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WORLD MARITIME UNIVERSITY

Malmö, Sweden

**PROPOSAL FOR IMPROVEMENT OF
MARINE FISHERIES MANAGEMENT
IN CAMBODIA**

By

SOM SAVATH

Kingdom of Cambodia

A technical paper submitted to the World Maritime University
in partial fulfillment of the requirements for the award of degree of

POSTGRADUATE DIPLOMA

in

**MARITIME SAFETY AND ENVIRONMENTAL PROTECTION
(Administration)**

1999

DECLARATION

I certify that all the material in this technical paper that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this technical paper reflect my own personal views, and are not necessarily endorsed by the University.

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ABSTRACT

Title of Technical Paper : **Proposal for Improvement of Marine Fisheries
Management in Cambodia**

Degree : **Postgraduate Diploma**

As the title implies, this technical paper is to present the various issues and problems, which impact on the present development of marine fisheries in Cambodia and its improvement. It also provides a comprehensive information respect to marine fisheries management in Cambodia.

First of all, a general view of marine fisheries management in Cambodia is given including the present status of marine fisheries and its production. In addition, it also presents a brief description of administration system on marine fisheries.

As far as Marine fisheries management is concerned, a brief description will be provided existing legislation, management and other constraints in marine fisheries development. The responsibility of Department of Fisheries will also be addressed.

Finally, the proposal for improvement of marine fisheries development in Cambodia is also provided. It contains recommendation the improvement and review of legislation, Monitoring, Controlling and how to produce human resources on marine fisheries management.

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LIST OF ABBREVIATION

DOF	Department of Fisheries
Cambodia	Kingdom of Cambodia
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
Hp	Horse power
Ha	Hectare
MOAFF	Ministry of Agriculture, Fisheries and Forestry
MSC	Monitoring, Control and surveillance
NEAP	National Environmental Action Plan
NGO	National Non Governmental Organizations
T	Tons
US\$	United States Dollar
USSR	The Union of Soviet Socialist Republic
WRI	World Resources Institution

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1 Introduction

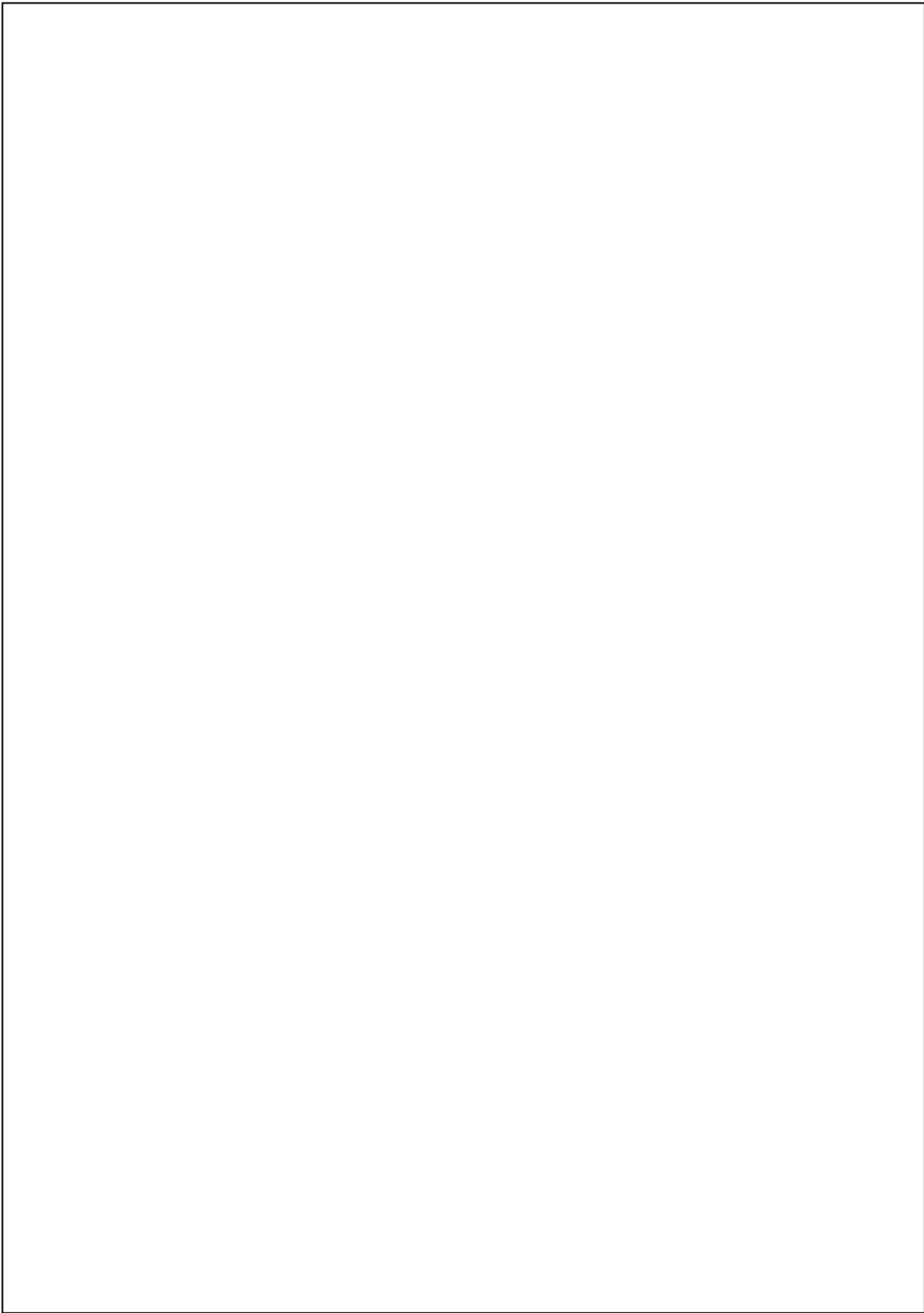
The Kingdom of Cambodia is situated in Southeast Asia and bordered by the Gulf of Thailand, Laos, Thailand and Vietnam (Figure 1). The total area of the country covers 181,035 sq. km. Cambodia has a coastline of 435 km, extending along the Gulf of Thailand. The coastal zone is a habitat significant for the marine ecosystem including mangrove forests, coral reefs and seagrass.

Cambodia's climate, which is typically hot and humid, is dominated by tropical monsoons. The average annual temperature is around 27 °C with a maximum average of 38 °C in April and a minimum average of 19 °C in December. The rainy season is from about May to October and the dry season from about December to May.

Cambodia's economy is based on agriculture, rice, timber and fisheries. Fish production is estimated to be 5% of GDP. Fisheries play an important role in the national diet and the socio-economy of country. About of 40-60% of the protein intake of the Cambodian population is provided by fish.

Marine capture fisheries and marine science were developed when the seaport of Sihanoukville was established in 1950. Modern fishery technology was introduced in 1958. The fish trawler was introduced by Thai and Vietnamese fishermen in the Cambodian sea. Marine fisheries activities gradually grew during 1970 to 1975. The annual report of production was approximately 45,000 tons/year. After 1975, the marine fisheries industry infrastructure of Cambodia, including manpower, equipment, and fisheries industry was destroyed by the Khmer Rouge regime (1975-1979). At that time, marine fisheries activities were exploited very little in coastal provinces because this regime did not allow fishermen to catch fish and exploited fisheries resources for supporting the Khmer Rouge army only. There was no data on fish production and fishing boasts. And addition, the exploitation of marine fisheries

Figure 1 Map of the Kingdom of Cambodia and its Main Transport Network



was increased gradually from 1979, at the beginning of the new Cambodian government.

On the other hand, Cambodia's marine fisheries at the present are faced with difficulties because of the lack of qualified manpower and a proper infrastructure. In addition, due to the lack of government management, the marine fisheries resources are coming under increasing pressure from a variety of developments, such as over-fishing and uncontrolled illegal exploitation of resources. This situation has led to weak management and undevelopment of marine fisheries in the present.

The purpose of this paper is to present the various issues and problems such as the administration system, regulation, human development, and monitoring, controlling and surveillance (MCS), which impact the present development of marine fisheries in Cambodia. It will also recommend to the government to consider review of the fisheries administration system, legislation and its regulation to comply with the International Convention.

2 Present status of marine fisheries management

The Ministry of Agriculture, Forestry and Fisheries (MAFF) has large responsibilities for the management, exploitation and control of natural resources in Cambodia. The Department of Fisheries (DOF) directly under the MAFF is responsible for marine fisheries management. DOF has a mandate for the management of activities related to water, fisheries, flooded forests, mangroves, swamps and fishery industries (Figure 2). DOF is also responsible for conducting ecological and socio-economic research to provide information for developing plans to manage marine fisheries. However, the effectiveness of marine fisheries management in Cambodia has been limited because of lack of existing legislation of marine fisheries and its enforcement.

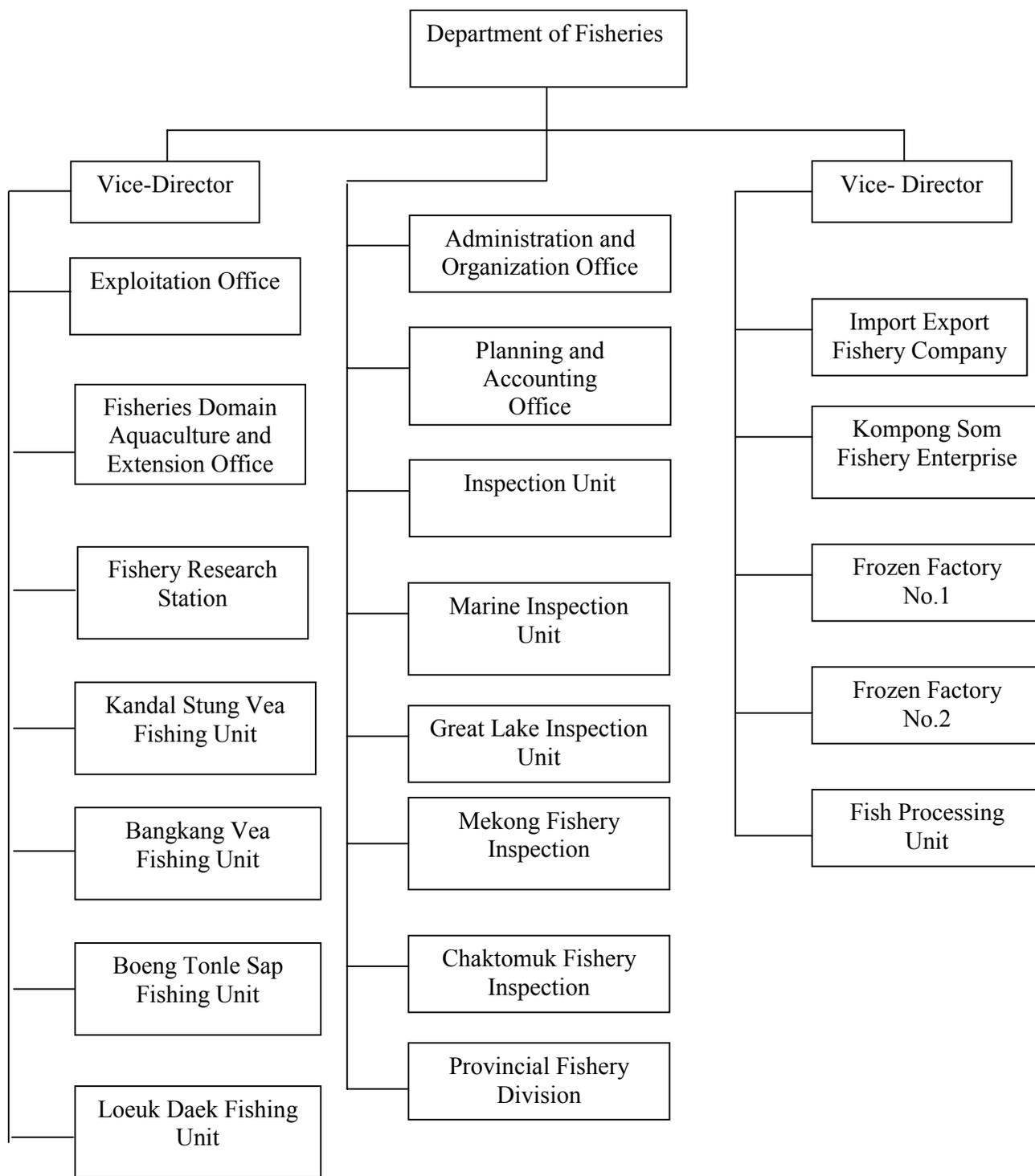


Figure 2 Organizational Structure of the Fisheries Department

Source: DOF, 1998

2.1 Types of fisheries stock in the exclusive economic zone (EEZ)

Cambodia declared its territorial sea and EEZ in January 1978. It is located between longitude 8 ° and 12 ° north and latitude 101 ° and 104 ° east in the Gulf of Thailand (Figure 3). Cambodia's EEZ covers 55,600 sq. km (World Resources Institute, 1994). It is recorded that an Oceanographic Institute was established in 1960 at Sihanoukville for conducting marine research and for collecting marine scientific data within the Cambodian Territorial Sea and EEZ, but it was closed during 1975 to 1982.

During 1983 to 1986, marine fisheries research scientists from the former Soviet Union and national officials collaborated on a survey of the fisheries resources again within EEZ and showed that there were more than four hundred fish and crustacean species from ninety four families. As resulting from this research, it was identified that pelagic and demersal groups are important for the commercial fishery market in the country and for the export market (ICLARM, 1998). The pelagic group includes mackerel, anchovy, sardine, scad, small tunas and pomfret. The demersal group includes croker, big eye, lizardfish, hairtail, flatfish, snapper, barracud shark and conger.

On the other hand, these scientists also estimated that the marine fish stock was about 50,000 tons in the Cambodian Sea, of which 20,000 tons per year could be caught for a maximum sustainable yield. The squid stock to have caught was 800 to 1000 tons per year, while shrimp stock was not identified because the research was not completed.

Furthermore, it was reported that the fish, squid, and shrimp have been exploited heavily (Figure 3) within the Cambodian waters since 1983, including legally and illegally, by foreigners and Cambodian fishermen due to lack of proper control and mismanagement of the fisheries authority.

2.2 Fishing boats and vessels

Most of the marine fisheries have been exploited in the form of joint venture between Cambodian fishermen and Thai fishermen and by local fishermen. Modern fishing practice was introduced to Cambodian water during 1958s. The total number of fishing vessels recorded before 1975 was about few hundred units whose capacity of engine power was not higher than 50 hp. Thai fisherman have also been introduced the shrimp trawlers since 1981. The most common varieties of vessels used in marine fisheries are trawlers, long lining and gill nets. However, boats without motors are used to operate beach seining, fishing barriers, fishing weirs, gill nets, crab traps and netting, squid trapping, push netting and long lining (Apheda, 1995). Motorised vessels rapidly increased since 1981. The capacity of these vessels is about 100 hp to 400 hp. Furthermore, it reported that there is a number of these vessels smuggling goods under the title of fishing vessels due to the lack of fishing management authorities.

The shrimp trawler and mackerel purse seines have been permitted by DOF to be utilised in the Kompong Som bay. There are two fisher groups within the two areas: one is located in the Thmar Sar/Chamlanf Kor or Koh Kong province and in the other group is located in the Tomup Rolork of Sihanoukville (ICLARM, 1998). Many of the trawlers have two nets to permit shrimp fishing at night and fin fishing during the day. Up to 70% of the trawl catch is trash fish. The most of purse seines have a 42 hp engine capacity, are in the 5-100 gross tonnage range, and have nets of a maximum length of 500 metres (NEAP, 1998). They operate seasonally from July to January, targeting pelagic, and frequently tie-up for the remainder of the year. The long liners and gill-netters fish year-round, targeting pelagic in season and mullet as a secondary species.

It also is recorded that since 1980 until 1983 there is no clear data on the number of fishing boats and vessels. In 1994, the Department of Fisheries had 6,173 vessels

Table 1 Coastal fishing boats and vessels, 1983-94

Year	Boat <5t	Boat >5t	Motorboat <10hp	Motorboat >10-30hp	Motorboat >30-50hp	Vessel >50 hp
1983	553	*	1436	446	203	205
1984	1801	*	1395	539	206	210
1985	2449	*	1429	550	205	217
1986	2453	*	1460	553	208	253
1987	2801	*	1695	482	305	312
1988	2807	*	2027	531	350	372
1989	1869	*	1291	341	213	402
1990	1176	263	903	489	413	431
1991	1000	809	960	718	230	178
1992	945	506	1,000	1162	187	180
1993	882	350	1,082	1377	250	186
1994	746	1,928	4,767	205	179	276

* No available information.

Source: DOF and Tana, 1994

registered. Of those 12% were not motorised and all of these were less than 5 gross tons; the majority of the fishing vessels, 77 %, were motorised with engines less than 10 hp (Table 1).

The small boats and low capacity motorised vessels are often confined by DOF to be utilised to inshore waters. These vessels operate for short periods of less than 24 hours. There are few vessels, such as foreign vessels or vessels of joint ventures between Cambodian and Thai fishermen that have been exploited in offshore waters. However, it is also reported that some vessels operating in inshore and offshore water are not registered by DOF (People of Sihanoukville, 1998).

On the other hand, the use of new and modern fishing methods has increased catch rates and over-fishing, and led to an additional decline in the sustainable fish population. Therefore, the government and ministries concerned should consider these problems strictly in national regulation, with the provision of mandatory seizure of vessels, gear and catch in order to manage the marine fisheries activities.

2.3 Production

The exploitation of marine fisheries resources in Cambodia originates from two sources: marine fisheries capture (inshore and offshore) and coastal aquaculture (Figure 3). During the 1960s, the average annual report of fish production was about 170,000 tons, of which 120,000 tons were from inland waters, 45,000 tons from coastal waters and 5,000 tons from freshwater aquaculture (Csavas, et al., 1993).

According to the Department of Fisheries reported in the table 2 that marine fish production in coastal zone provinces has ranged from a low of 814 tons in 1981 to a high of 39,000 tons in 1990. It then went into decline from 1991 to 1997.

Figure 3 Inshore and offshore fishing grounds

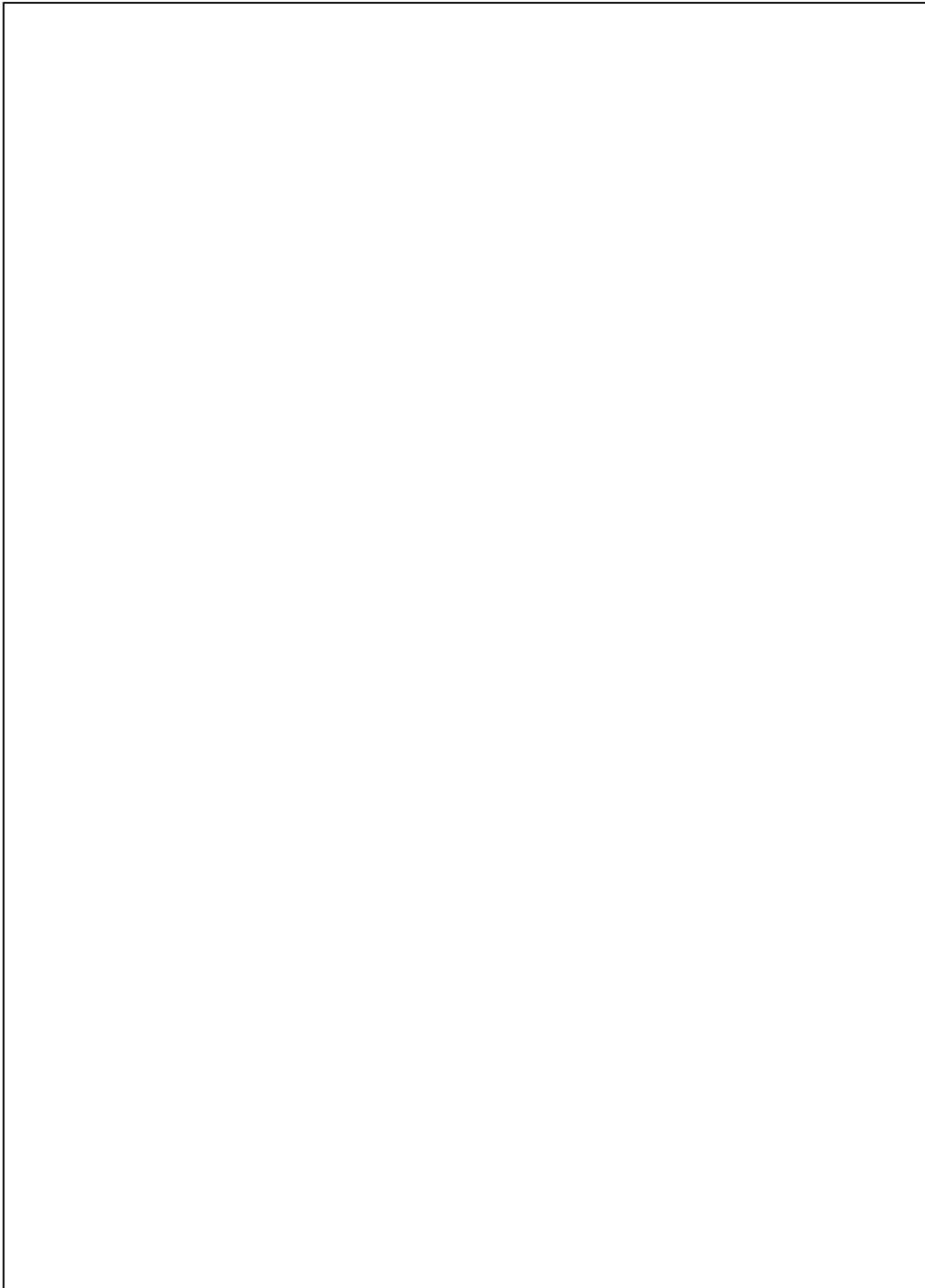


Table 2 Marine Captures in Coastal Zone Provinces, 1980-1997 (tons)

Year	Coastal Zone Provinces			Total
	Kampot	Kampong Som	Koh Kong	
1980	200	500	500	1,200
1981	567	247	0	814
1982	1,015	1,002	998	3,015
1983	7,376	2,068	0	9,444
1984	5,670	1,363	688	7,721
1985	5,216	2,248	3,714	11,178
1986	2,396	1,202	3,649	7,247
1987	5,755	5,150	6,512	17,417
1988	7,673	7,890	5,437	21,000
1989	8,000	9,120	8,930	26,050
1990	8,030	9,300	22,570	39,900
1991	8,100	8,300	20,000	36,400
1992	8,100	8,600	17,000	33,700
1993	7,940	8,560	16,600	33,100
1994	7,600	8,700	13,700	30,000
1995	7,400	8,600	14,500	30,500
1996	8,050	7,900	15,250	31,200
1997	7,200	7,750	12,050	28,000

Source: DOF, 1997

However, the marine fish production data collected by the Department of Fisheries are not systematic (Table 2 and Table 3), because these data seem to contain no data related to catch fish whether both inshore and offshore harvests and to exceed the estimated maximum sustainable yield. Therefore, it is difficult to identify trends of

specific fisheries resources and the impact of fisheries resources exploitation and management.

Table 3 Seafood Production, 1990-98 (tons)

Year	Finfish	Shrimp/ Krill	Crab	Mollusc	Squid/ Cuttle fish	By Catch	Lobster	Total
1990	13,687	5,233	2,499	1,661	3,025	12,447	648	39,900
1991	16,540	3,796	2,421	3,133	1,297	9,054	159	36,400
1992	13,723	4,593	2,270	3,012	1,260	8,660	162	33,700
1993	12,838	3,237	2,373	3,148	983	8,484	160	33,100
1994	14,244	3,629	2,647	1,015	1,066	7,306	89	30,000
1995	14,135	4,524	2,352	1,850	1,105	7,484	132	32,582
1996	14,005	3,707	2,296	1,320	1,280	8,000	100	31,200
1997	15,818	4,916	2,070	1,768	1,120	7,916	80	33,087
1998	14,900	5,100	2,420	1,660	1,300	8,200	120	34,400

Source DOF, 1998

2.4 Coastal aquaculture

Coastal aquaculture has primarily been established in Cambodia since 1980. The most important activity of coastal aquaculture is the shrimp farming that is located in the Koh Kong and Kompot provinces, which are attracting further investment in Cambodia. Other cultures such as oyster and fish culture are found in Koh Kong province. However, these cultures were not developed because of financial support. And addition, shrimp farming are also faced significant environmental problems, including economic loss due to shrimp disease and self-pollution of culture area

caused by indiscriminate discharge of pond effluent, and resource conflict, particularly with farm located in or near mangrove areas.

2.4.1 Shrimp aquaculture

The shrimp farming is traditional and operated by small-scale farmers and local fishermen. In 1991, Thai shrimp farmers and businessmen introduced intensive shrimp and traditional extensive farms to Cambodia. The intensive shrimp farms are found in Koh Kong province and the traditional extensive farm are found in Kampot province (Table 3). Most of the material and technology for farming construction and operation was imported from Thailand. The main species of shrimp farming are *P. Merguensis* and *P. Monodon* (Table 4).

Table 4 Shrimp Farming System, 1994

Farming system	Location	Species
Traditional extensive	Kompot	<i>P. Merguensis</i>
Modern extensive	Koh Kong	<i>P. Monodon</i>
Small (< 5ha)	Koh Kong	<i>P. Monodon</i>
Medium (5-20ha)	Koh Kong	<i>P. Monodon</i>
Large (>20ha)	Koh Kong	<i>P. Monodon</i>

Source: Tana, 1994

Most of shrimp farms are operated by Thai people and/or in joint ventures between Cambodian landlords and Thai farmers. It is reported that most shrimp farms have been dug in mangrove area and the stream banks of estuarine water in Kom Pot and Koh Kong provinces.

On the other hand, uncontrolled growth of aquaculture ponds for shrimp farming cultivation has led to a huge destruction of the mangrove forest in Cambodia. These practices need to be monitored to regulate the development of aquaculture and ensure that environmental degradation does not continue. In early 1994, about 117 shrimp farms of 1272 ha were licensed by the Department of Fisheries, of which 500 ha were already operating during construction (Table 5).

Table 5 Shrimp farms in Cambodia, 1994

Provinces	Farm area (ha)	Number of shrimp farms	Production (tons)
Kampot	422	63	23
Koh Kong	850	54	450
Total	1272	117	473

Source: DOF, 1994

2.4.2 Mollusc culture

This species is not very attractive in Cambodia. It is reported that there are two farms only for oyster culture of about 0.5 ha each in Koh Kong province. The oyster culture was primarily established in 1994, but it was not developed because of market constraints and lack of financial support.

2.4.3 Fish culture

The cage culture is found in Dong Tong River in Koh Kong province. It is reported that one private shrimp farmer in mid-1993 introduced the cage culture. But this cage

culture collapsed after 2 months of stocking because of the lack of technical support and the impact of freshwater during heavy rains in August 1993.

2.5 Legislation

Cambodia's fisheries legislation that the Ministry of Agriculture, Fisheries and Forestry (MOAFF) promulgated on March 1987 is copied from the old legislation in force 1956-58. Fisheries Law No. 33 on fisheries management in Cambodia is divided into 6 chapters and 44 articles covering definitions, exploitation of inland fisheries and aquaculture and processing of freshwater products, exploitation of marine fisheries aquaculture, processing of marine products. In the Fisheries Law there are detailed 40 different types of commercial gear permitted in marine fisheries. This gear includes trawl, purse and other seine nets; gillnets; traps; and hook and line (Tana, 1994).

The legislation has also placed a ban on motor-pulled trawls in water less than 20 m deep, which is intended to prevent over-fishing, in particular during periods of relatively large concentrations of fish, such as during the breeding seasons. However, the old legislation mostly focused on inland fisheries only; it did not place any importance on regulating marine fisheries management. The current legislation also lacks consideration of the marine environment and ecological protection. Furthermore, the effectiveness of the current fisheries legislation is limited because it lacks enforcement. The legislation is also not consistent with the current international law.

2.6 Administrative System

The marine fisheries management of Cambodia consists of two levels. One level is the central administration and the other level is the administrations of provinces and municipalities. Such an administrative structure causes difficulties in controlling

fisheries management. Sometimes, there also overlaps in implementation (e.g. data collection and fisheries inspection). Such a structure is not conducive to strong fisheries management. Of fisheries administration personnel a total of 43% are employed in central administration and 57% in provinces. However, there is also a lack of adequate staff with good training on professional fisheries management. Most of those employed are classified as unskilled: 67% in the central administration and 68% in the provincial administration (Tana, 1994). For example, in the provincial office of Sihanoukville, only two out of 55 have some training in fisheries management.

Though the DOF generates substantial income for the national treasury, its budget is insufficient to meet operational requirements. In 1995, for example, the DOF generated US\$ 4 million in revenue including US \$300,000 from the sale of fishing permits, fines and other fees from the three coastal provinces, but its total budget for both marine and inland operations was only US \$200,000 (NEAP, 1998).

3 Some major constraints in the development of marine fisheries

In Cambodia, marine fisheries are developing very slowly because there are some constraints conflicting with marine fisheries management, for example management capacity, legislation, human resources, processing and marketing.

3.1 Weak management capacity

As mentioned above, the Department of Fisheries (DOF), under the Ministry of Agriculture, Fisheries and Forestry (MOAFF), is responsible for the development and implementation of policies and legislation for managing the marine fisheries. However, because of human resource deficiencies and budgetary constraints, they have encountered difficulty in successful implementation in the developing fisheries sector. Although the department has a mandate to administer the Fisheries Law, the

lack of staff with training and experience has limited the Department's ability to manage the fisheries.

The policy of the Royal Government of Cambodia regarding financial resources for marine fisheries management need to be more generous. The management and administration have difficulty in following up by enforcing regulations because of the shortage of funds and low salaries of staff, which average 20 US dollars per month, and because budgetary allocation for fisheries management activities is inadequate. Budgetary allocation is limited and decided by the Ministry of Finance. Budgetary constraints have precluded effective management of the fisheries. For example, they need to buy equipment and boats for fishing, surveillance and enforcement activities, but they do not have funds. The enforcement unit in Sihanoukville has three boats, the largest of which is 20 m in length with a maximum speed of about 8 knots (MOE, 1996). These vessels are old and not well equipped for enforcement operations on the high seas. However, violators are well equipped and the fishery authorities have difficulty in catching them.

On the other hand, the other constraints that inhibit the fisheries administration are a lack of policy delineating the roles and responsibilities of the central and the provincial fisheries administrations, duplication of effort (e.g. monitoring, control and surveillance), and lack of decision-making capacity. The policy formulation and strategic planning capacity in the Department of Fisheries is insufficient.

3.2 Inadequacy in the present legal system for fisheries management

A major constraint on fisheries management in Cambodia is the lack of a legal and policy framework for fisheries management with which to implement it. Fisheries Law No. 33 and its regulation, which replaced the old Fisheries Law of 1956-58 and its regulation, in force in March 1987, are inadequate for the current real situation at the present. The inadequacies include the following:

- The efficiency of legislation enforcement is poor, which causes weakened fisheries management.
- There is no provision to limit the size or age of captured marine fish, especially endangered marine species. The fishing gear called the machine pushing gear for shellfish exploitation on the bottom of the water, which is destroying the seabed ecosystem, is not prohibited.
- This law (Fisheries Law No. 33) has never been amended.

3.3 Lack of human resources and public awareness

In order to achieve effective management of the fisheries, human resources and public awareness are of key importance and should be addressed. The lack of human resources and public awareness in fisheries management involve a number of constraints such as the following:

- A lack of suitable qualified persons, who have the appropriate qualification, knowledge, skill and experience in professional fisheries in the local authorities.
- A lack of knowledge of marine fisheries management and protection among the local people, especially fishing farmers. The property of the local people is also a critical factor contributing to pressure in the use of natural fisheries resources.
- A lack of availability of suitable educational funds for supporting education programmes on the local and the national level.

3.4 Unregulated fisheries

Rampant over-fishing and unregulated development pose serious constraints on marine fisheries such as the following:

- People's exploitation of natural resources (legal and illegal) is not sustainable.

- The management of the government in controlling illegal exploitation of resources is weak.
- Fishermen are catching all kinds of fish with various devices such as explosives, electricity, light and fine mesh nets that can lead to the destruction of fish resources.
- Over-exploitation of marine fisheries in offshore and inshore water by local people and foreign fishermen is increasing. Some of the foreign vessels have reportedly been poaching or colluding with local people to illegally secure fishing rights in the Cambodian EEZ.
- Infrastructure and supporting services (e.g. roads, ports, facilities and fuel) are inadequate.

3.5 Monitoring, control and surveillance (MCS)

The effectiveness of monitoring, control and surveillance of marine fisheries is principally constrained by such factors as the following:

- Lack of strong enforcement of fishing law and regulation within the Cambodian water. There is little patrolling of the EEZ by Cambodian authorities.
- Lack of availability of suitable equipment and patrol boats for control over fishery activities within the Cambodian waters.
- Lack of suitable technical staff for the enforcement of fisheries legislation.
- Low morale among MCS personnel because of poor remuneration and lack of physical resources to execute their mandate.
- Unawareness by many fishermen of fisheries legislation.

3.6 Coastal aquaculture

Coastal aquaculture in Cambodia faces the following major constraints:

- Lack of fish feed/feed ingredients for a significant expansion of fish and shrimp culture. Lack of fish seeds.
- Unsuitable design of ponds for the conditions of target villages because of a lack of skill and expertise.
- Lack of understanding and extensive knowledge of the local people on the induced breeding and larval rearing method of preferred species for culture.
- Lack of equipment for supporting services.
- Lack of financial support.
- Lack of co-ordination and co-operation among government officials, inhabitants and various agencies.

3.7 Processing and marketing

There are a number of constraints related to the domestic and export marketing and distribution of fisheries products, which should be considered, including the following:

- Lack of marketing information.
- Defective marketing and distribution system for internal marketing and export.
- Political and economic instability in the country.
- Lack of financial support.
- Lack of operation of a number of the fish sauce factories because of lack of technical assistance and spare parts for repairs.
- Lack of investment in the industry of fisheries.
- Lack of processing infrastructure and post harvest technology.

3.8 Marine and Coastal Environment

The three provinces Koh Kong, Kompong Som, and Kampot share Cambodia's 435-kilometer (km) coastline (Figure 4). It is estimated that only 5% of the country's

population live in these provinces. The coastal zone of Cambodia contains many mangrove forests and numerous bays and beaches. Cambodia's mangroves are mainly found along the coastline and estuarine areas (Peam Krasob/Koh Sralao, Andong Tuk, Sre Ambel, Chak Sre Cahm and Delta of Prek Kampot).

It was recorded in the past (before the 1970) that the mangrove forest covered about 37,000 ha of the Cambodian coast, of which 17,000 ha were found in the Kompot province and 16,400 ha in the Sihanoukville (Tana, 1994). However, according to the Mekong Remote Sensing Landsat 's study in 1992 shown that the total area of mangrove forest covers about 85,100 ha. Of this area about 63,700 ha are located in Koh Kong, 13,500 ha in Sihanoukville and 7,900 ha in Kampot province and the resort Kep city (ICLARM, 1998). There are 17 families and 34 species of which *Rhizophora mucronata* and *Rhizophora conjugate* are significantly important.

The coral reefs provide an area of high productivity for the marine ecosystem. Coral reefs can be found around the islands (Koh Daung, Koh Karang, Koh Rong Sanlem, Koh Russey, Koh Tang, Koh Pring and Koh Chlarm). Cambodia's coral reefs have many species such as *Sarcophyton*, *Diploria*, *Pocillopora*, *Fungia*, *Hydrophora Rigida*, *Moutiphore Aequituberculata*, *Favita*, and *Platygura*. The Cambodian coral reefs are similar to those of the coast of the near by Thai provinces of Chanturi and Trat. The coastal zone generally has a great number of species of corals, sea grass and mangrove, which are intertwined in complex and highly productive ecosystems. This plays a role in the survival of some fish species and marine organisms. Mangrove forests provide essential nutrients including detritus, planktonic and benthic organisms and leaf litter for marine organisms in the inter-tidal zones. Mangrove forests also serve as spawning or nursery grounds for several commercially important fish species.

On the other hand, Cambodia's coastline has been damaged recently by various developments including mangrove forest deforestation for agriculture, aquaculture,

domestic fuels, and sand mining. For example, people have sold about 700 ha of mangrove forest to investors who live outside these provinces for shrimp farming. It has also been recorded that the coastal environment of Cambodia is rapidly being degraded through intensive marine aquaculture development and the exploitation of mangrove forest for coal.

3.8.1 Degradation of critical habitats

Many factors currently threaten the marine and coastal ecosystem of Cambodia, especially inshore areas, as the result of various activities and the development of aquaculture. Many hectares of mangrove forest have been converted to aquaculture ponds, especially in Kompot and Koh Kong provinces. Mangrove forest has been heavily exploited for aquaculture and fuel coal without reforestation since 1982. More than 3% of the mangrove forest in Koh Kong has been exploited for shrimp farming (MOE, 1995).

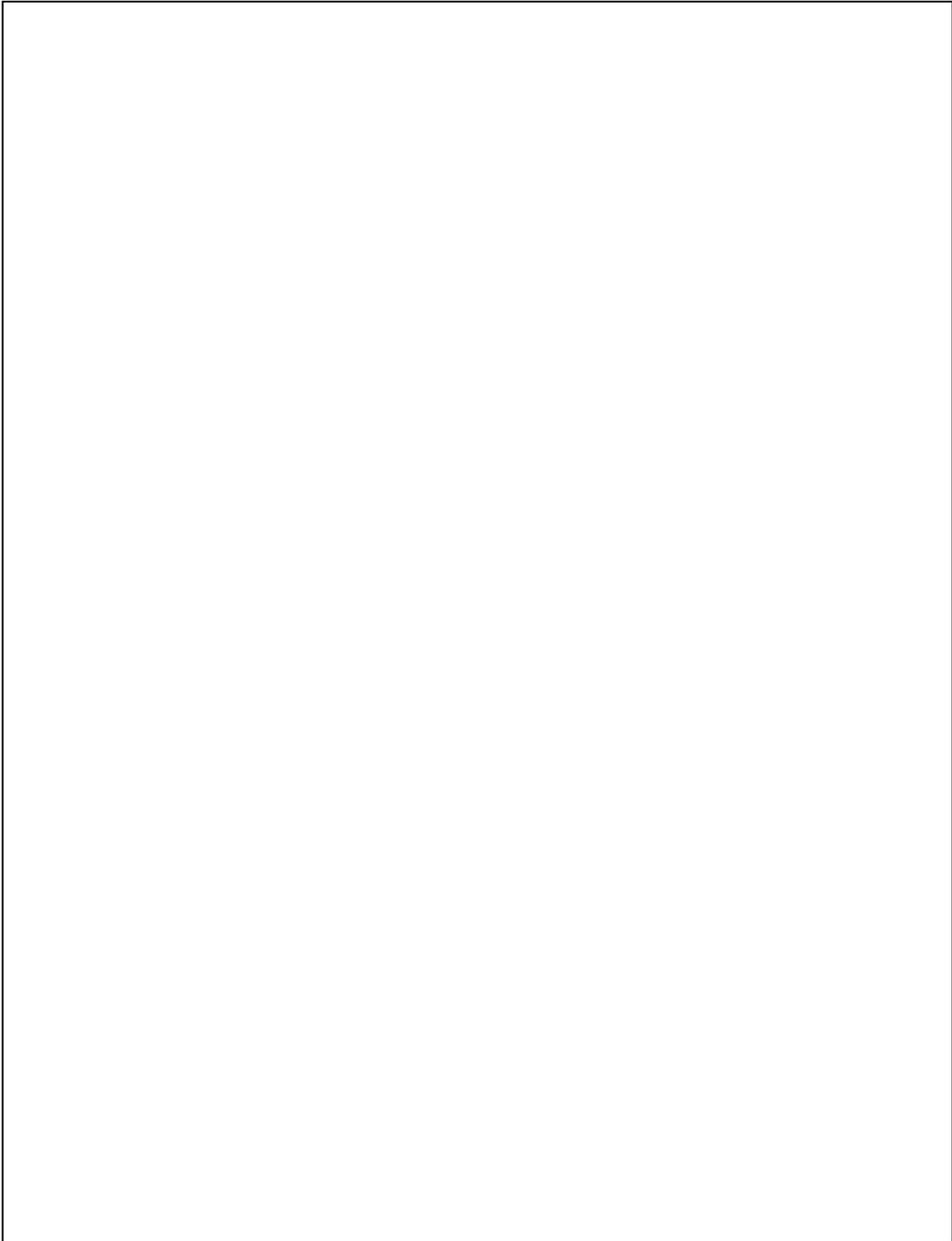
In 1994, about 238 ha of mangrove areas were converted to intensive shrimp farms, 177 ha of pond were under construction, and the Department of Fisheries had approved 425 ha of ponds for construction. This trend has accelerated because of growing interest in these relatively pristine mangrove areas for shrimp farming by local people and foreign investors from Thailand and Taiwan.

However, over-exploitation of mangrove forests for fuel wood can also adversely impact the marine fisheries. Presently, over-exploitation of mangroves in Cambodia appears to be localised, but this could become a major problem in the coastal areas if action is not taken. Harvesting of mangrove forest for charcoal making is one of the major causes of degradation. It has also been recorded that about 100,000 tons of mangrove trees were harvested in 1992 to produce 24,000 tons of charcoal, 90% of which was exported to Thailand and other Southeast Asian countries (MOE, 1998).

Figure 4 Coastal areas of Koh Kong, Sihanouk Ville, and Kompot



Figure 5 Coral Reef and seagrass beds in the EEZ



Some areas of coral reef and seagrass are found in bad condition (Figure 5) due to sedimentation, in the Polowaii and offshore island areas. Coral reef are found well that is located around Koh Rong, Sanlem, Koh Russey, Koh Taeiev, Koh Thmey, and Koh Ses island of Sihnoukville; Koh Tunsay of Kep city, and Koh Tang, Koh Pring and Koh Clarm offshore island. However, these areas are seriously under threat by human activities such as fishing and coral collection for selling.

3.8.2 Destructive fishing methods

Most fishing vessels complete to exploit inshore resources rather than offshore. Virtually all marine fish stocks are currently being exploited, using unsustainable methods of fishing. This is resulting in a general decline in the quantity of fish available, although quantities have fluctuates over the years.

Destructive fishing methods include the use of push nets and drag nets with small mesh sizes captures in seagrass bed, depletes stocks of juvenile fish and destroys the coral reef and seagrass ecosystem vital to the existence of many fish species. It is also shown by APHEDA's study in Kompot that users of the nets specifically aim at fishing in seagrass beds. The use of dynamite for fishing has permanently destroyed coral reefs, juvenile fish, and ecosystems for rearing fish.

4 The need to improve marine fisheries management

The population growth in Cambodia will increase the demand for fish, and is expected to substantially increase harvesting pressure on the marine fisheries in particular inshore and offshore. Therefore, Cambodia needs a basic framework for managing human activities in its ocean waters to improve the management of marine fisheries. The Cambodian government should have a strategy management policy to ensure sustainable resource use. The government should strengthen and extend the marine fishery monitoring, control, and surveillance capacity of local authorities to

enforce fishing activities within the Cambodian water and to ensure that fishery management measures are observed. Therefore, for the effective and successful implementation of a policy for marine fishery management, the author proposes the following:

4.1 Marine captures fisheries

- The system and facilities for receiving, processing and distributing marine fisheries products should be upgraded.
- The lack of statistics related to fishing efforts and catches, and any other basic data needed to conduct assessments of status, trends and ecological surveys is a problem in marine fisheries sectors. To enhance these data, the government should establish a marine fisheries research centre or if possible an oceanography institute, in the coastal area of Cambodia. However, the government should collaborate with international institutes as it did successfully with the former USSR in the 1980s.
- The government should establish a strict policy or regulation related to foreign fishing vessels in Cambodian water.
- The monitoring and controlling programme on fishing activities along the coast of Cambodia needs to be improved strengthened.
- Fisheries management plans for sustainable use that incorporate mechanisms limit the catch should be promulgated.

4.2 Coastal aquaculture

To improve coastal aquaculture in Cambodia, the following should be conducted:

- A strict regulation on foreign fishermen on the Cambodian territory; should be established, if possible a joint venture between national and foreign fishermen may be accepted with regard to sustainable development.

- Aquaculture development should be controlled strictly to provide an effective technique, which can lead to the decrease of aquaculture yield and to prevent the degradation of the environment such as mangrove forest.
- Policies and programmes to ensure sustainable use of natural resources for aquaculture development should be promoted.
- There should have strict planning including the Environmental Impact Assessment (EIA) in assessing development projects that could affect fisheries, the environment and other living marine resources.
- There should be consultation and co-ordination with national and local agencies responsible to ensure sustainable resources use.

4.3 Legislation

- Foreign fishing vessels should be prohibited within Cambodian Sea waters.
- The government should monitor and control the fishing activities of vessels to ensure compliance with applicable conservation and management rules, including accurate, detailed and timely reporting of catches.
- A strengthening of penalties should be included in regulation, with the provision of mandatory seizure of vessels, gear and catch, which may discourage illegal fishing activities.
- There should be stringent regulation on environmental protection in respect to the marine area to control coastal zone and various developments that lead to destruction of natural resources such as mangrove forest, coral reefs and seagrass.
- There should be a clear definition of between national and foreign fishermen and imposition of stricter licensing requirements on foreign fishermen for jurisdictional reasons. This may also require consideration of a joint venture arrangement.
- Facilitating meetings with community organisations to determine what regulations are needed and acceptable.

4.4 Administration

Effectiveness management of fisheries requires strengthening the administration system. There exists limited technical skill in the marine fisheries research and management capacity within the fisheries authority. Thus, priority to provide short term and long term training at the local level and national level for staff of fisheries is necessary and should address the following:

- To undertake a comprehensive capacity building programme for fisheries provincial officers in the coastal zone, especially in Sihanoukville, Koh Kong and Kompot provinces.
- To develop plans and strategies within the organisation and co-ordinate with local governments, line agencies, industries and NGOs in the implementation of the strategy plans to enhance the sustainable use of fishery resources.
- To recommend to the local legislation (provincial, city, or municipalities), wherever appropriate that may require certain legislation in support of a more efficient and effective control and enforcement.
- To encourage central government agencies to collaborate with community groups in management tasks.
- To conduct workshops (meetings) for fishing boat owners, regarding the regulations relating to marine fisheries management.

4.5 Monitoring, controlling and surveillance (MCS)

As an effective way to ensure the monitoring, controlling and surveillance system, the following should be conducted:

- Providing sufficient funding to carry out the effectiveness of MSC programmes to eliminate over-fishing, reduce catch, and identify and protect essential fish habitats.

- Reviewing their management systems and insuring that they too have enforceable means of eliminating over-fishing, reducing catch, and protecting essential fish habitats.
- Co-ordinating with national agencies and local governments to ensure that the MSC programme and its activities are conducted in an effective way. The co-ordinating activities shall be established as a working group.
- Equipping vessels with modern technology and equipment for the working group should be provided to work effectively for control over fishing activities.
- Co-operating with neighbouring countries to control illegal fishing activities in the region of the EEZ, especially foreign fishing operations.

4.6 Human resource development

Because of the current lack of human resources in the fisheries management and science, the following measures are important:

- Establishing a national institute on fisheries management to produce scientists and management people for sustainable development of fisheries in Cambodia.
- Co-operation with international institutes and finding scholarships for staff to study abroad to develop good experience in fisheries management. This should include short training programmes to brush up their knowledge.
- Providing short-term training to local staff to enable them to work effectively, especially for people who can not go to study abroad.
- Equipping training programmes and research centres with modern facilities, for control and surveillance of changes in fisheries production as well as fisheries resources.
- Providing guidelines or special short training programmes for fishermen.
- Conducting planning workshops with community groups.

- Training and educating the local government and personnel responsible for law enforcement and providing moral and physical support for them in order to enable working in the right situation.

4.7 Processing and marketing

Regarding marine fisheries processing and marketing the government should:

- Infrastructure improvements needs in marine areas to facilities domestic marketing and exports of marine products.
- Encourage improving or increasing aquaculture production to avoid over exploitation of marine fisheries resources.
- Restrict illegal exports of marine fisheries to neighbouring countries in order to contribute by taxation to the government fund.
- Increase and improve marine fisheries processing either for local use or for exportation. This way can contribute to national employment and national income, especially in the coastal zone area.

4.8 Co-management of Fisheries

To improve marine fisheries, the government should establish or strengthen co-ordinating mechanisms for integrating management of marine areas and their resources that can be affected. Such mechanisms should include consultation with other concerned ministries and institutions, the academic and private sectors, NGOs, local communities and public people. Additionally, monitoring, control and surveillance of fisheries in the sea, especially in the EEZ, demand that the government should have co-operation with neighbouring countries for control over illegal fishing activities and to exchange data and information on the fish stock. There shall also be collected regular data and information to control inshore and offshore areas, and to determine the level of allowable sustainable pressure on the

fish stock for catching the maximum sustainable yield, and to prevent over-exploitation of marine fisheries resources.

On the other hand, the effective and successful implementation of a policy for marine fisheries management should continue to improve the quality and efficiency of staff of the management services with technical capacities. To strengthen manpower, the training of personnel at the local and international level to implement fisheries management should be encouraged. If possible they may find scholarships or donations to provide for staff to study abroad.

5 Conclusion

Marine fishery is one of the major sectors for socio-economic development in Cambodia that is capable of making a significant contribution to national food security. However, in much of the mangrove forest and other coastal areas the important sources of habitat have suffered relative degradation of their marine environment because of rapid human pressure. Additionally, the unregulated and uncontrolled development of aquaculture can have seriously environmental resources in the future. Therefore, careful multi-sector marine planning is required for environmental reasons and to ensure that the removal of mangrove stands and intensive aquaculture activities do not negatively impact on inshore fisheries and habitats.

The use of new and modern fishing methods, which might to an extent increase catch rates, would certainly cause over-fishing and lead to an additional decline in the sustainable fish population. Such marine fish stocks have been reportedly exploited excessive maximum fish yield. Therefore, the government should need to be defined strictly in regulation with the provision of mandatory seizure of vessels, gear and catch for unauthorised fishing in order to discourage illegal fishing activities.

The effective, successful management of marine fisheries would require strengthening the administration system. In particular the government would be required strengthen the monitoring, controlling and surveillance (MCS) through providing training and knowledge for local authorities in marine fishery management.

The data collection from inshore and offshore fisheries is essential to determinate the levels of the allowable sustainable pressure on the fish stocks, and to prevent over-exploitation of marine fisheries resources, and should be done annually.

In order to encourage the processing and marketing of marine fisheries species should be improved through public sector initiatives and support for the private sector. Infrastructure improvements are also needed in marine areas to facilities domestic marketing and exports of marine products.

Lack of public support is also a major difficulty in solving marine fishery management problem. This is due to lack of public awareness and insufficient attention to community participation in marine fishery management. The key to successful fish management may not be the funding alone, but the administration sources of the community. Programmes to raise awareness for fish management should have promoted by both Government and NGOs. Therefore, the government should also recognise and encourage the knowledge and fishery resource management methods or guideline to local people. These should have ranged from focused education programme to anti-littering campaign. Media coverage should be organised through advertisements in newspapers, televisions and radio, as well as through public information displays.



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