MARINE FISHERIES MANAGEMENT IN CAMBODIA: OFFSHORE FISHERIES SUSTAINABLE DEVELOPMENT

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Marine Fisheries Management in Cambodia: Offshore Fisheries Sustainable Development

By

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ABSTRACT

This study examines marine fisheries sector in Cambodia, especially the offshore fishery which provides the potential for further exploitation.

The report introduces the Cambodian fishery sector including economic, resources, harvesting, processing and marketing. It then focusses on the offshore marine fishery and its future.

The fishing industry was the activity that provided the original basis for the economic development of Cambodia. Due to lack of investment, there are few Cambodian offshore vessels and there is no offshore patrol capability in Fisheries. Consequently there is little enforcement of legislation and foreign vessels are able to fish unhindered. Cambodia is trying to address this situation by encouraging fishers to invest in this area and displace the foreign fishers. At the same time, due to lack of investment and ability to harvest offshore, Cambodia actively seeks joint ventures with other countries to exploit the resources.

The report concluded that, if properly managed, the offshore fishery can add significantly to the country's food supply and economy. Proper management will depend on: the collection and analysis of ecological information and accurate harvesting data; creation and enforcement of appropriate regulations; and strengthening of human resource development for the sector.

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ABBREVIATIONS, ACRONONYMS AND CURRENCY

ADB	Asian Development Bank
AIT	Asian Institute of Technology
CIDA	Canadian International development Agency
DoF	Department of Fisheries
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
g	gram
GDP	Gross Domestic Product
Ha	Hectare
Hp	Horse power
KAMFIMEX Co	Kampuchea Fishery Import and Export Company
Kg	Kilogram
Km	Kilometer
Km^2	Square Kilometer
m	Meter
MAFF	Ministry of Agriculture Forestry and Fisheries
MoEF	Ministry of Economy and Finance
MoP	Ministry of Planning
MRC	Mekong River Commission
NEAP	National Environmental Action Plan
NGOs	Non Governmental Organizitions
RUA	Royal University of Agriculture
SAPL	School of Agriculture Prek Leap

CURRENCY EQUIVALENT
(As of January, 2000)
Currency unit - Riel
US$ 1 = 3,800 Riel

Chapter 1: Introduction

After more than two decades of civil war, the United Nations-sponsored elections in Cambodia in 1993 ushered in a new era of peace. To revive the country's war-torn economy and alleviate poverty, the government is focusing on sustainable use of the country's rich and diverse natural resources.

Cambodia is gradually and steadily emerging from a long history of the war and economic deprivation. Governmental institutions are being re-established and the overall standard of living and economic health is increasing. With the return towards stability and security, a severely damaged and poorly maintained infrastructure is being rebuilt.

The country is largely dependent upon productive natural resources, from its terrestrial, inland and coastal waters for food and income. The offshore fishery which is largely undeveloped hold major promise for development and is capable of making a significant contribution to the national economy.

As a contribution to the sustainable development of Cambodia's fisheries resources, this report provides a commentary and analysis of current marine fisheries resource management in Cambodia and outlines strategies and planning that might be adopted to rehabilitate and develop the offshore sector of the marine fishery.

1.1 Purpose and Scope of the Study

The purpose of this study is to provide a commentary and analysis on the marine fisheries in Cambodia. Following a description of present status of marine fisheries, relevant issues will be addressed in terms of their impacts on marine fisheries. In addition, economic aspects of marine fisheries will be reviewed. Major government

policies, constraints and strategies will be considered, and conclusions and recommendations will be drawn with respect to development of the offshore fishery in Cambodia. The study areas for this report are the three coastal provinces in Cambodia.

1.2 Justification for Research

The fishery of Cambodia is in a process of restructuring. It is believed that the fishery in the offshore area has the potential to be developed for the future, whereas the inshore fishery has been overexploited.

Cambodia's Exclusive Economic Zone (EEZ) is thought to be less exploited than that of its neighbours, Thailand and Vietnam. If this is true, it can continue to be an important source of fish and employment for coastal communities. To prevent the marine fishing industry from collapsing, Cambodia has to implement strategies to ensure sustainable development of the offshore fishery, and to manage the inshore fishery.

1.3 Approach

Previous studies have not examined the strategy for sustainable development of marine fisheries, although a considerable number has dealt with the lack of information problems in the country's EEZ. Literature relating to marine fisheries will be examined in order to highlight the offshore fishery resources of Cambodia and this study will be based on relevant aspects of the literature. The purpose is to illustrate the location of the resources, harvesting techniques, processing methods, and marketing, and to make recommendations that can lead to have the sustainable development of the offshore fishery.

The information for this report was obtained from the Cambodian Department of Fisheries (DoF), The Provincial Fisheries Offices, and Non-Government Organizations (NGOs), and by personal, unstructured interviews with fisheries officials, fishers, processors, and stakeholders.

The following guideline will be developed for this report. Firstly, the study will deal with the fisheries resources. Secondly, the study will review economic aspects of marine offshore fisheries. Thirdly, the study will analyze the issues related to resources, harvesting, processing, and marketing. Finally, the study will deal with offshore fishery development and planning.

1.4 Quality and sources of data and information

Data used in this report are those available from official sources. In some instances they are supplemented by information provided by officials from the DoF, and provincial fisheries officers. However, it is recognised that some data are limited, unreliable and otherwise deficient, and where estimates are made by the DoF and provincial fisheries services, such estimates are often based on outdated assumptions and methodologies. Gives the shortcomings of these data, they should be regarded as tentative, possibly indicating magnitudes only. However, in the absence of comprehensive alternative data sources, and since the data are official and used within the administration for planning and development, they have been used in this report.

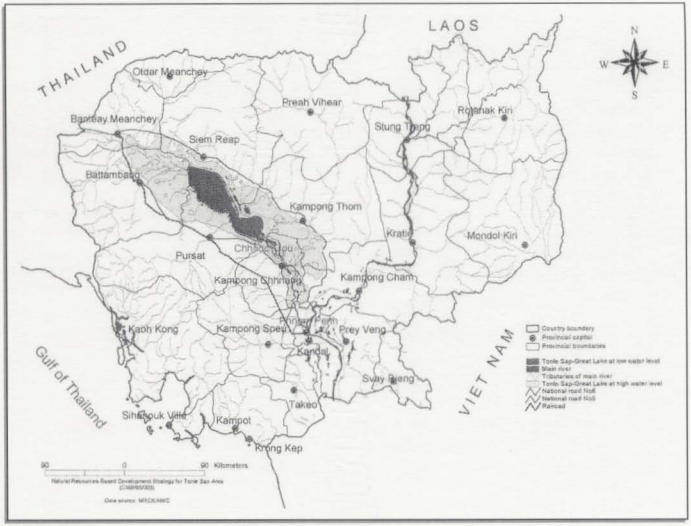
The issue of fisheries data quality is one that needs to be addressed as a matter of urgency, but in a complete and systematic manner. Such an approach will avert the need to collect data for planning, development, and policy purposes on an ad hoc basis, and

reduce the use of previously designed sampling and other collection techniques. The limitations of fisheries data and information, especially marine fishery, are considered in this report.

Chapter 2: Background

2.1 Geography

Cambodia is located in Southeast Asia, bounded by Thailand, Laos and Vietnam. It has a land area of 181 035 Km^2, about 20 percent of which is used for agriculture. The country's capital is Phnom Penh. An extensive central plain, drained by Boeung Tonle Sap (the Great Lake) and the Mekong and Bassac River systems, contrasts with the Kravang Mountains in the southwest of the country and the Dangrek Mountains in the north along the Thai border. In comparison with its neighbours, Cambodia is a geographically compact country administratively divided into 20 provinces and 4 municipalities, three of which have relatively short maritime boundaries on the Gulf of Thailand (Figure 2.1) (Ministry of Planning, (MoP), 1999).

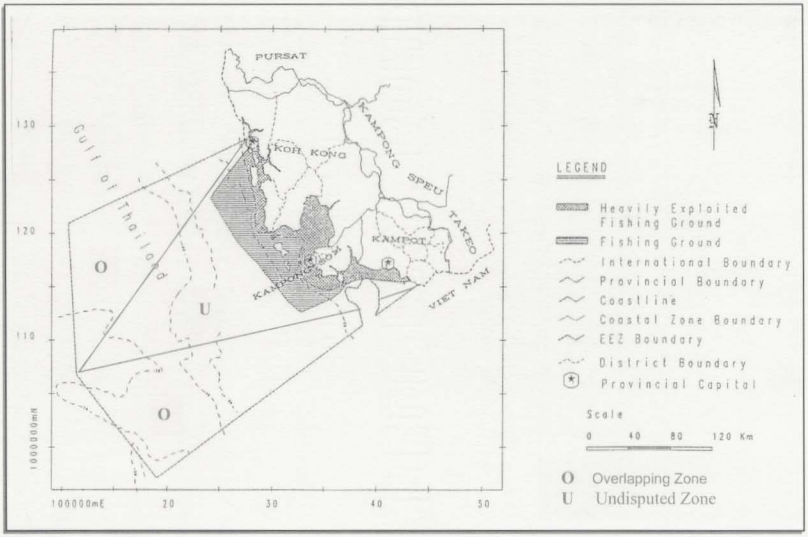


Source: Mekong River Commission, 1999

Figure 2.1: Map of Cambodia

The Cambodian coastline extends 435 Km between the Thai border and the Vietnamese border, and includes a large estuary in the northern part (Koh Kong Province) as well as the great Bay of Kompong Som. Four main islands (Koh Kong, Koh Rong, Koh Rong Sanlem and Koh Thmay) and a number of small islands are located in the near shore area, while there are three main islands located further off-shore: Koh Tang, Koh Pring and Koh Polowai. The total EEZ area is estimated to be 42, 000 Km^2, about 23 percent of Cambodia's land area (Csavas, et al, 1994).

The offshore areas of the EEZ can be thought of as comprising three zones which are distinguishable from one another on the basic of the status of EEZ claims. The southern third of the EEZ, roughly shaped like a right triangle with the hypotenuse facing north northwest, is a zone of overlapping claims between Cambodia and Vietnam. The northern third, also shaped like a right triangle, but with the hypotenuse facing southeast, is a zone of overlapping claims between Cambodia and Thai. The central zone, shaped like an isosceles triangle created by the hypotenuse of the two right triangles, is the so-called undisputed zone of Cambodia's EEZ (Figure 2:2) (ADB, 1996).



Source: ADB,1996, Tana, 1995

Figure 2.2: Fishing Ground and EEZ

2.2 Population characteristics

The percentage of urban population works out to 15.7 percent. In other words, the rural population is more than five times bigger than the urban population. About 84 percent of people live in rural areas and depend on farming as well as fishing income for their living (MoP, 1999). Ethnically the population consists of about 90 percent Cambodian (Khmer), 5 percent each of Chinese and Vietnamese and small numbers of hill tribes (Chams and Burmese). Khmer is the country's official language. It is spoken by more 95 percent of the population. French, as second language is also spoken, mostly by older people. English is more commonly spoken by the young generation (Csavas, et. al, 1994).

A general Population census of Cambodia, 1998 was conducted in March 1998 and it revealed a population of 11.4 million, growing at an estimated rated of 2.49 percent per year. The previous official census, conducted 36 years ago in 1962, counted a population of 5.7 million. The present figures show a national average population density of 64 persons per square kilometer (MoP, 1999). Information relating to population distribution throughout the country is scant. However, there is significant population concentration around the country's extensive inland water systems and by comparison, relatively light distribution of population in coastal areas.

The 1998 census shows that in the coastal provinces: Sihanouk Ville (Kompong Som) has an estimated population of 155,690; Kampot has an estimated population of 1,075,125; Koh Kong has an estimated population of 132,106; and Kep has an estimated population of 28,660 (MoP, 1999).

Life expectancy rate of both males and females is 50 years. Only 29 percent of the population has access to safe drinking water. The adult literacy rate, at 67.5 percent, is also high (MoP, 1999). Malnutrition is problematic throughout the country and estimated to affect 10 percent of the population in urban areas and 20 percent in rural areas (Csavas, et al. 1994).

Existing rate of population growth are expected to continue into the next century, particularly in view of the skewed population distribution (50 percent of population is under 18 years of age) (MoP, 1999).

Moreover, the resettlement of the rural people, many of whom have been socially and economically dislocated from rural living and who have acquired new skills, are likely to seek employment in urban areas. Resettlement, the high rates of population growth and established malnutrition levels have important implications for food security, and domestic policies and strategies for development relating to 4 components in fisheries: resources, harvesting, processing and marketing.

2.3 Micro-economic setting

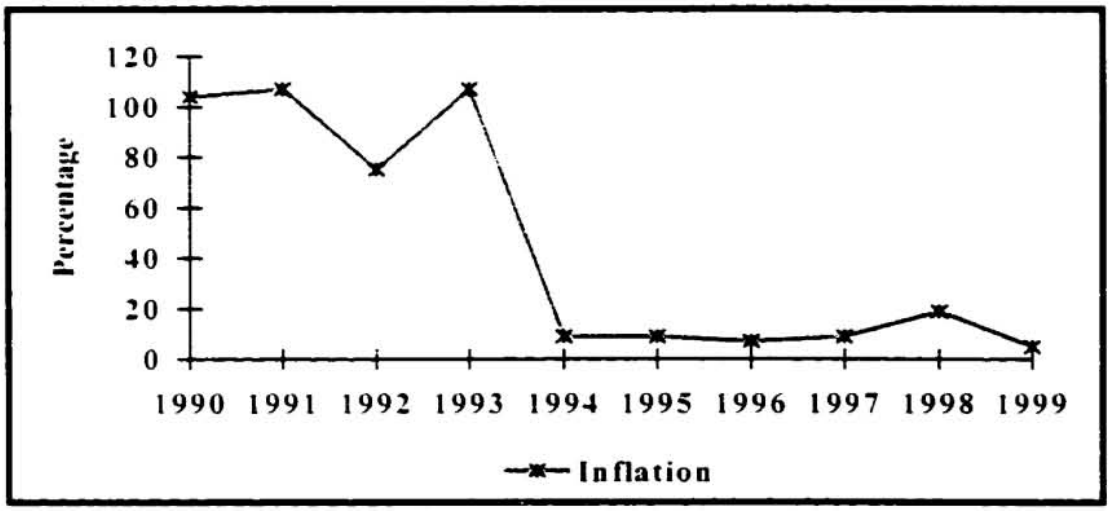
Cambodia has a fragile economy caused by more than two decades of internal war. In this period of rehabilitation and reconstruction, efforts are being made to enhance food production, stimulate a strong and viable private sector, reduce the size and activities of the pubic sector and re-open international trade channels.

In 1999 the nominal Gross Domestic Product was US$3,132 million (Ministry of Economy and Finance (MoEF), 1999). As an agriculture-based economy, production in, and exports from, the agriculture sector dominate economic activity. About 85 percent of

the country's workforce is engaged in agricultural activities (crops, livestock, fisheries and forestry). It is noteworthy that the agriculture sector contribute approximately 50 percent to the GDP with fisheries being 4 -7 percent of the latter (Peter, 1999).

Since the early 1980s Cambodia has been moving from a planned economy to a free market economy, and in recent years, particularly since 1989, the process has gained momentum. The benefits of this economic reform have been evident in agriculture sector.

High rates of inflation since 1990 have made economic management in Cambodia difficult. It has discouraged longer-term investment. In 1990 the rate of inflation was approximately 140 percent and it was 107 percent in 1991 (Csavas et al. 1994). The figure for 1992 was around 75 percent. However, after the election in 1993, the rates of inflation have decreased from 107 percent in 1993 to 5 percent in 1999 (Figure 2.3) (MoEF, 1999).



Source: MoEF, 1999

Figure 2.3: The Rate of Inflation in Cambodia 1990-99

Chapter 3: Fishery Resources

Fisheries resources of Cambodia can be divided into two main components on basis of their location: the inland fisheries and the marine fisheries. The inland fisheries can be subdivided into two main components on basis of their location: the Great Lake Tonle Sap fishery, and the Mekong Bassac inundation zone fishery. Similar to the inland fisheries, the marine fisheries can also subdivided into two components: the inshore fishery and the offshore fishery.

3.1 Inland fisheries

The inland fisheries in Cambodia are governed completely by annual cycle of hydrological events, the filling up and draining of the Great Lake by the Tonle Sap River, and the annual flooding of the plains around and downstream of Phnom Penh. The hydrological cycles determine the longitudinal and lateral migrations and reproduction of most of fish species. The inland fisheries are unique in a number of respects: they exploit a large diversity of the water bodies (e.g., a natural lake, rivers with their floodplains with a high inherent productivity based on a relatively high organic carbon content). The inundation zone provides the spawning and nursery grounds which supply the bulk of the young fish to repopulate most of the water bodies in the basin. The floods transfer suspended and dissolved solids onto the floodplains. Flooding also releases nutrients from the soil, vegetation and inundated organic debris, which in turn support an expansion of fish populations.

3.1.1 Wild fish

Many studies on the biology and itchology of fresh water fish fauna of Cambodia have been conducted in the past and yet even now the species composition of the Great Lake area has not been determined. Chevey and Le Poulin, 1940 identified 200 fish species. Fily and d'Aubenton, 1964 identified only a few dozen commercial species. Kottalat, 1985 found only 136 species. Vietnamese researchers in 1988 found 203 species (Tana, 1996).

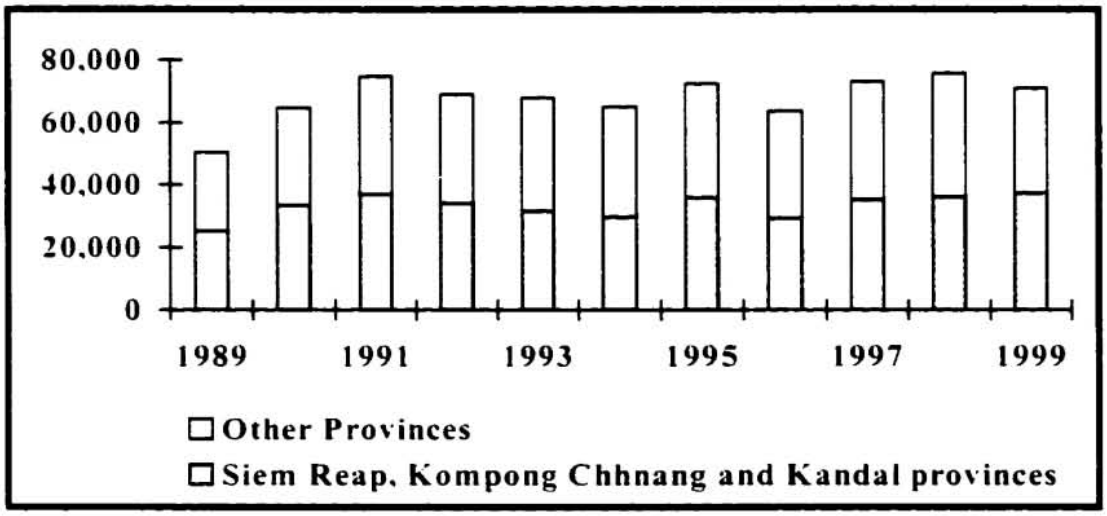
It is documented that over 200 fish species inhabit the inland waters of Cambodia most of which are captured and used as food. Most fish species in the Mekong River are well adapted to a widely fluctuating water level, and have a wide tolerance for the temperature, pH, dissolved oxygen and other environmental parameters. Some species can move over wetland which enhances survival when habitats dry up.

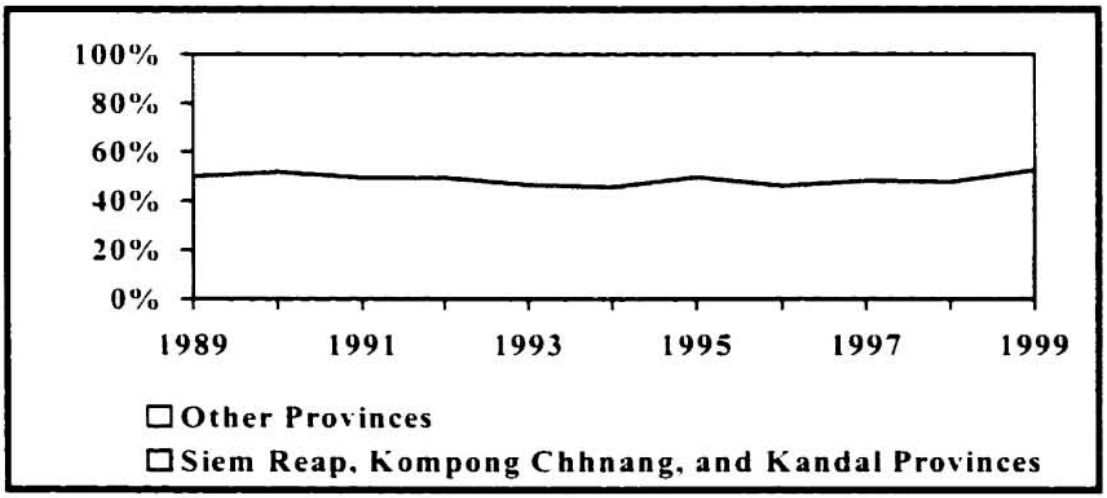
The Great Lake and Tonle Sap River are well-known as one of the richest fresh fishing grounds in the world. The annual catch in the Great Lake and the Tonle Sap River represents 75 percent of the total country inland fish catch and culture (Mekong River Commission (MRC), 1999). Three provinces, i.e., Siem Reap, Kampong Chhnang and Kandal, situated on Beoung Tonle Sap the Tonle Sap River and the Mekong River down to Vietnamese border, contributed 50 percent of the total commercial production from inland fisheries in 1999 (Figure 3.1) (DoF, 2000). These were the highest inland fish producing provinces in the country.

The inundated forest of the Great Lake, and to lesser extent the inundated forests of the Tonle Sap and Mekong Rivers, are considered to be essential for maintaining the

current level of inland fishery production. About 90 percent of the total freshwater fish stocks follow the flood season. Species such as Pangasius, breed below the rapids of the Mekong River close to the Laos border. They are passively carried downstream as fry and at rising or high water level enter the Great Lake through the Tonle Sap River.

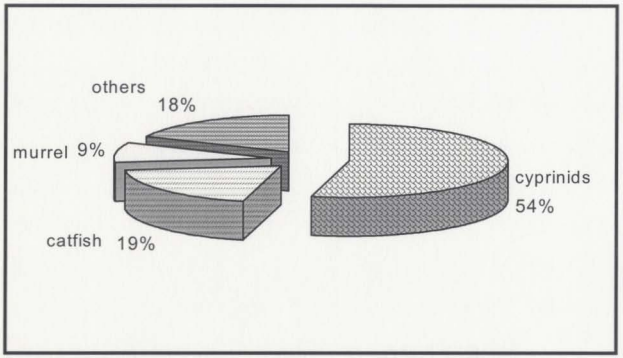
The dominant fish groups of the Great Lake, as they appear in fish catches, are carp (cyprinids) (54 percent), catfish (19 percent), murrel (9 percent), and other fish (Figure 3. 2) (CSavas, 1994). They are grouped into two major categories on the basis of their skin colour: white fish and black fish. The white fish are more important economically and include three species of carp and five river catfish. The economically important black fish are two species of murrel and a climbing perch which do not migrate from the inundated forest when the water level drops, but survive in small puddles or migrate overland.





Source: DoF, 2000

Figure 3.1: Total catches of inland fisheries (tonnes) 1989-99



Source: Csavas, 1994

Figure 3.2: Fish groups of the Great Lake, Cambodia

3.1.2 Aquaculture

Due to the abundance of the wild fish in Cambodia, cultured fish in the past did not play an important role in the volume of fish supply. However, the country is thought to be the cradle of cage and pen fish culture in Asia, its history going back to the 10th century. Due to the special hydrological cycle of the Mekong and its natural buffer reservoir, the Great Lake, the inland fish catch was always highly seasonal in Cambodia, especially in the case of the large-sized carnivores (*Channa* and *Pangasius* species), most sought-after by the well-to-do segment of the population. Fishermen in the Great Lake may have stored first the surplus of their catch in bamboo pens or their cages in order to "fatten" and sell them in the off-season. Capturing juveniles specifically for cage and pen culture and feeding them regularly over a whole growing season seems to be the end of a long evolutionary process. Cage and pen culture was thus developed and practised by fishing communities closely interrelated with their capture fisheries activities, as it is still the case, especially in the Great Lake.

There are no reports of aquaculture practices in Cambodia before the 1950s, most probably because of the interrelated production techniques of inland capture and culture fisheries. The cultured fish volume was only a few percent of the total inland fish production, which was estimated at about 120,000 tonnes/year at that time before the 1970s (DoF). Aquaculture production stopped completely between 1975 and 1979, and recommenced only after 1980.

From 1984 onward statistical data collection started separately on cultured fish production. The annual average growth rate was 8 percent per year between 1984 and

1999. The share of aquaculture in the total fish production was only 2.5 percent in 1984, this ratio has increased to 12 percent in 1999 (DoF, 2000). Although this is the highest ratio ever in Cambodia, one has to recall that by Asian standards it is still rather low: 62 percent of the total inland fish production comes from culture in the Asia-Pacific region, 46 percent in Thailand, 48 percent in Malaysia, 51 percent in Vietnam, 13 percent even in Laos (Csavas, et al. 1994).

Apart from fish, farmers are also interested in raising other aquatic animals such as water snake, eel, frog, shrimp and especially freshwater crocodiles. Production of the latter has boomed since the fisheries law was enacted in 1987 (Thouk and Sina, 1997). The fisheries law defines a permit is needed for establishment of crocodile farms holding more than 50 crocodiles and issued by DoF (Article 2). Crocodile farming is wide spread in the province of Siem Reap, Battambang, Kompong Chhnang and in Phnom Penh.

Aquaculture production shows a general increase from 1,610 tonnes in 1984 to 14,938 tonnes in 1999 with a bit of fluctuation in some years for fish. Crocodile farming increased from 4,372 heads in 1989 to 40,700 heads in 1998 and by 1999 production decreased 25,380 heads because the market collapsed (DoF, 2000). The 6 provinces surrounding the Great Lake produced more than half of the production and crocodile farming exists only in those provinces. Phnom Penh city seems to be transit place with a small number of breeding stocks (Thouk and Sina, 1997).

Even though aquaculture production shows a trend of steady increase every year, there are so many issues and constraint to be overcome. For example, pen-cage culture in the Great Lake depends on the natural stock from capture fisheries for fingerlings for

stocking and feeding. The culture system is characterized by stocking advanced fingerlings of Pangasius of around 250 g each during the closed season with limited feed. Intensive feeding occurs only during the peak of fishing season (February-May). The lack of adequate fish feed is a limiting factor for the increase of aquaculture production. Pangasius catfish is a low price species in the market and fingerlings of this species cannot yet be produced artificially in any hatchery.

3.2 Marine fisheries

The marine fisheries of Cambodia focus on a few coastal areas: Koh Kong, Sihanouk Ville, Kampot and Kep City (Figure 2.2). The coast is about 435 km long and in 1999 there were approximately 3,785 licensed fishing vessels (DoF, 2000). The Marine fisheries have developed slowly. Technology applied by Cambodian fishermen before 1960 was traditional. Trawlers were introduced in 1960 by Thai fishers. (Tana, 1995).

There were no marine fishing activities during 1975-1979 period of the Khmer Rough Regime. Activities restarted in late 1979 with a few fishing boats, but the number of boats increased very quickly to about 4,000 boats in the 1990s (DoF, 2000, Peter, 1998 and Tana, 1995).

The marine fisheries are mari-culture, inshore fishery and offshore fishery. Mari-culture includes shrimp farming, mollusk culture and cage culture. Shrimp farming uses both intensive and extensive culturing methods. Cage culture is practised in Dong Tong district, Kompot Province. Young fish (primarily snapper and grouper species) are stocked into cages at low water level (1-3 m depth) and are marketed as juveniles. The

inshore fishery is operated in inshore areas (up to 10 km from the coasts). Although much of the high-value fish will be exported, this fishery is capable of making a larger and more important contribution to the country's needs, especially in the maritime provinces. The offshore fishery is operated in offshore areas more than 10 Km from the coast. The offshore areas are important fishing grounds, though the participation of Cambodian fishers is limited because of the population's preference to fish from small vessels in the traditional near shore area.

3.2.1 Mari-culture

Due to the abundance of wild fish in Cambodia, mari-culture did not play the significant role of marine fish and seafood in the food supply therefore in the past there was no interest in developing coastal mari-culture. Mari-culture was negligible before 1988, although there were a few traditional extensive shrimp farm in Kampot province (Tana, 1994). In the 1990s, however, the financial success of mari-culture in neighbouring Thai provinces focused attention on the introduction and adaptation of some intensive mari-culture techniques producing primarily export products (Csavas, et al., 1994). The main types of mari-culture are shrimp, mollusc, snapper, and grouper.

2.3.1.1 Shrimp farming

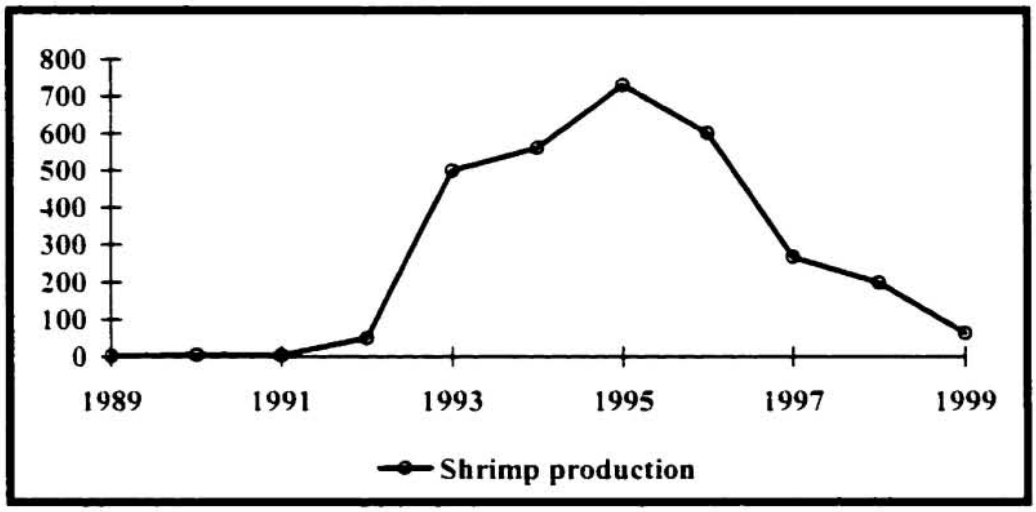
Shrimp farming can be classified as using both intensive and extensive culturing methods. Since its introduction in 1985 shrimp culture has developed rapidly along Cambodia's coastline: Koh Kong and Kompot provinces. The highest concentration of shrimp farms in Cambodia is in Koh Kong province. A clear reason for this, is the proximity to the Thai border, facilitating Thai investment. Shrimp farming began in Koh

Kong in 1988 with a modern extensive farm of 5 ha. By 1991, intensive shrimp farms involving high stocking densities, formulated feeds, aeration, and regular water exchange were in operation, financed by Thai shrimp farmers and businessmen.

Thai influence in the shrimp farming industry in Koh Kong is strong. Thai investors enter into joint ventures with Cambodians to gain concession licences to operate the shrimp farms. The DoF is responsible for issuing licenses for shrimp farms. Investment and labour, and almost all inputs required such as feed, seed, chemical and equipment are supplied from Thailand. Almost all production is exported back to Thailand. With Cambodians supplying only cheap labour, the benefit to Cambodia is minimal. According to Tana, 1994, Cambodian partners received only 5 percent of the income from the ventures. Pond yields are reported to be up to 7-8 tonnes/ha crop which is relatively high and profits are attracting further investment. However, the shrimp farm industry in Koh Kong is increasingly plagued by the self-induced negative side-effects of its operations. Economic losses are common due to shrimp disease and self-pollution of culture areas caused by indiscriminate discharge of pond effluents (ADB, 1996). Resource conflicts, particularly with farms located in or near mangrove areas, are also increasing. Farms have experienced a fall in productivity and poor yields have meant that many shrimp owners have had losses and can no longer afford to run their farms.

In Kompot, farms mostly use extensive methods, although there were two intensive farms (ADB, 1996). The extensive farms rely on natural supplies of feed and seed, with no feeding, fertilization or stocking and consequently pond productivity remains low at less than 100 kg/ha/year. The ponds are often constructed on or close to

the mangrove areas and some farms leave mangrove plants in the pond with deeper ditch close to the dike. Some farmers use the ponds as a reservoir of water to feed into salt pans. About 60 percent of the ponds are integrated with salt pans. Water management practices are simple as farmers let the water into the ponds during the high spring tides and normally exchanged each month. Harvesting of the shrimp is carried out during the monthly draining of the water and also by more regular trapping or netting of the shrimp in the pond. Fish may also be harvested along with the shrimp. The extensive shrimp farms have an estimated low pond yields of 30 to 35 kg ha year. In contrast, the intensive shrimp farms had an estimated production of 7,500 kg ha year (ADB, 1996). A traditional extensive shrimp farm was also an established in Prey Nup, Sihanouk Ville around 1992 (ADB, 1996), but it was reportedly abandoned a couple months later due to financial losses. Typically, farms are abandoned after five years. Figure 3.3 shows shrimp productivity in Cambodia since 1989. The year 1996 can be seen as the first year in which total production in Cambodia fell, suggesting that the productivity of farms has declined from the highest production level of 731 tonnes in 1995 to only 62 tonnes in 1999 (DoF, 2000 and Tana, 1994).



Source: DoF, 2000 and Tana, 1994

Figure 3.3: Production of shrimp culture (tonnes) in Cambodia 1989-99

The losses indicate urgent actions are required to improve the sustainability of shrimp cultured in Cambodia. These problems have led the local Government and concerned ministries (Ministry of Agriculture Forestry and Fisheries and Ministry of Environment) to place a moratorium on further licensing of shrimp farms.

3.2.1.2 Mollusc Culture

Mollusc culture is not very attractive in Cambodia because of market constraints and slow harvest. It is reported that oyster culture (hanging culture) was established in Koh Kong Province in 1994. But market constraints of this commodity hampered the development. Hanging culture of oyster was limited to an area of less than two ha since 1994. Harvesting took place slowly and farmer had financial losses. Green mussel culture

was found to have been established recently around 1995 for supplying the shrimp farms (ADB, 1996).

3.2.1.3 Cage culture

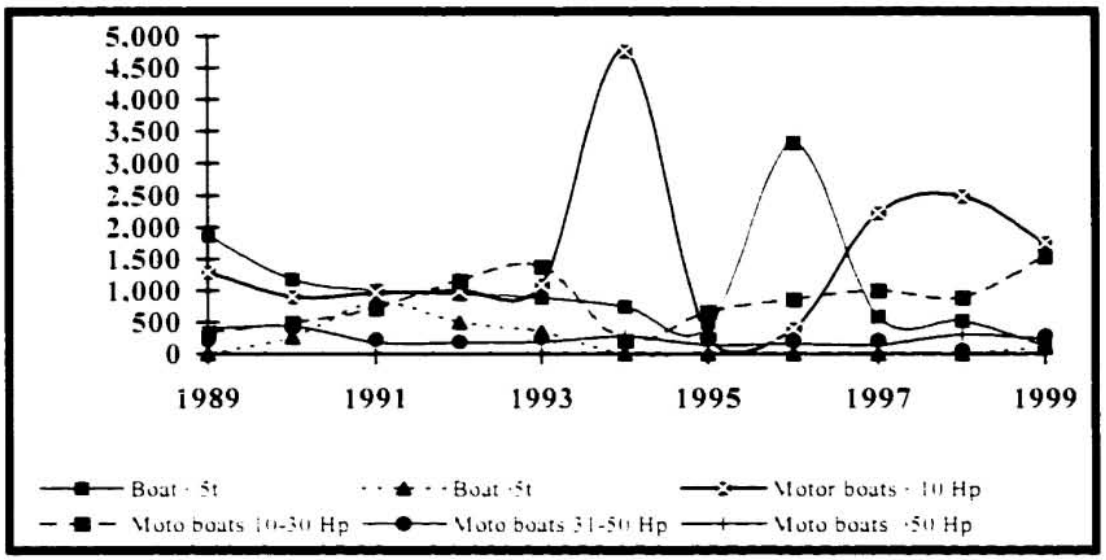
Cage culture was introduced to Koh Kong in mid-1993 by one private shrimp farmer. The stocking species were snapper and grouper. The location of this cage was in Dong Tong River which was influenced by the freshwater during rainy season. Unfortunately, this cage culture collapsed after two months of stocking due to impact of freshwater during heavy rains in August. Now no cage culture exists in that area or other places (ADB, 1996, Tana, 1994).

3.2.2 Inshore fishery

The marine fishery of Cambodia is definitely pelagic due to the physical feature of the exclusive economic zone area (maximum depth is less than 80 m) (Tana, 1995). Reportedly, the introduction of modern technology took place during the 1950s. Purse seiners, gill netters and long liners are the gear types which have been used by the Cambodian coastal fishers since the early stage of innovation. Fish trawlers were introduced to Cambodian coastal provinces around 1960s by the Thai fishers then fully adopted by local fishers in 1964 (Tana, 1995).

The inshore fishery was gradually developed and widely spread all along the coastline by 1975. It was recorded that there were several hundred of small vessels with the highest capacity being less than 100 Hp. Mackerel purse seiners, gill netters and long liners were commonly used. Unmotorized and small motorized boats (less than 30 Hp) were the most common type in the inshore fishery.

The number of fishing fleets along the coastal provinces fluctuated in response to natural, socio-economic, and market conditions and pressure from other sectors especially agriculture. Figure 3.3 shows the fluctuation of the number of fishing vessels from 1989 to 1999.



Source: DoF, 2000; ADB, 1996; Tana, 1994.

Figure 3.4: Number of marine fishing vessels of Cambodia 1984-1999

Figures shown in Figure 3.4 above are collected from licensed fishers only. The number of fishing boats in the coastal area is higher than that of the DoF's statistical data because the records of the coastal provincial fisheries departments exclude prohibited fishing gears (e.g. push netter and small trawler) (ADB, 1996).

The marine catches are not systematically recorded. Therefore, there is no data related to catch per unit effort which make it difficult to identify trends of specific fisheries resources and the impact of specific exploitation and management.

3.2.3 Offshore fishery

Complete official information on Cambodian offshore fishery is not available. The Gulf of Thailand is a productive sea due to its shallowness (average depth of 20 m, maximum depth of 87 m) and the predominance of muddy and muddy-sandy bottom. A great diversity of fish find these conditions very suitable.

Cambodia's EEZ is relatively small (55,600 Km^2) compared with Vietnam's (722,100 Km^2) or Thailand's (85,800 Km^2). The offshore areas of the EEZ can be thought of as Comprising three zones which are distinguishable from another on the basis of status of EEZ claims (see figure 2.2) (ADB, 1996, Tana, 1995). Despite its limited size it produces with the coastal area, approximately 30,000 tonnes of commercial fish per year (Cambodia National Environmental Action Plan (NEAP), 1998 and DoF, 2000).

According to NEAP and DoF, Cambodia's EEZ is thought to be less exploited than that of its neighbours, Thailand and Vietnam. The Thai fishery is over exploited of the EEZ and difficult to increase its catch from the Golf of Thailand (Csavas, et al. 1994 and NEAP, 1998). The offshore fishery is also thought to be the potential of generating foreign exchange, and of meeting of the population's protein requirements. There are few Cambodian offshore vessels, however there is a lack of enforcement capacity, illegal fishing by foreign vessels.

The authorities of the coastal provinces have licensed many Thai fishing vessels to fish in Cambodian seas but fish caught in the offshore areas by Thai fishers and local fishers is not landed in Cambodia. It is then directly to Thailand for processing and marketing. The effect of insufficient supply of raw materials make Cambodian fish processing plants closed and then it has resulted in the loss of employment, the value added prices from the raw materials and national income. Investors, therefore, are few looking for investment in fishing industry.

Chapter 4: Economic Aspects

4.1 Cambodia Marine Fisheries landings

The annual reports of total commercial marine capture in coastal zone provinces have been compiled since 1980, and the distribution of this capture among seven categories of seafood has been compiled since 1990. These reports suggest that total landings have ranged from lows of 814 tonnes in 1981 and 1,200 tonnes in 1980 to highs of 39,900 tonnes in 1990 and 38,100 tonnes in 1999 (DoF,2000). The increased landings in the 1990s are mostly attributable to Koh Kong province.

The order of dominance of categories of seafood by-catch is finfish, shrimp/krill, crab, mollusc, squid and finally, lobster (Figure 4.1). However, the meaning of the reports is not very clear because the accuracy and completeness of the figures is not known and the quantities of fish captured in Cambodian waters and landed in neighbouring countries is not known. Anecdotal evidence from field investigation carried out by ADB,1996 suggested that the catches of about 3,000 boats and small gillnetters may not be included in statistical data and that inclusion of these fishermen could double shrimp and crab catches of 3,000 tonnes and 2,000 tonnes, respectively and add about 5,000 tonnes to the total annual commercial marine capture.

There is belief in the DoF and elsewhere that there has been a general decline in both inland commercial fisheries landing and marine commercial fisheries landing. However, this is not substantiated by the official statistics, which, for the period since 1990, show annual commercial catch fluctuating between 30,000 to 40,000 tonnes in the marine fisheries (Figure 4.1). The statistics give only details in term of Grades (1, 2 and

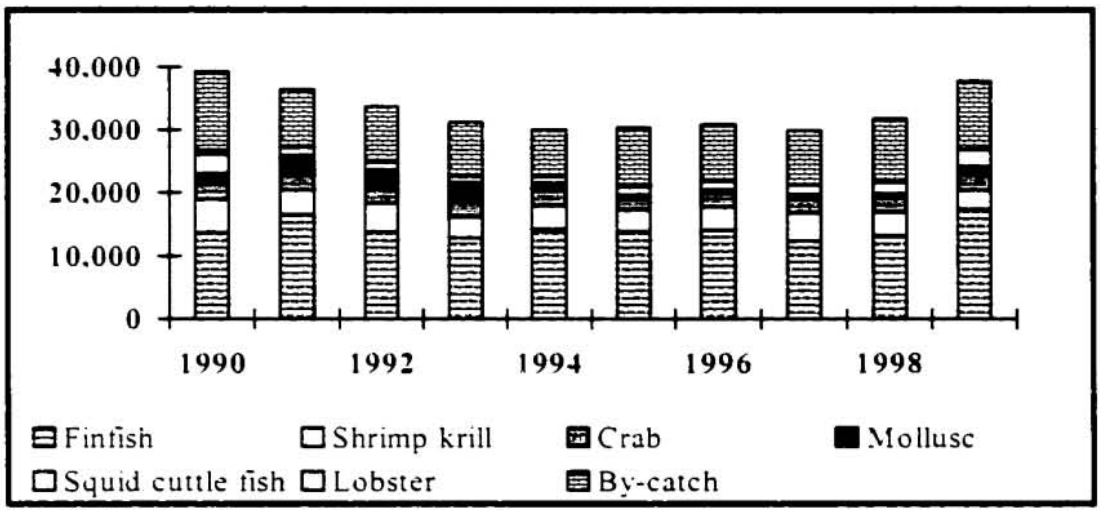
3) of marine fish landing, but no data on fish species. This is shown in (Figure 4.2). Before 1975, DoF had determined three grades of fish from marine catch as follows:

- 1st grade fish: fish price per unit weight is high and fish size is usually large but this depends on consumer preference and on the handling, transportation, processing and storing.

- 2nd grade fish: fish price per unit weight is lower than grade 1 and the fish are usually smaller in size.

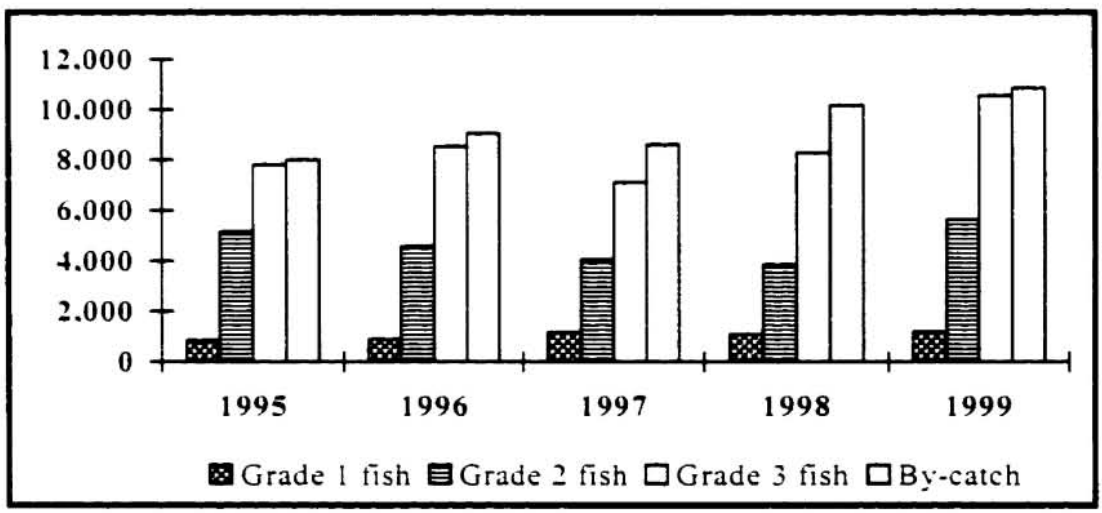
- 3rd grade fish: all small species of fish with a cheap price compared to the above two grades. Normally, third grade fish are used for processing into fish paste, low quality fermented fish and sun dried fish for animal feed. This latter category has been considered as trash fish when in abundance.

The above classification has been adopted by the present fisheries authority (1979-2000). There has been discussion about a better way to differentiate fish commodities but with little progress.



Source: Tana, Chamnan, 1995, ADB, 1996, and DoF

Figure 4.1: Landing of marine fisheries (tonnes), 1990-99



Source: DoF

Figure 4.2: Grades of fish (tonnes) from the landing of marine fisheries, 1995-99

4.2 Product forms

Marine fisheries play a less important role than inland fisheries in the nutrition of the Cambodian people. Much of the catch of the relatively small fishing boats operating offshore is never landed; it is sold directly to Thai fishing vessels in fresh condition (Tana, 1993).

The traditional small scale fishery on the near shore area is very important in the fresh fish supply to coastal markets, especially poor consumer markets. Mollusc, costly blood cockles and mangrove mud crabs are collected and supplied live to urban markets. The blue swimming crab (*Portunus pelagicus*) is sold live and fresh for the local tourists and a huge quantity is packaged in ice for sale to Thai markets.

Shrimp is sold fresh or frozen. Prior to 1990, an effort to tax shrimp exports from three coastal provinces covered about 10 percent of the total catch (Csavas, 1994), but since early 1990 the percentage of the controlled shrimp rose to about 40 percent (Tana, 1993) due to a requirement which compelled licensed fishers to sell part of their catch to a frozen shrimp plant which was established early in 1980 and operates under government supervision by Kampuchea Fishery Import and Export Company (KAMFIMEX Co.). About 300 tonnes of raw shrimp was designated as a compulsory supply to the factory through several shrimp gatherers. However, some of the shrimp is still sold illegally to Thai markets rather than to factory, because of the higher profits that can be made.

Yellow tail mackerel, hardtail scad and other species of small fish are supplied to private fish steaming enterprises and fish sauce enterprises which are located in Kompot,

Sihanouk Ville and Koh Kong Provinces at the rate 400-500 tonnes per year (Figure 5.2) (Tana, 1993). Tuna fish is also famous as a salty-fermented product which is exported illegally to Thailand. Other lucrative fish such as seabass, snapper, grouper, and pomfret are sold fresh to Thai vessels or to Thai coastal ports. By-catch fish is also sold in Thailand since there is only small local demand for it, as a food source for a private fresh water aquaculture growing shrimp (*Pangasius*).

Marine fish products specified in this report were identified through their role in local and export markets. The existing statistics identify fish commodities and fish products as follow:

Marine fish commodities

- Shrimp
- Lobster
- Crab
- Squid and cuttle fish
- Mollusc
- Sea cucumber
- 1st grade fish
- 2nd grade fish
- 3rd grade fish

Marine fish products

- Salt-dried fish
- Steamed fish

- Sun dried shrimp
- Sun dried squid
- Dried cucumber
- Fish sauce

There have recently been some additional products and fish commodities in the commercial statistics of DoF, 2000.

- Frozen shrimp
- Fish bourb (dried salted mackerel fish)
- Crab meat
- Shrimp meat

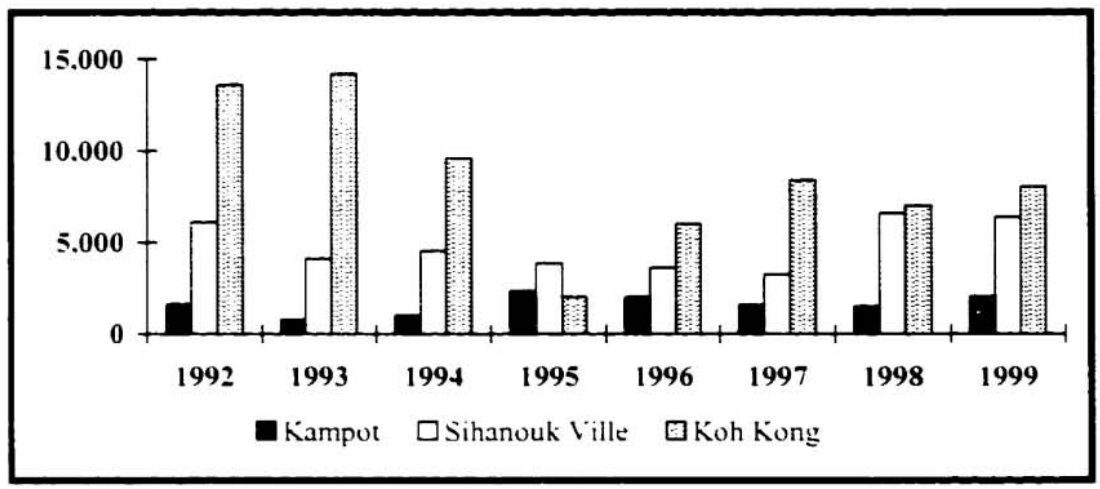
The classification of marine fish commodities and their derived product is incomplete which leads to difficulties in understanding the potential of fish commodities and their products from economic and marketing points of view. Marine fisheries obviously provide a wide range of commodities with the potential to derive many marketable products for both the local population and for export.

4.3 Markets/Prices

Fish marketing and distribution is undertaken by the state-owned enterprise KAMFIMEX and by the private sector. Although there are established regulations governing market arrangements, DoF officials indicate that regulations are often not followed or enforced.

In the marine fisheries, marketing and distribution networks are not well developed, although a wide range of inland and marine fish products are available and are

marketed. Although the DoF publishes data on production and exports, there are no corresponding data of value of production, value of exports or destination of exports (Figure 4.3) (Csavas, 1994). This issue should be addressed as matter of urgency in context of strengthening fisheries data collection and analysis.



Source: DoF

Figure 4.3: Total Fish Export (tonnes) by the Coastal Provinces, 1992-99

4.3.1 Export market

Cambodia has a tradition of exporting freshwater fish, dating back to at least the 1930s (Csavas, 1994). Thailand, and to a lesser extent Vietnam, are now the primary export destinations for fisheries exports. Small volumes are also marketed in a number of other countries as far afield as Australia and France.

Marine fisheries products exported include: finfish, squid, mangrove crabs, bache-de-mer, and mother of pearl for button making and inlay work. These products are exported by air (iced and live) from Phnom Penh, and by sea from Sihanouk Ville and

other coastal Provinces. Sea export involves the transportation of fresh and frozen fish, as well as export of live product (e.g., a collector vessel buys high-value marine species live such as grouper, pomfret, sea-bass and snapper from fishers and ships them to Hong Kong in tanks).

The DoF estimates that 65-70 percent of the marine catch is exported, though the proportion of shrimp exported is reckoned to be 80 percent of the production (20 percent of which is frozen and the remainder exported on ice). DoF further estimates that about 85 percent of all marine exports are destined for market in Thailand.

KAMFIMEX reported that about 30 percent of the enterprise's exports are derived from marine sources (principally small-scale trawl shrimp production) and the remainder from inland fisheries.

4.3.2 Domestic market

There is high domestic demand for fisheries products. This is because fish and fisheries products are the single most important protein source for the bulk of the population. Moreover, Cambodian people have a strong preference for fish over other forms of animal protein.

In coastal provinces, many residents are self-sufficient in marine products. High-value species are usually sold to traders for marketing in Phnom Penh or for export, however, the domestic market for marine products is small. Consumption of marine species by Cambodians is primarily confined to maritime areas because of a lack of knowledge and a higher price of export thus the product is not available to the people.

The domestic distribution of marine products is poorly developed, and is limited to fresh and frozen high-value species (e.g., shrimp, sea-bass, grouper and beche-de-mer). Marketing and distribution is primarily confined to Phnom Penh.

4.3.3 Price

Comprehensive and well-detailed information on the price behaviour and trader costs and earnings for the Cambodian fisheries are not available, and it is only possible here to present a rough appreciation of the overall situation.

In general, domestic prices for marine species of fish are lower than freshwater species. This situation reflects the preference for the latter species and probably a lack of knowledge by consumers about marine species.

Price series information either for domestic sales of fish or exports is not generally and systematically available. Occasionally, prices were quoted: for trawl-catch finfish for domestic consumption indicative prices were reported to be Riel 3,000 –5,000 (US$ 0.79-1.32) per kg; US$5.00-7.00 per kg for blue swimming crab, and high-value live marine species at US$ 7.00-13.00 per kg. The higher export prices and payment in foreign currency provided a strong incentive for entrepreneurs to focus on export, rather than domestic market.

4.4 Government Regulations

The DoF under the MAFF is responsible for the development of the fisheries sector and all matters pertaining to administration, planning, enforcement of fisheries laws and regulations, training, research, extension and compilation of fishery statistics.

In the year 2000, DoF had 22 branch fisheries divisions covering 20 provinces and 2 municipalities for enforcement of fishery laws and regulations, for concession management, taxation, and provision of technical guidance to local fishers and fish farmers.

Until now the fisheries of Cambodia has been confined mainly to the inland fishery and inshore fishery. In the late 1990s, the Royal Government of Cambodia was trying to address this situation by encouraging fishers to invest in offshore areas and replace foreign fishers, mostly Thai (Peter, 1999).

Promotion of marine fisheries development and management has taken place one step behind inland fisheries due to the socio-economic interests of the country. Management, according to existing fisheries law, is based on administration, commercial exploitation and enforcement. Reportedly, the compiled fisheries law and regulations issues during 1987 to 1989 were entirely copied from the law of former Kingdom of Cambodia during 1956 to 1958. According to Peter, 1999, the World Bank has an ongoing project that incorporates a full review and revision of the fisheries legislation because the law is out of date. Until recently, neither scientific work nor appropriate development has been taken into account by management (Table 4.1).

Under the compiled fisheries law, several ministerial regulations have been issued with the objectives of preserving and or conserving marine fishery resources, which include, interalia: (1) prohibition of the use of trawlers; (2) prohibition of the use of certain types of destructive fishing gears; (3) ban during the spawning period of

mackerel; and (4) prohibition of the use of intoxicants, toxic substances, electricity or explosives for fishing.

Activities	Management	Regulation	Enforcement
Scientific Research of fish resources	Absent	Fair consideration	Absent
Harvesting	Fair consideration	Licensing process Ban for destructive gears Taxation	Fair consideration
Landings	Poor consideration	Absent	Ignore
Processing	Fair consideration	Licensing process	Absent
Marketing	Slightly inhibit (State Company)	Slightly inhibit (Domestic transportation licensing)	High consideration

Source: ADB, 1996

Table 4.1: Management, Regulation and Enforcement Access to Marine Resources

NOTE: Poor consideration is not much attention being paid.

Fair consideration is quite amount of attention being paid.

High consideration is much attention being paid.

Slightly inhibit is a little sign of encouragement for investment

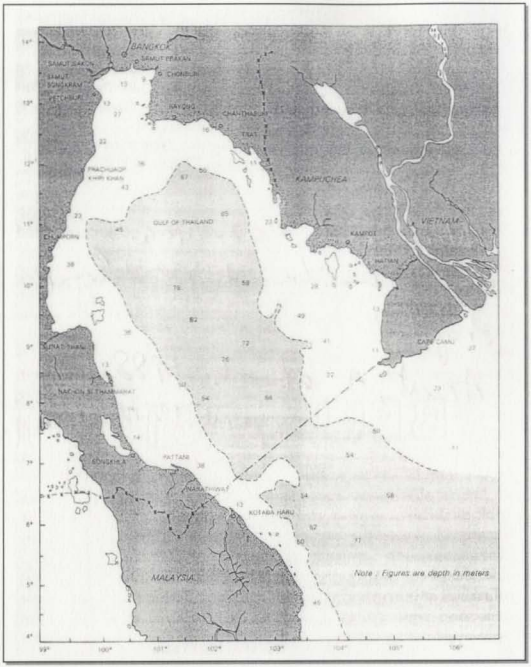
Chapter 5: Analysis of Marine Offshore Fisheries

5.1 Geography of offshore fishery

The Gulf of Thailand (Figure 5.1) extends northwest from the southern part of the South China Sea. It is approximately 835 Km long on its northwest axis. The maximum width is approximately 555 Km. The mouth of the Gulf, indicated by the dotted line, is about 370 Km. The Gulf of Thailand covers an area of approximately 350,000 Km^2 (Anat, et. al., 1988).

Being a part of the Sunda Shelf, the Gulf is relatively shallow, with a mean depth of approximately 45 m and maximum depth of 80 m (ADB, 1996, Vietnamese Ministry of Planning and Investment and Ministry of Fisheries, 1996, and Anat, 1988). The deepest part is located in a central basin between latitude 9°N and longitudes 101° and 102°E. This deep basin extends northward of Ko Chuang off Sattahip, Rayong province, Thailand, and is separated from the South China Sea by two ridges. One of these ridge extends southwest from Cape Camau, Vietnam at various depths of less than 25 m for more than 110 Km and other extends northeast of the Thai-Malaysia border for a distance of 167 Km at various depth less than 50 m. Between two ridges, there exists a deep channel with a sill depth of 67 m (Robonson, 1974, cited from Anat, et. al. 1988).

Bottom conditions largely muddy, with sandy components brought in during the Pleistocence (Anat, et. al. 1988).



Source: Anat, et. al. 1988

Figure 5.1: The Gulf of Thailand

The studies of the sediments at the three coastal provinces carried out by ADB in 1996 revealed that the bottom was covered with ooze, or mud mixed with sand or shell (Table 5.1).

Depth (m)	Description of sea floor
20-30	The sea floor is entirely flat and consists of sand with some inclusion broken shell (small pieces).
40-60	The sea floor is wavy with irregular mounds of 2-4 meters and in some locations is up to 10 meters high. The floor of this area consists of viscous mud which is dominated by soft mud with broken shell deposits (big pieces).
60-70	The floor is fairly flat and consists of very soft mud with inclusion of plastic mud or clay. In the northwestern part of this area, the floor is covered by pointed and high rock which can damage the bottom of trawl operations.

Source: MAFF, 1987

Table 5.1: Sea Floor Structure at Varying Depth in Cambodia

The Gulf of Thailand is a productive sea due to its shallowness (average depth of 20 m, maximum depth of 80 m) and the predominance of a muddy and muddy-sandy bottom. A great diversity of fish find these conditions very suitable.

5.2 Offshore marine resources

The DoF recognises the potential of the offshore fishery as a means of generating foreign exchange and providing income for industrial fishers. Offshore fisheries can play an important role in the economic development of the country, however, there is limitation of updated information on the status of marine resources, and more and accurate information is necessary for the development of the offshore fishery. There are various assessments of the potential yield of the pelagic resources of Cambodia's sea.

During the 1980s the former Soviet Union and Vietnamese scientists collaborated with local researchers to carry out surveys of marine resources which showed that there were 435 fish and crustacean species from 97 families in the offshore with total stock of 50,000 tonnes year. It identified mackerel, scad, anchovy, tuna and pomfret as the most commercially important pelagic fish; and threadfin bream, croaker big-eyes, lizard hairtail fish, flat fish, snapper, barracuda, grouper, shark and conger eel as the most commercially important demersal fish. The same source also identified 7 shrimp species, one squid species and two cuttle fish species with stocks of 1,300 tonnes year (Csavas et al. 1994; Tana 1994).

The study recommended that 20,000 tonnes of fish was allowed to be caught per year. The catch statistics indicate that annual total grew substantially, from 1,200 tonnes in 1980 to 39,900 tonnes by 1990. However, the catch began to decline after 1990, dropping to 29,800 tonnes in 1997 and increasing to 38,100 tonnes by 1999 (DoF, 2000). It seems the changes relate primarily to reported harvests rather than to changes in actual harvests.

Marine fishery resources comprise all aquatic species which can be utilized by man. They included fish (the most important group), shrimp, crabs, clams, and aquatic plants such as seaweed. Marine resources of the Gulf of Thailand are divided into two groups: pelagic and demersal (Table 5.2). Among the pelagic fish, *Atule mate*, *Megalaspis cordyla*, *Selar crumenophthalmus*, *Selaroides leptolepis*, *Stolephorus heterolobus*, *Stolephorus indicus*, *Auxis thazard*, *Rasterlliger brachysoma*, *Rasterlliger kanagurta*, *Scomberomorus commerson* and *Thunnus tongol* are commercially important species. The important demersal fish are *Lutjanus malabaricus*, *Lutjanus vitta* and *Priacanthus tayenus* (Somsak, and Purwito, 1986).

5.2.1 Marine fish

Of the 435 fish species from 97 families in the offshore areas (from 20m deep up to the outer border), it is observed that only 33 species were often found in catches. 5 species were very abundant: Hard tail Scads, Yellow queen fishes, Short-bodied Mackerels, Indian Mackerels and Banded Travelly.

Group	Family	Genus	Species
Pelagic fish	CARANGIDAE		
		Atule	A. mate
		Megalaspisb	M. cordyla
		Selaroides	S. leptolepis
		Selar	S. crumenophthalmus
	ENGRAULIDAE	Stolephorus	S. heterolobus
			S. indicus
	SCOMBRIDAE		
		Auxis	A. thazard
		Rasterlliger	R. brachysoma
			R. kanagurta
		Scomberomorus	S. commerson
		Thunnus	T. tonggol
Demersal fish	LUTJANIDAE		
		Lutjanus	L. malabaricus
			L. vitta
	PRIACANTHIDAE	Priacanthus	P. tayenus

Source: Somsak and Purwito, 1986

Table: 5.2: Occurrence of major commercial marine fish species in Cambodia

5.2.2 Sea cucumber

Local fishers showed that there are 3 abundant species of sea cucumber in the Cambodian sea territory. These species are *Holothuria fuscopunctata*, *Holothuria edulis* and *Holothuria leucospilota*. The last species is mainly caught by trawl as bycatches of the shrimp fishery.

5.2.3 Squid and cuttle fish

The stock of squid and cuttle fish in the Cambodian offshore area was about 1,300 tonnes (results from research in 1983-1986 by former Russian scientists). There are 3 Calmar species, 5 Sepia species and 1 Octopus species. They are Big fin reef squid (*Sepioteuthis lessoniana*), Squid (*Donytenthis singalensis*), (*Loligo duvanceli*), (*Sepia phavaomis*), (*Sepia esculenta*), (*Sepia aculenta*), (*Sepia vecuvirostris*), Long-armed Octopus (*Scaengrus unicirrus*) and (*Octopus sp.*).

These species are heavily harvested through targeted fishing and bycatch of shrimp fisheries.

5.3 Harvesting

Marine fish production plays a less important role in the nutrition of Cambodian people than fresh water fish production. The annual catch is about 30,000 tonnes (DoF, 2000). The offshore area of Cambodia is less exploited by local fishermen due to a lack of infrastructure, poor safety equipment and low skills. Cambodian vessels are typically trawlers, purse seiners, and squid traps that can not safely operate beyond the inshore fishing areas. The effectiveness of fishing gear used in the sea is still low compared to

those used in the neigbouring countries such as Thailand and Vietnam (Thouck, Sina, 1997).

By comparison, Thailand's trawl net fishery, commencing around 1962 (Anat, et. al. 1988), is highly developed, with a distant water trawl fleet operating off the coasts of Cambodia and other countries. According to Food and Agriculture Organization (FAO), 1993, some Thailand catches were reported to have originated from outside their water in the late 1970s. The development of luring purse seines in the early 1970s for harvesting sardines, mackerels and scads boosted the marine fishery production from the Gulf of Thailand (FAO, 1996).

The issue of illegal fishing of Cambodia's offshore fishery by foreign vessels is complex, because it is linked to the territorial disputes over the EEZ with Thailand and Vietnam (figure 3.5). Thai and Vietnamese vessels are able to operate freely in any of these areas, including the undisputed area that is claimed only by Cambodia. There is no information for qualifying or even roughly estimating the level of effort or the catch of foreign vessels operating in the offshore area. According to the ADB, 1996, records of licenses issued to foreign fishing vessels were not reviewed but are not expected to be informative on this point because compliance is not monitored and many boats are believed to operate in Cambodian EEZ without licenses.

Large parts of fishing grounds, especially in the offshore areas are rented to Thai fishers and the coastal provincial authorities only receive a tax from the rest. Most of the authors who have studied the situation complain that marine fish caught in Cambodian seas are sold directly to Thai vessels in fresh condition.

Due to over exploitation in it's EZZ from Gulf of Thailand, Thailand seeks joint ventures with countries which have under exploited resources, especially Cambodia (Csavas, et at., 1994). Joint ventures could be used to ensure that fish are landed and processed in Cambodia instead of other countries. Such an arrangement help increase level of local employment. Formalized joint ventures would be easier to manage and control than the present licensing system, and could be used to develop Cambodian fisheries.

5.4 Processing

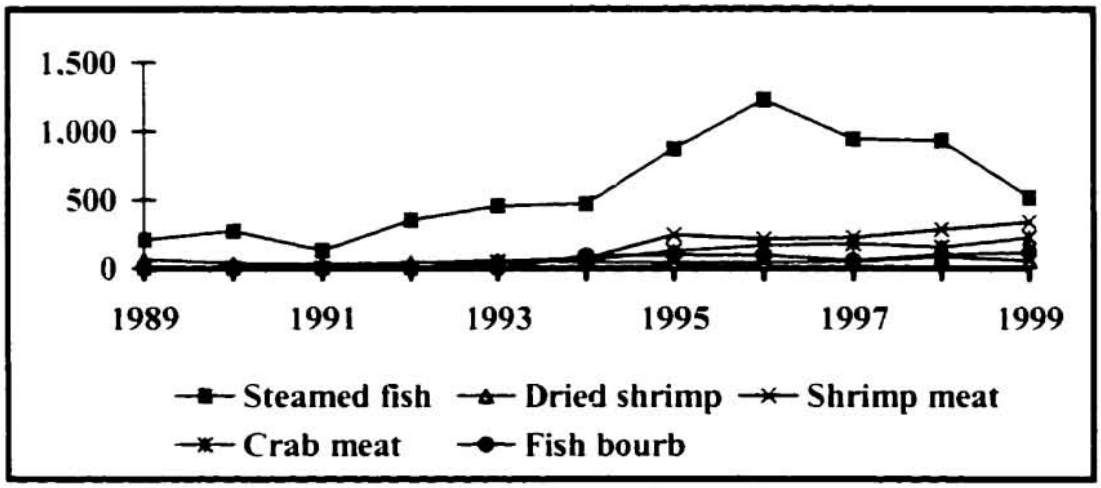
Cambodian people, in general, prefer to consume whole fresh fish from inland waters rather than from the sea. The marine species are processed for human and animal consumption. Most processed product is consumed domestically, though a proportion of higher-quality, higher-valued product is exported. There has been an increasing trend in the development of fish products such as added-value fish and fishery products in the form of frozen, with an increasing amount of them destined for export.

At present, marine fish are processed using both traditional technology and modern technology such as freezing. Principal species processed include finfish, shrimp, squid, octopus, and beche-de-mer. The traditional processing techniques include sun-drying, salt-drying, steaming, fermenting and saucing. Product development through new and improved processing techniques was reported such as crab meat, shrimp meat and fish bourb.

High value fish processing for export using modern facilities is undertaken in Sihanouk Ville. These plants were privatized in1991 (Csavas, et at., 1994). Employing 40

to 60 people, mainly women, they process shrimp for export to France in 0.2-0.5 Kg blocks. One foreign-financed fish processing plant is said to have closed due to insufficient supply of raw material (ADB 2000).

Figure 5.2 shows trends of marine fish processed between 1989 and 1999. Three products dominated the processed output over this period. These products were steamed fish which increased from 206 tonnes in 1989 to 929 tonnes in 1998 and 513 tonnes in 1999, shrimp meat which ranged from 51 tonnes in 1993 to 339 tonnes in 1999, and crab meat which grew from 40 tonnes in 1993 to 224 tonnes in 1999.

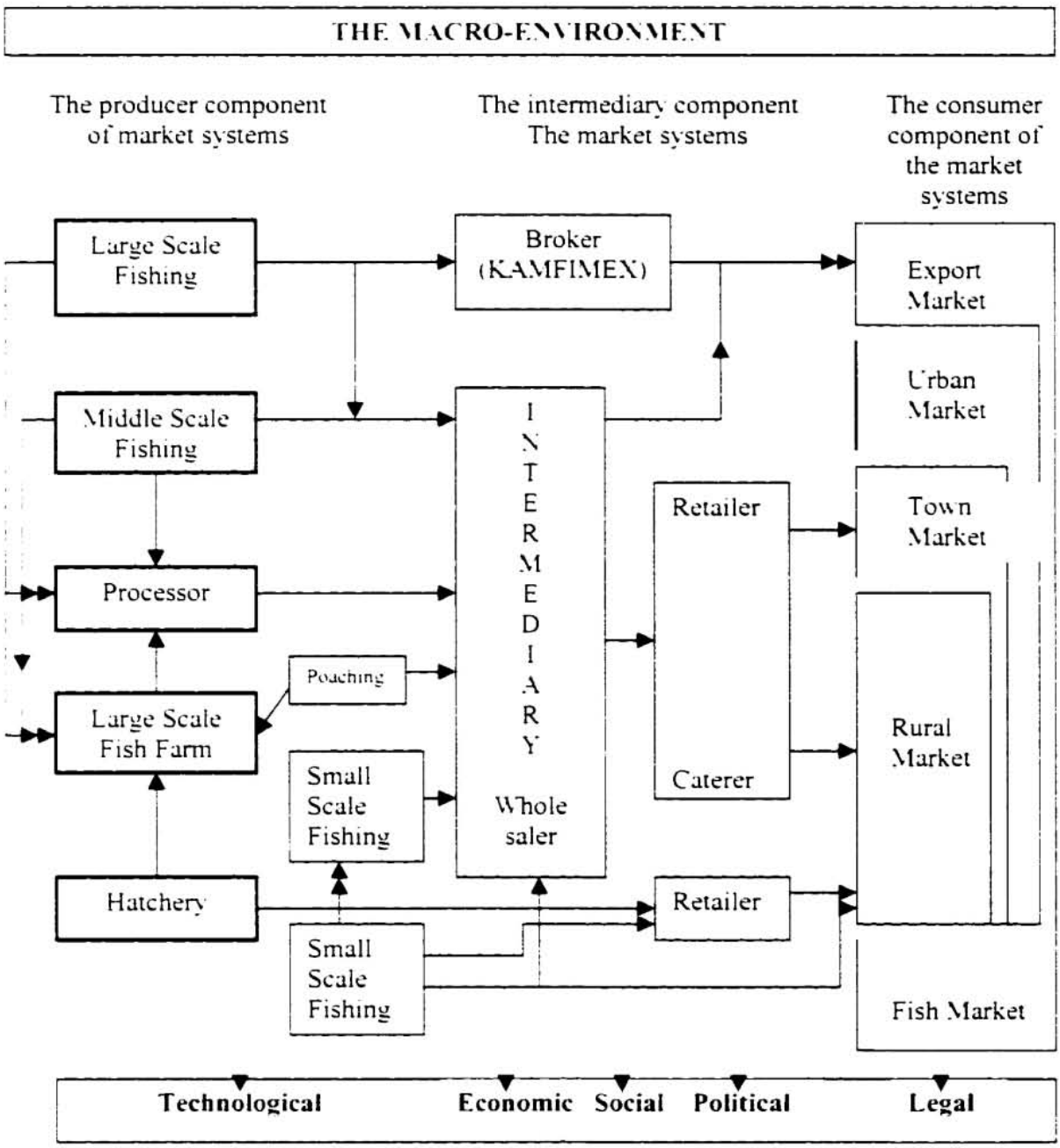


Source: DoF, 2000

Figure 5.2: Trends of marine fish processed (tonnes) in Cambodia, 1989-99

5.5 Marketing

Marketing of fish in Cambodia is presently in an underdeveloped state since most fish is handled in a traditional form. Until now there has been a high proportion of poor quality fish products and a high level of wastage in the distribution process. The present marketing systems are not properly organized which leads to problems in distribution. Figure 5.3 shows the fish marketing system in Cambodia (Tana, 1993)



Redrawn from Tana, 1993

Figure 5.3: Fish marketing system in Cambodia

5.5.1 Export markets

Exports are mostly to Thailand and to a lesser extent to Vietnam. They are confined to fin fishes and shell-fishes in iced, frozen or live condition. Among those commonly exported are marine prawns, lobsters, squids, cuttlefishes, crabs and pomfrets. The country's planned marine fishery exports in 2000 are shown in Table: 5.3.

The state-owned enterprise and the private sector do not purchase market information in support of their fish trading operations but rely informally on overseas contacts to assist with the provision of such information. Management seems to have little knowledge of strategic marketing planning and is unaware of the existence of price information available from sources such as INFOFISH and GLOBEFISH. On export pricing, the enterprise has a policy of offering product for sale on a cost of production (determined by purchase price) plus predetermined profit margin basis.

Product	KAMFIMEX	Koh Kong	Sihanouk Ville	Kampot	Kep City
Fresh fish	2.000*	8.000	6.000	2.000	20
Salted fish	8000*	0	20	10	2
Dried fish	100*	0	50	10	2
Dried shrimp	190	8	150	0	1
Shrimp meat	200	8	150	0	1
Crab meat	100	30	85	5	4
Fish bourb	200	0	50	0	0
Ki	10	2	10	12	0

Source: DoF, 2000

Table 5.3: Country's planned marine fisheries export for 2000 (tonnes)

NOTE:

Ki: Salted small krill.

* : include fresh water fish.

5.5.2 Domestic Markets

A government organization, KAMFIMEX Co., and some private sector companies handle the distribution of fish and fishery products in the domestic markets. The manner in which sales are conducted at present for fish and fish products on the domestic market point toward a sellers market where demand is greater than supply. Most of suppliers and processors are visited by buyers or dealers at the point of production and when a price is agree upon, the buyer arranges transport to move the purchase. In other cases, small-scale processors transport their products in small quantities by boats or motor cycles either direct to market or to a buyer's central collection point.

It is important to be aware of the fact that most of the traders in the landing sites are women (some landing sites reported 100 percent involvement by women), ranging from those who deal in huge quantities for distribution to distant markets and who have established bases near the market, to those with little more than two shallow baskets of fish carried on a pole for sale within walking distances.

Chapter 6: Future Offshore Fisheries Development and Planning

6.1 Development of harvesting capacity

As coastal and inshore fishery resources are overfished and declining in abundance, Cambodia plans to extend its fishing operations into the offshore waters of EEZ, with the assumption that there are still surplus resources in these waters. However, the capacity of the fishery resources in parts of these waters to sustain increased fishing operations has only been roughly estimated, whilst in other parts it has not yet been assessed. In this uncertain situation, fisheries management should be based on a precautionary approach regarding the level of harvesting. In the central part of the Gulf of Thailand, the bottom is a rolling hill and consists mainly of muddy ooze. Under these conditions, the fishing boats and gears may have to be modified.

Regional cooperation will help lower costs if the above policy is to implemented, e.g. in cooperative programmes for resources surveys, and in the planning and operation for fisheries harvesting, particularly in the overlapping areas of EEZ in the Gulf of Thailand. This is possible now that the delineation of the EEZ has been agreed with Thailand and Vietnam.

6.1.1 Cambodian vessels

There is a shortage of information concerning marine fisheries, especially in the offshore area, because they have not been given high priority by past administrations. The non-availability of data makes systematic analysis impossible.

A range of Cambodian vessels and gears are used in marine fisheries. All the vessels are comparatively small and are family owned. Cambodian vessels are not

equipped to stay at sea overnight and cannot reach offshore areas in one-day round trips. The vessel size and capacities of most the marine fisheries fleet mean that their operations are confined to inshore waters and most of vessels operate as "day boats" (i.e., fishing trips of short duration, and normally less than 24 hours).

Few vessels have a capacity of more than 30 Hp to fish offshore resources so they usually fish along coastal areas (Tana, 1995). Most of them in the EEZ are reportedly of Thai or Vietnamese origin. The number of Cambodian vessels has fluctuated frequently due to illegal ventures between vessels owners and Cambodian fishers. Sometimes, the vessels were removed back to the original countries when restricted by the provincial authorities (Tana, 1993, personal communication, 2000). The statistics give only details in term of the capacity of vessels, but no data on fishing grounds (inshore or offshore) for vessels. This is shown in Figure 3.4.

The number and size distribution of fishing boats has changed. Vessels with more than 30 Hp increased from 408 in 1983 to a peak of 844 in 1990, before dipping to 455 vessels in 1999 (Tana, 1994; DoF, 2000). It is not clear if these changes reflect a major shift in fishing pressure (or effort) or enforcement of the requirement that vessel operators get fishing permits from DoF.

6.1.2 Joint Ventures

Cambodia's offshore area is smallest in the Gulf of Thailand. It is about 55,600 km^2, given its small size and the overcapacity of neighbouring countries, it may not be prudent for the country to develop its own industrial fishing fleet, as this may lead to excess harvesting capacity and, eventually, a collapse of the offshore fishery.

Instead of developing a domestic industrial fleet, joint ventures with other countries can be used to extract profitable income from the offshore fishery. All inputs for construction and operation of vessels are invested by other countries and their catch can be landed and processed in Cambodia. Cambodian partners can provide fishing rights in their EZZ and designate employees to cooperate with their partners. Cambodian partners receive income from venture upon agreement between both sides. The success of such a venture, however, would depend on the administration's support for such an initiative and Cambodia's capacity for surveillance and enforcement to ensure the resource is properly managed.

6.2 Human resource development

In striving to strengthen Cambodia's capacity to better manage and develop the marine fishery, especially the offshore fishery, a primary focus must be human resource development. Human resource development is needed at all levels in DoF, in two institutions and mari-time provincial fisheries administrations. Both education and training is required at the undergraduate level in-country, short-term courses in-country and short-term and longer-term overseas training to address specific skill development.

Two national institutions are providing specialised fisheries education. These are the Royal University of Agriculture (RUA) and School of Agriculture Prek Leap (SAPL). All institutions suffer from a lack of qualified staff in marine fishery, equipment and teaching materials.

The Fishery is one of five faculties of RUA which offer 4 year bachelor degrees. SAPL offers 1 year and 3 year diploma fisheries training. SAPL has had a more applied

focus than RUA. Revision of the fisheries education curriculum for both institutions is already underway, including the change to credit system, but the revisions may not adequately address the needs of the marine fishery. Given the need for effective fisheries management and the careful development of the offshore fishery, curriculum revision for faculty should emphasise applied and practical aspects of marine fishery management and development. The Asian Institute of Technology (AIT) and Canadian International Development Agency (CIDA) might be requested to assist with the revision to ensure adequate attention is given to the marine fishery.

Officials noted that fisheries graduates, upon completion of their studies, had little research field experience related to marine subjects. Cambodia has a urgent requirement for marine fisheries research stations for applied research on many of its resources.

A range of constraints concerning human resource development in the marine fishery has been identified. These include:

- curricula for RUA and SAPL provides a multi-disciplinary approach only to inland fisheries education.
- few credits in marine fishery subjects are available at RUA and SAPL.
- a lack of qualified teaching staff with knowledge of marine subjects.
- lack of access to, and maintenance of, facilities for practical exposure to marine fisheries means that lecturers and students are largely theory-educated with little field or research experience.
- some marine education and training undertaken by fisheries officers in the past at overseas institutions was not used in the country.

- limited availability of funds to support marine fishery education.

A strategy consisting of short term and long term initiatives requires the adoption of a comprehensive package of measures dealing with human resource development in the marine fishery, especially in the offshore fishery. These initiatives would involve developing marine education and training components to address current deficiencies in the national institutions.

6.3 Policy and planning

Since 1979, the national fisheries policy has been to supply sufficient fish to people through harvesting of the natural resources of both inland and marine fisheries to meet the needs of the country and at same time, to conserve the resource for sustainable use and for the generations to come.

The first Socio-Economic Development Plan (1996-2000), according to Thouck, Lysa, 1997, anticipated a production level of 35,000 tonnes (about 4,000 tonnes above the 1996 level) from marine fisheries (Thouck, Sina, 1997).

At the present, the national fisheries policy relies on the management of the natural resources to supply sufficient fish to the people and to serve the export market as mentioned in the first socio-economic development plan (1996-2000).

In the offshore fishery, the administration's policy should support provincial initiatives to seek joint ventures with other industrial fishing countries.

Chapter 7: Conclusions and Recommendations

7.1 Conclusions

The resource situation in the offshore area is uncertain but that the resource is believed by the government to be under-exploited. Data is not only scare and inaccurate, but it is also at times contradictory. The lack of history by Cambodia in the offshore area makes planning and development difficult.

The Cambodian offshore fishery has the potential to be an important source of animal protein and export revenue for the country in the future. However, a combination of poor management and development practices, a lack of monitoring, control, surveillance and enforcement in the past has left the offshore fishery undeveloped by Cambodia. This situation is now being recognised by government, and the need to rationalize the exploitation of the country's offshore fishery resources and to promote joint ventures with other countries for development purposes, is acknowledged.

Developing the offshore fishery is a fundamental policy goal of national development. In the marine area, inshore fisheries are in urgent need of improved management, and fishing effort reduction programmes will need to be introduced which may involve moving the overcapacity and large vessels to the offshore area. This will require investment in both infrastructure and human resource training.

7.2 Recommendations

The Cambodian offshore fishery is undeveloped due to many factors. A lack of qualified manpower, absence of offshore fishing and research vessels, limited finances and the absence of appropriate policies and regulations are all major constraints. The long term development of the offshore fishery requires the MAFF and the DoF to have international and or bilateral co-operation in terms of research, training of staff and to develop the fishermen and appropriate policies and regulations.

The offshore fishery is thought to hold major promise for development and to be capable of making a significant contribution to the national economy. Thus it should become a major focus of administration policy and planning strategy.

Regular data collection from the offshore fishery is essential to determine the biomass level of the various fish stocks, and to prevent overexploitaion of offshore fishery resources.

To provide reliable information for development planning, an ecological survey should be undertaken to collect data on the number and status of fish species and potential level of catch. The government should collaborate with international institutions as it did successfully with the former USSR in the 1980s to conduct these surveys which would form the basis of future planning.

Comprehensive offshore fishery analysis is not possible at the present time because of the lack of complete and reliable data and the use, in some cases, of outdated estimation techniques. This matter requires urgent attention so that the offshore fishery potential can be identified and developed and prospects for the economy enhanced.

The fisheries act is not suitable for offshore fisheries development needs. It should therefore be revised. Political commitment and support for offshore fishery development plans and objectives is imperative for the success of any offshore development scheme. This is normally demonstrated through the existence of legislation that is current and which reflects international and national trends and obligations, and provides for appropriate levels of investment for operations.

Human resource development is a high priority and should be pursued at all levels in order to re-build capacity in resource research, harvesting, processing and marketing.

There is an attempt to encourage offshore fishing to relieve pressure on the inshore fisheries and also displace the illegal offshore fisheries. It is recommended that joint ventures to harvest the offshore fisheries be developed with other countries. This will require a major commitment from the Government and the cooperation of other nations. The management of such joint ventures and any development should be based on a precautionary approach with respect to the level of harvesting.

Cambodia must also work closely with its neighbours in the Gulf of Thailand since regional cooperation will help lower cost in cooperative programmes for resource surveys, and in the planning and operation for fisheries harvesting, particularly in the overlapping areas of EEZ.

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