According to island groupings, fishery products are in great shortage in Java, in slight shortage on Sumatra, and in surplus on all the remaining islands. It is surmised that the fish surplus of Kalimantan fills the shortage in Sumatra and Java. Furthermore, fishery products are abundant in the areas east of Java and the flow of fishery products in Indonesia moves from east to west.

Northern Sumatra Province is a fish shortage area and it is surmised that surplus fish products from Riau Province are shipped there. However, the flow of fish products is not determined by excessive shortage factors alone, but it is also strongly affected by price. Fish products flow predominantly to Jakarta and west Java where high prices are anticipated. It is believed that a major marketing route exits, which ships fish products from the Kab. Kepulauan Riau geographically near Java, Jakarta and Singapore. As a result, fresh fish (particularly high priced fish) tend to be in short supply on the island of Sumatra; and the major fish product consumed in the provinces of Riau and North Sumatra is the relatively inexpensive processed fish.

When factors such as the road network and the anticipated high prices of Jakarta are taken into consideration, it is surmised that the surplus fish supply of Kalimantan first flows to Java, and if the price is unsatisfactory or if there is a surplus, the fish is shipped by ferry, etc. to west Sumatra and further on to Riau and north Sumatra.

4.2.2 Supply and Demand of Fishery Products in the Study Area and Riau Province

(1) Production of fishery products

Riau Province includes the group of islands in the resource abundant South China Sea and fisheries is actively carried out. In 1991 the fishery production volume was 190,000 tons or approximately 120 billion rupiahs. Most of the production volume (92 percent) was from the ocean. Of the total production volume landed by ocean fisheries, 36 percent was consumed as fresh fish, 40 percent was processed as salted and dried fish, and 34 percent was earmarked for terasi processing.

Of the six kabupaten of Riau Province, the fishery production volume of Bengkalis facing the Malacca Straits was the highest, comprising about one half of the total production volume of the province. However, in monetary terms it was only one third of the entire revenue generated by fisheries in the province. In contrast, the production volume of the neighboring Kab. kepulauan Riau was only 19 percent of the total production volume of the state, yet it generated 24 percent of the entire revenue for fisheries in the province. It is significant that comparatively high price fish are produced here. The average price for fishery products of Kab. Bengkalis was much lower than Kab. kepulauan Riau at Rp.446/kg (1991), in comparison to Rp.806/kg for fish products from the Kab. kepulauan Riau.

Nearly three fourths of the production volume from ocean fisheries in Riau Province is comprised of fish species, while the remainder are made up of shrimps. A variety of fish species are harvested and according to statistics compiled by the Provincial Fisheries Department, there were more than 36 species listed. Approximately 85 percent (1991) of the shrimp species are small types and mysid and only 6,000 tons of the relatively high priced white shrimps were harvested in 1991.

In comparison to other kabupaten, Kab. Bengkalis produces a large volume of shrimps, comprising about 80 percent of the entire production volume of the province. However, the majority are of small shrimps or mysid (27,000 tons) and barely 4,000 tons of white shrimp are harvested. Although kab. Bengkalis has a large production volume of 54,000 tons, production of high priced fish is minimal, and the fish catch is mainly confined to low priced fish. Much of the catch is comprised of large volumes of bombay duck which are dried and salted (10,000 tons, 1991).

Of the entire fishery production volume of 88,000 tons for Kab. Bengkalis in 1991, 80 percent were concentrated in Kec. Banko in Bagansiapiapi and Kec. Kubu in Haran island. In contrast, the production volume of the three areas under the jurisdiction of Dumai, Bengkalis, and Tebing Tinggi combined was only 16 percent of the total production volume of the kabupaten. Within this area, the production volume of Selatpanjang (Kec. Tebing Tinggi/ Merbau) was very high at 11,000 tons, followed by 1,700 tons produced in the Dumai area and 1,600 tons landed in the Bengkalis area (Kec. Bengkalis/Bukit Batu). Each area comprised only 2 percent of the total production area of the kabupaten.

(2) Fish inflow/outflow (import/export)

The export volume of Riau Province rose from 9.400 tons in 1986 to 51,000 tons in 1991, indicating a growth of 5.4 times (DGF statistics, see Table 4.3). The growth rate in export volume for Riau Province did not differ greatly with the rest of the nation until 1989, however in 1990 it increased to three times the volume of the previous year, and became the province with the highest export volume in the nation. According to the estimates published by the Central Bureau of Statistics, the 1991 export volume for Riau Province was approximately 71,000 tons and the highest in the nation. The growth in export volume was large from 1990 to 1991 and it is anticipated to continue rising steadily. In 1986 export earnings were 4.2 million US dollars and in 1990 they reached 43.5 million US dollars, indicating a growth in earnings of about 10.4 times and exceeding the growth in export volume (see Table 4.3, 4.4). The growth in earnings was particularly remarkable from 1989; and it is surmised that exports of high value added fishery products have been increasing since that time.

Much of the volume of fishery products exported from Riau Province is fresh

fish (85 percent), followed by processed shrimp (4.2 percent). A major part of the export earnings is generated from fresh fish (83 percent), followed by frozen shrimp (5.9 percent). In addition, a small volume of high value added fish for collectors are also exported (see Table 4.5).

Much of the fish exported from Riau Province are landed in the Kab. kepulauan Riau to the east side of the study area and the Kec. Kubu and Banko in the Kab. Bengkalis, located west of the study area. Fish exported from the study area itself is exceedingly small. According to the export statistics of the DGF, the volume of fish exported from the study area was 137 tons in 1990, generating an earnings of US$ 56,000.

Fishery export from Kab. Bengkalis was mainly fresh fish and a small volume of dried and salted fish. In 1991 the export volume, converted to fresh fish, was equivalent to 11,640 tons or an earnings of 2.2 million US dollars (see Tables 4.6, 4.7). Of this volume, the export volume from the study area was 453 tons or an earnings of US$ 844,000 comprising only 40 percent of the entire kabupaten.

According to the interview survey conducted during the field study, fresh fish is exported to Singapore via Tanjung Barai Karimun in the Kab. kepulauan Riau from Selatpanjang, but the fish has not been recorded as having been exported from Selatpanjang. The export volume was about 400 tons in 1991, according to estimations based on the export volume from Tanjung Barai Karimun to Singapore (by the DPK of Tanjung Barai Karimun). Concurrently, although shrimp harvested by Gombang fishing in Tanjung Kedabu in Ransan island is exported to Singapore via Tanjung Barai Karimun, it is believed that this volume has been recorded as part of the export volume of Tanjung Barai Karimun in export statistics. In addition, much of the export volume handled by KUD of Rupat island is directly freighted to Malacca without passing the export checkpoint; and as a result, it is not recorded in the export statistics of Indonesia.

The volume of fishery products directly imported to Riau Province from 1986 to 1988 is estimated to be about 1200 tons, but it dropped to 600 tons in 1990 (see Table 4.8). This figure is equivalent to less than 1 percent of the total import volume of the nation. In addition, import earnings declined from 1986 to 1990, and import earnings for 1990 was about 1/18 of the earnings for 1986 (see Table 4.9). As Riau Province has a large surplus in fish production volume, an increase in import volume is not anticipated.

Although there is no data pertaining to import volume for Kab. Bengkalis available, an inflow volume of fresh fish to this area has been recorded in the annual report (see Table 4.10). However, in order to grasp the inflow volume of the entire kabupaten, a thorough estimation of the collected data has not been carried out and the

figures are not reliable. In particular, the fact that no inflow volume is given for Dumai, where fresh fish are in shortage, casts doubt on the reliability of the data. According to the given data, although the inflow volume to Tebing Tinggi has increased rapidly since 1990, it is only about 400 tons. This is very low, in view of the area's production volume. This signifies that the inflow volume is equivalent to 70 or 80 percent of the 1990 export volume for the entire kabupaten.

(3) Consumption of fishery products

1) Estimates on per capita consumption volume of fishery products in Kab. Bengkalis by the DPK

Per capita consumption volume of fishery products was estimated based on population, volume of production, inflow, export of each kecamatam and it is shown in Table 4.11.

Per capita consumption volume of fishery products for the entire kabupaten was 76kg/year which is very high in comparison to the entire nation. The figures for the Kec. Kubu and Banko were 303kg/year and 218kg/year, respectively. These figures are abnormally high because the domestic outflow of fresh fish to other areas is not clear and the outflow volume of dried and salted fish and fish for terasi to other areas is also unknown. This has contributed to an overestimation of the total consumption volume.

In contrast, the per capita consumption volume for Dumai and Siak is unusually low at 9.4kg/year and 2.1kg/year, respectively. This is due to insufficient monitoring of the outflow volume of fresh and processed fish (dried and salted) from this area.

In conclusion, there is no accurate figure for the total consumption volume of this area; and it is meaningless to calculate the per capita consumption volume by simply taking a value, approximating the production volume of the area, as the total consumption volume and dividing it by its population.

In addition to the export volume of each kecamatan, the Fisheries Department has also compiled data on transactions of fishery products between the islands (see Tables 4.12, 4.13). However, this data includes not only the transactions between the islands within Kab. Bengkalis, but between other islands as well. This data is only significant as a record of transactions for fishery products within the kabupaten. However, in a study of this record, when the volume of transactions are converted to fresh fish, it is equivalent to 28,000 tons or an earnings of 2,246 million rupiahs. When these figures are combined with the factor that the production volume in this area is large, it is estimated that a large portion of the production volume is shipped out to other kabupaten or provinces.

According to the socio-economic survey of the study area, the per capita consumption volume of fishery products was estimated at 42.4kg/year. Although this survey was carried out in the coastal fishing villages and its findings do not represent the inland areas, they are applicable to the Kec. Banko and Kubu. The consumption volume for the inland areas can be appropriately represented by the per capita fishery products consumption volume of 28.0kg/year for Riau Province, given in Chapter 4.2.1 "Balance in Supply and Demand in Indonesia".

2) Balance in supply and demand of fishery products in Riau Province

Since a clear statistic for per capita fish consumption volume of fishery products was not available, the balance in the supply and demand of fishery products was analyzed for the following two cases delineated below.

Based on the findings explained in Chapter 4.2.1 "Balance in Fishery Products Supply and Demand in Indonesia", the balance in supply and demand of fishery products in Riau Province (case 1) was formulated and the results are shown in Table 4.14. The underlying reason as to why the per capita fishery products consumption volume of Riau Province rose from 28.0kg/year to 28.2kg/year, was that the total population data below the kecamatam level in Riau Province obtained by the Central Bureau of Statistics, was not the same as their figure for the population of that province. As a result, the Central Bureau of Statistics adjusted the statistic for per capita consumption volume without changing the the total consumption value. In addition, the statistic for Riau Province, compiled by the DPK of the kabupaten was used; and the surplus fish of Kab. Kepulauan Riau was recorded as outflow and the remainder was apportioned to the Kab. Indragiri Hilir.

As shown in Table 4.14, per capita consumption volume of fishery products in Riau Province was established at 28.2kg/year. If the consumption volume was uniform throughout the entire province, the following conclusions on the outflow of fish to other areas can be made.

- The outflow of fish products from Kab. Bengkalis is 63,000 tons, roughly 70 percent of its production volume.
- The Kec. Kubu, Banko, and Tebing Tinggi in Kab. Bengkalis has a surplus of 90, 78, and 45 percent, respectively, of their production volume. This surplus is shipped out of the kecamatan; and a segment is used to fill the shortage within the kabupaten, while the remainder is shipped to outside areas.
- In addition to Bengkalis, Indragiri Hilir also has a surplus which is believed to flow inland to Pekanbaru, etc.

Other kabupaten have the same consumption volume as in case 1. If the

consumption volume of Kab. Bengkalis is established at 42.3kg/year, as estimated in the socio-economic survey, the conclusions are shown in Table 4.14 for case 2. (In this case, the surplus fish volume is smaller than case 1. This finding is only applicable in estimating the balance in supply and demand for Riau Province. If it is interchanged with the line on Riau Province in Table 4.2, the national balance will no longer be at zero, producing a contradiction.)

The only factor that changes from case 1 is Kab. Bengkalis. The value indicating the shortage within the kabupaten, grows larger and the surplus value becomes slightly smaller. The following can be deduced from this change.

- The outflow of surplus fish products is nearly the same as case 1.
- The shortage in the Kec. Dumai, Rupat, Bengkalis, etc. is two to three times the production volume. Despite the sale of high priced fish products to outside areas or the purchase of low priced products, the shortage may not disappear. As a result, per capita consumption volume may fall or fish prices may rise. Surplus fish for export may disappear and exports may come to a standstill.

4.3 Transport and Route of Fishery Products

Due to the undeveloped road network, with the exception of certain areas in Bengkalis island, the fish catch is transported by either fishermen's boats or the fish freighters owned by the fish trader, to the marketing point. According to fishery statistics, there are 121 fish freighters operating within the study area (Table 4.15). They are all small freighters of about one to ten tons. Although shipping costs are not clearly known, the shipping cost for fish products moving between Tanjung Barai and Singapore is 15 cents/kg in Singapore or 180 rupiahs/kg for a transport company.

Based on the findings of the interview survey on fish production, the patterns in fish marketing at fish landing sites are characterized as follows (see Table 4.16).

The fish landing sites are commonly located near the fishermen's homes; and 68 percent of the non powered boats and 45 percent of the powered fishing boats land their fish catch at their fishing villages. The fish catch is sold to the fish traders who arrive at the villages to ship the fish out to other areas or to process them as dried and salted fish or terasi, etc.

The second most common fish landing site, following the fishing villages, are the marketing points. Approximately 35 percent of the manually operated boats land their catch at the marketing points in Bengkalis, 18 percent in both Kec. Tebing Tinggi and Merbau, and 14 percent at Selatpanjang. In the case of powered fishing boats, 44 percent land their catch at the marketing points in Bengkalis, 19 percent in both Kec. Tebing Tinggi and Merbau, and 13 percent at Selatpanjang.

In addition, 7 percent of the non powered boats and 15 percent of the powered fishing boats turn over their catch to freighters. In the Kec. Tebing Tinggi, 10 percent of the manually operated boats and 26 percent of the powered fishing boats turn over their fish catch to freighters. This is a slightly higher ratio than other areas. The fish catch which is turned over to freighters are transported to marketing points and sold.

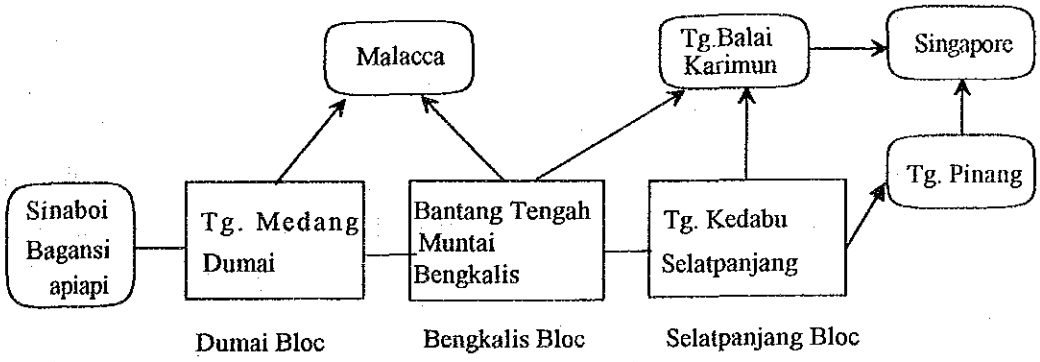
Although the fish landing ratio of the landing site in Kec. Tebing Tinggi is higher than other areas, it is surmised that much of the fish catch is landed at Tanjung Barai Karimun and Tanjung Pinang, which are export relay points to Singapore or it is directly landed in Malacca or Singapore.

Exported fish products are also ocean freighted. Although the speed of the freighter differs, the time it takes to transport the fish from the fish landing sites on the Malacca Straits side of the study area, to the export relay point of Tanjung Barai, and on to Malacca in Malaysia or Singapore is given below.

Rupat island - Malacca :	About 3 to 4 hours
Bengkalis island - Malacca :	About 4 to 6 hours
Ransan island - Malacca :	About 6 to 8 hours
Ransan island - Tanjung Barai :	About 4 to 5 hours

Usually the time it takes to transport the fish from the aforementioned areas to the domestic marketing points of Dumai, Bengkalis, and Selatpanjang is more than three to four hours; and in many cases it is more profitable to directly import the fish. The marketing routes of fishery products in the study area are shown in Fig. 4.1.

The study area is located near Singapore and Malacca in Malaysia; and the large fish production centers of Bagansiapiapi and Sinaboi in Kec. Banko are to the west. Although the influence of these two areas cannot be ignored, the core of the study area in terms of population, commerce, government, etc., is Dumai, Bengkalis, and Selatpanjang. This core forms three separate marketing zones, specifically the Dumai marketing zone in the west and the Bengkalis and Selatpanjang marketing zones (see Fig. below).



The Dumai marketing zone has two centers, namely Tanjung Medan (Rupat island) which is the export center for Malacca, and Dumai the local consumption center. The center of the Bengkalis marketing zone is Bengkalis, but Bantan Tungah on the Malacca Straits side is the export center for Malacca. The export center for the Selatpanjang marketing zone is Tanjung kudabu on Ransang island. Fish products are transported from here to Tanjung Barai Karimun.

Among the three marketing zones, Selatpanjang is the largest in terms of area and production and consumption volumes (according to the Department of Fisheries, Kabupaten statistics). In exportation, the Dumai marketing zone is linked to Malacca, Malaysia and the Selatpanjang marketing zone is linked to Singapore via Tanjung Barai Karimun. The Bengkalis marketing zone which is centrally located is strongly linked to Malacca, but its northeastern area is geographically closer to Selatpanjang and has strong ties with both marketing zones. In addition, exportation via Tanjung Barai Karimun is also carried out.

4.4 Wholesale Price at the Market of the Export Destination

(1) Wholesale price of harvested fish

Most of the harvested fish in this area are exported fresh to Malaysia and Singapore. As the quality management of the fish exported from this area is not satisfactory, they are not highly evaluated in foreign markets. Therefore the wholesale price of these fish is fixed at a lower level.

In the Malacca market, the average wholesale price between January and July 1993 for wolf herring and narrow-barred mackerel produced in Indonesia was Rp. 4,600/kg for each. In this market, the price fluctuates greatly according to the size and quality of the harvested fish. In September 1993, the common wholesale price of high quality wolf herring and narrow barred mackerel harvested in Indonesia was Rp. 7,200/kg for the large fish, Rp. 6,400/kg for the middle-sized ones and Rp. 4,800/kg for the small ones. The average wholesale price mentioned above is more than 1.5 times lower than that of high-quality large-sized fish.

In Singapore's Jurong market, high quality wolf herring and narrow barred mackerel harvested in Indonesia in September 1993 were sold at the wholesale price of Rp. 10,800/kg for large fish and Rp. 8,400/kg for the small ones (refer to Table 4.17).

The Taukes in the survey area bought the wolf herring and narrow-barred mackerel fresh from fishermen at Rp. 2,500 - 3,600/kg. Most of them purchased the fish at a little over Rp. 3,000/kg. Assuming that the average wholesale price in Malacca was Rp. 4,600/kg, the Taukes are considered to receive approx. a 30% - 50% margin including freight.

Even if the profit of the Taukes is maintained as is, it will be possible to increase the fishermen's profit by improving the quality control method for the harvested fish in

the survey area.

(2) Selling price of cultured marine products

Currently, giant sea perch are cultured in the survey area, and the products are entirely exported to Malaysia.

Giant sea perch are sold at Rp. Rp. 4,000 - 5,000/kg in the survey area, but they are exported to Malaysia at Rp. 7,200 -8,0000/kg (freight included). On the other hand, the wholesale price in Singapore is between Rp. 6,000 - 8,000/kg depending on the size of the fish. Singapore imports the cultured giant sea perch live from Malaysia at the wholesale price of Rp. 10,000 - 11,000 for about 600 g.

4.5 Consumption and Processing of Fish

The processed fish product which Kab. Bengkalis is most noted for is the production of terasi, the traditional Indonesian condiment made from mysid shrimp. The production centers are Haran island in Kec. Kubu and Bagansiapiapi in Kec. Banko where mysid shrimps are harvested in relatively large volumes.

Terasi is graded according to its content and top grade terasi is made up of nearly 100 percent mysid shrimp and is usually red in color. In terasi of second grade quality, 50 percent of the content is composed of other small shrimp and its color is either black and white or red and white. According to an interview survey in Haran island, top grade terasi is packed in boxes and shipped mainly to the market in Jakarta, where it is sold for Rp.400/kg, a price which includes the shipping costs. In contrast, second grade terasi is packed in bags (jute bags) and shipped to the markets in Surabaya, Chilenbon, and Palenbang where the black and white terasi is sold for approximately Rp.300 and the red and white terasi is sold for Rp.200.

In the study area, only first stage processed terasi is produced (mixing salt with the mysid shrimps and fermenting the mixture) where it is shipped in bulk to Jakarta. After arriving at the market in Jakarta, it undergoes second stage processing for the retailers and is sold through various marketing channels. The retail price in the supermarkets in Jakarta is high at Rp.5,000/kg.

According to statistics compiled by the DPK, approximately one third of all fish catch harvested in the study area is consumed as fresh fish. Due to the undeveloped road network, the ratio of fresh fish consumption is high in the coastal areas and low in the inland areas. In addition to being consumed as fresh fish, fish products are also consumed as either salted and dried fish or as terasi. Salted and dried fish products are produced at all fishing villages, but the production volume of each fishermen household is small. The cost of salt is Rp.150 to 200/kg and it is easily obtainable.

In studying the production volume of ocean fisheries which were processed in 1991, the ratio of fresh fish was 35.8 percent of the total production volume; and the ratio of fresh fish consumption has been rising steadily since 1988. The ratio of dried and salted fish was 39.9 percent in 1991, which was very high for this type of processing. However, this ratio has been declining since 1988. The ratio of fish produced for terasi is estimated to be about 24 percent (see Table 4.18).

In the area of processed products of fresh water fish, approximately 66 percent of catch volume was consumed as fresh fish in 1991 and about 25 percent was dried. In addition, about 8 percent was smoked. There have been no major changes observed in the aforementioned ratios as of 1986.

In the study, although the production of relatively expensive fish catch (shrimp, large fish) is small, they are earmarked for exportation, while good quality salted and dried products or shrimps for terasi are shipped to Java island. Fresh fish (kunbun, etc.) and salted and dried fish (ikan bilis, etc.) are locally consumed. In addition, dried and salted fish is also brought in from Padan, Medan, etc., the fishery centers of Sumatra island. Fish packed in ice is transported by truck from Padan in west Sumatra to Dumai, where the roads are in good condition.

4.6 Quality Control of Fishery Products

The quality of fishery products is determined by the level of freshness, hygienic condition, and shape. In particular, the level of freshness is crucial for fresh fish products and for export items, and it is essential that hygienic conditions are maintained for both fresh and processed products. In Japan, the appearance of the fish as well as the coloring of its meat are important, but in Indonesia these factors are not significant.

There are no regulations or laws that establish quality standards for locally consumed fresh and processed fish; and there is no agency to monitor the quality of fishery products. Moreover, fish is usually deep fried (goren) in Indonesia and a high degree of freshness is not important. However, Chinese Indonesians require a high level of freshness, and this factor is reflected in the fish price.

The majority of fishing boats operating in the study area are non- motorized boats; and motorized boats are under five tons. Fishing boats carrying a sufficient amount of ice are rare, with the exception of fishing boats harvesting export fish. As a result, fish which has been landed for local consumption, has deteriorated in freshness by the time it is landed. Hence there is a great difference in the quality of fresh fish sold in the town market.

Large differences in the quality of salted and dried products, sold in grocery stores run by Chinese Indonesians, also exist. They are not only sold in the local grocery stores, but are also shipped to outside areas such as Java. According to a development project by the DPP, the need to improve the quality of processed fish such as dried and salted fish, terasi, etc. through improved technology, has been recognized. In addition, since the processed fish product is sold to other provinces such as Java, measures to improve the quality of existing products as well as diversification is planned, since many of the products are first stage processed items which require additional processing.

There is a quality control inspection agency run by the provincial government in the Kab. kepulauan Riau which inspect frozen products such as shrimps and tuna for exportation. Both fresh and processed fish can also be inspected here. However, due to the lack of any legal obligation to inspect fresh and processed fish for exportation, they are not inspected. According to development plans, measures are being formulated to guarantee quality control of export items including fresh and processed fish, in order to achieve competitive viability in the international market.

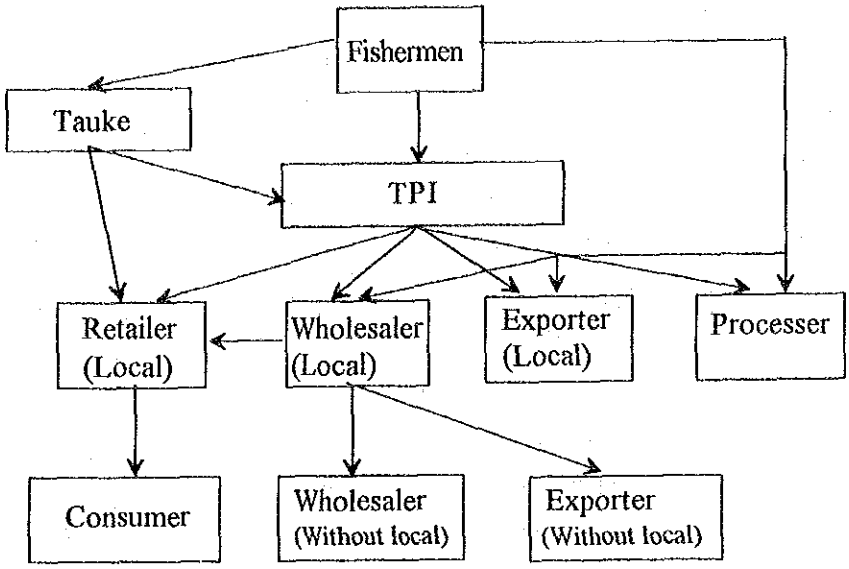
4.7 Organization and Structure of Fish Marketing

(1) Basic structure of marketing

According to the usual marketing pattern for fishery products, the fish catch is sold to the fish trader when it is landed at the local TPI, who in turn, sells it to the retailers and consumers at the local fish market. The retailers who purchase the fish sell it to the consumers at the free retail markets.

Relatively high priced fish and prawn sold at the fish auctions are exported to Malaysia and Singapore. These export transactions are usually dominated by the taukes or Chinese Indonesian fish traders. There are a total of six exporters operating in the study area, three in Dumai and three in Bengkalis. Fish catch which are exported to Singapore through Selatpanjang, usually pass through the midway point of Tanjung Barai in the Kab. kepulauan Riau. As a result, the operators in Selatpanjang are not statistically counted as exporters. Moreover, some taukes circumvent the fish auctions and directly export the fish catch. It is believed that this is done in order to prevent the fish catch from deteriorating in freshness, and to avoid paying the marketing tax. The counterpart in the other country is also usually a tauke; and the relationship between the two parties is based on long established trading ties. In addition, some fishermen KUD participate in shipping and marketing activities, as in Tanjung Medan on Rupat island.

The following figure on marketing channels of fishery products is shown below.



Based on the interview survey findings on fish production, the fish trading methods and selection of fish traders by fishermen are explained below (see Tables 4.19, 4.20).

Fish trading is commonly carried out through negotiation or consignment. However, many of the motorized fishing boat owners in kecamatan Dumai sell their fish catch through the auction. The majority of non powered boat owners in the Kec. Bengkalis and Sungai Apit sell their fish catch on a consignment basis, and in other areas the fish catch is negotiated.

70 percent of non powered boat owners sell their fish catch according to fish price; and it was observed that fish traders were selected on the basis of their fish price. A high 46 percent of the powered fishing boat owners sold their fish catch on the basis of fish price; 31 percent gave priority to tauke with whom credit ties existed, and 17 percent sold their catch to tauke with long established business ties. Hence it was also observed that factors other than fish price strongly determined the buyer. The cost of a powered fishing boat as well as operating costs such as fuel, are higher than non powered boats. As a result, fishermen will borrow the operating capital from the tauke and sell their fish catch to them in payment for the credit. Irrespective of credit ties, some fishermen sell their fish catch to tauke with long established business ties. In such cases, a relationship built on trust ensures the steady purchase of a fisherman's fish catch.

(2) Trends in fish price

The price of fresh fish in the study area fluctuates, but according to the fiscal year, they appear to be rising. However, the actual price of some fish species are falling, due to a rise in the cost of living (see Tables 4.21 - 4.23).

The difference between consumer's price and producer's price, which is

comprised of the distributor's margin and marketing costs, is often mainly due to the distributor's margin. A large difference signifies a large margin for the distributor. In a comparison of data on producer's price in the fish auction of November 1992 obtained from the Department of Fisheries in Dumai, and of the consumer's price in the retail market during the same period, the following trends were observed (see Table 4.24).

- For fish catch below the consumer's price of Rp. 1,500/kg.

  The higher the fish price, the larger the difference between the consumer's price and the producer's price, with the difference reaching Rp.200 to 500/kg. The difference in price was 30 to 60 percent of the producer's price.

- For fish catch higher than the producer's price of Rp.1,500 /kg

  The difference between the consumer's price and the producer's price was held down to Rp.500 to 800/kg, irrespective of the rise in fish price. The difference in price was 15 to 30 percent of the producer's price.

The consumer's price is generally determined by the balance in supply and demand. The demand in the study area is relatively stable throughout the year, but production fluctuates with the seasons. Consequently, the supply Although a simple comparison of local fish prices and export prices cannot be made due to differences in fish species, quality, and transport costs, the fish price in Malacca is 30 to 50 percent higher than local prices; and in the Singapore market, it is 50 to 100 percent higher (DPP estimates). In addition, export prices fluctuate according to the changes in the market price in the other country.

In contrast, the price of salted and dried fish products are generally stable. For example, the price of dried sardine and mackerel from other areas was Rp.1,250/kg in 1988 and in 1991, the consumer price was Rp.1,500/kg.

There were no notable differences in the fish price of the three marketing zones of Dumai, Bengkalis, and Selatpanjang within the study area.

4.8 Fish Marketing Facilities

(1) TPI

The fish auction facility is located near the market and is comprised of a fish landing site and auction space. The facilities are constructed by the provincial government, but they are under the management of the local Department of Fisheries. The costs are met by both the province and kabupaten.

According to regulations set up by the province, a five percent marketing tax is added to all sales completed at the auction. This tax is paid by the seller (fisherman) and the buyer (Tauke) and 2.5 percent is collected from each party. Originally, this tax was collected by the DPK, the Kabupaten government, the fishermen organization, and the tax office of Kab. Bengkalis, but as of April 1, 1992 a private association was

established to collect the marketing tax. The provincial government, the kabupaten, and the collection agency receive 50, 30, and 20 percent, respectively, of the collected tax.

There are no restrictions on either the buyers or sellers participating in the fish auction. Thus, it is possible for a fisherman from Kec. Bengkalis to sell his fish at the auction in Selatpanjang. As a rule, the auctions are conducted by the auctioneer, acting as the middleman, but auctions are rarely carried out in the study area; and the common mode of transaction is through direct consignment, according to the findings of the interview survey on fish production delineated in section 4.6.

Among the four locations of Tanjung Medan, Dumai, Bengkalis, and Selatpanjang in the study area, the only place where the original functions of the auction are being carried out, is in Dumai. The auction facility in Tanjung Medan on Rupat island has never been in use since its completion. A major underlying cause is the fishermen KUD in the neighboring area which bypasses the TPI in their export operations. In Selatpanjang, the auction facility is still under construction (see Table 4.25).

(2) Fish market

The fish market (Pasar Ikan) and the vegetable and meat markets are housed in one facility, constructed by the kabupaten. In principle, it is maintained and operated by the Bureau of Markets (Dinas Pasar).

The number of sellers is limited (20 to 50 sellers per marketplace) and they are required to pay Rp.7,500 per month in order to secure one table to display their wares. As a rule, one individual is prohibited from monopolizing numerous tables.

In addition, a fish retailer is required to pay Rp. 300 per day in order to sell his fish in the outdoor or free markets.

There are eight fish markets in the study area (Department of Fisheries statistics), which are mainly concentrated in Dumai (two locations), Selatpanjang (one location), and Bengkalis (one location) (see Table 4.26).

(3) Ice plant

There are presently a total of nine ice plants in the three marketing zones (see Table 4.27). Ice is sold to fishermen, taukes, restaurants, etc. Ice production capacity in the kabupaten averages 5 tons/day for one ice plant; and for the nine plants in the study area, the total production capacity is 27 tons/day. The price of ice varies widely, but approximately one ton of ice is 30,000 to 60,000 rupiahs. The ice is slightly yellowish in hue and it is not good quality ice, but it is sufficiently useful in preventing deterioration in fish freshness.

Many fishing boats and freighters transporting fresh fish will stop over in the

ports of Malacca and Tanjung Barai Karimun on their return trip and load their boats with ice. The ratio of ice and fish during transport is usually one to one.

(4) Cold storage and freezing facilities

There are small cold storage rooms in the fish market where unsold fish or export items are stored. There are no freezing facilities in the study area.

4.9 Development in View of Fish Marketing and Processing

4.9.1 Problems of Fish Marketing and Processing

Problems of fish marketing and processing in the study area are as follows;

- Insufficiency of infrastructure for fisheries even though the well existence of exporting fishery products
- Lack of the idea of utilizing by-catch (low commercial valued fish)
- Lack of technology enabling to process fishery products to high value added
- Lack of technology, management ability and funds to enhance fishery products processing industry

4.9.2 Development from the Viewpoint of Marketing and Processing of Fishery Products

From the viewpint of marketing and processing of fishery products, the following three points are to be observed in the development program of the study area.

- Increase in export of fresh/live fish
- Increase in the added value of the processed fish
- Active use of undeveloped fishery resources

Each of these points will be discussed below:

(1) Raising the price of fresh fish by ensuring quality control and examining the possibility of exporting live fish

As mentioned in the Section 4.4, the fresh fish imported from the survey area are not highly regarded in the important neighboring markets of Malacca and Singapore. We will discuss the way to improve the quality of fresh fish and to raise the unit selling price by providing sufficient quantity of the cheap but high-quality ice to fishermen.

Live fish are not yet exported from the survey area, but sand goby are exported live to Singapore from Tg. balai in Kab. Kepulauan Riau, adjoining the survey area.

It is technically possible to transport live fish to Malaysia and Singapore, which are close enough from the survey area. The production cost is sufficiently competitive with that of Thai and Malaysian producers. Potential products to be exported include groupers, giant sea perch, mud crab, and shellfish. We will discuss the live export of

these products as a means of increasing income.

(2) Increase in the added value of the processed fish

It is considered necessary to classify the fish when they are harvested by their species, forms (whether they are chipped or not), size and freshness before processing, which takes place in the survey area. Mainly, anchovies and mysids are processed. This pre-processing classification allows the quality of the products to be improved and standardized and the unit price to be raised. Although the dried anchovies and mysids are mostly consumed locally, it will be possible to export them to international markets such as Japan by improving the quality of these products.

One profitable use of the mysids is the production of terasi. In the survey area, most fishing households only carry out the drying process just after harvesting. Few operate the primary processing in which the dried mysids are mixed with salt and fermented. The last processing takes place after the products arrive at the market. In order to add value to the harvested fish, it is preferable that as much processing as possible be done within the village. Therefore, it is considered that the fishermen's income will be increased by diffusing the terasi processing technology to the villages that are currently harvesting mysids.

(3) Active use of undeveloped fishery resources

The muddy land where mangroves grow is also a habitat of lugworms. Currently, there is no habit of catching lugworms, but considering the size of the mangrove forest zone, it is expected to hold a great amount of resources.

Around Malacca on the opposite shore of the Malacca Straits, lugworms are caught and sold at a high unit price as bait for game fishing. In the Kab. Riau islands, lugworms are brought in from Thailand as bait for the sport fishing. If the production of lugworms begins in the opposite shore area, commercialization will be quite possible, as the cost of labor is low. Prior to realizing such operation, it will be necessary to consider the export/import procedures.

Table 4.1 Estimation of Per Capita Consumption of Fishery Products by Province (1990)

	Province	Population	Protein (g/day)	Consump. (ton)	Adjusted Consump. (ton)	Per Capita Consump. (kg/year)
1	DI Aceh	3,416	13.94	110,412	110,497	32.3
2	Sumatra Uatara	10,256	11.49	273,233	273,444	26.7
3	Sumatra Barat	4,000	7.39	68,539	68,592	17.1
4	Riau	3,304	12.08	92,543	92,614	28.0
5	Jambi	2,021	10.45	48,969	49,006	24.2
6	Sumatra Selatan	6,313	8.85	129,543	129,643	20.5
7	Bengkulu	1,179	7.20	19,683	19,698	16.7
8	Lampung	6,018	5.76	80,373	80,435	13.4
9	DKI Jakarta	8,254	5.75	110,044	110,129	13.3
10	Jawa Barat	35,381	6.70	549,642	550,066	15.5
11	Jawa Tengah	28,522	3.34	220,883	221,053	7.8
12	DI Yogyakarta	2,913	1.39	9,388	9,396	3.2
13	Jawa Timur	32,504	4.62	348,188	348,457	10.7
14	Bali	2,778	5.63	36,264	36,292	13.1
15	Nusa Tenggara Barat	3,370	7.21	56,338	56,381	16.7
16	Nusa Tenggara Timur	3,269	4.79	36,307	36,335	11.1
17	Timor-timur	748	2.43	4,214	4,218	5.6
18	Kalimantan Barat	3,239	9.68	72,698	72,754	22.5
19	Kalimantan Tengah	1,396	11.76	38,065	38,095	27.3
20	Kalimantan Selatan	2,598	13.67	82,346	82,410	31.7
21	Kalimantan Timur	1,877	12.77	55,576	55,619	29.6
22	Sulawesi Utara	2,479	11.83	67,998	68,051	27.5
23	Sulawesi Tengah	1,711	10.99	43,600	43,633	25.5
24	Sulawesi Selatan	6,982	12.58	203,655	203,812	29.2
25	Sulawesi Tenggara	1,350	13.84	43,322	43,355	32.1
26	Maluku	1,856	17.55	75,525	75,583	40.7
27	Irian Jaya	1,641	9.44	35,918	35,946	21.9
	Grand total	179,375	7.01	2,913,266	2,915,514	16.3

Remarks

Step 1 : Calculation of Per Capita Consumption in Whole Country

Whole Country (ton)		
(a) Production		3,162,469
(b) Import		73,285
(c) Export		320,240
(d) Consumption	(d)=(a)+(b)-(c)	2,915,514
(e) Population		179,375
(f) Per Capita Consumption (kg)	(f)=(d)/(e)	16.3

Adjustment Factor 1.0007716

Step 2 : Calculation of Per Capita Consumption by Province
Per Capita Consumption was assumed to be in proportion of Protein Consumption from Fishery Products by Province.

Source : 1) Population : Central Bureau of Statistics.
2) Consumption of Calorie & Protein of Indonesia and Province, 1990 Central Bureau of Statistics
3) International Trade Statistics of Fishery Commodities, 1990, DGF
4) Fish Production : Fishery Statistics of Indonesia, 1990, DGF

Table 4.2 Supply/Demand Balance of Fishery Products by Province (1990)

Province	Fish Supply			Fish Demand			Balance
	Sub-total	Production	Import	Sub-total	Consumption	Export	
Whole Country	3,235,754	3,162,469	73,285	3,235,754	2,915,514	320,240	-
a. Sumatra	862,451	855,849	6,602	907,230	823,929	83,301	-44,779
1 DI Aceh	111,476	111,290	186	110,575	110,497	78	901
2 Sumatra Uatara	231,695	226,481	5,214	303,613	273,444	30,169	-71,918
3 Sumatra Barat	69,169	69,169	-	68,662	68,592	70	507
4 Riau	182,055	181,418	637	143,299	92,614	50,685	38,756
5 Jambi	22,490	22,490	-	49,664	49,006	658	-27,174
6 Sumatra Selatan	132,994	132,994	-	130,993	129,643	1,350	2,001
7 Bengkulu	14,890	14,890	-	19,698	19,698	-	-4,808
8 Lampung	97,682	97,117	565	80,726	80,435	291	16,956
b. Jawa	967,621	901,186	66,435	1,353,940	1,239,101	114,839	-386,319
9 DKI Jakarta	64,893	30,196	34,697	157,024	110,129	46,895	-92,131
10 Jawa Barat	300,648	300,648	-	550,066	550,066	-	-249,418
11 Jawa Tengah	257,339	254,404	2,935	224,231	221,053	3,178	33,108
12 DI Yogyakarta	3,216	3,216	-	9,396	9,396	-	-6,180
13 Jawa Timur	341,525	312,722	28,803	413,223	348,457	64,766	-71,698
c. Nusa Tenggara	264,188	264,167	21	141,136	133,226	7,910	123,052
14 Bali	143,455	143,452	3	43,181	36,292	6,889	100,274
15 Nusa Tenggara Barat	65,736	65,719	17	56,381	56,381	-	9,355
16 Nusa Tenggara Timu	54,180	54,180	-	37,355	36,335	1,020	16,825
17 Timor-timur	817	816	1	4,219	4,218	1	-3,402
d. Kalimantan	384,804	384,798	6	257,806	248,877	8,929	126,998
18 Kalimantan Barat	87,614	87,613	1	75,147	72,754	2,393	12,467
19 Kalimantan Tengah	85,426	85,426	-	38,409	38,095	314	47,017
20 Kalimantan Selatan	124,999	124,994	5	84,345	82,410	1,935	40,654
21 Kalimantan Timur	86,765	86,765	-	59,906	55,619	4,287	26,859
e. Surawesi	533,343	533,339	4	395,814	358,851	36,963	137,529
22 Sulawesi Utara	81,658	81,657	1	78,995	68,051	10,944	2,663
23 Sulawesi Tengah	38,718	38,718	-	43,753	43,633	120	-5,035
24 Sulawesi Selatan	318,263	318,260	3	223,688	203,812	19,876	94,575
25 Sulawesi Tenggara	94,704	94,704	-	49,378	43,355	6,023	45,326
f. Maluku & Irian Jaya	223,347	223,130	217	179,827	111,529	68,298	43,520
26 Maluku	154,494	154,291	203	113,532	75,583	37,949	40,962
27 Irian Jaya	68,853	68,839	14	66,295	35,946	30,349	2,558

Sources:1) Population : Central Bureau of Statistics.
2) Consumption of Calorie & Protein of Indonesia and Province, 1990
Central Bureau of Statistics
3) International Trade Statistics of Fishery Commodities, 1990, DGF
4) Fish Production : Fishery Statistics of Indonesia, 1990, DGF

Table 4.3 Annual Export Volume of Fishery Products by Province (1986~1990)

Unit : ton

Province	1986	1987	1988	1989	1990	1991
Whole Country	107,445	140,378	181,217	228,594	320,240	411,586
a. Sumatra	24,755	31,471	37,400	43,307	83,301	114,641
1 DI Aceh	283	667	519	274	78	58
2 Sumatra Uatara	13,043	17,269	23,522	27,493	30,169	39,569
3 Sumatra Barat	63	34	58	74	70	58
4 Riau	9,407	11,566	11,203	13,694	50,685	70,950
5 Jambi	-	5	205	2	658	1,002
6 Sumatra Selatan	1,950	1,929	1,877	1,719	1,350	1,828
7 Bengkulu	3	1	-	-	-	-
8 Lampung	6	-	16	51	291	1,176
b. Jawa	35,904	47,136	72,705	104,073	114,839	153,669
9 DKI Jakarta	13,021	18,292	33,398	43,398	46,895	48,436
10 Jawa Barat	10	24	1,001	7	-	-
11 Jawa Tengah	3,109	3,092	3,807	6,343	3,178	2,663
12 DI Yogyakarta	-	-	-	-	-	175
13 Jawa Timur	19,764	25,728	34,499	54,325	64,766	102,395
c. Nusa Tenggara	340	1,644	3,253	7,837	7,910	8,752
14 Bali	189	1,464	2,936	7,590	6,889	7,985
15 Nusa Tenggara Barat	128	80	175	88	-	-
16 Nusa Tenggara Timur	23	100	142	159	1,020	767
17 Timor-timur	-	-	-	-	1	-
d. Kalimantan	5,206	7,847	8,714	8,411	8,929	9,288
18 Kalimantan Barat	962	2,181	2,421	1,974	2,393	1,892
19 Kalimantan Tengah	330	320	387	256	314	300
20 Kalimantan Selatan	1,213	2,115	2,134	2,225	1,935	1,855
21 Kalimantan Timur	2,701	3,231	3,772	3,956	4,287	5,241
e. Surawesi	15,076	20,548	23,038	21,281	36,963	25,326
22 Sulawesi Utara	655	3,188	3,720	3,848	10,944	13,026
23 Sulawesi Tengah	394	187	120	98	120	202
24 Sulawesi Selatan	10,432	12,391	13,655	14,027	19,876	7,852
25 Sulawesi Tenggara	3,595	4,782	5,543	3,308	6,023	4,246
f. Maluku & Irian Jaya	26,164	31,732	36,107	43,685	68,298	99,910
26 Maluku	6,688	12,166	12,330	24,372	37,949	40,339
27 Irian Jaya	19,476	19,566	23,777	19,313	30,349	59,571

Sources : International Trade Statistics of Fishery Commodities, 1990, DGF

Table 4.4 Annual Export Amount of Fishery Products by Province (1986~1990)

Unit : FOB US$ 1000

Province	1986	1987	1988	1989	1990
Whole Country	374,116	475,526	712,205	822,747	1,039,681
a. Sumatra	71,818	96,356	144,166	161,898	209,893
1 DI Aceh	3,041	8,054	6,401	520	545
2 Sumatra Uatara	48,597	66,038	116,637	138,659	152,784
3 Sumatra Barat	124	82	92	114	105
4 Riau	4,240	5,754	5,954	10,098	43,509
5 Jambi	-	3	210	92	1,385
6 Sumatra Selatan	15,811	16,423	14,868	12,356	9,748
7 Bengkulu	5	2	-	-	-
8 Lampung	-	-	4	59	1,817
b. Jawa	157,401	186,661	332,631	446,228	582,120
9 DKI Jakarta	54,007	65,251	142,929	201,278	236,385
10 Jawa Barat	1	4	848	3	-
11 Jawa Tengah	25,895	24,728	29,597	30,572	21,839
12 DI Yogyakarta	-	-	-	-	-
13 Jawa Timur	77,498	96,678	159,257	214,375	323,896
c. Nusa Tenggara	2,680	5,484	13,702	21,411	25,463
14 Bali	2,027	5,028	12,651	20,533	24,401
15 Nusa Tenggara Barat	646	434	813	413	-
16 Nusa Tenggara Timur	7	22	234	406	1,050
17 Timor-timur	-	-	4	59	12
d. Kalimantan	28,768	44,173	53,466	44,723	43,787
18 Kalimantan Barat	3,653	10,506	13,449	10,031	10,287
19 Kalimantan Tengah	2,742	2,335	3,090	1,584	2,187
20 Kalimantan Selatan	6,090	11,591	12,870	12,361	9,026
21 Kalimantan Timur	16,283	19,741	24,057	20,747	22,287
e. Surawesi	49,673	65,436	88,147	84,019	91,224
22 Sulawesi Utara	416	2,326	4,456	4,454	13,280
23 Sulawesi Tengah	293	495	332	308	480
24 Sulawesi Selatan	45,660	58,287	77,880	76,263	71,510
25 Sulawesi Tenggara	3,304	4,328	5,479	2,994	5,954
f. Maluku & Irian Jaya	63,776	77,416	80,093	64,468	87,194
26 Maluku	33,388	42,912	38,823	34,991	47,608
27 Irian Jaya	30,388	34,504	41,270	29,477	39,586

Sources : International Trade Statistics of Fishery Commodities, 1990, DGF

Table 4.5 Export of Fishery Products in Riau (1990)

		Net Weight (ton)	Value of FOB (US$)
1	Other marine ornamental fish	3.6	9,128
2	Fresh water ornamental fish, bettas	7.4	88,121
3	Fresh water ornamental fish, gurami	12.6	51,942
4	Other fresh water ornamental fish	3.4	11,008
5	Other live fish	112.5	307,525
6	Trout other than fry	0.3	813
7	Other fish, fresh or chilled	1,377.7	516,161
8	Other flat fish, fresh or frozen	295.3	177,138
9	Marine fish, fresh or chilled	42,146.3	36,052,962
10	Other marine fish, fresh or chilled	5.7	2,671
11	Other salmonidae, frozen	1,477.4	1,032,205
12	Teri fish, dried	248.9	238,407
13	Shark fins, dried	13.7	72,515
14	Other than marine fish, dried	14.0	6,836
15	Teri fish, salted	9.5	2,862
16	Other fish, salted but not driedor smoked	7.1	2,529
17	Shrimps and prawns, frozen	620.9	2,556,023
18	Other than cray fish, frozen	190.7	639,265
19	Rock lobster & other sea craw fish other than in airtight container	139.5	445,879
20	Lobster, other than in airtightcontainer	0.5	400
21	Shrimps and prawns, other thanin airtight container	2,133.3	694,894
22	Crabs, other than in airtightcontainer	135.8	93,163
23	Cuttlefish, other than frozen	3.2	2,464
24	Cray Fish, in airtight container	334.2	272,864
25	Other cray fish	1.9	7,221
26	Other crustacenous, other thanin airtight container	195.4	32,554
27	Jellyfish, live, fresh, chilled	14.5	9,975
28	Jellyfish, frozen	107.6	16,142
	Total	49,612.8	43,343,667

Remarks : Volume was converted into weight of fresh whole fish.
Sources : Statistical Office in Riau Province

Table 4.6 Annual Export Volume of Fishery Products in Kabupaten Bengkalis (1987~1991)

Unit : Ton

	Kecamatan	1987	1988	1989	1990	1991
1	Kubu	215	1,838	1,369	443	226
2	Bangko	1,893	813	1,240	549	486
3	Dumai/Rupat/Bukit Kapur	63	54	101	73	237
4	Bengkalis/Bukit Batu	-	38	276	89	193
5	Tebing Tinggi/Merbau	-	-	-	-	23
6	Mandau/Tanah Putih	-	-	31	3	-
7	Siak/Sungai Apit	-	-	-	-	-
	Total	2,171	2,743	3,017	1,157	1,164

Remarks: Export consist of fresh fish and dried/salted fish.
Dried/salted fish volume converted into weight of fresh fish.
Source : Laporan Tahunan 1987 - 1991, Cabang Dinas Perikanan, Kabupaten Bengkalis

Table 4.7 Annual Export Value of Fishery Products in Kabupaten Bengkalis (1987~1991)

Unit : US$

Kecamatan	1987	1988	1989	1990	1991
1 Kubu	124,115	666,725	532,054	633,646	428,450
2 Bangko	1,970,485	1,814,565	1,935,908	1,034,297	923,909
3 Dumai/Rupat/Bukit Kapur	28,830	17,550	167,992	138,243	449,730
4 Bengkalis/Bukit Batu	-	15,238	458,567	167,712	365,750
5 Tebing Tinggi/Merbau	-	-	-	-	28,927
6 Mandau/Tanah Putih	-	-	50,811	4,752	228
7 Siak/Sungai Apit	-	-	-	-	-
Total	2,123,430	2,514,078	3,145,332	1,978,650	2,196,994

Sources : Laporan Tahunan 1987 - 1991, Cabang Dinas Perikanan, Kabupaten Bengkalis

Table 4.8 Annual Import Volume of Fishery Products by Province (1986~1990)

Unit : ton

Province	1986	1987	1988	1989	1990	1991
Whole Country	57,426	65,377	37,861	56,735	73,285	3,765
a. Sumatra	4,726	4,018	21,576	5,064	6,602	700
1 DI Aceh	10	9	-	1,612	186	-
2 Sumatra Utara	2,588	2,925	19,985	2,002	5,214	38
3 Sumatra Barat	-	-	-	-	-	-
4 Riau	1,225	1,084	1,473	1,256	637	662
5 Jambi	-	-	-	-	-	-
6 Sumatra Selatan	903	-	100	-	-	-
7 Bengkulu	-	-	-	194	-	-
8 Lampung	-	-	18	-	565	-
b. Jawa	51,677	61,011	14,952	49,470	66,435	2,531
9 DKI Jakarta	31,662	45,371	11,633	32,011	34,697	838
10 Jawa Barat	-	-	-	-	-	-
11 Jawa Tengah	2,021	2	164	1,470	2,935	1,109
12 DI Yogyakarta	-	-	-	-	-	-
13 Jawa Timur	17,994	15,638	3,155	15,989	28,803	584
c. Nusa Tenggara	795	84	96	2,066	21	7
14 Bali	795	1	45	1	3	7
15 Nusa Tenggara Barat	-	33	18	2,065	17	-
16 Nusa Tenggara Timur	-	50	33	-	-	-
17 Timor-timur		-	-	-	1	-
d. Kalimantan	38	35	-	1	6	3
18 Kalimantan Barat	33	31	-	1	1	3
19 Kalimantan Tengah	-	-	-	-	-	-
20 Kalimantan Selatan	-	-	-	-	5	-
21 Kalimantan Timur	5	4	-	-	-	-
e. Surawesi	150	35	31	2	4	6
22 Sulawesi Utara	150	-	-	-	1	-
23 Sulawesi Tengah	-	7	-	-	-	-
24 Sulawesi Selatan	-	28	31	2	3	6
25 Sulawesi Tenggara	-	-	-	-	-	-
f. Maluku & Irian Jaya	40	194	1,206	132	217	518
26 Maluku	34	194	1,206	132	203	293
27 Irian Jaya	6	-	-	-	14	225

Source : International Trade Statistics of Fishery Commodities, 1990, DGF

Table 4.9 Annual Import Value of Fishery Products by Province (1986~1990)

Unit : FOB US$ 1000

Province	1986	1987	1988	1989	1990
- Whole Country	28,175	27,830	20,705	32,883	47,685
a. Sumatra	6,156	2,482	12,135	3,103	5,393
1 DI Acch	33	44	-	1,154	336
2 Sumatra Uatara	1,085	1,335	11,174	1,199	3,518
3 Sumatra Barat	-	-	-	-	-
4 Riau	2,688	1,103	939	296	152
5 Jambi	-	-	-	-	-
6 Sumatra Selatan	2,350	-	4	-	-
7 Bengkulu	-	-	-	454	-
8 Lampung	-	-	18	-	1,387
b. Jawa	21,392	25,009	8,173	28,171	41,870
9 DKI Jakarta	13,859	18,625	5,981	18,666	20,750
10 Jawa Barat	-	-	1	-	-
11 Jawa Tengah	467	1	51	768	1,100
12 DI Yogyakarta	-	-	-	-	-
13 Jawa Timur	7,066	6,383	2,140	8,737	20,020
c. Nusa Tenggara	488	252	145	1,536	54
14 Bali	488	7	10	10	30
15 Nusa Tenggara Barat	-	30	15	1,525	24
16 Nusa Tenggara Timur	-	215	120	-	-
17 Timor-timur		-	-	1	-
d. Kalimantan	32	15	-	1	13
18 Kalimantan Barat	11	11	-	1	3
19 Kalimantan Tengah	-	-	-	-	-
20 Kalimantan Selatan	-	-	-	-	10
21 Kalimantan Timur	21	4	-	-	-
e. Surawesi	48	10	37	3	54
22 Sulawesi Utara	45	1	-	-	52
23 Sulawesi Tengah	3	1	-	-	-
24 Sulawesi Selatan	-	8	37	3	2
25 Sulawesi Tenggara	-	-	-	-	-
f. Maluku & Irian Jaya	59	62	215	69	301
26 Maluku	54	62	215	69	266
27 Irian Jaya	5	-	-	-	35

Source : International Trade Statistics of Fishery Commodities, 1990, DGF

Table 4.10 Annual Inflow Volume of Fishery Products into Kab. Bengkalis (1987~1991)

Unit : Ton

Kecamatan	1987	1988	1989	1990	1991
1 Kubu	-	-	-	-	-
2 Bangko	8.0	0.1	3.0	56.4	40.5
3 Dumai/Rupat/Bukit Kapur	-	-	-	-	-
4 Bengkalis/Bukit Batu	36.0	61.3	-	173.5	277.9
5 Tebing Tinggi/Merbau	41.0	-	-	405.4	346.4
6 Mandau/Tanah Putih	105.0	124.2	125.4	171.0	245.1
7 Siak/Sungai Apit	-	-	-	-	-
- Total	190.0	185.6	128.4	806.2	909.8

Remark : Some inflow was not covered.

Source : Laporan Tahunan 1987 - 1990, Cabang Dinas Perikanan Kabupaten Bengkalis

Table 4.11 Production and Consumption of Fishery Products in Kabupaten Bengkalis (1991)

Kecamatan	Population (persons)	Fish Produc. (ton)	Per Capita Produc. (kg/year)	Per Capita Consump. (kg/year)
1 Kubu	102,122	48,453	474.5	303.9
2 Bangko	98,825	22,018	222.8	218.3
3 Dumai/Rupat/Bukit Kapur	157,938	1,728	10.9	9.4
4 Bengkalis/Bukit Batu	115,773	1,590	13.7	14.5
5 Tebing Tinggi/Merbau	157,284	10,800	68.7	58.8
6 Mandau/Tanah Putih	171,846	3,161	18.4	19.8
7 Siak/Sungai Apit	109,005	231	2.1	2.1
Total	912,793	87,981	96.4	76.0

Source : Laporan Tahunan 1991, Cabang Dinas Perikanan Kabupaten Bengkalis

Table 4.12 Annual Interisland Trading Volume of Fishery Products in Kab. Bengkalis (1987~1991)

Unit : Ton

Kecamatan	1987	1988	1989	1990	1991
1 Kubu	71,915.7	67,678.3	63,480.7	38,681.6	28,289.8
a. Terasi	22,532.0	20,543.0	20,497.3	12,195.5	8,918.7
b. Dried/salted fish	4,882.9	4,778.3	2,854.2	2,123.0	1,358.8
c. Fresh fish/shrimp	-	-	260.0	389.3	204.9
d. Boiled fish	-	-	-	-	79.9
e. Shellfish	-	-	-	-	106.5
f. Fish meal	6.6	408.2	66.5	45.5	76.5
2 Bangko	12,526.5	12,449.7	12,749.4	9.3	-
a. Terasi	1,781.5	1,672.2	1,419.0	-	-
b. Fresh fish	-	-	136.3	8.4	-
c. Dried/salted fish	4,833.7	4,986.8	5,563.2	0.6	-
3 Dumai/Rupat/Bukit Kapur	-	-	0.3	13.0	1.8
a. Fresh fish	-	-	0.3	10.0	1.0
b. Shrimp	-	-	-	3.0	0.8
4 Bengkalis/Bukit Batu	-	-	1.7	0.4	0.2
a. Shrimp	-	-	1.7	0.4	0.2
5 Tebing Tinggi/Merbau	4,202.2	7,789.5	1,113.4	1,179.1	1,541.5
a. Terasi	1,138.0	1,749.0	268.0	235.0	322.0
b. Dried/salted fish	460.0	1,559.0	226.0	330.0	373.0
c. Dried shrimp/mysid	158.0	256.0	-	-	31.0
6 Mandau/Tanah Putih	-	-	52.63	10.61	-
a. Fresh fish/shrimp	-	-	16.6	5.0	-
b. Fish meal	-	-	9.0	1.4	-
Total	88,644.4	87,917.5	77,398.1	39,894.1	29,833.3

Source : Laporan Tahunan 1987 - 1991, Cabang Dinas Perikanan Kabupaten Bengkalis

Table 4.13 Annual Interisland Trading Value of Fishery Products in Kab. Bengkalis (1987~1991)

Unit : Rp. 1,000

Kecamatan	1987	1988	1989	1990	1991
1 Kubu	6,779,145	5,240,183	5,785,670	3,786,697	2,246,393
2 Bangko	3,100,820	3,277,397	113,177	2,590	-
3 Dumai/Rupat/Bukit Kapur	-	-	540	15,355	2,470
4 Bengkalis/Bukit Batu	-	-	1,688	400	200
5 Tebing Tinggi/Merbau	1,455,000	3,044,835	53,244	61,935	-
6 Mandau/Tanah Putih	-	-	52,677	30,510	-
7 Siak/Sungai Apit	-	-	-	-	-
Total	11,334,965	11,562,415	6,006,996	3,897,488	2,249,063

Source : Laporan Tahunan 1987 - 1991, Cabang Dinas Perikanan Kabupaten Bengkalis

Table 4.14 Supply/Demand Balance of Fishery Products in Kab. Bengkalis (1990)

(CASE 1 : Per Capita Fish Consumption = 28.2kg/year)

Unit : Ton

Kabpaten/Kecamatan	Fish Supply			Fish Demand			Balance
	Sub-total	Production	Import	Sub-total	Consumption	Export	
- Riau	182,224	181,418	806	143,299	92,614	50,685	38,925
1 Pekanbaru	-	-	-	11,252	11,252	-	-11,252
2 Kampar	4,209	4,209	-	16,027	16,027	-	-11,818
3 Induragiri Hulu	3,327	3,327	-	10,373	10,373	-	-7,046
4 Induragiri Hilir	32,365	32,365	-	26,113	13,491	12,621	6,253
5 Bengkalis	89,461	88,655	806	26,673	25,515	1,158	62,788
1 Kubu	48,994	48,994	-	3,185	2,741	444	45,810
2 Bangko	21,509	21,452	56	3,301	2,752	549	18,208
3 Dumai/Rupat/B.Kapi	1,843	1,843	-	4,516	4,442	73	-2,673
4 Bengkalis/Bukit Batu	1,721	1,547	173	3,351	3,263	89	-1,631
5 Tebing Tinggi/Merba	11,998	11,592	405	4,431	4,431	-	7,566
6 Mandau/Tanah Putih	3,283	3,112	171	4,842	4,839	3	-1,558
7 Siak/Sungai Apit	113	113	-	3,047	3,047	-	-2,934
6 Kep. Riau	52,862	52,862	-	52,862	15,956	36,906	0

(CASE 2 : Per Capita Fish Consumption = 43.4kg/year)

Unit : Ton

Kabpaten/Kecamatan	Fish Supply			Fish Demand			Balance
	Sub-total	Production	Import	Sub-total	Consumption	Export	
- Riau	182,224	181,418	806	157,032	106,347	50,685	25,192
1 Pekanbaru	-	-	-	11,252	11,252	-	-11,252
2 Kampar	4,209	4,209	-	16,027	16,027	-	-11,818
3 Induragiri Hulu	3,327	3,327	-	10,373	10,373	-	-7,046
4 Induragiri Hilir	32,365	32,365	-	26,113	13,491	12,621	6,253
5 Bengkalis	89,461	88,655	806	40,406	39,248	1,158	49,055
1 Kubu	48,994	48,994	-	4,660	4,216	444	44,335
2 Bangko	21,509	21,452	56	4,782	4,233	549	16,727
3 Dumai/Rupat/B.Kapi	1,843	1,843	-	6,907	6,833	73	-5,064
4 Bengkalis/Bukit Batu	1,721	1,547	173	5,107	5,019	89	-3,387
5 Tebing Tinggi/Merba	11,998	11,592	405	6,817	6,817	-	5,181
6 Mandau/Tanah Putih	3,283	3,112	171	7,447	7,444	3	-4,163
7 Siak/Sungai Apit	113	113	-	4,687	4,687	-	-4,574
6 Kep. Riau	52,862	52,862	-	52,862	15,956	36,906	0

Remarks : The import volume of Riau was assumed to be that of Bengkalis, and that of other Kab. to be zero, since the import volume of Benkalis exceeded that of Riau (637 tons).

CASE 1 : Per Capita Fish Consumption = 28.2, based on Table 4.1

CASE 2 : Per Capita Fish Consumption = 42.4, based on the Socio-economic Survey carried out by the Team (Nov. 1992).

Source : 1) Population : Central Bureau of Statistics.

2) Consumption of Calorie & Protein of Indonesia and Province, 1990, Central Bureau of Statistics

3) International Trade Statistics of Fishery Commodities, 1990, DGF

4) Fish Production : Fishery Statistics of Riau, 1990, Dinas Perikanan Riau

5) Laporan Tahunan 1990, Cabang Dinas Perikanan Bengkalis

Table 4.15 Number of Fish Carrier Vessels (1991)

Kecamatan	Number	GT
1 Kubu	20	10 - 20
2 Bangko	87	5 - 35
3 Dumai/Rupat/Bukit Kapur	82	5 - 10
4 Bengkalis/Bukit Batu	15	4.4- 8.5
5 Tebing Tinggi/Merbau	24	1.2-44.4
6 Mandau/Tanah Putih	-	-
7 Siak/Sungai Apit	-	-
Total	228	-

Source : Laporan Tahunan 1991, Cabang Dinas Perikanan Kabupaten Bengkalis

Table 4.16 Unloading Place of Fish Catch

(Non Powered Boat)

	Dumai	Bengkalis	Selatpanjang	Own Village	Collecting Vessels	Others	Total
1 Bengkalis	-	19	-	33	3	-	55
	-	34.5%	-	60.0%	5.5%	-	100.0%
2 Tebing Tenggi	-	-	21	68	11	14	114
	-	-	18.4%	59.6%	9.6%	12.3%	100.0%
3 Merbau	-	-	4	20	1	3	28
	-	-	14.3%	71.4%	3.6%	10.7%	100.0%
4 Bukit Batu	1	-	-	19	-	-	20
	5.0%	-	-	95.0%	-	-	100.0%
5 Sungai Apit	-	-	-	10	1	-	11
	-	-	-	90.9%	9.1%	-	100.0%
6 Rupat	-	-	-	10	1	2	13
	-	-	-	76.9%	7.7%	15.4%	100.0%
9 Dumai	-	-	-	8	-	-	8
	-	-	-	100.0%	-	-	100.0%
Total	1	19	25	168	17	19	249
	0.4%	7.6%	10.0%	67.5%	6.8%	7.6%	100.0%

(Powered Boat)

	Dumai	Bengkalis	Selatpanjang	Own Village	Collecting Vessels	Others	Total
1 Bengkalis	-	23	1	24	4	-	52
	-	44.2%	1.9%	46.2%	7.7%	-	100.0%
2 Tebing Tenggi	-	3	10	18	14	9	54
	-	5.6%	18.5%	33.3%	25.9%	16.7%	100.0%
3 Merbau	-	5	4	15	8	-	32
	-	15.6%	12.5%	46.9%	25.0%	-	100.0%
4 Bukit Batu	-	-	-	3	-	-	3
	-	-	-	100.0%	-	-	100.0%
5 Sungai Apit	1	1	1	3	-	-	6
	16.7%	16.7%	16.7%	50.0%	-	-	100.0%
6 Rupat	3	-	-	16	-	5	24
	12.5%	-	-	66.7%	-	20.8%	100.0%
9 Dumai	7	-	-	1	-	-	8
	87.5%	-	-	12.5%	-	-	100.0%
Total	11	32	16	80	26	14	179
	6.1%	17.9%	8.9%	44.7%	14.5%	7.8%	100.0%

Sources : Result of the Fishery Interview Survey carried out by the Team (November, 1992).

Table 4.17 Wholesale Price of Fish from Riau/Sumatra

Unit : Rp. /kg

Species	Malacca *1	Singapore *2
Wolf herring		
Big	7,200	10,800
Medium	6,400	-
Small	4,800	8,400
Narrow barred king mackerel		
Big	7,200	10800
Medium	6,400	-
Small	4,800	8400
Treadfin		
Big	7,280	24600
Medium	4,960	-
Small	4,640	19200
Silver pomfret		
Big	9,600	22800
Medium	8,000	-
Small	6,400	18000

Note *1 ; Result of field survey on 11, Sept. 1993
*2 ; Result og field survey on 11, Sept. 1993, Exchange rate ; Rp.800/M$, Rp.1,200/S$
Sources : Result of field survey

Table 4.18 Annual Production Volume by Product Type in Kab. Bengkalis (1987~1991)

Unit : ton

	Description	1987	1988	1989	1990	1991
a.	Marine Production					
	1 Fresh	50,881	46,195	48,690	55,296	62,155
	2 Dried	73,913	73,875	74,818	69,983	69,324
	3 Terasi	32,203	39,220	39,714	42,300	40,896
	4 Others	469	209	304	283	1,462
	Total	157,466	159,499	163,526	167,863	173,837
b.	Inland Water/Aquaculture Products					
	1 Fresh	8,068	8,117	8,294	8,583	8,860
	2 Dried	3,038	3,235	3,146	3,169	3,335
	3 Terasi	196	192	206	212	206
	4 Fumigation	721	577	747	742	1,037
	Total	12,022	12,122	12,392	12,706	13,438

(Composition of Production)

	Description	1987	1988	1989	1990	1991
a.	Marine Production					
	1 Fresh	32.3%	29.0%	29.8%	32.9%	35.8%
	2 Dried	46.9%	46.3%	45.8%	41.7%	39.9%
	3 Terasi	20.5%	24.6%	24.3%	25.2%	23.5%
	4 Others	0.3%	0.1%	0.2%	0.2%	0.8%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
b.	Inland Water/Aquaculture Products					
	1 Fresh	67.1%	67.0%	66.9%	67.5%	65.9%
	2 Dried	25.3%	26.7%	25.4%	24.9%	24.8%
	3 Terasi	1.6%	1.6%	1.7%	1.7%	1.5%
	4 Fumigation	6.0%	4.8%	6.0%	5.8%	7.7%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Sources : Laporan Tahunan 1987 - 1991, Cabang Dinas Perikanan, Kabupaten Bengkalis

Table 4.19 Selling Type of Fish Catch (1992)

(Non Powered Boat)

	Auction	Negotiation	Consignment	Others	Total
1 Bengkalis	-	7	27	-	34
	-	20.6%	79.4%	-	100.0%
2 Tebing Tenggi	4	46	21	13	84
	4.8%	54.8%	25.0%	15.5%	100.0%
3 Merbau	-	14	4	2	20
	-	70.0%	20.0%	10.0%	100.0%
4 Bukit Batu	-	10	5	3	18
	-	55.6%	27.8%	16.7%	100.0%
5 Sungai Apit	-	3	6	-	9
	-	33.3%	66.7%	-	100.0%
6 Rupat	-	8	1	1	10
	-	80.0%	10.0%	10.0%	100.0%
9 Dumai	-	7	-	-	7
	-	100.0%	-	-	100.0%
Total	4	95	64	19	182
	2.2%	52.2%	35.2%	10.4%	100.0%

(Powered Boat)

	Auction	Negotiation	Consignment	Others	Total
1 Bengkalis	7	4	32	-	43
	16.3%	9.3%	74.4%	-	100.0%
2 Tebing Tenggi	-	24	6	-	30
	-	80.0%	20.0%	-	100.0%
3 Merbau	-	6	21	3	30
	-	20.0%	70.0%	10.0%	100.0%
4 Bukit Batu	-	3	-	-	3
	-	100.0%	-	-	100.0%
5 Sungai Apit	-	-	3	1	4
	-	-	75.0%	25.0%	100.0%
6 Rupat	-	4	12	4	20
	-	20.0%	60.0%	20.0%	100.0%
9 Dumai	5	2	-	-	7
	71.4%	28.6%	-	-	100.0%
Total	12	43	74	8	137
	8.8%	31.4%	54.0%	5.8%	100.0%

Sources : Result of the Fishery Interview Survey carried out by the Team (November,1992)

Table 4.20 Reason for the selection of Wholesaler

(Non Powered Boat)

	Fish price	Credit tie	Business tie (without credit)	Others	Total
1 Bengkalis	19	2	2	11	34
	55.9%	5.9%	5.9%	32.4%	100.0%
2 Tebing Tenggi	58	8	2	14	82
	70.7%	9.8%	2.4%	17.1%	100.0%
3 Merbau	12	3	1	2	18
	66.7%	16.7%	5.6%	11.1%	100.0%
4 Bukit Batu	10	-	-	5	15
	66.7%	-	-	33.3%	100.0%
5 Sungai Apit	9	-	-	-	9
	100.0%	-	-	-	100.0%
6 Rupat	5	-	-	3	8
	62.5%	-	-	37.5%	100.0%
9 Dumai	7	-	-	-	7
	100.0%	-	-	-	100.0%
Total	120	13	5	35	173
	69.4%	7.5%	2.9%	20.2%	100.0%

(Powered Boat)

	Fish price	Credit tie	Business tie (without credit)	Others	Total
1 Bengkalis	17	16	7	3	43
	39.5%	37.2%	16.3%	7.0%	100.0%
2 Tebing Tenggi	28	-	2	1	31
	90.3%	-	6.5%	3.2%	100.0%
3 Merbau	5	15	6	2	28
	17.9%	53.6%	21.4%	7.1%	100.0%
4 Bukit Batu	1	-	-	-	1
	100.0%	-	-	-	100.0%
5 Sungai Apit	4	-	-	-	4
	100.0%	-	-	-	100.0%
6 Rupat	3	9	5	1	18
	16.7%	50.0%	27.8%	5.6%	100.0%
9 Dumai	3	1	2	1	7
	42.9%	14.3%	28.6%	14.3%	100.0%
Total	61	41	22	8	132
	46.2%	31.1%	16.7%	6.1%	100.0%

Sources : Result of the Fishery Interview Survey carried out by the Team (November, 1992)

Table 4.21 Annual Fisherman Price of Major Species in Dumai (1987~1991)

Unit : Rp./kg

Species	1987	1988	1989	1990	1991
Tenggiri	2,000	2,200	3,000	3,000	3,400
Kakap	-	-	-	3,700	-
Kembung	1,200	1,300	1,500	1,750	1,600
Bawal Putih	1,600	2,000	1,250	1,180	1,400
Kurau	-	-	-	4,500	-
Selangat	-	-	1,300	1,300	1,400
Puput	1,500	1,500	1,300	1,300	2,000
Udang Merah	-	1,300	-	4,000	-
Cencaru	1,000	1,000	1,400	2,200	1,600
Senangin	2,300	2,600	3,500	3,500	3,600
Sembilang	-	-	-	-	1,675
Terubuk	-	-	-	-	4,000
Biang-biang	-	-	1,250	1,200	1,500
Udang Putih	-	1,600	4,000	6,600	4,800
Kerang	-	-	550	500	550

Source : Laporan Tahunan 1987-1991, Cabang Dinas Perikanan Kabupaten Bengkalis

Table 4.22 Annual Fisherman Price of Major Species in Bengkalis (1987~1991)

Unit : Rp./kg

Species	1987	1988	1989	1990	1991
Tenggiri	2,700	2,500	3,000	3,000	3,800
Kakap	2,500	2,500	3,000	1,200	-
Kembung	1,300	1,350	1,500	2,200	1,750
Pari	500	500	850	1,000	1,350
Kurau	-	3,500	4,000	4,000	-
Patin	2,400	2,750	3,600	4,200	4,400
Selangat	1,000	1,200	700	-	1,300
Puput	1,800	-	-	-	-
Udang Merah	-	1,500	-	3,700	-
Duri	-	-	-	1,200	1,200
Cencaru	-	1,000	1,200	800	1,575
Senangin	2,400	2,750	2,850	3,600	3,600
Sembilang	1,600	1,600	1,350	1,300	1,675
Terubuk	-	-	3,500	4,000	4,000
Biang-biang	1,100	1,000	1,000	1,500	1,500
Udang Putih	-	2,500	-	3,000	-
Kerang	-	-	550	600	600

Source : Laporan Tahunan 1987-1991, Cabang Dinas Perikanan Kabupaten Bengkalis

Table 4.23 Annual Fisherman Price of Major Species in Tebing Tinggi (1987~1991)

Unit : Rp./kg

Species	1987	1988	1989	1990	1991
Tonkol	1,200	1,300	-	-	4,000
Tenggiri	2,000	2,000	2,750	3,500	6,500
Kembung	1,200	1,100	1,800	2,000	3,450
Kurau	3,000	3,000	4,450	5,000	5,200
Patin	2,700	3,000	-	-	-
Selangat	750	750	1,800	2,000	2,000
Puput	1,600	-	3,000	3,500	3,500
Udang Merah	-	1,100	2,500	3,200	3,500
Cencaru	1,200	-	1,600	2,000	3,400
Senangin	-	-	3,600	4,000	5,700
Sembilang	1,500	1,500	1,800	2,500	3,200
Terubuk	-	-	4,500	5,400	6,000
Biang-biang	-	-	-	-	1,600
Udang Putih	-	-	3,000	4,600	5,000
Kerang	-	-	550	500	300

Source : Laporan Tahunan 1987-1991, Cabang Dinas Perikanan Kabupaten Bengkalis

Table 4.24 Comparison between Fisherman and Consumer Price in Dumai (1992)

Unit : Rp./kg

Species	(A) Fisherman Price (Rp./kg)	(B) Consumer Price (Rp./kg)	Difference (B)-(A)
Kembung	1,500	2,000	500
Tenggiri	3,000	3,500	500
Parang Parang	2,800	3,300	500
Senangin	3,000	3,500	500
Cencaru	1,200	1,700	500
Selangat	1,000	1,500	500
Bawal Putih Kecil	1,000	1,500	500
Bawal Putih Besar	3,000	3,600	600
Puput	1,000	1,500	500
Biang-biang	900	1,400	500
Ajah	1,500	2,000	500
Kakap	1,400	2,000	600
Bawal Hitam	2,000	2,600	600
Kurau	2,800	3,500	700
Kerang	700	1,000	300
Manyung	800	1,200	400
Senohong	4,000	4,800	800
Sebelah	600	900	300
Pari	500	800	300
Udang Putih Besar	4,500	5,200	700
Udang Putih Kecil	2,000	2,500	500
Kerang	400	600	200

Remark : Species were written in Indonesia.
Source : Price Data Prepared by Dumai Office in Nov. 1992

Table 4.25 TPI in Kab. Bengkalis (1991)

Kecamatan	Number of TPI		
	Total	Active	Non-active
1 Kubu	3	2	1
2 Bangko	2	2	-
3 Dumai/Rupat/Bukit Kapur	2	2	-
4 Bengkalis/Bukit Batu	4	1	3
5 Tebing Tinggi/Merbau	2	1	1
6 Mandau/Tanah Putih	2	1	1
7 Siak/Sungai Apit	1	-	1
Total	16	9	7

Source : Laporan Tahunan 1991, Cabang Dinas Perikanan Kabupaten Bengkalis

Table 4.26 Number of Fish Markets and Free Markets in Kab. Bengkalis (1991)

	Kecamatan	Fish Market	Free Market
1	Kubu	1	-
2	Bangko	3	-
3	Dumai/Rupat/Bukit Kapur	5	7
4	Bengkalis/Bukit Batu	2	1
5	Tebing Tinggi/Merbau	1	1
6	Mandau/Tanah Putih	4	2
7	Siak/Sungai Apit	1	1
-	Total	17	12

Source : Laporan Tahunan 1991, Cabang Dinas Perikanan Kabupaten Bengkalis

Table 4.27 Number of Ice Plants in Kabupaten Bengkalis (1991)

	Kecamatan	Number of Ice Plant	Capacity (ton/day)
1	Kubu	6	68.00
2	Bangko	13	65.00
3	Dumai/Rupat/Bukit Kapur	3	6.10
4	Bengkalis/Bukit Batu	4	16.50
5	Tebing Tinggi/Merbau	2	4.80
6	Mandau/Tanah Putih	2	0.90
7	Siak/Sungai Apit	2	0.25
-	Total	32	161.50

Source : Laporan Tahunan 1991, Cabang Dinas Perikanan Kabupaten Bengkalis

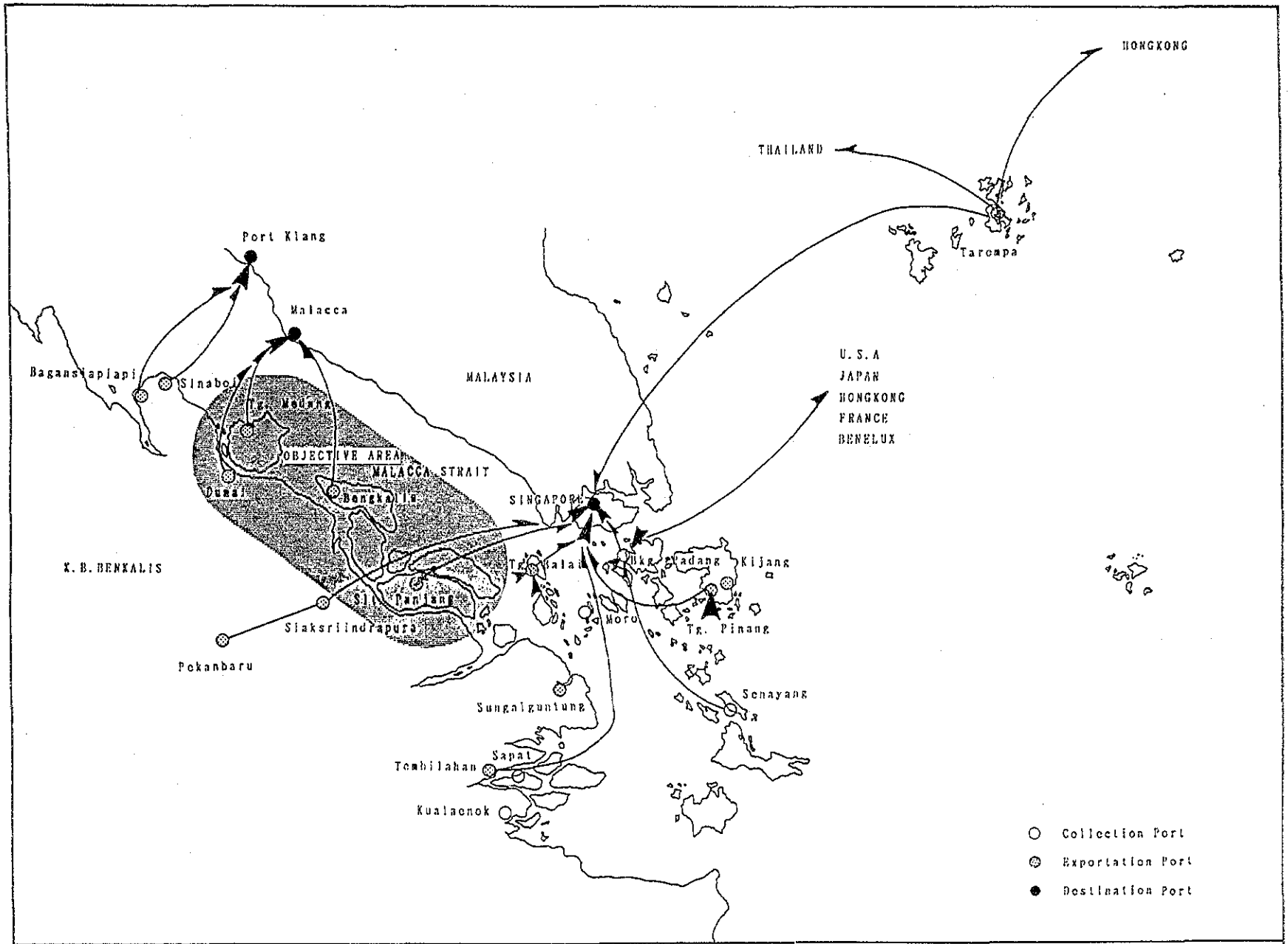


Fig. 4.1 Export Channel of Fishery Production in the Study Area

5. Fishermen Organization/Institution

5. Fishermen Organization/Institution

Tables & Figures

5. Fishermen Organization/Institution

5.1 Fishery Policies of Indonesian Government

5.1.1 Outline of Fisheries Laws in Indonesia

The Government of Indonesia is fully aware that development of its enormous fishery resources in its territorial waters and exclusive economic zone, is a means of raising national prosperity and public welfare. It realizes that through practical utilization of its fishery resources, employment opportunities are created for the nation's artisanal fishermen and aquaculture operators and the level of income is raised. Yet simultaneously, it also acknowledges the need to carry out resource management and to implement measures ensuring fishery resource sustainability. Restrictions on fisheries activities which support resource management are outlined below.

1) Fishing gear
2) Safe navigation
3) Required conditions for the fishing boat
4) Allowable fish catch volume, banned fish species and size
5) Fishing grounds, channels and fishing period
6) Fisheries resource, environmental protection
7) Distribution of new fish species
8) Propagation of fish species and protection
9) Prevention of fish diseases
10) Other items necessary for fishery resource management

In the area of practical utilization of fishery resources, private parties and legal corporations engaged in the fishery industry should be required to pay a tax in order to obtain their fishing licenses. However, artisanal fishermen and aquaculture farmers whose daily existence is dependent on their fishing activities, should be exempted from the tax.

Government measures to promote fisheries through guidance activities of artisanal fishermen and aquaculture farmers should extend their assistance through the fishermen organizations and implement measures to improve the basic infrastructure in fisheries.

In order to implement development measures that will allow fishery resources sustainability, the government has implemented policies prohibiting the use of fishing gear and fishing methods that may cause to overfishing. Based on these policies, trawling has been completely prohibited since 1983, with the exception of shrimp trawling in the waters east of longitude 130°. In addition, emphasis has been placed on measures to regenerate and propagate fishery resources by protecting mangrove forest areas, placing artificial reefs, increasing spawning grounds, etc.

5.1.2 Overview of Fisheries Act Regulations of Riau Province

Fisheries Act regulations are established according to the Fisheries Act of Indonesia. Here, we will discuss the fishing license system and the operation regulations by fishing methods.

(1) Fishing license system (SIUP/SIKP)

In order to work in fishery in Riau Province, fishermen must obtain a fishing license (Surat Izin Usaha Perikanan: SIUP) and fishing boat license (Surat Izin Kapal Perikanan: SKIP) issued by the provincial government of Riau.

These licences are classified into the following three groups:

Group A : Collection, transport and processing of marine products such as, fish and shrimp in market activities

Group B : All harvesting fisheries using outboard engine fishing boats

Group C : All harvesting fisheries using outboard engine fishing boats and non powered boats

In order to obtain these licenses, fishermen submit an application form to their respective Kecamatan's (Country's) Fisheries Office. After having obtained the approval of the Kecamatan's Harbor Office (Syabandar) and the Kecamatan's Office, the Kecamatan's Fisheries Office then sends the applications to the Kabupaten's (Prefectural) Fisheries Office. The applications for fishing licenses A and B are then sent to Province's Fisheries Office; and fishing license A will be issued by the provincial governor and license B by the provincial Fisheries Office. License C will be sent by the Kabupaten's Fisheries Office to the Kabupaten governor, who will issue it to the applicant. Both licenses are valid for one year and need to be renewed annually.

Upon application for the fishing license, fisheries requiring the installation of fishing tackle on the specific waters such as Jermal, Gombang, and Cici for a substantial period of time need to submit the following papers in addition to the ordinary application form.

- Letter of recommendation issued by the Kecamatan's Fisheries Office, stating the position and the size of the fishing tackle installation area
- The applicants' statement specifying that they will immediately remove the tackle at their expense if the fishing area needs to be occupied for the public use and security.
- The Harbor Office's notification stating that the area in which the fishing tackle is installed does not fall in an the ocean liner route.

SIUP and SIKP are both valid for one year and need to be renewed annually. A certain amount of tax depending on the fishing method and scale must be paid upon renewal of the licence.

Operation restrictions by fishing method

The Riau Province fixes the size of the fishing tackle and the range of installation by fishing method. Especially for the methods that require the fixation of the tackle as Jermal, Gombang, and Cici, the distance between the adjoining tackle is provided (see Table 5.1).

5.1.3 Laws Pertaining to Fish Marketing

Marketing structures differ according to area throughout Indonesia and no centralized structure has been established. Regulations on fish marketing also differ according to province.

In Riau Province where the study area is located, all fish catch must be landed at TPI and fish landings at other areas are prohibited. Fish auctions are organized by a steering committee composed of members from the local fisheries office, the local tax office, local governments, and KUD; and the auctions are operated by KUD. The TPI staff members are appointed by the governor for a period of three years, based on recommendations from the director of the Fisheries Office. The buyer and the seller at the auctions must each pay 2.5 percent of the transacted sales amount as local tax. Of the total amount of bounty collected, 5 percent is distributed to the fisheries office, the local tax office, and to the local government. The remaining amount is paid to each of the following institutions, according to the percentages given below.

Riau provincial government	30	percent
Each kapubaten government	35	percent
Auction implementing agency	20	percent
Fishermen disaster compensation, and capital for village construction	15	percent

The amount apportioned to the auction implementing agency is distributed to TPI staff members and security guards as remuneration; and it is used to maintain TPI facilities and to cover management costs for auctions. The money allocated for fishermen disaster compensation and village construction is paid to the local fisheries office; and it is managed by the director of the local fisheries office who is in charge of how the money is spent.

5.1.4 Fostering and Strengthening Fishermen Organizations

(1) Ministry of Cooperatives and KUD

The doctrine of cooperatives in Indonesia is to contribute to the regional society by basing its core activities on traditional village community. Since the establishment of this doctrine in 1945, various organizations, both large and small have been established. According to the Presidential Order of 1973, these cooperatives were divided into the Village Economic Unit, Badan Usaha Unit Desa (BUUD) and KUD. BUUD is smaller in scope and is seen as a germination stage of KUD. KUD was established as a sphere of economic activities for the regional communities. Subsequently, local inhabitants play a role and bear their share of the responsibility in economically developing the area and contributing to improvements in their livelihood. In order to assist such cooperatives, the government appointed a minister in charge of cooperatives in 1978; and in 1982 established the Ministry of Cooperatives and strengthened its activities.

1) Target of the Ministry of Cooperatives in REPELITA V

Qualification conditions for KUD to receive assistance and guidance from the Ministry of Cooperatives are described below.

- The members of KUD must be composed of at least 25 percent of the adult population living in the area under the jurisdiction of the KUD.
- At least 60 percent of all KUD activities must contribute to improving the productivity of the members' work activities or must provide services for its members.
- The KUD must have a record of continuous activity for minimum of three years. And member meetings must be held periodically, in accordance with the regulation on services.
- The managers and the inspectors are selected from among the members. A maximum of five managers and three inspectors is permitted.
- The funds of hand of each KUD is a minimum of Rp.2,500,000.
- The difference in business plan and actual achievement is more or less 20 percent.
- Total revenue generated from activities must be proportionate to the total number of members. The minimum average annual income of each member must be Rp.250,000.
- The overall revenue must be able to cover minimum costs.
- Operation facilities must be properly provided and can be maintained independently.
- The managers must be honest and aboveboard in all matters pertaining to KUD.
- There must be no debts incurred by the KUD.

The major target confronting the Ministry of Cooperatives as set forth in

REPELITA V, is to provide assistance to approximately 2,000 KUD out of the existing 8,000, in order to achieve their economic independence. An outline of the goals to be achieved in the plan to autonomize 2,000 KUD are delineated below:

- The needs of the local inhabitants in each business of finance, distribution, processing, and sales to be met.
- The ratio of KUD members to exceed 40 percent of the total number of families within the area.
- The total annual expenses of KUD activities to exceed 5 million rupiahs to eventually reach 30 million rupiahs.
- A minimum of three KUD activities to be carried out by full- time staff members.
- The investment capital from all members for KUD activities to exceed 50 million rupiahs.

2) KUD functions

The KUD is the nucleus of all economic activities in the community; and its to the sphere increase the independence of its village members and to accelerate economic democratization. The scope of its activities are given below:

- Food, crops, livestock, fisheries, farms and other industries in the first sector
- Supply daily necessities relevant to food, clothing and shelter to village members
- Accept savings deposits and extend loans
- Transport, electricity, construction
- Small scale industries, manufacturing
- Other areas pertaining to the village community

Although the operation and finances of the KUD will be initially assisted by the government, the role of the cooperatives will be enlarged to allow it to become an economically powerful and autonomous organization.

The following KUD functions are in demand:

- Give priority in loan opportunities to KUD members and low income workers
- Provide competitively viable pricing of products produced by the KUD and village members and to guarantee their sale
- Accept savings deposits
- Provide educational and training opportunities for members
- Integrate and unify the village economy into the KUD

3) KUD organization

The organization of the KUD is comprised of the general members' assembly, the executive committee, and the inspection committee. The general assembly will have the greatest decision making power within the organization. As a rule, all decisions will be made on the basis of negotiation and if a consensus cannot be reached, the decision will be made according to majority vote. Items

which will be decided by the general assembly are as follows:

- Cooperative articles of association
- Election and dismissal of the executive and inspection committee members
- Planing activities of the cooperative and duties of the executive committee members

The duties of the executive members are to provide guidance for KUD activities and to implement the decisions made by the general assembly as quickly as possible. They will take responsibility for their actions and are obligated to report to the general assembly.

The duties of the inspection committee members are to inspect and report on the various activities implemented by the cooperative, in addition to the activities carried out by the executive members. They possess the right to inspect all documents and data collected and maintained by the organization. They are obligated to remain confidential on all inspection findings and will take responsibility for their actions.

The actual management and operations of the cooperative will be implemented by an appointed executive committee member or a professional manager. The manager will be selected among those with professional knowledge and management ability, irrespective of KUD membership.

The financial resources of the KUD is mainly autonomous capital based on its members' reserve funds, bank loans, and government subsidies. For KUD with a large membership of economically weak, low income wage earners, it is possible to receive financing from the Ministry of Cooperatives.

In order to ensure stability and growth of KUD activities, an outside advisory protection committee (BPP) is set up. The BPP committee members are comprised of elected advisory personnel specializing in religion, the common law, regional sociology, etc. who will been appointed or dismissed by the governor. The role of the BPP is to provide advice and guidance to the KUD executive committee, in order to strengthen and stabilize its activities, and to advise the governor as well. However, the BPP is prohibited from interfering or participating in KUD activities. It is strictly an external organization whose operational expenses are paid by the government.

4) Direction of KUD activities in the fisheries sector

Fostering KUD activities which include fisheries will improve the standard of living for the its members and for the neighboring communities. In order to achieve this goal, it is necessary to provide assistance in the form of funds and services for members engaged in the fisheries sector, specifically fishing, aquaculture, processing and fish sales. Managing and operating the KUD is the

responsibility of the Ministry of Cooperatives and resolving issues in fishing technology is in the jurisdiction of DGF. Facilities and materials required to carry out fisheries activities will be provided jointly or separately by the Ministry of Cooperatives and DGF.

(2) Activities and functions of the Kelompok

Fishermen organizations in Indonesia are comprised of the KUD and the Kelompok, which have been established under a separate fishing act. The organizational functions of the Kelompok which have been planned by the government, are following three areas.

- Place of learning;

  In order to foster independence among the fishermen, the Kelompok provides a place where discussions on fishing technology and other related matters can be carried out within the organization. In addition, administrative guidance and lectures sponsored by the government can be received here.

- Place of production;

  By utilizing the potential production capabilities of the area, the Kelompok provides a place where products that meet market demands can be produced.

- Place of joint activities;

  In order to achieve high profit productivity, the Kelompok provides a place where joint activities among members, and between other Kelompok and third parties can be conducted.

Hitherto, Kelompok organized specifically for fishermen were included in regional agricultural guidance activities. However, from 1992 measures to accelerate the organization of fishermen were implemented; and fishermen Kelompok became independent of the agricultural sector, with the government providing guidance in regional fisheries. The goal of the government is to organize all village fishermen into Kelompok that would be incorporated into the KUD organization.

The government aims to organize the fishermen from the grass roots level and presently, it is trying to achieve this through administrative guidance of the Kelompok. For example, when the Department of Fisheries provides assistance for fishermen, its selection criteria of fishermen is as follows:

1) The existence of a Kelompok
2) Low income (income of one fishermen household does not exceed Rp.2,000 to 3,000 per day)
3) Full-time fishermen

In order to raise the efficiency of its guidance and assistance measures, the government seems to utilize the Kelompok. In general, the KUD is an organization promoting economic activities, while the Kelompok is an organization providing guidance.

The leader of a Kelompok must fulfill the following four roles.

1) A leader of Kelompok activities
2) As a leader of government guidance seminars, he must be able to concisely relay members' opinions.
3) A pioneer in village construction
4) Play the role of a government counterpart, in order to smoothly implement government programs

By fulfilling the aforementioned four roles, the Kelompok leader will assist in fostering the KUD, which will become the economic foundation of the village.

The duties of a Kelompok member is to help the unification and cooperation of the entire community, to closely unite with other members in the face of adversity and problems, and to provide financial cooperation, in order to help resolve problems. These responsibilities and obligations are not written on paper. It requires an established spirit of cooperation within the village. Rights pertaining to duties have not yet been established.

5.1.5 Credit System of Government Fund

(1) Planned and unplanned financing

Presently, there are two types of financing programs which are available to KUD. They are the planned finance (Kredit Program) and the unplanned finance (Kredit Non-Program) systems.

1) Credit Program

The Credit Program was established to increase agricultural production and it is implemented by the Ministry of Agriculture, the Ministry of Cooperatives, the Bank of Indonesia, and the Indonesian People's Bank. The role of each of institution is given below:

Ministry of Agriculture : Management of production technology

Ministry of Cooperatives : Management of KUD organization and operations

Bank of Indonesia : Secure capital

Bank Rakyat Indonesia : Implementing agency

Finance plans which have been concretely implemented are low interest agricultural loans (BIMAS), Kuredit Usaha Tani (KUT), etc.

a. BIMAS

BIMAS was started in 1964 as part of the countermeasure to improve rice production. Currently, it has been expanded to include other farm crops, estate crops, livestock, fisheries, etc. (see Table 5.2) and the areas have been categorized according to commodity.

Originally, BIMAS provided a packaged loan program for farms engaged in intensive agriculture through KUD which included government provision of fertilizer, pesticides, improved seeds, and other production materials, in addition to daily living expenses and technological guidance. However, due to increased operating capital of farms, the declining ratio of loan repayment, dropping petroleum prices, and other shortages in financial resources, the package was discontinued in 1985. Presently, only loans which cover the cost of production materials required by the farm are provided.

b. Kuredit Usaha Tani (KUT)

KUT was established when BIMAS discontinued its packaged program and began providing ordinary loans. It provides operating loans to KUD members, i.e. when KUD farmers need capital to purchase seeds, fertilizers, and pesticides, the government provides loans through KUD.

In addition, a program known as Kredit Pengadann Pagan has been instituted for KUD, in which capital required to purchase crops from farmers is provided; and a program known as Kredit Pengadann Pupuk which is limited to providing capital to farmers purchasing fertilizer, is available. A unique feature of these programs is that collateral is not required and repayment has been guaranteed by Perum Pengumbangan Keuangan Koperasi, a public agency for financial development of cooperatives.

2) Kredit Non-Program

Financing which has not been included in the Kredit Program, has been included in the Kredit Non-Program. These are the usual forms of financing which require collateral such as real estate, in order to qualify for the loan. Individual finance plans include the Kredit Investasi Kedil(KIK) which replaced the Kredit Investasi Kecil (KIK), due to the implementation of Packet January 1990, and the KMKP which was reformed into the Kredit Kecil Modal Kerja (KKMK); and the two were combined and called Kredit Usaha Kecil(KUK). The KIK and KMKP were financed by the Bank of Indonesia (75 percent) and the Indonesian People's Bank (25 percent), whereas the KUK operates on 100 percent financing from the Indonesian People's Bank (see Table 5.3).

The beneficiaries of KUK are business owners, KUD, and others whose personal assets such as cars and real estate do not exceed 6 billion rupiahs.

Collateral such as pertinent assets or real estate is required. Although cars and boats are accepted as collateral, the major form of collateral is real estate. Kredit Mini and Kredit Midi were discontinued in 1984 and replaced with Kredit Umum Pedesaan (KUPEDES). This is a credit system which is extended to legal business owners in all sectors, KUD, and individuals. Financing is provided for investment and operating capital. Real estate is required as collateral and a bill of sale and an income statement of the enterprise must be submitted. Loans for operating capital must be repaid in one year at a monthly interest rate of 2 percent and a set amount is collected monthly. If the loan is repaid in one year as stipulated in the contract, the beneficiary earns the right to receive a back payment of 0.5 percent of the interest paid (Insentive Pembayaran Tepat Waktu; IPTW). If there is one payment default within the one year period, the beneficiary loses this right.

KIK and KMKP was originally established as a financing program for puribumi with an extremely favorable annual interest rate of 12 percent. In contrast, KEB, the financing program for non- puri, charged an annual interest rate of 21 percent. However, this system was abolished in 1990 with the advent of KUK. Presently, a uniform interest rate of 23 to 25 percent is charged for both puribumi and non-puri.

(2) Financing for fishermen

1)Kredit Kepres

Currently, there is no established system of financing for fishermen. In the past a financing system (Kredit Kepres No. 39/1980) for fishermen, provided operating capital for trawling operations before its ban in 1980 and capital to modernize traditional fishing operations.

In Kab. Bengkalis 305 fishermen (148 from Kec. Rupat/Dumai and 75 from Kec. Bengkalis/Bukit Batu) received loans, totaling Rp.937,667,000. At the time, fishermen organizations such as KUD and the Kelompoks did not exist and loans were given individually to the fishermen. The fishermen were selected on the basis of the following two criteria.

- Their status as full-time fishermen was guaranteed by the village captain or kecamatan chief
- A guarantee that income and livelihood will be improved by the loan, as technologically recommended by the local fisheries office.

Fishermen who met the above criteria were interviewed by a staff member of the Indonesian People's Bank; and their assets were checked, and the loan was granted by the manager of the branch office upon further review. Loans averaging of 3 million rupiahs per fisherman were granted at an annual interest rate of 12

percent, with a grace period of one year, and a repayment period of five years. These conditions were highly favorable, in view of the fact that ordinarily loans were granted at an interest rate of 18 percent, with monthly collections, and the principle was repaid in either six month installments or in one installment once a year. Fishermen could purchase fishing boats, engines, and fishing gear using the loans granted by Kredit Kepres.

The repayment ratio of the Kredit Kepres loans was an extremely low 14 percent (see Table 5.4), and the program ended in failure. Consequently, the government has not actively initiated financing for fishermen since that time. Thus in actuality, the aforementioned financing system has been limited to the agricultural sector.

The local fisheries office in the kabupaten has compiled the following data on the cause underlying the poor repayment rate.

- The supplier did not provide the appropriate materials required by fishermen.
- Televisions, radios, and other consumer goods were purchased instead of production materials.
- An investigation of the fisherman's qualifications was insufficient and loans were given to inexperienced fishermen.
- The rise in fish price did not cover the sudden rise in the cost of fuel, fishing gear, and spare parts, making it difficult to make loan repayments.
- Many fishermen considered the loans to be a bonus from the government and were not aware of their obligations to repay the loans.
- Trips to the bank to deposit the repayments were inconvenient for fishermen living in distant areas.
- There were no legal penalties enacted for defaults in payment.
- The collection agency responsible for collecting repayments was not clear.

In addition to the aforementioned reasons, the factors delineated below also contributed to defaults on loan payments.

- Although the fishermen purchased production materials with the loan received, their operating capital and family living expenses were borrowed from the middleman (the Tauke).
- Credit is repaid to the Tauke from the fish catch sales at the time the fish is landed. As a result, repayment of the loan from the Indonesian People's Bank became secondary.
- Often the fishermen were so indebted to the Tauke, that repaying the loan to the Indonesian People's Bank was impossible.

In conclusion, the financial ties between the fishermen and the Tauke made repayment of the loans to the bank impossible.

2) Perusahan Inti Rakyat (PIR) system

A possible means of providing financing to fishermen is the introduction of the Perusahan Inti Rakyat (PIR) system. This system was introduced in the agricultural sector of Kab. Bengkalis and the Bank Bumi Daya and Bank Eksim began financing PT. Perkubunan, the nucleus company (Inti). Under this system, PT. Perkubunan, the Inti, started Plasuma, a farm run by local farmers near the PT. Perkubunan farm. The Plasuma receives financing from the Inti to purchase required materials. As it normally takes several years from the time the farm is commenced to the first harvest, during that interim, the farm receives financial assistance from Inti. When the harvest is reaped, it is sold to Inti and the loan is repaid. As the farm is owned by each individual farmer, once the loan has been repaid, the Plasuma becomes the sole owner. Under this system, the bank is able to help farmers indirectly through loans to Inti. It is possible to adopt this system into the fisheries sector and thereby, indirectly finance fishermen.

5.2 Fishermen Organizations in Kab. Bengkalis

5.2.1 KUD

(1) Conditions in KUD

There are 417 KUD organizations (84,003 members) in Riau Province, of which 105 are in Kab. Bengkalis (18,136 members). Among the KUD in Kab. Bengkalis, there are 13 KUD for fishermen of which 10 are still active. The total number of members for this 10 KUD is 1,564 which is only 9 percent of the total number of KUD members in Kab. Bengkalis. The membership ratio is also nominal in contrast to the total fisherman population throughout the kabupaten.

Of this 10 KUD, only 2 percent of the membership (34 members) were engaged in aquaculture and the main activity of members was centered on fishing (see Table 5.5). The members were mainly comprised of Chinese Indonesians and Melayu and some organizations were entirely composed of Chinese Indonesians. In some cases, both fishing boat owners and crew members belonged to the organization; and usually the fishing boat owner was Chinese and the crew members were Melayu.

(2) Issues confronting KUD

A major cause underlying the low membership rate of fishermen organizations is the financial ties between the fishermen and the Tauke or tengkulak. Banks will not deal with fishermen in need of daily operating capital and if they do so, an application form must be filled out and several months are required before the loan is granted. Due to such conditions, the fishermen are forced to rely on the Tauke. This relationship has continued for many years and the fishermen depend on the Tauke for their operating capital, capital to cover their daily living expenses, fishing materials, and for all other aspects of their livelihood.

The study area is located opposite to the shores of Malaysia and Singapore and, consequently, it is strongly influenced economically by both nations. The Tauke living in Malaysia and Singapore swiftly and conveniently provide the engines, nets, and other production materials that the Tauke in Indonesia requires. Such investment gives the Tauke in Singapore and Malaysia a guaranteed means of acquiring the fish catch at an advantageous price.

If the fishermen organize under the guidance of KUD and become economically independent, the Tauke will no longer be able to purchase the fish catch at their desired price. Such a situation is threatening to the Tauke and their activities is one of the factors obstructing KUD development.

In order to free the fishermen from their financial ties to the Tauke, an enormous amount of finance capital is required. Unfortunately, the KUD does not have that capability at present. The government policy has been to provide operating loans to fishermen for their food and fuel costs and to collect repayment by deducting the amount from the sale of the fish catch. Thus its aim has been to slowly wean them away from the Tauke. The relationship between the fishermen and the Tauke initially began with loans to cover the cost of daily expenses, which grew over the years; and therefore, it can be said that the government's method of resolving the situation is correct.

Although the ideal situation would be for the KUD to provide a complete system of operating loans for fishermen and to organize all fishermen in the area, its existence is still on unstable footing and to coerce the fishermen to organize would be detrimental. Despite the fact that the relationship between the fishermen and the Tauke is based on financial ties, it is not a contractual relationship, but one based on personal allegiance. For example, if the relationship between a fisherman and Tauke is on good terms, the loans provided are interest free, but if it is no longer friendly, the fisherman is charged interest. The determining factor of the relationship, is whether the fisherman always makes his fish catch available to the Tauke.

The issue confronting the Ministry of Cooperatives is how to accelerate a growth in the membership ratio of fishermen in the KUD. However, there have been no concrete plans forthcoming from the ministry; and only the possibility of adopting the Nucleus Estate System (PIR) introduced in the agricultural sector, has been discussed.

5.2.2 Kelompok

The Kelompok system was established under the auspices of a separate fishing act; and it is separated into fisheries and aquaculture. In 1991 there were 82 Kelompok engaged in fisheries (3,507 members) and 38 Kelompok engaged in aquaculture (511 members) in Kab. Bengkalis.

The Kec. Kubu and Bengkalis/Bukit Batu in Kab. Bengkalis are the most active in fisheries, with a total of 16 Kelompok and 1,163 members (see Table 5.6).

The Kelompok are recipients of government assistance and therefore, the Department of Fisheries has been aggressive in its efforts to organize the fishermen. However, it appears that operational and technological guidance have been deficient due to an inadequate budget.

5.3 Activities of Fishermen Organizations in the Study Area

5.3.1 KUD Activities

The conditions surrounding the KUD Bengkalis and KUD Rupat which are currently active in Kab. Bengkalis have been explained below.

(1) KUD Bengkalis

The 172 members of KUD Bengkalis are comprised of both fishing boat owners and crew members. The total number of motorized boats owned by members is approximately 100 boats, of 3.6 tons with 12 to 16 horsepower or 1.2 tons of 4 to 5 horsepower. Approximately 70 were gill net fishing boats and 30 were bottom long-line boats. In addition, there are 200 to 300 manually operated fishing boat owners who are affiliated with the organization, but remain largely unregistered. The executive committee of the cooperative is comprised of seven Tauke who are owners of export carries. They are located throughout Kab. Bengkalis and own a total of 16 carries (see Table 5.7).

The duties of the KUD entail processing and issuing export licenses. It receives Rp.25,000 per voyage after the licenses have been issued. Other KUD functions such as the joint purchase of food and fuel, and financing do not exist due to a shortage of capital. Member fishermen receive assistance for operating capital and daily expenses from the Tauke in the executive committee. Their credit payment is deducted from the price of the fish catch at the time of landing. When the fish catch volume is small, their credit repayment are waived. In this respect, the organizational structure of KUD Bengkalis is based on the personal ties between the fishermen and the Tauke which have traditionally existed; and the KUD has only unified this relationship into an organization. Its foremost duty has been to issue export licenses in order to legitimatize exportation.

If the fish landing volume handled by the seven Tauke is interpreted as the handling volume of KUD Bengkalis, approximately 60 tons/month is handled, of which 70 percent is directly exported to Malacca, 15 percent is exported to Singapore through Tanjung Balai Karimun, and the remaining 15 percent is consumed within the Bengkalis area. The fish species which are exported are mainly limited to threadfins, wolf herrings, mackerel, pomfrets, and medium to large sized prawns. The other species are consumed locally.

The two major export fishery bases in Bengkalis island are Muntai and Bantang Tengah. Fishing boats operating in the fishing grounds near Bengkalis and the Panjang channel, land their fish in Bengkalis. However, fishing boats operating in the fishing grounds on the Malacca Strait side, land their fish at one of the aforementioned fishing bases and transfer their fish catch to fish carries. In addition, traders are known to purchase the fish catch when the fishing boats are still in mid-sea, and export the catch directly from that point. Although both the tax and fisheries offices have stipulated that fish is to be landed in Bengkalis, substantial fishing grounds are all located on the Malacca Strait side. In view of the fuel cost and time loss entailed in making the round-trip to Bengkalis and the deterioration in fish quality, the ineffectiveness of the stipulation can be easily deduced.

Presently, Muntai and Bantang Tengah have very poor port facilities. A future countermeasure in resolving this situation would be to install improved port facilities and to place them under the management of the tax and fisheries offices, in order to further promote exportation.

(2) KUD Rupat

According to the data of the kabupaten office of the Ministry of Cooperatives, there are 378 members in KUD Rupat, but based on an interview survey of KUD Rupat, there were only 220 members. The difference in the data is due to the recent organizational revisions which have taken place in KUD Rupat. Prior to 1991, eight villages in the northern area of Rupat island were included in the KUD. However presently, the area under the jurisdiction of KUD Rupat is limited to the four villages of Tanjung Medang, Tanjung Punak, Kadur and Terkul, all areas with a large volume of fish landings. The head of the KUD is a Chinese Indonesian Tauke who is also the owner of a charcoal kiln. The composition of the members is 75 percent Chinese and 25 percent Melayu ; and the majority are fishermen using motorized boats, although there are fishermen engaged in traditional fishing, using non-powered boats.

KUD Rupat was originally the first KUD to begin fresh fish export operations, but presently, PT. Kepal Jala Guna, a fish export firm of the naval investment cooperative has monopolized fish exports and KUD Rupat has been relegated to the role of collection of the fish catch. PT. Kepal was set up in 1976 and its main office is located in Dumai. It operates out of Tanjung Medang, Panipahan, Bagansiapiapi, Sinaboi, Bengkalis, and Selatpanjang and its operations have incorporated the characteristics of the area. Its export volume reached 589.5 tons in 1991 and for the past five year period, the export volume has remained stable at the same levels.

All the fresh fish collected by KUD Rupat is sold by PT. Kepal; and KUD Rupat is paid a commission of 2 to 13 percent by the firm for export fish. At the time of the survey, this was equivalent to 2,500 Malaysian rupiahs/month (about Rp.19,000). Approximately 200 fishing boats are affiliated with PT. Kepal, of which only a few are owned by the firm and the majority are contracted boats. Fishing boats which are contracted to PT. Kepal have given the firm the right to purchase their entire fish catch, in return for loans to construct boats or purchase fishing gear. The maximum amount of a loan is 10 million rupiahs for a boat owner. The loan is interest free and payment is repaid by deducting the amount from the sale of the fish landing.

There appears to be a slight misunderstanding between KUD Rupat and PT. Kepal regarding contracted fishing boats. PT. Kepal regards the contracted fishing boats as vessels under their jurisdiction and not as KUD members. According to the firm, there are only a few KUD member boats (about 20). In contrast, according to the interview survey conducted at KUD Rupat, the cooperative sees the contracted fishing boats as its members and not just the 20 boats recognized by PT. Kepal. It is surmised that in actuality, the line between KUD members and non-members is vague.

KUD fulfills the role of gathering and organizing the fishermen; and the members' obligation is to deposit Rp.500 a month under the KUD savings plan. In return, the fishermen are granted loans to meet their operating costs, and repayment is collected by deducting the amount from the fish landing sale. Bonuses are paid yearly to fishing boats which have increased their fish landing volume. The administrative duties of KUD include local administrative duties, tax collection, obtaining statistical data, business transactions, and other duties which are normally implemented by the local Fisheries Office.

(3) KUD Kalimun Jaya

KUD Kalimun Jaya reflects a direction in KUD activities which is explained below.

KUD Kalimun Jaya is widely active in Tanjung Balai, Kalimun. It was established in 1979 and has a membership of about 800, of which 75 percent is Melayu and 25 percent is Chinese. In an occupational breakdown of its members, 30 percent is in agriculture, 30 percent is in fisheries, 20 percent is in commerce, and 20 percent is in transport. Moreover, they can also be further categorized into business managers and traditional operators. All of its executive and inspection committee members are Melayu; and there are no Chinese Indonesians on either committee. It appears that Chinese Indonesian members have joined the organization in order to legally protect their businesses and do not desire to participate openly in KUD activities. As mentioned earlier, this cooperative is involved in a variety of activities in many different sectors; and it has a manager for each sector. They are appointed by the executive committee and are responsible for implementing the activities adopted by the members. The managers must answer to the executive committee and the executive committee must answer to KUD members.

The activities currently in implementation and their content is outlined below.

- Fresh fish export operations
- Providing loans to members
- Implementing organized activities by members for the Kelompok
- Sale of fertilizer and pesticides to farmers
- Sale of food to members
- Collecting payment for electricity

In addition, the following activities are currently in planning:

- Sale of fuel to members
- Collecting television fees
- Cleaning duties for the town

This particular KUD does not have any facilities or materials. Therefore, all of the aforementioned activities must be implemented by its members or by third parties who are paid on a commission basis.

For example, in the area of fresh fish export, the Tauke based in Tanjung Balai and Singapore, transport 30 tons of consigned fish by 60 ton carrier once a week on a commission basis to cover the cost of transport and export procedures.

In 1991/1992, 15 million rupiahs were loaned in a one year period to member farmers and 16 million rupiahs in loans are being planned for 1992/1993. The capital is provided by the Bank Rakyat Indonesia (BRI); and an equivalent of 300,000 rupiahs in seeds, fertilizer and pesticides per one hectare have been provisioned, at a monthly interest rate of 1.5 percent. The repayment period of KUD to BRI is 12 months; and the repayment schedule of KUD members to the organization is seven months. Payment can be collected monthly at a set rate or repaid in one installment seven months later.

In 1981 the Kredit Investasi Kecil (KIK) granted a total of 10 million rupiahs in loans to three fishermen for the purchase of fishing boats and fishing gear. Repayment was scheduled for a five year period, but actual repayment took longer than five years to complete. As a result, loans to fishermen have not been granted since that time. The underlying reasons are the minimal number of working days for fishermen, which averages 12 days/month, and the high inconstancy of the fish catch in comparison to agricultural crops.

When the KUD committee members were interviewed about the present situation, they all agreed that although KUD activities were expanding, due to the lack of KUD facilities and materials, they had to be implemented on a commission basis. As a result, the organization remained economically weak. The Rp.300,000 allocated for loans to their farmers did not meet the amount of capital required by the organization. The fact that government assistance was sought, is in itself, an indication of a shortage in capital. In order to remedy this situation, activities have been expanded; and this strategy is not anticipated to change for the foreseeable future. As a result, according to its executive members, KUD will amass its own capital to provide more comprehensive financing for its members. Although the cooperative is unable to operate its activities autonomously, they have expanded their activities in various sectors. Their aggressive and active program provides an example for other KUD in Kab. Bengkalis.

5.3.2 Kelompok Activities

There are 50 Kelompok and a total of 1,826 members active in the study area. The location of the Kelompok and the number of members confirmed in the field study are shown in Table 5.8.

Since the Kelompok have been organized according to fishing methods, a Kelompok member who utilizes two types of fishing gear will be statistically registered in plural Kelompok.

The number of Kelompok by village (desa) are the highest in Kab. Bengkalis. The Kelompok activities of the Perapat Tungal /desa Meskom /Kec. Bengkalis, and Siarang Pasung/Kec. Tebing Tinggi, and present conditions of administrative guidance programs implemented by the Department of Fisheries for the Kelompok in Pangkalan nyirih / kec. Rupat are delineated below.

(1) Kelompok activities in Meskom and Perapat Tungal

The Kelompok in this area were all established by the Department of Fisheries approximately three years ago. The government's goal was to foster fishermen and to carry out technological guidance programs by the Department of Fisheries; however, financial assistance has been inadequate. There are five Kelompok representing each of the five fishing methods which exist in this village, including one Kelompok for fish processing. Their current conditions are outlined below.

1) Kelompok for gill net fishing

There are 64 members who are all boat owners possessing one to three fishing boats; and the majority are racially of Malay Indonesian extraction. There are a total of 72 two ton fishing boats loading 16 horsepower. Each boat has one skipper who is also the owner, and two crew members. The crew are not members of the Kelompok. Each boat carries about 60 rolls of surface drift net of which mesh net in 2.5 to 3.0 mm.

2) Kelompok for bottom long-line fishing

There are a total of 64 members and 72 boats that belong to this Kelompok; and these members and boats are the same as the aforementioned Kelompok for surface drift net fishing. Bottom long-line fishing are engaged at same time during drift net fishing; and statistically they are simply recorded as belonging to two Kelompok. However, the crew members differ and they are changed according to the fishing method used. The number of branch-line used averages 300, for a total length of 1,000 meters.

3) Kelompok for Gombang fishing

There are a total of 118 members who are all puribumi, hired fishing laborers. Gombang owners are not members of this Kelompok.

There are 23 units of Gombang, each unit having a total of 10 to 15 bag nets.

There are four to five Chinese Gombang owners and the rest are puribumi. Each owner possesses one to two units.

4) Kelompok for Ambai fishing

There are 35 members who are all hired fishing laborers. There are seven units of Ambai which belong to one Chinese owner. One unit is made up of a total of 10 to 13 bag nets and is operated by five people.

5) Kelompok for Pengurih fishing

There are a total of 84 members who are all puribumi. Some of the members are pengerih owners and some are hired laborers. There are 24 units with one unit containing a total of five to six bag nets. One unit is operated by three to four people.

6) Kelompok for fishermen's wives

This Kelompok is comprised of fishermen's wives and it is a Kelompok for fish processing. There are approximately 70 members and the processed fish products fall into the following four categories.

- Terasi production, 18 members
- Dried shrimp production, 27 members
- Dried and salted fish production, 10 to 12 members
- Production of fish crackers, 13 members

The executive committee of each Kelompok is comprised of one leader, six secretaries, and five to six accountants. One chief leader is appointed for six Kelompok, whose role is to coordinate the organizations.

The monthly income of boat owners engaged in gill net/long-line fishing averages Rp.400,000 to 500,000 and the monthly wage for crew members is Rp.200,000 to 300,000. After family food expenses are deducted, a crew member's wages is left with an average of Rp.50,000 to purchase clothes and to pay for his children's educational expenses. On special occasions such as weddings or repair of a house, he will borrow the money from the Tauke who will deduct the loan amount from his fish catch. There were seven Tauke in this village. All were boat owners engaged in gill net/long-line fishing who hired crew members to work their boats. They owned a total of 39 fishing boats and did not belong to any of the aforementioned Kelompok. Subsequently, in addition to the earnings generated from their fishing operations, they had secured the fish catch of Kelompok members through their credit activities. The Kelompok are financially weak and are unable to meet the financial needs of fishermen. Many of the KUD face a similar situation. Banks do not consider the Kelompok as potential loan beneficiaries. Subsequently, when the fishermen are in need of capital, they rely on the Tauke.

Since the fishermen are individually indebted to the Tauke, the Kelompok as

an organization, does not have to borrow credit from the Tauke. Such a situation would place a double financial burden on the fishermen. Although the Department of Fisheries has an assistance program to address issues in fishing technology, it has no system of financial assistance. As a result, the most serious issue confronting the Kelompok at present, is the shortage of capital. If the Kelompok in this area had sufficient capital, the following activities would be implemented.

- Purchase processing machine for terasi production (pulverizer)
- Expand the scope of the fishing gear
- Motorize fishing boats
- Utilize a variety of fishing gear according to fish species and fishing season

Efforts to improve the social position and livelihood of fishermen who have lost the right to determine fish prices due to their credit ties to the Tauke, are an uphill climb and the future prospects of this endeavor are dim.

(2) Assistance activities for Kelompok Pangkalan Nyirih in Rupat island

In 1991/1992, a comprehensive regional development project (PKT) was implemented by the APBN. Each group of selected fishermen was given one manually operated boat and 20 rolls of gill nets. The objective of the project was to improve fishermen income and to lighten their financial burdens by having them save a part of their fish landing sales to cover depreciation costs. Subsequently, this would stimulate revolving capital and expand economic activities.

The PKT project area encompassed the five villages of Teluk Lecah, Pangkalan Nyirih, and Sei Cingam in Kec. Rupat and Teluk Piyai, Sei Kubu in Kec. Kubu and affected a total of 212 fishermen. In order for the fishermen to support a livelihood in this area, each group of fishermen required a motorized fishing boat of five tons and 50 rolls of gill nets. However, due to a shortage of funds, the project was begun with one non-powered fishing boat and 20 rolls of gill nets. The project aimed to achieve the following goals within a three year period:

- improve the standard of living,
- renew fishing gear,
- possession of one non-powered fishing boat and 20 rolls of gill nets by each fisherman.

The Department of Fisheries formulated a repayment plan for fishermen receiving assistance under the PKT project. According to their calculations, the cost for one day of fishing was determined by the number of operating days, the fish catch volume/operation, fish price/kg for both the peak and lean fishing seasons; and the average net income was calculated at 362,500 rupiahs/month (see Table 5.9). Based on assumed figure, the reserve fund to cover depreciation and maintenance costs of fishing gear and boat was formulated. According to this plan, the monthly living expenses for two fishermen families was set at 239,250 rupiahs (see Table 5.10).

In the case of Pangkalan Nyirih village in Rupat island, the village contained 24 fishermen families. The Kelompok was formed recently, in order to receive assistance from this project. There were 24 members and the executive committee was comprised of a leader, accountant and three inspectors. The role of the leader was to coordinate the organization and to promote friendly relations among members. The accountant was in charge of collecting obligatory fees from members and to deposit them in the bank; and the duties of the inspector were to check the fish catch volume while the boats were still out at sea, to inspect fish production activities of members, and to ensure the safety standards of the fishing operation.

According to the findings of the interview survey conducted during the field study, it was discovered that fishermen who were the recipients of the PKT assistance program were engaged in fishing only 14 days of the month due to tidal conditions. When they were not fishing, they were engaged in rubber cultivation, livestock, or the cutting of mangrove trees for charcoal making, i.e. they were part-time fishermen.

In contrast to the government's calculations, the actual fish landing volume varied from 15 kg to 2 kg, making income derived from fisheries, difficult to calculate. The fish catch is sold to the Tauke based in Rohon, but only export species such as mackerel, promfrets, and threadfins are purchased. The purchase price for fresh fish is about Rp.2,500; and this price is a higher figure than the government estimate. The volume of other fish species which are landed and consumed by the fisherman's family or by the village, is minimal. The government estimate for the number of operating days/month was 20 days. However, in actuality the number of operating days/month was about 14 days and there was a difference of 6 days.

Under the strategy devised by the project, it was suggested that surplus capital should be saved to purchase a motorized boat to tug the manually operated fishing boat to the fishing grounds. At the end of the fishing operation, the motorized boat would tug the fishing boat back to the port. This would expand the fishing grounds for the fishing boats and would enable the fish catch to be swiftly transported and landed, prevent degradation in freshness, and thereby increase its value added price. However, the possibility that the Kelompok would accumulate enough surplus capital to purchase a motorized boat, is slim. At most, the Kelompok would only be able to purchase one or two rolls of extra gill nets.

(3) Assistance activities for Kelompok of Siarang Pasung on Rangsang island

Cooperative activities were never carried out in some Kelompok and they have disappeared. However, this Kelompok has aggressively implemented Gombang operations, aquaculture, and farming activities.

It was established in 1981 and as of 1992, there were 20 members. The executive committee is comprised of the leader and five members. Its operating capital is comprised of Rp.20,000 a month, assistance from the local office of the Department of Fisheries, and a monthly fee of Rp.2000 which is collected from each member.

Gombang fishing is the Kelompok's major activity. The village owns 20 units of Gombang and fishing operations are carried out twice a day during the high tide. The Gombang units are set up ten days prior to the spring tide and the nets are washed and repaired during the five days of low tide. Subsequently, fishing operations are carried out 20 days/month.

The fish catch is transported to the fish market in Selat Panjang and large shrimps are sold for Rp.6,000/kg and small trash fish are sold for Rp.1,000/kg. Fish landing volume for one day is approximately 10kg, of which one portion is used as feed for their aquaculture operation. Earnings average Rp.5,000/day.

The aquaculture activity of the Kelompok is the culture of giant sea perch through traditional methods. In addition to this, a culture pond for mud crabs has been recently constructed through government assistance, and its operation was started in December 1992 on a trial basis. However, the goal is to obtain as many fry as possible, in order to begin full scale operations. Harvesting natural fry is possible in conjunction with improved fishing methods. The mangrove forests which are the spawning grounds for fry are also targeted for coastal environmental conservation measures. In this respect, it has been concluded that the Kelompok's prospects for their aquaculture activities are bright.

The Kelompok's farm production is also an important economic activity, producing rubber, coconuts, sago, etc. Per capita land ownership is one jalur (2,000m^2), but some members do not own farms. In such cases, joint activities (harvesting, etc.) are more like individual production activities.

Presently, the revenue earning activity for the Kelompok is centered on Gombang fishing. It is surmised that its profits are economically borderline, and development of aquaculture activities holds the key to its success. Simultaneously, the activities of this Kelompok are significant in setting the direction for other Kelompok throughout Kab. Bengkalis.

5.4 Points to be Observed upon Selection of the Model District in the Survey Area

(1) Points to be observed regarding the survey area

The Taukes who collect, export and sell the harvested fish as a profession occupy an important position in the fishing activities in the survey area.

In general, the Taukes lend money to fishermen to cover the purchase of fishing boats and the operating fee. In return, fishermen sell their harvests to the Taukes. Therefore, there is a system providing that the fishermen who have borrowed money from the Taukes cannot sell their fish to others until their loan is paid off.

From the Tauke's point of view, the loan to fishermen is the guarantee of the stable supply of fish. The more fishermen who borrow money from the Taukes, the greater the volume of fish on the market. For this reason, in the villages where the supply of fishing gear, fuel and ice is unstable, the Taukes transport these articles from the town and sell them. Some Taukes supply ice for free to the fishermen who bring their harvest to them. In general, the Taukes lend money to fishermen without interest and buy their fish cheaper than the market price.

Most fishermen in the survey area are not rich enough to be able to purchase a powered boat on their own, and the banks do not finance them. Therefore, they cannot buy their own boat unless they borrow money from the Taukes. Fishermen are free to choose their customers once their loan has been paid off, but the distribution channel for exportable fish with high market value is so limited that there is practically no alternative other than selling the fish to one of the Taukes.

As mentioned above, the relations between the Taukes and fishermen are basically those of mutual assistance. However, when fishermen are unable to choose their own Tauke in the restricted area, some Taukes fix a purchase price for the harvested fish at a lower level than usual, or they buy the fish from the fishermen who are not dependent of the Taukes at the same price as they buy from those who have borrowed money.

When a new fishermen organization is formed within the survey area, it is necessary to set up a plan in consideration of such relations between the Taukes and fishermen.

(2) Important Factors in Selecting the Model Area in the Study Area

The study area was divided into the three regions of Dumai/Rupat, Bengkalis, and Tebing Tinggi/Merbau. The characteristics of each region was studied in order to select the model area. The findings are given below.

1) Dumai/Rupat

There is a large population of Chinese Indonesians in the northern area of Rupat island; and it is an area with a high level of fisheries. Fishermen who have been organized into KUD Rupat in Tg. Medang receive loans from PT. Kepal, due to joint activities between KUD Rupat and PT. Kepal. Subsequently, all the fish catch is sold to PT. Kepal.

As a result, the TPI which was constructed next to the KUD fish landing site in Tanjung Medang two to three years ago, has not been used once, since all the fish catch flows to PT. Kepal. In contrast, the central southern area of Rupat island has a very small population of fishermen and the level of fisheries is not high. The government is currently implementing a project to raise the living standards of the artisanal fishermen there, by providing them with gill nets and non-powered fishing boats.

If this region is selected as the model area for the project, it is essential that the effect of PT. Kepal is thoroughly considered and project activities do not compete with this company. If this precaution is not taken, the project will tread the same path as the aforementioned TPI. If possible, the project should utilize the firm's base of operations and provide some merit for the company as well. For example, by organizing the artisanal fishermen to participate in aquaculture activities, it may be possible for the harvested product to be included in the export and sales network of this company.

2) Bengkalis

This region is centered on KUD Bengkalis and is greatly influenced by a minority of Tauke. One NGO organization is trying to free the artisanal fishermen of their dependence on the Tauke by providing assistance to the fishermen Kelompok. In order to achieve this, it will probably take many years of intensive assistance activities. It has been concluded that a safe method of weaning the artisanal fishermen from the Tauke, without endangering the fishermen's financial status, would be to include the Tauke into the project.

Presently, it is legally stipulated that the fish catch must be transported to

and exported from Bengkalis. However, the fishing grounds are located on the Malacca Strait side; and since the export destination is Malacca, the stipulated route (fishing grounds-Bengkalis-Malacca) is not taken and the route from fishing grounds to Bantang Tengah or Muntai to Malacca is used instead. Consequently, a ten hour loss is saved and fish quality is maintained.

The port facilities at Bantang Tengah and Muntai are inadequate, costing the fishing boats time and operational losses. By recognizing Bantang Tengah as an export fisheries base, improving the port and installing an ice plant, refrigeration facilities, and other basic improvements, and placing the port under the jurisdiction of the government as the sole export base of Bengkalis, the convenience of the fishermen, the profits of the Tauke, and a rise in government revenue through tax collection would be achieved.

3) Tebing Tinggi/Merbau

Although the region is large and the fish production volume has been high, it has declined over the past several years. A total of 20 units of Cici nets harvested 10kg of prawns five years ago, but production volumes have dropped to less than half in recent years. These conditions are indicative of the following trends among marine fisheries operators.

- Full-time fishermen are becoming part-time fishermen

  Fishermen who were engaged in marine fisheries full-time have shifted to other occupations such as farming or crop farming, engaging in fishing only part-time.

- Promoting measures to relocate fishermen

  Fishermen who were engaged in traditional fishing methods such as cici, have shifted to gill net and long-line fishing, relocated to the eastern area of Riau island, and are operating in the fishing grounds on the South China Sea side. As a result, the population of fishermen engaged in marine fisheries has declined in this region.

Due to these factors, the Department of Fisheries at the kabupaten level has put efforts into introducing and promoting aquaculture in this region. This policy, endorsed by the Department of Fisheries, cannot be ignored in the selection of the model area for in this study.

Chinese Indonesian fishermen are concentrated on the Malacca Strait side of Rangsang island. They possess Bangliau (fish drying area) and motorized fishing boats and are engaged in Gombang and gill net fishing. In terms of fishing technology and accumulated capital, their fishing capabilities are higher than ethnic Malay fishermen.

As a result, the government has focused its efforts to assist the puribumi

fishermen in this region. Moreover, although the economic ties between the Tauke and fishermen can be generally discerned, there are groups of Malay fishermen whose ties to Tauke are relatively weak. For example, Kelompok Belat in Desa Keala Merbau in Merbau island are not obligated to sell their catch to the Tauke due to credit ties, but sell their fish catch to the highest bidder.

Based on these conditions, it has been deduced that Kelompok which can contribute to improve living standards of artisanal fishermen, can be established in this region without undue interference by the Tauke.

Table 5.1 Regulation for Standerds of Fishing Gear in Riau Province

Type of Fishing Gear	Length/unit	Mesh size of net	Distance of each fishing gear	
			Front and rear	Right and left
Gill net	1,000m/60pc	1 3/4 to 6"	1,500 - 2,000m	300 - 500m
Cici	10 - 25 units	1/2 - 4"	1,500 m	100 m
Gombang	10 - 25 units	1/2 - 4"	1,500 m	100 m
Ambai	10 units	1/2 - 3"	1,500 m	100 m
Pengirih	5 units	1/3 - 5"	1,000 m	50 m

Sources: 1770/X/84/532/411, Pemerintah Propinsi Daerah Tingkat I Piau Dinas Perikanan

Table 5.2 Objective Farm Productions of BIMAS Project

	Term	Objective products
REPRITA I	1969～1973	Rice.
REPRITA II	1974～1978	Rice, Crops, Sugarcane.
REPRITA III	1979～1983	Rice, Crops, Sugarcane, Vegitables.
REPRITA IV	1984～1988	Rice, Crops, Sugarcane, Vegitables,Cotton, Live stock, Fish farm.
REPRITA V	1989～1993	Rice, Crops, Sugarcane, Vegitables, Cotton, Live stock, Fish farm, Industrial materials, Farm production for export.

Table 5.3 Financing System of Government Capital

Credit	Type of Credit	Object	Amount of Credit per Individuals	Interest	Period	Grace Period	Security	Recipient	Notes
Kredit Kecil Investasi (KKI)	Non-program	All kinds of investment	Maximun Rp 200,000,000	23~25 %	5 years	Maximam 2 years	Immovable property and others	Capital less than Rp 600,000,000	Funded by BRI, Set up since April 1990 instead of KIK
Kredit Kecil Mod Kerja (KKMK)	Non-program	Operation cost	Maximun Rp 200,000,000	23~25 %	1 years	Non	Immovable property and others	Capital less than Rp 600,000,000	Funded by BRI, Set up since April 1990 instead of KMKP
Kredit Umum Pedesaan (KUPEDES)	Non-program	All kinds of investment and	Rp 100,000 ~ 25,000,000	24 %	2 years	6 monthes	Immovable property and others	All kinds of industrialists, KUD and individuals	Monthly repayment, 0.5% of interest per mont returned by IPTW , Replaced Kredit Mini / Kredit Midi
		operation cost	Rp 100,000 ~ 25,000,000	24 %	1 year	Non			
Kredit Usaha Tan (KUT)	Program	Operation cost	Rp 100,000 ~ 300,000 / packet (1packet = 1Ha)	16 %	1 year	Lump sum repayment after 1 year	No need (Cirtificated by PKK)	KUD	Funded for operation cost of KUD members, Set up since 1984
Kredit Pengadaan Pagan (KPP)	Program	Operation cost	Not limited (Depend on the program)	18 %	1 year	Lump sum repayment after 1 year	No need (Cirtificated by PKK)	KUD	Purchase funds for KUD to buy the products from KUD members

Table 5.4 Results of Kredit Kepres No. 39/1980 in Kab. Bengkalis

District	Number of Recipient	Year	Amount of Credit (RP 1,000)	Amount of Repayment (RP 1,000)	Amount of Outstanding (RP 1,000)	Number of Complete Repay Person	Repayment ratio (%)
Bagansiapiapi (Kubu & Bangko)	82	1981	302,969	159	302,810	-	0.05
Dumai (Rupat & Dumai)	148	1981	428,050	3,164	424,885	-	0.74
Bengkalis (Bengkalis & B. Batu)	75	1981	200,400	123,045	77,355	4	61.4
Total	305		931,419	126,368	805,050	4	14.14

Sources : Data from Report of Bank Rakyat Indonesia, December, 1986

Table 5.5 Number of KUD Member by Kecamatan in Kab. Bengkalis (1991)

Unit : Person

Kecamatan	Name of KUD	Member of KUD			
		Fisherman	Fish Farmer	Others	Total
Kubu	KUD Minabaakti	-	-	-	-
	KUD Mina Jaya	-	-	-	-
Bangko	KUD Bagan	72	-	-	72
Dumai/Rupat	KUD Medel Rupat	254	-	-	254
	KUD Dumai Barat	33	-	110	143
Bengkalis/B.Ba	KUD Bengkalis	110	20	2	132
Tibing Tinggi /Merbau	KUD Selat Hitam	27	-	238	265
	KUD Sukajaya	42	-	113	155
	KUD Kec. Merbau	52	-	477	529
Duri	KUD Mandau	-	1	65	66
	KUD Misayamina	10	-	15	25
	KUD Karya Usaba	-	13	10	23
Siak/Sei Apit	-	-	-	-	-

Sources : Laporan Tahunan 1991, Cabang Dinas Perikanan, Kabupaten Bengkalis

Table 5.6 Number of Kelompok and Its Member by Kecamatan in Kab. Bengkalis (1991)

Unit : Person

	Kelompok (Unit)			Member (Person)		
	Fisherman	Fish Farmer	Total	Fisherman	Fish Farmer	Total
Kubu	16	-	16	1,163	-	1,163
Bangko	10	6	16	414	-	414
Dumai/Rupat	10	14	24	188	173	361
Bengkalis/B.Batu	16	-	16	1,163	-	1,163
Tebing Tinggi/ Merbau	8	2	10	209	93	302
			0			0
Mandau/T.Putih	3	5	8	67	98	165
Sei.Apit/Siak	19	11	30	303	147	450
Total	82	38	120	3,507	511	4,018

Sources : Laporan Tahunan 1991, Cabang Dinas Perikanan, Kabupaten Bengkalis

Table 5.7 Number of Tauke and Transport Vessels under Tauke in Kec. Bengkalis

Desa	No. of Tauke	No. of Vessels
Bengkalis	2	7
Bantang Tengah	3	5
Mentai	1	2
Meskom	1	2
Total	7	16

Sources : Hearing from KUD Bengkalis

Table 5.8 Number of Kelompok and Its Member in the Study Area (1990)

Kecamatan	Desa	Name and/or Type of Kelompok	No. of Member
Dumai Barat	Bukit Timah	KM 11 (Aquaculture)	10
	Bukit Timah	Bagan Sari (Aquaculture)	10
	Bukit Timah	Bagan Jenawi (Aquaculture)	10
	Bukit Timah	KM 15 B.Timah (Aquaculture)	15
	Bukit Timah	PKK (Aquaculture)	15
	Pernama	PKK (Aquaculture)	15
	Pernama	Buntal (Fishing)	20
	Pangkalan Susai	Belangat (Fishing)	14
Dumai Timur	Tanjung Paras	Senangin (Fishing)	22
	-	Lancang Kuning (Fishing)	18
Rupat	Sungai Injap	Biang biang (Fishing)	20
	Tanjung Medang	Lumba lumba (Fishing)	25
	Tanjung Punak	Tenggiri (Fishing)	20
	Teluk Roh	Bawal (Fishing)	20
	Makuluh	Kerang (Fishing)	10
	Sungai Cingam	Terubuk (Fishing)	19
Bengkalis	Meskom	Nelayan Gill Net	64
	Meskom	Nelayan rawai	64
	Meskom	Nelayan Ambai	35
	Meskom	Nelayan Pengerih	84
	Meskom	Nelayan Gombang	118
	Meskom	Wanita Nelayan(Processing)	70
	Teluk Latak	Nelayan Pengerih	20
	Sei Alam	Nelayan Pengerih	20
	Sei Alam	Nelayan Gill Net	10
	Penampi	Nelayan Gill Net	9
	Penampi	Nelayan Ambai	5
	Penampi	Nelayan Kiso	5
	Jangkang	Nelayan Gill Net	20
	Teluk Pambang	Nelayan Gill Net	25
	Teluk Pambang	Nelayan Rawai	32
	Muntai	Nelayan Rawai	35
Tebing Tinggi	Insit	Muri Jaya (Aquaculture)	16
	Anak Setatah	Beringin Jaya (Aquaculture)	19
	Alah Air	Nelayan Pengerih	21
	Banglas	Nelayan Gombang	11
	Alai	Nelayan Gombang	30
	Sialang Pasung	Nelayan Gombang	37
	Kedabu Rapat	Nelayan Gill Net	20
	Bantar	Nelayan Gill Net	47
	Tanjung Kedabu	Nelayan Gill Net	20
	Melai	Nelayan Gill Net	23

Sources : Result of Interview Survey

Table 5.9 Estimate Income of Fisherman by PKT established by DGF

Fishing season	6 months X 20 days X 15kg X RP 1,750/kg	Rp.	3,150,000
Out of fishing season	6 months X 20 days X 10kg X RP 2,000/kg	Rp.	2,400,000
Annual gross income		Rp.	5,550,000
Averaged monthly gross income		Rp.	462,500
Monthly operation cost	Rp 5,000 x 20 days	Rp.	100,000
Net Monthly Income		Rp.	362,500

Table 5.10 Repayment Plan for Fisherman by PKT

- Net income for 2 fishermen's household		Rp. 239,250	66.0 %
- Depreciation		Rp. 81,563	22.5 %
- Maintenance cost for fishing gear and boat		Rp. 7,250	2.0 %
- Deposite for kelompok member		Rp. 7,250	2.0 %
- Developing fund for kelompok	*1	Rp. 5,438	1.5 %
- Developing fund for village community	*2	Rp. 3,625	1.0 %
- Operation fund for project	*3	Rp. 18,125	5.0 %
- Total		Rp. 362,500	100.0 %

Remarks : *1; Allocated to O/M cost of kelompok for its 20%, conpensation to the leader and the executives for it respectivety and cost of training and education for its 12%.

*2; Allocated to compensation to the village captain for its 45% and village construction for its 55%.

*3; Allocated necessary items in order to execute the project smoothly, based on discussing among mer

6. Current Condition • Management and Utilization of Mangrove Forest

6. Current Condition • Managemet and Utilization of Mangrove Forest

Tables & Figures

6. Current Condition • Managemet and Utilization of Mangrove Forest

Riau Province had a forest area of approximately 9.4 million ha in 1986, accounting for slightly less than 5% of Indonesia's total forest area (KANWIL Kehutanan). The forest area of the Study Area controlled by the 3 branch Offices of the Riau Provincial Forestry Service (CDK), i.e. Dumai, Bengkalis and Selatpanjang, is approximately 3.7 million ha, accounting for slightly less than 40% of the forest area in Riau Province. The area of mangrove forests in Riau Province was estimated to be 276,000ha in 1982, accounting for some 3% of the provincial forest area and some 6% of the national mangrove forest area (DEPHUT).

6.1 Current Condition of Mangrove Forest

6.1.1 Forest Land Use Categories

The DEPHUT has adopted a land zoning system called Agreed Forest Land Use Categories (Tata Guna Hutan Kesepakataan: TGHK) based on forest functions. The zoning in each province has been agreed with the governor or other provincial authorities with particular emphasis on the conservation of water and Soils. The characteristics of each forest land use category are described below.

Protection Forest (Hutan Lindung) : forest serving for the protection of an important water reservoir area or for the prevention of soil erosion where no felling is permitted

Reserve Forest (Hutan Suaka Alam dan Hutan Wisata) : forest serving for the biological diversity of fauna and flora (natural reserve, wild life sanctuary and national park included in this category) where no felling and hunting is permitted

Production Forest (Hutan Produksi) : forest serving for the production of timber; most production activities conduct by the private sector in accordance with concession agreements (under the supervision of the DEPHUT); either a limited production forest (Hutan Produksi Terbata) that forest utilization by concessions is limited such as with only selective felling permitted for protection requirements or an ordinary production forest (Hutan Produksi Tetap) that little forest utilization by concessions is limited such as with clear felling also permitted

Conversion Forest (Hutan Konversi) : forest which can be converted to farmland

Of the total forest land area of approximately 144 million ha (DEPHUT,1984), one-third is subject to the total prohibition of any type of felling. The zoning of reserve forests is based on the biological and cultural characteristics of the forest in question while the zoning of protection forests, production forests and conversion forests is based on 3 factors, i.e. slope, soil erodibility and rainfall intensity.

Forest land areas by TGKH in Indonesia are shown in Table 6.1. Most mangrove forests in Riau Province are designated to the limited production forest (Dinas Kehutanan). The sub-Directorate of Land Conversion (the Directorate Genderal of Forest Inventory and Land Use Planning) of the Ministry of Forestry made the following comments on the Study in addition to generally agreeing with the comments made by the regional offices and the provincial service concerned.

a. The TGHK should be complied with in regard to decisions on land use.
b. No development activity should be prepared for areas designated as protection forests or reserve forests.
c. The Director General of Forestry Inventory and Land Use

Planning must be immediately consulted in the case of any problem occurring with the enforcement of TGHK.

Comment a. means that a land use change for the creation of a new settlement, etc. does not comply with the TGHK. The creation of aquiculture ponds is permitted on the landward side of greenbelts. Comment b. means that such reserve areas as Suaka Alam and Cagar Alam, etc. must not be subject to development plans. One example of an event covered by comment c. is a large-areaed conversion of forests to a aquiculture ponds.

6.1.2 Distribution of Mangrove Forests

General distribution of the mangrove forests in the Study Area and those temporal changes during the past 15 years were studied by reconnaissance observation using satellite images and existing vegetation maps. The distribution and changes are shown in Fig. 6.1 and those areas are tabulated in Table 6.2. There are some 70,000ha mangrove forests located in mainly Rupat island, Tebingtinggi island, Bengkalis island and Rangsang island, covering some 26% of mangrove forest in Riau Province. It is estimated that some 95,000ha of mangrove forests distributed in the Study Area as of 1976 and some 25,000ha (some 25%) of them have been diminished during some 15 years up to 1991.

Small islands classified as other islands have diminished remarkably (some 70%). Padang Island and Merbau Island also indicate some 40% of the existed forests have diminished at the diminished grade.

1) Characteristics of distribution of mangrove forests

The mangrove coverage is generally very thin and the width of forests is narrow along the coastline of the Strait of Malacca. The width of mangrove forests is also narrow around end of major channels.

In contrast, the large mangrove coverage was found along large rivers and minor channels. The mangrove coverage along the coast of Sumatra Island in the Study Area is rather limited.

2) Secular changes of mangrove coverage

The characteristics of the secular changes are summarized as follows:

a. Sites of conspicuous reduction

- Bengkalis Island : landward of Selatbaru River and Bantang Tengah River
- Padang Island : near Akar River and Raya River
- Merbau Island : near Merbau River
- Rangsang Island : northwest coast
- Tebingtinggi Island : near Tohor River

b. Distribution of coverage reduction sites

- Many sites of large secular changes are found on Merbau Island and its surrounding areas.
- Many sites of large secular changes are found in the case of conversion forests (HPK) or other utilizations (APL) and their surrounding areas among the various forest land use categories (TGHK)(Dinas Kehutanan).
- The scale of reduction is larger at the landward area along rivers.
- Many reduction sites are found along the coast facing the Strait of Malacca on Rangsang Island.

There is a correlation between a large-scale deterioration and diminishment of mangrove forests and TGHK. It is desirable that local characterization will be done by extraction of high stressed area by human activities using TGHK.

3) Classification of mangrove forests in the study area

Mangrove forests in the Study Area can be classified into as follows (see Table 6.3) :

Class 1: An area with large secular changes within a narrow mangrove forests.

Impact including the current human activity is considered to result in pronouncedly serious damage to the mangrove ecosystem because of poor condition for the establishment and maintaining of mangrove forests and much reduction of mangrove forests.

Class 2: An area with large secular changes within an extensive mangrove forest

Impact including the human activity may be causing serious damage to the mangrove ecosystem because this zone has much reduction and is believed to be suitable for the growth of mangrove.

Class 3: An area with small secular changes within an extensive mangrove forest

Impact including the human activity is not expected to cause much damage to the mangrove ecosystem because this zone has little reduction and is believed to be suitable for mangrove growth.

Class 4: An area with small secular changes within a narrow mangrove forest

Coasts with no past or present mangrove growth or with mangrove forest of which the width is narrower than the minimum effective width will be classified as this zone. Because this zone is unsuitable for establishment of and maintaining mangrove forests, the possibility of existing forests maintaining their ecosystem appears to be low.

Most of the mangrove forests in the Study Area belong to Class 3 and have some 40,000ha in area in 1991. Mangrove forests that have been diminishing are ones of Class 1 and some 70% of the existed forests have diminished.

6.1.3 Stand Conditions of Mangrove Forests

There are many areas in which the stands have been conspicuously deteriorating in those forests near settlements or of narrow width. Low stands of mangrove forests been maintained, generally, particularly on the water edge along rivers. No stand was found where large-scale clear felling or intensive selective felling had recently taken place. Some seedling growths were found at one part of forests subject to intensive selective felling but present human activity might lead disturbance of mangrove ecosystems.

Characteristics of forest structure (standing trees' composition) of mangrove forests in the Study Area are as follows based on the field investing :

a. There is usually a concentration of charcoal kiln sites in areas of extensive mangrove coverage. No clear difference in crown density was found in relation to the distance from the nearest kiln site.
b. The existing regulation (DEPHUT,1978) provides that about 40 trees/ha seed trees with diameters of 20cm and over must be preserved. Except some high trees (average height: 20m), the average tree height of most forests is 10m or less. Seed trees are not found except in areas of major mangrove coverage.
c. Except tall trees subject to preservation, the average stem diameter is around 10cm. The values of average stem diameter on Rupat Island tend to be smaller than on other islands.

6.1.4 Site Environment of Mangrove Forest

(1) Distributing factors of mangrove forests

The following characteristics of mangrove forests in the Study Area are summarized as follows in terms of main distributing factors.

a. Site environment

Mangrove forests exist in and around deltas of large rivers, on coral islands and muddy or sandy coastal areas and so on. Growth of mangrove forests are different depend on locality. Environments where mangrove forests grow are categorized into three types in Indonesia:

- Open Sea Type (Terbuka): coasts directly faced to the open sea

- Inland Sea Type (Terlindung): coasts affected a little by waves or currents because of gulfs or islands.
- River Type (Tepian sungai): shores in brackish water areas along river system around estuaries of the large rivers.

The Study Area is located in small islands on the coast of the Malacca Strait, and there is no geographical distribution of the large rivers. The width of the mangrove forest belts is not very wide compared with standard width of mangrove forest belts in Riau Province in KLH's material.

b. Components of matrix

The matrix of mangrove forests is generally muddy, and mangroves grow better on the muddy matrix than those on coral, pebbly, or sandy matrix. Most of the mangrove forests in the Study Area grow on muddy matrix.

c. Hydraulics

Waves and currents are primary factors of erosion and sedimentation, and as a result they help to spread seeds of mangroves. As a result, succession of mangrove forests has risen.

Mangrove trees begin to invade the seaside when sedimentation progresses to the point of the mean high water neap. With the establishment of a mangrove forest, the speed of sedimentation is accelerated and this will eventually slow down when sedimentation progresses to the point of the mean high water spring. If separated from the sea due to the formation of a coastal sandbank or natural bank along a river, a mangrove forest is replaced by terrestrial or freshwater vegetation (Kyuma et al. 1986).

The period between the commencement of invasion and the replacement of a mangrove forest by other types of vegetation is short at a coast where a large volume of sediment is supplied by a river or sea current and long at a coast with a poor supply of sediment.

The mangrove forests of the open-sea type grow poorly and also geographical distributions of the mangrove forest are limited along the Malacca Strait or ends of water channels in the Study Area where affects of erosion-sedimentation or waves are very severe.

d. Climate

Wide distribution of mangrove forests is limited in the tropical coastal areas crossing the equator. Temperature, winds, precipitation are the important climatic conditions for the mangrove forests distribution.

The yearly precipitation of Kab. Bengkalis is about 1,800mm (Dinas Kehutanan, 1990), and this is relatively little compared with the data of other tropical areas.

There is no significant difference of temperature and precipitation in the study areas. It is presumed that strong winds and waves would affect during rainy season in the vicinities of Malacca Strait and eastward shores.

e. Utilization of mangrove forest and land use

Felling for charcoal making has been going on for so long time in the mangrove forest in the Study Areas as well as some provinces adjacent to Malacca Strait including Aceh Province. Thus most of the mangrove forest are secondary forests. Some forests do no have many mangrove trees with diameter of 10cm or larger that may be cut down legally.

A secular change of the mangrove forests (especially rear mangrove) tells that degradation of the mangrove forests is caused mainly by the land conversion such as oil development, agricultural development, or establishment of settlement although some mangroves are cut down for domestic consumption by residents. There are close relationships between mangrove forests and the terrestrial vegetation and land use through rear mangroves (back mangroves) and swamp forests. The coastal ecosystem is composed of the above inter-ecosystem and the linkage between the ecosystems on the lands and aquatic ecosystems in the water body. Therefore it is desirable that local characterization will be done using also landuse and vegetation around and back of mangrove forests, and watersheds that characterize dynamics of soils and waters among the factors to affect the vegetation and land use.

(2) Zonation by site condition

The structure of mangrove forests is called a zonation. That is because forest composing tree species changes on after another along the environmental gradient (the change of environmental factors such as degree of tidal inundation) from the seaside to the inland area. Usually each composing species ranges in parallel with the seashore. The tree species can be classified into the pioneer species type in the seaward zone - the meso type zone - the landward species zone - the pioneer species type in the brackish water zone (rear mangrove).

According to the survey (Yamada et al. 1986) made in Malaysia, *Avicennia* spp., *Sonneratia alba* and *Rhizophora mucronata* are the dominant species of the pioneer species type in the seaward zone. Dominant species of the meso-type zone are *Rhizophora apiculata, Bruguiera cylindrica, Bruguiera parviflora* and *Bruguiera gymnorrhiza*. Typical zonation is considered to start from the pioneer species type in the seaward zone and changes to the meso-type zone, and to the landward species zone such as (*Ceriops tagal* and *Lumnitzera littorea*) and then to the pioneer species type in the brackish water zone such as *Nypa fruticans*.

The characteristics of the species composition type of mangrove forests in the Study Area identified by the field investigation are summarized below.

a. *Avicennia* spp. - *Sonneratia* spp. Type (a pioneer type in the seaward zone)

These species belong to the dominant species on sites inundated by medium high tides. This type is dominant mainly in places where the mangrove coverage width is narrow, and is narrowly distributed on the water edge in other places. *Sonneratia* spp. tends to be more dominant than *Avicennia* spp. in the southeastern part. This type is often absent or mixed with *Xylocarpus* spp. and/or *R. mucronata* in areas with extensive mangrove coverage.

b. *Rhizophora* spp. Type (a meso-type)

These species belong to the dominant species on sites inundated by normal high tides. Most mangrove forests found in the Study Area belong to this type. *R. apiculata* is the dominant species and *R. mucronata* is also found in the lower places. *Xylocarpus* spp. is mixed with *Rhizophora* spp. on the landwards.

c. *Bruguiera* spp. Type (a mixed-type of the meso-type and the landward type)

These species belong to the dominant species on sites inundated by spring tides. This type has no distinctive distribution pattern. Some species that often found in landward areas, exists on the water edges. This type isn't said to exist on Bengkalis Island. Forests along Suir River tend to show a dominance of this type. *Xylocarpus* spp. is often mixed on the landwards areas. This type mixed with *R. mucronata* is found along the Padang channel and the Asam channel.

Generally mangrove forests in the Study area have zonation similar with one in Malaysia in terms of species composition. Site conditions of the mangrove forests in these areas, therefore, are expected to be almost same with ones in Malaysia. But from the viewpoint of species, there are many forests without monospecific zonation, because of, maybe, human activity.

In the study, the mangrove forest management for the model mangrove areas was decided to be examined using mangrove forest type maps (showing not only species composition but also site conditions).

6.2 Functions of Mangrove Forests for Public Interest

The mangrove forests have the function of supplying forest products and it is necessary to consider functions for public interest. Stems of mangrove trees are mainly used for charcoal making or firewood in the study areas, and are important forest resource.

Among the functions for public interests, particularly functions for erosion prevention and for gathering and breeding place for fish are expected in the study areas in addition to the functions as coastal protection forests such as tide-water & wind break function.

(1)Erosion prevention function

Generally ground covered with the mangrove forests is not strong against erosion because the matrix is almost saturated with water and interconnecting power of particles in deposition is very weak. Thus it is not regarded that fastening power of roots is effective.

However when the mangrove forests spread in a certain dimension, the trunks or the stilt roots disturb water movement and diminish speed of water flow and prevent erosion. Hence the mangrove forests need a certain dimension to function for the erosion prevention and the width of the forest belts need to be determined considering that the edges of the forests are easily eroded.

The ocean sea type mangrove forest is distributed in an area of very severe site condition for it's growth and the whole mangrove forest belt is considered to require protection.

As to mangrove forests of inland sea type, the minimum requirement is to protect the mangrove forest belt that *Rhizophora* spp. are dominant (Watoson's innundation class 3). That is because the forest land dominated by the species are subject to erosion, being caused by the oversaturated matrix for a very long time.

In a 1990 Presidential decree coastal protection areas (sempadan pantai) and river bank protection areas (sempadan sungai) were designated definite preservation areas (Kawasan perlindungan setempat). It is thought that this will make it possible to protect the mangrove forest having effect of the function.

(2) Function of gathering and breeding place for fish
(nursery function for fishery resources)

The environment of mangrove forest would create a good living state for fish, and provide good fishing places, which is called as nursery effect.

Production of water phytoplankton in the water area of the mangrove forests is not very much, but livings in near bottom such as diatoms which depend on resolved nutrious salts which are derived from branches and leaves of the mangroves would support the basis of food chain, and sustain a chain of various aquatic lives. These factors are considered to maintain the favorable environment.

Based on the Study results, it appears difficult, at least for the time being, to directly hold the felling of mangrove forests for charcoal production responsible for the fish catch decline in areas of seas in the Study Area. Nevertheless, the significant changes of distribution of some mangrove forests over the years in the Study Area and the diminishment of mangrove forests along large rivers flowing into the areas of the sea near the Study Area may have affected decline of this function.

It is necessary to keep a fixed amount of litters and to avoid haphazard felling (especially clear felling) in order to maintain the function of gathering and breeding place for fish.

Until it becomes clear how this casual relationships are mangrove forests need to be protected to keep a stable level of litter and mangrove forestation is required to increase litter production.

A 1990 presidential decree designated mangrove forest coastal areas as natural conservation areas (Kawasan suaka alam dan cagar budaya) which are thought to preserve the mangrove forest that provide a gathering and breeding place for fish.

6.3 Policy on Forests and Forestry

6.3.1 Forestry Administration

(1) Organizations

1) Ministry of Forestry (Department Kehutanan: DEPHUT)

This is the central organization responsible for forests and forestry issues.

2)Regional Forestry Office in Riau Province (Kantor Willayah Department Kuhutanan Propinsi Riau: KANWIL)

This is the regional office of the Ministry of Forestry and is responsible for coordinating forest policies and project management in the region. In addition to the KANWIL, there are several local offices of technical implementation units (Unit Pelaksana Teknis) of Directorates General of the DEPHUT and the following are involved in the Study.

a. Sub-center of Land Rehabilitation and Soil Conservation Indragiri-Rokan (Sub Balai Rehabilitasi Lahan dan Konservasi Tanah Indragiri-Rokan: Sub-BRLKT)

This Sub-center is responsible for the planning, guidance and supervision of re-afforestation projects in addition to soil conservation projects.

It is planned that the Sub-BRLKT will be directly responsible for the mangrove forest reforestation project. It is said that its office will be opened at Dumai.

b. Sub-center of Forest Survey and Mapping (Sub Balai Inventarisasi dan Perpetaan Hutan: Sub-BIPHUT)

This Sub-center is responsible for the preparation of forest-related maps and also for the implementation and/or supervision of resources and the other surveys.

c. Sub-center of Natural Resources Conservation (Sub Balai Kanservasi Sumber Daya Alam: Sub-BKSDA)

This Sub-center is responsible for the protection or conservation of specific species and areas and also for the management of national parks.

3) Provincial Forestry Service in Riau Province (Dinas Kehutanan Propinsi Dati I Riau: Dinas)

This Service belongs to the Riau provincial government (related to Ministry of Home Affairs) and is directly responsible for project management and the enforcement of forest-related laws and regulations. Coordination to DEPHUT is conducted through KANWIL. It has the authority to permit small scale concessions (Hak Pemungkutan Hasil Hutan: HPHH)

4) Branch Office of Provincial Forestry Service in Riau (Cabang Dinas Kehutanan : CDK)

The Study Area is under the jurisdiction of 3 CDKs (CDK Dumai, CDK Bengkalis and CDK Selatpanjang). The Branch office has the following sub-organizations.

a. District Office (Kantor Bagian Kesatuan Pemangkuan Hutan KBKPH)

The area of jurisdiction of each District Office is almost the same as the district administrative boundary (Kecamatan). Officials responsible for the supervision of felling of mangrove forests (some 3 Juru Ukur Kayu/Office) belong to these District Offices.

b.Ranger Office (Kantor Resort Pemangkuan Hutan)

There are several ranger offices in each district. The availability of full-time officials depends on the operation size of the concessions(s) involved.

(2) Staff

The number of DEPHUT staff is approximately 27,000 nationwide (as of June, 1990), of which some 3,000 are working at the central offices. A quarter of those working at the central offices have some kind of forestry education.

In Riau Province, some 1,200 people (including part-timers) are working in forestry-related fields, of which some 90 (less than 10%) have received formal forestry education.

6.3.2 Forestry Policies

The Fifth 5-Year Development Plan (REPELITA V, 1989-1994) describes the creation of employment opportunities for the rapidly growing workforce as one of the country's most urgent tasks. It is estimated that the annual growth of the workforce during the plan period will be 2.4 million, necessitating annual economic growth rate for 5% in real terms to absorb the growing workforce. It is understood that the successful achievement of such economic growth will require the increased export of local commodities in addition to the traditional oil and natural gas, the prices of which have been sluggish for some time, and increased general tax revenues. REPELITA V has 2 basic agendas in the forestry. One is reforestation and revegetations to conserve forest soil and water source and to prevent flood. The other is incidental service felling concessions to which are that concession holder must construct centralized timber processing centers and conduct tree planting, tending and yielding in its own concession area. The main forestry issues incorporated in REPELITA V are described next.

(1) Survey on and evaluation of forest resources and environment

The importance of conducting a national forest inventory survey (Inventarisasi Hutan Nasional: IHN), of preparing forest vegetation and ecology maps and of establishing the boundaries for planned conversion forests are emphasized to provide appropriate data on conversion forests and prepare reliable forest data on conversion forests and to prepare reliable forest data through improved data in terms of both quantity and quality and the development of better survey methods.

(2) Forestry production

In terms of log production, the Fifth 5-Year Development Plan anticipates an increase of some 19% for timber and some 38% for plywood on the Fourth Plan results.

The Fifth Plan forecasts a pulp and paper production volume of 2,539,000 tons, a five-fold increase on the Fourth Plan result of 551,000 tons. Administrative emphasis is also given to encouraging the particle board industry and furniture industry as related industries to the wood industry. High production of fuelwood also is prospected in the Fifth Plan.

In addition, the Fifth Plan refers to surveys on the resources prospect of cut-over areas (4 million ha), forest patrols (2.3 million ha) and the development of reforestation technologies.