3-2-4-3. Northern Region

Fisheries in the Northern Region operate purse-seiners with engine capacities greater than 100 h.p. They work in waters 45 - 50 m deep to target scad and mackerel. In this region most purse-seiners are small, with an engine size of less than 60 h.p.. Apart from generators for the light attactor, vessels lack deck equipment. In the Northern Region purse-seining using a light attractor is conducted during the period March - October, and long-lining is done for the remainder of the time. Fishing trips last 5 - 7 days, and 3 - 4 trips are made each month. Catching rates are 0.5 - 0.8 t/night. Target species are scad and sardine.

3-2-5. Gill Net and Drift Gill Net

There are two types of drift net, one used on the surface and the other on the bottom. For the surface drift net fishers use about 100 units (5,800 m long) of nylon multi-filament net 210/9-12, with a mesh size of 3.5 inches str. and net height of 15 m. A crew consists of 8 - 10 fishers who spend from 2 - 3 days to 10 - 15 days for each trip. The main target species are bonito, Eastern little tuna (*Euthynnus affinis*), Frigate mackerel, and Indian mackerel, all of which are taken in night operations.

For bottom drift netting, fishers use about 40 - 60 units (2,000 - 3,000 m long) of nylon monofilament net 210/9-12, with the two mesh sizes of 3.5 inches str. and 2.7 inches str. and net height of 3.5 m. A crew consists of seven persons, who spend 1 - 4 days per trip for daytime operations, targeting bonito, King mackerel, hairtail, round scad, and Indian mackerel.

3-2-5-1. Southern Region

In this region off-shore gill-netting is done using boats powered by 100 - 300 h.p. engines, with a hull length up to 18 - 22 m. Deck equipment consists of home-made net-hauling gear. Vessels have radio-telephones and the larger vessels are equipped with echosounders.

Many of the larger drift gill-netter vessels make trips of up to 27 days and carry in excess of 10 km of net. On the hand, small bottom gill-netters in the Southern Region use bottom nets. Nets are either set individually or tied together in 2 km for boats fishing in shallow waters and 10 km for boats fishing in off-shore waters, which catch overnight. When the bottom gill-nets have been set crew members fish for squid and cuttlefish using hand line and light attraction. Some kinds of gill-netting is conducted for a total of 250 - 300 days per year in near-shore area, while off-shore fleets can operate about 200 days per year.

Catch rates are generally high, at 0.15 - 0.4 t/night. Since higher valued species are targeted, gill-netters carry sufficient ice for preservation, usually up to 25 - 30 t/trip. Targeted species include Redfin snapper, grunts, seabream, Bastard mullet, and the like.

Inshore gill-netters use smaller boats powered by 18 - 100 h.p engines. They operate about 0.4 - 1.0 km of nets. The gill-netting seasons in the south are January - April and September - November. Trips range from 1 - 7 nights and amount to some 200 day/year. Overnight catching rates are 25 - 100 kg, with the main targeted species being crab, cuttlefish and various species of marine catfish. Inshore gill-netters are subject to severe over-crowding and resource competition. In response they have been resorting to smaller nets sizes, which only exacerbates the problem.

3-2-5-2. Central Region

Off-shore gill-netters in the Central Region do not use the large boats characteristic of the Southern Region. Rather, their vessels are generally 15 - 20 m long and fitted with 60 - 100 h.p. engines. No deck equipment is installed. Some vessels have electronic equipment, including radar, satellite navigation systems, and radio-telephone. Nets are fixed to drift with the current at a depth of about 30 m, in waters 40 - 400 m deep. Individual nets are 50 - 60 m long and the total length used is about 5 - 8 km.

Fishing is conducted during the months of the Southwest Monsoon, when trips of 16 - 25 days are made. Up to 15 - 20 t of ice is carried on a vessel 16 m in length. catch rates of 3 - 5 t per trip can be anticipated during the Southwest Monsoon, if fishing is done near Spratley Islands. However, since Spratley Islands cannot be reached during the Northeast Monsoon season, catches are reduced by about 50% (i.e., 1.5 - 2.5 t/trip). An average of six trips are made during the Southwest Monsoon season. The main target species are all of high value, and mainly the larger pelagics: Spanish mackerel, wahoo, several species of tuna, yellowfin, bonito, sailfish, shark.

Inshore gill-netters in the Central Region use very small vessels. Often the circular woven bamboo boats are used. Some are powered by 5 - 10 h.p. engines, whereas others are not motorized. Typically they operate 0.2 - 0.5 km of nets, each piece of which is 50 - 100 m long. The main fishing season is May - September. Trips are made each night when sea conditions permit. Catch rates are about 30 - 40 kg/trip, with scad and sardine providing the bulk of the catch.

3-2-5-3. Northern Region

Small-scale inshore gill-netting is conducted in the Northern Region from boats 10 - 18 m long powered by engines of 20 - 60 h.p. Individual nets are 50 - 60 m long and typically set in lengths of 1 - 1.5 km in waters 6 - 30 m deep.

In this region gill-netting is conducted in the period February - June, with hand-lining for squid occupying the remainder of the year. Gill-netters typically operate for 8 - 12 nights in succession, followed by a 3-day rest period. Catch rates are 20 - 100 kg/night. In Quang Binh Province, targets are larger pelagics such as bonito, tunas and sailfish. Nets are therefore set 5 - 10 m below the surface in waters 80 - 100 m in depth. Catches are 0.6 - 1.5 t per 6-day trip.

3-2-6. Squid Cast Net

Squid cast nets are operated from a 10 t boat by a crew of 8. They

attract squid right below the boat using light installed on board. They extend a 12 m long beam to the port side stern and cast a square net of 12 × 12 m. Once a school of squid are attracted and has gathered near enough for catching all lights but one are turned off to induce squid to concentrate in a single spot, where the net is cast. This relatively efficient fishing method has led to a concern about over-fishing, leading the provincial authorities to consider imposing stricter restrictions on its use.

3-2-7. Set Net

3-2-7-1. Southern Region

A large number of different types of fixed gear such as bag net are operated in the distributories of the Mekong Delta. However, none of any significance are used in marine fisheries.

3-2-7-2. Central Region

The inlet- and island-studded inshore waters of the coast of Khanh Hoa Province provide good sites for set netting to exploit the coastwise current during the summer fishing season. At present 12 set nets are operated off Nha Trang City, Khanh Hoa Province. These nets have two fence nets that cross at an angle of 90 degrees, and a bag net to trap fish. Two fishing boats stand by and when fish are seem trapped, the net is hauled. One set net observed had fence nets of 442 m and 72 m. Setting these nets is based on traditional knowledge of fish behavior, local fishers saying that even a 5m difference in the position of set nets can lead to failure. Target species are King mackerel, bonito, and Yellowfin tuna.

3-2-7-3. Northern Region

A wide variety of small fixed nets are operated by family members to take advantage of the current in tidal creeks and small bays. Typical is the tidal stow net, which targets Pink shrimp (*Metapeneus affinis*) and Yellow or Shiba

shrimp (*M. joyneri*). In addition, juveniles of a wide variety of finfish are taken. Catches average 2 kg of shrimp and 2 kg of miscellaneous small fish per tidal period.

3-2-8. Long-Line

3-2-8-1. Southern Region

As long-lining is not conducted in Varia Province, we could not gather information on this fishing method.

3-2-8-2. Central Region

In this region long-liners use fairly small vessels powered by 20 - 45 h.p. engines. They lack any deck equipment. Between 10 and 20 km of lines are used per vessel, with individual line lengths varying by species. Demersal species around reefs are caught on lines 20 - 40m long and fitted with 40 - 50 hooks. Lines for pelagic species are 50 - 600m in length, each with 25 - 30 hooks spaced at 20m intervals. Long-line fishing trips are 2 - 5 days in duration, with catch rates of 0.1 - 0.5t/trip. Target species for demersal long-liners are grouper, snapper, and Conger pike and for pelagic long-liners tunas and sailfish, among others.

Apart from the mentioned above, here is a bottom long-line to catch large shark to supply the shark fin trade. Nylon monofilament of 3.6 mm diameter is used for the main rope, to which branch lines of 6 m length are attached at 35 m intervals. For branch lines, 5-m long nylon monofilament of 3.4 mm diameter and hooks of 25 mm are used. Each fishing boat carries 850 hooks attached to a main rope, which can extend for as long as 30 km. Fishing grounds are around the Spratley Islands. The main season is March - June, when sea is calm.

3-2-8-3. Northern Region

Even smaller vessels, powered by 10 - 25 h.p. engines, are used in the

Northern Region. Vessels typically use 2 - 5 km of line, in 100m units. Only day-long trips are undertaken. In this region most long-liners target demersal species; Conger pike, breams, snappers, and croakers, among others.

3-2-9. Shellfish Diving

Ten divers and five boat operators consist of a crew of a diving. A boat used for cockle-diving is crewed by 10 divers and 5 boat operators. They make one day trips, leaving in the morning and returning in afternoon. Divers wear a long-sleeved shirt, long pants, gloves, and canvas shoes. They carry a 10 kg weight at the waist and hold an oxygen hose to their mouth. They work at depths of up to 20 m for 2 - 3 hours, and claim that a group of 10 divers can collect 200 kg of cockle per trip.

(4) Fishing Grounds

The major fishing grounds for fishing boats based in the Central Region are located in the South China Sea (or "East Sea" as it is known in Vietnamese). The 200 m isobath that extends westward from Hainan Island reaches the coast of Viet Nam off (Quy Nhon town, Binh Dinh Province), in the Central Region. Thus in that region the seaward slope is steep and the continental shelf narrow. These topographical characteristics make the development of trawl fishery difficult. In contrast, the shallow and gently sloping bottoms of the Sunda Shelf, off the Southern Region, are ideal for trawlers. Trawlers and purse seiners from Ba Ria-Vung Tau Province work in these fishing grounds in summer, when the sea is calm.

The Paracel Islands and Spratly Islands, scattered in South China Sea, are important fishing grounds for Vietnamese fishers. Particularly those from Phu Qui Island have long used these fishing grounds. If they present a certificate issued by the Vietnamese navy stationed there, fish caught in Paracel and Spratly Islands fishing grounds are exempt from tax.

Fig. 6-1 shows the fishing grounds used by fishers interviewed in the

five surveyed provinces. Except in the Paracel Islands and Spratly Islands, fishing grounds are located within the 100 fathom line. Because the 100 fathom line runs close to shore in the Central Region, the major fishing grounds are divided into the shallow waters of the Gulf of Tonkin to the north and Sunda Shelf to the south. In the Gulf of Tonkin, squid-anglers and drifting gill-netters use offshore fishing grounds, while purse-seiners operate off Hai Phong. In the south, long-liners, pair-trawlers, drift-gill netters, purse seiners, and some lift-netters typically venture offshore fishing grounds.

Compared with others coastal regions of Viet Nam, the Central provinces are characterized by a very narrow band of shallow water nearshore, and a rapid drop-off from the continental shelf within a comparatively short distance of the coast. The sea is deep, bottom materials are mainly mud and sand admixed with shells (N. Long, 1993), and there is comparatively little freshwater and nutrient discharge from riverine sources in this region. This means that off the Central Region, virtually all fishing is conducted just a short distance from the shore.

The fisheries of Ba Ria-Vung Tau Province, however, are distinct. In common with the entire Southeastern Region, fisheries are conducted over very large grounds of shallow water, with muddy bottom and a huge freshwater and sediment discharge from the Mekong River system.

Needless to say, different fisheries operate in different fishing grounds. Single-trawlers use waters of less than 20 fathoms, except off Quang Ngai Province and Phu Quy Island (Fig. 6-2). This is not only because shrimp, the major target species of trawlers are naturally abundant in shallow waters, but also because the small size of the boats prevents them from working offshore areas. Compared to single-trawlers, pair-trawlers have already advanced offshore; they operate in the waters of 50 - 60 fathoms in the Gulf of Tonkin and even on distant fishing grounds more than 460 km away along the Sunda Shelf, to the south. Of course, this is because pair-trawlers are larger than single-trawlers, but at the same time they are attracted by the rich offshore resources which

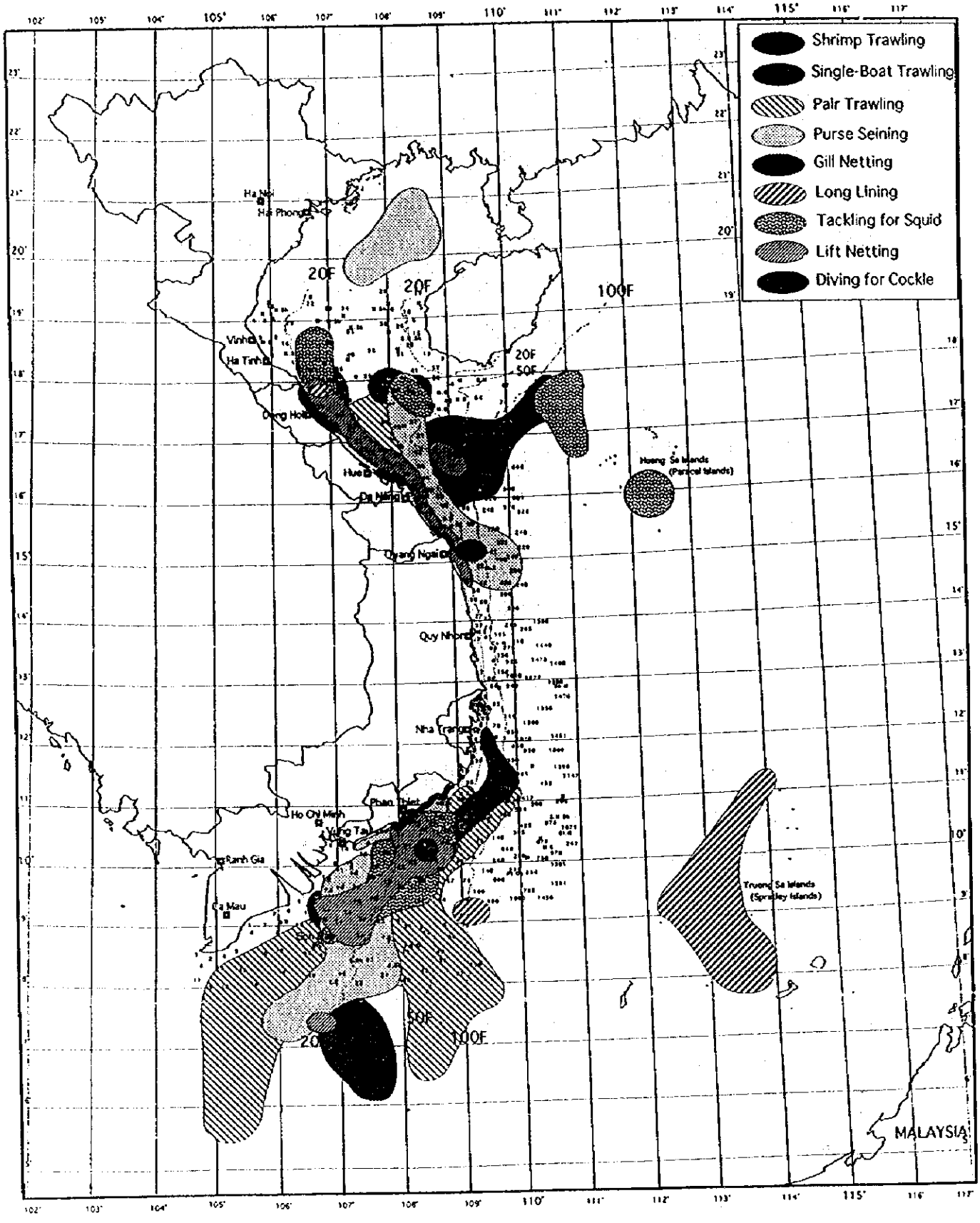

Fig. 6-1 Fishing Ground Distribution for the Central Region in Viet Nam

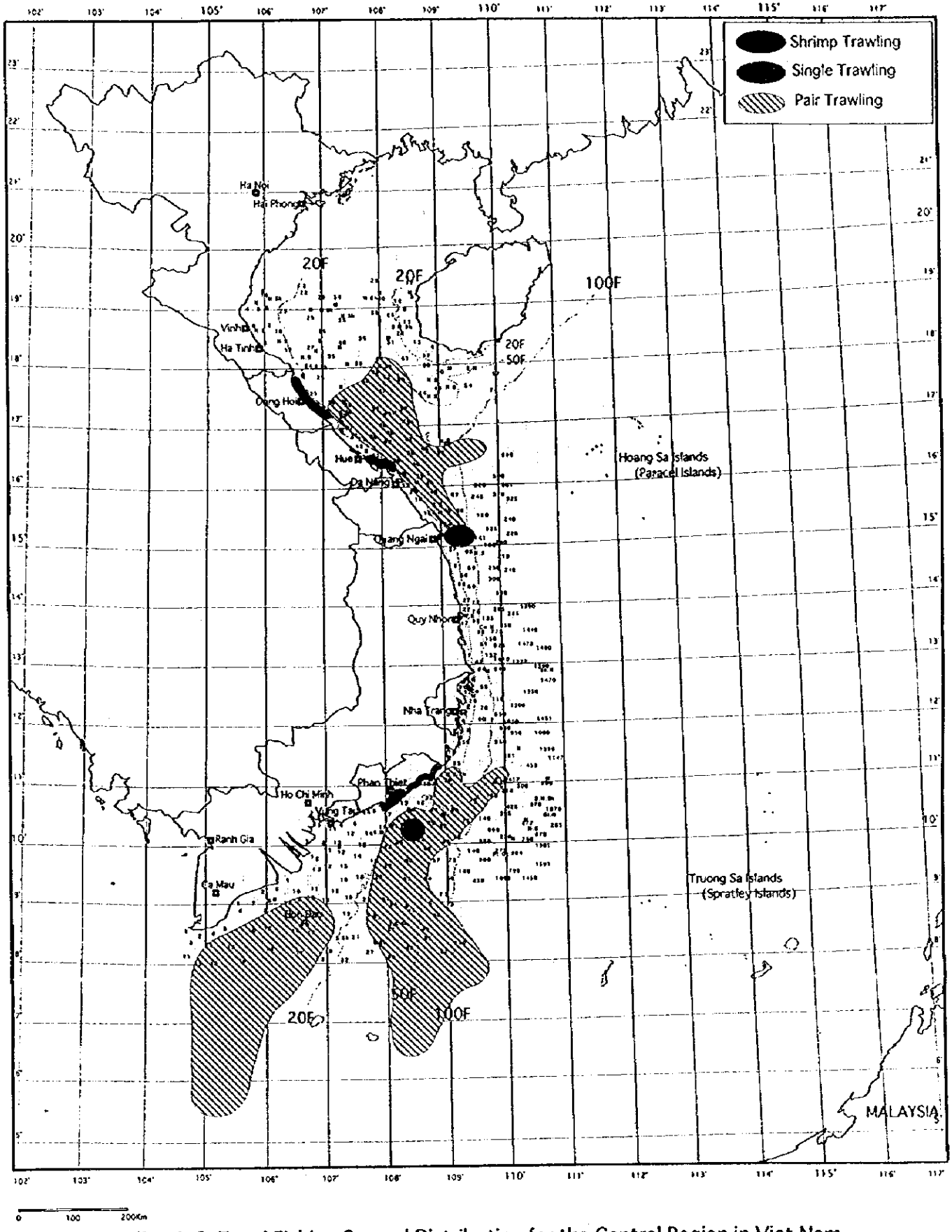

Fig. 6-2 Trawl Fishing Ground Distribution for the Central Region in Viet Nam

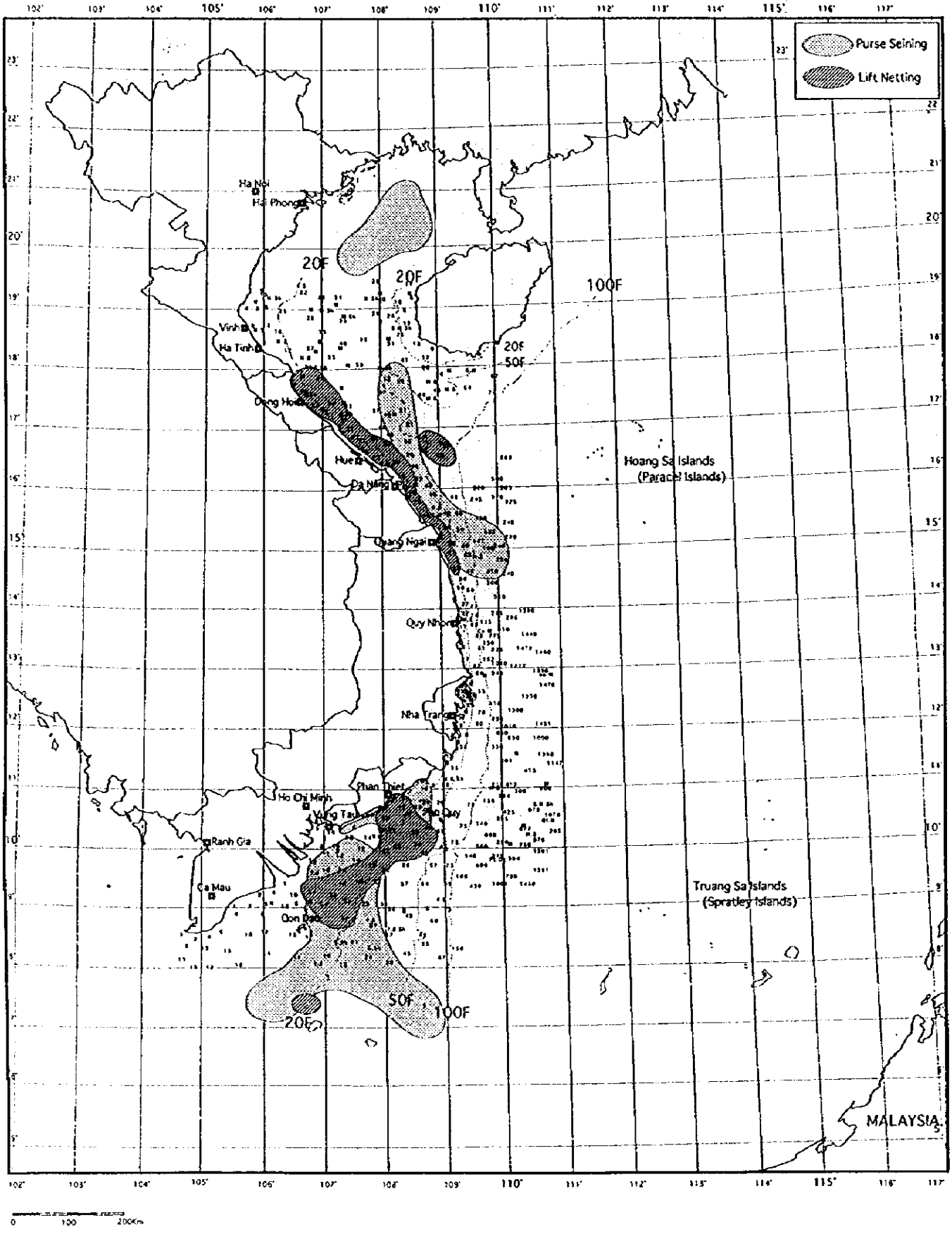

Fig. 6-3 Lift Netting and Purse Seining Fishing Ground for the Central Region in Viet Nam

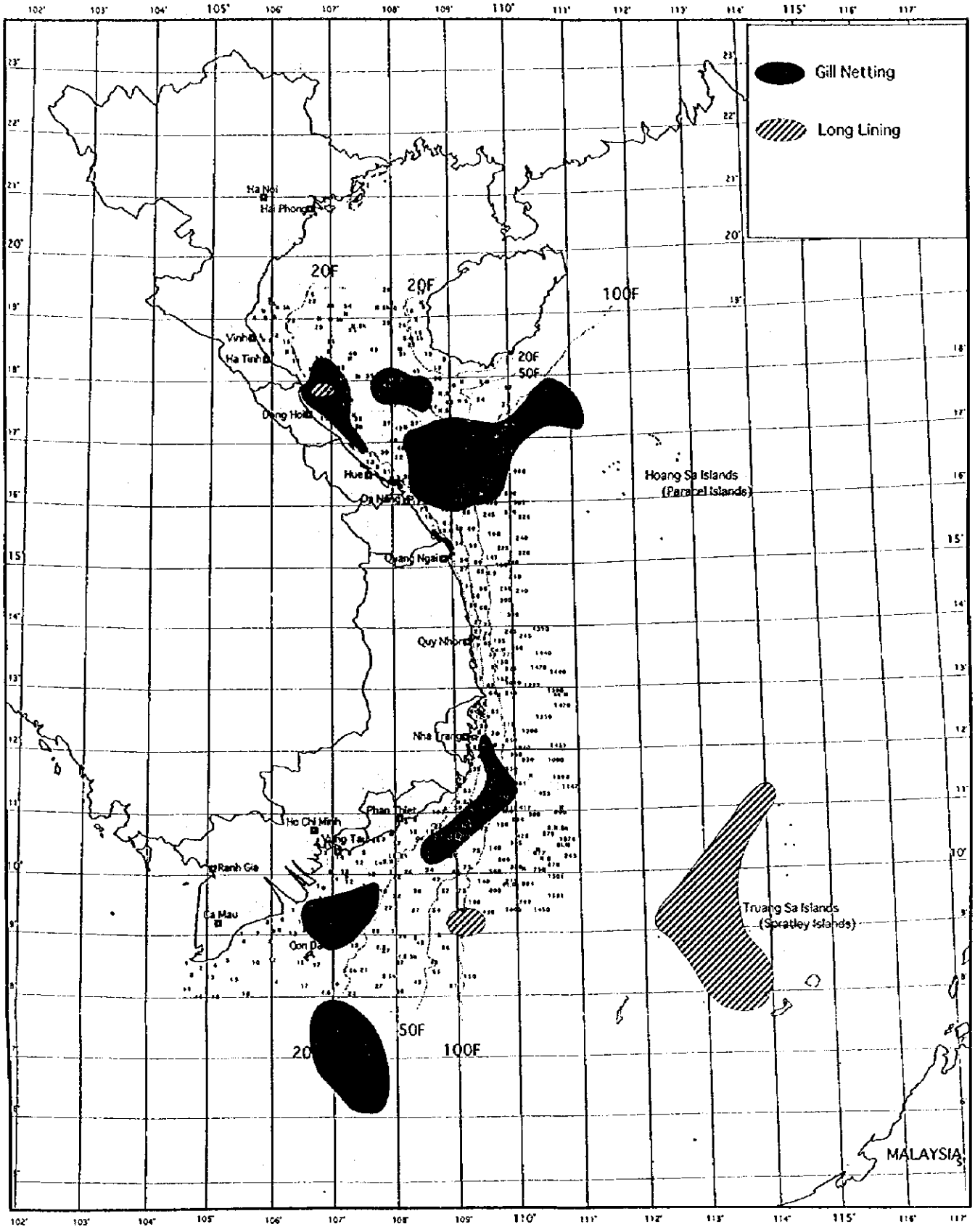

Fig. 6-4 Gill Netting and Long Lining Fishing Ground for the Central Region in Viet Nam

offer far greater incentives than do local coastal fishing grounds already depleted by overfishing. Where the continental shelf is narrow and the continental slope steep, neither type of trawlers operate.

The same tendency in the use of fishing grounds is also observed for lift-netting and purse-seining (Fig. 6-3). The fishing grounds for lift-netting lie within the 50 fathom isobath, and are concentrated mainly in waters shallower than 20 fathoms, except off Quang Nam Da Nang Province. Since lift nets cannot be operated in deep waters, lift netters who want to switch to offshore fishing grounds do so by becoming purse-seiners. Other than off Quang Ngai Province where purse-seiners work in waters of more than 100 fathoms, they usually operate on a wide range of fishing grounds with water depths of less than 50 fathoms.In the Gulf of Tonkin, they work the northernmost areas and a depression in the seabed of more than 50 fathoms, which occurs in the south of the Gulf. In the Southern Region purse seiners operate on grounds of 20 - 50 fathoms, some of which coincide with grounds for lift-netting. Some large purse-seiners now exploit offshore waters 170 km southeast of Con Dao Island.

Gill-nets are used over wider areas, from inshore to offshore (Fig. 6-4) because the variety of gill nets ranges from small ones targeting coastal demersal species to medium ones targeting offshore migratory species. However, these fishing grounds are located largely in the Northern and Southern regions, whereas few occur in the Central Region. Long-line grounds are clearly divided to inshore and offshore areas. Long-liners operating inshore are small-scale and target resident species in rocky areas, whereas medium-scale gill-netters target sharks in waters off the Spratly Islands.

(5) Fish Species by Gear Type

Although some 1,260 species have been identified in the marine waters of Viet Nam, only about 50 are of major economic importance to commercial fisheries. Most fish are generally small, with maximum TBL of 780 mm and an average of 100 - 200 mm. Most species are also short-lived. Coastal species

have an average natural life span of 1 - 2 years and those in deeper waters of 4 - 5 years (N. Long, 1993). The spawning grounds are known to be near the coast, with spawning occurring April through June (N. Long, 1993).

The different gears used by Vietnamese fishers basically target different species. The target species of purse-seiners are yellow tail round scad (*Decapterus maruadsi)*, round scad (*Decapterus lajang*), eye scad (*Atule mate*), yellow stripe trevally (*Selaroides leptolepis*), Indian mackerel (*Rastrelliger kanaguruta*), frigate mackerel (*Auxis thynoides*), and Eastern little tuna (*Euthynnus affinis*). Particularly, yellow tail and round scad are the most important.

The targets of lift-netters are anchovy (*Stolephorus commersonii*), herring (*Sardinella jussieu*), Indian mackerel (*Rastrelliger kanaguruta*), (*Rastrelliger brachisoma*), yellow tail, round scad, yellow round scad sp. (*Decapterus lajang*), eye scad (*Atule mate*), and swordtip squid (*Loligo edulis*). In particular, anchovy, the preferred raw material for fish sauce is one of the most important targets.

Pair-trawlers target high value species for the export market, such as cuttlefish (*Sepia sp.*) and swordtip squid, and they make considerable efforts to explore new fishing grounds in search of them. They also target other species, including purple-spotted bigeye (*Priacanthus tayenus*), ornate threadfin bream (*Nemipterus dexodon*), golden threadfin bream (*Nemipterus virgatus*), white croaker (*Pennahia argentata*), barracuda (*Sphyraena jello*), lizardfish sp. (*Saurida sp.*).

Single-trawlers catch swimming crabs, poker-chip venus (*Meretrix lusoria*), radiated scallop (*Amusium pleuronectes*) in addition to the species caught by the pair trawlers. Shrimp-trawlers target smooth shell prawn sp. (*Parapenaeopsis hardwickii*), green tail prawn sp. (*Metapenaeus affinis*), black tiger prawn (*Penaeus monodon*), and Western king prawn (*Penaeus latisulcatus*).

Drifting gill-netters catch a large volume of Eastern little tuna

(*Euthynnus affinis*) and bonito (*Katsuwonus pelamis*), in addition to thynoid tuna (*Auxis thynoides*), eastern little tuna (*Euthynnus affinis*), frigate mackerel (*Auxis thazard*), king mackerel (*Scomberomorus commersoni*), Indo-pacific mackerel (*Scomberomorus guttatus*), and barracuda (*Acanthocybium solandri*). Bottom gill-netters catch mainly king mackerel, hairtail (*Trichiurus haumela*), and jackmackerel (*Trachurus japonicus*).

(6) Fishing Season

Viet Nam is located in the Asian monsoon zone, and so has two main seasons, the northeast monsoon and the southwest monsoon. Conditions such as temperature, precipitation and ocean currents prevailing in these seasons determine fisheries activities.

The northeast or winter monsoon is from October to March, when seas are rough owing to a strong northeast wind. This forces many small fishing boats stay in ports, especially during the period from November to January. What local fishers consider the "bad season" is caused by abiotic than biological factors. In contrast, the southwest monsoon prevails from April to September. During the transition from the northeast monsoon to southwest monsoon, during April to June, winds weaken, bringing calm seas. This is the best season for purse-seining and lift-netting operations which are difficult in rough seas.

The wet season in the South Region corresponds to the southwest monsoon season and the dry season to the northeast monsoon. However, the Central Region northwards of Khanh Hoa Province receives much rain from October to December, and experiences a dry season from May to September. The months of June and July are the "poor fishing season" for Khanh Hoa lift-net and purse-seine fisheries, which operate at night with lamps. Fishers say that during the calm seas of this season fish are able to recognize and avoid nets in the clear waters that accompany calm seas.

During the northeast monsoon season, a counter-clockwise current in South China Sea flows north to south along the coast of Viet Nam. In the

southeast monsoon season, an ocean current which flows clockwise through South China Sea moves south to north, and part of this current becomes counter-clockwise in the Gulf of Tonkin and flows back north to south along the coast of the Northern Region. Finally the two currents meet off the Central Region, creating a good fishing grounds for the set net fishery around Nha Trang City, Khanh Hoa Province.

Typhoons strike Viet Nam mainly from June to September. Northern Viet Nam, particularly the Gulf of Tonkin coastal area, is affected the most. Areas south to Binh Thuan Province is seldom hit directly, but Khanh Hoa Province suffers a direct hit every 8 - 10 years. In contrast, Quang Nam Da Nang and Quang Binh provinces experience an average of more than 10 typhoons a year, with 2 - 4 direct hits. Fishers suffer a reduced income owing to typhoons and as a result often become financially further dependent on fish merchants.

The results of interviews with local fishers regarding fishing seasons for individual fisheries in the Central Region are summarized in Table 6-7. As discussed above, the timing of the onset of wet and dry seasons changes gradually from north to south, and calm seas occur more frequently in the dry season. It can be seen from Table 6-7 that good fishing seasons develop in the transition periods between the two monsoon seasons. This phenomena is conspicuous in the three more northerly provinces in the table. In the two southern provinces, Binh Thuan and Ba Ria-Vung Tau, the winter (December to February), with rough seas, corresponds to the dry season. With the exception of this three-month period, local fishing boats can operate year round.

In the coastal waters of Viet Nam, the principal factor driving annual fish migration is the monsoonal pattern. During the northeast monsoon fish move southwards along the coast, toward warmer waters, as well as into deeper waters, where temperatures are higher than close to the surface. Conversely, during the southwest monsoon fish move northwards along the coast. The diurnal pattern is that fish move toward shallower surface waters at night and to

deeper waters during the daytime.

Table 6-7 Fishing Season by Type of Fisheies at the Central Region in Viet Nam

●Good, △Intermediate, ×Poor

Region	Type of Fisheries	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Quang Binh	Drift Netting	●	●	●	△	△	×	×	×	×	△	△	●
	Lift Netting		×	×	●	●△	△	△×	●	●	△	×	
	Single-Boat Trawling			△	△								
	Pair Trawling	△	△										
	Squid Angling	●	●						●		●	●	●
QN Da nang	Purse Seining	△	△	△	△	△	●	●	●	△	△	△	△
	Pair Trawling for Fish						△	△	●	●	●	●	
	Pair Trawling for Shrimp	△	△●	●	●	△	△						
Khanh Hoa	Purcse Seining	●	●	●	●	△	×	×	△	△	△	△	△
	Bottom Drift Netting	△	△	●	●	●	●	●	×	×	△	△	△
	Surface Drift Netting		△	△	●	●	●	△	△	×	×	×	×
	Pair Trawling		×	×	△	△				●	●	×	×
	Set Netting		×	×	△	●	●	△	×	×	×	△	△
	Long Lining for Shark		△	●	●	●	△						
	Squid Angling	△	△							△	●	●	△
	Lift Netting	△	△		●	●	×	×	●	●	△	△	△
Binh Thuan	Single-Boat Trawling	△×	△×	△	△	●	●	●	●	●	●	●△	●△
	Lift Netting for Squid			△	△	△	△	△	●	●	●	●	
	Cast Netting for Squid	△	△						△	●	●	●	●
	Diving for Cookie	●	●	●						△	△	△	△
	Purse Seining	×	×	●	●	●	●	△	△	△	×	×	×
BR Vung Tau	Large Size Purse Seining	×	×	●	●	●	●	●△	△	△	△	×△	×
	Large Size Pair Trawling	△×	×△	×△	△	△	●△	●	●	●	●	●	△×

(7) Fisheries Infrastructure

There are fish landing facilities for large-sized fishing boats in 32 fishing ports in Viet Nam, which can supply fuel, ice and water, and provide repair services and emergency refuge. However, little modern fishery infrastructure is available in small- to medium-sized fishing ports, where a large quantities of fish are landed directly onto sand beaches, owing to the lack of landing facility.

As of 1992, there were 120 ice plants nationwide, producing 2,000 tons of ice per day. There are also 126 cold storage facilities with a combined the

total capacity of approximately 20,000 tons (RIMP, 1994). Thirty five state-run boatyards build and repair fishing boats, and include yards capable to building large boats with engine of more than 100 h.p. and equipped with a freezer. In addition, there are many small local yards building smaller fishing boats based on traditional technology.

Only 30 - 60% of boats carry ice on fishing trips. Landed fish are not handled quickly and properly in landing places. In many places small sampans move back and forth between a beach and fishing boats which remain at anchor off the beaches. The unloading work requires a long time, and in the climate of Viet Nam naturally lowers the freshness of fish. Often, people gut fish on beach and "clean" them with seawater. However, since a proper drainage system and toilets are lacking in many landing places, human and domestic waste flows across the beach or directly into the sea, where it mingles with waste oil and other discharge from fishing boats. Such a situation in many fish landing places raises concern about the sanitary conditions of landed fish.

The Vietnamese government intends to improve the situation by constructing new ports and rehabilitating existing ports. The construction of Cat Lo Fishing Port in Ba Ria-Vung Tau Province will be completed in 1998, using USD 24 million grant provided by the Japanese government. The Vietnamese government will implement 10 other projects to rehabilitate or upgrade fishing ports during the period 1996 - 98. These fishing ports are at Cat Ba (Hai Phong), Cua Hai (Nghe An), Xuan Pho (Ha Tinh), Gianh (Quang Binh), Thuan Phuoc-Han (Quang Nam Da Nang), Phan Thiet (Binh Thuan), Tac Cau (Kien Giang), Phu Quy (Binh Thuan), Con Dao (Ba Ria-Vung Tau), and Ca Mau t (Minh Hai). Of a total budget of USD 71 million, USD 57 million is being financed by the Asian Development Bank.

(8) Marketing

Landed fish are purchased by fish traders. The fish are then sorted by species and size, cleaned with seawater and packed with crushed ice and

sometimes salt in baskets made of bamboo, rattan or plastic. Finally they are trucked to consumers, mainly in urban areas, both within a province or in other provinces.

Financially powerful fish traders provide credit to fishers to finance fishing operations and boat maintenance. They are repaid by the right to exclusive sale of the catch. In Nha Trang City, Khanh Hoa Province, a trader dealing with export species such as cuttlefish, squid, shrimp and lobster finances 15 subsidiary trawlers and 40 - 50 other fishing boats, including drift-netters, set-netters and purse-seiners. She sells 90% of fish to a province-run cold storage and 10% to private cold storage enterprises. Small-time fish merchants buy fish at the beach and carry it in fresh to local consumers on foot or by bicycle. Most do not use ice.

(9) Fish Processing

The fish processing industry in Vietnam has developed remarkably over the last 15 years. The production of marine products in 1992 is shown in Table 6-8. Frozen shrimp accounts for an overwhelming share of the exports of marine products, accounting for 67% of total export value. Squid and cuttlefish are also important export commodities. Squid caught by angling are dried on board, and cuttlefish are caught by trawlers and exported as a frozen product.

Table 6-8 Production of Fish Processing (1992)

Type of Fish Processing	Domestic Consumption	Export
Dried	5,635ton	4,441ton
Frozen Shrimp	462ton	47,797ton
Frozen Squid / Cuttlefish	324ton	5,000ton
Frozen Fish	-	15,000ton
Fishmeal	15,155ton	-
Fish Sauce	143,352kl	-

Source: FAO, 1993

Fish are frozen in the round or filleted before exporting. There is also a limited volume of canned fish. But only 10% of the fish production of Viet Nam is for export markets. In the domestic market fish are consumed fresh, salted, dried, grilled, processed to fish meal and as fermented fish sauce and other products. As much as 120,000 t/year of fish is used to produce fermented fish sauce (*nuoc mam*), the indispensable condiment in Vietnamese cuisine. Anchovy (*Com*) is the preferred species for this, but fingerlings of round scad and other species are also used.

The fish processing sector in Viet Nam is divided into an industrial sub-sector, which processes mostly for export, and an artisanal sub-sector, which produces for the domestic market. The bulk of the industrial sub-sector processes frozen fish, whereas the artisanal sub-sector relies mostly on the traditional techniques of salting, sun-drying, and fermentation. Only a minor fraction of landings enter the domestic market without any processing.

Apart from the production of fermented fish sauce, and related products, there is virtually no information on fish processing products. This is to be expected since most are produced by households and small-scale operators. The total production of fermented fish sauce remained constant at almost 160 million liters per year during the period 1986 - 1991, the last year for which estimates are available. The industry sub-sector is the dominant in fish sauce production in the Southern Region, while the Northern Region is characterized by cottage industry as well as by household production. As a consequence, there is considerable variation in the production processes over the Northern Region.

(10) Consumption

The per capita annual fish consumption, which was 18 - 19 kg in the late-1960s, had declined to 12 kg by 1988. The decline has continued and estimated consumption in 1990 was 10.5 kg. More recent estimates of fish consumption range from 12 kg, of which 8.4 kg is derived from marine fish (Ramboll, 1996), to 14 kg (State Planning Committee-GSO, 1994; GSO, 1995).

Table 6-9 Annual per Capita Consumption of Fisheries Products (1988)

Region	Annual per Capita Consumption
Northern Mountain	2~3kg
Northern Delta	6~10kg
Central North	8~9kg
Central South	18~20kg
South	20~60kg

Source : MOF

Table 6-10 Annual per Capita Consumption of Basic Foodstuffs in Viet Nam and the Coastal Regions

Location	Rice(kg)	Meats (k)	Eggs (units)	Aquatic Products (kg)	Vegetables (kg)	Fermented Saucesand Pastes (liters)
VIET NAM	165	7	13	14	51	4
VN (Urban Areas)	137	11	29	17	53	5
VN (Rural Areas)	172	6	10	13	50	4
North-Central Coast	163	5	11	10	55	4
South-Central Coast	146	5	11	20	34	6
North-East South Coast	148	8	11	19	40	5

Source: Computed from data in State Planning Committee - GSO (1994) and GSO 1995(b)

Fish consumption patterns vary by region, depending on access to fish products, income level, and local preferences (Table 6-9). The share of fishery products in the total animal protein intake was approximately 50% in the 1960s and 1970s but subsequently declined to 32% in 1991.

The information on the annual average per capita consumption of basic foodstuffs provided in Table 6-10 demonstrates the well-known changes in dietary behaviour resulting from urbanization. For example, rice consumption is below the national average of 165 kg in urban areas, the urbanized North-East South Coast and along the relatively urbanized South-Central Coast. Similarly, with the exception of the South-Central Coast, the consumption of meat, aquatic

Table 6-11 Export Total Amount (US$1,000) by Province in 1993-94 and their Ranking

Region	Province	1993	Ranking	1994	Ranking
North	Quang ninh	3,000	19	3,900	20
North	Hai phong	4,600	15	6,200	15
North	Thai binh	470	27	650	27
North	Nam ha	2,000	21	2,500	23
North	Ninh binh	183	28	400	28
North	Thanh hoa	5,020	14	8,000	12
North	Nghe an	2,000	21	3,500	21
North	Ha tinh	2,140	20	4,005	18
Central	Quang binh	1,600	24	2,010	25
Central	Quan tri	1,700	23	3,100	22
Central	Thua Thien Hue	4,020	17	4,607	16
Central	QN Da nang	8,500	8	13,500	8
Central	Quang ngai	1,382	25	2,400	24
Central	Binh dinh	4,237	16	4,030	17
Central	Phuyen	1,265	26	1,030	26
Central	Khanh hoa	15,237	4	23,000	5
Central	Ninh thuan	7,000	11	11,000	11
Central	Binh thuan	11,899	5	11,500	10
South	BR Vung tau	9,515	6	16,000	6
South	Ho Chi Minh	52,032	2	34,182	2
South	Thien giang	8,200	10	6,500	14
South	Ben tre	9,188	7	12,050	9
South	Tra vinh	6,509	13	6,582	13
South	Vinh long	3,900	18	4,000	19
South	Can tho	7,000	11	28,000	3
South	Soc trang	8,336	9	14,000	7
South	Minh hai	96,500	1	113,533	1
South	Kien ginag	17,430	3	24,526	4
	Others	73,572		93,495	
	Total	368,435		458,200	

Source : MOF (Provinces Surveyed)

products and fermented sauces and pastes of marine origin is also higher than the national average. In terms of fisheries it is important to note that whereas 14

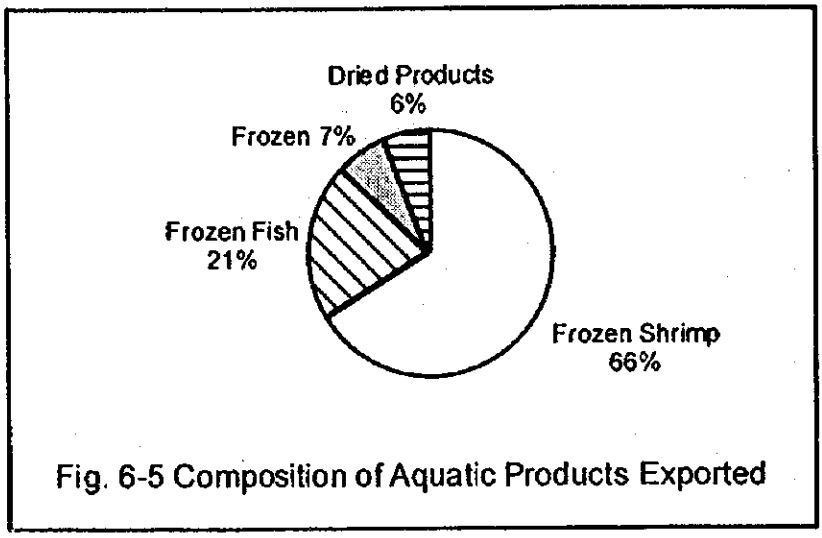

Fig. 6-5 Composition of Aquatic Products Exported

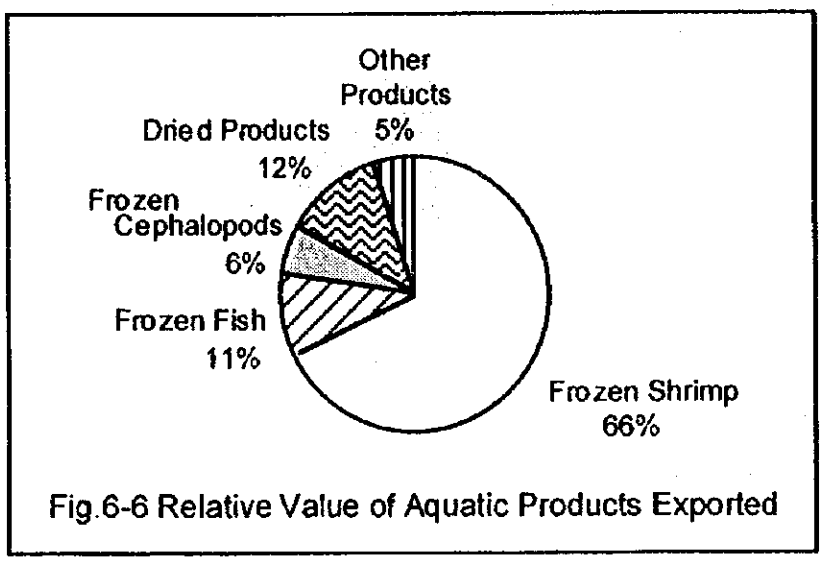

Fig.6-6 Relative Value of Aquatic Products Exported

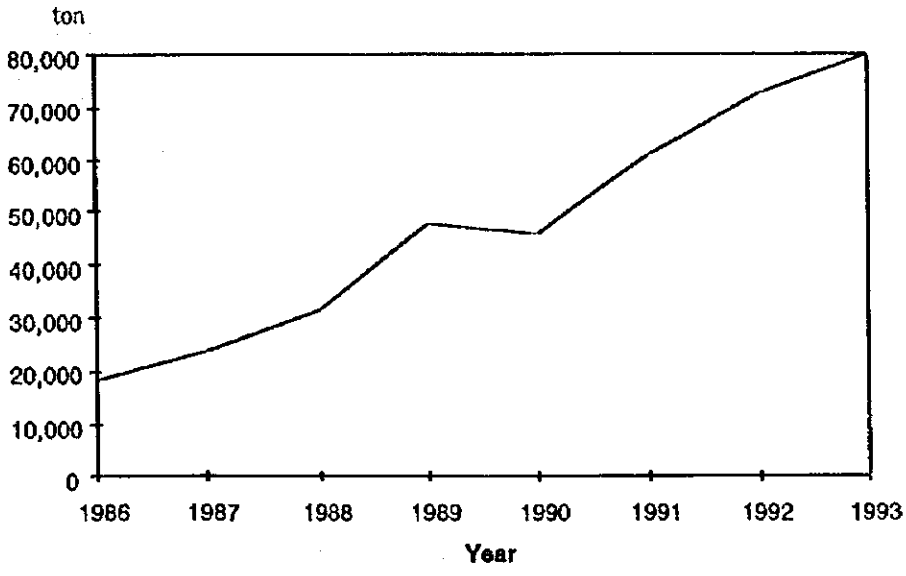

Fig. 6-7 National Increase in Exports of Aquatic Products, 1986-1993

kg is the estimated national average consumption, there is regional variation. The rate is less in rural areas nationwide (13 kg).

(11) International Trade in Fishery Products

The export of fishery products from Viet Nam increased 20-fold from 3,241 t in 1980 to 64,366 t in 1990, making Viet Nam one of major marine products exporting countries in Asia. Export earnings of USD 11.2 million (1988) increased rapidly to USD 305 million (1992) and to USD 458 million (1994), a 40-times increase. Shrimp-producing provinces of the Southern Region are the leading exporters; the first is Minh Hai Province, with USD 114 million followed by Ho Chi Minh City, Can Tho Province, and Kieng Giang Province (Table 6-11).

The composition and value of aquatic commodities exported are show in Figs. 6-5 and 6-6, respectively. The growth rate of the volume of aquatic products exported during the period 1986 - 1993, for Viet Nam is shown in

Figs. 6-7[1]. As is demonstrated in Figs. 6-5 and 6-6, the export sector is dominated by frozen products (shrimp, fish and cephalopods), which together comprise 94%. Frozen shrimp, which accounts for 66% of both the quantity and value, is the main product exported. As is demonstrated in Fig. 6-7, the volume of marine products exported has increased dramatically during the period 1986 - 1993, from about 20,000 t (1986) to around 80,000 t (1993)

During the last almost two decades the fish processing sector in Viet Nam has increased greatly, particularly the capacity to export shrimp and frozen fish. The number of fish freezing plants has increased from 20 in 1980 to 164 in 1995 (DANFICO, 1995). The total national processing capacity is an estimated 130,000 - 150,000 t per year. Most (80%) of the fish processing plants remain within the public sector, with the remaining 20% under various modes of ownership (DANFICO, 1995).

(12) Fisheries Education and Extension

12-1. University Education

Only the Nha Trang Fisheries University, which was founded 37 years ago, is the only university exclusively in the field of fisheries education in Viet Nam. The university is operated by the Ministry of Education and Training. The university offers a 4 and 5-year Bachelor degree, as well as graduate degrees at the masters (2 - 3 years) and doctoral (4 - 5 years) levels. It also has a 3-year college and a 2-year vocational training program. There are approximately 4,000 students. The annual intake is about 1,000, but about 50% drop-out during the 4-year program. There is a 600-student branch campus near Ho Chi Minh City.

The university has the following departments:

- Marine Products Exploitation,
- Seamanship,

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1 However, it should be noted that in the available sources consulted the data are contradictory, and so unreliable.

- Fishing,
- Mechanical Engineering,
- Aquaculture,
- Fish Processing,
- Fisheries Economics,
- Information (including the administration and management of fisheries), and
- Oceanography.

The University has specialised research/education centers, in the following fields:

- Gear and Boat Manufacture,
- Aquaculture,
- Fish Processing,
- Fisheries Technology, and
- Information and Foreign languages (English and Russian).

In addition, both undergraduate and post-graduate courses either directly in or related to marine fisheries and aquaculture (or both) are offered at the University of Agriculture No. 1, in Hanoi, the University of Agriculture and Forestry, in Ho Chi Minh City, and at the University of Can Tho, in the Mekong Delta. However, in all three universities the emphasis is on culture fisheries and marine capture fisheries receives comparatively little attention.

12-2. Fisheries Training Institutions

Four specialized fisheries vocational training schools conduct training based on government requirements or via contracts with individual provinces or other organizations. Three of these vocational schools are located in the Hai Phong area and one in Ho Chi Minh City. All have somewhat distinct areas of training (Table 6-12).

Table 6-12 Type of Training Provided by Fisheries Training Institutions

TRAINING INSTITUTION	TRAINING AREAS
Fisheries V ocational Training School No. 1 (Hai Phong)	Technicians in fish exploitation, boat engine, boat-building, fish processing and re-training captains and engineers.
Fisheries V ocational Training School No. 4 (Ha Bac)	Technicians m ainly in aquaculture, planning, wages and labor, statistics, accounting, and up-grading courses
Fisheries Technical Workers School (Hai Phong)	Training o f sailors, mechanics, radio operators, a nd refrigeration and electrical technicians
Fisheries V ocational Training School No. 2 (Ho Chi Minh City)	Training technicians, and workers and up-grading courses.

12-3. Fisheries Extension Services

Since 1993 a major effort has been made to by the MOF to develop a fisheries extension system. Most coastal provinces have Fisheries Extension Centers (FECs) under the control of provincial fisheries departments, each staffed by 5 - 7 persons. Each FEC is responsible for developing an annual Fisheries Extension Program, which must be approved by the provincial Fisheries Department before implementation. Funds are provided by the central government via the provincial fisheries departments.

Two of the five approved extension programs concern marine capture fisheries: (a) the development of off-shore marine fisheries and the protection of fishery resources and (b) conservation, processing and up-grading of aquatic products[2]. Between late-1994 and early-1995 some 750 training courses of 2 - 3 days duration had been given during which 450 extension officers and approximately 42,000 fish farmers and capture fishers were trained. For marine capture fisheries courses were provided in the use of advanced electronic equipment (echosounders and GSP instruments), fish processing and conservation. Such courses are organized for leading members of fishing communities who then are expected to pass on what they have learned to other

2 The other three extension programs are directed toward marine and fresh water fisheries.

members of their community.

From the perspective of capture fisheries, the main constraint in the program is that the core technical staff at the FECs are aquaculturalists. In the capture fisheries sector most effort is directed at explaining the laws and local rules that must be obeyed, rather than imparting new technical information to fishers.

Other constraints must be overcome if the fisheries extension system based on the FECs is to become effective in reaching marine capture fisheries. The main constraints are:

- the principal sources of funding from the MOF and provincial Fisheries Departments is insufficient;
- most programs are aimed at aquaculture;
- few extension officers have received any training in extension methodologies (courses for which are not provided in either universities of vocational training schools);
- although extension documentation is generally widely available it is not used well since documents are generally handed to fishers without oral explanation and so may not be fully comprehended.

(13) Fisheries Administration

13-1. The National Level

At the central government level, principal responsibility for fisheries administration is vested in the Ministry of Fisheries (MOF). The MOF receives directives from the Council of Ministers and coordinates its actions with the Fisheries Department of the State Planning Committee. Established in 1976 as the successor to the General Department of Fisheries, which was founded in 1960, the MOF is organized into nine departments which function as advisory bodies to the Minister of Fisheries. The functions of the departments is shown in Table 6-13.

Table 6-13 Ministry of Fisheries Departments and Their Responsibilities

Department	Responsibilities
Planning and Investment Department	To aid the minister in the fields of investment planning, capital construction, statistics linking fisheries development with coastal economic, social and security development, evaluating to establish and re-establish state-owned fisheries enterprises.
Finance and Accounting Department	In charge of financial management of the Ministry, managing accounting activities of the Ministry's administrative departments. It also manages state budget to the Ministry and its administrative units, units, financial accounting of development investment implemented by the Ministry.
Science and Technology Department	To aid the minister in fisheries sciences and technological aspects, building strategies and policies for fisheries sciences and technological development.
International Co- operation Department	To aid the minister in international co-operation, serving as co-ordinator in economic and technical co-operation with foreign countries.
Fisheries Management Department	To study and build policies and directions for developing fisheries; renovating, building and developing non-state fisheries enterprises.
Personnel and Labor Department	aiding the minister in labour organization, salary and training
Department of Resources Preservation	To aid the minister in preservation and development of fisheries resources, fisheries veterinary, fisheries safety insurance, organizing and managing the work of fisheries resources preservation and disease prevention, monitoring technical safety, registering ships and pressurisea machines as regulated by the Ministry, inspecting the preservation of fisheries resources.
Inspectors Section	To aid the minister in inspecting and considering letters, serving as the office for receiving and settling complaints, co-ordinating with other concerned departments to carry inspection in the Ministry, managing inspection over other departments and units of the Ministry.
Administration Office of the Ministry	To aid the minister in Building up and organizing the implementation of working programs, following after this implementation, proceeding information for leaders of the Ministry, following up with the implementation of the minister's decision, carrying out Administration Office of the ministry, administrative, statistic job, ensuring logistical communication condition for the Ministry.

Source : MOF

The MOF is also responsible for five national fisheries research institutes, three vocational schools, one technical training school, and seven fisheries enterprises.[3] Formerly its mandate was the direct control of fishing activities. Although it set production targets it lacked both the authority and means to ensure that the targets were met. But since the reforms the MOF now has the role of projecting central government's influence in policy and planning together with the People's Committee of each province to ensure the transition of the fisheries sector to a market orientation.

13-2. The Provincial Level

Fisheries authorities exist in 27 of the 42 provinces of Viet Nam and in 127 of the 400 Districts within the nation. An unknown number exist in communes, the lowest administrative level. They are responsible for capture and culture fisheries activities, planning, collection of statistics, and regulating local fisheries enterprises. Although nominally under the MOF, these local authorities are under the administrative and political direction of the People's Committee in each province, district and commune. Despite an overall agreement on national fisheries policy and technical cooperation, this dual allegiance of the fisheries administration can be a source of conflict, as each level of government apparently has its own agenda and set of priorities for the local fisheries sector. At the provincial level, fisheries are open access to all provincial fishers. In some cases, inter-provincial entry contracts, plus an entry license for each boat, are made to permit outsiders to operate in provincial waters.

(14) National Fisheries Policy

At the beginning of this decade, the Vietnamese government has indicated five principal policy objectives for the period 1991 - 2000 (MOF,

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3 The five research institutes are: No1, No2, No3 (Nha Trang City), RIMP and Institute for Fisheries Planning and Economy (Hanoi City).

1992). These are to:

- increase the direct consumption of fishery products;
- increase export earnings;
- create employment within the sector;
- improve the infrastructural, equipment and technological base; and
- increase the contribution to the national budget through increased rent.

14-1. Increase the Direct Consumption of Fishery Products

The estimated average annual per capita fish consumption in Viet Nam is 14 kg in 1994, accounting for an estimated 40% of national animal protein intake. Although it is intended to increase this rate of consumption, no target consumption figures are available.

14-2. Increase Export Earnings

It is intended to increase foreign exchange earnings by (1) increasing the volume and value of the export-oriented species landed, and (2) greatly increasing the amount of value added by improving the fish processing sector. In particular, it is intended to eliminate the need for reprocessing and repackaging of products in importing countries by processing in Viet Nam precisely to end-user requirements.

14-3. Create Additional Employment

Somewhat over half a million persons are employed directly in the fisheries sector. In addition probably several million other persons are dependent on fisheries either for subsistence or in related commercial industries such as fish processing, a particularly important source of employment for women. According to Chung (1993) policy-makers aim to employ about 4 million in the fishery sector by the year 2000 (an additional 3 million persons, since he is

assuming about 1 million persons are already employed directly in the sector).

14-4. Improve the Infrastructure, Equipment and Technological Base

Along with capital supply, the need to upgrade the infrastructure, equipment and technological base is regarded as the most important of the five main aspects of the nation's fisheries policy. Infrastructure development would include principally the upgrading of landing site and marketing and distribution facilities. Improvement of equipment and the technological base is mainly aimed at reducing the number of small vessels operating in already overexploited nearshore waters by building larger fishing boats for distant waters. There is also an increasingly urgent need to construct fishing boats from materials other than the traditionally used timber, since the availability of the requisite species is now declining.

14-5. Increase the Contribution to the National Budget

Although inshore waters with depths of less than 50 m are now regarded as fully exploited, it is estimated that an additional catches could eventually be landed from 1 million km^2 of continental shelf waters under the jurisdiction of Viet Nam. Much of this added production could be processed in Viet Nam to add to tax revenue for the government.

6-2. Fisheries in Each Province

(1) Relative Importance of the Five Provinces in National Marine Fisheries

1-1. Marine Fisheries

Although with the exception of Quang Binh Province, the five provinces surveyed rank fairly high in the percentage contribution to the total national marine fisheries production, they are relatively lower in the value ranking. The combined tonnage of marine fish landed annually in the five provinces represents almost 29% of the total national marine fish landings (Table 6-14). Four of the provinces surveyed are within the "top ten" marine fish producers in Viet Nam; Ba Ria-Vung Tau Province alone is responsible for 10% of the national total,

Table 6-14 Contribution (1993) of the Total Production of Marine Fisheries in the Five Provinces of National Total and National Ranking of Province

Province	Amount (1,000 t)	%	Rank
B. Vung Tau	65.9	10	2
Binh Thuan	55	8.3	4
Khanh Hoa	31.2	4.7	5
QN Da Nang	29.8	4.5	7
Quang Binh	7.8	1.1	20

Source: General Statistical Office (1994)

Table 6-15 Contribution (1993) of the Gross Value of Fisheries Production in the Five Provinces Surveyed as Percentage of National Total and National Ranking of Province

Unit: USD Million

Province	Amount	%	Rank
B. Vung Tau	8.85	5.7	6
Binh Thuan	6.74	4.3	7
Khanh Hoa	3.06	2	10
QN Da Nang	2.44	1.5	14
Quang Binh	1.25	0.8	23

Source: General Statistical Office (1994)

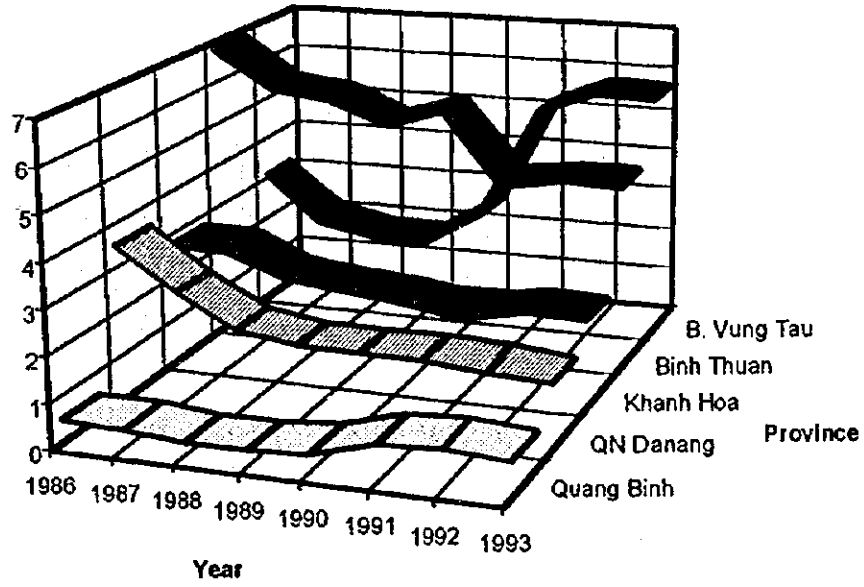


Fig. 6-8 Percentage Contribution of the Five Provinces Surveyed to the Total National Value of Aquatic Resource Production, 1986 - 1993

and ranks only second to Kien Giang Province, further south. Binh Thuan Province ranks fourth, Khanh Hoa Province fifth, and Quang Nam Da Nang Province seventh. Only Quang Binh Province is among the lowest producers, ranking 20 out of the 26 provinces for which data are recorded. Together, the five provinces contribute 14.3% of the total value of the fish production of Viet Nam in 1993 (Table 6-15).

Over the 8-year period 1986 - 1993, the combined contribution of the five provinces to total national fisheries production has increased slightly, from 25.9% in 1986 to 28.5% in 1993. However, this varies by province (Fig. 6-8). Only Ba Ria-Vung Tau Province recorded a major increase in its contribution during the period, from 4.3% in 1986 to 9.9% in 1993. The contribution of Binh Thuan Province also grew slightly, and that of Khanh Hoa Province has essentially remained constant throughout the period. In contrast, whereas Quang Binh Province declined slightly from 1.2% in 1986 to 1.1% in 1993, the contribution of Quang Nam Da Nang Province showed a large decrease from 7.6% to 4.5%. In terms of value, the share of the five province combined

declined slightly from 16.7% in 1986 to 14.3% in 1993.

1-2. Fish Processing

Combined, the five landing sites surveyed account for 11% of the total aquatic products exported from Viet Nam, based on 1993 figures (GSO, 1994) (Table 6-16). If the very high export of frozen shrimp from Minh Hai Province, which accounts for 25% of national exports in the sector is excluded, the five provinces account for 15% of Viet Nam's export of aquatic products.

Table 6-16 Aquatic Products Exports (1993) of the Five Province Surveyed as Percentage of National Total and National Ranking of Province

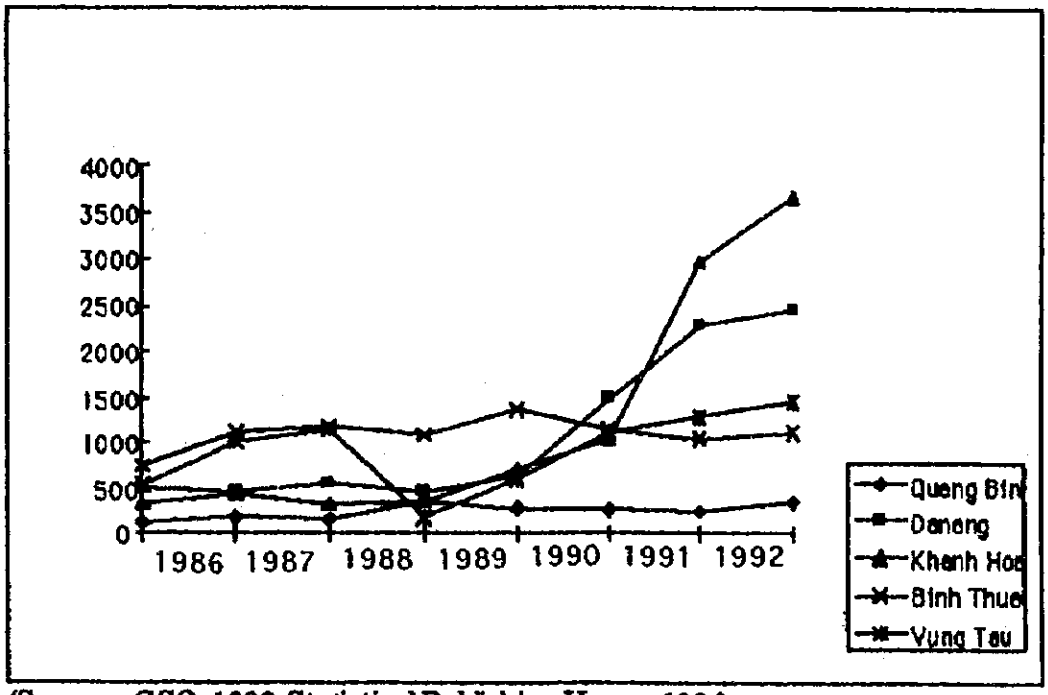
Province	Amount(t)	%	Rank
Khanh Hoa	3670	4.6	2
QN Da Nang	2440	3.0	4
BR Vung Tau	1440	1.8	8
Binh Thuan	1100	1.4	14
Quang Binh	350	0.4	22

Source: Calculated from data in GSO 1994

In each of the five provinces, an increasing trend in the exports can be discerned over the 1986 - 93 period(Fig. 6-9). This has occurred markedly since 1990 in the cases of Khanh Hoa and Quang Nam Da Nang, and somewhat earlier in Ba Ria-Vung Tau. Binh Thuan Province appears to have participated to a far lesser expansion of processed fish exports is probably deceptive because a large amount of the fish landed in Phan Thiet and other sites in the province are purchased by agents of processing plants in Ho Chi Minh City. As a result those amounts do not appear in the export results of Binh Thuan Province.

As is demonstrated in Table 6-17, the five provinces surveyed contribute only insignificantly to the export of frozen shrimp, the principal aquatic product exported from Viet Nam. Together, they contribute a total of just under 2% to the national export of this commodity. Apart from Quang Nam

Da Nang, which is ranks as the twelfth shrimp freezing province, the remainder are among the lowest producers of this product in Viet Nam.



(Sources: GSO, 1992; Statistical Publishing House, 1994)

Fig. 6-9 Rate of Export of Aquatic Products in Five Provinces Surveyed

Table 6-17 Frozen Shrimp Exports (1993) of the Five Provinces Surveyed as Percentage of National Total and National Ranking of province

	Amount (t)	%
QN Da Nang	456	0.93
Khanh Hoa	120	0.3
BR Vung Tau	128	0.26
Quang Binh	120	0.25
Binh Thuan	100	0.2

Source: Calculated from data in GSO 1994

Notes: Khanh Hoa data are for 1991

(Statistical Publishing House, 1992)

(2) Ba Ria-Vung Tau Province

2-1. Profile of the Province

Geography

Ba Ria-Vung Tau Province covers both mainland and offshore territories. The mainland part of the province covers 96% of the total area, borders Dong Nai Province in the north and Binh Thuan Province in the east, and faces the South China Sea in the south and east. The offshore territory of the province which covers 4% of the total area is Con Dao Island, 200 km away from Vung Tau City. The mainland Ba Ria-Vung Tau Province is situated on Di Linh Highlands, but three quarters of the area are low valleys which are favorable for agriculture. Ba Ria-Vung Tau Province has a coastline of 100 km, not including islands, which provides tourist resorts and bases for fisheries.

The capital of Ba Ria-Vung Tau Province is Vung Tau City. There are also four other administrative units -- three mainland districts of Chau Thanh, Xuyen Moc, Long Dat and the offshore district of Con Dao. The population of the province is around 700,000 of which 300,000 people are economically active.

Socio-economics

The province's economy is booming with the national economic growth. In 1993, industrial and handicraft production output increased by 4.6%, agricultural output 15%, export volume 10% and turnover from tourist services 33.3%. Per capita GDP of the province is USD 328 in 1995.

Industry

The province is one of a few places in Viet Nam that offers the biggest potential of oil and gas exploitation and refinery industry. Its offshore continental shelf is a major site for oil and gas production, with the reserves of some billion tones. Numerous oil rigs are working as far as 60 km offshore. Oil and gas production is the predominant industrial sector in the province,

contributing considerably to advance the overall economic development of Ba Ria-Vung Tau Province.

The processing of fish and farm products is also an important sub-sector in the industry. In recent years, small-scale private factories are innovative in applying new food processing technology to make products such as desiccated beef. State- and province-owned companies are also play an important role in producing food, feed and rubber latex.

Agriculture

The agricultural sector makes a significant contribution to the economy of the province by supplying raw material to agro-industry. The province has 81,760 ha of farming land, equivalent to 41% of the total area of the province. They are 47,300 ha for perennial plants and 34,460 ha for annual crop, of which 15,100 ha are used for paddy. In addition, forests cover 67,540 ha.

Land used for annual crop has increased by 3.2% in 1995 from the previous year, particularly for rice, maize and cassava. Gross food products are evaluated to be 149, 030 t on basis of rice value, a 11.4% increase from 1994. Industrial crops include rubber, coffee, cashew and pepper. Rubber plantations grow rapidly, with the production area of 19,460 ha and an annual output of 9,500 t of latex. The intensive farming of coffee and pepper has also developed, while the number of cashew tree has increased considerably.

For livestock raising, the number of pigs was 104,700 at the end of 1994, but it has increased to 125,000 in 1995 with an output of 13,700 t of pork meat. The province also has approximately 25,370 heads of cattle and 2,540 heads of buffaloes.

Service Sector

The service sector of the province, tourism in particular, has grown to the highest level of development within Viet Nam. There are many hotels and restaurants in and around Vung Tau City. Tourism and other services contribute

about 33% of the provincial GDP.

2-2. Fisheries Overview

There are 2,987 fishing boats in 1995 in Ba Ria-Vung Tau Province. By engine capacity fleet composition is: less than 20 h.p. (36%), 20 - 45 h.p. (26%), 45 - 75 h.p. (24%) and greater than 75 h.p. (14%). Compared to other provinces, where engine capacity of less than 20 h.p. is predominant, a unique feature of the Ba Ria-Vung Tau fishing fleet is that the number of boats in these four engine capacity classes is fairly even (Fig. 6-10).

Trawlers account for 38% of the fleet of the province, the highest percentage among the various gear types, followed by boats for hook-and-line fishing, gill-netting, and purse-seining (Fig. 6-11). Trawlers and purse-seiners are generally large, at 25 - 60 t and powered by 60 - 100 h.p. engines. Ba Ria-Vung Tau Province is clearly the most technologically developed in fisheries among the five provinces surveyed. The province has larger trawlers and purse seiners and is adopting advanced technology, and local fishers are active in exploring distant fishing grounds, particularly over the Sunda Shelf. These conditions make the fisheries in the province promising.

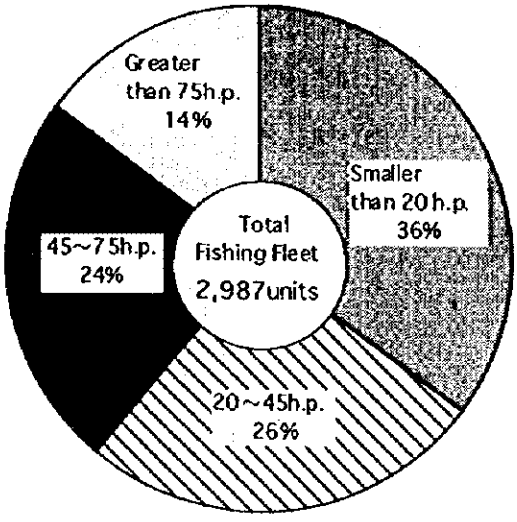


Fig. 6-10 Fishing Fleet Composition by Engine Capacity in BR-Vung Tau Province

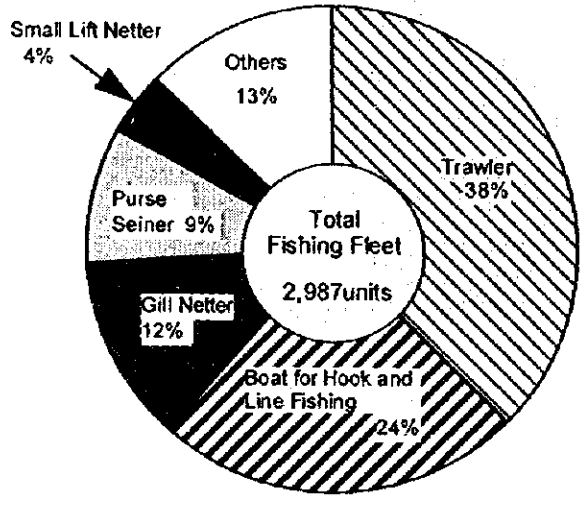


Fig. 6-11 Fishing Fleet Composition by Gear Type in BR-Vung Tau Province

2-3. Purse Seine Fishery

There are 268 purse-seiners registered in Ba Ria-Vung Tau Province, 224 of which are based in Long Hai Village. The seasonal change in catch per medium size boat (45 - 75 h.p.) and large boat (more than 75 h.p.) is shown in Fig. 6-12. The average annual catch of a medium-size purse seiner is 96 t, with an average monthly catch of 10 t during the period February - October though larger purse-seiners catch 243 t/year. Prominent seasonal changes in production are observed (Fig. 6-12), with an monthly catch of 30 - 40t in the April - June period, around 15 t during August - October, and a poor catch of 5 - 6.5 t after November. Larger purse seiners have an advantage during the March - June season, when their high mobility pays off handsomely in the calm sea. For this reason many purse-seine fishers wish to enlarge their boats.

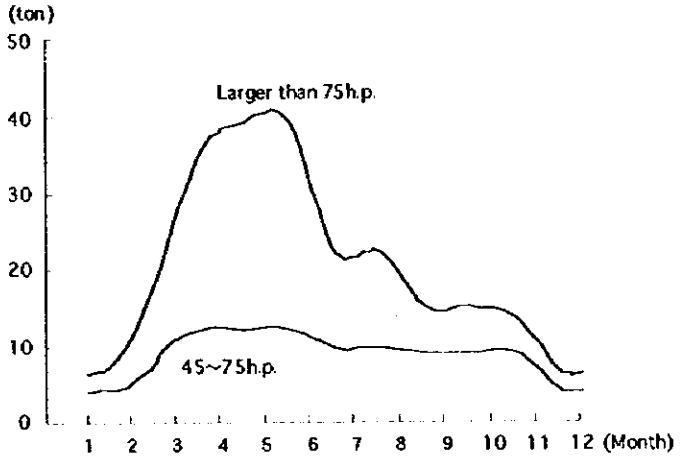


Fig. 6-12 Seasonal Fluctuation in Catch per unit of Purse Seiner

The distribution of fisheries operations based in the province is shown in Fig. 6-13. The fishing grounds for purse seiners extend from Vung Tau City southwards to 370 km offshore. The good fishing season is in March - June, when seas are generally calm and boats can sail up to 170 km south of Con Dao Island, around which the Sunda Shelf forms a shallow sea of only 60 - 70 m depth. About 15 t of fish can be taken during a 6 - 10 day fishing trip. Yellow

tail round scad (*Decapterus maruadsi*) and round scad (*Decapterus lajang*) are the major target species, which together account for 80% of the catch. More yellow tail round scad is usually caught than round scad.

The poor season lasts from November to January, when the sea becomes rough, with a northeast wind and a north-to-south ocean current. During this season the main fishing ground is at a depth of 40 - 60 m and lies 90 - 190 km offshore to the southeast of Vung Tau City. Since fishers operate nearer to land owing to the bad weather, production falls to 2 - 9 t per 8 - 12 day trip. The ratio of round scad to other species tends to be higher during this season.

The period August - October is the intermediate season. As the north current gives way to the south current in October, fishing operations become difficult owing to changeable currents. The fishing ground during this season lies somehow in the middle of the fishing grounds formed in good and poor seasons. Each fishing trip takes 7 - 12 days and yields an average of 6 - 15 t.

Fish prices fluctuate according to the season. Yellow tail round scad and round scad fetch USD 0.16 - 0.18/kg in the March - June good season, but the price increases to USD 0.36/kg in other seasons. Expenses per 7 - 8 day trip for a medium-size boat are approximately USD 900, with 35% of the expense for fuel, 45% for ice and 20% for food. Expenses for a large-size boat making a 10 - 12 day trip are approximately USD 1,450, about 30% being for fuel, 55% for ice, and 15% for food. Note that the proportions of the ice cost are as high as about 50% in both cases.

After deducting operational expenditures from the proceeds of the catch, net profits from a trip are distributed between boat owners and 22 crew members on a 50-50 basis. The Captain receives 3.5 share units, the Chief Engineer 2.5 unit, and an ordinary crewman 1 unit. Before and after purse-seine operations crew members are allowed to catch squid by jigging. Since this catch belongs to the individual crew member, a crewman's income from squid can sometimes exceed the share profit from purse seine fishing.

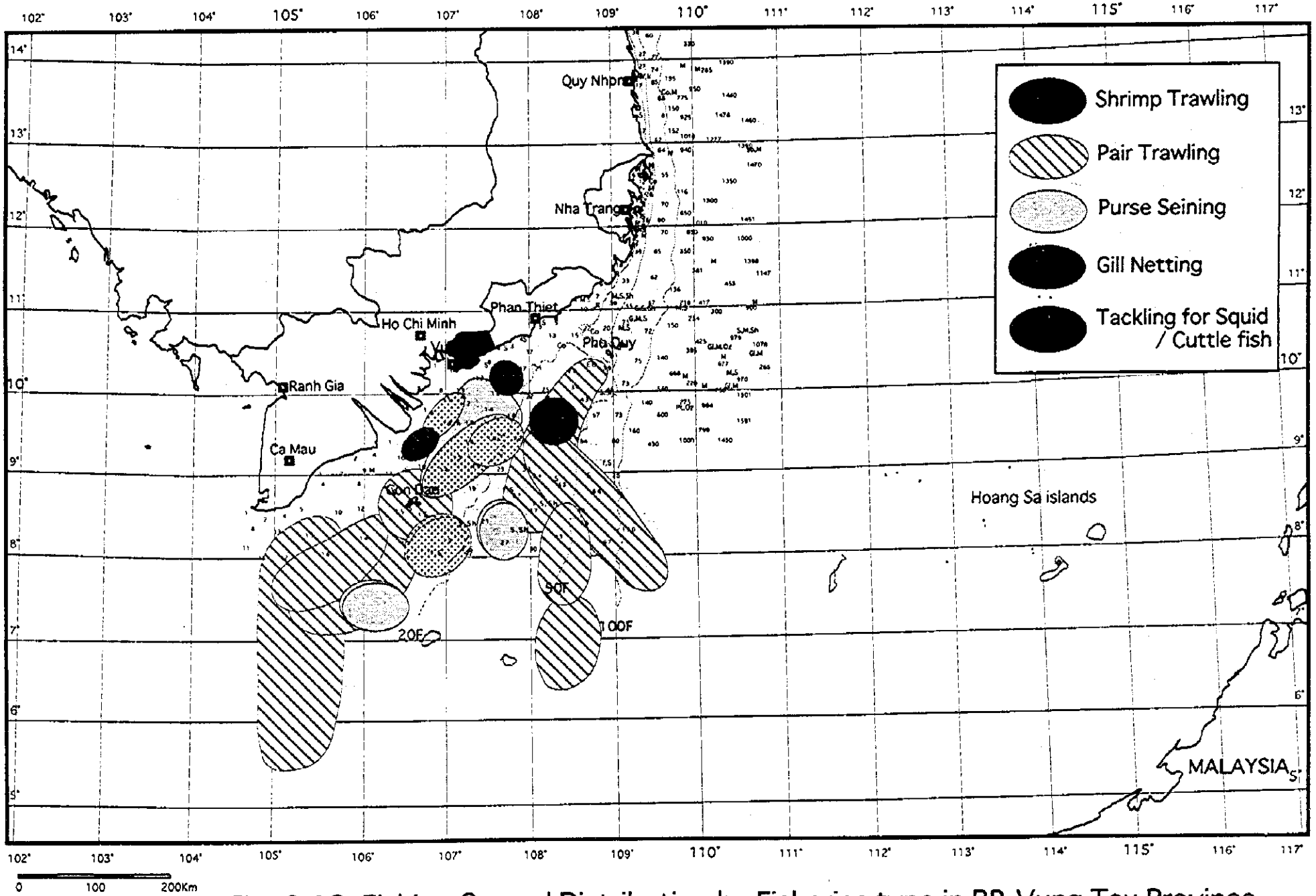


Fig. 6-13 Fishing Ground Distribution by Fisheries type in BR-Vung Tau Province

2-4. Trawl Fishery

In 1995, 1,116 trawlers were registered in Ba Ria-Vung Tau Province, of which 580 are based in Vung Tau City and 497 in Phuoc Thin Village, Long Dat District. These two places are the centers of trawl fishery in the province. A typical 40-t pair trawler is made of wood, is 18 - 22 m, with a 5.1 - 5.5 m beam and a draft of 2.1 - 2.8 m. It is powered by a diesel engine with a capacity of 60 - 100 h.p..

When pair-trawling was first introduced to Ba Ria-Vung Tau Province from China in 1962, it was done using only sailing boats. Since then, as trawlers became larger, they have worked fishing grounds increasingly further offshore. Until about 1975 the main fishing ground was 60 km from Phan Thiet and Xom Mui. By the early 1980s, fishing had extended to 110 km offshore, including the sea around Con Dao Island. Since 1985 boats have worked in the Gulf of Thailand and they now routinely fish up to 650 km south of Vung Tau (Fig. 6-13). Shrimp trawlers operate in areas up to 190 km offshore.

The total production of the trawl fishery in the province, estimated from interview results, is 24,000 t, excluding the 15,000 t of by-catch. The following discussion is based on the classification of pair-trawlers into three classes: (i) medium-size with more than 45 h.p. but less than 75 h.p., (ii) large-size with more than 75 h.p., and (iii) shrimp trawlers with more than 20 h.p. but less than 45 h.p.

The seasonal change in average production by a pair of trawlers (per trawler) is shown in Fig. 6-14. (Note that the figures do not include by-catch.) Medium-size trawlers catch 67 t of "table" fish and 72 t of by-catch. The period from July to November is the good fishing season, with an monthly average catch of more than 10 t. During other seasons production falls to the 4.7 - 7 t level. Large trawlers, on the other hand, catch 139 t of "table" fish and 72 t of by-catch every month. During the good fishing season, from July to October, the monthly average production increases to 18 t. Production by large trawlers in other seasons differs little from the pattern of medium-size trawlers. This is

similar to the case of purse-seining, discussed above.

For analysis the catch of pair trawlers is divided into finfish, squid/cuttlefish and by-catch. A medium-size trawler's monthly catch is around 15 t all year, except during November and December (Fig. 6-15). But an examination of species composition reveals differences among fishing seasons; the good season lasts from June to October, during which more finfish and squid/cuttlefish (about 10 t of both per 20 - 24 day trip) are caught and less by-catch is dumped into the sea. The intermediate season is from January to May, during which less finfish and squid/cuttlefish (about 7 t per 25 day trip) are taken and more by-catch caught. Finally the period from November to December is the poor fishing season, when species composition is similar to the intermediate season but when total production decreases by 30%. The catch per 20 - 24 day trip falls to only 8 - 9 t.

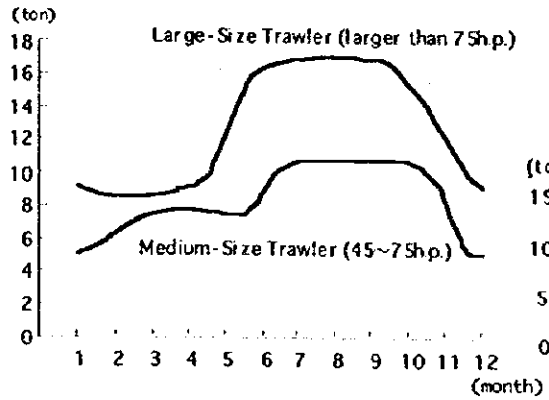


Fig. 6-14 Seasonal Fluctuation in Catch per unit of Pair Trawler (excluding by-catch)

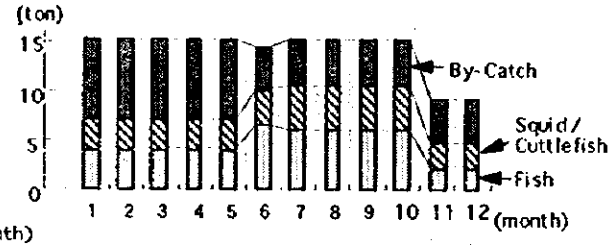


Fig. 6-15 Seasonal Fluctuation in Catch Composition of Medium size Pair Trawler (45~75h.p.)

Large trawlers catch 25 t for each of 20 - 25 day trip during the good season, but by-catch amounts to about 8 t (Fig. 6-16). During the poor season, 11 - 12 t of finfish is caught per month, with 4 t of by-catch. Little squid/cuttlefish are taken at this time.

The seasonal fluctuation in pair-trawl production of "table" fish and by-catch is shown in Fig. 6-17. As is clear, "table" fish production is very high from

July to October and the by-catch from February to June exceeds of other months. Low-value by-catch is dumped overboard in good seasons, when more "table" fish are caught. By-catch fetches only USD 0.05 - 0.09/kg even in poor seasons whereas cuttlefish sells USD 0.95/kg and "table" fish for domestic markets at USD 0.21 - 0.54/kg. However, as "table" fish production decreases, by-catch begins to have some economic value.

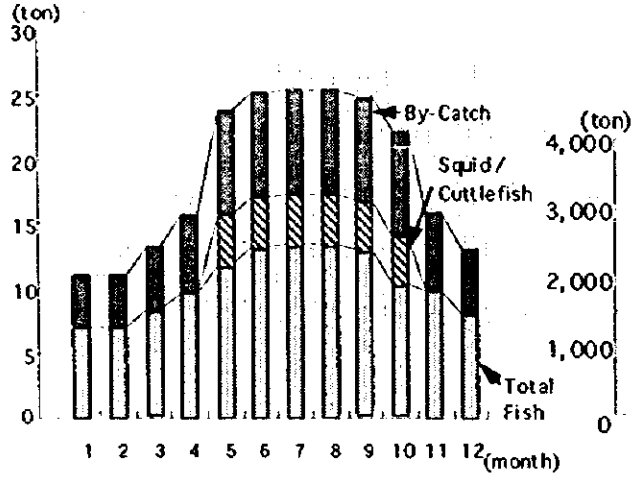


Fig. 6-16 Seasonal Fluctuation in Catch Comsumption of Larger size Trawler (larger than 75h.p.)

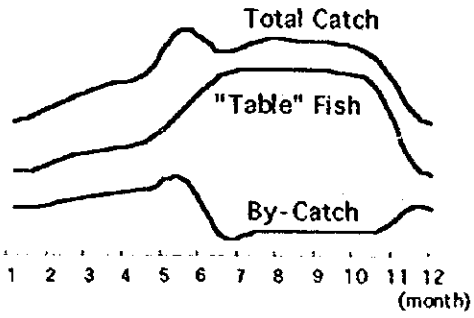


Fig. 6-17 Seasonal Fluctuation in Pair Trawl Production

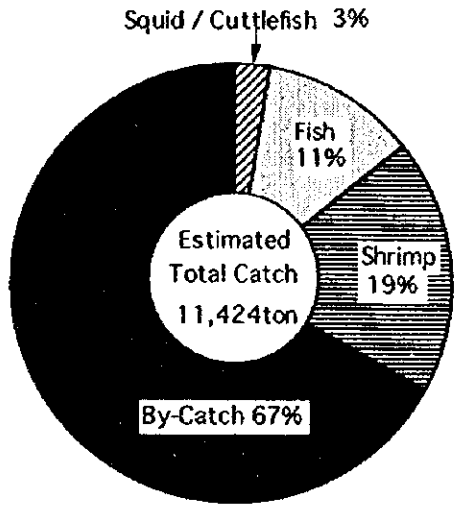


Fig. 6-18 Catch Composition of Shrimp Trawling

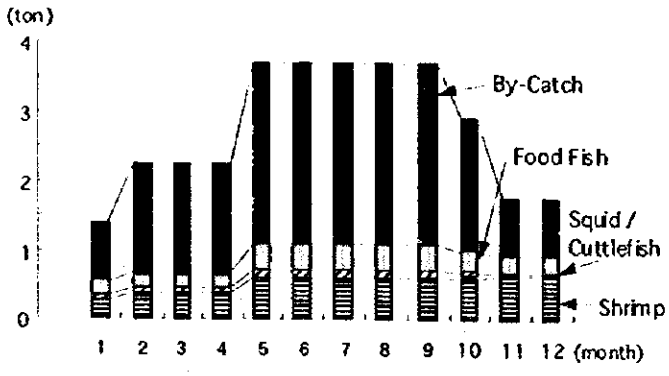


Fig. 6-19 Seasonal Catch Fluctuation in species composition per unit of shrimp trawler

The estimated catch volume of shrimp trawlers from Ba Ria-Vung Tau

Province is 11,000 t. Of this shrimp accounts for 19%, food finfish for 11%, squid and cuttlefish for 3%, and by-catch for 67% (Fig. 6-18). It is likely that the ratio of by-catch is so high because shrimp trawlers operate in shallow waters where the sea bottom is covered with seaweed and seagrass that provide nursery grounds for juvenile fish. The seasonal change in species composition is shown in Fig. 6-19. An increase in catch size is apparent from May to October, when the weather is calm, and when by-catch predominant.

The operational costs of a 20 - 25 day fishing trip are USD 4,500 - 6,500, of which 56 - 62% is expended for fuel, 10 - 12% for ice, 8% for food, and 18 - 26% for other expenses, including fishing gear. A large expenditure for fuel is a characteristics of trawling. A pair-trawler unit earns an average of USD 9,000 - 13,500 per trip in the good season, USD 4,500 - 8,200 in the intermediate season, and USD 5,400 - 7,300 in the poor season. It should be noted that seasons are defined here in terms of catch volume (not value) and that although the catch increases in the intermediate season earnings tend to be stagnant because of the larger amount of small fish and by-catch produced. In contrast, although the catch declines naturally in the poor season earnings do not decrease proportionately because landings are smaller in this season and fish prices therefore higher.

Earnings are distributed according to a share system in which the proceeds of sales, after deducting operational expenses, are divided between a ship owner (65%) and crew members (35%). Pair-trawlers have a total of 10 crewmen, with five on each boat. On some boats the crew share is sub-divided equally among all the men. Alternatively, a captain is given a fixed per trip income of USD 400 - 500 while other crew members are rewarded on a proportionate basis, with a guaranteed minimum of about USD 90 per trip. Boat-owners may provide captains and other crew members with bonus before *tet* (Lunar new Year). They also fulfill their social obligations of making contributions on ceremonial occasions of their crews and of providing financial assistance when they are either sick or impoverished owing to prolonged bad

weather, or for other reason.

2-5. Fisheries Infrastructure

Four fishing ports are located within Vung Tau City: Ben Da , Incomap, Ben Dinh, and Lo Than. Apart from Lo Than, these ports are all located close by. There follows a brief profile of Ben Da Fishing Port, the largest among the four.

Ben Da Fishing Port

In addition to boats from Ba Ria-Vung Tau Province, a similar number of trawlers from other provinces use this port, which has a total area of 5,000 - 6,000 m^2. Ben Da is active for about 330 days a year, and more outsider boats enter the port than do local boats from June to November, and vice versa in other seasons. An average of 20 trawlers unload at Ben Da everyday. The average monthly landings are 30 t for export, 100 t for domestic consumption, and 300 t of by-catch for use as animal feed. Altogether Ben Da handles about 5160 t, approximately 6% of the total landings in Ba Ria-Vung Tau Province

The port is managed by the Ba Ria-Vung Tau Fishing Boat Service, a provincial company under the provincial Department of Fisheries. The company rents port space and facilities to fishing boats, fish traders and input suppliers. The landing quay is divided into 12 blocks, each of which is rented to fish traders for a monthly rent of USD 91. These fish traders are often also input suppliers to fishing boats. The company also rents space needed for fuel and ice supply to input suppliers. However, the company does not provide these services itself because, according to the company, its nature as a public company requiring cash settlement for each transaction would not help smooth business with fishermen who want to receive supplies in credit.

The infrastructure and facilities in Ben Da Fishing Port include the following:

(a) Quay and Piers

The length of the quay is 100 - 120 m. Water depth is 3 m at low tide. There is no unloading pier, but there are four 10 m-long piers which are rented to an ice suppler and two fuel suppliers.

(b) Other Infrastructure

The access road is unpaved and has many puddles after rain. There is a parking space behind the quay. No drainage gutter exists. The sewerage system needs repair to work. Municipal collectors remove the garbage daily.

(c) Major Facilities

In an unloading space, covered by a roof, fish traders sort, weigh and pack fish. There is no auction hall, since fish are not sold by auction, rather a fish traders buys all his/her client-boat's catch. There are neither cold storage nor warehouse facilities; ice is brought in from two ice plants in the neighborhood. One has the capacity to supply 1,000 pieces of 50 kg ice blocks daily, and the other can supply 500 pieces per day. The Ba Ria-Vung Tau Fishing Boat Service has a plan to construct an additional ice plant with a daily output capacity of 1,000 - 2,000 pieces in the near future.

(d) Incidental Facilities

Five staff members of the Ba Ria-Vung Tau Fishing Boat Service work at an office located at the entrance of the port. They are also responsible for the maintenance of the good order inside the port. There are no facilities such as cooperative or fishers' center, but fishers gather at a coffee shop to talk together.

(e) Public Utilities

Vung Tau City supplies 1,500 m^3 of water per month. There

are two fuel stations, with a combined capacity of 300,000 l per month. Electricity supply is 2,500 KVA/ month. A telephone is available.

(f) Equipment

The equipment owned by fish traders for their business includes: a telephone, a radio to communicate fishing boats, weight scales, bamboo baskets with a capacity of 70 kg of fish for the domestic market and 20 kg plastic baskets for export markets.

2-6. Fish Processing

At the industrial level there are 8 freezing plants, processing shrimp, squid and finfish for export, and two fish sauce factories (that in addition to producing for the local market also export large quantities to China) in this Province. In addition, there are three large plants producing sun-dried fish, together with an unknown number of small-scale household operations. Fermented shrimp paste (mam tom) production is done entirely at the household level, and the number of producers is unknown.

2-7. Voices of the Fishers

As part of field survey, we interviewed fishers about the problems and issues they confront. Their comments are classified into (a) expectations and aspirations, (b) constraints, (c) positive development perspectives ,and (d) negative development perspectives. They are listed in the order of the number of fishers making the same comment.

(a) expectations and aspirations,

1, install a larger engine;

2, long-term credit;

3, construction of a larger fishing boat;

4, exploit offshore fishing grounds.

(b) constraints

1, high tax;

2, inadequate equipment and/or funds;

(c) positive development perspectives

1, Larger boats and engines will enable fisheries development

2, Advanced equipment will enable fisheries development

3, Offshore areas have under-exploited fish resources

(d) negative development perspectives

1, declining catch owing to deteriorating resources.

2, devastated coastal fishing grounds

3, Overfishing by larger boats

4, An increase in the number of fishing boats

Twelve of the 20 respondents indicated a strong intention to fish further offshore. They are independent-minded and will not necessarily rely on government support for this regard. Thirteen of 24 fishers were positive about the future of their fishing. However, this should be interpreted with caution because many added pre-conditions qualifying their good perspectives, such as the use of offshore fishing grounds with larger boats. This indicates that both positive and negative groups of fishers are well aware of the resources problem.

(3) Binh Thuan Province

3-1. Profile of the Province

Geography

Binh Thuan Province stretches along the National Highway No. 1A and trans-nation railway running through the province. It has a coastline of 192 km and is bounded by Ninh Thuan Province in the north, Dong Nai and Ba Ria-Vung Tau provinces in the south and Lam Dong Province in the west. The province has an area of 799,000 ha, with 547,000 ha of forest, 91,000 ha of farming land and 52,000 ha of coastal zone. Besides Phan Thiet City, the capital

city, the province is administratively divided by eight other districts.

Socio-economics

The province has a population of 854,000, of which 435,000 people are economically active. Annual population growth rate is 2.5%. Reflecting its unique historical background, Binh Thuan's population is composed of various ethnic groups such as Kinh which is the mainstream, Cham, Hoa, Tay, Nung. The economy of the province is largely based on agriculture, fisheries and the food processing industry utilizing their products.

1) Industry

The industrial sector has developed to process agricultural, forestry, and fishery products. Besides, it has branched out to some other areas like minerals, construction material, mechanical repairing, fine-art handicraft. Some spots in the province are considered to have potential for oil and gas production and the exploration is now underway by Malaysian and Japanese companies. The province has also mining potentials, including precious stones, bentonite clay, glass sand, gold, tin, wolfram, lead, silver.

2) Agriculture

Agriculture is a key economic sector for the province, with 91,000 ha of cultivated land. Rice (45,000 ha), beans and cashew (9,000 ha), rubber (1,300 ha), and fruit (300 ha) are major crops. Currently, there are 100,000 cows and 120,000 pigs raised in the province. These numbers will most likely increase to satisfy demands for meat in and out of the province.

As will be discussed in details later, the fishery sector is also very important in the province, producing over 90,000 t of fish per annum. There are 130 ha of shrimp aquaculture ponds.

3) Service Sector

Binh Thuan's coastal area is spotted with numerous beautiful locations like Phan Thiet City and Mui Ne and historical relics of the old-time Cham Empire such as Cham towers and Cham Royal Museum. To boost tourism, the provincial government has worked out plans to upgrade and renew tourism infrastructure. If two airports Phan Thiet and Ham Tan are rehabilitated to offer routine commercial flights, the province is promising as an emerging resort area in the lower Central Region.

3-2. Fisheries Overview

In Binh Thuan Province there are 5,116 motorized fishing boats in 1995. In terms of engine power, only 0.4% of the boats have engines of more than 75 h.p., 19% have engines of 75 - 45 h.p., 42% are powered by engines of 45 - 20 h.p., and 39% have engines of less than 20 h.p.. Most are small boats with engine capacities of less than 45 h.p. (Fig. 6-20).

The fishery sector in Binh Thuan Province is active and diversified. As shown in Fig. 6-21, 28% of the boats are engaged in squid fishing and 21% in gill-netting. Others are used for pair-trawling, single-trawling, lift-netting, hook-and-line fishing other than for squid, purse-seining, and cockle-diving.

Based on data derived during the field survey, the total fishery production in Binh Thuan Province was 82,000 t (1995). As indicated in Fig. 6-22, of the total the lift net fishery contributes 27%, purse-seining 18%, pair-trawling 18%, single-trawling 15%, gill-netting 11%, and squid-angling 11%. In Fig. 6-23 our estimate is compared with the official statistics of the province. Both sets of data agree reasonably well, except for the trawl fisheries. This appears to be because fishers deliberately underreport their catch size to reduce tax burden. Single-trawlers of this province are concentrated in Mui Ne District within Phan Thiet City. Mui Ne was formerly famous for the production of nuoc mam made from anchovy and round scad caught by lift-netting. But since the liberalization of fishing activities in 1986, many lift-netters have converted to single-trawling. In June 1995, just before our field survey began, a tax

inspection targeted trawlers in Mui Ne. As a consequence, fishers were understandably reluctant to discuss openly their fishing performance. We suspect this led to some under-reporting of trawl production, and hence our estimate is probably too low.

The fishing grounds of coastal fishers are concentrated less than 130 km from shore. Most local fishers depend on them. Lift-netters, purse-seiners and squid-anglers use an area up to 280 km from shore, toward Con Dao Island, and some lift-netters extend their operations up to 440 km south of Phan Thiet City. Nevertheless, except for long-liners who routinely operate near the Spratley Islands, most fisheries in Binh Thuan Province are carried out in coastal waters (Fig. 6-24).

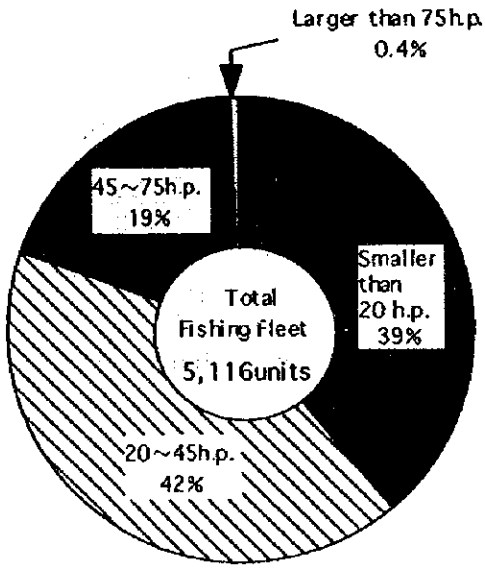


Fig 6-20 Fishing Fleet Composition by Engine Capacity in Binh Thuan Province

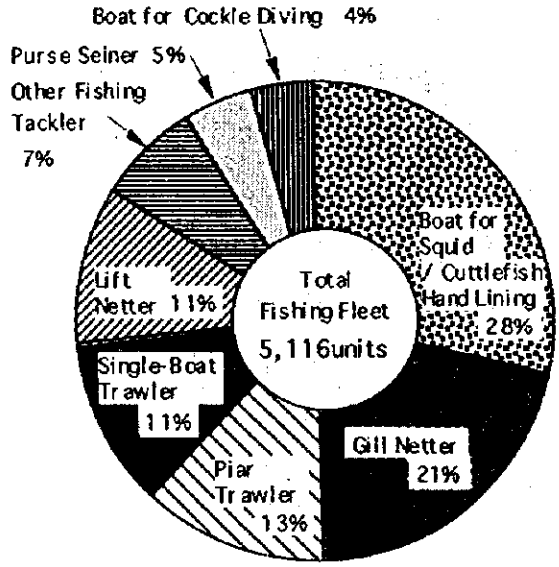


Fig. 6-21 Fishing Fleet Composition by Gear Type in Binh Thuan Province

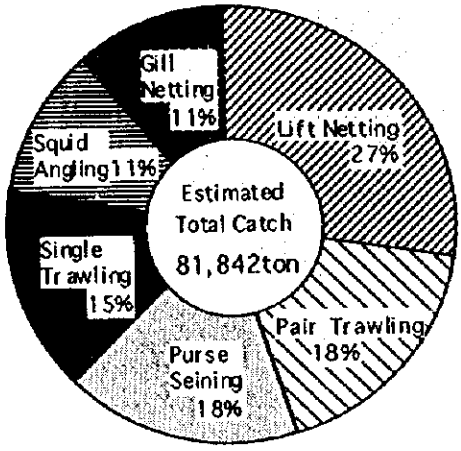


Fig. 6-22 Estimated Catch Composition by Type of Fishing Gear in Binh Thuan Province

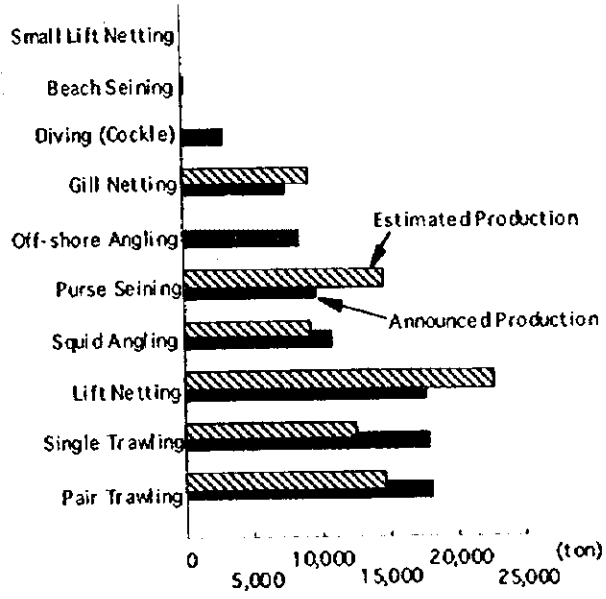


Fig. 6-23 Production Composition between Statistical and Estimated Figure in Binh Thuan Province

3-3. Purse Seine Fishery

About half of 272 purse seiners registered in Binh Thuan Province are based in Phu Hai Village, in Phan Thiet City. Formerly the villagers used lift nets with payao, but conversion to purse-seining has continued from the 1980s and now has been completed. Some 30 larger purse-seiners catch round scad, while about 100 smaller boats target anchovy.

The seasonal production change of 45 - 75 h.p. purse seiners targeting round scad are shown in Fig. 6-25. The fishing season is from March to June, when the sea is calm. During this season average monthly catch totals 18 - 19 t. Boats make 3 - 5 fishing trips per month and return with catches of 5 - 6 t per 2 - 7 day trip. Target species include yellow tail round scad, round scad sp., black pomfret, eye scad, thynoid tuna, eastern little tuna. The fishing ground is located 50 - 80 km offshore in the direction 125 degree from Phan Thiet in waters 32 - 40 m deep.

The intermediate fishing season is from July to October, when average monthly catch is 12 - 15 t of small-sized round scad and eye scad. These fishes

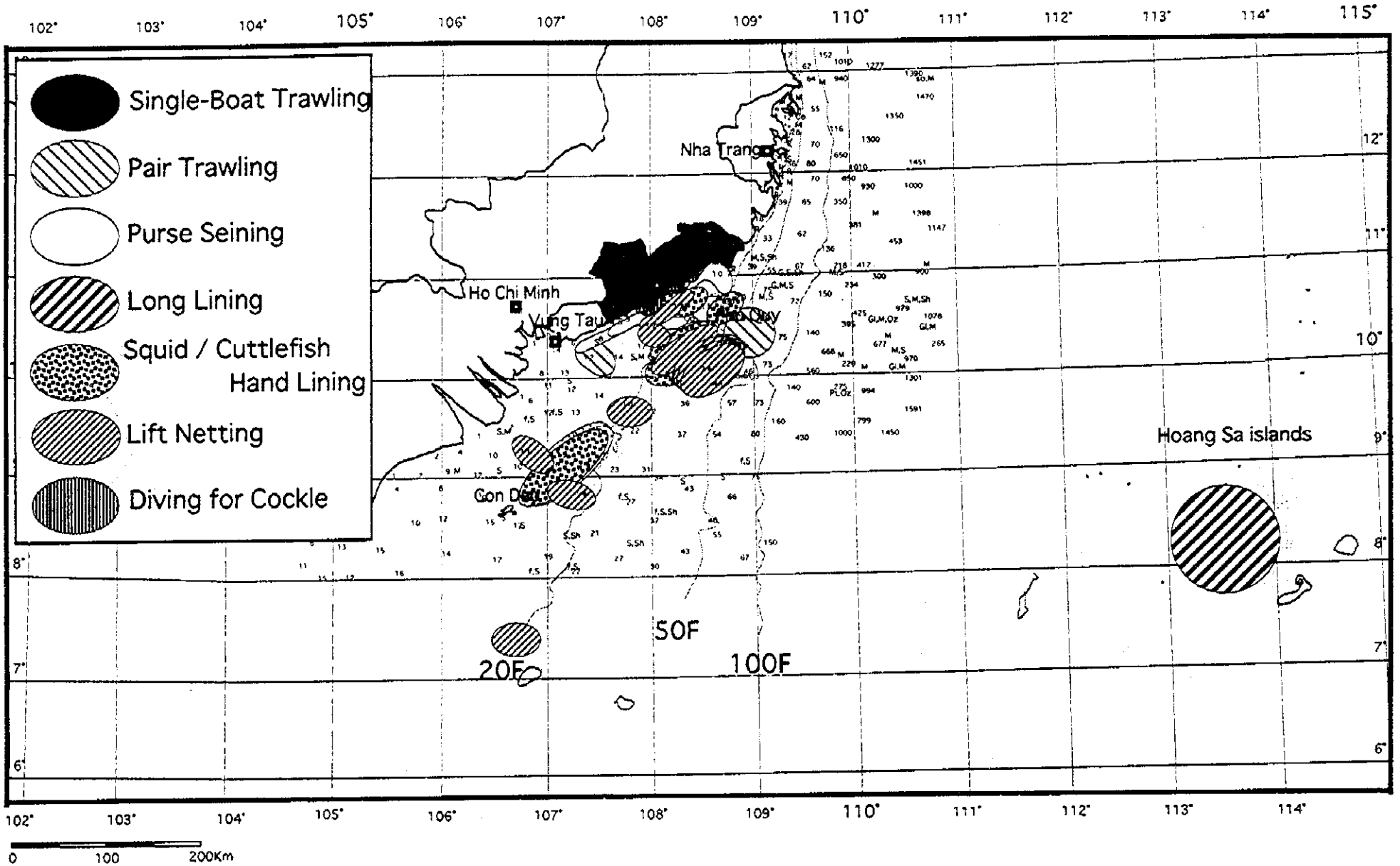


Fig. 6-24 Fishing Ground Distribution by Gear Type in Binh Thuan Province

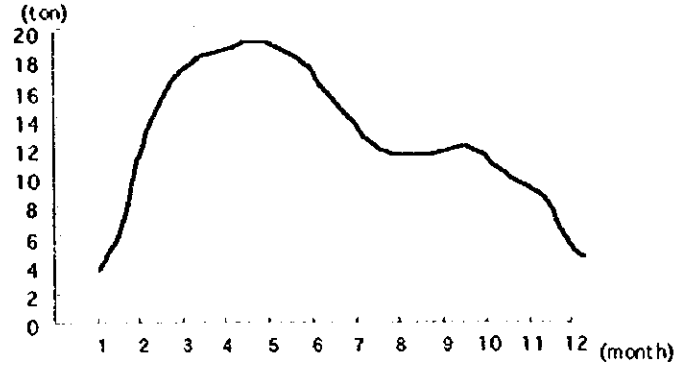


Fig. 6-25 Seasonal Production Change per unit of 45~75h.p. Purse Seiner

are used for making nuoc mam, and so fetch only low prices. A fishing trip lasts for three days, and 5 - 7 trips are made each month. From late July to August, when the weather is unfavorable, the grounds worked are either those near the coast or around Con Dao Island, but when the sea is calmer, from September to October, fishing move to grounds further offshore.

Poor fishing yielding only 4 - 10 t per month is a characteristic of the stormy season, from November to February. Fishers make 2 - 4 trips in this season, each of 3 - 7 days, to work in coastal waters. Operating costs of a 5-day trip are about USD 140 - 180, of which 60% is for fuel, 30% for ice, and 10% for food. Net profits are shared on a 50-50 basis by the boat-owner and the 13-14 crew members. Among the crew members, the captain takes 1.5 units, the engineer 1.2 , and ordinary crewmen 1. In addition, crews can earn extra income from squid that they catch during the trip. This supplemental income, which belongs entirely to the man who caught the squid, is sometimes substantial, possibly three times more than an individual crewman's share, at an average of USD 36.

3-4. Trawl Fishery

In Binh Thuan Province there are 1349 trawlers registered, i.e., 639 single-trawlers and 710 pair-trawlers as of 1994. According to provincial data

for 1993, the single-trawlers caught at total of 17,794 t of fish and the pair-trawlers 18,009 t. Per unit, the catch is 50.7 t for pair-trawlers and 27.8 t for single-trawlers[4].

Fishing grounds naturally differ according to boat size. Throughout the year small single-trawlers with engines of 20-33 h.p. operate within the coastal waters up to 40 km offshore. There the water depth is 20-32 m, with some rocks on the bottom. Fishing boats with engines of more than 33 h.p. operate in the coastal waters during the unfavorable weather conditions prevailing from November to April, but from May to October can move to an offshore area 60 km distant, where the water depth is 32-40 m and the bottom muddy. Although night operation is difficult owing to the many payao floating in this area, the catch is generally better than that achieved in coastal fishing grounds. Fishing boats with engines of more than 74 h.p. always operate in offshore fishing grounds. Pair-trawlers operate even further offshore, either in waters 40 m deep or in the fishing grounds near Phu Qui Island. Because the fishing grounds around Phu Qui Island are too deep, at about 55 m, single-trawlers seldom work there.

The seasonal change in the estimated catch of an average single-trawler is shown in Fig. 6-26. As explained above, actual production is probably larger than our estimated figure, and thus this figure should be considered as an indicative seasonal trend.

The seasonal change in the ratio of food fish to by-catch caught by a single-trawler is shown in Fig. 6-27. In the good season the amount of by-catch is 3.4-3.8 t, 1.7-2.6 t in the intermediate season, and 1.2-1.7 t in the poor season. By-catch is utilized as raw material for making fish meal, but the high ratio of by-catch is of concern for future fishery development.

The same seasonal change for a unit of pair-trawlers is shown in Fig. 6-28.

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4 Note that to obtain per unit catch, the per boat production figure must be further multiplied by two in the case of pair-trawlers.

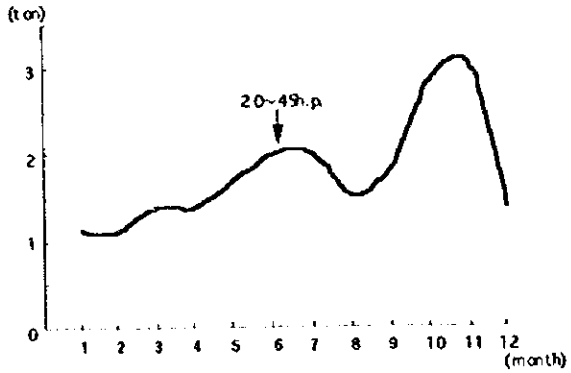

Fig. 6-26 Seasonal Catch Fluctuation per unit of Single Trawler(without By-Catch)

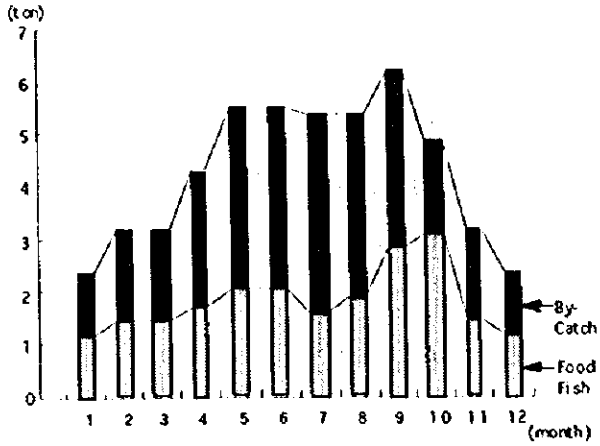

Fig. 6-27 Seasonal Change In Composition per unit of 45 ~75h.p. Single Trawler

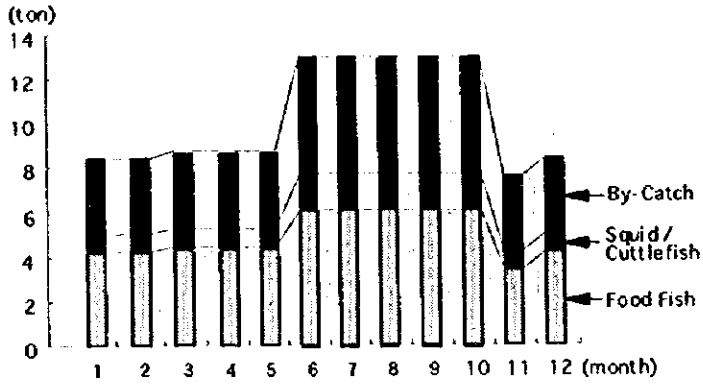

Fig. 6-28 Seasonal Change in Composition per unit of 45~75h.p. Pair Trawler

Of a monthly production of 13 t during June to October period, 6 t are food fish, 2 t are squid and cuttlefish and the remaining 5 t by-catch. In comparison, during the January to May poor season as well as from November to December, of about an 8 t of monthly catch, 4 t are food fish, 1 t is squid and cuttlefish, and 3 t are by-catch.

The operational cost per 5-day fishing trip is approximately USD 27,200, with 67% being expended for fuel, 17% for ice, and 16% for food. Profits are shared on a 50-50 basis between an owner and about 6 crew members. The allotment for the captain is 1.5 units and each other crew member receives 1 unit.

3-5. Other Fisheries

As of 1994, 181 gill-net boats, 720 lift-net boats, and 1,423 squid-angling boats were registered in Binh Thuan Province. The 1993 official production figures for these three fisheries were 7,325 t, 17,491 t and 10,580 t, respectively.

Since the term of "gill-net fishery" embraces diverse types of fishing gear and methods, a detailed understanding of this fishery is difficult. For instance, local fishers use a gill-net for cuttlefish from January to April but convert to finfish gill-netting after May.

Squid angling also includes different combinations, and at least three patterns exist: (1) as a supplement which can be engaged in at the same time as lift-netting and purse-seining, (2) as the technological conversion from such fisheries, and (3) as an independent activity. However, there is no clear production pattern for squid angling.

It is known that some 200 squid cast-net boats are based in Mui Ne District of Phan Thiet City. The provincial Department of Fisheries has closed the fishery from March 1 to July 31, due to a concern about over-fishing. As a result, fishing starts in August and ends in February, and the good season is from September to February. Every month, fishers make 3-4 fishing trips, each of 4 days duration. Spear squid comprises 70% of the catch with the balance being swordtip squid. The fishing grounds range between 40-140 km off Mui Ne. Cast-netters operate in waters 100-150 m deep in September and October, at depths of 80 m during November and December, and in 18-25 m in July and August.

The permitted period for the cockle diving fishery is from September to March. Fisheries management was introduced in 1995 through a prohibition on collecting cockles of less than 4 cm in size, and fishing grounds were zoned.

3-6. Fisheries Infrastructure

The center of fisheries in Binh Thuan Province is the Phan Thiet Fishing

Port, where water and fuel are supplied by private businesses. At present, a new port quay is being constructed under ADB financing. This, together with other facilities, will soon result in a substantial up-grading of the port.

Phan Thiet Fishing Port

The fleet landing fish at the Phan Thiet Fishing Port is composed of 50% lift-netters, 25% purse-seiners and 25% single-trawlers. Their landing volumes correspond approximately to the percentage of the total fleet that they compose. When the weather is generally bad during the north-easterly monsoon, most boats landing at the port are local, but many boats from other provinces land at the port during the favorable south-easterly monsoon season. The daily landings total about 100 t in the good season and about 10 t in the poor season.

There is no pier at the port so boats berth along the quay, which is in part a 150-200 m concrete wall, but mostly the natural river bank. The high and low water levels at the quay are 6.0 and 0.5 m, respectively. The water depth has gradually become shallower, such that the present depth is substantially less than the 10 m level of decades ago. Dredging will soon be required.

Trucks can enter into the port, but the access road from the main street is unpaved and in a bad condition. As there is no facility for waste water treatment, dirty water flows directly into this river port.

Fish are sold, without bidding, to fish traders with whom fishers have a business relationship. The port has 18 shops belonging to those fish traders, and 10 of them are conduct business actively. Each work space is 8-12m^2 and is rented from the harbor office for USD 13.6 - 22.7 per month. People work busily in these shops, crushing ice and sorting and packing fish.

(a) Fuel Supply

There are three fueling facilities in the port, with a total daily capacity of 30 t of diesel oil. A province-run company and a state enterprise wholesale fuel, but retailers are the private fish traders.

(b) Water Supply

Private water suppliers sell water to fishing boats from ships with a 10-15m^3 water tank installed.

(c) Electricity

The port receives 3,000 kwh of electricity per month, but a power failure occurs every two months, on the average. Electric wire inside the port is old and electricity may leak. Landing places are dark, and boats use their lights when unloading fish at night.

(d) Ice Supply

A private ice plant located next to the port produces 2,000 pieces of 50-kg ice blocks everyday.

Phan Ri Cua Fishing Port

The construction of a fishing port quay has been underway since 1994 in Phan Ri Cua Fishing Port in eastern Binh Thuan Province. About 1,500 small fishing boats with an engine capacity of less than 60 h.p. are based at this port. The construction work, implemented by the provincial government, was interrupted in March 1995 because of a shortage of funds. And construction materials together with a partly completed section were washed away by typhoon. The water becomes as shallow as 1.5 meter in the port, so it could not be used without regular dredging. It appears that reexamination may be needed on physical conditions of this port site for development.

3-7. Fish Processing

This province is a major exporter of frozen cuttlefish and squid, accounting for 23% (600 t) of the export of this product in 1993. The principal exporter is Ha Tinh Province, which accounts for 34% of the total (GSO, 1994).

3-8. Voices of Fishers

The Local fishers interviewed in Binh Thuan Province gave their opinions with little hesitation. As before, their comments are classified into (a) expectations and aspirations, (b) constraints, (c) positive development perspectives, and (d) negative development perspectives, and listed below in the order of frequency in which they were made.

(a) expectations and aspirations

1, larger boats and engines;

2, long-term credit;

3, install modern devices like echosounder, radio, GPS;

4, exploit offshore fishing grounds;

5, resolve gear conflict;

6, tax reduction

(b) constraints

1, inadequate capital and/or funds;

2, taxes too high;

3, resources degradation;

4, gear conflict

(c) positive development perspectives

1, Offshore waters have under-exploited resources;

2, No serious threat is felt in resources condition;

3, Larger boats and engines will enable fisheries development;

4, Advanced equipment will enable fisheries development

(d) negative development perspectives

1, Declining catch owing to reduced resources.

2, Intensified gear conflict with other fisheries

3, An increase in the number of fishing boats.

As in Ba Ria-Vung Tau Province, 26 out of 37 responded interviewees expressed a strong desire to advance to working offshore waters. They therefore consider the lack of funds as the most critical problem for their business.

Twenty fishers were particularly positive about the future of fisheries, with a strong expectation for offshore fishing. On the other hand, some are more cautious owing to the decline in coastal fisheries production and intensified gear conflicts among different types of fisheries over the same fishing grounds, a problem prominent to this province.

(4) Khanh Hoa Province

4-1. Profile of the Province

Geography

Khanh Hoa Province is a coastal province situated in the lower Central Region, with a 200 km-long coastline. In the west, Khanh Hoa is bounded by the Central Highlands; it lies next to Phu Yen Province in the north, Ninh Thuan Province in the south. Khanh Hoa Province has diverse topographies from the mountainous western area to coastal plain in the eastern area. Additionally, the province has over 100 islets scattering along its coast. Of the total area of 5,258 km^2, 578 km^2 or 11.6% are used for agriculture and 3,234 km^2 or 61.2% are covered with forest.

The province is sub-divided into 8 administrative units: 7 mainland districts and one island district. Nha Trang City is the capital of the province. The province not only enjoys the national transportation infrastructure such as National Highway No. 1 and Nha Trang Airport but also benefits from well maintained roads connecting with inland areas.

Socio-economics

The population of Khanh Hoa Province is over 900,000, accounting for 12.5% of the population of the central coastal region. The average population growth rate is around 2.2% per annum. There are about 500,000 people who are economically active, and the half of those are young people.

Khanh Hoa's GDP growth rate in 1994 was 12%, and annual per capita GDP has reached around USD 300. The proportion of industrial production in

GDP is 40% and agriculture 24%. Khanh Hoa's economy is mainly based on mining, processing industry, agriculture, fisheries and tourism.

1) Industry

Khanh Hoa possesses large potential for industrial development based on locally available resources such as cotton and fish. In addition, it can benefit from the existence of the two important sea ports in Nha Trang and Cam Ranh, around which industries like chemical, petro-chemical and ship building could be deployed in the future. The provincial GDP from the local industry increased from USD 5.3 million in 1992 to USD 7.6 million in 1995.

2) Agriculture

Khanh Hoa's agriculture has two goals to attain: self-sufficiency of foodstuff in the province and the supply of raw material to its processing industry. Out of 53,000 ha of agricultural land, 47,900 ha are used for food crops such as paddy and maize, the rest is for cash crops like cashew, pineapple, cotton, sugar cane, peanut etc. Livestock raising is also important; the number of buffaloes, cows and pigs in 1994 amounts to 193,000. Aquaculture area occupies 8,000 ha, 75% of which are used for shrimp farming for export markets. Marine fisheries will be discussed in detail in the following section.

3) Service Sector

Thanks to this easy access to the sea, Khanh Hoa Province has an advantage in maritime transportation through sea ports in Nha Trang and Cam Ranh. Under open economic policy promoted by the government, hotels and restaurants are flourishing in Nha Trang City which attracts thousands of visitors every year. The province has a hydropower plant which is the main power source for the province.

4-2. Fisheries Overview

There were 4,439 fishing boats registered in Khanh Hoa Province as of 1995. By engine horsepower, 0.2% have engines of 82 - 140 h.p, 6% are equipped with 45 - 82 h.p. engines, 19% are in the 32 - 45 h.p. category, and 19% have engines of 16 - 32 h.p.. But most boats in this province (56%) have only small engines of less than 16 h.p. (Fig. 6-29).

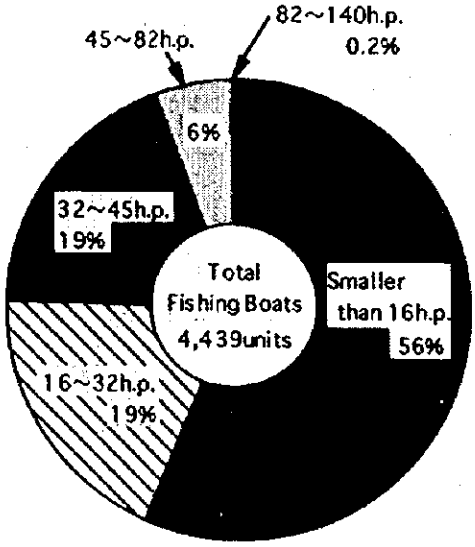

Fig. 6-29 Fishing Fleet Composition by Engine Capacity in Khanh Hoa Province

As indicated in Fig. 6-30, by fishery type 48% of the boats undertake the combination of gill-net and hook-and-line fishing, followed by lift-netting (19%), trawling (13%), purse-seining (3%), shrimp gill-netting (3%), set-netting (0.3%), and other gear types (14%).

Fig. 6-31 shows the composition of the 1994 production of 39,848 t recorded as the official production figure in Khanh Hoa Province. Purse-seiners landed the largest share, at 21%. The contribution of other fisheries was as follows: squid-angling (2%), non-squid hook-and-line fishing (15%), lift-netting (15%), shrimp trawling (12%), gill-netting (9%), stick-held dip netting (6%), fish-trawling (6%), and set- netting (3%). However, the estimate derived from

our survey indicates a much higher production level than the official figure; our estimate indicates that 123,000 t was landed in 1995 (Fig. 6-32), or three times more than the official figure. (We will return to discuss this point in more detail in Chapter 4.)

In terms of per unit productivity, the set net has the highest rate at 66.4 t, followed by 44.7 t for the purse seine, 9.3 t for trawling, 7.5 t for the lift net, 3.6 t for the combination of gill net and hook-and-line, and 2.5 t for shrimp gill net.

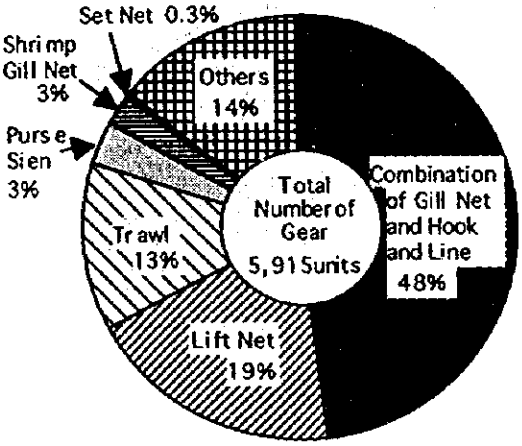

Fig. 6-30 Fishing Gear Type Composition in Khanh Hoa Province

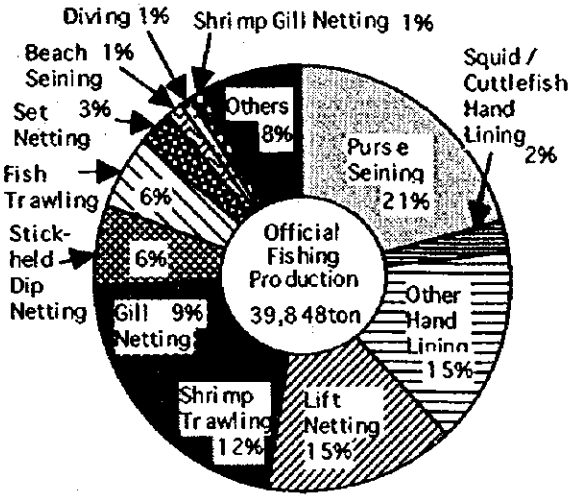

Fig. 6-31 Composition of Official Production Figure by Fishing Type

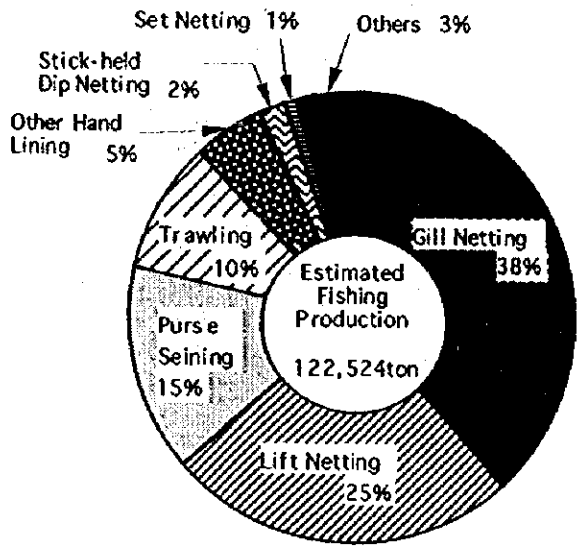

Fig. 6-32 Composition of Estimated Figure by Fishing Type

As is clearly shown in Fig. 6-33, the use of fishing grounds by Khanh Hoa fishers is skewed toward the south. Gill-netters in particular spreads out over 670 km from Nha Trang City. Pair trawlers use fishing grounds off Binh Thuang Province, since the offshore area suitable for trawling is limited off Khanh Hoa Province, where isobaths converge. Long-liners fishing in the Spratley Islands target large shark. Although not shown in Fig. 6-33. a type of set net unique in Khanh Hoa Province is constructed near Nha Trang City. In addition to a favorable oceanic conditions, a result of the convergence of the south- and north- flowing currents, this province has a complex coastal topography, which is a major advantage for the set-net fishery.

4-3. Lift Net and Purse Seine Fisheries

At present, a sizable conversion from lift net fishery to purse seine fishery is underway in Khanh Hoa Province. For example, 20% of 200 lift netters in Vinh Truong District, Nha Trang City have already converted to purse seining, and many other owners of lift net also wish to change to purse seining when they acquire the necessary funds. This is attributable to the fact that lift netting is not

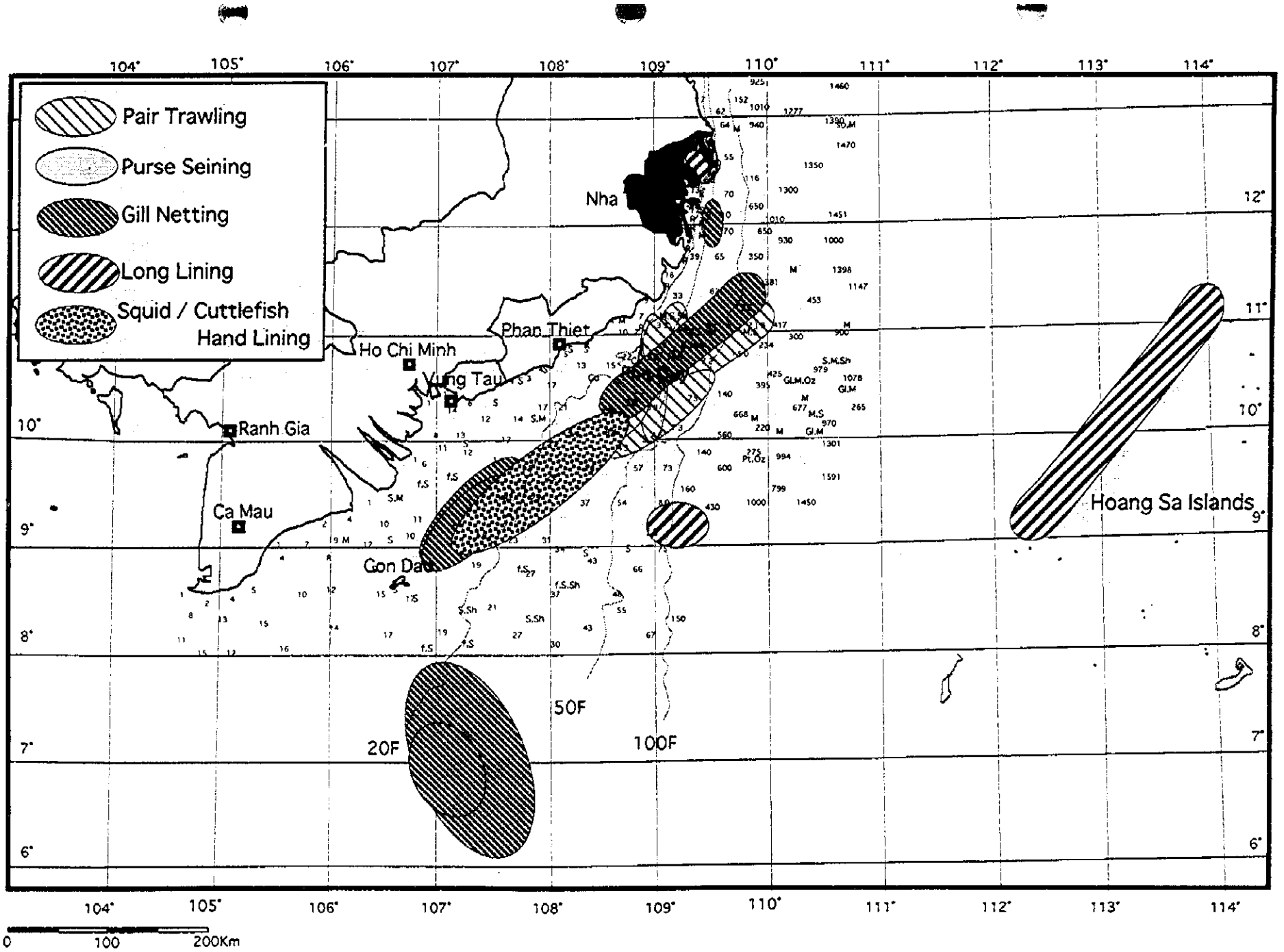

Fig. 6-33 Fishing Ground Distribution by Fishing Type in Khanh Hoa Province

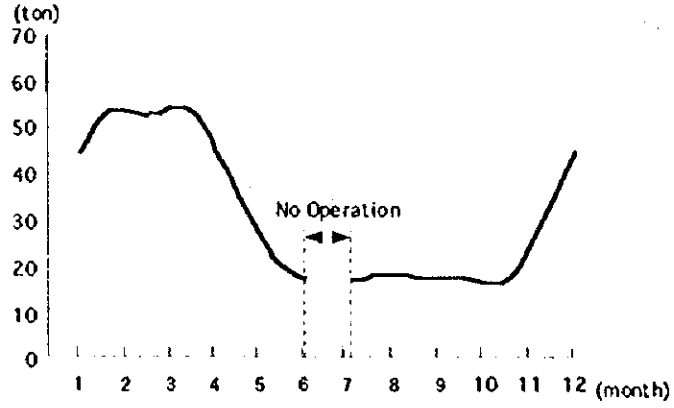

Fig. 6-34 Seasonal Fluctuation of Estimated catch per unit of Purse Seiner (25~45h.p.)

feasible in waters with a depth of more than 70 m, whereas many of them are being crowded out from coastal waters in which the number of boats is increasing perceptibly.

Lift netters sail out to fish in the afternoon, operate by night and return the next morning. Target species are anchovy and small round scad, both used to make nuoc mam.

Despite some outward expansion of fishing grounds, purse seiners who have converted from lift-netting maintain the operation pattern of lift-netting, i.e., departing in the afternoon, operating in the coastal waters at night, and returning to port in the next morning. The seasonal change of production by an average local purse-seiner with a 20 - 45 h.p. engine is shown in Fig. 6-34. The good season lasts from January to April, the intermediate season from May to June and from August to December, which differs slightly from the lift-net fishery. Purse-seiners cease operations from the end of June to mid-July, owing to the absence of fish schools. This is also the same as in lift-netting.

4-4. Drift Net Fishery

There are two sub-categories of drift-netting in Khanh Hoa Province, surface drift-netting and bottom drift-netting. Boats engaged in drift netting are

either the small 13 t type with a 16 - 45 h.p. engine, or the medium 25 t type with a 45 - 82 h.p. engine. There is no structural difference between gill nets each uses, but naturally 25 t boats can carry 25% more net than the smaller boats. When weather is unfavorable, from September to November, small boats stop gill netting and switch to squid-angling, while a half the medium-size boats convert to pair-trawling.

4-5. Long Line Fishery

Long liners in Khanh Hoa Province target shark in fishing grounds around the Spratley Islands from March to June, cease fishing from July to August, and then engage in squid-angling near Con Dao Island from September to February. The seasonal change of long line production and the conversion to squid angling is shown in Fig. 6-35. In April, the best season, a 3-day fishing trip to the Spratley Islands to work in 100 m deep waters can yield an average of 100 kg of shark fin from 10 t of Malay shark. In May, the intermediate season, about 50 kg of shark fin can be obtained from 5 t of shark.

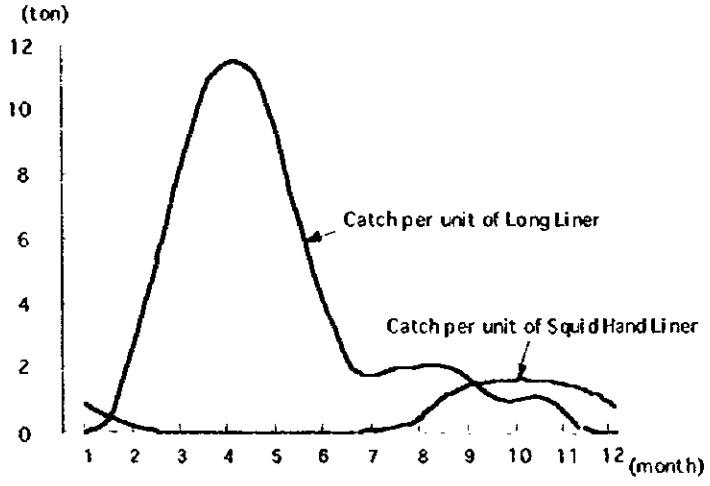

Fig. 6-35 Seasonal Change of shark Long Line Production and Conversion to Squid Angling

A trip for squid angling around the Con Dao Islands lasts 26 - 30 days.

The target species is spear squid, which are washed and dried on board. In October which is the good season, a production of 260 kg of dried squid is possible, whereas production falls to 75 kg in January.

4-6. Set Net Fishery

Because of ideal oceanic and topographical conditions, coastal areas of Khanh Hoa Province provide good fishing grounds for set net fishery. Currently, 5 set net units are operated around Hon Tre Island near Nha Trang City, one unit in Hon Do Island and 6 units in Xa Van Thanh. Those around Hon Tre Island record particularly good catches of such migratory species as king mackerel, bonito, and yellowfin tuna. The good season lasts from April to October, but after August the strong current increasingly prevents operations. The intermediate season is November to February, whereas the fishery has only poor catches from late-February to March, owing to the absence of migrating fish. Local fishermen have observed an occasional change of major species; for instance, bonito were caught in volume a few years ago but king mackerel has now replaced bonito. Some days fishers catch as much as 15 t of yellowfin tuna at a time.

4-7. Fisheries Infrastructure

Fishing communities in Nha Trang City are so congested with houses and alleyways that not only fish marketing activities but also social services are restricted. Vinh Tho District is particularly densely populated, with 1,050 persons per ha. In an effort to improve living conditions in Vinh Tho District, the provincial government is planning to ease the congestion by relocating some people to Hon Ro Village in the suburbs of Nra Trang City. Construction of a bridge connecting Hon Ro Village and Nra Trang City has started in January 1996 using provincial budget, but there may be a long way to go before a new community actually emerges there, mainly because of budgetary constraints. Moreover, the plan assumes only 3,500 people comprising about 800 families

will move to the new community, but there are concerns about the inadequate scale of this plan to resolve the congestion issue.

There follows a brief sketch of Vinh Truong Fishing Port in Nha Truang City and Cam Ranh Fishing Port, the latter located in the southern part of the province.

Vinh Truong Fishing Port

This is a new fishing port located in the river mouth at Nra Trang City. The port is clean but much smaller than Cu Lao Fishing Port, the old port in the downtown of the city. SPECO (Sea Products and Equipment Company), a subsidiary company of the province-run fishery corporation, is charged with managing the port, although the level of their maintenance is not immediately apparent. For example, people dump garbage over the quay, making the water level shallow and blocking fishing boats from berthing. No remedial action has been taken so far. There are two fueling facilities, and ice is supplied from a factory 3 km away. However, only a limited space is available for sorting fish, and the access road is narrow and unpaved.

Cam Ranh Fishing Port

The fishing port in Cam Ranh Bay is the second largest in the province, and is used by about 200 boats. Its new jetty and quay are capable of accommodating boats of up to the 400 t class. When we visited the port, construction work to extend the quay was on-going. The port has supply facilities for fuel and water, a fish handling space, two cold storages (100 t and 50 t), three ice plants with a total daily capacity of 150 t, an administrative office, a good access road, a canteen-cum-grocery, etc. It appear to be the best organized fishing port among those we visited in Viet Nam.

A quasi-independent province-owned company, Cam Ranh Fishery Company, is responsible for the management of the port. According to company officials, because the company earns profits from exporting marine products, it

is not necessary to charge local fishing boats and 10 fish traders doing business in the fishing port.

4-8. Fish Processing

Khanh Hoa Province is one of the main fish processing provinces in Viet Nam. There is a total of 35 fish processing factories plus about 200 individual small-scale fish processors in the province. The total processing capacity is an estimated 15,000 - 20,000 t per year (Anon, 1995).

The 15 of them are freezing plants for finfish, squid and crustaceans. One is owned by the central government, 10 by the provincial government and 4 are private. All have several product lines, the principal of which are frozen fish, sun-dried fish, sashimi, and fish sauce. The total fish freezing capacity is 90t per day.

Twenty of the processing factories, in addition to 125 of the small-scale operations, are engaged in the production of salted and sun-dried fish and fish fermentation. An estimated 3,000 t per year of dried fish is produced in the province (Anon, 1995). Seven of the factories specialize in the production of fish sauce. They have an estimated total fermentation tank volume of 4,000 m^3. In addition, another 60 small-scale operations have a total tank volume of 1,000 m^3. The estimated total provincial production of fish sauce is 4.5 million litres per year (Anon, 1995).

4-9. Voices of Local Fishers

Local fishers in Khanh Hoa Province expressed their views freely. As in the preceding sections their comments are classified into (a) expectations and aspirations, (b) constraints, (c) positive development perspectives, and (d) negative development perspectives, and listed below in the order of the frequency that they were made.

(a) expectations and aspirations

1, conversion to other fisheries;

2, long-term soft credit.

(b) constraints

1, low engine quality and spare parts shortage;

2, inadequate investment and operational funds.

(c) positive development perspectives

1, no serious threat in resources condition;

2, good prospects for export markets

(d) negative development perspectives

1, declining catch owing to deteriorating resources.

Unlike Ba Ria-Vung Tau and Binh Thuan provinces, it seems that most respondents in Khanh Hoa Province require long-term soft loans to convert to other fisheries, particularly from lift-netting to purse-seining, rather than to build larger boats. They therefore consider the lack of funds as the most critical problem. Eight fishers out of 19 gave cited prospects for the future of local fisheries. They did not attach any conditions to the optimism, whereas some are not so optimistic, seeing mainly the negative perspective of resource decline.

(5) Quang Nam Da Nang Province

5-1. Profile of the Province

Geography

Quang Nam Da Nang province is an important and the largest province among coastal provinces in the Central Region. The province is bordered with Thua Thien Hue Province in the north, Quang Ngai and Kon Tum provinces in the south, Laos along Truong Son Mountain Range in the west. It also has a 160 km-long coastline. Its topography is characterized by three main areas covering a total area of 12,000 km^2: western mountainous area, hilly midland area and coastal plain. The National Highway No. 1 and the trans-national railway run through the province, providing favorable transportation infrastructure.

Da Nang City is the capital of the province and has the population of 444,000, more than 25% of the total provincial population. Besides, the

province has two big towns of Tam Ky and Hoi An, together with 14 districts and Son Tra Peninsula.

Socio-economics

Over 1.8 million population of the province concentrate in urban areas on the coastal plain. The population growth rate was around 1.9% in 1995. The economically active population is over 1 million, with 62% distributed in agriculture and 15.2% in industry.

In 1995, Quang Nam Da Nang's per capita GDP was USD 268. Out of the GDP in 1995, the industrial sector accounts for 21%, the agricultural sector 38%, the service sector 41%, respectively.

1) Industry

The industrial sector of Quang Nam Da Nang Province ranges from food processing, construction material, textile and other consumer goods. Particularly famous items are silk (around 80 t per annum), aquatic products, wood products and transportation machinery from bicycle to cargo ship. Small industries and handicrafts are also playing an active role in the province, with a share of 60 - 65% of industrial gross output.

2) Agriculture

The province has a favorable topography to develop diversified agriculture in its farming land of 104,000 ha. The agricultural sector absorbs 60% of the province's labor force in the production of rice, mulberry, coconut, sugar cane, cashew, tobacco, etc. The province has 51,800 buffaloes, 197,600 cows and oxen, and 509,900 pigs in 1994.

Forest and forestry land occupy 75% of the total area of the province. Presently, there exist over 400,000 ha of waste land and barren hills, some 200,000 ha of which situated in midland regions are the priority area for developing industrial forestry. Apart from potential oil and gas resources under

the continental shelf, the province is endowed with various marine products, which will be examined in the following section.

3) Service Sector

As one of Viet Nam's urbanized provinces, Da Nang City is the center in the Central Region for many businesses and services including insurance, trading and transportation. The province also has Tien Sa Port which can accommodate ships of 30,000 tones, in addition to nine smaller river ports. As for tourism, Hoi An and Son Tra peninsula are famous tourist resorts which provide considerable income for the province.

5-2. Fisheries Overview

The number of fishing boats registered in Quang Nam Da Nang Province is 3,758 in 1995. In terms of engine capacity, 0.3% have more than 75 h.p., 7.2% have 47 - 75 h.p, 32.1% have 20 - 45 HP, and 60.4% less than 20 h.p.. Quang Nam Da Nang Province has even a higher ratio of small boats of less than 20 h.p. than does Khanh Hoa Province (Fig. 6-36). The total number of fishing gear is 9,530 units, or 2.5 times the number of fishing boats, reflecting the multi-gear use of fishing boats in this province. The distribution of types of gear is as follows: shrimp trawlers (26%), gill net (18%), pair trawl (11%), lift net (9%), squid angling (8%), squid trammel net (8%), shrimp gill net (6%), hook-and-line (4.3%), purse seine (0.7%), and others (9%). The trawl fishery and gill net fishery are the two most important types in the province.

A total production of 50,000 t attained in 1976 had declined by 50% to 25,000 t in 1980 before recovering to 40,000 t in 1986. During the last 10 years, production has remained in the range of 25,000 t to 40,000 t. Production in 1995 was also around the 40,000 t level.

In terms of annual productivity, an average purse seiner catches more than 180 t, followed by 80 t by a lift netter and about 20 t by pair-trawlers and shrimp trawlers. As shown in Fig. 6-37, the productivity of pelagic fisheries is

generally high, but the existing 64 units of purse-seine are equivalent to only 0.7% of the total fishing gear units in the province, contributing to a relatively small share in the total catch volume. Therefore if the number of purse seiners increases in the future, there is a possibility that catch volume will increase substantially.

Fishing grounds extend both southward and northward (Fig. 6-38). The southern fishing grounds are used particularly by purse seiners and lift netters. Lift netters operate nearer to the shore than purse seiners which also operate in the inner Gulf of Tonkin. Gill netters and squid anglers extend their operations into offshore fishing grounds, venturing to as far as Parcel Islands. The fishing grounds extending to the north of Da Nang, at the entrance of Gulf of Tonkin, are worked by all pair- trawlers, shrimp trawlers, gill-netters and lift-netters.

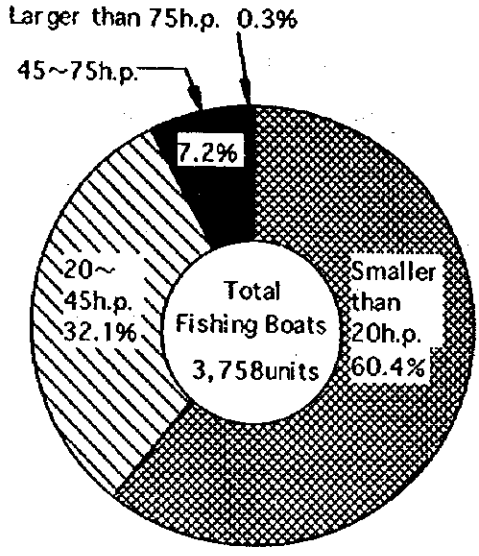

Fig. 6-36 Fishing Fleet Composition by Engine Capacity in QN-Danang Province

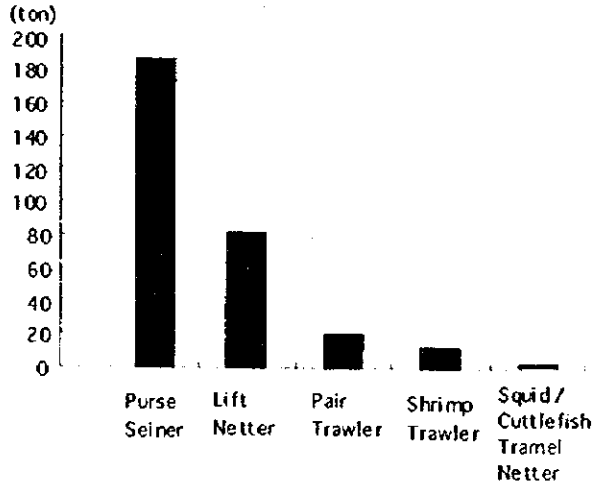

Fig. 6-37 Annual Productivity per boat by Gear Type

5-3. Trawl Fishery

There are 2,394 shrimp trawlers and 1,062 pair-trawlers registered in the province, of which 54% of shrimp trawlers and 86% of pair trawlers are concentrated in Da Nang City, the capital of the province.

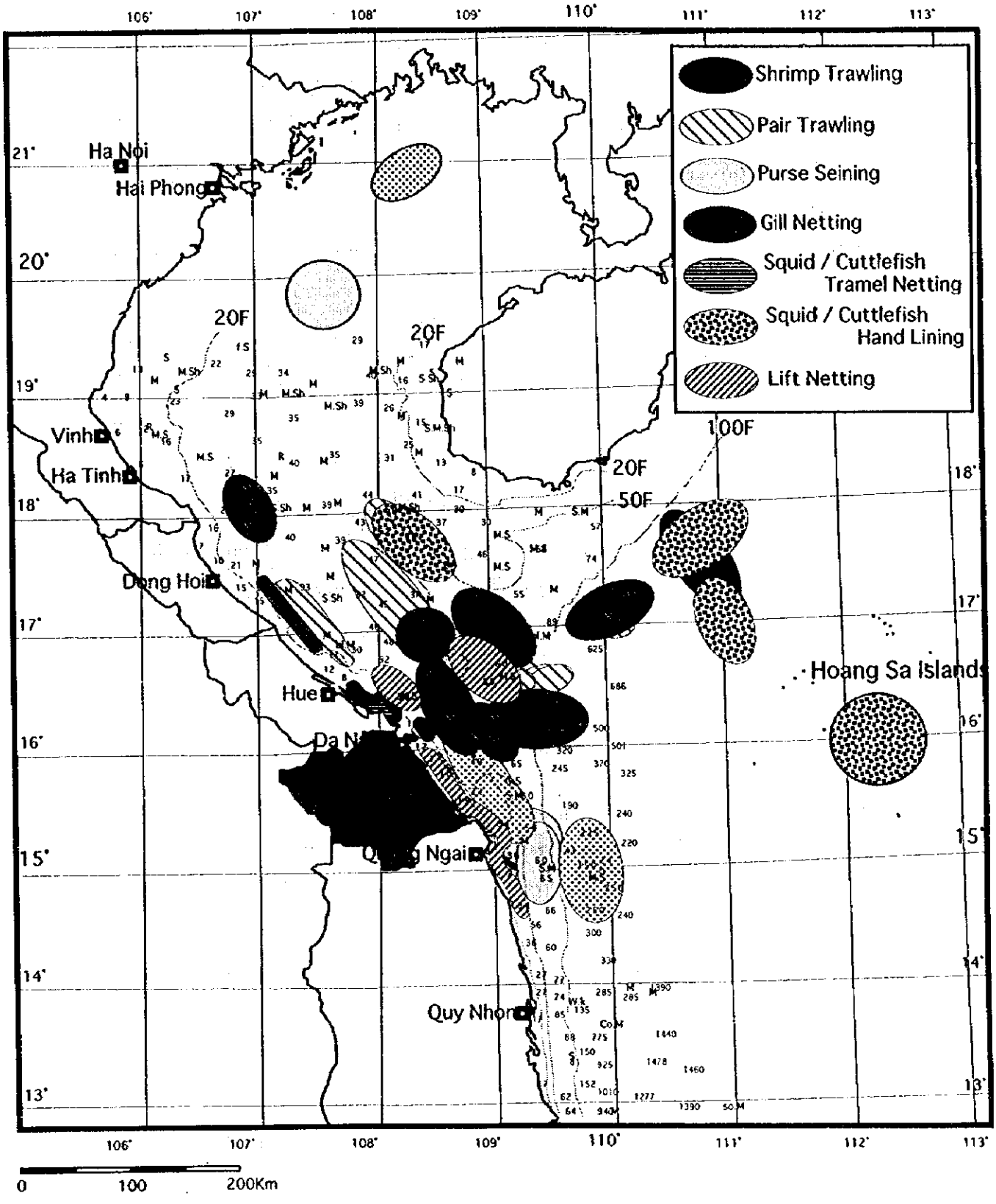

Fig. 6-38 Fishing Ground Distribution by Fishing Type in Quan Nam Da Nang Province

Fig. 6-39 demonstrates the different patterns of seasonal change in catch, excluding by-catch between a unit of small pair trawlers of the 20 - 45 h.p. class and of medium pair trawlers of the 45 - 75 h.p. class. The monthly catch of the former fluctuates within the range of 1.5 - 3 t, while the latter has a larger range of 2 - 5 t between good and poor seasons. Another difference is that the former tends to have good fishing season somewhat earlier than the latter.

Fig. 6-40 and Fig. 6-41 show the similar seasonal changes in catch, including by-catch, for the 20 - 45 h.p. class and 45 - 75 h.p. class, respectively. It is evident that smaller trawlers have a higher ratio of by-catch than do medium trawlers. From this it may be inferred that smaller trawlers operating in shallow waters are more harmful to coastal nursery grounds.

Fig. 6-42 shows the seasonal change in catch of small shrimp trawlers of less than 20 h.p. and of medium shrimp trawlers of 20 - 45 h.p.. An average small shrimp trawler constantly yields about 0.5 t per month, while an average medium-size trawler catches 1.5 - 3 t per month and enjoy a good fishing season from January to March.

Figs. 6-43 and 44 were derived by adding quantities of by-catch to data in Fig. 6-42. The ratio of by-catch is particularly high in small shrimp trawlers which take green tail prawn and smooth shell prawn for export markets in coastal fishing grounds from Da Nang to the mouth of Gianh River. These fishing grounds are shallow, only 16 fathoms deep and even shallower towards the north. Small shrimp trawlers operating in shallow waters naturally have a larger percentage of by-catch.

5-4. Purse Seine Fishery

Of the 64 purse seiners registered in Quang Nam Da Nang Province, 52 are concentrated in Nui Thanh District. The purse seine fishery in this province uses two boats, a 15 t main boat and an 8 t transport boat. When targeting round scad, yellow tail round scad, and Indo-pacific mackerel, purse seiners use light

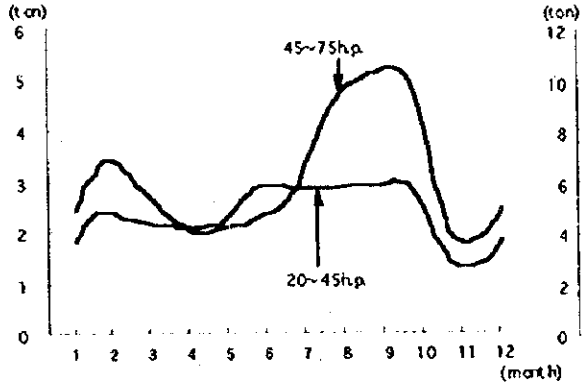

Fig. 6-39 Seasonal Catch Fluctuation per unit of Pair Trawlerby Engine Capacity (without by-catch)

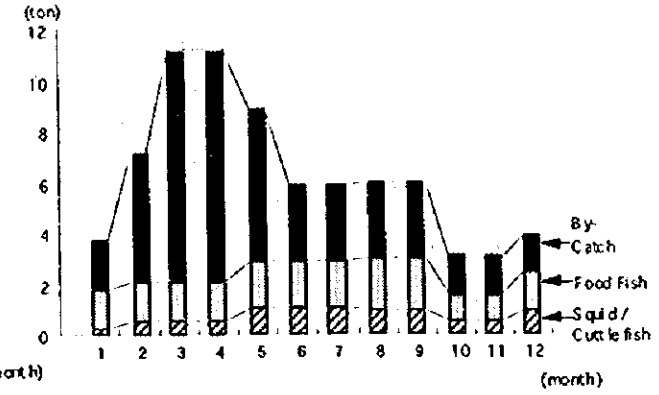

Fig. 6-40 Seasonal Fluctuation of Catch Composition per unit of Pair Trawler (20~45h.p.)

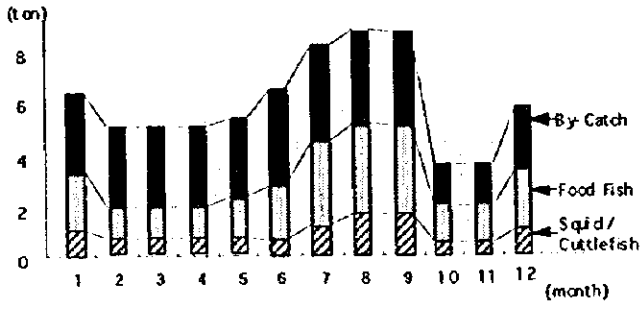

Fig. 6-41 Seasonal Fluctuation of Catch Composition per unit of Pair Trawler (45~75h.p.)

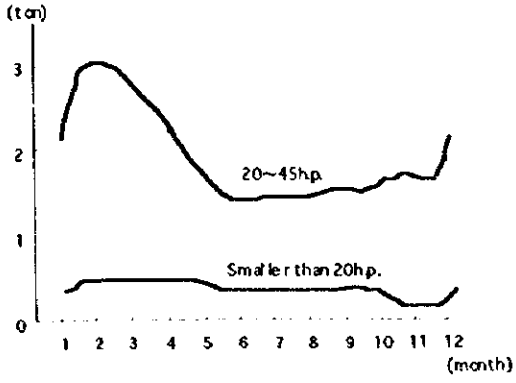

Fig. 6-42 Seasonal Catch Fluctuation per unit of shrimp Trawlerby Engine Capacity (without by-catch)

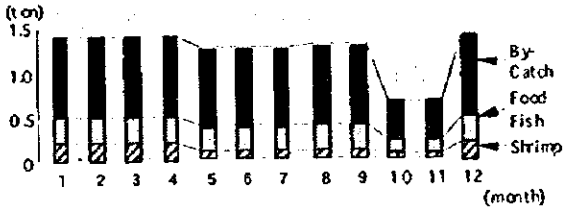

Fig. 6-43 Seasonal Fluctuation of Catch Composition per unit of Shrimp Trawler (Smaller than 20h.p.)

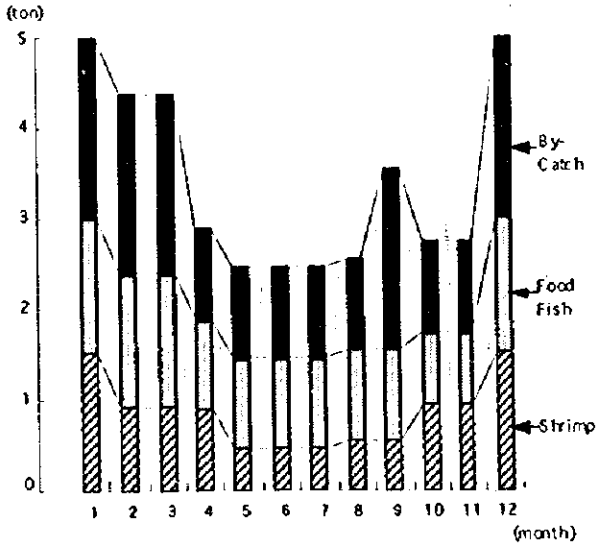

Fig. 6-44 Seasonal Fluctuation of Catch Composition per unit of Shrimp Trawler (20~45h.p.)

to attract fish. The main boats stay in the sea for about 7 days, while the transport boats go back and forth between the fishing ground and a fishing port.

Fig. 6-45 shows the seasonal change in catch by an average purse seiner which yield 30 t per month during a good season of June - August. Species caught at that time are round scad (*Decapterus lajang*) for 70%, yellow tail round scad (*Decapterus maruadsi*) for 15%, and other pelagic fishes for 15%. While purse seiners catch these species at night, they also chase bonito schools during the daytime for an additional income, particularly in June and July. After October, the monthly catch decline to 15 t due to bad weather, with round scad for 60%, yellow tail round scad for 10 - 20%, and other pelagic fishes of an increased portion.

Fig. 6-45 Seasonal Fluctuation of Estimated Catch per unit of Purse Seiner

Fishing grounds for purse seining extend offshore waters of 40 - 130 m deep and a rocky bottom between Cu Loa Re Island and Cu Lao Cham Island off Quang Nam Da Nang Province and its southern neighboring province of Quang Ngai. The sea bottom in this area is rocky, but purse seine does not reach the bottom so it is not a problem.

5-5. Other Fisheries

Together with the trawl fishery, the gill net fishery by 3,054 gill netters

comprises the core of the fisheries sector in Quang Nam Da Nang Province. Table 6-18 shows the distribution of the gill net fishery within the province. Ordinary types of fish gill net are the most common and are used throughout the province, including Da Nang City. They range from those used to catch pelagic fishes, like flying fish and sardine, to those for demersal species. The cuttlefish trammel net is concentrated in Dien Ban District. This is often used as the second fishing gear by small shrimp trawlers of less than 20 h.p. from December to April. During this season, the monthly catch of cuttlefish ranges from 200 - 400 kg. The shrimp gill net is common in Hoi An, Da Nang, and Dien Bant Districts

Table 6-18 Distribution of Gill Net Fishery in Quang Nam Da Nang Province

Area	Miscellaneous Gill Netting	Squid / Cuutkefish Gill Netting	Shrimp Gill Netting
DA NANG	300	32	146
NUI THANH	313	135	7
HOI AN	320	0	206
HOI VANG	49	0	1
DIEN BAN	12	517	120
DUI XUYEN	11	0	82
THANG BINH	300	0	11
TAM KY	372	90	30
CTY KT. DV	0	0	0
TOTAL	1,677	774	603

Source : Fisheries Office in Quang Nam Da Nang Province

There also are 871 units of lift net, mostly in Thang Binh, Da Nang City, Nui Thanh, and Hoi An. An average lift netters catch 20 - 50 t per month from May to October, but many boats convert to gill netting when sea conditions become unfavorable from November to April.

5-6. Fisheries Infrastructure

Thuan Phuoc Fishing Port located inside Da Nang City is the most

important fishing port in the province.

Thuan Phuoc Fishing Port

There is no paved road leading to Thuan Phuoc Fishing Port, and the road condition is particularly bad after rain. The port has no parking lot, so trucks park on the road. A part of the quay has decayed, but on it many small-time fish sellers, mostly women, buy and sell small amounts of fresh fish just unloaded from fishing boats.

A specific fish merchant (market intermediary) purchases the entire catch of a fishing boat, so there is no auction system at the landing place. Fish are conveyed from the anchored fishing boats to the quay by sampans and, after weighing and icing, fish are transported to processing plants for preparation for export or to retailers for domestic markets. There are at least 30 fish merchants active in the port. They provide loans to boat owners, obliging boat owners to sell fish only to them.

Next to the port are two fish processing factories. Seatecco is one of them, with an ice plant having the daily output of 60 t, a cold storage of 4 - 5 t capacity at minus 5 degrees, and its own jetty. In Da Nang City, there are six such factories processing marine products for export markets.

5-7. Fish Processing

About 20% of the total catch from this province is processed for export, and fisheries products comprise nearly 50% of the total of provincial exports. There are 11 freezing plants for export, mostly located in Da Nang City. In 1994, USD 17 million worth of processed fish products were exported from provincial government factories and USD 25 million from state-run factories in the province. Fish meal and fish sauce are processed for domestic use only.

5-8. Voices of Fishers

As for the other provinces, the opinions of local fishers interviewed in

Quang Nam Da Nang Province are classified into (a) expectations and aspirations, (b) constraints, (c) positive development perspectives, and (d) negative development perspectives, and listed below in the order of frequency that the comments were made.

(a) expectation and aspiration

1, install modern devices such as echosounder, radio, GPS;

2, larger boats and engines;

3, capital, including long-term soft credit;

4, exploit offshore fishing grounds;

(b) constraints

1, inadequate capital and/or funds (12 persons);

2, resource degradation (6 persons);

3, foreign vessels intruding in local fishing grounds;

4, low and unstable fish prices;

5, increasing number of fishing boats;

6, short-term loans with high interest rates;

(c) positive development perspectives

1, Offshore waters have under-exploited resources;

2, Government support will enable fisheries develop further;

3, There is no serious threat in resource condition;

4, Larger boats and engines will enable fisheries development;

5, Catch is now better than before.

(d) negative development perspectives

1, declining catch owing to deteriorating resources;

2, degradation of coastal fishing grounds;

3, over-fishing by larger boats;

4, lowered profitability;

5, a sudden increase in the number of fishing boats;

6, the lack of capital and/or funds

More than half the 55 interviewees indicated their desire to build a larger boat and move to offshore waters. Indeed, the enlargement of boats and engines is an on-going process. Twelve interviewees answered that they want financing for building a fishing boat of 30 - 110 h.p.. The 36 fishermen pointed constraints to fisheries development. Complaints regarding low and unstable fish prices were heard from owners of larger fishing boats.

Although 23 fishers out of 40 were positive about the future of fisheries, most qualified their responses with conditions such as the enlargement and modernization of their boats and government assistance policy. On the other hand, 17 fishers view the future of local fisheries negatively, from the decline of both catch and resources. Obviously, these positive and negative views are not necessarily mutually exclusive; many consider that advance to further offshore fishing grounds by building a larger and powerful boat is the only solution to the ever-deteriorating situation of coastal fisheries.

(6) Quang Binh Province

6-1. Profile of the Province

Geographical position and topography

Quang Binh Province is situated in the northern most area of the Central Region stretching from the two North latitudes of 17°05' and 18°06'. It lies next to Ha Tinh Province by the North, Quang Tri Province by the South, Laos by the West and the Chine Sea by the East. In this geographical location, the province enjoys the nationwide transport infrastructure such as National Highway No. 1A, the trans-national railway, the sea port of Nhat Le, and Highway No 29 directing to Laos.

With the total area of over 7,900 km^2, Quang Binh's topography can be featured by four different zones: sandy zone accounting for 4% of the total area, plain zone for 10.9%, hilly zone for 19.8% and mountainous zone for 65.3%. Mountainous and hilly regions occupy over 80% of the natural area and densely concentrate in the west of the province with high mounts sloping down east to

small hills and plain strips and coastal sand.

Some municipal locations of the province are the towns of Dong Hoi, Ba Don, Kien Giang, Hoan Lao. These urban centers lie in the surrounding of the sea port of Nhat Le, port of Gianh River. In addition, the construction of Hoan Lao port has been planned for next year, which will support future economic development of the province.

Socio-economics

Population of the province is around 767,500, with the population density of 94 people per m^2 and the population growth rate of 2.8%. The economically active population is 348,000, or 45.3% of the total population in 1993. The rate of unemployment and underemployment was 8.7%.

Average GDP growth rate in the 1990 - 1993 period was 2.2% with industrial production increasing by 6.8%, services by 9.2% and agricultural production by 1.4%. Yet, the growth rate is still lower than that of the population (2.8%), and the per capita GDP is very low, about USD 142. Although the proportion of industry and service sectors is increasing in the province's economy , agriculture is still the dominant economic sector. The revenue of the province is not enough to cover the current expenditures of the provincial government.

Industry

The gross output of the local industrial sector is seen in a gradually increasing trend from over USD 5.2 million in 1991 to over 7.6 million in 1995. Its industrial development is directed towards products for export market. The production of cement, slab stone, rubber is being promoted.

Agriculture

The gross output of paddy per capita in 1994 is 149 kg; the number of cattle in 1994 is over 240,000 across the province. The development of

agriculture also goes in line with that of the processing industry. Quang Binh Province is now integrally developing the economy in hilly regions, combining agriculture and forestry, perennial and short-term crops, and crops production and animal husbandry.

Service Sector

The province is underdeveloped in terms of commercial activities and tourism industry, particularly compared with other four provinces surveyed at this time.

6-2. Fisheries Overview

There are 3,084 fishing boats registered in Quang Binh Province in 1995. Fig. 6-46 shows the size distribution of registered boats in terms of engine capacity: 28% have an relatively large engine of more than 20 h.p., whereas 72% have smaller engines (41% with 12 - 14 h.p. and 31% with 6 - 10 h.p.). The data of Quang Binh Province do not subdivide the class over 20 HP, but according to field investigation the majority of fishing boats in this class actually have engines of 30 - 40 h.p.. There are 7,661 units of registered fishing gear, or 2.5 times of the number of fishing boats, indicating that fishers possess two or three types of fishing gear. The main gear types include gill net (45%), trawl net (28%), hand line (10%), small fixed lift net (6%), other lift net (6%), and beach seine (5%) (Fig. 6-47).

Assuming a total provincial production in 1994 of 10,400 t, the figure compiled by the provincial government, the per boat annual production is only 3.4 t. Although fish production data by gear type are not available, it is assumed that a large percentage is caught by gill netters, the main gear type used. Fishing gear used in this province are often used only in a specific season and replaced with others in the season that follows. For example, fishers use lift nets in summer and convert to coastal shrimp trawling or long-lining and squid angling in winter, when the sea is rough. This leads comparatively low production levels

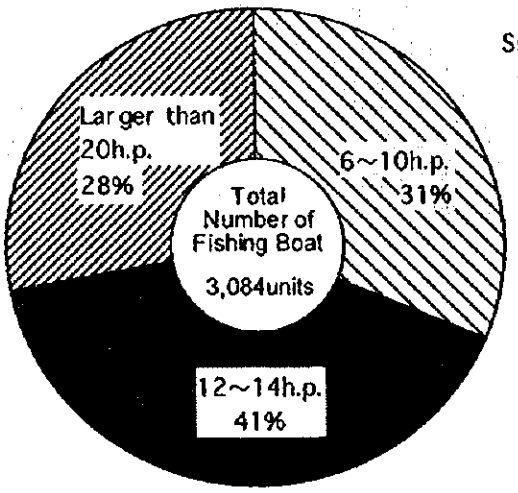

Fig. 6-46 Size Distribution of Registered Fishing Boats by Engine Capacity in Quang Binh Province

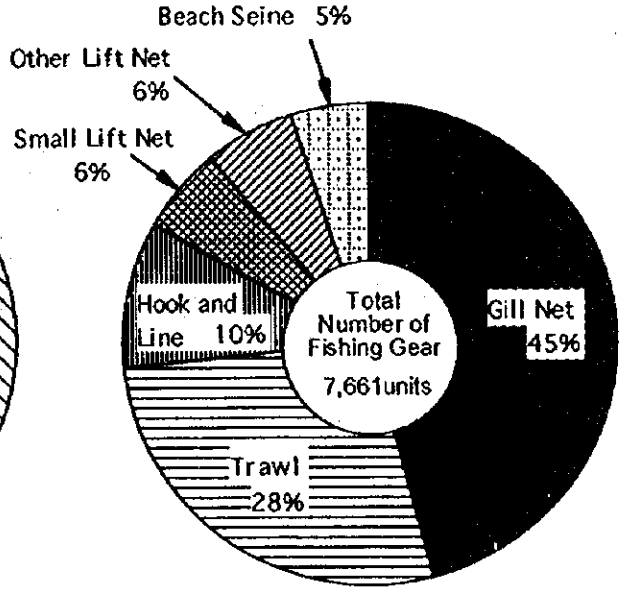

Fig. 6-47 Type Distribution of Fishing Gear Unit in Quang Binh Province

of trawlers and lift netters despite the percentage of registered boats under these categories.

Local fishers operate mainly in coastal waters off the province, but have expanded their operations to other areas in the Gulf of Tonkin. Although the fishing grounds of trawlers and lift netters in general, and shrimp trawlers in particular, concentrate in coastal waters, those of purse seiners and gill netters are extensively distributed in offshore areas. Purse seiners go to even the northern Gulf, off Hai Phong (Fig. 6-48).

6-3. Gill Net Fishery

Gill nets used in this province is classified into various types such as conger pike gill net, spiny lobster gill net, trammel net, bottom gill net and nylon gill net, reflecting variations in their type and size. Five informants, owners of relatively large-seized drift gill net boats provide catch data. The average size of theirs boats is 12.4 t and the engine capacity 31.7 h.p.. They have an annual average catch of 58 t of such migratory fish as Eastern little tuna (*Euthynnus*