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**Trends of Development of Myanmar Fisheries:
With References to Japanese Experiences**

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SUMMARY

Judging by the increase in landing volume, Myanmar fisheries is developing fast. Due to the amount of export earning fisheries sector have its role as one of the main contributors to the national GDP. Thus fisheries are recognized as an important economic sector for the country. The fisheries landing is significantly increasing in recent years. It is more than three times larger than that of 1990s.

In 1990-91 the earning from fisheries export was only US\$ 13 million. It has been significantly increased in 10 years to US\$ 218 million in 2000-2001 and then US\$ 250 million in 2001-2002. Thereby fisheries export is promoted and the landings are given priority for exporting. Due to the lack of proper reporting and recording system, it is difficult to clarify the actual domestic utilization of fisheries products in terms of food or non food.

In 2005-2006 about 270,000 MT was exported. In this case it should be assumed the fresh products of about 450,000 to 675,000 MT was used as raw material. In other words 18% - 26% of the overall landing was used for export processing. Thus export surplus will be more or less 2 million MT. According to FAO estimation, 10% of landing is utilized as non food or animal feed. Then per capita utilization for 55.5 million peoples is estimated as 32.4 kg.

The Myanmar Foreign Investment Law, clearly states that the government's policy is to "increase export of any available surplus of the country". The proper usage of fisheries surplus can be made only after knowing the self efficiency volume of fish to meet nutritionally recommended level. However, in Myanmar there are no indications of minimum requirement of fish and never had been attempted to access it. In this context the onset of promoting fisheries export policy has adverse impact on adequate domestic supply of fish and leading to the degradation of standing fisheries resources. The volume of fisheries export is apparently increasing, however the proportion is generally ranged between 10% to 13% of total landing due to the declining of catch in high value commercial fish.

There are several reports that indicate declining of commercially important species resources. In Rakhine water, the landing of the shrimp in 2003 has reduced by 65% from that of 1991. Also in the Ayeyarwaddy waters, the overall catch rate of fishing vessels has declined from 260 kg per hour in 1980-81 to 130 kg per hour in 2000. The trends of the commercially relevant species that are declining include pomfret, Indian threadfin, croaker, marine catfish, sardines and small anchovy, grunts, conger eels and, ribbon fish etc¹.

As the source of foreign exchange earning, fisheries export has been promoted. In this regard the status of resources and recent utilization needs to be clarified for the sake of appropriate formulation of noble fisheries development policies. Therefore the following measures become the main tasks to support the sustainability of the whole fisheries industries.

¹ National Report of Myanmar on the Sustainable Management of the Bay of Bengal Large marine Ecosystem. 2004.

- i. assessment of standing fisheries resources
- ii. extension of resources management
- iii. efforts and capacity on analytical fisheries statistic
- iv. inputs of high value adding of the product (means to increase earning by quality oriented fisheries export rather increasing volume)
- v. extension of fisheries information
- vi. intensification of market promotion
- vii. range of subsidies and invest for research and development
- viii. measures of capacity building to render effective management

Japan is the second largest fish consuming country in the world after Iceland. The per capita consumption of fish in Japan in 2003 was 36.2 kg on a net weight basis while it was 67.4 kg on a crude weight basis. For the daily food supply 40% of the animal protein has received from fish and fisheries product, which is about 22% of the whole protein intake.

All along the coastal of Japan, there are about 6300 fishing villages under the management of prefecture governments. Historically, the village people are making a living through fishing. Due to the differences in resources endowment, each village has specific characteristics of fisheries products. Japan has been making efforts for the sustainability of fisheries resources focusing on the livelihood, adequate supply of quality fish as well as improve fisheries manufacturing and trading.

The annual landing from all areas according to species as well as volume has recorded and analyzed to grasp the status of resources and catching efforts. Generally the overall capacity of fishing efforts is controlled by the national and prefecture government licensing systems. However, the fishing operations are limited within the frame of “Total Allowable Efforts – TAE” and “Total Allowable Catch-TAC”.

Normally fisheries in the coastal are small scales. According to the Fisheries Law, the fishing villages in a form of fisheries cooperatives have privilege rights to explore and extend management to the adjacent fisheries resources. In this regard the maximum level of catch volume for every each species and season are notified by the Fisheries Agency through the Prefecture Governments. Since the fisheries are the livelihood of the fishing villages in general, the villagers usually behave fishing in a sustainable manner. Even there is the catch limit prescribed in the areas, fishers keep their limit on their own in order to further enhancement of the stock in future.

For the sake of the fisheries development, the Fisheries Agencies have been undertaking integrated fisheries research in collaboration with research institutes and Universities. The research policies are set up for resources management, stock enhancement, nutritional purposes and extension on introducing of potential species as food.

The fisheries products are primarily used for food, and the other uses are for animal feeds and fertilizers. The usages are categorized by volume as well as by species. Therefore it is possible to trace the contribution of fisheries for the people’s consumption and its value in

non food manufacturing. In the context of Japan Fisheries, it has been clearly noted the decline of fisheries resources decrease of landing down to 50% of its peak in 20 years. The policy makers acknowledge fishing records and statistical data in formulating fisheries planning. The catch and fishing efforts have been limited. Fisheries researches constantly conducted to support fisheries productions as well as determining the nutritional value of the species. The status of resources and catch efficiency are closely monitored by systematic data recording.

Apparently, one can make argument, Japanese fisheries management are reflected by its developmental status and modern infrastructure. However, my studies on Japanese fisheries enable to understand that all of fisheries management activities are based on the sound statistical reports and fisheries research.

For instance, the data of landing and trends of utilizing for every species has been properly recorded. The used of fisheries product for food and non food is classified. Per capita consumption as well as the rate of self efficiency could have been estimated properly. So that prominent role of fisheries for food security and its support to the livelihoods as well as efforts on wealth building have always identified.

The structure of whole fisheries sectors need to be transparently figured out. Then the policy makers can perfectly formulate fisheries development program which may include-

- effective use of resources by further identify of potential species
- upgrade the quality of the products by means of value adding

In this way benefits from trading based on quality rather than volume of the products will be achieved and fishing efforts and pressures will automatically decrease and giving path for the natural fisheries resources to restore and sustain.

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CHAPTER I INTRODUCTION

Fishery is an important sector for the socio-economic development of Myanmar. Fisheries sector contributes it higher to the national GDP and also important as a source of export earnings. The role of fisheries becomes more significant in the recent decade by increasing its share in GDP. The contribution of 7.2% in 1990-91 was risen up to 7.9% in 1999-2000 which further increased to 9.1% in 2005-2006.

Generally, fisheries in Myanmar are classified into three categories as marine, inland and aquaculture fisheries. It was estimated that about 3 million people (about 5% of the population) are directly employed in the fisheries (marine 1.3, inland 1.4 and aquaculture 0.3 million) and about 12-15 million people (22% - 27% of the population) are likely to benefit indirectly from the fisheries through improvement in food security, employment and income¹.

In 2005-2006 the earning from fisheries export was about US\$ 360 million, which was 80% increase compared to the end of 1990s. 160000 MT was exported in FY1998-1999, and then more or less doubled to 270000 MT² in 2005-2006. Such effort of fisheries has lifted the role of livestock and fisheries sector in the national economy. The livestock and fisheries has ranked in the forth position among the 14 economic categories. Particularly, the contribution from capture fisheries was about 1.7% and contribution from aquaculture was 1.2%.

The development of aquaculture is impressive in recent years due to the efforts of DOF in dissemination of integrated aquaculture methods and constant encouragement of the Ministry of Livestock and Fisheries. The increasing demand in local market as well as its large potential in the export markets has boosted more investment in aquaculture. The harvest of aquaculture is contributing to the total landing of the whole fisheries sector since 2001. In 2005-2006, about 22% of the total fisheries production was from aquaculture. Also as much as 20% of fisheries exports were of aquaculture products³.

After the implementation of three year project on the development of shrimp and finfish aquaculture (2000-2002), the establishment of aquaculture accounted as much as 407000 and the harvest reached about half a million metric tons. In this regard Myanmar was listed in the world's top ten aquaculture producing nation, with high contribution on Average Annual Percentage Growth Rate (APR) (45.1% for 2002-2004). The aquaculture production in 2004 was worth of US\$ 1231 million, Myanmar is among the top ten nations of the largest producing tilapia, and carp and barb species⁴. However, the constant supply of quality feeds and prevalence of disease are the challenges to the further development of aquaculture.

¹ Myanmar Agricultural Sector Review Vol.1 FAO, 2003

² Statistics of Fish and Fisheries product (2005-2006), Department of Fisheries, 2006

³ Fisheries Statistics, Department of Fisheries

⁴ Status and potentials of the fisheries and aquaculture in Asia and the Pacific, APFIC: FAO 2006

Inland fisheries play an important role in contributing in supplying fresh fish and fisheries products for domestic consumption. Producing 0.454 million MT in 2004, it was ranked in the 4th position in the world.

Although the fisheries sector is increasing quite remarkably, the challenge that it face is that they are exported as raw materials. The importers reprocess or transform them for further marketing. In this regard, it is needed to upgrade the product be semi-processed or value added in order to increase product value. The approaches to upgrade traditional fisheries processing and preservation methods as well as market promotion is also crucial for the effective utilization of fisheries resources.

Fisheries is, in other words is the exploitation of living resources. Extension of fishing efforts regardless of considering its natural recruitment capacity may cause the decline and eventually the deterioration of the resources. In this regard, the implementation of fisheries resources management comes into account. The recruitment capacity, favorable natural and environmental conditions, interferences of fishing pressure is among the several important factors to be considered.

In brief, to achieve sustainable development of the fisheries sector, the following will be highly crucial.

- the long term existence of the resources
- the effective utilization of the products
- Providing benefits from fisheries trade at every level

This study tries to identify the means and ways on the integration of fisheries product processing and extend trading of product in order to support further development of national economy. The study focuses on the small scales fisheries, on which less attention has been paid despite its important role.

The purposes of the study are to understand the following

- operational and institutional characteristics of the fisheries
- the trends of fisheries management system
- the role of fisheries research and development
- market needs and potentials to extend and promote Myanmar's fisheries product

The outcomes of this study are expected to support fisheries resources management and to identify existing fisheries resources in line with the local capacity. In this way the local fisheries especially the inshore coastal fisheries may

- utilize fisheries resources effectively
- benefit from fish trade through reduction of post harvest losses while improving the product quality
- increase earning by quality upgrading of the products while controlling fishing efforts.

CHAPTER II

STATUS OF FISHERIES IN MAYANMR

2.1 Overview of Fisheries in Myanmar

The history of Myanmar fisheries can be traced back to the mid of 1800s during the Kingdom of Ava. The fisheries were conducted in seasonal flood plains and permanent inland water bodies, called as (*Inn*). The fishing rights in such fishing grounds were leased by fixed rental fees. During the prewar period the fisheries revenue was approximately 7.5% of the annual total land revenue and provided employment to more than 70,000 (55,000 permanent and 16,000 temporary) fisheries workers in the early 1930s. The report on cost of living indicated an average family spent as much as 66% for fish to that spent for rice⁵. The lease holders *Innthugyis* were among the wealthiest and had influential roles in the society.

In contrast, the development of marine fisheries was far left behind due to the underdevelopment of consumer market, difficulties in transportation and less interest of the government. There were a few family based traditional processing industries in the coastal areas until the beginning of the 1960s. However to meet consumers demand, the processed fisheries product was imported. Of which, 80% was dried fish.

After the establishment of the socialist government in 1962, the efforts to establish commercial marine fisheries began. The People's Pearl and Fisheries Board was established to promote of marine fisheries. The board conducted fishing and supplied fishing materials and disseminated modern fishing methods and materials to fisheries cooperative and individuals in the coastal areas. In order to accelerate marine fisheries development, the traditional fishing sailed boats and canoes from the fishing cooperatives were replaced by advanced engine and fishing gears especially in drift net fishing (for mackerel and sea bream), surround net fishing (for sardine and herrings), and trap net fishing (for deep water fishes).

Meanwhile the formally organized Fisheries Bureau was reformed and upgraded its mandatory role as the Directorate of Fisheries. All of fisheries related board and agencies were under the Ministry of Agriculture and Forestry, while fisheries cooperatives were under the Ministry of Cooperatives. In the early 1970s the Peoples Pearl and Fisheries Board was restructured and transformed as People's Pearl and Fisheries Cooperation (PPFC). In the beginning PPFC had fishing vessels as much as 47 of different standards including off fishing vessel "Lin Zin", which received from affiliated Japanese Fishing Company. In line with the socialist economic policy, the PPFC was the only company that could engage commercial fisheries and exports. Although it was not directly involved in the coastal (inshore) fisheries, which actually were small scale, PPFC collected catch through its buying stations at landing

⁵ U. Khin Fisheries in Burma, 1948

sites. PPFC's fast food stalls (*Yamonar*) in the main market places sold several sea food recipes and invited consumers interests in sea food. Since then, sea food becomes popular in Myanmar.

In FY 1973-74 the socialist government formulated the long term twenty years plan. In order to uplift the country's economy, the plan aimed to fully utilize production resources and to promote export.⁶ The fisheries sector benefited to increase its fishing capacity and cold storage infrastructure thanks to foreign aids and loans. The main contributors were the Food and Agriculture Organization of the United Nations (FAO), Oversea Development Assistance of the United Kingdom (ODA-UK), Japan International Cooperation Agencies (JICA), Oversea Fisheries Cooperation Foundation of Japan (OFCF), and Asian Development Banks (ADB).

Due to the failures in most of economic sectors in the 1980s political base of the Burma's Socialist Program Party weakened. In September 1988, the State Law and Order Restoration Council have taken power of the country. Soon after its ruling, the SLORC government promulgated the "Union of Burma Foreign Investment Law" and subsequently declared the abolishment of "Socialist Economic System" on the 1st December 1988 and March 1989 respectively⁷. Since then the "open-door policy" was introduced. Foreign investments is promoted to-

- i. increase utilization of the abundant resources
- ii. increase export
- iii. create new employment opportunities
- iv. develop economic and social in states and divisions along with the expansion and improvement of transport and communications.

In the beginning, the cooperation in fisheries between Myanmar Fisheries Enterprise (former PPFC) and major fisheries importers based in Hong Kong and Singapore was initiated as a pilot project. The main purposes of these cooperation projects (CP) were to increase shrimp export. CP bought shrimp and prawn directly from the producers, in Bogalay and Pyapon townships. The CP then transformed into Joint Venture Cooperation (JVC). During 1990 through 1994 there were eight fisheries JVC. These are the joint ventures between Myanmar Fisheries Enterprise and foreign based fisheries companies.

2.2 The Role and Structure of Fisheries in Myanmar

Apart from its original role in fish food supply, fisheries are one of the main contributors to the development of the country's economy. Through its earning of foreign exchange from

⁶ Maung Maung Than.2007: The Political Economy of Industrialization; Planned State Under Party Guidance

⁷ Mya Than 1990: The Union of Burma Foreign Investment Law; Prospect of Mobilizing Foreign Capital for Development.

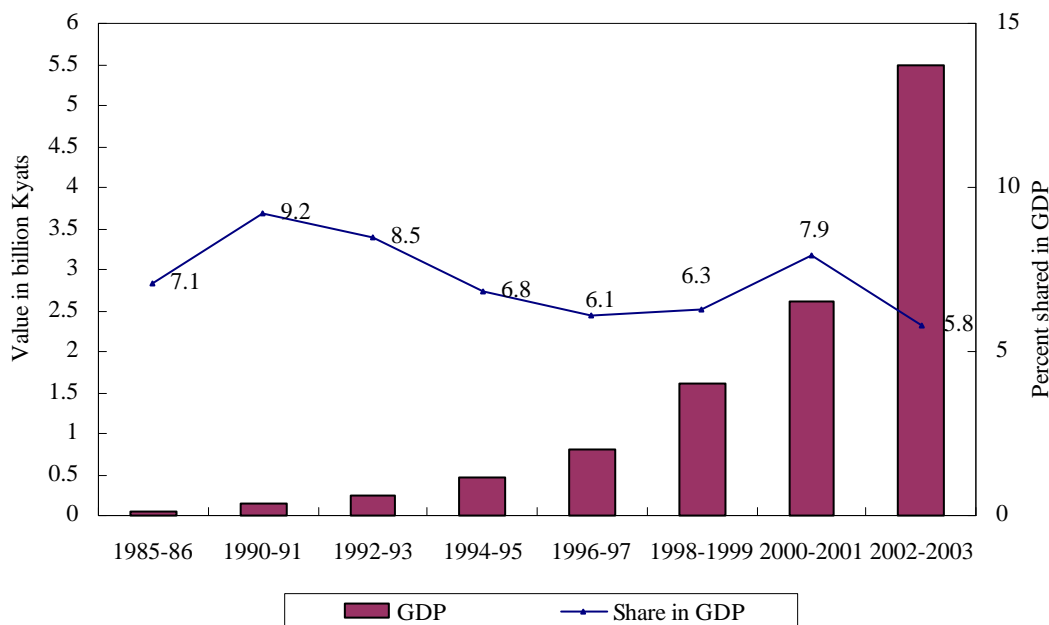
exports, the status of livestock and fisheries has been ranked in the high position as a contributor to GDP (Fig 2.1).

In line with increasing production, it is assumed that the rate of per capita fish consumption also is increasing. About 10-13% of all landing is exported. The rest are used in the local market. A simple calculation of the ratio between the existing population and fisheries export has been assumed as per capita use of fish in the country. As such, the amount of per capita use of fish increased up to 41 kg in 2005-2006 from 17 kg in 1995-96 (Table 2.1).

However based on the survey on monthly per capita consumption of meat and fish in 2001, per capita consumption of fish and fisheries product was 15.12 kg (11.52 kg for fresh fish and crustacean, and 3.6 kg for processed products)⁸.

Actually, fisheries products are important for Myanmar people as a main source of animal protein. Fisheries product accounts for about 12% of monthly expenditure of average household⁹ (Table 2.2).

Fig 2.1: Changes in the Contribution of Livestock and Fisheries to National GDP



Source: Livestock and Fisheries Statistics. Central Statistical Organization, Ministry of National Planning and Economic Development, Yangon Myanmar 2004

⁸ Livestock and Fisheries Statistics (2002-2003) Central Statistical Organization, Ministry of National Planning and Economic Development, Yangon Myanmar 2004

⁹ Statistical Year book 2004, Central Statistical Organization, Yangon, Myanmar 2004

Table 2.1: Utilization of Fisheries Product in Myanmar

Fiscal Year	Population (Million)	Total landing (Mil MT)	Domestic use (Mil MT)	Export (Mil MT)	Per Capita Utilization (kg)
1995-96	44.74	0.67	0.62	0.05	17
1996-97	45.57	0.86	0.19	0.67	17
1997-98	46.40	0.91	0.84	0.07	18
1998-99	48.16	1.01	0.88	0.13	18
1999-00	49.13	1.20	1.08	0.12	22
2000-01	50.13	1.31	1.17	0.14	23
2001-02	51.13	1.47	1.27	0.20	25
2002-03	52.18	1.61	1.4	0.21	26
2003-04	53.23	1.99	1.78	0.21	33
2004-05	54.31	2.22	1.96	0.26	36
2005-06	55.50	2.56	2.29	0.27	41

Source: Fisheries Statistics (2005-2006), Department of Fisheries Myanmar

Table 2.2: Average Monthly Household Expenditure for Food (2001)

Commodities	Union	Urban	Rural
	Total expenditure 100	Total expenditure Index 1.15	Total expenditure Index 0.94
1. Fisheries products	12.30%	11.42%	12.68%
i. Fresh	8.83%	8.22%	9.13%
ii. Dried	1.81%	1.95%	1.75%
iii. Paste and sauces	1.62%	1.25%	1.80%
2. Rice	15.81%	12.45%	17.45%
3. Pulses	2.07%	2.22%	2.00%
4. Meat	9.81%	11.89%	8.79%
5. Eggs	2.36%	2.63%	2.23%
6. Cooking oil and fat	8.30%	7.66%	8.61%
7. Fruits and vegetables	7.20%	7.08%	7.26%
8. Spices and condiments	3.82%	3.10%	4.17%
9. Beverages	1.56%	1.58%	1.56%
10. Sugar and other food	1.44%	1.00%	1.66%
11. Milk and milk products	0.50%	0.63%	0.43%
12. Others and eating out	6.77%	8.13%	6.11%

Source: Statistical year book 2004, Central Statistical Organization

2.2.1 Marine Fisheries

The marine territory extends about 486,000 square kilometers with exclusive economic zone (EEZ) and provides considerable large fisheries resources. There are approximately 770 finfish species identified in Myanmar. Among these, 470 species are of marine fishes including 67 commercially important pelagic species¹⁰. Several species remain to be identified.

The complex ecosystems along the coastal areas are important for the fisheries resources to develop further. The mangroves, coral reefs, sea grass, sand beach and mud flats are creating habitats and grounds for spawning, nursing of several aquatic animals. Owing to the extensive mangrove areas, Myanmar is ranked the fourth position among the largest mangrove prevalence Asian countries (Table 2.3).

However mangrove degradations in most of the coastal areas are underway. Rehabilitation processes are undertaken by the Forestry Department, mostly focused in the Ayeyarwaddy Division.

The compressive resources survey in the early 1980s indicated pelagic and demersal fish stock was estimated 0.97 MT and 0.79 MT respectively. In order to use the resources without impacting recruitment capacity, about 50% (0.5 million MT) of pelagic fish stock was marked as maximum allowable catch volume (Table 2.4).

Similarly, about 70% (0.55 million MT) of the demersal stock was the maximum exploitable volume without impacting the recruitment capacity of the standing biomass (Table 2.5).

Table 2.3: Southeast Asia Mangrove Forest Areas

Country	Area of mangroves (Ha)
1. Malaysia	652,219
2. Bangladesha	417,013
3. Papua New Guinea	411,600
4. Myanmar	382,023
5. India	356,500
6. Thailand	287,000
7. Viet Nam	286,400
8. Pakistan	249,489
9. Philippines	246,699
10. Indonesia	216,271
11. Sri Lanka	4,000

Source: UNDP. FAO (Mya/90/003) Report on mangrove forest products and utilization of the Ayeyarwaddy Delta

¹⁰ Source: Report of the Resources Survey DOF, 1944.

Table 2.4: Biomass of Small Pelagic Fish in the Coastal of Myanmar

Coastal Region	Total Biomass (Metric tons)			Maximum Exploitable Volume (50% of the Biomass) Metric Tons
	Pre- monsoon	Post- Monsoon	Mean	
Rakhine	180000	170000	175000	87500
Ayeyarwaddy	370000	640000	505000	252500
Tanintharyi	70000	520000	295000	147500
Total of all coastal	620000	1330000	975000	487500 Say (500000)

Source: Reports of survey with the R.V Dr Fridtjof Nansen (Sept- Nov 1979 and March- April 1980)

Table 2.5: Biomass of Demersal Fish within 50-200 Meters Depth in Myanmar

Region	Depth range (Meter)	Biomass			
		Pre Monsoon	Post- monsoon	Mean	
Rakhine Continental shelf area	0-50	103200	240100	171650	121195
	51-100	14000	97100	55550	39222
	101-200	38700	36600	37650	26583
	Total	155900	373800	264850	187000
Ayeyarwaddy Continental shelf area	0-50	276900	168700	222800	158171
	51-100	37700	61000	49350	35035
	101-200	16500	12500	14500	10294
	Total	331100	242200	286650	203500
Taninthayi Continental shelf area	0-50	155600	113700	134650	92036
	51-100	97900	76200	87050	59500
	101-200	14100	9200	11650	7964
	Total	267600	199100	233350	159500
Accumulation (all continental shelf areas)	0-50	535700	522500	529100	370778
	51-100	149600	234300	191950	134512
	101-200	69300	58300	63800	44710
	Total	754600	815100	784850	550000

Source: The result of trawling survey in the continental shelf and slopes 1981-83.

In summary, the standing fishing resources was estimated about 1.8 million MT. Exploitation of 1.05 million MT would be the maximum for the resources to be balanced and sustained the biomass. Since then, all of the marine fisheries operators recognized 1.05 million MT as the maximum limit from marine landing (Table2.6).

However, the researchers from RV Fridtjof Nansen reconsidered the methodology and data in the early 1980s. The assumed stock was revised down ward by 33% in 1999. In this regard the coastal nations including Myanmar has to be aware on the sustainability of the existing resources and the volume of exploitation.

Among the whole fisheries sector in Myanmar, marine fishery is most important. During the 1900s about 60 to 70% of all fisheries landing is from marine fisheries. However the composition started to decline since 2000-2001. (Fig 2.2)

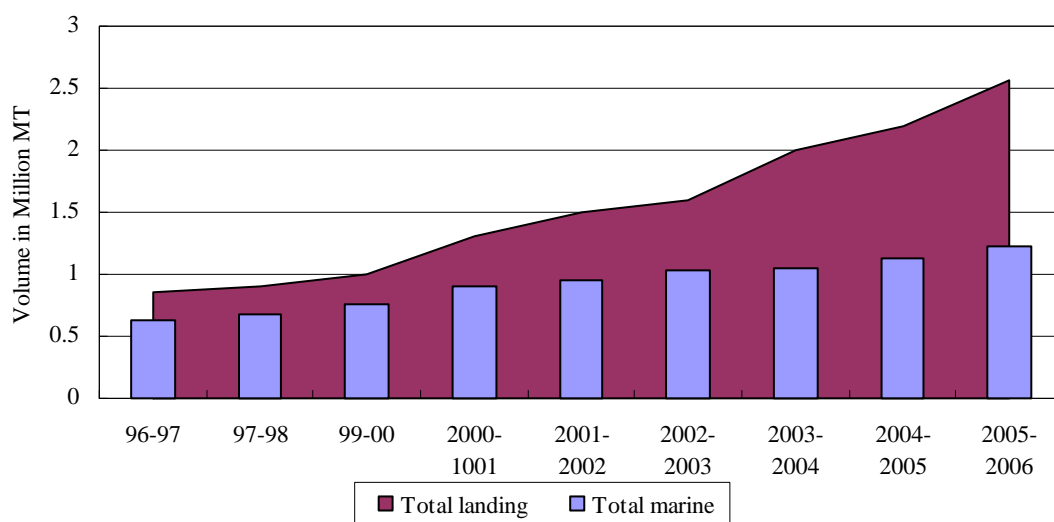
Since the introduction of trawl fishing in the early 1970s, the coastal resources have been heavily exploited. Even without detailed landing data, the signs of resources decline were visible. Some fishing vessels reported the decline of catch rate. Also, on board fishing log recorded of the Department of Fisheries indicated the rate of shrimp catch in 2003 was only 34% to that of 1997. Other commercial species such as pomfret, Indian threadfins, croakers, sardines and herrings, ribbon fish, and conger eel are depleting as the landing has declined 50% in recent years¹¹

Table 2.6: Upper Limit of Exploitable Fisheries Resources

Resources	Biomass		
	Standing Stock MT	Allowable Catch Volume	Exploitable volume MT
Pelagic	975,000	50%	500,000
Demersal	784,850	70%	550,000
Total	1,759,850 Say (1,800,000)		1,050,000

Source: Reports of survey with the R.V Dr Fridtjof Nansen (Sept- Nov 1979 and March- April, 1980)

Fig 2.2: Composition of Marine Fish Landing



Source: Fisheries Statistics (2006-2007) Department of Fisheries Myanmar.

¹¹ National Report of Myanmar on the Sustainable Management of the Bay of Bengal Large Marine Ecosystem, 2004

The FAO assisted technical cooperation project on “Reformulation and Strengthening of Fisheries Statistic System” in 1997. The main objectives of the project were to train enumerators and statisticians to be core operators in fisheries statistics.¹²

In the beginning, marine fisheries was composed of onshore fisheries, inshore fisheries and offshore fisheries. After the promulgation of the 1990 Marine Fisheries Law, onshore and inshore fishery was combined into inshore (coastal) fisheries. The inshore fishing ground is ranged within 8 fathom (48 feet) depth areas at lowest low tide which generally is 5 to 10 nautical miles off the shore. Small boats of less than 30 feet and some traditional boats are used in this type of fisheries.

Inshore fisheries actually are of small scales but as a matter of fact, it supplies several high value species (lobsters, shrimp, grouper, mud crab, clams etc). There are no specific statistics for inshore and offshore fisheries other than the aggregated data on the whole marine fisheries. Most of the available statistics focus on fisheries revenue. However, in the formulation of 30 years planning for the whole fisheries sectors, the landing from coastal fisheries was estimated 30 to 35% of the overall landing during 2001 through 2006¹³.

Off the demarcation line of inshore fisheries (off 8 fathom depth line) is the ground for offshore fishing. In order to administer properly and monitor the fisheries activities the marine territorial water was drawn 140 grid blocks as fishing grounds. Each block is extended to 30x30 nautical miles and offshore fishing is permitted by license. Large scale fishing such as bottom trawling, purse seining, surrounding, drift netting and long lining are common in offshore fishing. Several types of fishing vessels is used from the minimal capacity of 30 GRT to high capacity of 100 GRT and above.

About 30000 to 33000 boats are operating in marine fishing as a whole. Almost 90% of them are registered as inshore fishing boats and half of them is non-powered. Generally, the fleet for offshore fishing is composed of local and foreign fishing vessels that covered more or less 8-10% of the total marine fishing fleet. Foreign fishing vessels are allowed to fish in Myanmar offshore fisheries water under the marine fishing right system. (Table 2.7)

The fishing efforts have been controlled by the licensing system. Any fishing activities without licenses are illegal. Several provisions have endorsed with fishing licenses, such as, limits in fishing ground, fishing periods, and fishing gear and methods. However, the fishing vessels are not properly monitored. The fisheries licensing system is not functioning well to meet its main purposes to control the fishing efforts and landing. The large scale trawling with high-powered boats are subjected to destruct coastal fishing grounds in shallow waters as they are cruising into inshore fishing territory. Also there are conflicts between the trawlers and small scale fishers in use of fishing grounds.

¹² FAO 1997: Reformulation and Strengthening of Fisheries Statistics System, Field document No 1. Bangkok 1997

¹³ Thirty Year Planning on the Development of Myanmar Fisheries Sector (2001-2002 to 2030-2031). Ministry of Livestock and Fisheries, Government of the Union of Myanmar, March 2002.

Table 2.7: Composition of Fishing Vessels in Marine Fisheries

FY	Inshore Fishing			Offshore Fishing			Total Fishing Fleet
	Powered	Non - powered	Total inshore	Local	Fishing rights	Total offshore	
1996-97	17299	10161	27460	1609	176	1785	29245
1997-98	12211	9660	21871	1709	426	2135	2135
1998-99	14245	10720	24965	1984	1066	3050	28015
1999-00	12043	11191	23234	2032	639	2671	25905
2000-01	12846	13253	26099	1987	36	2023	28122
2001-02	13591	14649	28240	1999	150	2149	30389
2002-03	15607	14813	30420	2309	9	2318	32738
2003-04	13664	16335	29999	2121	61	2182	32181
2004-05	14176	16687	30863	2150	423	2573	33436
2005-06	14097	16352	30449	1858	254	2112	32561
2006-2007	14284	16289	30573	1849	206	2055	32628

Source: Fisheries Statistics 2006-07 Department of Fisheries Myanmar

2.2.2 Inland Fisheries

All along the main river systems, natural lakes, reservoir and seasonal flood plains are inland fisheries water. It was estimated the permanent water bodies cover 1.2 million hectares (excluding recent established reservoirs). Inland fisheries play an important role in supplying fresh water fish, which are most esteemed in the country. Inland fisheries are worked out by two categories: the leasable fisheries and the open fisheries. A total of 3714 leasable fisheries areas have been designated. Open fisheries consists of all kinds of fishing in streams, lakes, and reservoir and in the rice fields etc. Since 1995 fishing in reservoir was banned. Thus, the landing from the reservoir is not included in the fisheries statistics.

2.2.3 Aquaculture

Due to increase in local demand and potentials in export markets, most of investments are inflowing into aquaculture. As a result the acreage of pond as well as the harvest increased. As of 2005-2006 the harvest covered about 20% of over all fisheries landing. Also about 20% of the fisheries export was from aquaculture. Currently 407,000 acres for shrimp and freshwater fish farming were established. In this regard Myanmar became the world's top ten aquaculture producer nations for high contribution on Average Annual percentage Growth Rate (APR) with 45.1% during the year 2002-2004 (Table 2.8).

Table 2.8: Changes of Aquaculture in Myanmar

Fiscal Year	Area (Acre)		Total	
	Freshwater Fish	Shrimp and prawn	Acres	Production MT x (1000)
1996-1997	59389	47860	107243	82.79
1997-1998	57873	50870	108743	82.02
1998-1999	60566	53157	113723	91.17
1999-2000	61096	67476	128572	102.60
2000-2001	72502	101791	174293	121.95
2001-2002	90733	119784	210517	190.12
2002-2003	124112	199961	324073	252.01
2003-2004	155509	205091	360600	400.36
2004-2005	182452	208591	391043	485.22
2005-2006	197150	209942	407092	563.14

Source: Fishery statistics (2005-2006), Department of fisheries

Also Myanmar was among the top ten nations for higher aquaculture production by value. It was estimated by the APFIC as the aquaculture produces in 2004 was worth of US\$ 1231 million. Also it is in the top ten nations of largest producing Tilapia, and carp and barb species¹⁴.

Unlike the capture fisheries, development of aquaculture needs applied technique and essential inputs. In the context of developing country, the intensification of aquaculture generally is limited by inadequate feed inputs, weakness in water management and less capacity to access disease control and scarcity of qualified operators. However, in the case of Myanmar, the environment is almost free from pollution. Therefore the most possible challenge in further development will be the constant supply of quality feed and the intensity of disease controlling capacity.

2.3 Fisheries Production

The overall fisheries production is more than 3 times larger than it was in the last decade. The volume from marine fisheries has doubled from 0.63 million MT in 1996-97 to 1.37 million MT in 2005/2006. The production of aquaculture was about 6 times larger than that of 1996-1997 (Table 2. 9).

¹⁴ Status and potentials of the fisheries and aquaculture in Asia and the Pacific, APFIC: FAO 2006

Table 2.9: Fisheries Production in 1996-97 to 2005-2006

Fiscal Year	Total landing (Mil MT)	Landing by sector (Million MT)				
		Aquaculture	Inland fishery			Marine fishery
			Leasable	Open	Sub total	
1996-97	0.863	0.083 (9.6%)	0.063	0.087	0.149 (17.2%)	0.63 (73.14%)
1997-98	0.913	0.082 (9.0%)	0.063	0.087	0.149 (16.3%)	0.68 (74.65%)
1998-99	1.011	0.092 (9.0%)	0.068	0.092	0.160 (15.8%)	0.76 (75.18%)
1999-00	1.196	0.103 (8.6%)	0.083	0.113	0.196 (16.4%)	0.90 (75.00%)
2000-01	1.310	0.012 (9.3%)	0.091	0.147	0.238 (18.2%)	0.95 (72.50%)
2001-02	1.474	0.192 (12.9%)	0.096	0.159	0.255 (17.3%)	1.03 (69.80%)
2002-03	1.596	0.252 (16.0%)	0.110	0.180	0.290 (18.0%)	1.05 (66.00%)
2003-04	1.987	0.400 (20.1%)	0.122	0.332	0.454 (22.8%)	1.13 (56.90%)
2004-05	2.217	0.485 (21.9%)	0.137	0.366	0.503 (22.7%)	1.23 (55.50%)
2005-06	2.581	0.575 (22.0%)	0.153	0.478	0.630 (24.6%)	1.38 (53.42%)

Source: Fishery Statistics (2005-2006) Department of Fisheries Myanmar (Provision)

2.4 Fisheries Export

Apparently, the volume of fisheries export increased up to three folds compared to 1998. Normally, the products are exported alive, fresh frozen or chilled and processed. The fisheries export earning was increased about two folds during 1998 through 2005-2006 (Table 2.10).

The shrimp is always in the top of the fisheries export commodities as it generates half of fisheries export earning during the 1990s. However it started to decrease since 2001. It remains to generate only one third of the total export earnings even with stable in export volume, which is around 20,000 MT. However, the volume of fish export is steadily increasing that it is about two folds to that of late 1990s. In terms of value, about 50% of the overall export value has earned from fish exports.

Border trade with China and Thailand has been the major importer for Myanmar fisheries export. As of 2005-2006 about 62% of the total fisheries export volume was transacted through border trade system (Table 2.11).

Table 2.10: Changes of Fisheries Export form Myanmar

Fiscal Year	Fish		Prawn		Others		Total	
	Volume Mil MT	Value Mil US\$	Volume Mil MT	Value Mil US\$	Volume Mil MT	Value Mil US\$	Volume Mil MT	Value Mil US\$
1998-99	0.071	70.233	0.014	96.957	0.0422	34.138	0.127	201.328
1999-00	0.072	68.765	0.016	90.678	0.029	24.262	0.117	183.705
2000-01	0.092	80.745	0.020	104.227	0.033	33.14	0.145	218.29
2001-02	0.138	103.607	0.022	94.403	0.042	53.523	0.202	251.533
2002-03	0.136	143.146	0.023	105.197	0.0541	69.039	0.213	317.382
2003-04	0.125	127.227	0.023	113.548	0.0579	77.74	0.205	318.514
2004-05	0.159	162.040	0.024	133.745	0.0730	71.136	0.256	346.921
2005-06	0.173	180.417	0.023	105.002	0.0750	73.776	0.271	359.195

Source: Statistics of fish and fisheries products (2005-2006), Department of Fisheries, 2006.

Table 2.11: Fisheries Export by Type of Trade

Export category	Border trade		Normal trade		Total	
	Volume (MT)	Value Mil US\$	Volume (MT)	Value Mil US\$	Volume (MT)	Value Mil US\$
Fish and others	162674	145.82	85049	108.42	247723	254.24
Shrimp	6015	16.54	17333	88.47	23348	105.01
Total (% shared)	168689 (62%)	162.36 (45%)	102382 (38%)	196.89 (55%)	271071 (100%)	359.25 (100%)

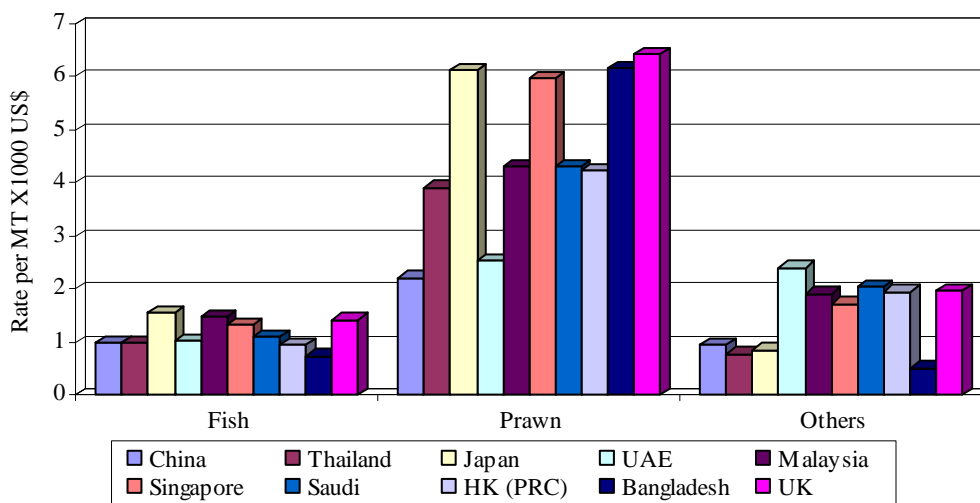
Source: Statistics of Exported fish and fisheries product, DOF Myanmar, 2005-2006

During 2005-2006 about 270,000 MT was exported to 35 countries and the China and Thailand are major importers. However in terms of prices, it varies widely between the importers. The price variance is due to the differences in type of product and the level of product quality.

In this regard the average price for fish exported to China was less than US\$ 1000 while Japan offered around US\$ 1500. In case of exporting other fisheries commodities, China is the main importer and offered average price (Fig 2.3).

In the marine fisheries export, fish accounted for 54%, and the export of shrimp shared 10% and categories of "Other commodities" was 35% (Table 2.12).

Fig 2.3: Value Offered from Importers



Source: Statistics of Exported fish and fisheries product, DOF Myanmar, 2005-2006

Table 2.12: Composition of Fisheries Export by Volume (2005-2006)

Landing (Mil MT)		Export (Mil MT)				Domestic used (Mil MT)
		Fish	Shrimp	Others	Total	
Marine	1.37	0.115 (54%)	0.022 (10%)	0.075 (35%)	0.212 (100%)	1.16 (85%)
Inland	0.63	0.003	0.002		0.005	0.625 (99%)
Aquaculture	0.56	0.055	?		0.055	0.505 (90%)
Total (by sector)	2.56	0.173 (64%)	0.024 (9%)	0.075 (27%)	0.272 (100%)	2.29 (89%)
Accumulation	100%	11%				

Source: Statistics of Exported Fish and Fisheries Product, DOF, 2005-2006

2.5 Fisheries Product Utilization and Processing

Generally fisheries products are given priority for local utilization and only the surplus is exported. However lack of data for domestic utilization leads to wide variation in per capita consumption. Most of pelagic fishes are dried at landing for the purposes of animal feed. Also fishmeal plants consuming large volume are not negligible. In this regard FAO has estimated about 10% of the landing from Myanmar fisheries is used as non food¹⁵.

¹⁵ Myanmar Country Profile FAO, 2006.

Generally, the fisheries products are exported in the processed form. In processing the weight losses ranges 40-60% depending on the type of products. Then, the total export volume of about 270,000 MT can be assumed as it is derives from the processing of 450,000 to 675,000 MT of raw material. In this regard, statistics for non food utilization and weight loss at fisheries processing is important for the proper estimation of per capita consumption.

Normally Myanmar people prefer to eat fresh fish but there are several traditional types of processed and preserved fisheries product. Generally the basic ways of processing are drying, boiling, smoking, salting, fish paste and sauce producing, fermenting and putrefying. Among these dry fish, fish paste and sauce is the mainstay in daily food.

From the small scale inshore fishing there are huge volume of small pelagic fishes and small shrimps that are too small for export. All of these are traditionally sun dried for local market. Depending on the status of drying process the products are used as food or for animal feeding. In this way the livelihoods of coastal community are being sustained. The recent export of dry fish such as anchovies has been stimulating to increase efforts in fishing. The fishing efforts are extended even in the off season and also the fish are lured by light attraction.

As a result, the sub standard sizes and un-matured fishes are included in the landing, which can lead to deterioration of the resources. Through extending fishing efforts, several high value species disappeared, such as Spanish mackerel, pomphret, conger eel, ribbon fish, snappers, breams, lobsters and top shells.

In this regard the sustainability of the resources and livelihoods of the users has rising to call fisheries management and up grading of fisheries processing methods in the coastal areas.

2.6 Fisheries Policy and Legal Frameworks

The government has set “National Policy on Fisheries Sector” as follow

- i. promote all round development in the fisheries sector
- ii. increase fish production for domestic consumption and share the surplus with neighboring country
- iii. encourage the expansion of marine and freshwater aquaculture
- iv. upgrade the socioeconomic status of the fisheries communities.

In need of institutional demand the 1954 Fisheries Law (derives 1905 Fisheries Law) was repealed and substitute with the following laws relating to fisheries.

1. Law relating to the fishing rights of foreign fishing vessels (1989)
2. Aquaculture Fisheries Law (1989)
3. Myanmar Marine fisheries Law (1990) and
4. Freshwater Fisheries Law (1991)
5. Law amending the law relating to the fishing rights of foreign fishing vessels (1993)

6. Law amending the Myanmar Marine Fisheries Law (1993)

As describing in provisions of these laws, the main objects are to-

- i. prevent fisheries from extinction
- ii. safeguard and prevent the destruction of fisheries water and environment
- iii. obtain duties and fees payable to the State and
- iv. extend fisheries management activities in accordance with the law.

The fishing right laws grant concession to conduct fishing within Myanmar marine territorial to joint ventures and foreign fishing companies. However, extending of trawl fishing beyond the permitted fishing ground is violation of the law. The considerable conflicts between fishing rights trawlers and traditional fishers were happened. Thus, the 1989 law of fishing right was amended comprehensively in order to enforce marine fisheries management. In 1993 “Law amending the law relating to the fishing rights of foreign fishing vessels” and “Law amending the Myanmar marine fisheries law” were enacted.

According to the provision of these laws, Department of Fisheries is the main institutional body to limit fishing grounds, fishing methods and catch volume for the fishing rights operations.

The Myanmar marine fisheries law has its provisions mainly focused on the system establishment of (i) marine fisheries operations (ii) collection of marine fisheries product for sale (iii) operation of fisheries related activities and (iv) commercial sport fishing. Due to the marine fisheries law none of the fisheries activities could be established without license, which basically is granted by the DOF.

Regarding sustainable fisheries management, every each of fisheries law prohibits

- i. harassment of fish and other aquatic organisms
- ii. efforts that may lead pollution of fisheries water

Also the laws provide regulations

- i. method (explosive, poison, chemicals and dangerous material are prohibited)
- ii. species or size to be caught
- iii. grounds and period for fishing.

The existing fisheries laws are basically formulated to strengthen the legal frameworks to

- i. earn more revenue through fishery taxation
- ii. protect fisheries resources
- iii. ensure equitable allocation of fisheries resources
- iv. obtain accurate fisheries data and information
- v. strengthen effective and systematic administration measures to reduce conflict among fishing communities.

2.7 Directives and Notifications

In needs of strengthening management, Department of Fisheries has issued specific directives and notifications such as –

- i. Protect brood stock, fry and fingerlings of freshwater fishes during spawning and nursing period
- ii. Prohibit exporting under size mud crab, which have carapace length smaller than 8.15 cm.
- iii. Protect breeders and fingerlings of giant freshwater prawn (*Macrobrachium rosenbergii* and *M. malcomsonii*) and marine shrimp such as (*Penaeus monodon*, *P. indicus*, *P. semisulcatus* and *P. merguensis*) during spawning and nursing period
- iv. Protect whale shark (*Rhynchodon typus*) in all Myanmar waters and forbidden to catch and trade.
- v. Controls producing and trading of African giant catfish (*Clarias garipinus*) which is highly voracious.
- vi. Prohibits and protect from catching, holding and trading of aquatic species that are listed as endangered by Convention on International Trading of Endangered Species of Animals and plants (CITES)
- vii. 1992 Forest laws has described all the mangroves forest as protected areas and prevent fishing in the areas off 300 yards (about 100 meters) from the edge of mangroves.

2.8 Fisheries Institution

The Department of Fisheries under the Ministry of Livestock and Fisheries is the main government institution. The Department undertakes all round fisheries development and extend management to commercial fisheries activities including exports. The head office dedicates fisheries administrations to the provincial offices in States and Divisions. The level of administration is down to the Township level fisheries offices.

To materialize its responsibilities the Department of Fisheries is implementing the following issues. –

- i. Conservation and rehabilitation of fisheries resources
- ii. Promotion of fisheries research and survey
- iii. Collection and compilation of fisheries statistics and information
- iv. Fisheries extension services
- v. Supervision of fisheries sectors
- vi. Sustainability of fisheries resources.

All of its tasks are then shared among the relevant management line. The administrative

structure of the Department has following four directorates

- i. Fisheries Supervision and Revenue
- ii. Aquaculture
- iii. Fisheries Inspection and Quality Control and
- iv. Administration and Finance.

Under the management of Yangon Division Department of Fisheries, the section for research and development has organized with The “Institute of Fisheries Technology” and “Marine Fisheries Research”. The regular training courses on aquaculture, aquatic animal disease control, fisheries inspection and quality control, and fisheries inspections are conducted year round.

The marine fisheries research has been focused on resources management. The recent activities are dealing with conservation of shark, Ayeyarwaddy dolphin and sea turtles. The collaboration with Association of Southeast Asian Fisheries Development Centers (SEAFDEC) on Marine Fisheries Resources Survey is undergoing in the early of 2007.

In Myanmar, the Central Statistical Organization (CSO) is the only authority to undertake national level statistical data collection, processing and compiling. In the case of fisheries statistics, Department of Fisheries is responsible in data collection, processing and dissemination. All of these activities in the department are undertaken by the “fisheries planning and statistic section”.

2.9 Myanmar Fisheries Federation (MFF)

As part of ASEAN Fisheries Federation, Myanmar Fisheries Federation (MFF) was established. Currently it is one and only NGO that deals with fisheries industries and supporting aquaculture development. It provides recommendation to the Department of Fisheries for the grant of license on newly establishment aquaculture and also to Livestock and Fisheries Bank to disburse loans for aquaculture extension.

Currently the main body of the Federation is composed of relevant associations such as fisheries exporters, fish farmers, shrimp farmers, crab exporters, eel exporters, ornamental fish growers as well as aquatic animal feed producers etc..

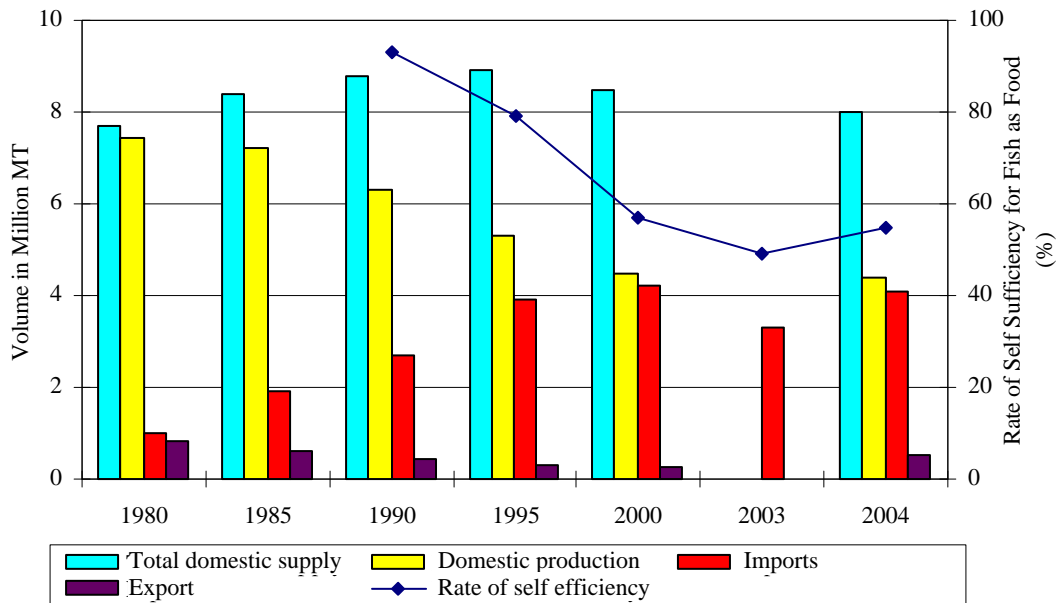
CHAPTER III STATUS OF FISHERIES IN JAPAN

3.1. Overview of Fisheries in Japan

Diverse fisheries resources coupled with enforcement in fishing efforts have made Japan to be one of the world's top marine fisheries producers. During the 1970s Japan's marine fisheries landing was the largest in the world. In 1985 Japan produced maximum volume with 12.3 million MT. However the production has steadily decreased and the position was moved to the sixth largest fisheries production nation in 2003¹⁶.

Japan relies on fish and fisheries product as a main source of protein. As of 2004, about 40% of animal protein or 21.5% of the total protein intake is acquired from fish and fisheries product¹⁷. Generally Japanese people eat fish from the raw fresh to variety of processed commodities. It stands second to Iceland as the largest fish consumption nation in the world. In 2003, per capita consumption of fish in crude weight basis was 67.4 kg or 36.2 kg on a net weight basis¹⁸.

Fig 3.1: Supply of Fish and Shellfish for Food



Source: Visual Japan's Fisheries: Fisheries Agency 2006 September

¹⁶ World Review of Fisheries and Aquaculture, FAO 2006

¹⁷ Food Balance sheet "Ministry of Agriculture, Forestry and Fisheries"

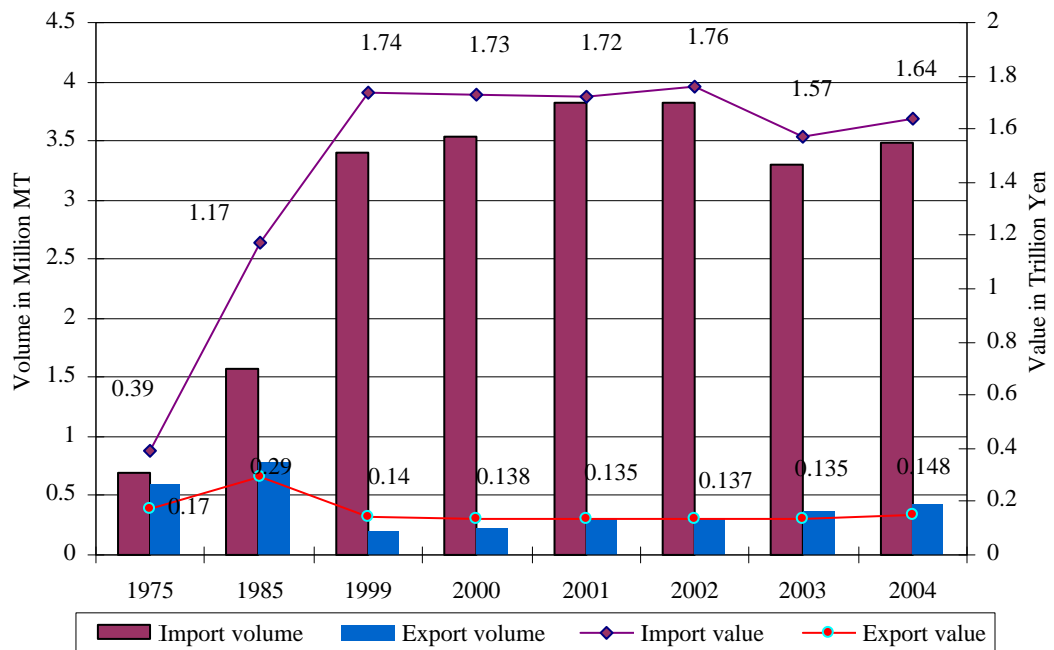
¹⁸ FAO country report 2006.

The self efficiency rate of fisheries product in Japan has been declining since 1964, which was 113%¹⁹. Currently, Japan is using about 80% of her landing for the domestic consumption. However the supply meets only 55% of the demand. To fulfill domestic consumption, Japan increased imports and it becomes the top fisheries importing nation in the world. The world's overall fisheries landing was 120 million MT in 2005 and 37% of that was exported. Of these, Japan's import accounts for almost 25%²⁰ (Fig 3.1).

During the late 1970s Japan's volume of fisheries import and export are equal out, however the import was drastically increased (Fig 3.2).

Normally, the imported fisheries products is grouped into nine categories: shrimp, tuna /marlin, salmon/trout, crab, prepared eel, cod roe, prepared shrimp, squid and others²¹. Myanmar is in the list of shrimp exporter to Japan. In the late 1990s Japanese shrimp imports was closed to 0.3 million MT, however, it has reduced to 0.2 million MT in the recent years²² (Fig 3.3).

Fig 3.2: Changes of Fisheries Import and Export



Source: Statistical Handbook of Japan. Chapter 5, Agriculture, Forestry and Fisheries, FY 2005 Trends in Fisheries and Fisheries Measures for FY 2006 Outline.

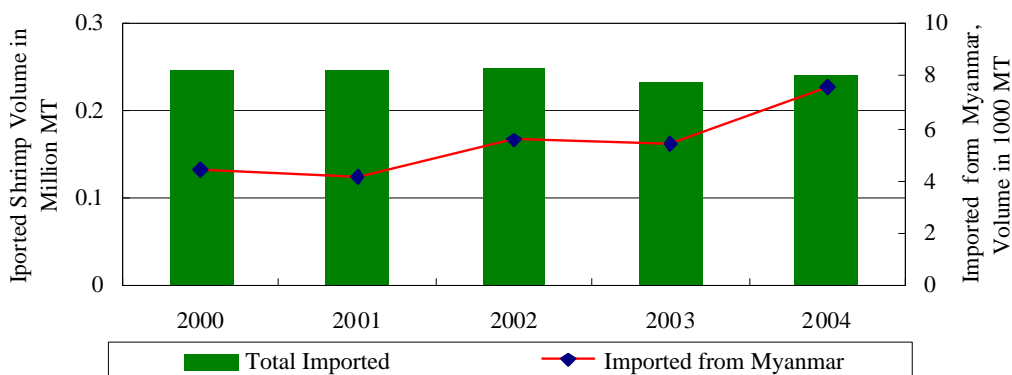
¹⁹ Visual Japan's Fisheries: Fisheries Agency 2006 September

²⁰ The Status of Fisheries and Aquaculture NASO FAO 2006

²¹ Statistical Bureau & Statistical Research and Training Institutes

²² Southwest Regional Office, Regional Marine Fisheries Services < <http://swr/fmd/sunee/shrimp/jshjan05htm>>

Fig 3.3: Japan's Shrimp Import



Source: Southwest Regional Office, National Marine Fisheries Services

3.2 The Structure of Fisheries in Japan

Generally, fisheries in Japan have the divisions of fresh water and marine fisheries. However due to the limitation of inland resources, marine fisheries is the major fishery producing sector over the periods.

3.2.1 Marine Fisheries

According to the type of fishing, utilization of fishing gear and methods and target species, marine fisheries has been classified into four categories: (i) the distance fisheries (ii) the off shore fisheries and (iii) the coastal fisheries and marine aquaculture.

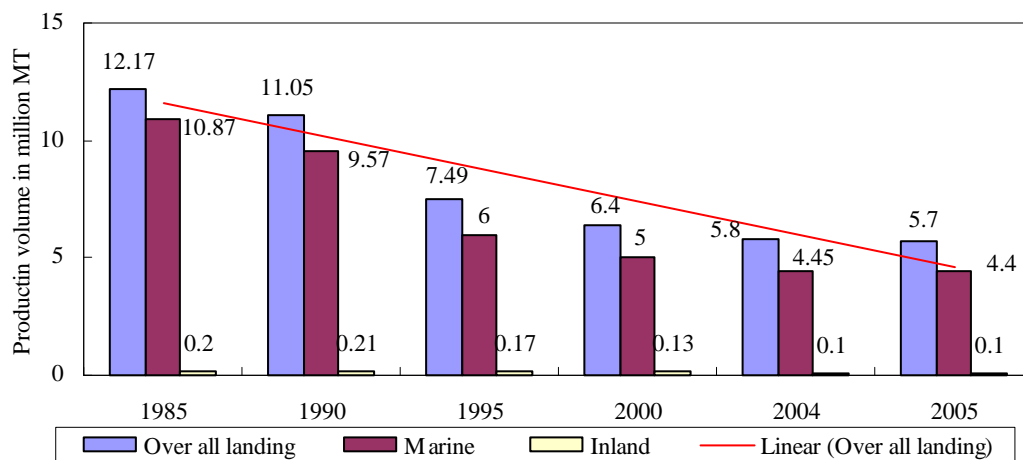
The landing of marine fisheries has been constantly declining over the two decades and the present landing is only 50% of that in 1985 (Fig 3.4).

(i) Distance water fisheries: - The fishery operates in the high sea of international water outside of Japan's Exclusive Economic Zone (EEZ). However, Japan fishing vessels are operated in the EEZ of foreign countries that is not adjacent to Japan's EEZ, according to bilateral agreements. The licenses are issued by the national government and fishing vessels should be registered.

(ii) Offshore fisheries: - It is operated within the area of Japan's EEZ as well as in the EEZ of the neighboring countries, which is adjacent to Japan's EEZ. The license is issued by the national and the prefecture government. Normally, the production of offshore fishing contributes more or less 50% in overall marine landing.

(iii) Coastal fisheries: - Coastal fisheries are operated according to the traditional right based management system in the adjacent waters of the fishing villages along the coastal.

Fig 3.4: The Changes of Marine Fisheries Landing



Source: Annual Statistics on Fisheries and Aquaculture Production, Statistics Department, MAFF Japan.

The licenses are provided by the prefecture government. Fishing is conducted by small boats less than 10 GRT using traditional or modified specific gear and methods.

(iv) Marine aquaculture: - Normally, farming of marine species is practiced in shallow coastal areas under the demarcated fisheries right. The types are specified into hanging culture, cage culture and sea bed sowing in semi-inland sea areas. Sea weed, oyster, scallop, yellow tail, mackerel, red sea bream, halibut, eel, globe fish, shrimp and lobsters are mainly produced. In 2004 cultured blue fin tuna, which hatched out in the hatchery and grown for two years (the weight is about 20kgs) was marketed first in ever in the word.

3.2.2 Inland Fisheries

Inland fisheries are not common in Japan due to the limited resources and water bodies. However, inland fisheries play an important role in supplying freshwater fish such as eels, carp, sweet fish (Ayu) trout and mullet and several of fresh water mollusks and fish. There are two categories, inland capture fisheries and inland aquaculture.

(i) Inland capture fisheries: - provides freshwater species such as, carps, sweet fish and diadromous species such as mullet, salmon and trout, eel, shrimp and mollusks, and sea weed as well. The production was 60642 MT in 2003.

(ii) Inland aquaculture produces carps, sweet fish, eels, mullet, shrimp, mollusk and kinds of seaweeds. The production in 2003 was 50276 MT.

3.3 Fisheries Production

In general, the trend of overall fisheries production has been leading downwards. Common reasons are declining fisheries resources, decrease of fisheries establishment, aging of fisheries employee and scarcity of fishery workers.

3.3.1 Decline of Fisheries Resources

The coast line of Japan stretches about 35,000 km. With 200 meters depth continental shelf the exclusive economic zone (EEZ) covered 4.5 million km², which is the 6th largest possessing in the world after USA, Australia, Indonesia, New Zealand and Canada. Thus Japan originally has huge marine resources and fisheries potentials. Within the sea territorial of Japan, there is trespassing of cold water current the *Oyashio* flows from the north Pacific to the south ward and warm water current the *Kuroshio* streaming from equator to north ward has enhanced Japan's fisheries resources with diverse fauna of both temperate and oriental species.

However, due to the deterioration of fisheries resources around Japan coupled with tightened international fisheries regulation in far sea (distance water fishing) led to decline almost 50% of the catch in recent years (Table 3.1).

To assess the status of important fisheries stock, "Resources Assessment on Major Fisheries Resources in the Water Surrounding Japan" has been undertaken every year. The survey results in two consecutive years of 2003 and 2004 indicated that 50% of the standing stock was declining. In particular, 96 species were prioritized as the target species to be evaluated. Of which 42 species (44%) were found at the lower resource level. Similarly among the 81 target species in 2004 survey, 49 species (60%) were at the low level of resource condition. The fishes that are at the low resources level include common mackerel, Alaska Pollack, snow crab, sardine etc (Table 3.2).

Table 3.1: Changes of Fisheries Landing in Japan

Type of fisheries	Total landing (Million Metric tons)					
	1985	1990	1995	2000	2004	2005
Total	12.17	11.05	7.49	6.38	5.78	5.71
Marine fisheries	10.88	9.57	6.01	5.02	4.46	4.41
Inland fisheries	0.11	0.12	0.09	0.07	0.06	0.05
Marine aquaculture	1.09	1.27	1.32	1.23	1.22	1.21
Inland aquaculture	0.09	0.09	0.08	0.06	0.04	0.04

Source: Annual statistics on Fisheries and Aquaculture Production, MAFF

Table 3.2: Resources Condition in Japan’s Marine Water

Year	Target species Numbers	Regard low level	Proportion	Related species
2003	96	42	44%	Common mackerel (Pacific and the Tsushima warm current),
2004	81	49	60%	Alaska Pollack (North Sea of Japan and the Pacific), snow crab (Sea of Okhotsk), Sardine (Pacific) etc
Mean	89	46	52%	

Source: Assessment of Fisheries resources in Water Surrounding Japan “Fisheries Agency/Fisheries Research Agency

The influx from households and industries wastes water has impacted the coastal ecosystem. The disappearances of sea grass beds means the lost of spawning and nursing sites for several aquatic fauna. This is one of the direct impacts of man made interferences such as land reclamation and sea gravel extraction. On the other hand, the increase of sea water temperature has impacted the food web within coastal ecosystem. During the year 2002 and 2003 the massive infection of large jelly fish along the water ranging from Sea of Japan to the North Pacific coastal of Honshu Island has seriously affected the fixed net fisheries.

To recover the fisheries resources, the resources restorations activities are undergoing in four areas under “Implementations of Resources Restorations Plans” since 2002 for -

- i. Offshore fishery of flatfishes including rough scale flounders, willow flounders, big hand thornyhead, and yellow goose fish in Northern Pacific Oceans
- ii. Small trawl fishery of ocellate puffers, mantis shrimp, and conger myriaster in the Ise Bay and Mikawa
- iii. Bay Drift net fishery of Spanish mackerel in the Seto inland Sea and
- iv. Offshore trawl fishery of flat head flounders and snow crab in the west part of the Japan Sea.

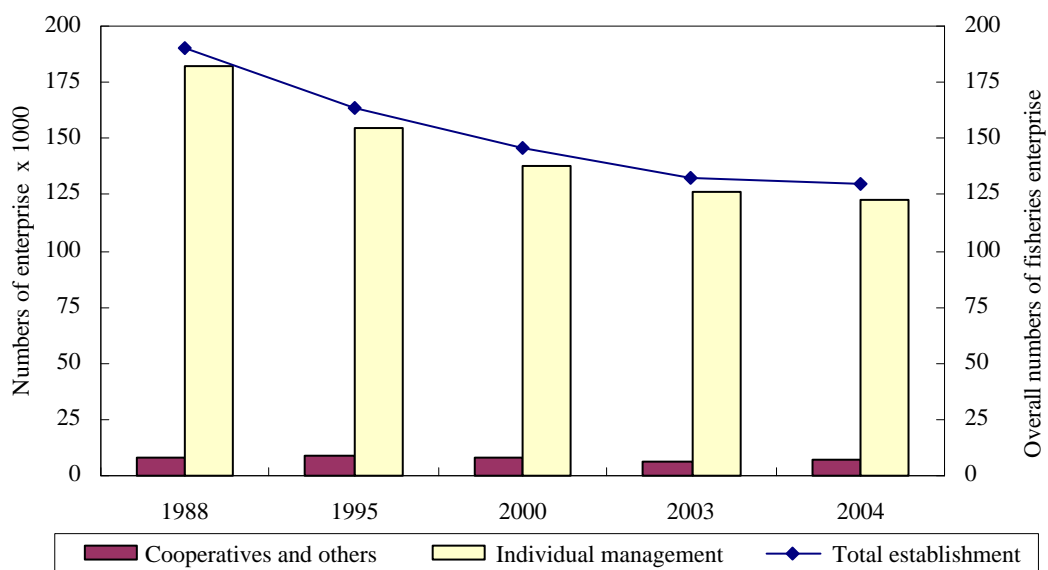
The, the relevant species have been subjected to restriction from catching and the stock is controlling by total allowable efforts (TAE) system²³.

3.3.2 Fisheries Establishment

The households and establishments that conduct fisheries and aquaculture including sea weed culture are designated as fisheries establishment or enterprise. Individual household (enterprise) engages in marine fisheries less than 30 days during a year is not relevant here.

²³ Annual report on the Development in Japan Fisheries in YF 2002, Part I. Outline of the Developments in Japan’s Fisheries.

Fig 3.5: Changes of Fisheries Enterprise



Source: The Statistics Department, Ministry of Agriculture, Forestry and Fisheries.

In line with a strong growth of fisheries production there was a large numbers of fisheries establishments during 1972 to 1988. However the decrease of landing reduced fisheries establishment as well. In 1988 the total fisheries establishment in Japan was more than 190000 ranging from family based entities to large scale fishing ventures in far sea and offshore fisheries. In 2004 it was only remained about 130000 establishments.²⁴ About 68% of fisheries established went decreased in two decades (Fig 3.5).

3.3.3 Fisheries Workers

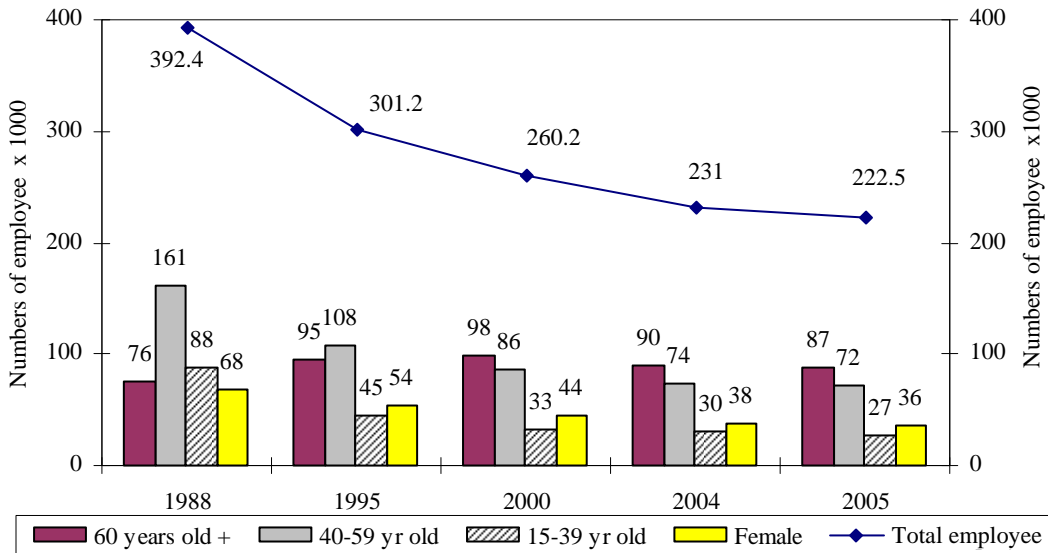
The number of fisheries workers also decreased almost 43% during 1988 through 2005. The composition of aged and experiences fisheries workers above 60 years has increased while the number of young workers of 15-39 years decreased. The decline of fisheries workers is more pronounced in offshore and distance water fisheries. It is because of the increase of people who prefer to work in other industries to earn higher income (Fig 3.6).

To overcome the problem of decrease of numbers as well as aging fisheries workers, the fisheries cooperatives association and fishing households are trying to recruit new fisheries workers.²⁵ Foreign workers also are recruited for the Japanese fishing vessels under the

²⁴ The Census of Fisheries and Annual Statistics on Movement of Fisheries Enterprises, Statistics Department, Minister's Secretariat, MAFF, Japan

²⁵ Annual Report on the Development in the fisheries in FY 2004 Part 1 development in the Fisheries Summery

Fig 3.6: Changes of Fisheries Employee



Source: The Statistics Department, Ministry of Agriculture, Forestry and Fisheries.

“Maru-ship” system. *Maru* indicates Japanese ships its name often end with maru. The “Maru-ship” refers to a Japanese ship with non Japanese crew to a certain percentage of the whole crew onboard²⁶.

3.4 Fisheries Products

Several preservations methods are used in processing. Generally, about 80% of domestic landing are meant for domestic consumption. Of which about 50% are used as processed food. They can be grouped into eight major types according to the kind of fish used and means of preservation and value adding: (1) paste (2) frozen (3) dried (4) salted (5) smoked and dried (6) cured (7) prickle, seasoning and cooked and (8) sea weed processing.

Several different methods of preservations and value adding exist for each of every major type of processed products. In parallel with decreasing domestic landing the volume of processed fisheries products also reduced. The recent outputs from domestic landing are only 50% to that of 20 years ago (Table 3.3)

²⁶ Annual Report on the Development of the Fisheries in FY 2004 Part 1, Development in the Fisheries

Table 3.3: Supply of Fisheries Product

FY	Source	Volume 1000 MT	Utilization (1000 MT)				
			Food				Non-food Total
			Fresh	Processed	Canned	Total	
1980	Domestic landing	10425	2320	4256	945	7421	3004
	Imports	1689	847	169	11	1027	662
	Exports	1023	202	12	603	817	206
	Total local supply	10734	3009	4383	274	7666	3068
1985	Domestic landing	11464	2100	4413	755	7268	4196
	Imports	2257	1356	509	15	1880	377
	Exports	1357	154	123	324	601	756
	Total local supply	12263	3342	4717	357	8416	3947
1990	Domestic landing	10278	1510	4351	450	6331	3967
	Imports	3823	2034	662	18	2714	1109
	Exports	1140	280	97	76	453	687
	Total local supply	13028	3315	5067	416	8798	4230
1995	Domestic landing	6768	1205	3682	368	5255	1513
	Imports	6755	3123	730	19	3872	2883
	Exports	283	206	37	20	263	20
	Total local supply	11906	4167	4432	322	8921	2985
2000	Domestic landing	5736	2198	2008	309	4515	1221
	Imports	5883	1685	2522	42	4249	1634
	Exports	264	191	52	10	253	11
	Total local supply	10812	3667	4524	338	8529	2283
2004	Domestic landing	5135	2317	1863	244	4411	711
	Imports	6055	1583	2407	113	4103	1952
	Exports	627	474	54	8	536	91
	Total local supply	10481	3439	4217	349	8005	2476

Source: Abstracts of Statistics on Agriculture Forestry and Fisheries in Japan.

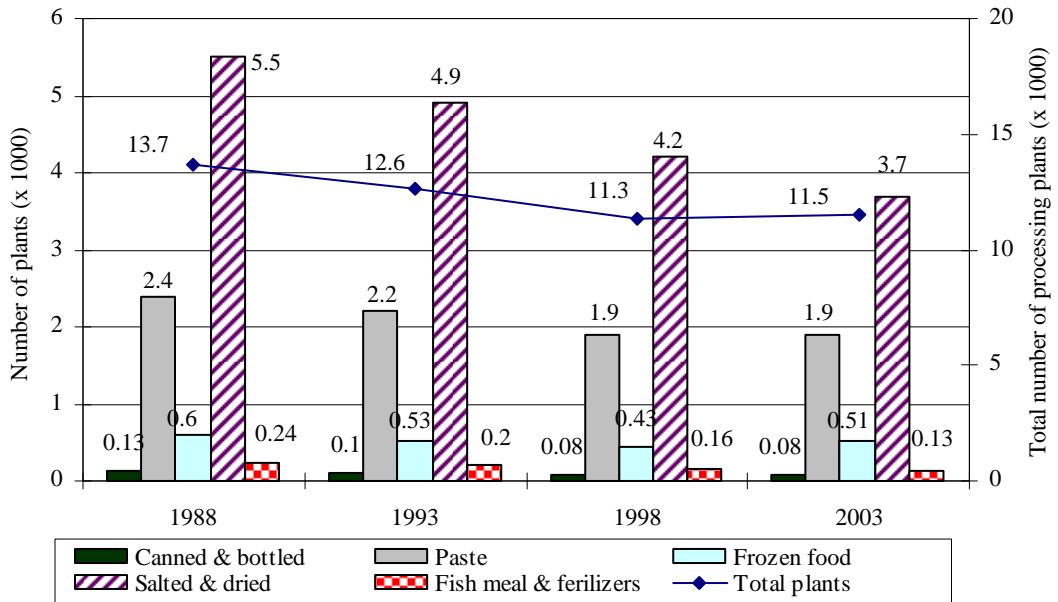
3.5 Fisheries Processing Industries

The structure includes essential infrastructure and facilities for ice producing, holding, processing, and storage of fisheries landing and finished products. As of 2005 reported by “National List of Freezing Plants”, the overall establishment in Japan is as the following:

- Ice plant: 4250 (capacity 19500 MT of ice per day),
- Cold storage: 3463 (storage volume 33 million cubic meter) and
- Refrigerating plants: 1263 (capacity 30000 MT per day)

The establishments of fisheries product processing plants as a whole also decrease in line with the decreasing domestic landing. The overall establishment has reduced about 15% in 2003 compare to that of existed in 1988 (Fig 3.7).

Fig 3.7: Changes of Fisheries Product Processing Plants



Source: Abstracts of Statistics on Agriculture Forestry and Fisheries in Japan.

3.6 Fisheries Product Distribution

Recently, the consumption of half cooked meals has increased due to the fact that more women have less time in preparing meals at home. Also eating out (eating at restaurants and food stalls) is getting common instead of cooking fresh fish and meat.

As a result the dependence on fresh fish and meat as food has been decreasing over the years. Meanwhile supermarket stores have been taking a larger share in retail distribution. It accounted as much as 70% of retail market in 2003. Thus the role of supermarkets and restaurants become important for fisheries producers as direct buyers.

In contrast, the ordinary retailers market has been getting smaller. It only accounts for 11% in overall fisheries market recently. In the late 1980s the share used to be about 35%.

3.6.1. Ensuring Safety and Labeling

According to the Japan Agriculture Standard Law, all fresh food product including fisheries products require to indicate the name and place of origin since July 2000. The Ministry of Agriculture, Forestry and Fisheries, the Food Safety Commission, the Ministry of Health, Labor and Welfare have cooperated in promoting risk assessment on food all over Japan.

Generally for the processed products, it is needed to indicate the name, the ingredients and use by date. In addition, it is needed to indicate if the product is originated from the defrosted or frozen raw materials or cultured. For the processed fisheries product in particular, it has been required to indicate even the origin of ingredient used in processing²⁷.

The national and prefecture governments have implemented the surveillance and guidance system in order to monitor food labeling closely. On site inspection, regular monitoring survey at food stores has been undertaken. Also nationwide telephone number for food labeling inquiries was established for the consumers to seek prompt information about the product.

Regarding the imported food the exporters have to indicate raw material and producer. The imported commodities are subjected to inspection. According to the Food Hygiene Law, the imported products are strictly detected if the hazardous residual chemical composition is higher than allowable level. The Minister of Health, Labor and Welfare have right to ban, if necessary, without any inspection the import of products produced in a certain country or areas in order to protect from risks²⁸.

3.6.2 Adding High Value

In response to the increasing awareness of consumers on food safety, the fisheries cooperatives and other group of fisheries product producers making efforts to add higher value such as promoting brand names nation wide. For example,

- Sendaiwan Akagai (Sendai Bay arch shell) from Miyagi prefecture; produced by higher quality control means and it is established as high class sushi item
- Matsuba Gani (snow crab) from Fukui prefecture; Controlling quality standard and mentioned place of origin
- Gon Aji (golden belly horse mackerel) from Nagasaki prefecture; the catch are kept in marine cage to further improve of quality before shipment. Sale as live fish high price as much as 1000 Yen per fish.
- Seki Aji (horse mackerel) caught by single hook fishing. Sale price is as high as 2000 yen per kilogram

In order to respond to consumers need, the exchange of opinions between the consumers and fish farmers have been undertaken through the sponsorship of “Japan Marine Aquaculture Association”. The program includes fish farms touring, lectures and seminars in fish food security and safety and wider the publicity of marine aquaculture.

²⁷ Annual report on the Development in Japan's Fisheries in FY 2002 Part 1, Outline of the Developments in Japan's Fisheries

²⁸ Annual Report on the Development in the Fisheries in FY 2004, Part 1 Development in Fisheries. Summery (Provisional translation)

3.6.3 Introduction of Traceability

There are several means to produce food. The methods of preservation, utilization of preservatives, storage, distribution and marketing are subjected to risks that can have an impact on the product to deviate from safe utilization. Fish can transmit undesirable substance from the water to the consumers through eating. The fish itself will be the media for harmful microorganisms. In this regard, traceability system is getting very important in fisheries. It may allow consumers to trace the products at any stage from production to distribution. Therefore, it has been attempted to extend traceability system in all fisheries producing countries.

In Japan the onset of the traceability system is under consideration to apply in two correspondent commodities from each of the following groups.

- Fish and shell fish (tuna, salmon, short neck clam, mackerel)
- Sea weed (wakame, kelp, larver, hijiki mekabu)
- Cultured fish (eel, young yellow tail, sea bream, yellow tail)

The system will create path to trace the trends of production to distribution by inserting barcodes tag. In this way the origin of product could be promptly figured out in case of encountering food safety related accidents.

3.7 Fisheries Institutions

The Ministry of Agriculture, Forestry and Fisheries (MAFF) plays a role in promoting balanced development of the agriculture, forestry and fisheries. In line with the overall development,

MAFF is comprehensively undertaking management in the following areas

- (i) Administration of production and consumption of food products
- (ii) Promote rural development program to upgrade rural welfare focusing on stable food supply and
- (iii) Sound development of agriculture, forestry and fisheries industries

3.7.1 Fisheries Agency

In order to achieve proper and effective administration in fisheries, the MAFF has organized Fisheries Agency in 1962. The main responsibility of the Fisheries Agency includes the following measures.

- i. Provide overall fisheries administration and making basic policies
- ii. Efforts in fisheries resources management and supervising all fisheries activities. On set of Total Allowable Catch (TAC) and Total allowable Efforts (TAE) is one of the

outstanding tasks in the recent years.

- iii. Develop fisheries resource enhancement policies and regulations
- iv. Investigate the status of resources and undertake stock enhancement activities in order to stabilize fishing and landing capacity in the coastal fisheries.
- v. Facilitate and subsidize fisheries supportive infrastructure such as construction of fishing port and maintenance of the port areas for long term utilization
- vi. Mediation of fisheries related conflicts through Fisheries Coordinating Committee.

3.8 Japan Fisheries Cooperatives

Japan has a cooperative system organized with Japan Agricultural Cooperative (JA), Japan Fisheries Cooperative (JF) and Japan Forestry Cooperative (Morikumi). The purpose of the cooperative system is to provide assistance and lead business, and daily affairs of farmers, fishers, and foresters.

3.8.1 National Federation of Fisheries Cooperative Associations (JF Zengoren)

JF Zengoren is a nation wide federation of Japan fisheries cooperative associations. It is an overall representative of the prefecture federation of fisheries cooperative (JF Gyoren), which in turn is represented for all Community Fisheries Cooperative (JF Gyokyo) in the areas of prefecture government.

3.8.2 Prefecture Federation of Fisheries Cooperative (JF Gyoren)

JF Gyoren is composed of community fisheries cooperative associations (JF Gyokyo). Apart from the responsibility to lead FCAs the unique structure includes in prefecture federation are Prefecture Credit Federation, Educational Federation and Cooperatives for Japan Pelagic Squid Jiggers.

3.8.3 Community Fisheries Cooperatives (JF Gyokyo)

JF Gyokyo has been organized by local fishers under “the Fisheries Cooperative Union Law”. The objectives of JF are focused the improvement of socio-economy status of cooperative member through sustainable utilization of its fisheries resources. The main function of the JF is to provide

- i. enhancement of production technology and strengthen fisheries resources management measures
- ii. economic services through the storage, processing and sale of products and supply of

- essential inventory for the business and livelihoods
- iii. financial services by disbursement of loans
- iv. mutual life insurance and mutual causality insurances.
- v. supply of essential fisheries operational materials, service providence,
- vi. backup and reinforce local fisheries cooperative associations.

As of April 2005 there are 1444 of fisheries cooperative association all along Japan coastal area. Generally, the community fisheries cooperative have branches of associations regarding to the specific characters of the business.

- i. Coastal area Fisheries Cooperative Association, (Coastal FCA)
- ii. Inland water Fisheries Cooperation (Inland –water FCA)
- iii. Fishing gear specific Fisheries Association (Gear specific FCA)
- iv. Fisheries Production Association
- v. Fisheries Processors Cooperatives

The current resources restoration activities by TAE and TAC and restriction of the fishing efforts have a impacts on the economic condition of the fisheries cooperative. In order to recover the declining resource, the restriction will be extended for several numbers of species. In this way the fisheries cooperatives attempt to stabilize catch. Fisheries cooperatives are merged and established larger cooperative associations to cover large areas. Through the mergers, the following large fisheries cooperatives have established;

- Akita fisheries cooperative associations
- Oita fisheries cooperative associations
- Kumano-nanda fisheries cooperative association
- Shimano-kuni fisheries cooperative association
- Toba-isobe fisheries cooperative association

In order to further extend the activities on self-sustainable fisheries cooperatives, the national conferences of the fisheries cooperative associations has adopted the resolution for more of mergers between fisheries cooperatives²⁹.

3.9 Legal Institutions

The legal institution of Japanese fisheries is extensively founded on the customs and law. The fishing right system has been established historically when the feudal lord granted fishing privilege to villagers in the coastal under his jurisdiction. The Fisheries Law of 1901 gave the legal definition of fishing rights. An advantage of the 1901 Fishery Law was that, it motivated all fishers themselves to organize Fisheries Society (developed into Fisheries Cooperative Associations). It was the beginning of the Community Base Fisheries Management System in

²⁹ Cooperative System and the Cooperative Credit Business

coastal fisheries.

Fishing licenses system was established in order to prevent over-fishing especially after the introduction of trawl fishing in off-shore waters. The exploitation of fisheries resources has been limited by the number of fishing license, the size of fishing boats, and fishing gear in use, fishing area and fishing period. The use of different fishing gears for different target species in the same fishing right waters resulted in over fishing and caused several conflicts among groups of resources users.

3.9.1 The 1949 Fisheries Law

The 1901 Fisheries Law was amended and was enacted as new Fisheries Law in 1949. The main objectives and provisions of the law was centered on the establishment of Fisheries Coordinating Committee (FCC) to make democratic and optimum use of fisheries resources. According to this law, FCC is established as legal organizations in all of 47 prefectures. FCC is working independently on behalf of the fishers. Thus it has a role in mediating prefecture government and fishers. Generally the efforts of FCC are mainly focused on adjusting exploitable resources capacity, the resources users and the policy making through manipulating the following activities.

- i. formulate systematic use of fisheries resources
- ii. taking measures for the conservation of fisheries resources
- iii. issue fisheries management related orders
- iv. organize public hearing as much as possible to listen the voice of fishers.
- v. issue fishing rights and licenses by the prefecture government.
- vi. issue orders to regulate fishing in case of necessary
- vii. amend and adjust the situation of fisheries resources and utilization
- viii. coordination between a prefecture government and resources users, the fishers.

In order to systematize fishery management, the following legal frameworks are simultaneously established

- i. 1949 Fisheries Law
- ii. Fisheries Cooperative Law
- iii. Fishing Harbor Law
- iv. Fishing Boat Law
- v. Fisheries Resources Conservation Law
- vi. Fisheries Insurance Law

3.9.2 The 1951 Fisheries Resources Conservation Law

The purpose of the law is to contribute supportive measures for sustainable development of fisheries through protection, conserving and enhancing of fisheries resources. It restricts

fishing, using explosive substances and poison material, determination on prescribe number of licensed fishing boats, designate protected water, where aquatic plants and animals take places for spawning and nursing, administration and plans of administration, extend of construction in protected water areas.

The law also emphasizes resources research related to the catch efficiency, operational condition at fishing ground according to the fishing types. For proper monitoring, the law demands fishery landings and the status of fishing grounds from fisheries operators. The Fisheries Resources Conservations Officers are assigned for the guidance and disseminate information on conservation in order to fisheries resources further. The Ministry allocate budget for this purpose.

3.9.3. Fisheries Basic Act (2005)

The current strategy for fisheries activities and establishment of Fishery Policy Council has enacted by 2005 Fisheries Basic Act. The provisions expressed in basic policy framework are-

- securing the supply of fisheries product,
- sound development of fisheries
- role and function for the administrative organs and fisheries relevant organization

The act provide the establishment of Fisheries Policy Council with not more than 30 members to study and deliberate important issues to be enacted through the consultation of Minister for Ministry of Agriculture, Forestry and Fishery and other related ministers concern

3.10 Structure of Fisheries Management

The structure of fisheries management in Japan is established by two ways: the “Community- Based Fisheries Management (CBFM) System” and “Total Allowable Catch (TAC) System” The community-based management system has been developed with the initiative and participation of the local fishers. The system is mainly applied to coastal small scale fisheries, which is the mainstay of Japanese Fisheries. The total allowable catch (TAC) has been developed in accordance with the Law of the Sea of the United Nations (UN). The system is mainly applied to migratory fishes such as Saury pike, Alaska Pollack, horse mackerel, pilchard, mackerels and Tanner crab³⁰.

The practice of CBFM is based on the fishing rights. The system is descended from feudal days. Under their jurisdiction, the landlord granted fishing privileges to the villages in

³⁰ Tadashi Yamamoto: *Collective Fisheries Management Development in Japan, Why Community-Based Fisheries Management has been well Developed in Japan*. IIFET 2000 Proceeding.

the coastal areas. It has been legalized by fisheries law and systematized the legal meaning of fishing rights all over Japan's coastal communities³¹.

The system is common in coastal fisheries management. The fisheries cooperative associations traditionally acquired exclusive rights for operating fisheries. Provisions of rights also render automatically responsibility for sustainable use of fisheries resources. The right has limited fishing condition such as season, target species and methods. The fishing right is prohibited from transfer, lease and mortgage. The rights are authorized by the prefecture governor. The governor has an authority and right to revoke or revise the fishery right by settlement of compensation in case of public interest. There are three types of fishing rights.

- i. **Common fishing right or joint fishing right (Kyodo-Gyogyoken):** It covers the entire coast of Fisheries Cooperative Associations. This fishing right is commonly granted to every FCA, in which two thirds of members are engaged in coastal fisheries for at least 90 days per year in the area. The cooperative members use the license on an individual basis. The license allows to fish sedentary species such as abalone, turban shell, lobsters, and scallop and sea weeds. Also it allows the use of non mobile fishing gear. According to the target species and fishing method, four types of license are issued which are valid for 10 years. -

- Type 1: Shell fish collecting
- Type 2: Small scale set net fishing
- Type 3: Beach seine
- Type 4: Fishing with fish attraction

The rules and regulation on the implementing of fishing right is determined by the respective fisheries cooperative. To amend or abolish fisheries rules and regulations such as fishing season, fishing area, and gear use, it requires instituting two-third of majority consent from members of the cooperatives. The total license issued in 2001 was 6702.

- ii. **Aquaculture right or demarcated fishing right (Kukaku- Gyogyoken):** The right allows utilization of coastal area for suitable aquaculture in the common fishing right areas. The common types of aquaculture are (i) hanging culture (ii) cage culture (iii) seabed sowing cultivation in inland sea areas. Farming of seaweed and cage culture is classified as special demarcated fisheries.

The independent fisheries cooperatives, which income is solely depend on the fisheries, have the first priority to access the special demarcated fisheries. Then the priority is given to the enterprise run by fishers, followed by fisheries production associations and ordinary fishers (individual or corporate entities). The license for

³¹ Marine Resources Exploitation and Management in the Economic Development of Japan: Salvatore Comitini; *Economic Development and Cultural Changes* Vol14, N04 (Jul., 1966) pp 417-427.

special demarcated fishing rights is effective for 5 years while the other in the category is extended to 10 years. 10103 licenses has issued in 2001.

- iii. **Set net fisheries right (Teichi-Gyogyokan) :** This right is granted to set large set net with a depth of 27 meters and above that aims at catching migratory fishes. Generally the set net fishery targets salmon, yellow tail and others. The self supporting fisheries cooperative have the first priority for the license. Then the second priority is given to cooperation consisting of 7 or more local fishers. Other applicants are also considered. However the priority is granted to the local resident. The grant is valid for 5 years. There were 1876 licenses issued in 2001.

3.10.1 The Fishing License System

The fishing capacity is restricted by licensing system. The system limits fishing units, areas, and the season of fishing. There are two types of fishing licenses.

- i. **Prefecture government license system:** It is issued by the prefecture government to the fishing boats that operate fishing within prefecture sea waters. The license is valid 5 years. The following type of fishing are relevant to the prefecture government license system:
 - Medium scale purse seining with 4-40 GRT boats
 - Smalls scale trawling with less than 15 GRT boats
 - Small scale salmon fishing by drift net with less than 30 GRT boats (excluding high seas)
 - Trawling in Seto-inland Sea.
- ii. **The national license system:** Fisheries operations in a nation wide scale or in the international water requires National Fisheries License, which is issued by the Minister responsible for fisheries. The licenses specify detail term and conditions regarding fishing areas, season, base fishing port, fishing gear used and fishing methods. There are two types of licenses: the designated fisheries license (*Shitei-gyogyo*) which permitted fishing with larger than 10 GRT fishing boats including trawl fishing in Japan offshore as well as in the international waters. The permitted fisheries license (*Shonin-gyogyo*) is relevant to all fishing normally operates with less than 10 GRT fishing boats in the Sea of Japan, East China Sea Pacific Ocean and in the Atlantic Sea. Long line, drift net, bottom gill net as well as snow crab fishing are common under this type of fishery license.

3.10.2 Catch Controlling System

The Law Regarding Conservation and Management of Marine Living Resources provides provisions to the Total Allowable Catch (TAC) and Total Allowable Effort (TAE) system and the basic framework for conservation and management of marine resources in the exclusive economic zone (EEZ).

- i. Total Allowable Catch (TAC) system:** The system has been implemented for seven major fishery species, which are (i) sardine (ii) jack mackerel (iii) mackerel (iv) saury (v) walleye pollock (vi) common squid and (vii) snow crab. According to the system the upper limit for catching of such species has set in the EEZ area. As in needed of detail scientific data the application of TAC to all commercial specie is not applicable at this stage. Currently, the species relevant to the following issues have been given priority to be designated in the list of TAC
 - - having high commercial value with tangible harvest level nation wide
 - - that needs urgent resources conservation measures or
 - - that are potentially targeted by the foreign fishing operations

- ii. Total Allowable Efforts (TAE) System:** The system has established to set an upper limit on the number of fishing days and the number of fishing vessels operate in the specific fishery areas within EEZ. Unlike TAC that need detail scientific data for the threaten species, TAE can be introduced without detail scientific information. Thus TAE has been considered to be suitable for the management of catch declined species and those species with fluctuating population.

3.10.3 Resources Recovery System

The plan is comprehensively focused on the species which are in the vulnerable state. The system includes:

- reduction of fishing efforts by reducing fishing boats in operation
- establish no fishing period
- releasing seeds produced from hatcheries into the natural waters
- extending conservation for fishing ground
- specific formulation by the national and local government on the recovery of resource in the target water.

3.10.4 Enforcement of Fisheries Management

The fisheries management measures have been extended to the fishing operations by constant monitoring and surveillance though

- i. inspection of fishing vessels at landing sites,
- ii. patrolling by vessels and aircrafts at inside and out side of the Japan's and
- iii. application of vessels monitoring system VMS in some fishing ground.

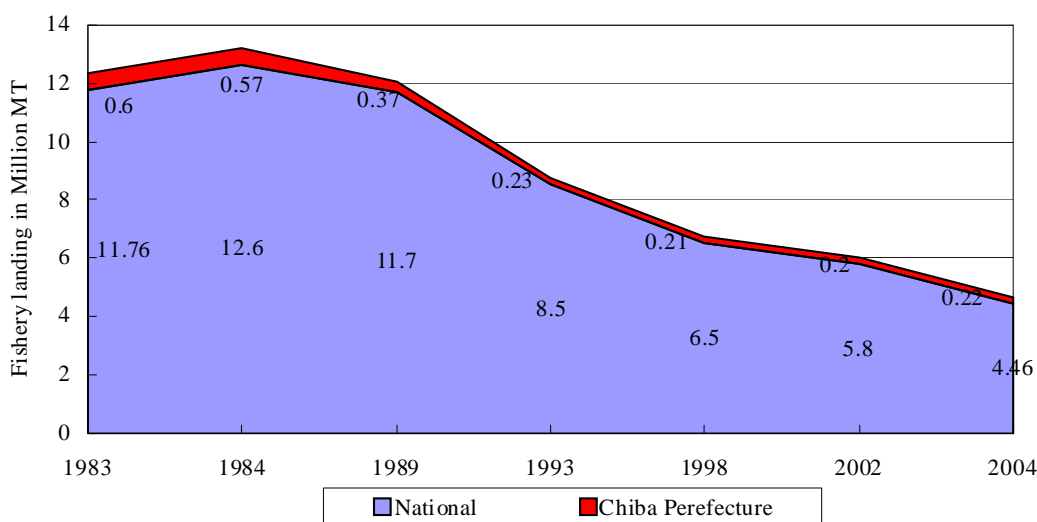
3.11 Current Status of Fisheries in Chiba Prefecture

All of 47 prefectures in Japan have fishery management program in line with the national framework; Here a case of Chiba prefecture is presented; Chiba is one of the top leading fishery prefectures in Japan.

As Japan fisheries had its peak in the 1980s, Chiba prefecture also had the largest volume of landing in 1983 (0.6 million MT), which was 5% of overall landing in Japan. In 2004 Chiba produced about 0.2 million MT and positioned 3rd largest in national level. However it is almost 65% decrease in two decades (Fig 3.8)³²

Major landing of Chiba are Japanese sardine (*Sardinella* sp), sea bass, spiny lobsters, pilchards, yellowtail, Pacific saury (skipper), and abalone and larval. The total national landing of Japanese sardine in 2002 was 0.44 million MT. Chiba accounts for almost 25% (0.101 million MT), which was marginally higher than that of Ibaraki prefecture. Also the inland aquaculture, Chiba stands 10th of national total carp production (Table 3.4).

Fig 3.8: The Trends of Landing in Chiba Prefecture



Source: An Overview of Fisheries Industry in Chiba Prefecture 2007.

³² Office of the Chiba Prefectural Government

Table 3.4: Status of Landing in Chiba Prefecture in 2002

Fish , shellfish and Seaweed	National total	Landing at Chiba		
		Total (MT)	Shared in national	
			(%)	rank
Half mouth sardine	443158	104515	24.0%	1 st
Sea bass	10737	2389	22.0%	1 st
Spiny lobster	1378	307	22.0%	1 st
Pilchard	50313	9807	19.0%	2 nd
Yellow tail	51194	6992	14.0%	2 nd
Short neck clams	34494	8873	26.0%	2 nd
Hard clams	1300	203	16.0%	2 nd
Edible brown algae	6973	1465	21.0%	2 nd
Carp	3359	334	10.0%	2 nd
Sauries	205282	9943	5.0%	4 th
Abalone	2223	164	7.5%	4 th
Agar weeds	2614	85	3.0%	6 th
Mackerel spp	279633	10442	4.0%	7 th

Source: An Overview of Fisheries Industry in Chiba Prefecture 2007

3.11.1 Overview of Fisheries in Chiba Prefecture

Fisheries operations in Chiba prefecture are classified into two categories, as fishing by license and fishing by fishing right privilege. The major fisheries were round haul net fishing (64%), aquaculture (11%) and fixed net fisheries (6%).

As of 2002, there exists 4998 fisheries establishment (3.1% of the national) with 7080 fisheries employees (2.9% of the national). There are 6419 fishing boats, and 69 numbers of fishing ports. Among the fisheries areas, the Choshi-Kujukuri area, which is on the east coast and facing to the Pacific Ocean have least fisheries establishment. However, it produced more than 50% of total landing in Chiba prefecture in 2002 (Table 3.5).

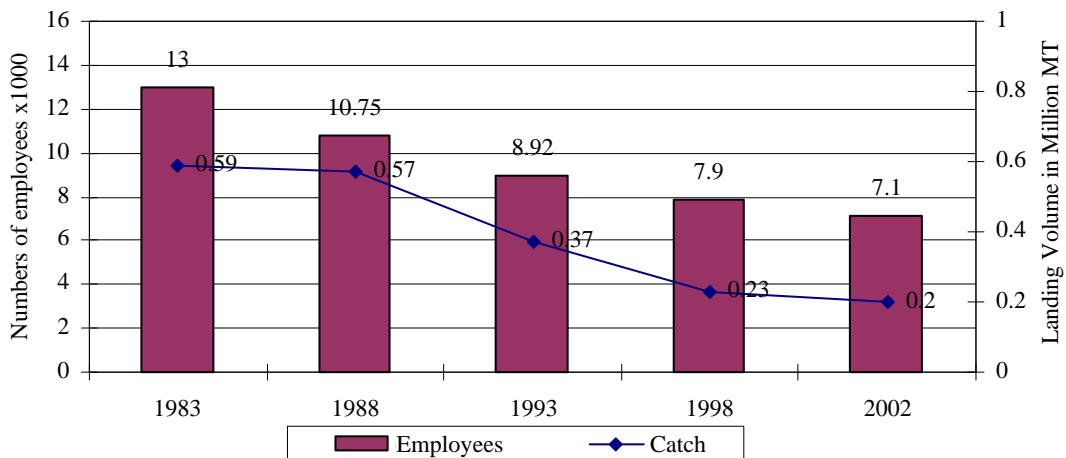
Marine fisheries have been decreasing since the late 1980s in Chiba. The landing in 2002 was only 40% to that of early 1980s. The main reasons of decline are deterioration of fisheries resources, trimming out of fisheries establishment and aging of fisheries employees, which encountered and challenges Japan's fisheries as a whole (Fig 3.9)

Table 3.5: Fisheries Establishment and Share of Landing

Area	Establishment		landing	
	Numbers	%	MT	%
Total	4998	100	202660	100%
Tokyo Bay	1622	32.7	35,526	17.53%
Uchibo	793	15.0	15,087	7.44%
Sotobo	2160	43.2	28,043	13.83%
Choshi-Kujukuri area	423	8.5	124,004	61.20%

Source: Source: An Overview of Fisheries Industry in Chiba Prefecture 2007.

Fig 3.9: Changes of Catches and Numbers of Employee



Source: An Overview of Fisheries Industry in Chiba Prefecture 2007.

Chiba Prefecture Government has laid out fisheries activities with the following objectives in line with the Fisheries Act 2005.

- (i) Creating the sea enriched with marine resources for sustainable utilization of fisheries communities
- (ii) Ensure stable supply of safe and quality fisheries products to meet consumers demand by promoting and better distribution and processing systems and methods.
- (iii) Maintain fisheries management methods to stabilizing fisheries operations and enhance realization on women roles in fisheries.
- (iv) Establish fisheries infrastructure to support fisheries operations by construction of fishing ports and fisheries base.

3.11.2 Role of Fisheries Cooperative Association (JF) in Chiba prefecture

The coastal fisheries in Chiba prefecture are operated under Fisheries Cooperative Associations in every each of fishing community. Generally JF formulize and regulate the limit of fishing, landing, fishing period, and the fishing gears and methods. However, these regulations can be amended by the consensus from members in the fisheries cooperatives.

In this context the fisheries cooperatives in Chiba prefecture has putting emphasis on the following areas.

- i. Activate resources management efforts
- ii. Guide on fisheries operation and production methods
- iii. Provide financing, funding and acceptance of deposit
- iv. Supply fisheries inputs such as oil, other materials
- v. Provision of facilities for community such as
- vi. Support sale of the fisheries products by assisting transport, processing, storage and
- vii. Provide administration and exercises of fishing rights
- viii. Provisions of relief in the event of accident etc.

As of 2002 there were 41 fisheries cooperative association in Chiba prefecture. Actually it was 57 associations from 1989 to 1993 but reduced to 43 establishments in 1998.

The numbers of member is decreasing by more or less 1% yearly for every association. As a consequence of decreasing landing, JF in Chiba prefecture is challenged by operational and financial problems (Table 3.6).

Table 3.6: Changes of Fisheries Structure in Chiba Prefecture

Particular	1989	1993	1998	2002
Number of Fisheries Cooperative Associations	57	57	42	41
Numbers of members	20014	19316	18637	17727
Numbers of fisheries employees	783	742	712	656
Investment (Million Yen)	4758	5542	6731	7101
Total assets (Million Yen)	108,911	102,382	72,712	56,430
Surplus in current year (Million Yen)	115	-727	206	-332
Surplus carried forward (Million Yen)	-1990	-2517	-2385	-3216
Number JF whose liabilities exceed their assets	7	10	7	8

Source: An Overview of Fisheries Industry in Chiba Prefecture, 2007

3.11.3 Utilization of Fisheries Products in Chiba Prefecture

The trends of fresh fish consumption has been steadily deviated while the volume for processed was increased since early 1990s. In recent years more than 50% of landings are used for processing. The utilization in non-food purposes, such as for agriculture fertilizers industries and fish oil production was stable more or less 10% of the catches.

Dried fish, salted, smoke and preserved food that need deep frozen condition after processing, are main types of processed fisheries products.

There are different varieties in dried fish. The product processed into dried, salted products account for 70% of overall processed products in Chiba prefecture. Normally small pelagic fishes such as sardine and anchovies are dried and salted (Table 3.7).

Table 3.7: Volume of Fisheries Product Utilization

Subject		1983	1988	1993	1998	2003	2004	
Total landing MT		764936	616085	482771	390228	369799	272714	
(A) Food	Fresh and frozen	539793 (71%)	413012 (67%)	280941 (58%)	214268 (54%)	161886 (34%)	135653 (40%)	
	Processed	1. Dried	486	1635	699	365	273	277
		2. Salted and dried	58248	52488	58370	66971	71152	59694
		3. Boiled and dried	3535	5830	4246	6726	4279	4375
		4. Smoked	571	562	59	724	756	763
		5. Salted	29614	43648	44509	27077	84620	35235
		6. Smoked –dried	823	1347	782	609	568	563
		7. Fish paste	10655	13223	13969	7287	18144	9292
		8. Deep frozen	17495	24621	19810	14047	14955	13341
		9. Others	11208	11846	12449	10947	13166	13521
Total Processed	132635 (17%)	155200 (25.%)	154893 (32%)	134753 (35%)	207913 (56%)	137061 (50%)		
(B) Non food	Fish oil	6171	4710	3007	5876	-	-	
	Bait & Fertilizers	86337	43163	43930	35331	-	-	
	Total non food	92508 (12%)	47873 (8%)	46937 (10%)	41207 (11%)	(10%)-	(10%)-	

Source: An Overview of the Fisheries Industry in Chiba Prefecture, 2007

3.11.4 Fisheries Management Activities

The activities by Chiba Prefecture Government have three main themes: (1) resources management (2) distribution and processing of the products and (3) survey of fishing and oceanographic conditions are briefed as following: -

1. Resources management: There are resources management measures according to the types of granted licenses for the large and medium scale fisheries. Based on the provisions of prefecture and national government, the JF in coastal community have set their own ceiling of catch for certain species, limits of fishing efforts, gear and methods and fishing season

In some cases, the JF had retard fishing due to relevant status of resource on ground condition even there was allowable catch limit. Such kind of community participation in response to the responsible fisheries management is common in all coastal fisheries areas. The clam fishers in Choshi-Kujukuri coastal areas commonly practice such resource management by their own determination.

Apart from common and regular rules the specific efforts have been made for selective fishing gear and methods to protect and enable juvenile fishes to escape from entrapped by fishing gears.

- The two layer trawl net which is widely applied in all small scale bottom trawler at Choshi-kujukurihama area was developed in 1994 and started to operate commercial basis in 1998.
- Cylindrical trap to capture conger eel was developed in 1999 and it is widely used in all Tokyo Bay fishing areas
- Recently, the trap base bottom trawl for conger eel fishing has just developed and will be introduced in Tokyo Bay area.

2. Distribution and Processing of the Product: Supplying fish with fresh condition to the consumers is critical. In order to speed up distribution, freshly landed fish in the morning is delivered to the consumers market in the evening.

In order to supply different types of processed product, new processing methods are developed. The recent improvement of processing and value adding is seen in anchovy and half mouth sardine into “sardine pickled and sprinkled with sesame seeds”. Currently Chiba prefecture is in the first position in the national ranking for volume of landing of half mouth sardine and 47% of processed fisheries included sardine products.

3. Establishment of Marine Industries Information System: In April 1992 “Chiba Prefecture Marine Industries Information Center” was established. The system enables communication with all fishing vessels registered in the prefecture by radio to ensure

safety in the sea. Also the information network has set up and the following fisheries related information and data are compiled

- i. Satellite information on the sea condition and relevant fisheries research outcome
- ii. Data and information from Fisheries Research Centers
- iii. Fishing ground survey from research vessels.
- iv. Catch data and fishing conditions of every fishing vessel registered in the prefecture.
- v. Market information for marine products from fisheries cooperative associations

The wide spectrum of information system has been developed through the link with fisheries research centers, fishing ground survey system, research vessels, fishing vessels at ground and market information from fisheries cooperative associations.

The updated information and data were prepared. For example, (i) fishing ground oceanographic and fishing condition (ii) fisheries market information (iii) catch composition and (iv) uploading of fisheries general information in the web pages. This information are provided through (i) Fax in wireless or cable (ii) Radio broadcasting (iii) Internet connection and (iv) Cell-phone.

CHAPTER IV CONCLUSION

4.1 Trends of Global Fisheries

In all coastal countries, the roles of fisheries are important not only as the source of protein but also as key player for economic development. Although the extent of aquaculture has been pronounced in recent days, the products from marine fisheries are still contributing larger share in the total fisheries landing. In 2005, the world's total landing was 141.6 million MT of which 84.2 Million MT (60%) was marine fisheries product. The trend of landing from marine fisheries is declining as it shared 66% in total landing of 131.1 million MT in year 2000. The investigation on fisheries stock has indicated that about half (52%) of the resources were fully exploited so that the catches were at or closing to their maximum sustainable limits, with no room for further expansion. The other 25% were either overexploited or depleted³³.

4.2 State of Bay of Bengal Large Marine Ecosystem (BBLME)

Over fishing are increasing and the high value species are decreasing through the evidences of trawl surveyed and records of catches in the regions of Large Marine Ecosystems (LMEs). The Bay of Bengal LME is located in the tropical and bounded by Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand. The commercial species includes anchovies, croakers, shrimp and tuna. The landing of these species increased by heavy fishing since 1950s. Using cyanide fishing in coral reefs and deterioration of mangrove and estuaries in region leads to decline the balance of coastal.

In the Bay of Bengal LME, the marine fisheries resources are subjected to deplete because of over fishing. In the case of Myanmar, marine fisheries landing has been reached to its maximum allowable catch since 2000. However the increase of fishing efforts are encouraged instead of enhancing awareness on effective counter measures. Quantitatively, the statistics describes a stead increase of landing. The lack of detailed statistics needs to be taken seriously. Present statistics do not allow us to identify even the usage of fisheries landing. Due to absence of good processing and transporting facilities, much of fresh landing has been used as animal feeds in coastal areas. Thereby, calculation of per capita consumption through the ration of export surplus and existing population may have a wide range of variations, which in tern interferes the role of fisheries in domestic food security and nutritional supply.

³³ FAO 2006: World Review of Fisheries and Aquaculture Part 1. Food and Agriculture Organization of the United Nations, Rome

Marine fisheries actually are utilization of naturally gifted living resources. The existence relies on the interrelation of environment, biological characteristics of the species itself and the on set of interferences. Thus the sustainability of fisheries resources are challenged by fishing pressures, and natural recruitment capacity coupled with the changes of climatic and environmental conditions. In other words, fisheries management should be meant for the long term use of fisheries resources.

4.3 Trends of Myanmar Fisheries

Judging by the increase in landing volume, Myanmar fisheries is developing fast. Due to the amount of export earning, fisheries sector have its role as one of the main contributors to the national GDP over the periods. Thus fisheries are recognized as an important economic sector for the country.

In 1990-91 the fisheries export earning was only US\$13 million. It has been significantly increased 10 years by US\$218 million in 2000-2001 and US\$ 250 million in 2001-2002. Thereby the encouragement has been given to promote fisheries export and the landings are given priority for exporting. The fisheries policy and development program are meant to fulfill the domestic consumption and only the surplus shall be exported. Nevertheless, the products are given priority for export and only the surplus is used in the domestic market. Due to the absence of proper reporting and recording system, it is difficult to clarify the actual domestic use of fisheries products.

In 2005-2006 about 270000 MT was exported. In this case it should be assumed the fresh products of about 450,000 to 675000 MT was used as raw material. In other words 18- 26% of the overall landing was used for export processing. Thus export surplus will be more or less 2 million MT. According to FAO estimation, 10% of the landing is used as non food or animal feeding. Then per capita utilization for 55.5 million peoples of 32.4 kg is estimated.

The estimation on average monthly expenditure of households (average 5 person) indicates that consumption of fresh fish and processed fisheries products was 15.2 kg in 2001, meaning per capita consumption of fish and fisheries product was only 3.4 kg.

According to the Myanmar Foreign Investment Law, the government's policy is to "increase export of any available surplus of the country". The logical determination of fisheries surplus can be made only after knowing the self efficient volume of fish to meet nutritionally recommended level. In Myanmar there are no indications of minimum requirement of fish for adequately supply as food and never had been attempted to access it. In this context the promoting fisheries export policy can adversely impact on adequate supply of fish food and degradation of standing fisheries resources.

The volume of fisheries export is apparently increasing, however the proportion is generally ranged 10 to 13% of total landing. The export volume has increased in line with

increase in landing. Such limitation in export is not relevant as the surplus from the domestic uses but it is mostly concerned with the declining composition of high value fish in marine fisheries landing.

There are several reports that support this estimation by which indicate the decline of commercially important species. In Rakhine water, the landing of the shrimp in 2003 has reduced by 65% from that of 1991. Also in the Ayeyarwaddy waters, the overall catch rate of fishing vessels has declined from 260 kg per hour in 1980-81 to 130 kg per hour in 2000. The declining species are including pomfret, Indian threadfin, croaker, marine catfish, sardines and small anchovy, grunts, conger eels and, ribbon fish etc³⁴.

Fisheries resources are natural gift which support country's socio-economic development. In this context the vital important issue is to maintain fisheries resources for the next generations.

The systematic surveyed of fisheries resources by RV Dr. Fridtgof of Nensan has estimated the maximum exploitable fisheries resources is about 1.05 million MT (0.5 million MT for pelagic and 0.55 million MT for demersal species). There may be changes of fisheries resources capacity in recent years; however neither of such comprehensive surveyed has conducted. Thus the marine resources and landing status has to refer 1.05 million MT as the maximum landing volume. In this regard the marine fisheries landing have reached to its maximum exploitable level (MSY) since FY 2001-2003.

As the source of export earning, fisheries export is promoted. In this regard the status of resources and recent utilization needs to be clarified for the sake of appropriate formulation of noble fisheries policies. Therefore the following measures are important the sustainability of the whole fisheries industries.

- i. assessment of standing fisheries resources
- ii. extension of resources management
- iii. efforts and capacity on analytical fisheries statistic
- iv. inputs of high value adding of the product (means to increase earning by quality oriented fisheries export rather increasing volume)
- v. extension of fisheries information
- vi. intensity of market promotion
- vii. range of subsidies and invest for research and development
- viii. measures of capacity building to render effective management

4.4 Trends of Japan Fisheries

Japan is one of the second largest fish consuming country in the world after the Iceland.

³⁴ National Report of Myanmar on the Sustainable Management of the Bay of Bengal Large marine Ecosystem., 2004.

The per capita consumption of fish in Japan in 2003 was 36.2 kg on a net weight basis while it was 67.4 kg on a crude weight basis. To the daily food supply to the Japanese people, 40% of the animal protein has received from fish and fisheries product, which is about 22% to the whole protein intake.

All along the coastal of Japan there are about 6300 fishing villages, under each prefecture government. Historically, the villages' people are making living through fishing. Due to the differences in resources endowment, each village has a specific characteristic of fisheries products. It is visualized that Japan has been motivating all the efforts for the sustainability of fisheries resources focusing on the livelihood, adequate supply of quality fish as well as improvement of fisheries manufacturing and trading.

The annual landing by species as well as by volume has recorded and analyzed to reach the status of resources and efforts of catching. Generally the overall capacity of fishing efforts is controlled by the national and prefecture government. However, the fishing operations are limited within the frame of "Total Allowable Efforts – TAE" and "Total Allowable Catch-TAC".

Normally fisheries in the coastal are small scale. According to the Fisheries Law, the fishing villages in a form of fisheries cooperatives have privilege rights to explore and extend management to the adjacent fisheries resources. In this regard the maximum level of catch volume for every each specie and season are notified by the Fisheries Agency through the Prefecture Governments. Since the fisheries are the livelihood of the fishing villages in general, the villagers usually behave fishing in a sustainable manner. Even the catch limit for the certain species is prescribed in the areas, the fishers abandoned fishing in order to further enhancement of the stock in future.

The underlining reasons of the decline of domestic fisheries production in Japan are resources depletion, scarcity of fisheries workers and the ageing of the fisheries workers. In order to revitalize the fisheries, the fisheries workers have recruited from overseas. Through the maru ship system, the crews for fishing vessels are recruited. Through the JITICO system the workers from overseas are recruited for the fisheries processing.

For the sake of the fisheries development, the Fisheries Agencies has been undertaking integrated fisheries research in collaboration with research institutes and Universities. The research policies are being set up in resources management, stock enhancement, nutritional purposes and extension on introducing of potential species as food.

As the fisheries products are primarily used for food, and the other uses are for animal feeds and fertilizers. It is possible to trace the contribution of fisheries for the people's consumption and its value in non food manufacturing. Japanese people eat fish by several means and ways of processing according to localities and level of higher value adding.

In the context of Japanese Fisheries, it has been clearly notified the decline of fisheries resources decrease of landing down to 50% of its peak in 20 years. The fisheries policy makers acknowledge fishing records and statistical data in formulizing fisheries planning. The

catch and fishing efforts have been limited. Fisheries researches are constantly conducted to support productions as well as determining the nutritional value of the species. The status of resources and catch efficiency are closely monitored. Through this way the total allowable catch system could be effectively implemented.

In general, the fisheries management in Japan emphasizes the adequate supply of fish food. The measures undertaken are subjected to –

- i. uplift fisheries resources from declining
- ii. provide upper limit of catch in order to balance the state of resources and fishing efforts
- iii. sustain fishing industries in fisheries communities, which are main fisheries product suppliers
- iv. extend responsibilities of resources management into the hand of resources users and
- v. safe consumption of fisheries products

Apparently, one can make argument, Japanese fisheries management are reflected its developmental status and applying of modern infrastructure. However, my study on Japanese fisheries enables to understand that all of fisheries management activities are based on the sound statistical reports and fisheries research.

For instance, the data of landing and trends of utilization for every species has been properly recorded. The utilization of fisheries product for food and non food is classified. Per capita consumption as well as the rate of self efficiency could have been estimated in realistic means. So that prominent role fisheries to food security and its supports to the livelihoods as well as efforts on wealth building can be always identified.

Therefore, the structure of whole fisheries sectors is figured out clearly. Then the policy makers can perfectly formulize fisheries development program which may include-

- effective use of resources by further identify of potential species
- upgrade the quality of the products by means of value adding

In this way benefits from trading by quality rather than volume of the products so that, extending of fishing efforts and pressures will be automatically decrease and giving path for the natural fisheries resources to restore and sustain. .

4.5 Recommendations

Throughout the study on the development of fisheries sector in Japan, the measures for overall fisheries industries development were learnt. Thus in view to sustain and further development of Myanmar Fisheries, the following recommendations can be made.

(i) Assessment of Standing Fisheries Resources

The total landing from marine fisheries is increasing in recent years and that covered almost 50% of overall fisheries landing. In the year 2005-2006, the total fisheries export was 0.272 million MT in which marine product includes 78% (0.212 million MT), the aquaculture and inland fisheries product included 20% and 2% respectively. In other word, in the whole marine fisheries landing of 1.13 million MT has included high value exportable fish to produce 0.212 million MT of finished product. The indication is important that the trends is leading the depletion of quality fishes.

Thus the proper reporting and record keeping system from all landing of inshore and offshore fisheries is urgently needed. Then the state of landing volume and its quality of products would be figured out for the relevant policy to be implemented.

Meanwhile the approaches should be rendered to FAO, SEAFDEC, JICA and ODA for the assistance to make comprehensive fisheries resources assessment in Myanmar marine territorial water.

(ii) Extension of Resources Management

In particular, 1989 Law relating to the fishing rights of foreign fishing vessels and 1990 Myanmar Marine Fisheries Law are legal framework relevant to the fisheries resources management. The objectives are:

- prevent fisheries from extinction
- safeguard and prevent the destruction of fisheries water and environment and
- extend fisheries management in accordance with the law

So that, to protect, conserve and manage of the marine environment has to be undertaken by the Department of Fisheries to retain resources for future generation.

Actually there are several potential fisheries resources in the coastal areas. However most of the species are remained unidentified and it leads to confusion in the trading and statistical reporting.

In general international trading, the importing countries are cautious of the quality. The exporters should indicate its products the common name, scientific name, origin of landing or country of the origin in order that it can easily trace back the products' history.

Currently, the large volumes of Myanmar fisheries products are directed to China and Thailand, who are the fisheries re-processors. Due to increasing pressure on fisheries export earning of fisheries exports, the trends of fisheries export need to be oriented to the value added and processed exports. In this regard, Department of Fisheries should extend its mandate towards resources identification in collaboration with competent inter government agencies and Universities.

(iii) Extension of Efforts on Analytical Fisheries Statistics

Currently there are two series of fisheries statistics compiled by the Department of Fisheries. They provide information as much as possible but mostly emphasize fisheries trading. It is less applicable to extend fisheries management purposes and even to realistic analysis of per capita fish consumption.

In a matter of fact the statistical data and information are compulsory needs for the appropriate analysis of fisheries resources and trends of fisheries development. The good statistics will support fisheries policy makers to set sound management program, efficient supply of fish food, extend fisheries trading and improve livelihoods of resources users.

In order to sustain recent fisheries development, the analytical reports of fisheries statistics should be upgrade to categorize -

- i. fisheries landing by major type of fishing grounds (inshore, offshore) and major type of resources (fin fish, shrimp, coelenterate, crab etc)
- ii. in-country usage of fisheries products in order to clarify the utilization of fish as food and non food, which in turn can make assumption of per capita fish consumption more realistic
- iii. overall uses of fresh raw material by major type of resources in the process of fine product to be exported. Then, the surplus from export can be closely estimated and it will be possible to make further analysis of domestic uses
- iv. all fisheries processed products according to type of processing and sources of raw material so that the trends on effective uses of fisheries product can be traced
- v. the numbers of fishing villages in the areas as well as the numbers of fishers or fisheries workers in order to clarify the role of fisheries in contributing to the livelihoods and job creation for the local people

(iv) High Value Adding of the Product

The global trends of consumers market are leading higher demand of simple and easy to cook fish base ready meals with high value adding. New production and processing technology has been introduced.

The Myanmar fisheries product are currently exported as fresh frozen, or in live forms. In this regards the traditional fisheries processing should find means to upgrad and high value adding of the products quality. In this way, the small scale fishers and processors will have benefits from fish trade, which in tern supports nation's economic development.

(v) Provision of Subsidies and Investment for Research and Development

The developments of fisheries industries have a close link to the research and

development. The outcome from analytical research addresses proper consideration and formulation of fisheries policy and finding solution of the problems as well. In this regard the Department of Fisheries should build up its capacity to extend research to understand the following: –

- i. Intensity of biota, which are of fisheries potential in coastal ecosystem especially in the mangroves, mud flat and coral reefs.
- ii. Population structure and dynamic of distribution of important fisheries species.
- iii. State of landing, utilizing and supports to the wealth building of coastal fisheries resources.
- iv. Overall clarification of fisheries landing from all marine fisheries

In using the results from these research, it can be clearly understood the real status of the resources. Then the logistics and ministrators can plan for extention of fisheries management and make maximum level of exploitation.

In 1990 Myanmar Marine Fisheries Law, the provision No 53 of chapter XIII particularly describe that “ for research , development and conservation of species of fish for the fisheries the Department of Fisheries is entitled to use 5% of duties and fees collected form the fisheries”.

Therefore the prompt activation of research programs intended for the whole fisheries sector development is necessary.

(vi) Capacity Building to Render Effective Fisheries Management

The Department of Fisheries’ administration is dedicated to the township level fisheries offices from where the line of management extends to the village level. The major roles of fisheries offices are to dedicate the mandate of the Fisheries Department. The main responsibilities are the resources conservation, extend of research and development, collecting of statistical data, extend fisheries supervision according to Fisheries Laws.

Basically the fisheries officers in provinces are biologist. However, due to the pressures to meet annual quota of revenue, most of their efforts are dealing with fishers and fisheries traders mainly for the purposes of revenue and payable duties from trading.

Thus it is wise to encourage and improve the capacity of Institute of Fisheries Technology in order to render more efforts to disseminate training on fisheries resources management. Similarly, the fisheries data collecting system should be improved. Thereby, the decisions makers can set reasonable sound strategic frame works in fisheries development.

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