing activity. The total number of establishments only or mainly engaged in marine capture fishery was 16 531. Therefore, the error made by using fishery establishments as the number of households mainly engaged in marine capture fishery is about 4 percent.

Table 3: Number of fishery establishments by type of fishery along the Andaman Sea coast (coastal zone 5) 1995 (Department of Fisheries and National Statistical Office 1997)

Province	Marine capture fishery only	Marine capture and coastal aquaculture	Mainly marine capture fishery	Mainly coastal aquaculture	Total
Ranong	2 145	86	81	5	2 231
Phang-nga	3 333	637	445	192	3 970
Phuket	1 064	30	16	14	1 094
Krabi	3 014	91	42	49	3 105
Trang	2 558	93	62	31	2 651
Satun	3 628	167	143	24	3 795
Total	**15 742**	**1 104**	**789**	**315**	**16 846**
Only or mainly working in marine capture fishery	15 742	–	789	–	16 531

Average size of a fishing household

The average size of a fishing household in each province along the Andaman coast is shown in Table 4. The average size for all six provinces is five members per household. The smallest household size was found in the province of Phang-nga, the biggest in the southernmost province, Satun. The average size of a fishery-employee household was 4.4 members. The smallest households, with 4.0 members, were again found in Phang-nga and the largest in Satun, with 4.8 members.

Table 4: Number of fishery households, of fishery-employee households and of household members along the Andaman coast (coastal zone 5) 1995 (Department of Fisheries and National Statistical Office 1997)

	Fishery household			Employee household		
Province	**Household**	**Member**	**Members/ household**	**Household**	**Member**	**Members/ household**
Ranong	2 437	11 783	4.8	704	2 890	4.1
Phang-nga	4 911	23 281	4.7	1 086	4 328	4.0
Phuket	1 262	6 158	4.9	692	2 845	4.1
Krabi	4 470	23 124	5.2	1 025	4 322	4.2
Trang	3 750	18 479	4.9	1 942	9 053	4.7
Satun	4 507	23 679	5.3	1 875	8 922	4.8
Total/Average	**21 337**	**106 504**	**5.0**	**7 324**	**32 360**	**4.4**

The data collected for this study show no different picture. In an interview of 330 fishing households in the bay of Phang-nga – about two percent of all fishing households along the Andaman coast –, it was found that the average size of a fishing household was 4.92 members, compared with the 5.0 members officially reported.

Fishing infrastructure

Table 5 shows the types of fishing boat employed by marine capture fishery establishments. The vast majority (77.4 percent) have outboard engines and can be categorized as small-scale fishing boats. These long-tail boats are also used for transportation, communication and leisure. About 6.2 percent of the boats have no engine and are categorized as small-scale fishing boats too. Additionally, there are 1 167 establishments without any boat. The total number of small-scale fishing establishments based on fishing boats is 15 247 or 90.5 percent. In the southern part of Thailand, small-scale fishermen use inboard-powered boats. Furthermore, some authors categorize boats with inboard engines of up to 10 gross tonnage also as small-scale fishing boats. This would further increase the total number of small-scale fishing establishments.

Table 5: Number of marine capture fishery establishments and fishing boats separated by type of engine along the Andaman coast 1995 (Department of Fisheries & National Statistical Office 1997)

Province	**Marine capture fishery establishments**	**Without boat**	**Per-cent-age**	**Non-powered boats**	**Per-cent-age**	**Outboard - powered boats**	**Per-cent-age**	**Inboard-powered boats**	**Per-cent-age**
Ranong	2 231	173	7.8	197	8.8	1 630	73.1	231	19.7
Phang-nga	3 970	400	10.1	273	6.9	3 091	77.9	206	6.0
Phuket	1 094	186	17.0	44	4.0	739	67.6	125	32.4
Krabi	3 105	306	9.9	229	7.4	2 497	80.4	73	2.9
Trang	2 651	26	1.0	152	5.7	2 322	87.6	151	19.9
Satun	3 795	76	2.0	153	4.0	2 753	72.5	813	24.0
Total/ Average	16 846	1 167	6.9	1 048	6.2	13 032	77.4	1 599	15.2

The main types of fishing gear used by the marine fishery establishments along the Andaman coast classified as commercial gear and small-scale fishing gear are presented in Table 6. In all,

781 or 5 percent of all gear are categorized as commercial gear and 16 065 or 95 percent as small-scale fishing gear.

Table 6: Number of marine capture fishery establishments by type of main fishing gear along the Andaman Sea coast; gear marked in grey are used in this study (Department of Fisheries and National Statistical Office 1997)

Gear	Number of establishments	Percentage
Commercial fishery		
Otter boat trawl	385	49.3
Bamboo stake trap	160	20.5
Anchovy purse seine	78	10.0
Mini Thai purse seine	13	1.7
Thai purse seine	66	8.5
Pair trawl	29	3.7
Beam trawl	28	3.6
Mackerel purse seine	18	2.3
Luring purse seine	1	0.1
Bonito purse seine	1	0.1
Rocky fish surrounding net	1	0.1
Chinese purse seine	1	0.1
Total	***781***	***100***
Small-scale fishery		
Shrimp gillnet	2 952	18.4
Crab gillnet	1 511	9.4
Hook and line	1 458	9.1
Crab portable lift net	1 264	7.9
Boat push net	1 071	6.7
Squid trap	925	5.8
Crab trap	875	5.4
Mullet gillnet	863	5.4
Whiting gillnet	716	4.5
Fish trap	649	4.0
Small grouper trap	571	3.6
Other gillnet	548	3.4
Set bag net	527	3.3
Miscellaneous	527	3.3
Mackerel gillnet	450	2.8
Hand push net	292	1.8
Other cast net	280	1.7
Squid falling net	105	0.7
Other lift net	77	0.5
Mackerel encircling gillnet	73	0.5
Clam dredge	63	0.4
King mackerel gillnet	62	0.4
Beach seine	61	0.4
Other trap	58	0.4
Acetes dip net	53	0.3
Anchovy stick-held lift net	29	0.2
Anchovy stick-held box net	5	0.0

Gear	Number of establishments	Percentage
Total	**16 065**	**100**

Among the small-scale fishing gear listed in Table 6, the three types used for this study (highlighted in grey) rank as first, second and fifteenth in terms of frequency of use. This shows that they are not specific to the bay of Phang-nga but are also widely used along the Andaman coast. This is also documented in Table 7, which gives an overview of the distribution of the three types of gear in the six provinces along the Andaman coast. It should be mentioned that the type of mackerel gillnet used in the bay is not comparable with the mackerel gillnets used outside the bay.

Table 7: Number of main capture fishery establishments by type of gear used for this study and by province (CDCF and Statistical Office 1997)

Province	Mackerel gillnet	Crab gillnet	Shrimp gillnet
Ranong	5	100	227
Phang-nga	63	351	839
Phuket	5	83	64
Krabi	56	153	830
Trang	116	484	286
Satun	205	340	706
Total	**450**	**1 511**	**2 952**

The bay of Phang-nga

The bay of Phang-nga is hemmed in by the provinces of Phang-nga, Phuket and Krabi. Along its coast, there are 114 fishing villages, or about 18 percent of all villages along the Andaman coast. These villages have 5 759 fishing households, 35 percent of all fishing households along the Andaman coast, with 13 111 fisherfolk, an average of 2.3 per household. Tables 8 and 9 (overleaf) show the districts along the bay. Surprisingly, one third of the fishermen are female; but the data give no further information about their role in Phang-nga bay fishery.

Table 8: Number of households and population in the Andaman Sea, 1995

Province	District	Sub-district	Village	Household	Fishing households [%]	Fishing household [n]	Population
Phang-nga	4	14	63	8 887	42.4	3 771	41 962
Phuket	2	6	28	8 910	8.2	734	41 008
Krabi	2	8	23	3 800	33.0	1 254	16 227
Total	8	28	114	21 597	average: 27.8	5 759	99 197

Source: Data collected from the National Statistical Office in each province

Six representative villages around the Phang-nga bay were chosen to collect socio-economic data. The choice was made with the following criteria:

- the villages should be easily accessible;
- the help and support of the fishermen was assured; and
- the villages were of normal size and had no unusual advantages or disadvantages compared with other fishing villages.

Table 9: Fishing households and fishermen, 1995

(Data collected from the National Statistical Office in each province)

Province	Phang-nga				Krabi		Phuket		Total
District	**Muang**	**Takua Thung**	**Thap Pud**	**Ko Yao**	**Muang**	**Ao Luk**	**Muang**	**Tha Lang**	
Fishing household	978	995	557	1 241	380	874	269	465	5 759
Fisherfolk	2 116	2 516	1 016	3 188	896	1 739	722	918	13 111
Male	1 475	1 888	753	2 321	757	1 375	591	802	9 962
Female	641	628	263	867	139	364	131	116	3 149

The villages and the number of fishing households relative to the total number of households are presented in Table 10. Figure 2 (p15) gives an overview of the sites of the villages along the Phang-nga bay coast.

Table 10: Villages covered by this socio-economic study and number of representative fishing households in the bay of Phang-nga

Village	Fishing household	Percentage	Other household	Percentage	Total
Ban Ao Khung	20	29	49	71	69
Ban Bang Chan	48	58	35	42	83
Ban Hin Rom	112	86	18	14	130
Ban Sam Chong Tai	58	100	–	–	58
Ban Bang Pat	47	100	–	–	47
Ban Laem Sak	323	85	57	15	380
Total	608		159		767

4 Fishery characteristics

The description of small-scale fishery along the Andaman Sea coast is divided into 11 chapters. The first chapters describe the boats, the gear and the fishing grounds of the main gear types used and provide a well-documented overview of the catch composition, of the effort and of the catch per effort. Subsequent chapters analyse the income per unit effort, cost, profit made and total catch in the bay of Phang-nga and along the Andaman coast.

4.1 Fishery facilities in the bay of Phang-nga

The number of fishing boats classified by type of engine is shown in Table 11 for the bay of Phang-nga. The most commonly used boats are those with outboard engines (4 446) followed by non-powered boats (705). Only 315 inboard-powered boats were enumerated in the bay. Numbering altogether 5 151 (Table 11), the boats with or without outboard engine that are used in small-scale fishery represent about 94 percent of all boats in the bay of Phang-nga. Compared with 84.9 percent for the whole Andaman coast (Table 5), the percentage in the bay is 10 percent higher. The bay is home to 30.5 percent of all fishing boats with or without outboard engine used along the Andaman coast.

Table 11: Type of fishing boat in the Phang-nga bay, 1995

Boat	Phang-nga				Krabi		Phuket		Total
	Muang	Takua Thung	Thap Pud	Ko Yao	Muang	Ao Luk	Muang	Tha Lang	
Inboard	2	1	–	175	58	16	46	17	315
Outboard	864	869	465	770	215	715	241	307	4 446
No engine	143	153	100	65	63	123	–	58	705
Total	1 009	1 023	565	1 010	336	854	287	382	5 466

Table 12 shows the number of fishing boats in the six representative villages. This number varied between 14 and 430. Except for Laem Sak, the village with the highest number of fishing boats, no inboard-powered boats were found. In all six villages, the percentage of outboard-powered boats was over 95 percent. Only Hin Rom had five non-powered boats. The 679 small-scale fishing boats used as sample boats for this study comprised 13 percent of all small-scale fishing boats in the bay of Phang-nga or 4.7 percent of all small-scale fishing boats along the Andaman coast.

Table 12: Number and quality of fishing boats in the six representative fishing villages used for the collection of socio-economic data

Village	Inboard - powered	Per-centage	Outboard - powered	Per-centage	No engine	Per-centage	Total
Ao Khung	–	0	14	100	–	0	14
Bang Chan	–	0	48	100	–	0	48
Hin Rom	–	0	115	95.8	5	4.2	120
Sam Chong Tai	–	0	40	100	–	0	40
Bang Pat	–	0	47	100	–	0	47
Laem Sak	20	4.6	410	95.4	–	0	430
Total	**20**		**674**		**5**		**699**

The various types of gear used in the bay of Phang-nga are shown in Table 13. The trammel net was the most common gear with 1 723 units, followed by the grouper trap with 940 and the crab bottom gillnet with 699 units. The mackerel gillnet is listed as the fifth most commonly used gear, with 473 units. This reflects a situation similar to that shown in Table 6, with the exception of the mackerel gillnet, which differs from the type used outside the bay.

Table 13: Type and number of fishing gear used in the bay of Phang-nga (Anonymous 1995)

Fishing gear	Phang-nga				Krabi		Phuket		Total	
	Muang	Takua Thung	Thap Pud	Ko Yao	Muang	Ao Luk	Muang	Tha Lang	[n]	[%]
Trammel net	338	365	–	469	69	417	31	34	1 723	26.9
Grouper trap	288	118	252	133	17	96	6	30	940	7.4
Crab bottom gillnet	134	185	63	159	40	44	3	71	699	10.9
Crab lift net	128	140	95	8	19	129	–	47	566	3.7
Mackerel gillnet	63	144	10	21	29	190	–	16	473	4.2
Push net	124	46	143	14	15	51	–	15	408	14.7
Mullet gillnet	25	61	33	40	19	39	28	24	269	8.8
Whiting gillnet	26	11	2	98	4	12	74	10	237	0.8
Bamboo stake trap	15	145	–	5	13	13	–	37	228	0.9
Push net	44	9	40	12	15	41	26	39	226	6.4
Horse mussel scoop net	25	12	23	–	–	54	–	29	143	3.6
Anchovy purse seine	–	–	–	93	9	–	24	–	126	0.9
Cast net	–	21	2	9	17	6	2	2	59	2.2
Squid trap	–	–	–	22	14	–	1	20	57	2.0
Rock-fish bottom gillnet	5	2	–	15	5	5	14	8	54	3.5
Rays long line	–	–	6	13	1	27	5	–	52	0.5
Fish trap	–	–	–	22	–	–	18	3	43	0.7
Trawler	–	–	–	11	6	15	–	2	34	0.5
Squid luring light	–	–	–	–	31	–	–	–	31	0.8
Beach seine	6	1	8	–	–	14	–	–	29	0.5

The main types of gear used in the six representative villages along the bay of Phang-nga were the trammel net with 360 units, the mackerel gillnet with 198 and the crab bottom gillnet with 137 units (Table 14, overleaf). These gear types were among the five most frequently used in the bay of Phang-nga.

Table 14: Type and number of gear used in the six representative fishing villages for the collection of socio-economic data (Own data)

Gear	Ao Khung		Bang Chan		Hin Rom		Sam Chong Tai		Bang Pat		Laem Sak		Total	
	[n]	%	[n]	%	[n]	%	[n]	%	[n]	%	[n]	%	[n]	
Trammel net	8	18.6	2	4.3	74	44.3	6	7.2			270	53.3	360	
Mackerel gillnet			1	2.1	42	25.1	4	4.8	1	2.7	150	29.6	198	
Crab bottom gillnet	8	18.6	40	85.1	31	18.6	30	36.1	18	48.7	10	2	137	
Whiting gillnet	3	7					2	2.4	8	21.6	10	2	23	
Cast net	10	23.2					12	14.5					22	
Mullet gillnet	2	4.7	1	2.1	3	1.8	3	3.6			12	2.4	21	
Long line							1	1.2			15	3	16	
Push net (by hand)							14	16.9					14	
Pomfret gillnet											10	2	10	
Fish trap					10	6							10	
Other	12	27.9	3	6.4	7	4.2	11	13.3	10	27	29	5.7	72	

The trammel net

The trammel net is a three-layered drift bottom gillnet. The outer layers are nylon multi-filaments with mesh sizes of 14 cm and the inner layer is a nylon monofilament with a mesh size of 3.8-4.2 cm. The length of the net is 24-30 m per piece and normally the fishermen use 20-35 nets per boat. The net can be used for two to three months and after that time, the lead and buoys can be reused to build a new net. The number of nets per boat differs in the three representative villages. Ao Kung villagers use 30-35 nets; Hin Rom fishermen use 20-25 nets whereas Laem Sak folk use 25-30 nets. Figure 2 indicates the main fishing areas of the three fishing villages investigated in the bay of Phang-nga.

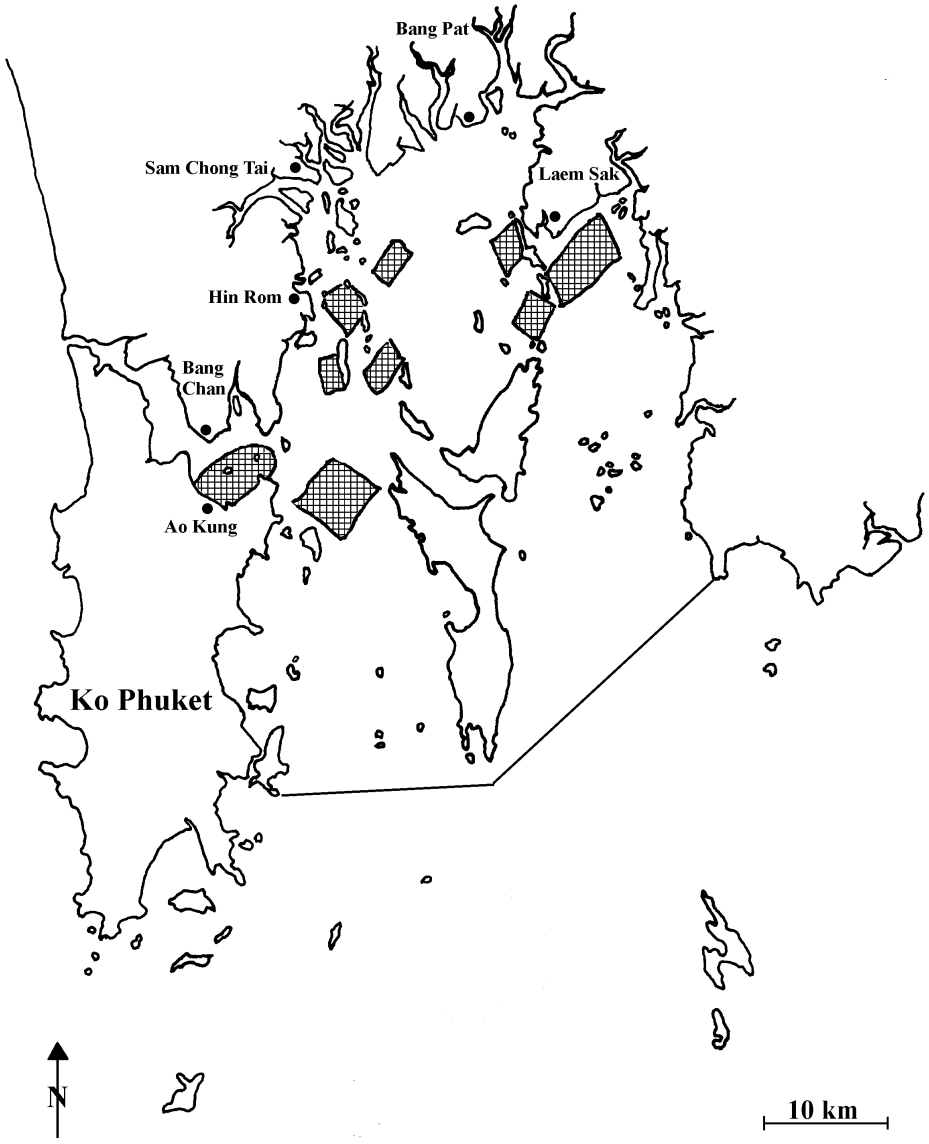

Figure 2: The main fishing areas of the three representative fishing villages in the Phang-nga bay using the trammel net

The crab bottom gillnet

The crab bottom gillnet is a set bottom gillnet. It is a nylon monofilament with mesh sizes of 3-4.5 inches. The usual length of the net is 26-34 m, though in some villages it could be 100-m long depending on the environment. Each fisherman uses at most 25 to 85 nets and at least 20 to 25 nets. The net lasts for a couple of months and the fishermen change the net only. The total number of nets per boat in each representative village is 25-35 nets in Ao Khung, 80-85 nets in Bang Chan, 35-40 nets in Hin Rom, 30-35 nets in Sam Chong Tai and 20-25 nets in Bang Pat. In some other villages, only one piece of net is used. The net is used near the villages, and the main fishing areas of the chosen representative villages are close to the shoreline. Figure 3 shows the main fishing areas of the representative fishing villages for the crab bottom gillnet in the bay of Phang-nga.

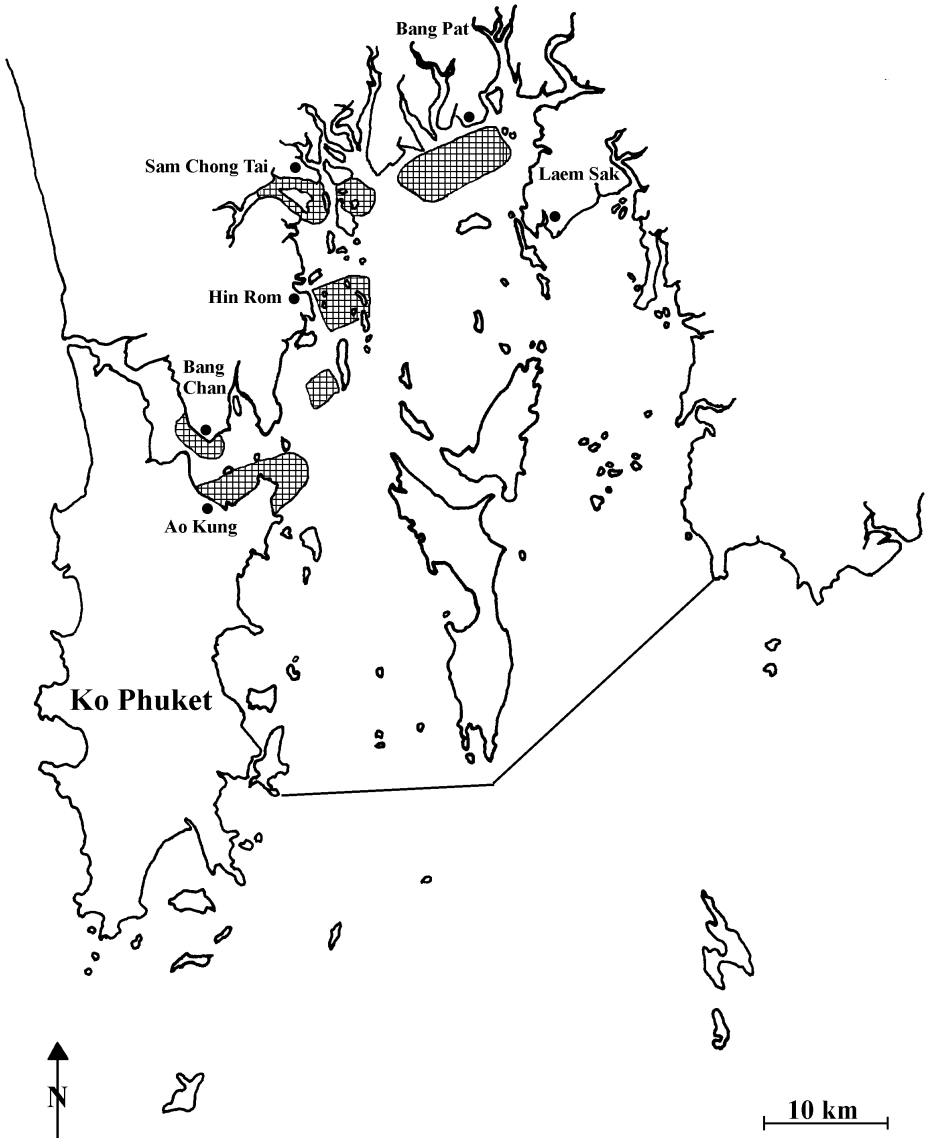

Figure 3: The main fishing areas of the crab bottom gillnet of the representative fishing villages in Phang-nga bay

The mackerel gillnet

In the bay of Phang-nga two types of mackerel gillnet are in use, the first in the morning near the bottom with plastic buoys, the second in the evening in the mid-water near the surface with buoy No4. The net is made of nylon monofilament with mesh sizes of 4.3-4.7 cm. It is 100 m to 120 m long. One boat uses five to eight nets. Mackerel gillnet can be used for two to three years during the fishing season, from June to December. There is a closed season for mackerel from April until June. The length of the nets and number of nets per boat vary slightly in two villages investigated. Hin Rom uses five or six nets, which are 120 m long, and the total number of nets per boat is five or six. In Laem Sak, the fishermen use seven or eight 100 m long nets per boat. The type of mackerel gillnet used in the bay is not comparable with the gear used outside the bay.

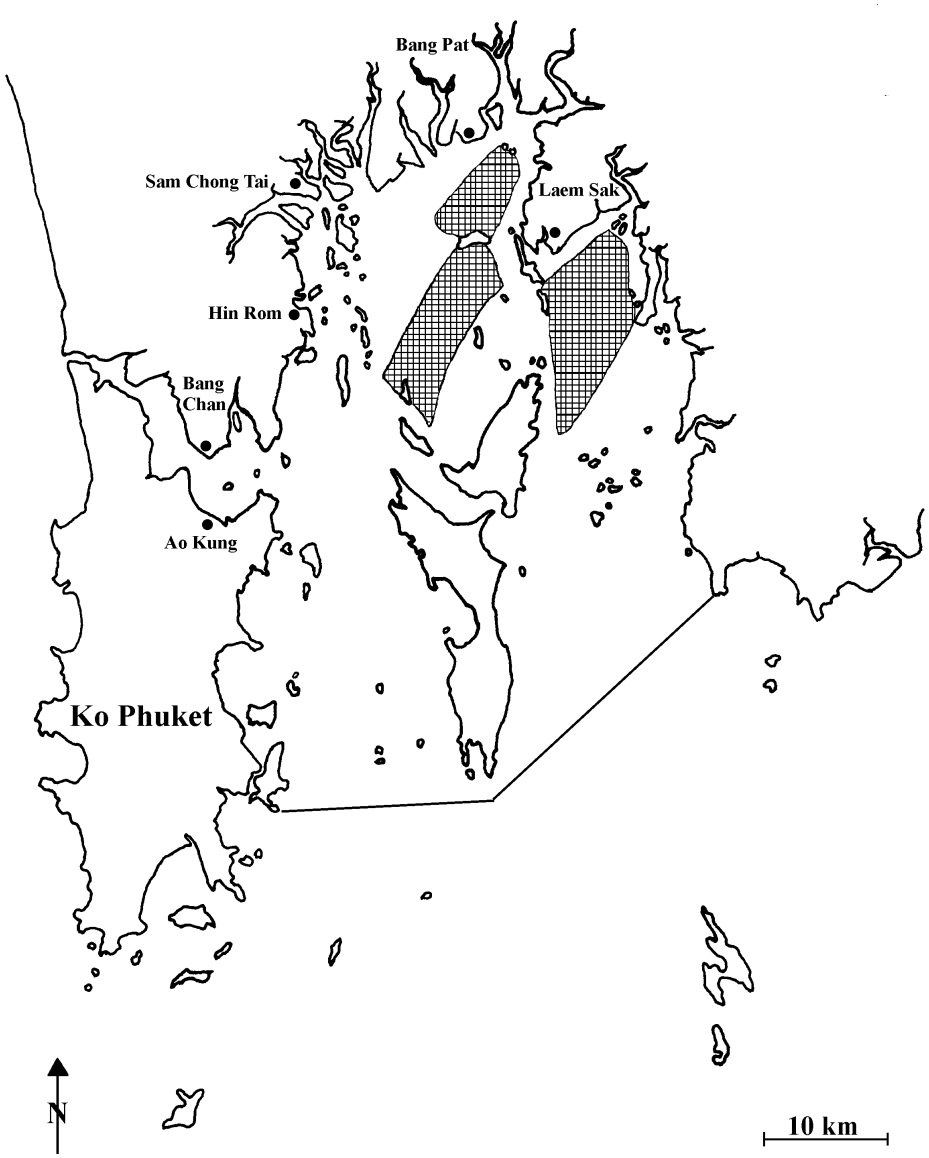

Figure 4: The main fishing areas for the mackerel gillnet in the Phang-nga bay

4.2 Catch composition

The catch of small-scale fishermen in the bay of Phang-nga was investigated for the three main types of gear, namely trammel net, crab bottom gillnet and mackerel gillnet, used in the six representative fishing villages. Two approaches were used in this study to collect the needed information.

As presented in this section, the catch composition for each gear was determined by sampling. The whole catch was divided into species and species groups then weighed before the fishermen landed the catch.

The data used in the following sections was collected by middlemen and fishermen using logbooks. This method allowed the collection of more than a thousand data sets for some years, gear types and villages. Comparing the datasets of fishermen and middlemen checked the reliability of the data. Reportedly, the whole catch of shrimp was bought for personal consumption, so the weight of the shrimp was compared with the data in the logbook. During the establishment of the logbook system, several fishermen were excluded from the sampling routine because their data were not reliable.

The composition of the main target species for each village, each year and each of the three gear types investigated are shown in Tables 37 to 53 appended in annex. The crab bottom gillnet and the mackerel gillnet are highly selective, as demonstrated by high catches of the target species.

The trammel net is less selective. It catches mainly shrimp, i.e. *Penaeus merguiensis* followed by *Metapenaeus spp.* and *Penaeus monodon*. The main pelagics caught are *Rastrelliger spp*. and *Sardinella sp*. The catch also contained a certain amount of *Pennahia anea.* The catch composition per trip for the main shrimp, pelagic and demersal species during the monthly samplings in 1995 and 1996 is presented in Figure 5. In Laem Sak, the main shrimp species was *Metapenaeus spp.* The village has deeper fishing grounds and different seabed conditions.

The crab bottom gillnet was highly selective for crabs, in the bay of Phang-nga mainly for *Portunus pelagicus*. In some cases more than 90 percent of the total catch consisted of the target species. Besides, some rays, *Dasyatis spp.,* and a few snails, *Pila ampullacea,* were also caught. The catch composition per trip during the sampling years for these species is shown in Figure 6.

The mackerel gillnet was used only in two villages. Catches were mostly *Rastrelliger spp*. There were also some *Anodontostoma chacunda, Pennahia anea* and *Scomberomorus spp*. caught with this gear. The catch composition per trip and per month in the sampling years 1995 and 1996 are shown in Figure 7.

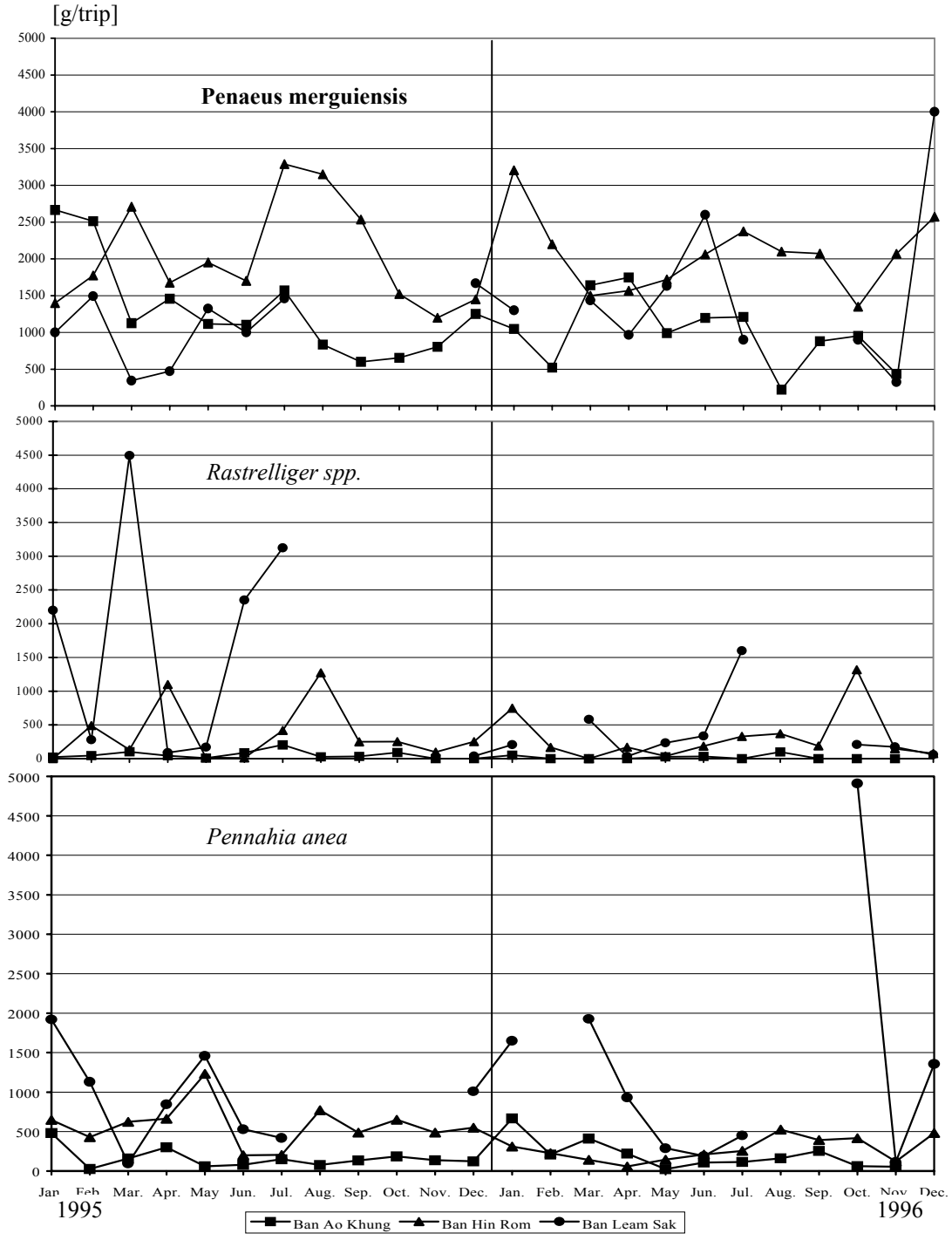

Figure 5: Amount [g/trip] of the major target species or species groups, *Penaeus merguiensis*, *Rastrelliger spp*. and *Pennahia anea* in the trammel net sampled catches in 1995-96

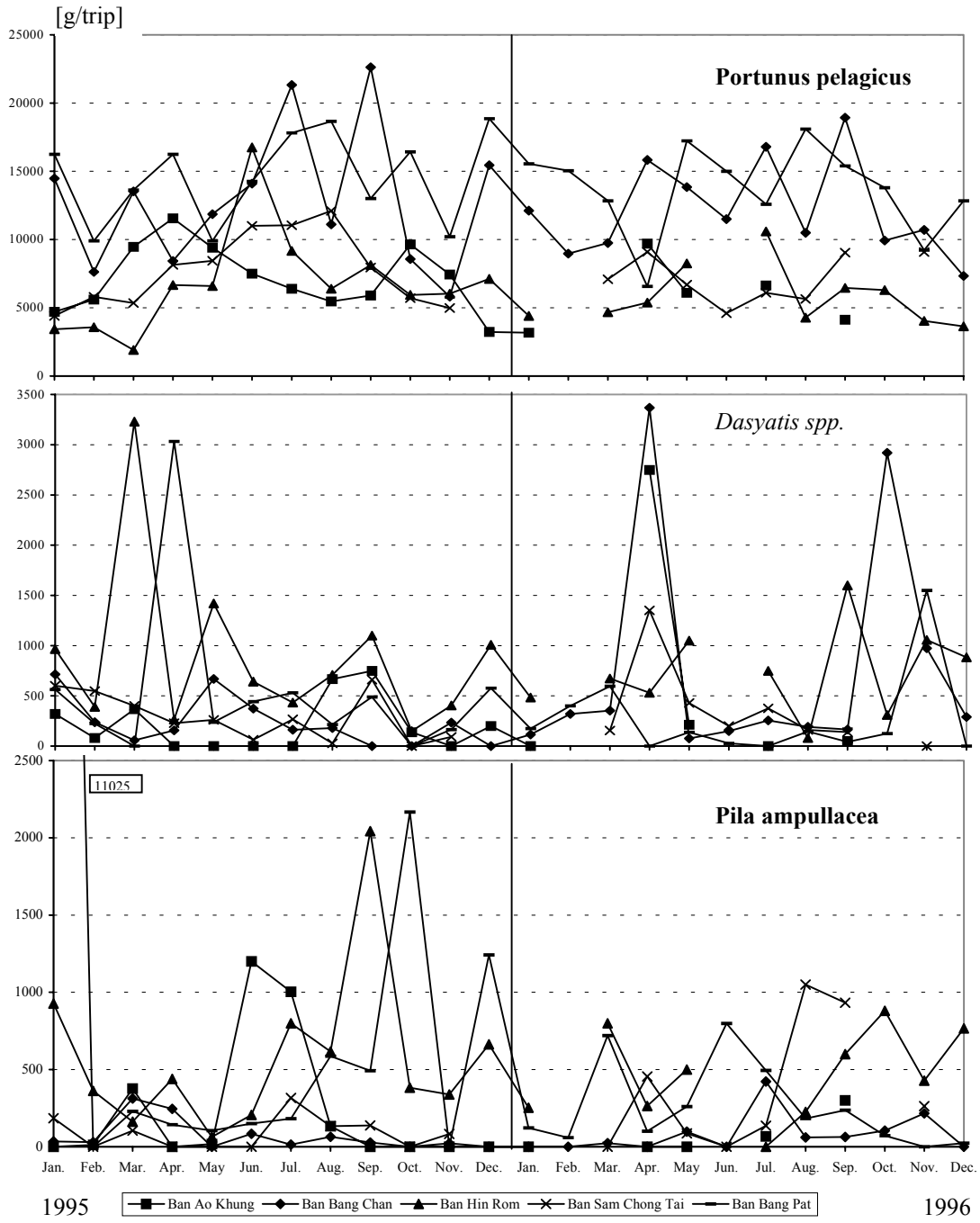

Figure 6: Amount [g/trip] of the major target species or species groups, *Portunus pelagicus, Dasyatis spp.* and *Pila ampullacea* in the crab bottom gillnet sampled catches in 1995-96. The ordinates have different scales.

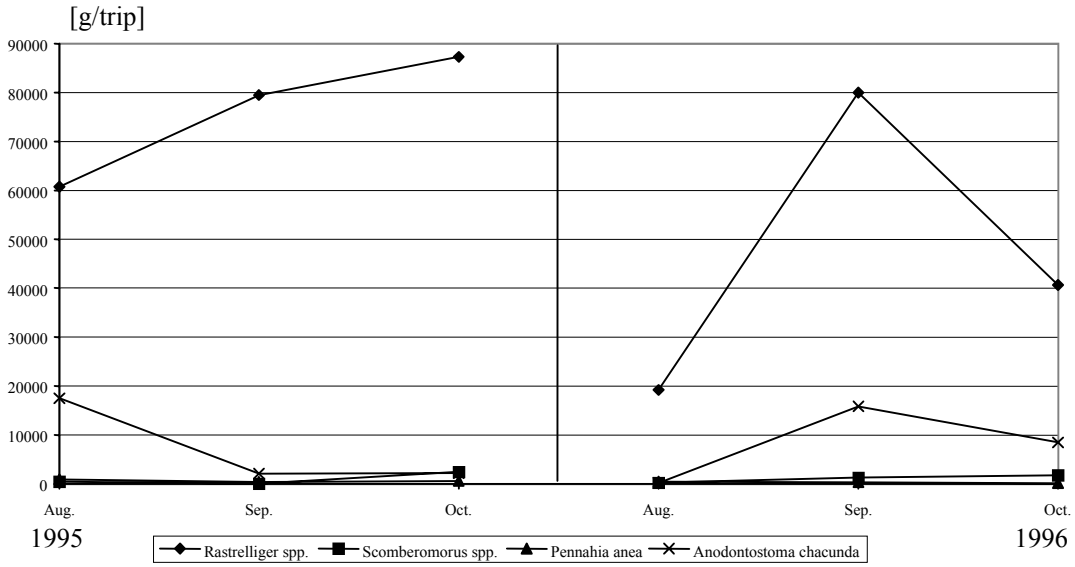

Figure 7: Amount [g/trip] of the major target species or species groups *Rastrelliger spp*., *Scomberomorus spp*., *Pennahia anea* and *Anodontostoma chacunda* in the mackerel gill net sampled catches in Hin Rom 1995-96

4.3 Fishing effort and catch per unit effort

Data for the fishing effort in fishing days per month and for the catch per unit effort were collected with logbooks provided to the fishermen and middlemen. This method may not be as accurate as direct collection but it did provide high numbers of samples, as many as 2 151 for the catch per unit effort in Hin Rom in 1996 for the trammel net. Such high numbers allow for a good determination of the catch per unit effort, which can be used for further calculation and estimation of the total catch along the coast for the three gear types used in this study.

In the bay of Phang-nga the **trammel net** is used throughout the year. Outside the bay, fishermen cannot fish during the southwest monsoon, between May and September. The trammel net is the main gear used by Phang-nga bay fishermen. They use it in the nearshore area in front of their villages. The gear is lifted two to six times a day, at intervals of 15 to 120 minutes. In some villages the gear is also used twice per night during the dry season, with a lifting time interval of 120 minutes. The total fishing time depends on the fishing ground and on the current.

The fishing effort for the trammel net in 1995 and 1996 is presented in Figure 8 and Table 15. The effort varied between one fishing day per month in Laem Sak in November 1995 and 21 days per month for May 1995 and October and November 1996 in Hin Rom. Seasonal changes in the effort showed a slight increase between May and September in both years, except for Laem Sak (Figure 8). The low fishing effort for the trammel net in Laem Sak especially in the second half of the two investigated years was due to alternative seasonal fishing with mackerel gillnets. The average fishing effort for the trammel net was highest in Hin Rom, with 17 and 18 fishing days per month in 1995 and 1996 respectively. Ao Kung and Laem Sak showed similar average fishing efforts with 10 to 12 days per month.

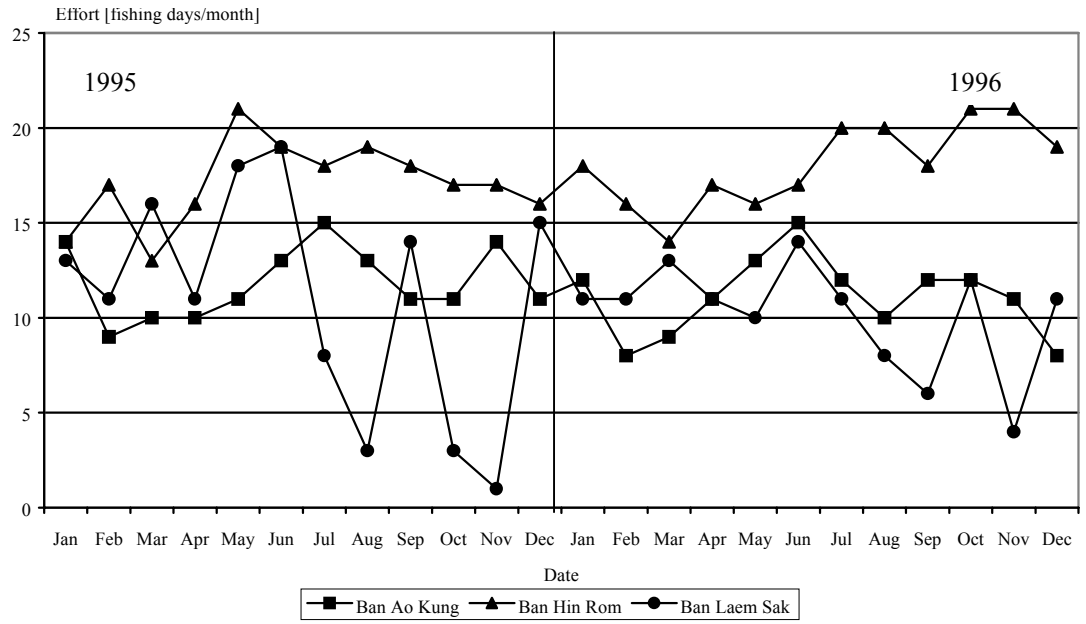

Figure 8: Effort in fishing days per month for the trammel net sampled by logbook in three of the six representative fishing villages in 1995-96

Table 15: Fishing effort in the number of fishing days per gear for the trammel net in three of the six representative fishing villages in 1995-96

Village	Ao Kung		Hin Rom		Laem Sak	
Year	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**
January	14	12	14	18	13	11
February	9	8	17	16	11	11
March	10	9	13	14	16	13
April	10	11	16	17	11	11
May	11	13	21	16	18	10
June	13	15	19	17	19	14
July	15	12	18	20	8	11
August	13	10	19	20	3	8
September	11	12	18	18	14	6
October	11	12	17	21	3	12
November	14	11	17	21	1	4
December	11	8	16	19	15	11
Total	**142**	**133**	**205**	**217**	**132**	**122**
Average	11.83	11.08	17.08	18.08	11.00	10.17

The catch per unit effort for the trammel net is shown in Table 16 and Figure 9. It varied between 0.4 kg/day in Laem Sak in 1995 and 5.36 kg/day in Ao Kung in May 1995. The low catch per unit effort in Laem Sak is based on a single fishing day. In general, the catch per unit effort was rather low during the dry season, mainly February, March and April, and increased between May and August in both years.

Direct comparison of the catch per unit effort between the villages is difficult, because some villages, for example Hin Rom and Laem Sak, additionally used alternative gear like the mackerel gillnet. Fishermen used alternative gear if the target species caught did not provide them with sufficient income or fish distribution or if the tide allowed better catches using other types of gear. In general, the catch per unit effort per year for the trammel net varied roughly between 2 and 4 kg/day.

Table 16: Catch per unit effort in kg/day for the trammel net used in three of the six representative villages 1995-96

Village	Ao Kung		Hin Rom		Laem Sak	
Year	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**
January	4.05	3.11	2.14	2.49	2.68	1.80
February	3.38	2.56	2.02	2.63	1.58	2.62
March	2.91	2.57	2.24	2.15	1.80	1.67
April	3.45	2.28	2.55	2.11	1.59	1.60
May	5.36	2.94	2.76	2.30	2.46	2.10
June	5.26	3.62	4.29	3.42	2.46	1.86
July	4.01	4.02	4.22	3.12	1.69	1.50
August	3.42	3.14	4.06	2.84	2.93	0.68
September	3.11	3.06	3.33	3.15	3.93	2.75
October	2.90	2.79	2.55	2.55	2.90	1.61
November	2.72	2.48	2.90	2.33	0.40	3.15
December	2.68	2.31	2.60	2.23	2.08	2.54
Average	3.77	2.97	3.08	2.62	2.14	1.92
Sample [n]	365	257	1 733	2 151	590	528

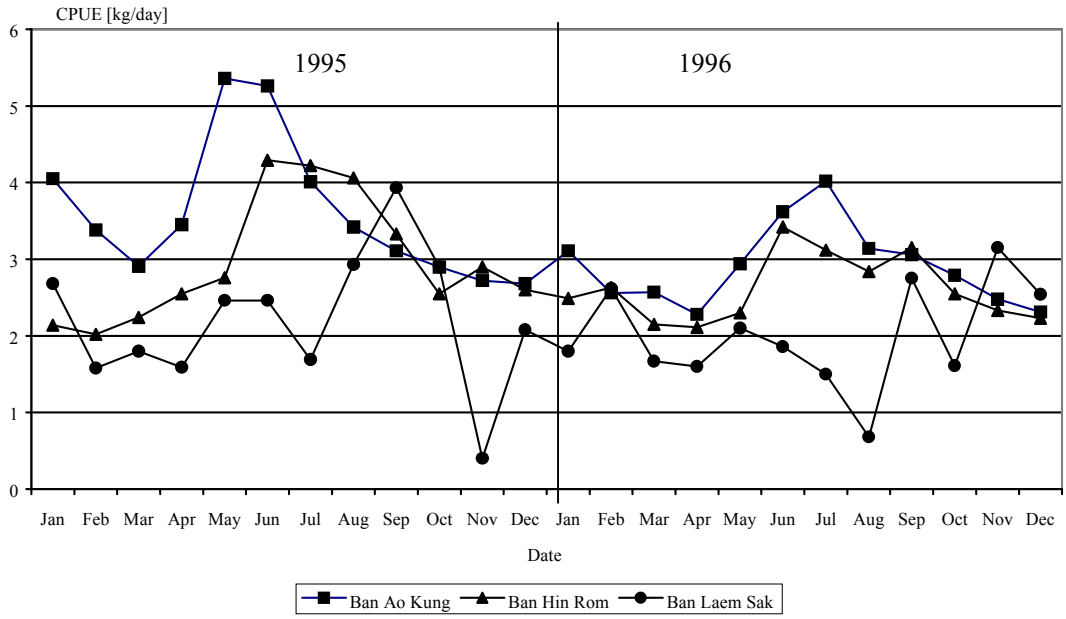

Figure 9: Catch per unit effort for the main target species, *Penaeus merguiensis*, in kg per fishing day for trammel net sampled by logbook in five of the six representative fishing villages in 1995-96

The **crab bottom gillnet** was used at night and lifted only once. In some villages it was used only during neap tide as an additional gear, anchored with stones. When the crab bottom gillnet was the main fishing gear, a metal anchor was used.

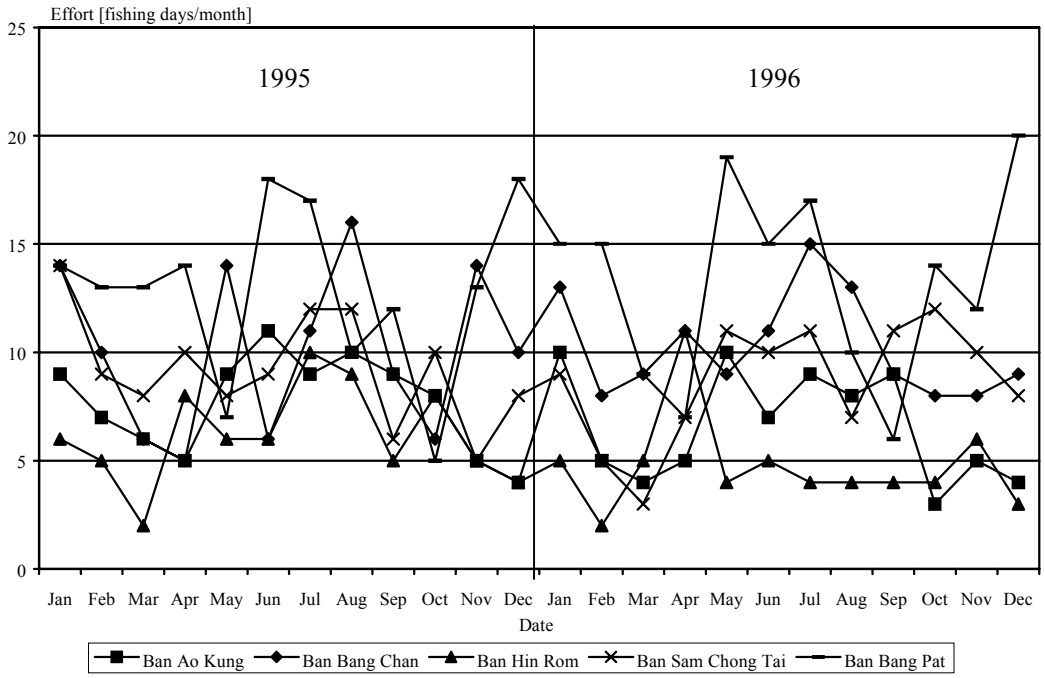

Figure 10: Effort in fishing days per month for the crab bottom gillnet sampled by logbook in five of the six representative fishing villages in 1995-96

The fishing effort for the crab bottom gillnet is shown in Figure 10 and Table 17 for five villages. The effort in fishing days per gear varied between 2 days in Hin Rom and 20 days in Bang Pat. The average fishing effort per year was highest in Bang Pat, with about 13 days, followed by the villages of Bang Chan with 10 days, Sam Chong with 9 days, Ao Kung with 7 days and Hin Rom with 4 to 6 days for 1995-96. In general, the effort increased slightly between May and September in both years.

Table 17: Fishing effort in number of fishing days per gear for the crab bottom gillnet in five of the six representative fishing villages in 1995-96

Village	**Ao Kung**		**Bang Chan**		**Hin Rom**		**Sam Chong Tai**		**Bang Pat**	
Year	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**
January	9	10	14	13	6	5	14	9	14	15
February	7	5	10	8	5	2	9	5	13	15
March	6	4	6	9	2	5	8	3	13	9
April	5	5	5	11	8	11	10	7	14	7
May	9	10	14	9	6	4	8	11	7	19
June	11	7	6	11	6	5	9	10	18	15
July	9	9	11	15	10	4	12	11	17	17
August	10	8	16	13	9	4	12	7	10	10
September	9	9	9	9	5	4	6	11	12	6
October	8	3	6	8	8	4	10	12	5	14
November	5	5	14	8	5	6	5	10	13	12
December	4	4	10	9	4	3	8	8	18	20
Total	**92**	**79**	**121**	**123**	**74**	**57**	**111**	**104**	**154**	**159**
Average	7.67	6.58	10.08	10.25	6.17	4.75	9.25	8.67	12.83	13.25

Table 18: Catch per unit effort in kg/day for the crab bottom gillnet used in five of the six representative villages in 1995-96

Village	**Ao Kung**		**Bang Chan**		**Hin Rom**		**Sam Chong Tai**		**Bang Pat**	
Year	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**
January	5.54	4.19	8.17	11.21	3.55	8.42	6.37	7.55	13.22	10.24
February	6.20	5.47	7.56	8.68	3.57	8.30	5.88	3.04	10.80	10.65
March	8.33	2.65	9.49	3.72	1.90	6.55	4.82	6.72	11.83	7.73
April	8.61	8.16	12.19	9.23	6.65	6.69	5.04	5.12	10.54	7.33
May	8.96	7.55	8.01	10.28	11.14	7.43	11.28	7.48	11.35	10.82
June	8.43	5.82	12.88	8.01	14.59	12.25	13.56	8.34	25.71	13.23
July	8.94	6.47	13.27	12.04	11.10	7.36	10.99	14.02	21.57	13.16
August	9.07	7.46	13.15	8.54	16.50	6.38	10.86	9.05	16.84	15.76
September	7.81	7.30	11.75	15.06	9.98	7.89	10.39	8.98	13.36	10.78
October	8.46	4.50	13.20	9.13	10.02	10.36	10.52	12.80	12.23	8.52
November	8.31	3.16	6.11	8.97	8.13	4.13	7.89	9.04	11.78	8.93
December	4.46	2.73	5.70	4.91	9.38	3.64	8.26	5.83	11.94	6.93
Average	8.04	6.02	10.72	9.31	11.65	8.09	9.50	8.52	14.69	10.91
Sample [n]	256	136	378	241	384	208	337	233	511	342

The catch per unit effort for the crab bottom gillnet (Table 18, Figure 11) was 2.65 and 25.71 kg/day in Ao Kung in March 1996 and in Bang Pat in June 1995 respectively. The highest average catch per unit effort per year obtained for Bang Pat was 10.91 and 14.69 kg/day followed by Hin Rom with 8.09 and 11.65 kg/day, Bang Chan 9.31 and 10.72 kg/day, Sam Chong Tai 8.52 and 9.50 kg/day and Ao Kung with 6.02 and 8.04 kg/day, for 1995 and 1996 respectively. In both years the catch per unit effort increased during May-June until October.

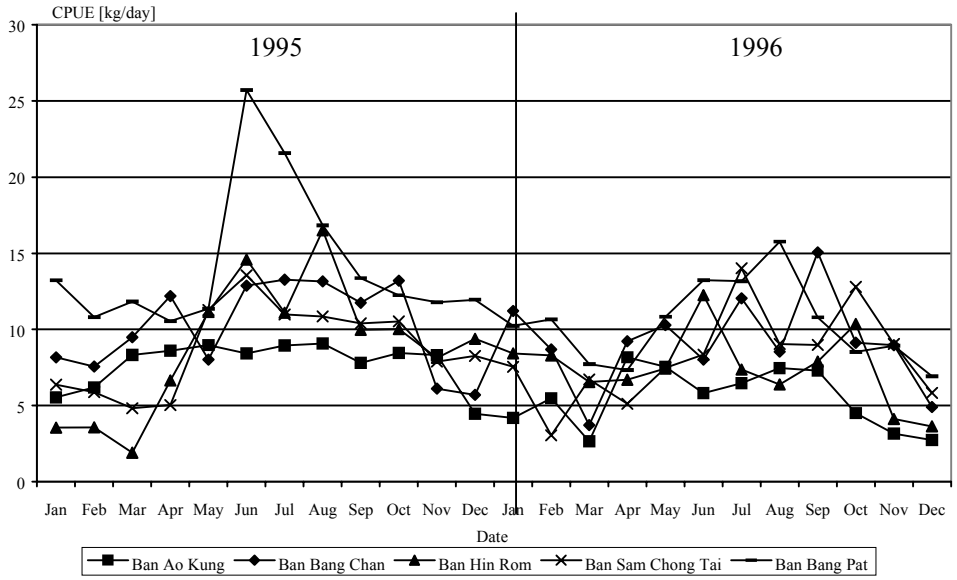

Figure 11: Catch per unit effort for the main target species, *Portunus pelagicus*, in kg per fishing day for the crab bottom gillnet sampled by logbook in five of the six representative fishing villages in 1995-96 In Bang Chan, Sam Chong and Bang Pat the fishermen were largely dependent on the catch from the crab bottom gillnet whereas in Hin Rom they also used alternative gear.

The **mackerel gillnet** was used only in two of the six investigated villages between July and December to catch *Rastrelliger spp* of marketable size. The fishing grounds were not close to the villages.

In Laem Sak the highest fishing effort was found in November 1996, with 19 fishing days, whereas Hin Rom showed the highest effort in August 1995, with nine fishing days. The average effort over the fishing months was in Laem Sak, 9.33 and 12.8 days respectively in 1995 and 1996, and in Hin Rom: 6.5 and 6.33 days respectively. The effort for the mackerel gillnet (Table 19, Figure 12) in Hin Rom was low, because the fishermen used it as supplementary gear, shortly before and shortly after springtide. In Laem Sak it was the main fishing gear resulting in the higher fishing effort.

Table 19: Fishing effort in the number of fishing days per gear for the mackerel gillnet in two of the six representative fishing villages in 1995-96

Village	**Hin Rom**		**Laem Sak**	
Year	**1995**	**1996**	**1995**	**1996**
July			3	
August	9		12	18
September	8	5	14	8
October	7	8	13	14
November	2	6	9	19
December			5	5
Total	**26**	**19**	**56**	**64**
Average	6.5	6.33	9.33	12.8

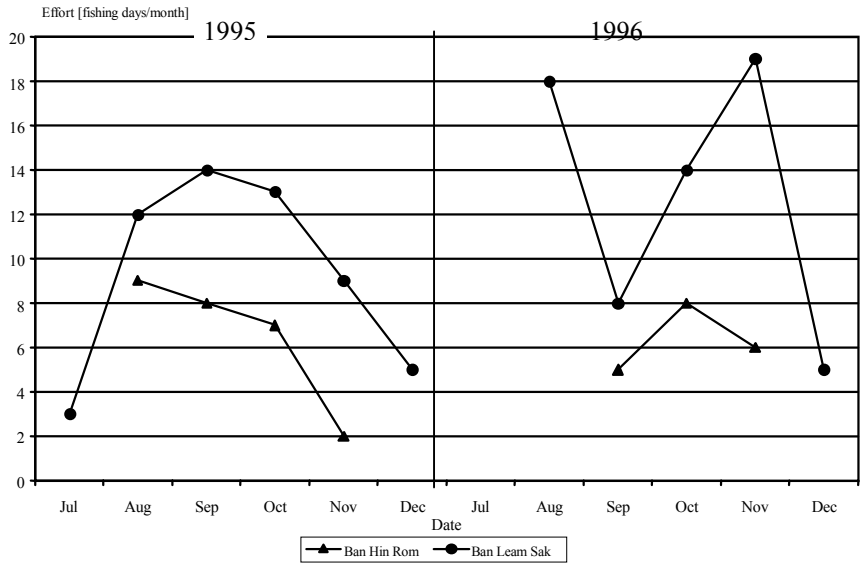

Figure 12: Effort in fishing days per month for the mackerel gillnet sampled by logbook in two of the six representative fishing villages in 1995-96

The catch per unit effort for the mackerel gillnet (Table 20, Figure 13) showed for Laem Sak, which had an average of 77.75 and 76.35 kg/day in 1995 and 1996 respectively, the highest catch obtained in both villages. The catch per unit effort varied for Laem Sak between 17.7 and 138.1 kg/day in 1995 and between 30.3 and 111.21 kg/day in 1996. In Hin Rom it was found in 1995 to be 52.18 kg/day on average, with a maximum of 83.58 kg/day and a minimum of 30.85. In 1996 the average catch per unit effort was only 25.25 kg/day, with monthly variations of 21.78 to 29.23 kg/day.

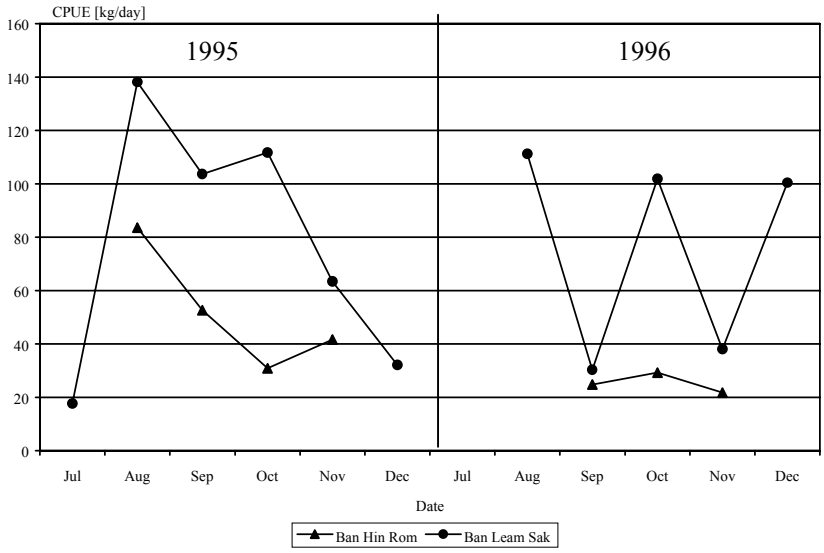

Figure 13: Catch per unit effort for the main target species, *Rastrelliger spp.*, in kg per fishing day for the mackerel gillnet sampled by logbook in two of the six representative fishing villages in 1995-96

Table 20: Catch per unit effort for the mackerel gillnet used in two of the six representative villages in 1995-96

Village	**Hin Rom**		**Laem Sak**	
Year	**1995**	**1996**	**1995**	**1996**
July			17.67	
August	83.58		138.10	111.21
September	52.65	24.75	103.59	30.30
October	30.85	29.23	111.70	101.80
November	41.63	21.78	63.35	38.05
December			32.10	100.40
Average	52.18	25.25	77.75	76.35
Sample [n]	173	154	209	145

4.4 Income per unit effort

The income per unit effort (IPUE) was computed based on data collected by middlemen in logbooks. This method of data collection ascertained the ways in which middlemen buy fish from fishermen. Some middlemen buy only the main target species separated by size or species or both; others lump shrimp or fish of different species or sizes together. The price is not fixed for a product and depends on the fisherman's indebtedness to the middleman. As most fishermen are Muslims, middlemen cannot charge interest rates on their loans but they compensate for this by paying lower prices for the catches.

At Ao Kung, the middlemen bought only the shrimp, i.e. *Penaeus merguiensis* and *Penaeus semisulcatus*, all sizes at the same price, from the catch of trammel nets. For *Penaeus monodon* they paid a higher price regardless of the size. The middlemen in Hin Rom bought *P. merguiensis* according to the size of the shrimp. The jumbo size had an average carapace length of 40.30 mm, with a range of 37.90 to 46.55 mm, and an average weight of 47.38 g per piece, with a range of 37 to 67 g. The medium size, which was mixed with *P. semisulcatus* had an average carapace length of 28.34 mm, with a range of 23 to 35.55 mm and weight of 18.18 g, with a range of 13 to 32 g. They bought *P. monodon* at the same price for all sizes and bought all sizes of *Silago sihama*. The middlemen in Laem Sak bought shrimp like in Hin Rom but also bought all other species like fish, crab, squid, and mantis shrimp.

The IPUE for the main target species *Penaeus merguiensis* for the trammel net is shown in Figure 14 and Table 21. The IPUE varied between Bt257 and Bt969 in Laem Sak in October and November respectively. The highest annual average IPUE was in Ao Kung at Bt605 followed by Laem Sak at Bt588 in 1995 and Bt546 in 1996. For Ao Kung and Laem Sak the average IPUE varied between Bt540 and Bt600; for Hin Rom it varied between Bt400 and Bt450.

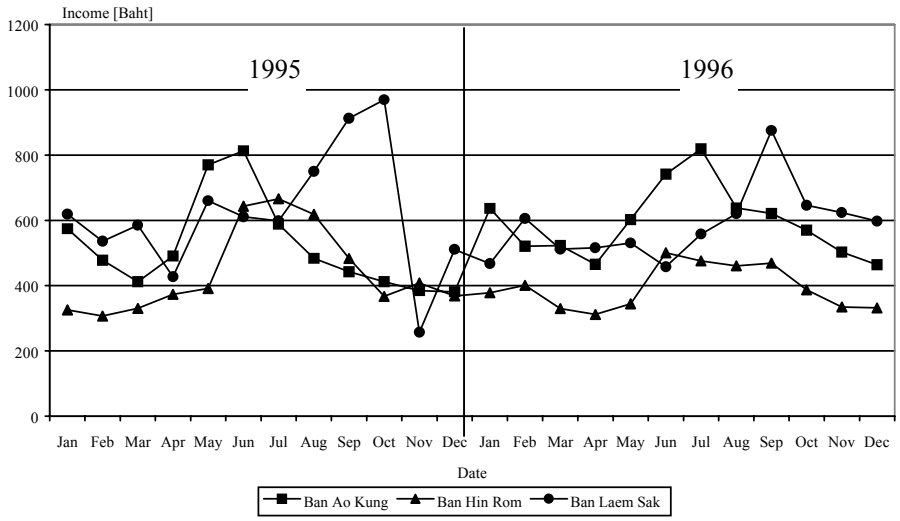

Figure 14: Income per unit effort for the main target species *Penaeus merguiensis* in Baht per fishing day for the trammel net sampled by logbook in three of the six representative fishing villages in 1995-96

Table 21: Income per unit effort for the trammel net used in three of the six representative villages in 1995-96

Village	Ao Kung		Hin Rom		Laem Sak	
Year	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**
January	573.76	636.48	325.29	377.82	619.33	467.51
February	477.57	520.75	306.54	401.13	535.92	605.92
March	412.26	522.53	330.40	329.86	584.84	511.74
April	489.97	465.62	373.04	311.63	427.44	516.11
May	770.28	602.44	391.25	344.31	660.11	530.66
June	813.25	741.28	643.47	500.35	610.57	457.40
July	588.72	818.83	666.01	475.58	598.25	557.31
August	483.07	638.00	618.15	460.49	749.67	620.20
September	442.73	620.78	483.29	469.04	912.89	875.25
October	412.18	569.83	366.68	387.12	969.08	646.10
November	384.20	502.57	408.16	334.74	257.00	623.75
December	380.95	464.27	368.47	331.60	510.22	597.50
Average	545.21	605.07	454.23	395.52	588.59	546.14
Sample [n]	365	257	1 733	2 151	590	528

In the five villages using the crab bottom gillnet the middlemen bought all *Portunus pelagicus.* They also bought catfish but no data were available. The IPUE is shown in Figure 15 and Table 22. The lowest IPUE observed was Bt54 in Ao Kung in December 1996 and the highest in Bang Pat, Bt780 in June 1995. The average IPUE for the two investigated years varied widely, from up to Bt470 in Bang Pat to only Bt125 in Ao Kung in 1996.

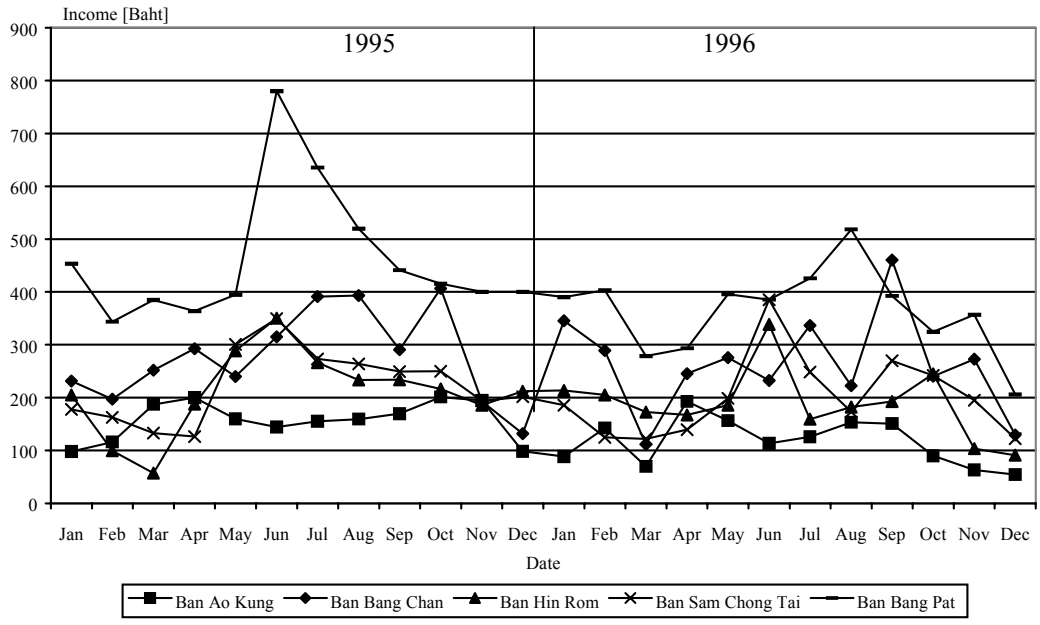

Figure 15: Income per unit effort for the main target species *Portunus pelagicus* in Baht per fishing day for the crab bottom gillnet sampled by logbook in five of the six representative fishing villages in 1995-96

Table 22: Income per unit effort for the crab bottom gillnet used in five of the six representative villages in 1995-96

Village	Ao Kung		Bang Chan		Hin Rom		Sam Chong Tai		Bang Pat	
Year	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**	**1995**	**1996**
January	97.98	88.74	231.28	345.31	205.25	213.60	177.88	185.91	453.62	390.47
February	115.91	142.53	197.05	289.17	99.80	205.33	162.56	124.83	343.51	403.08
March	187.38	69.50	251.96	111.44	57.00	172.50	132.70	121.92	384.83	278.59
April	199.98	192.40	292.65	245.43	187.44	167.26	126.68	139.56	364.00	293.23
May	159.94	156.43	239.70	275.56	288.94	185.70	300.65	198.43	394.96	395.89
June	144.24	113.71	314.93	232.55	350.42	338.57	349.50	385.50	780.01	385.42
July	155.19	125.82	391.09	336.62	266.46	159.09	273.36	248.15	635.35	425.63
August	159.38	153.40	393.25	222.58	233.69	182.31	263.96	173.13	519.78	518.42
September	169.84	150.76	290.65	460.35	233.81	192.54	249.42	269.98	440.82	392.17
October	201.07	90.00	406.46	240.56	216.65	245.12	249.89	241.85	415.66	324.79
November	194.49	63.20	193.02	272.94	185.60	103.33	194.19	195.00	400.40	357.00
December	98.37	54.50	131.70	129.35	212.10	91.04	201.62	122.44	400.28	205.88
Average	158.27	125.73	295.91	266.98	245.48	205.37	238.86	210.13	470.97	377.38
Samples	256	136	378	241	384	208	337	233	511	342

The middlemen in Laem Sak bought the whole catch of the mackerel gillnet, including trash fish, crab and squid. In Hin Rom the middlemen bought only *Rastrelliger spp., Scoboromorus spp., Anodontostoma chacanda* and shrimp, i.e. *P. merguiensis*. Table 23 and Figure 16 give an overview of the observed IPUE for the two fishing villages using the mackerel gillnet. The highest IPUE was found in Laem Sak, with Bt1 309 in August 1996; the lowest in Hin Rom, with Bt174 in November 1996. The average IPUE for the observed fishing months was Bt930 for Laem Sak in 1995 and 1996, but only Bt430 and Bt200 for Hin Rom in the same years.

Table 23: Income per unit effort for the mackerel gillnet used in two of the six representative villages in 1995-96

Village	Hin Rom		Laem Sak	
Year	**1995**	**1996**	**1995**	**1996**
July			478.33	
August	668.63		1 133.12	1 309.18
September	421.19	198.04	846.21	643.06
October	246.82	233.87	927.92	858.67
November	333.00	174.22	757.86	421.97
December			580.32	859.25
Average	427.49	204.73	931.84	935.18
Sample [n]	173	154	209	145

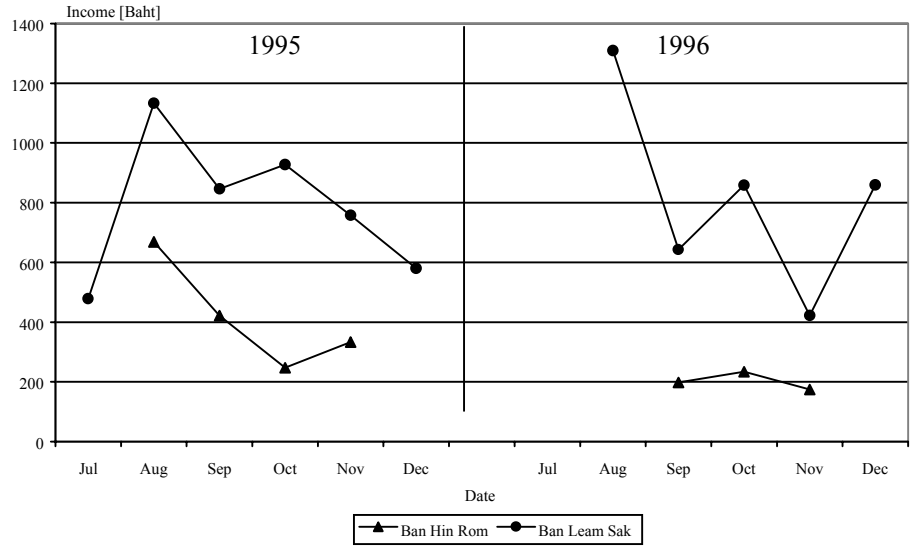

Figure 16: Income per unit effort for the main target species *Rastrelliger spp.* in Baht per fishing day for the mackerel gillnet sampled by logbook sin two of the six representative fishing villages in 1995-96

4.5 Expenditure and profit of Phang-nga bay fishermen

Tables 24 to 26 give an overview of the costs incurred from the fishing activities of the three types of gear used in this study. Table 24 presents the price of the gear, the average age and average fishing effort as well as the resulting cost per fishing effort. It was determined that the fishermen were able to recycle about 50 percent of the lead and buoys for the trammel net and the mackerel gillnet and about 90 percent for the crab bottom gillnet. The average fishing effort for each gear was calculated as the mean average fishing effort in the two years (Tables 15, 17 and 19).

Table 24: Cost per fishing effort in 1995-96, Part one: Gear cost

Gear	Complete gear [Bt]	Net only [Bt]	Percentage/ Cost of gear recycled [%]	[Bt]	Gear per trip [n]	Average age of gear [month]	Average fishing effort [day/month]	Cost per fishing effort with recycled net [Bt]
Trammel net	413	220	50	96.5	25	2.5	13	243.5
Crab bottom gillnet	93	23	90	63	30	1.5	9	66.6
Mackerel gillnet	1 456	690	50	383	6.5	3 years x 6 months	9	43

Table 25 presents the average age and cost for boat and engine and the resulting total cost per fishing day.

Table 25: Cost per fishing effort in 1995/96, Part two: Boat and engine per fishing day

Gear type	Boat 8-12 m [Bt]	Engine 5-12 hp [Bt]	Average age of boat [Month]	Average age of engine [Month]	Average fishing effort [Day/Month]	Cost per effort average boat and engine cost [Bt]
Trammel net	13 500-21 500	16 200-24 800	180	120	13	21
Crab bottom gillnet	13 500-21 500	16 200-24 800	180	120	9	30
Mackerel gillnet	13 500-21500	16 200-24 800	180	120	9.5 Six months only	60

The additional cost for ice and fuel based on observation and interviews are presented in Table 26.

Table 26: Cost per fishing effort in 1995/96, Part three: Additional cost per fishing day

Gear	Fuel per day [Bt]	Ice per day [Bt]	Cost per effort [Bt]
Trammel net	30-50	5	45
Crab bottom gillnet	20-30	–	25
Mackerel gillnet	30-50	20	60

With the average income per fishing effort (Tables 21, 22 and 23), the resulting average profit per fisherman, fishing effort and gear was calculated in Table 27. The profit was highest for the mackerel gillnet, with Bt462, followed by the trammel net (Bt212.5) and the crab bottom gillnet (Bt138.4). When comparing these profits it has to be kept in mind that fishing mackerel can only be done six months a year.

Table 27: Profit per fishing effort for the three gear types used in the Phang-nga bay in 1995/96

Gear	Average income per effort [Bt/day]	Average cost per effort			Profit per fishing effort [Bt/day]
		Gear	Boat	Additional cost	
		[Bt/day]			
Trammel net	522	243.5	21	45	212.5
Crab bottom gillnet	260	66.6	30	25	138.4
Mackerel gillnet	625	43.0	60	60	462.0

No cost for the interest rates of debts is included in the calculation, because most fishermen are Muslims and it is not usual to pay interests in Muslim communities.

4.6 Net income per head and per day in a Phang-nga bay fishing household

Based on the calculated profit per fishing day (Table 27), the fishing effort in fishing days per month and the size of a fishing household (Table 4), the resulting net income per household per head and per day is presented in Table 28.

The calculation does not include the use of other than the main fishing gear, nor does it include other income-generating activities such as aquaculture, tourism, transportation or rubber gardening. The absolute amount of money available to each family member is thus higher. Nonetheless, the calculation being based on data from full-time fishermen using their main fishing gear, it gives a good idea of the amount of money available per head that is derived from the main fishing activity.

The total amount of money available per head and per day varied from Bt8.2 for the crab bottom gillnet and Bt18.1 for the trammel net (Table 28). Fishing with the mackerel gillnet, although done only six months a year, generated B13.7 per day per head. Based on these results, it is believed that the fishermen use alternative gear during the remaining six months.

Table 28: Net income per household and per head derived from fishing with the three gear types in 1995/96

Gear	Profit per fishing day [Bt]	Fishing days per month in Phang-nga bay [n]	Months of fishing [n]	Household members [n]	Net income per household available per day per year [Bt]	Net income per head available per day per year [Bt]
Trammel net	212.5	13	12	5	90.5	18.1
Crab bottom gillnet	138.4	9	12	5	41.0	8.2
Mackerel gillnet	462	9	6	5	68.4	13.7

These results show that a good combination of gear provided a relatively good income for the small-scale fishermen. The model calculations in Table 29 are given as an example of the combined use of the mackerel gillnet and trammel net. Such fishery can generate a daily income per head of up to Bt22.7 without increasing the observed average fishing effort per gear. This might explain why Hin Rom, where all three types of gear analysed are used, is more developed than the other villages.

Table 29: Model calculation of the yearly net income of a fisherman using the mackerel gillnet for six months and the trammel net for six months

Gear	Months used [n]	Average fishing effort per month [n]	Profit per fishing day [Bt]	Total net income per year [Bt]	Total net income per household per day [Bt]	Total net income per head per day [Bt]
Trammel net	6	13	212.5	16 575	45.4	9.0
Mackerel gillnet	6	9	462	24 948	68.4	13.7
Total				**41 523**	**113.7**	**22.7**

Comparison of the net income of a fishing household (five household members) and the average total income of a household (3.67 household members) in the whole country (Table 30) shows that fishermen earn with their main fishing activity only about one fourth to one ninth of what the average household earns in Thailand. This underlines the importance of further assistance to small-scale fishermen.

Table 30: Net income per year and per household or head resulting from fishing with the main gear types in the Phang-nga bay compared with the average total annual income per household and per head in 1996 in Thailand (National Statistical Office 1998)

Gear	Amount per household available per day over the year [Bt]	Amount per head available per day over the year (5 persons/ household) [Bt]	Amount available per household per year [Bt]	Amount available per head per year (365 days/ year) [Bt]	Average household annual income countrywide [Bt]	Average per capita annual income countrywide (3.67 persons/ household) [Bt]
Trammel net	90.8	18.1	33 032.5	6 606.5	129 348	35 206
Crab bottom gillnet	41.0	8.2	14 947	2 989		
Mackerel gillnet	68.4	13.7	25 002.5	5 000.5		

4.7 Total profit earned in the Phang-nga bay with three types of gear

Table 13 presents the total number of the three types of gear used in the bay of Phang-nga. Based on these data the total profit made with this gear was calculated on the assumption that the average catch in the six representative villages was comparable with the catch in the other villages of the bay. In Table 31, the total profit made in the bay was calculated based upon the average effort per month and the average profit already calculated (Table 27).

The total profit per year in the bay of Phang-nga under the given assumptions was of about Bt57 million for the trammel net, about Bt10.5 million for the crab bottom gillnet and about Bt12 million for the mackerel gillnet. For all gear, it amounted to about Bt79 million or about US$3 million (US$1 was equal to Bt26 in 1996).

Table 31: Total profit made in the Phang-nga bay with the three gear types in 1995/96

Gear	Establishments using such gear (Table 13) [n]	Profit per effort [Bt]	Effort per month [n]	Number of fishing months [n]	Total profit in the bay by gear per year [Bt]
Trammel net	1 723	212.5	13	12	57 117 450
Crab bottom gillnet	699	138.4	9	12	10 448 093
Mackerel gillnet	473	461.9	9	6	11 797 849
Total					**79 363 392**

4.8 Total profit earned along the Andaman coast with three types of gear

Table 6 presents the total number of establishments along the Andaman coast using the three types of gear. To calculate the total profit made with such gear, it has to be kept in mind that during the southwest monsoon fishermen outside the bay of Phang-nga cannot go out fishing with the trammel net and the number of fishing months is reduced to seven a year. Furthermore, it is assumed that the average catch per effort outside the bay is similar to the average catch per effort in the bay of Phang-nga. Under these assumptions, the total profit generated along the Andaman coast outside the bay of Phang-nga with the three gear types is presented in Table 32.

Table 32: Total profit made along the Andaman coast outside of the Phang-nga bay in 1995/96

Gear	Establishments using such gear (Tables 6, 13) [n]	Profit per effort [Bt]	Effort per month [Days]	Months of fishing [n]	Total profit outside the bay by gear per year [Bt]
Trammel net	1 229	212.5	13	7	23 765 788
Crab bottom gillnet	812	138.4	9	12	12 137 126
Mackerel gillnet	Not used outside the bay				
Total					**35 902 914**

The total profit generated outside the Phang-nga bay with the three types of gear was of approximately Bt36 million or US$1.4 million. The resulting total profit along the Andaman coast was Bt115 million or US$4.4 million (see also Table 31).

4.9 Total profit generated by small-scale fishery along the Andaman coast

In calculating the total profit made in small-scale fishery along the Andaman coast, the following criteria were defined:

1. The above calculations show that small-scale fisherfolk are among the poorest of the coastal population. Nevertheless, there is a lower profit border that fishermen cannot cross without losing fishing as their main income-generating activity. This means that there is a minimum income generated by fishing activities that allows a fisherman to earn a livelihood for him and his family – the average fishing household described in Chapter 3.
2. The definition of small-scale fishing in Thailand is based on the gear used. Therefore, it is set that there is an upper profit border due to the equipment used. If a fisherman is able to

buy and use commercial gear like seines or trawls he is no longer considered a small-scale fisherman. A very successful small-scale fisherman will automatically upgrade his status and become a commercial fisherman.

3. Small-scale fishermen have access to all kinds of small-scale fishing gear. They adjust to the local coastal situation and optimize their fishing activities to increase their income.
4. Based on the above settings of an income range between lower and upper profit borders and full access to all kinds of fishing gear, a very rough calculation of the total income generated by small-scale fishery along the Andaman coast can be made. To calculate the total profit, the average profit generated with the three different types of gear in the bay of Phang-nga is considered as the average profit made with all gear along the Andaman coast (Table 33).

Table 33: Estimated total yearly profit earned in 1995 and 1996 along the Andaman coast

Small-scale fishing households (Tables 3, 36) [n]	**Average net income per day per fishing household for the 3 gear types (Table 28, average per household) [Bt]**	**Calculated total daily profit along the Andaman coast [Bt]**	**Calculated total annual profit along the Andaman coast [Bt]**
15 765	66.6	1 050 474.5	383 423 192.5
	US$	40 402.9	14 747 045.9

Based on the above given settings, the total profit generated by small-scale fishery along the Andaman coast is Bt383 million or about US$14.7 million.

The error of this approach increases if the calculated average profit of small-scale fishery is much higher or lower than the real average profit, which cannot be calculated, and if the fishermen have limited access to certain types of small-scale fishing gear and are unable to adjust to the most effective fishing practices in their area. This would translate into higher variations in the profit generated along the coast.

The second error does happen, apparently: only in two of the six representative villages did the fishermen go out fishing with the mackerel gillnet, which generates a relatively good income. On the other hand, fishermen using the crab gillnet may have used the trammel net as well to increase their income.

The error made using the average profit for the three gear types as the average income of all fishermen along the Andaman coast is due to the lack of alternative data in this field. Nevertheless, the calculated total profit gives a good idea of the economic importance of small-scale fishery along the Andaman coast.

4.10 Total catch for three types of gear in the bay of Phang-nga

The total catch in the bay of Phang-nga for the three types of gear was calculated as the product of the average fishing effort, the number of fishing months, the total number of gear and the average catch per unit effort, given that the catch for the three gear types is comparable in the whole bay.
For the trammel net the total catch in the bay of Phang-nga was 739 tons of shrimp, for the crab bottom gillnet it was 736 tons of crab, and about 1 478 tons of mackerel for the mackerel gillnet (Table 34).

Table 34: Calculated total catch along the bay of Phang-nga in1995/96

Gear	Unit (Table 11) [n]	Average catch per unit effort [kg/day]	Average effort [day/ month]	Months of fishing [n]	Total Phang-nga bay catch [ton]
Trammel net	1 723	2.75	13	12	739
Crab bottom gillnet	699	9.75	9	12	736
Mackerel gillnet	473	57.88	9	6	1 478

4.11 Total catch for three types of gear along the Andaman coast

During the southwest monsoon (May to September), no trammel nets are used to fish outside the bay of Phang-nga. This was included in the calculation of the total catch along the whole Andaman coast. Therefore, the total catch outside the bay was calculated separately (Table 35) and the result added to the total catch from the Phang-nga bay.

Table 35: Total catch along the Andaman coast outside the Phang-nga bay in 1995/96

Gear	Unit [n]	Average catch per unit effort [kg/month]	Average effort [day/month]	Months of fishing [n]	Total catch along the Andaman coast [ton]
Trammel net	1,229	2.75	13	7	308
Crab bottom gillnet	812	9.75	9	12	855
Mackerel gillnet	Not available				

Table 36 presents the total catch inside and outside the bay of Phang-nga and compares the resulting total catch in the Andaman Sea with official FAO data.

Table 36: Total catch along the Andaman coast for the three gear types in 1995/96 compared with FAO data (FAO 1998a)

Gear	Total catch in Phang-nga bay [ton]	Total catch outside Phang-nga bay [ton]	Total catch along the Andaman coast [ton]	1966 FAO statistics for main target species along Andaman coast [ton]	Percentage caught in small-scale fisheries [%]
Trammel net	739	308	1 047	20 020	5
Crab bottom gillnet	736	855	1 591	11 220	14
Mackerel gillnet	1 478	NA	1 478	227 070	0.7

The total catch in 1995/96 for the trammel net was about 20 000 tons of shrimp or about 5 percent of the FAO statistics, for the crab bottom gillnet 11 220 tons or 14 percent, and for the mackerel gillnet 227 070 tons or 0.7 percent.

5 Alternative income-generating activities

This study has focused on fishery and its contribution to small-scale fishing household earnings. In this context, the calculations in Chapters 5.5-5.9 provide an overview of the contribution of fishery to the total budget of a small-scale fishing household. However, an increasing amount of money is earned outside fishery. Various projects and programmes foster such development by promoting alternative income-generating activities. Although the consequences of such a shift out of fishery are not fully understood, the promotion of alternative income-generating activities helps to improve the financial situation of small-scale fishing households.

These activities can be divided into two types. One type is related to the aquatic environment or to the equipment used in fisheries such as aquaculture or as tourist guides in the creeks of the mangrove areas. This type of activity is dependent on the weather or the equipment, as is fishery. Unlike fishery, however, fish availability no longer influences the income generated – with one exception: that of the many family members that work as fish processors, boiling, frying or drying fish before it is sold to the middlemen or on local markets.

The second type of activity is no longer related to the aquatic environment and therefore does not present the same risks. It consists of work outside fishing, like rubber gardening or work in nearby factories or opening a shop to support the fishing activities of other village members. In such cases, success depends on other factors than the weather, the gear or the catch.

Although various alternative activities are widely promoted by local or regional projects and programmes, not much is known about the income they generate. This lack of knowledge may create further problems in the near future because the impact of the changes involved is not fully understood. It is not clear whether the various activities are sustainable within the context of small fishing villages. Furthermore, the strong dependency on financial help from middlemen keeps most fishermen in their traditional business without any prospect of improvement.

Within the context of this study, it was not possible to obtain reliable information on income derived from alternative income-generating activities. For a complete overview of the socio-economic situation of small-scale fisherfolk, such an investigation is required as a follow-up to this study.

6 Fishing activities and their social implications

Overview

Fishery along the Andaman coast provided a livelihood to 16 531 fishing households, mainly active in marine capture fishery, in 621 fishing villages along the west coast of Thailand. The average size of a fishing household of five family members was about 1.3 household members higher than the average size countrywide. About 83 000 people depended directly on marine fishery as their main income-generating activity.

Along the bay of Phang-nga, altogether 13 111 fisherfolk were living in 114 fishing villages or 18 percent of all fishing villages along the Andaman coast. For 5 759 fishing households (35 percent of all fishing households along the Andaman coast), marine fishery was the main occupation. On the average, 2.3 members per fishing household were engaged in fishery.

Small-scale fishing households

It is difficult to determine the total number of small-scale fishing households. Using the officially published fishery data, the total number of small-scale fishing households presented in Table 36 was calculated in three different ways. The first approach looked at the households and considered operator households as small-scale fishing households. The second approach used the main types of gear in the household to separate small-scale and commercial fishery. The third approach used the boats as indicators of small-scale fishing households, excluding households with inboard-powered boats, which were considered as households involved in commercial fishing. Table 36 shows the resulting numbers and percentages of small-scale fishing households.

Table 36: Small-scale fishery in the Andaman Sea defined by household, by boat and by type of gear (National Statistical Office & Department of Fisheries 1997)

Criteria	Small-scale (including no boat)	Commercial	Total	Small-scale [%]	Commercial [%]
Household	16 487	359	16 846	97.9	2.1
Gear	16 065	781	16 846	95.4	4.6
Boat	15 247	1 599	16 846	90.5	9.5

Surprising was the fact that about 1 599 inboard-powered boats were owned by fishery establishments, although only 781 households used commercial gear. Excluding the 359 joint management establishments (Table 2) and the 781 households using commercial gear (Table 6), there were still 459 households using inboard-powered boats with small-scale fishing gear. This discrepancy can be explained by the existence of a second type of boat used for small-scale fishery. Especially in the southern parts of the Andaman coast, small-scale fishermen use small inboard-powered boats.

For this study, the total number of small-scale fishing households was calculated as the percentage resulting from comparison of the gear and the total number of operator households. This meant that about 95 percent of 16 531 households, or 15 765, were small-scale households.

Small-scale fishing gear

Comparison of the different gear types used along the Andaman coast showed that the most common small-scale fishing gear was the shrimp gillnet or trammel net, used by 2 952 households along the coast in 1995 (Table 6). In the bay of Phang-nga, 1 723 households

mainly used trammel nets. The main target species were shrimp; additionally, some short mackerels and sardinellas were caught.

The trammel net provided a small-scale fishing household with the highest annual net income, Bt33 032. Fishing with the trammel net generated about 25 percent of the average annual income in the whole country for one household or, compared with the higher number of household members in fishery households, about Bt6 606 per capita per year, 19 percent of the average in Thailand. Compared with the other small-scale types of gear, the trammel net provided a relatively high income, which also explains its high popularity.

The target species of the trammel net was shrimp. Shrimp are highly valued and a system of middlemen assured fast transport to the local as well as national markets. The main problem for the fishermen came from competition between the trammel net and other commercial types of shrimp-catching gear. Especially in the nearshore areas, the push net was still used, although it is illegal to do so. This destructive gear catches the target species but high numbers of undersized shrimp and fish too and it destroys the bottom structure of the fishing grounds. Its use within three kilometres from the shoreline was banned in August 1979. The enforcement of this regulation has been lax due to its socio-economic impact. The fishermen using the push net are poor. With the growing awareness of the environmental impact of push netting and the need to protect the environment as feeding and nursery grounds for the shrimp, small-scale fishermen are now trying to stop the push netters from devastating their fishing grounds. This has caused violent conflicts among the fisherfolk.

The most common commercial gear along the Andaman coast was the otter boat trawl, which also mainly catches shrimp. Trawling too has been banned within three kilometres from the shoreline since 1979, yet still takes place. To enforce the ban, the Department of Fisheries now uses artificial reefs: they make it impossible to trawl in the area, and protect the fishing grounds in front of the fishing villages. Conflicts between small-scale and commercial fishermen remain, especially because during its development the shrimp move from the nearshore areas into deeper waters and become an easy target for the trawlers.

The second type of small-scale fishing gear used in this study was the crab bottom gillnet, or crab gillnet (Table 6). Next to the trammel net, it was the most common gear used along the Andaman coast and it was the third most common net in the bay of Phang-nga. No other commercial gear competed for the same fishery resource. The crabs were caught in nearshore areas close to the mangrove forests or seagrass beds in front of the villages. The gear was highly selective and the fishing activity environmentally friendly.

The profit made from this fishing activity was of about Bt138.4 per fishing day or an annual net income per capita of Bt2 989. This was about 8.5 percent of the average for the whole country. It is believed that such an activity could not provide enough income to support a fishing household and fishermen had to use alternative gear or activities to earn a living. Furthermore, the increased destruction of mangrove areas and seagrass beds due to aquaculture, tourism and urbanization would worsen the loss of income for these fishermen.

The mackerel gillnet used in the bay of Phang-nga is not comparable with the gear used outside the bay. The profit generated with the mackerel gillnet was of Bt462 per fishing day or Bt5 000 per capita per year. This was about 14 percent of the country average. Such net income per capita was not sufficient to support a small-scale fishing household and it is believed that the fishermen were also using alternative gear or activities to increase their income.

The middlemen

Socio-economic analysis of small-scale fishery along the Andaman coast has to include the trade of the catch and to analyse the system of dependence between fishermen and middlemen.

Due to their low income, small-scale fishermen are largely dependent on the middlemen, who provide needed financial support, i.e. to buy boats or gear and support the families with all kinds of household goods. For this service, the fishermen have to accept the price for the catch that the middlemen offer. The main result is that the middlemen control the fishing activities and therefore the money available in the fishing households. The fishermen have no way out of this trap and no means to improve their welfare and social status. To try to break out of the poverty trap, fishermen need first of all to be financially independent.

In the village of Sai Buak Hoi, the fishermen have set up a cooperative and sell their catch directly to traders two to four times a week, excluding the middlemen from the trade. The total income of the cooperative has increased. This was largely dependent on the following points:

1. the break of fishermen's dependence on the middlemen;
2. the provision of facilities to store the catch properly;
3. the accessibility of the village thanks to the construction of roads; and
4. the development of certain business skills by the members of the cooperative.

In Sai Buak Hoi, the fishermen were not dependent on middlemen because most of them were also landowners and fruit producers as well. A net repair hall, paid for by the Andaman Sea Small-scale Fishery Development Project, provides the space needed to store the catch, mainly shrimp, and to negotiate with the traders. Whenever enough shrimp is caught, the traders are informed by telephone, a set of which was installed nearby. The traders then come by car bringing their own transport boxes for the catch and fresh ice for the storage of the next catch. Each trader makes an offer for each product, i.e. different-sized shrimp, and the cooperative decides to whom to sell the catch.

7 Small-scale fishery along the Andaman coast

According to the calculations made in Chapter 5.9, the 15 765 fishery households along the Andaman coast generated about Bt383 million, or US$14.7 million, per year in 1995 and 1996. Compared with total marine fishery production of about US$1.4 billion in each of those years, small-scale fishery along the Andaman coast generates only 1 percent of the total value.

The total catch along the Andaman coast for the three types of gear is presented in Table 36. According to FAO statistics, the catch varied between 0.7 percent for the mackerel gillnet and 14 percent for the crab bottom gillnet, and the trammel net caught about 5 percent of the total catch of Thailand.

For this study, only the catch from the main fishing gear types was examined in each household; in fact, the total catch in each household was higher than could be assessed. Besides, most of the small-scale catch is not covered by the FAO statistics, which therefore underestimate the total catch of Thailand. It seems realistic to assume that some five percent of the total catch along the Andaman coast – as shown for the trammel net, the most common small-scale fishing gear – is caught through small-scale fishery, which means in turn that the five-percent commercial fishermen catch about 95 percent of all fish. This clearly shows the need for further fishery management plans if small-scale fishermen along the Andaman coast are to keep their occupation.

8 Recommendations for proper small-scale fishery management ensuring sustainable use of marine resources

The problems faced by the small-scale fisherfolk along the Andaman coast are complex and diverse. The main ones are dependence on the middlemen, decreasing catches due to competition with commercial or illegal fishery and degrading environment and fishing grounds. Given also the already low income of small-scale fishery and the high number of household members, this social group has serious difficulties to keep its traditional occupation.

A management plan for small-scale fishery has to provide solutions to the main problems. Usually such solutions are divided into short-term and long-term activities founded on a long-term perspective of the social, economic and environmental situation of the area of concern. The main target of such a management plan should be to improve the income generated by small-scale fishery while sustaining the nearshore fishery resources. The following recommendations include short-term as well as long-term activities. Their implementation will depend largely on financial support and on the will to enforce existing fishery regulations.

9.1 Gear

To increase the income of small-scale fishermen their fishing activities have to be diversified, so that they can shift from one target species to the other, depending on the season, weather, tidal elevation, etc. Also, such diversification of the mainly very selective small-scale fishing gear would decrease the pressure on some main target species, like shrimp. The model calculations in Table 29 have proven that the combination of types of small-scale fishing gear, for example the trammel net and the mackerel gillnet, increases the total amount of money earned by the small-scale fishing households. Additionally, diversification would allow further management of nearshore fishery resources. The use of alternative types of gear would provide an income when seasonal as well as geographic restrictions for certain types of fishing or types of gear are enforced.

9.2 Cooperatives

Any attempt to break the dependence of fishermen on middlemen should be promoted and the establishment of cooperatives supported. The cooperative in Sai Buak Hoi has proven that the formation of a cooperative can result in an immediate increase of the income derived from small-scale fishery. The necessary steps to form a cooperative have been mentioned earlier. Additionally, these cooperatives would be the best local partners to set up a community-based fishery management system. The increasing income generated by the cooperatives would provide the trust needed to set up local management plans and activities within the village or fishing area covered.

9.3 Alternative income-generating activities

The lack of knowledge on alternative employment opportunities and their impact on existing fishery may become a serious problem in the near future. Such activities may lead to the destructive use of aquatic resources or the destruction of mangroves, which are one of the main grounds for small-scale fishing. This in turn may lead to erosion and to the loss of fishing grounds. A clear analysis of the impact of alternative income-generating activities is needed before they are recommended or promoted.

A negative example is the guided tours through the mangrove creeks and the islands of the bay of Phang-nga. Too many villages offer such tours and the infrastructure needed to answer tourist needs destroys the village communities and the landing sites of traditional fishery. In this view, the development of elevated wooden footpaths through the mangrove has to be analysed critically. Such attraction uses the productive mangrove areas and needs a lot of wood, which typically also comes from the mangrove. If such activities are not controlled, the destruction of mangrove forests will be hastened.

9.4 Shift from commercial to small-scale fishery

The small-scale fishermen will only be able to stay in business if the income generated through fishery allows them to earn a living for their families. To achieve this goal a major step would be a complete ban on all illegal fishing in nearshore areas. Push netters especially have been tolerated too long. Such illegal fishing activity threatens the livelihood of many families by stealing the catch from legally operating fishermen and systematically destroying the shrimp fry for the next season as well as the nearshore fishing grounds. A buyback scheme combined with proper training to understand the ecological and economic impact should be established. In the case of the Phang-nga bay, both unrepentant and reluctant push-net users have to be punished in accordance with existing rules. Such action is unpopular but urgently needed for the benefit of the legally operating fishermen who otherwise lose their confidence in government policies.
A long-term goal for the prosperity of the small-scale fishermen would be a shift from commercial to small-scale fishery. The government should seriously consider such a shift. Especially in shrimp fishery, the combination of a growing number of cooperatives and decentralized fishery management of local waters would improve the welfare of the fisherfolk. Such a shift could be a ban on trawling periodically increasing the distance from the shoreline. Such development is already taking place indirectly with the use of artificial reefs to exclude trawlers from nearshore fishing grounds.

Properly managed small-scale fishery following the given recommendations and actual enforcement of existing rules and recommendations would promptly be of benefit to small-scale fishermen and would sustain the fishing resources in inshore waters for the use of future generations.

REFERENCES

Anonymous 1995. Project of coastal resources management, supporting fishing communities in the Phang-nga bay. Draft. Project under Queen Sirikit to conserve plants and wildlife.

Chansang H, Poovachiranon S. 1994. The distribution and species composition of seagrass beds along the Andaman Sea coast of Thailand. Research Bulletin, Phuket Marine Biological Centre, No. 59: 43-52

Chantawong P. *in press*. The Phang-nga bay and adjacent areas, Thailand. Andaman Sea Fisheries Development Centre, 77 Sakdidej Rd, Phuket, Thailand 83000

Chullasorn S. 1998. Status of fishery resources along the Andaman Sea coast of Thailand. In Nickerson DJ (ed.) 1998: *Community-based fishery management in the Phang-nga bay, Thai-land*. Proceedings of the National Workshop on Community-based Management organized by the Department of Fisheries of Thailand, FAO and the Bay of Bengal Programme, Phuket, Thailand, 14-16 February 1996. FAO Bangkok. RAP Publication 1998/3 (BOBP Report No 78): 72-84

Department of Fisheries and National Statistical Office 1997. *1995 Marine Fishery Census*. National Statistical Office, Larn Luang Rd, Bangkok 10100, Thailand: 47-48

Food and Agriculture Organization (FAO) of the United Nations. 1998a. *Fish data from Statfish*, UN FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy.

Food and Agriculture Organization (FAO) of the United Nations, 1998b. Without better managing the oceans, there will be not enough fish for food. FAO Press release PR 98/31. UN FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy

Food and Agriculture Organization (FAO) of the United Nations. 1995. Code of conduct for a responsible fishery. UN FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy, 41 p.

Indo-Pacific Fishery Commission. 1994. Socio-economic issues in coastal fisheries management: *Proceedings of the Indo-Pacific Fishery Commission*, Bangkok, Thailand, 23-26 November 1993. RAPA Publication 1994/8, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Phra Athit Road, Bangkok 10200, Thailand, 442 p.

Janecarn V, Chullasorn S. 1997. Environmental impacts on coastal fisheries along the west coast of Thailand. In: *Asia-Pacific Fishery Commission (APFIC): Environmental aspects of responsible fisheries*. Proceedings of the APFIC Symposium Seoul, the Republic of Korea, 15-18 October 1996. FAO Bangkok. RAP Publication 1997/32: 222-233

Limpsaichol P, Khokiattiwong S, Bussarawit N, Sojisuporn P. 1998. Environmental factors influencing the health and productivity of the Phang-nga bay. In Nickerson D. J. (Ed.) 1998: *Community-based fisheries management in the Phang-nga bay, Thailand*. Proceedings of the National Workshop on Community-based Management organized by the Department of Fisheries of Thailand, FAO and the Bay of Bengal Programme, Phuket, Thailand, 14-16 February 1996. FAO Bangkok. RAP Publication 1998/3 (BOBP Report No 78): 85-120

Menasveda D. 1997. Fisheries Management Frameworks of the Countries bordering the South China Sea. FAO Bangkok. RAP Publication 1977/33: 151 p.

National Statistical Office 1998. *Report of the 1996 Household Socio-Economic Survey*. National Statistical Office, Larn Luang Rd, Bangkok 10100: 47-48

Ruamporn Sirirattrakul (pers. com.). National Statistical Office, Economic Statistics Division, Larn Luang Rd, Bangkok 10100

Satapoomin U. 1997. Fish fauna of the mangroves and seagrass beds in the west coast of Thailand, the Andaman Sea. Phuket Marine Biological Centre, Technical Paper No. 2: 36 p.

SundstrÖm B, Janekarn V, Hylleberg J, Boonruang P. 1987. Annual pelagic primary production with notes on physical and chemical variables at Phuket, the Andaman Sea, Thailand. Research Bulletin Phuket Marine Biological Centre, No. 46: 12 p.

Table 37: Catch composition by samplings from Trammel net, Ban Ao Kung, Phuket, 1995

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**5**	**8**	**4**	**3**	**8**	**8**	**8**	**6**	**2**	**3**	**2**	**2**		
P. merguiensis	2 664	2 511	1 125	1 457	1 114	1 104	1 570	833	600	653	805	1 250	1 066.2	27.9
P. monodon	383	108	69	31	85	204	197	36	0	0	170	160	75.7	2.0
P. semisulcatus	4	1	4	0	120	41	4	17	0	0	9	0	24.4	0.6
Metapenaeus spp.	5	8	16	37	14	8	43	38	26	5	19	100	15.6	0.4
Other shrimp	10	5	0	0	7	21	0	18	0	0	0	0	1.7	0.1
Total shrimp	3 066	2 633	1 214	1 525	1 340	1 378	1 814	942	626	658	1 003	1 510	1 183.8	31.0
Rastrelliger spp.	21	46	102	42	9	87	204	28	33	92	0	0	20.2	0.5
Sardinella sp.	247	3	0	68	0	0	0	4	15	0	0	0	67.2	1.8
Carangoides spp.	0	0	0	0	0	0	0	0	0	0	0	0	3.7	0.1
Alepes spp.	0	0	0	0	5	0	10	0	0	0	0	0	7.0	0.2
Other fish	367	97	43	0	20	51	204	67	0	20	35	0	46.0	1.2
Total Pelagics	635	146	145	110	34	138	418	99	48	112	35	0	143.9	3.8
Sillago spp.	148	49	219	20	22	28	134	34	0	13	8	121	93.3	2.4
Pennahia anea	482	26	160	300	60	79	150	77	134	186	138	123	182.4	4.8
Mustus spp.	26	0	75	135	0	29	54	11	0	0	0	55	42.4	1.1
Grammoplites scaber	111	121	95	360	41	212	389	336	0	0	30	45	109.4	2.9
Gynoglossus spp.	5	0	0	0	0	0	0	12	0	0	85	0	9.1	0.2
Upeneus spp.	11	33	53	53	16	12	51	12	0	0	43	269	53.0	1.4
Other Fish	2 920	563	389	1 232	420	390	528	385	80	1 168	445	245	1 196.0	31.3
Total Demersals	3 703	792	991	2 100	559	750	1 306	867	214	1 367	749	858	1 658.7	43.4
Total Crabs	1 638	522	979	275	539	134	782	645	588	1 252	920	0	723.3	18.9
Total Mantis	0	40	0	0	0	12	0	0	0	0	0	0	9.7	0.3
Total Squids	86	62	82	45	23	216	84	152	134	72	20	0	105.3	2.8
Grant Total	9 128	4 195	3 411	4 055	2 495	2 628	4 404	2 705	1 610	3 461	2 727	2 368	3 824.7	100

Table 38 : Catch composition by samplings from Trammel net, Ban Ao Kung, Phuket, 1996

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**3**	**2**	**3**	**7**	**6**	**6**	**6**	**4**	**2**	**2**	**4**			
P. merguiensis	1 047	520	1 640	1 746	990	1 197	1 209	222	880	950	435		1 438.1	38.4
P. monodon	213	30	112	98	61	24	53	148	13	68	26		134.1	3.6
P. semisulcatus	0	0	57	16	25	8	37	95	0	0	4		20.7	0.6
Metapenaeus spp.	58	20	0	4	10	9	33	5	43	11	6		22.0	0.6
Other Shrimp	0	0	13	0	0	0	0	10	0	0	0		7.1	0.2
Total Shrimp	1 318	570	1 822	1 864	1 086	1 238	1 332	480	936	1 029	471		1 622.0	43.3
Rastrelliger spp.	52	0	0	0	28	32	0	98	0	0	0		66.4	1.8
Sardinella sp.	220	48	12	45	0	51	5	26	20	664	28		25.8	0.7
Carangoides spp.	0	0	0	19	5	0	0	0	0	0	0		0.0	0.0
Alepes spp.	0	7	0	6	0	13	0	36	0	20	0		2.1	0.1
Other Fish	0	35	24	73	8	7	0	264	110	0	13		93.4	2.5
Total Pelagics	272	90	36	143	41	103	5	424	130	684	41		187.7	5.0
Sillago spp.	27	0	0	69	69	131	70	373	50	50	81		68.5	1.8
Pennahia anea	668	209	413	222	25	108	115	161	255	62	55		140.3	3.8
Mustus spp.	48	110	0	54	0	167	0	43	0	0	0		28.4	0.8
Grammoplites scaber	248	0	223	60	45	0	113	535	0	0	0		174.2	4.7
Cynoglossus spp.	0	43	0	16	18	0	0	26	0	0	0		4.5	0.1
Upeneus spp.	42	35	0	94	43	52	34	170	0	30	5		34.2	0.9
Other Fish	3 192	907	879	1 618	1 090	1 258	673	1 275	1 080	588	175		718.9	19.2
Total Demersals	4 225	1 304	1 515	2 133	1 290	1 716	1 005	2 583	1 385	730	316		1 168.9	31.2
Total Crabs	167	103	249	723	1 423	273	241	2 669	410	620	420		667.4	17.8
Total Mantis	0	0	0	5	50	0	17	0	0	0	0		7.0	0.2
Total Squids	0	112	0	29	88	245	294	101	70	0	0		91.6	2.5
Grant Total	5 982	2 179	3 622	4 897	3 978	3 575	2 894	6 257	2 931	3 063	1 248		3 744.7	100

Table 39: Catch composition by samplings from the Trammel net, Ban Hin Rom, Phang-Nga, 1995

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**4**	**8**	**8**	**8**	**7**	**3**	**8**	**8**	**3**	**5**	**8**	**4**		
P. merguiensis	1 398	1 775	2 708	1 675	1 952	1 700	3 288	3 150	2 533	1 520	1 200	1 450	2 104.3	36.2
P. monodon	0	29	107	38	91	65	249	94	92	65	96	50	88.4	1.5
P. semisulcatus	10	3	14	58	64	215	132	56	43	23	0	10	47.5	0.8
Metapenaeus spp.	631	485	323	56	7	85	584	328	363	45	60	63	257.7	4.4
Other Shrimp	0	0	249	18	69	0	57	102	75	90	74	0	69.6	1.2
Total Shrimp	2 039	2 292	3 401	1 845	2 183	2 065	4 310	3 730	3 106	1 743	1 430	1 573	2 567.5	44.2
Rastrelliger spp.	0	491	132	1 099	14	10	419	1 272	248	253	96	253	421.9	7.3
Sardinella sp.	46	0	4	9	8	0	0	9	58	13	63	8	16.1	0.3
Carangoides spp.	0	0	0	69	14	23	0	0	50	0	0	13	12.5	0.2
Alepes spp.	69	0	0	94	7	0	6	28	4	54	0	0	22.0	0.4
Other Fish	68	8	98	64	20	0	11	1	33	188	1	175	48.6	0.8
Total Pelagics	183	499	234	1 335	63	33	436	1 310	393	508	160	449	521.1	9.0
Sillago spp.	373	159	142	123	217	88	315	238	267	354	115	98	202.2	3.5
Pennahia anea	648	429	624	663	1 230	199	205	771	487	650	487	550	596.5	10.3
Mustus spp.	306	103	187	500	290	97	302	415	8	160	175	248	254.3	4.4
Grammoplites scaber	225	0	0	11	313	33	146	257	115	155	33	0	106.6	1.8
Cynoglossus spp.	0	0	5	36	22	83	58	157	10	146	99	0	54.1	0.9
Upeneus spp.	20	11	16	11	31	0	16	6	2	45	23	50	18.7	0.3
Other Fish	214	211	372	700	1 372	646	648	1 254	935	1 492	569	646	747.0	12.9
Total Demersals	1 786	913	1 346	2 044	3 475	1 146	1 690	3 098	1 824	3 002	1 501	1 592	1 979.4	34.1
Total Crabs	334	407	352	247	676	33	956	823	368	620	584	363	523.9	9.0
Total Mantis	288	69	50	33	25	0	17	65	3	16	64	0	51.3	0.9
Total Squids	29	18	177	36	261	115	349	463	0	230	60	0	165.7	2.9
Grant Total	4 659	4 198	5 560	5 540	6 683	3 392	7 758	9 489	5 694	6 119	3 799	3 977	5 808.9	100.0

Table 40: Catch composition by samplings from the Trammel net, Ban Hin Rom, Phang-Nga, 1996

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**7**	**5**	**4**	**3**	**5**	**1**	**8**	**7**	**7**	**7**	**6**	**7**		
P. merguiensis	3 203	2 200	1 500	1 567	1 720	2 060	2 372	2 098	2 071	1 349	2 068	2 571	2 126.2	27.6
P. monodon	38	48	118	20	71	35	0	127	10	104	102	130	66.9	0.9
P. semisulcatus	16	61	59	0	28	49	69	31	39	43	12	19	36.6	0.5
Metapenaeus spp.	229	154	926	8	162	407	652	1 478	594	3 043	2 346	307	925.0	12.0
Other Shrimp	264	196	59	0	117	119	120	47	180	687	485	206	223.1	2.9
Total Shrimp	3 750	2 659	2 662	1 595	2 098	2 670	3 213	3 781	2 894	5 226	5 013	3 233	3 377.8	43.8
Rastrelliger spp.	746	165	0	170	38	184	330	369	188	1 318	146	76	347.6	4.5
Sardinella sp.	29	0	13	83	0	100	199	19	30	151	77	0	63.3	0.8
Carangoides spp.	41	0	0	27	16	44	88	7	5	0	17	5	22.7	0.3
Alepes spp.	22	0	0	0	0	7	14	14	15	3	23	6	10.0	0.1
Other Fish	31	20	0	0	0	12	24	9	41	7	37	14	18.1	0.2
Total Pelagics	869	185	13	280	54	347	655	418	279	1 479	300	101	461.6	6.0
Sillago spp.	310	226	143	58	145	210	256	525	393	417	120	481	298.0	3.9
Pennahia anea	1 980	1 086	765	357	188	630	1 072	671	264	733	1 101	648	826.8	10.7
Mustus spp.	874	279	565	210	225	313	401	601	742	461	500	464	493.0	6.4
Grammoplites scaber	94	330	0	0	8	22	36	111	93	165	161	165	103.6	1.3
Cynoglossus spp.	4	2	50	70	31	81	130	369	142	161	205	8	112.7	1.5
Upeneus spp.	123	50	118	0	11	6	0	23	46	25	15	40	37.5	0.5
Other Fish	1 376	1 290	1 138	110	1 142	572	1 001	1 291	1 023	1 102	1 712	678	1 070.0	13.9
Total Demersals	4 761	3 263	2 779	805	1 750	1 834	2 896	3 591	2 703	3 064	3 814	2 484	2 941.6	38.1
Total Crabs	567	460	638	170	110	844	588	846	696	1 660	788	540	702.7	9.1
Total Mantis	4	77	0	0	196	107	19	0	120	239	118	171	91.8	1.2
Total Squids	22	130	70	0	29	174	317	362	141	231	45	0	141.8	1.8
Grant Total	9 973	6 774	6 162	2 850	4 237	5 976	7 688	8 998	6 833	11 899	10 078	6 529	7 717.4	100

Table 41: Catch composition by samplings from the Trammel net, Laem Sak, Krabi, 1995

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**3**	**8**	**6**	**8**	**8**	**5**	**8**					**3**		
P. merguiensis	1 000	1 494	343	471	1 324	1 000	1 460					1 667	1 029.8	9.6
P. monodon	25	125	64	218	46	36	125					63	97.6	0.9
P. semisulcatus	7	5	50	12	8	12	0					45	16.7	0.2
Metapenaeus spp.	6 227	2 841	4 390	2 003	1 818	600	700					3 333	2 621.3	24.4
Other Shrimp	563	633	135	362	1 112	1 921	845					2 413	881.1	8.2
Total Shrimp	7 822	5 098	4 982	3 066	4 308	3 569	3 130					7 521	4 646.4	43.3
Rastrelliger spp.	2 200	279	4 495	89	168	2 351	3 125					38	1 301.7	12.1
Sardinella sp.	0	0	2	4	9	0	0					53	6.6	0.1
Carangoides spp.	0	0	0	6	9	0	0					0	2.9	0.0
Alepes spp.	0	0	16	36	2	87	0					18	20.5	0.2
Other Fish	0	31	0	0	11	18	0					30	12.1	0.1
Total Pelagics	2 200	310	4 513	135	199	2 456	3 125					139	1 343.7	12.5
Sillago spp.	32	88	333	23	206	30	0					79	116.4	1.1
Pennahia anea	1 920	1 129	96	845	1 460	530	420					1 010	937.9	8.7
Mustus spp.	158	80	114	54	240	123	150					57	121.9	1.1
Grammoplites scaber	93	33	319	15	108	0	0					567	119.4	1.1
Cynoglossus spp.	198	154	565	170	250	59	45					177	220.7	2.1
Upeneus spp.	53	27	24	29	3	11	0					135	28.6	0.3
Other fish	775	268	281	175	5 669	215	214					1 955	1 401.7	13.0
Total Demersals	3 229	1 779	1 732	1 311	7 936	968	829					3 980	2 946.6	27.4
Total Crabs	753	1 325	2 358	1 588	1 003	806	1 818					3 033	1 500.0	14.0
Total Mantis	280	238	965	32	25	61	0					21	217.6	2.0
Total Squids	168	0	0	0	348	157	0					0	94.7	0.9
Grant Total	14 452	8 750	14 550	6 132	13 819	8 017	8 902					14 694	10 749.1	100

Table 42: Catch composition by samplings from trammel nets, Laem Sak, Krabi, 1996

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**2**		**3**	**4**	**3**	**3**	**2**			**2**	**1**	**2**		
P. merguiensis	1 300		1 433	964	1 633	2 600	900			900	325	4 000	1 608.2	18.2
P. monodon	55		24	148	117	75	135			48	0	173	93.6	1.1
P. semisulcatus	0		0	28	0	0	55			0	0	0	10.0	0.1
Metapenaeus spp.	1 350		1 833	2 625	300	1 200	1 500			5 150	230	6 550	2 265.0	25.6
Other shrimp	1 325		650	636	1 165	2 082	1 995			2 850	1 095	1 350	1 380.4	15.6
Total Shrimp	4 030		3 940	4 401	3 215	5 957	4 585			8 948	1 650	1 2073	5 357.2	60.5
Rastrelliger spp.	205		582	33	232	335	1 600			210	175	58	359.0	4.1
Sardinella sp.	0		0	13	0	13	0			240	40	372	61.6	0.7
Carangoides spp.	0		70	48	40	12	0			35	475	79	57.2	0.7
Alepes spp.	0		0	0	0	10	150			0	0	13	16.2	0.2
Other Fish	50		27	0	45	13	33			100	0	0	28.2	0.3
Total Pelagics	255		679	94	317	383	1 783			585	690	522	522.1	5.9
Sillago spp.	35		148	46	17	0	0			120	166	295	79.2	0.9
Pennahia anea	1 650		1 927	931	288	190	450			4 910	115	1 355	1 263.0	14.3
Mystus spp.	335		70	95	77	183	35			0	0	750	164.1	1.9
Grammoplites scaber	0		116	28	30	0	0			190	65	43	49.1	0.6
Cynoglossus spp.	10		838	124	0	185	225			425	0	108	232.0	2.6
Upeneus spp.	0		35	53	0	0	0			45	0	21	20.5	0.2
Other Fish	400		703	582	923	203	198			360	45	235	465.8	5.3
Total Demersals	2 430		3 837	1 859	1 335	761	908			6 050	391	2 807	2 273.6	25.7
Total Crabs	700		1317	328	437	87	733			400	180	212	504.5	5.7
Total Mantis	10		0	31	23	0	0			280	95	223	59.8	0.7
Total Squids	0		83	0	193	369	180			0	55	328	136.6	1.5
Grant Total	7 425		9 856	6 713	5 520	7 557	8 189			16 263	3 061	16 165	8 853.7	100.0

Table 43: Catch composition by samplings from the Crab bottom gill net, Ban Ao Kung, Phuket, 1995

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**1**	**7**	**6**	**2**	**4**	**1**	**3**	**3**	**2**	**2**	**2**	**4**		
Portunus pelagicus	4 700	5 614	9 457	11 550	9 400	7 500	6 400	5 467	5 900	9 650	7 450	3 238	7 121.4	87.6
Charybdis sp.	0	0	0	0	0	0	62	0	0	0	0	0	5.0	0.1
Other	0	100	255	45	36	0	76	200	0	255	100	0	108.1	1.3
Total Crabs	4 700	5 714	9 712	11 595	9 436	7 500	6 538	5 667	5 900	9 905	7 550	3 238	7 234.5	88.9
Dasyatis spp.	320	80	367	0	0	0	0	667	750	138	0	200	206.9	2.5
Grammoplites scaber	0	80	48	0	0	0	0	200	0	0	420	0	61.8	0.8
Mustus spp.	0	0	0	0	0	0	0	10	0	0	0	0	0.8	0.0
Pennahia spp.	0	0	0	0	0	0	0	10	0	0	0	0	0.8	0.0
Ephippus orbis	0	22	30	0	23	0	237	225	0	0	168	0	58.0	0.7
Other Fish	0	48	126	45	90	1 100	53	888	235	1 500	43	0	243.8	3.0
Total Fish	320	230	571	45	113	1 100	290	2 000	985	1 638	631	200	572.0	7.0
Pila ampullacea	0	13	377	0	18	1 200	1 003	133	0	0	0	0	190.0	2.3
Trachypleus gigas	235	88	149	65	0	0	223	200	0	0	250	175	117.4	1.4
Other	0	71	28	0	15	0	0	0	0	0	0	0	19.7	0.2
Total Others	235	172	554	65	33	1 200	1 226	333	0	0	250	175	327.2	4.0
Grant Total	5 255	6 116	10 837	11 705	9 582	9 800	8 054	8 000	6 885	11 543	8 431	3 613	8 133.7	100.0

Table 44: Catch composition by samplings from crab bottom gill nets, Ban Ao Kung, Phuket, 1996

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**1**			**2**	**2**		**3**		**5**					
Portunus pelagicus	3 180			9 700	6 100		6 643		4 130				5 796.9	75.0
Charybdis sp.	850			0	0		0		110				107.7	1.4
Other	150			1 000	175		137		254				321.5	4.2
Total Crabs	4 180			10 700	6 275		6 780		4 494				6 226.2	80.5
Dasyatis spp.	0			2 750	213		0		50				475.0	6.1
Grammoplites scaber	0			290	70		0		50				74.5	1.0
Mustus sp.	0			0	0		0		0				0.0	0.0
Pennahia anea	0			0	0		0		0				0.0	0.0
Ephippus orbis	0			0	50		0		22				16.2	0.2
Other Fish	0			0	10		443		741				388.9	5.0
Total Fish	0			3 040	343		443		863				954.5	12.3
Pila ampullacea	0			0	0		67		300				130.8	1.7
Trachypleus gigas	500			0	642		500		400				406.5	5.3
Other	0			0	0		0		41				15.8	0.2
Total Others	500			0	642		567		741				553.0	7.2
Grant Total	4 680			13 740	7 260		7 790		6 098				7 733.7	100.0

Table 45: Catch composition by samplings from the Crab bottom gill net, Ban Hin Rom, Phang-Nga, 1995

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**6**	**5**	**2**	**8**	**5**	**8**	**3**	**6**	**5**	**6**	**4**	**6**		
Portunus pelagicus	3 433	3 570	1 900	6 665	6 600	16 750	9 167	6 400	8 140	5 950	6 025	7 117	7 080.2	77.3
Charybis sp.	0	0	0	19	31	0	0	0	50	50	0	23	15.6	0.2
Other	76	44	0	0	0	0	0	0	1 580	98	38	83	153.4	1.7
Total Crabs	419	3 614	1 900	6 684	6 631	16 750	9 167	6 400	9 770	6 098	6 063	7 223	7 249.1	79.2
Dasyatis spp.	965	390	3 230	265	1 420	642	432	708	1 100	150	405	1 008	752.7	8.2
Grammoplites scaber	13	170	140	8	0	60	0	0	148	17	0	0	40.5	0.4
Mystus spp.	40	21	62	111	831	56	10	46	132	350	250	83	164.5	1.8
Pennahia anea	46	55	0	125	0	13	0	0	0	0	143	27	37.3	0.4
Ephippus orbis	30	0	43	37	70	77	0	0	0	19	0	0	25.6	0.3
Other Fish	276	17	0	554	284	146	0	83	311	83	0	0	176.7	1.9
Total Fish	1 370	653	3 475	1 100	2 605	994	442	837	1 691	619	798	1 118	1 197.2	13.1
Pila ampullacea	927	362	162	439	63	207	800	617	2 043	383	338	663	580.0	6.3
Trachypleus gigas	0	0	0	38	0	28	133	50	48	113	0	83	41.3	0.5
Other	306	50	6	138	0	161	0	0	220	21	0	0	89.4	1.0
Total Others	1 233	412	168	615	63	396	933	667	2 311	517	338	746	710.7	7.8
Grant Total	3 022	4 679	5 543	8 399	9 299	18 140	10 542	7 904	13 772	7 234	7 199	9 087	9 157.0	100.0

Table 46: Catch composition by samplings from crab bottom gill nets, Ban Hin Rom, Phang-Nga, 1996

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**4**		**4**	**8**	**2**		**1**	**4**	**2**	**4**	**6**	**3**		
Portunus pelagicus	4 400		4 675	5 375	8 250		10 600	4 275	6 450	6 300	4 033	3 650	5 177.6	72.2
Charybdis sp.	0		0	0	120		0	0	0	0	0	0	6.3	0.1
Other	288		0	0	250		0	350	1 015	38	178	37	168.7	2.4
Total Crabs	4 688		4 675	5 375	8 620		10 600	4 625	7 465	6 338	4 211	3 687	5 352.6	74.6
Dasyatis spp.	483		673	531	1 050		750	81	1 600	311	1 058	883	670.6	9.4
Grammoplites scaber	0		0	0	8		0	0	400	58	92	203	58.1	0.8
Mustus spp.	111		0	118	205		0	40	55	180	265	83	121.7	1.7
Pennahia anea	38		125	51	0		0	31	515	119	51	147	90.4	1.3
Ephippus orbis	0		50	0	0		0	0	305	0	113	0	39.1	0.5
Other Fish	0		263	29	0		0	35	148	959	301	17	194.9	2.7
Total Fish	632		1 111	729	1 263		750	187	3 023	1 627	1 880	1 333	1 174.7	16.4
Pila ampullacea	253		800	264	500		0	225	600	880	428	767	468.7	6.5
Trachypleus gigas	250		0	0	1 100		0	250	0	0	205	0	142.9	2.0
Other	56		0	34	100		0	0	0	43	83	0	36.1	0.5
Total Others	559		800	298	1 700		0	475	600	923	716	767	647.6	9.0
Grant Total	5 879		6 586	6 402	11 583		11 350	5 287	11 088	8 888	6 807	5 787	7 174.9	100.0

Table 47: Catch composition by samplings from the Crab bottom gill net, Ban Sam Chong, Phang-Nga, 1995

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**8**	**4**	**4**	**2**	**2**	**2**	**6**	**3**	**4**	**5**	**6**			
Portunus pelagicus	4 406	5 800	5 350	8 150	8 450	11 000	11 050	12 100	7 950	5 700	4 983		7 127.2	86.1
Charybdis sp.	21	0	0	68	1 050	0	0	0	0	0	0		52.2	0.6
Other	0	0	0	0	0	0	24	8	38	24	0		9.6	0.1
Total crabs	4 427	5 800	5 350	8 218	9 500	11 000	11 074	12 108	7 988	5 724	4 983		7 188.9	86.8
Dasyatis spp.	602	548	400	228	260	63	267	27	660	0	92		316.9	3.8
Grammoplites scaber	0	13	0	0	60	0	0	133	0	0	0		12.4	0.2
Mustus spp.	24	25	0	133	40	0	7	0	0	0	0		14.8	0.2
Pennahia anea	0	0	0	40	15	0	0	0	10	0	0		3.3	0.0
Ephippus orbis	21	63	100	1 030	0	0	0	0	0	0	0		62.6	0.8
Other Fish	87	63	636	0	15	168	150	0	156	0	0		116.9	1.4
Total Fish	734	712	1 136	1 431	390	231	424	160	826	0	92		526.8	6.4
Pila ampullacea	184	0	105	0	0	0	317	133	138	0	83		113.9	1.4
Trachypleus gigas	0	0	0	0	250	0	1 233	1 667	250	120	637		398.3	4.8
Other	0	0	500	0	205	0	0	0	0	0	0		52.4	0.6
Total Others	184	0	605	0	455	0	1550	1 800	388	120	720		564.6	6.8
Grant Total	5 345	6 512	7 091	9 649	10 345	11 231	13 048	14 068	9 202	5 844	5 795		82 80.3	100.0

Table 48: Catch composition by samplings from Crab bottom gill nets, Ban Sam Chong, Phang-Nga, 1996.

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]			**5**	**4**	**4**	**1**	**4**	**2**	**3**		**4**			
Portunus pelagicus			7 084	9 100	6 688	4 600	6 100	5 650	9 033		9 088		7 493.3	85.9
Charybdis sp.			0	0	0	0	0	0	0		0		0.0	0.0
Other			150	0	25	0	213	200	100		319		136.1	1.6
Total Crabs			7 234	9 100	6 713	4 600	6 313	5 850	9 133		9 407		7 629.4	87.4
Dasyatis spp.			155	1 350	430	200	375	160	140		0		382.8	4.4
Grammoplites scaber			0	0	0	0	0	0	0		0		0.0	0.0
Mustus sp.			10	13	17	0	8	0	23		59		18.6	0.2
Pennahia anea			46	0	11	0	0	0	0		0		10.2	0.1
Ephippus orbis			25	42	21	0	4	0	0		0		14.5	0.2
Other fish			23	0	0	0	288	0	17		0		48.7	0.6
Total Fish			259	1 405	479	200	675	160	180		59		474.8	5.4
Pila ampullacea			0	456	86	0	136	1 050	933		263		320.9	3.7
Trachypleus gigas			94	0	350	500	0	1 250	163		188		226.3	2.6
Other			0	0	41	0	63	375	23		200		75.4	0.9
Total Others			94	456	477	500	199	2 675	1 119		651		622.6	7.1
Grant Total			7 587	10 961	7 669	5 300	7 187	8 685	10 432		10 117		8 726.8	100.0

Table 49: Catch composition by samplings from the Crab bottom gill net, Ban Bang Chan, Phang-Nga, 1995.

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**5**	**7**	**4**	**3**	**6**	**7**	**6**	**7**	**3**	**4**	**7**	**2**		
Portunus pelagicus	14 484	7 629	13 525	8 433	11 867	14 103	21 333	11 114	22 633	8 575	5 814	15 450	12 372.8	89.7
Charybdis sp.	0	19	59	0	38	141	114	0	0	0	0	0	37.2	0.3
Other	395	101	111	0	148	141	205	107	1133	833	993	748	363.2	2.6
Total Crabs	14 879	7 749	13 695	8 433	12 053	14 385	21 652	11 221	23 766	9 408	6 807	16 198	12 773.2	92.6
Dasyatis spp.	714	238	58	158	668	374	162	181	0	0	233	0	269.4	2.0
Grammoplites scaber	426	71	241	0	300	136	244	370	870	366	16	33	240.3	1.7
Mustus sp.	97	0	60	90	8	64	13	113	68	60	18	0	48.1	0.4
Pennahia anea	0	0	0	0	0	0	0	0	0	0	14	0	1.6	0.0
Ephippus orbis	69	0	28	60	14	0	14	10	43	0	126	0	30.8	0.2
Other Fish	581	55	33	73	42	310	37	290	250	341	44	416	189.7	1.4
Total Fish	1 887	364	420	381	1 032	884	470	964	1 231	767	451	449	779.9	5.7
Pila ampullacea	35	30	313	245	0	84	14	64	27	0	22	0	61.2	0.4
Trachypleus gigas	246	262	0	0	124	140	0	271	87	223	103	0	140.3	1.0
Other	252	0	0	0	46	0	44	19	103	0	0	0	36.8	0.3
Total Others	533	292	313	245	170	224	58	354	217	223	125	0	238.3	1.7
Grant Total	17 299	8 405	14 428	9 059	13 255	15 493	22 180	12 539	25 214	10 398	7 383	16 647	13 791.3	100.0

Table 50: Catch composition by samplings from Crab bottom gill net, Ban Bang Chan, Phang-Nga, 1996.

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**2**	**3**	**7**	**3**	**5**	**2**	**2**	**6**	**4**	**4**	**4**	**3**		
Portunus pelagicus	12 125	8 970	9 744	15 833	13 836	11 500	16 800	10 500	18 925	9 925	10 713	7 333	11 908.9	84.6
Charybdis sp.	0	0	27	0	0	115	0	134	21	0	144	0	41.9	0.3
Other	600	1 486	111	705	75	217	195	291	144	558	618	405	399.7	2.8
Total Crabs	12 725	10 456	9 882	16 538	13 911	11 832	16 995	10 925	19 090	10 483	11 475	7 738	12 350.5	87.7
Dasyatis spp.	115	320	352	3 368	76	150	255	192	164	2 920	973	290	737.6	5.2
Grammoplites scaber	90	278	194	247	227	320	260	402	572	534	249	90	300.1	2.1
Mustus sp.	40	0	24	22	112	178	38	13	105	153	99	0	62.3	0.4
Pennahia anea	0	0	16	0	0	0	0	20	0	0	0	0	5.2	0.0
Ephippus orbis	35	0	58	167	0	153	0	0	88	65	0	121	50.1	0.4
Other Fish	85	132	195	358	243	148	160	150	174	391	370	164	221.5	1.6
Total Fish	365	730	839	4162	658	949	713	777	1 103	4 063	1 691	665	1 376.8	9.8
Pila ampullacea	0	0	23	0	98	0	423	60	63	105	216	0	75.3	0.5
Trachypleus gigas	0	70	51	72	277	110	835	198	60	218	685	475	233.8	1.7
Other	0	15	7	87	0	0	23	68	0	125	0	270	47.1	0.3
Total Others	0	85	81	159	375	110	1 281	326	123	448	901	745	356.2	2.5
Grant Total	13 090	11 271	10 802	20 859	14 944	12 891	18 989	12 028	20 316	14 994	14 067	9 148	14 083.5	100.0

Table 51: Catch composition by samplings from the Crab bottom gill net, Ban Bang Pat, Phang-Nga, 1995.

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**8**	**4**	**3**	**4**	**6**	**6**	**7**	**7**	**8**	**3**	**6**	**4**		
Portunus pelagicus	1 6250	9 900	13 633	16 250	9 900	14 267	17 814	18 657	13 013	16 433	10 217	18 850	14 634.9	78.7
Charybdis sp.	0	0	0	0	38	0	0	0	0	0	16	51	8.0	0.0
Other	123	200	20	6	77	0	157	351	1213	433	105	338	285.9	1.5
Total Crabs	16 373	10 100	13 653	16 256	10 015	14 267	17 971	19 008	14 226	16 866	10 338	19 239	14 928.8	80.3
Dayatis spp.	563	225	0	3 033	237	442	530	214	488	0	165	576	515.2	2.8
Grammoplites scaber	6	206	0	0	15	85	90	31	83	0	0	24	46.7	0.3
Mustus spp.	286	224	25	258	450	1418	158	164	212	162	188	88	324.3	1.7
Pennahia anea	18	85	0	161	150	216	36	74	116	33	87	25	86.9	0.5
Ephippus orbis	14	66	20	31	115	78	1	74	406	60	9	85	92.0	0.5
Other Fish	254	35	0	1423	87	117	124	51	348	63	32	85	209.4	1.1
Total Fish	1 141	841	45	4 906	1 054	2 356	939	608	1 653	318	481	883	1 274.5	6.9
Pila ampullacea	11 025	0	230	143	105	150	182	586	493	2167	0	1243	1 693.6	9.1
Trachypleus gigas	1 243	225	0	200	43	0	371	1 086	981	427	1 215	1 125	651.8	3.5
Other	136	50	0	0	87	10	44	106	44	0	17	25	52.7	0.3
Total Others	12 404	275	230	343	235	160	597	1 778	1518	2 594	1 232	2 393	2 398.2	12.9
Grant Total	29 918	11 216	13 928	21 505	11 304	16 783	19 507	21 394	17 397	19 778	12 051	22 515	18 601.4	100.0

Table 52: Catch composition by samplings from the Crab bottom gill net, Ban Bang Pat, Phang-Nga, 1996.

Species	Catch rate (g/trip)													
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Av.**	**%**
Samples [n]	**4**	**5**	**5**	**3**	**6**	**6**	**6**	**2**	**7**	**4**	**2**	**3**		
Portunus pelagicus	15 550	15 040	12 840	6 567	17 233	15 000	12 583	18 100	15 400	13 800	9 225	12 833	14 082.1	87.5
Charybdis sp.	0	0	0	0	0	26	0	0	0	0	0	0	3.0	0.0
Other	338	1 040	240	358	700	658	838	400	493	50	410	400	537.3	3.3
Total Crabs	15 888	16 080	13 080	6 925	17 933	15 684	13 421	18 500	15 893	13 850	9 635	13 233	14 622.3	90.9
Dasyatis spp.	175	400	595	0	138	27	0	145	43	125	1 550	0	204.8	1.3
Grammoplites scaber	15	7	0	63	0	79	18	183	0	0	0	0	23.3	0.1
Mustus sp.	120	0	204	1 200	203	173	228	73	365	103	370	177	247.4	1.5
Pennahia anea	20	46	115	83	8	0	27	0	137	14	0	158	53.6	0.3
Ephippus orbis	0	10	17	20	17	0	72	0	41	0	0	17	20.1	0.1
Other Fish	30	453	267	362	144	87	314	0	189	17	0	0	178.6	1.1
Total Fish	360	916	1 198	1 728	510	366	659	401	775	259	1 920	352	727.7	4.5
Pila ampullacea	123	59	720	100	260	798	494	183	236	71	0	23	308.8	1.9
Trachypleus gigas	673	0	0	0	417	3	142	0	0	750	1 700	2 867	397.3	2.5
Other	44	0	32	0	110	65	63	0	0	0	0	40	35.6	0.2
Total Others	840	59	752	100	787	866	699	183	236	821	1 700	2 930	741.6	4.6
Grant Total	17 088	17 055	15 030	8 753	19 230	16 916	14 779	19 084	16 904	14 930	13 255	16 515	16 091.6	100.0

Table 53: Catch composition by samplings from the Mackerel gill net, Ban Hin Rom, Phang-Nga, 1995-1996.

	Catch rate (g/trip)										
Species	**1995**						**1996**				
	Aug.	**Sep.**	**Oct.**	**Av.**	**%**		**Aug.**	**Sep.**	**Oct.**	**Av.**	**%**
Samples [n]	**2**	**4**	**7**				**2**	**3**	**2**		
Rastrelliger spp.	60 750	79 500	87 286	80 808	90.26		19 250	80 000	40 650	51 400	80.2
Scomberomorus spp.	430	28	2464	1 402	1.57		243	1 267	1 750	1 112	1.7
Sardinella sp.	530	396	91	253	0.28		85	293	120	184	0.3
Alepes spp.	1 050	48	564	480	0.54		76	167	0	93	0.2
Other Fish	2 487	14	63	421	0.47		57	173	30	99	0.2
Total Pelagics	65 247	79 986	90 468	83 363	93.12		19 711	81 900	42 550	52 889	82.6
Pennahia anea	955	376	610	591	0.66		463	343	160	325	0.5
Anodontostoma chacunda	17 513	2 113	2 230	4 545	5.08		198	15 833	8 500	9 271	14.5
Leiognathus spp.	128	391	499	408	0.46		66	50	650	226	0.4
Others	380	177	582	426	0.48		408	1 727	800	1 085	1.7
Total Demersal	18 976	3 057	3 921	5 971	6.67		1 135	17 953	10 110	10 907	17.0
Total Shrimp	77	0	98	64	0.07		440	102	150	212	0.3
Total Crabs	275	200	43	127	0.14		55	0	165	63	0.1
Grand Total	84 575	83 243	94 530	89 525	100.00		21 341	99 955	52 975	64 070	100.0