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MARINE FISHERIES OF SOUTH AND SOUTHEAST ASIA: A REVIEW OF THE RESOURCES AND THE NEED FOR MONITORING CONTROL AND SURVEILLANCE

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1. INTRODUCTION

Marine fisheries in the south and southeast Asian countries have developed rapidly, starting in the 1970s and continuing into the early 1990s. One of the driving forces behind this rapid development was the increased accessibility of global markets for fisheries commodities, coupled with an export liberation policy in many countries of the region. The fisheries exploit resources in an extensive area from the Indian Ocean to the western central Pacific, with major concentrations of fisheries in the Bay of Bengal and in the South China Sea and its vicinity. Landings in the region were 11.7 million t in 1996, an increase of 19.4% from the 1990 level of 9.8 million t. The total value of exports deriving from the fisheries sector has almost doubled since 1990, reaching $US 8 900 million in 1995. The region is one of the fastest-growing regions in terms of fisheries development, as reflected by the historical landing figures.

Fisheries in the region are typically tropical, exploiting a multitude of species, especially the demersals, together with a variety of small pelagics, cephalopods and highly migratory fish species, such as tuna. The multigear nature of the fisheries is also typical of the region. In general, the fisheries are still dominated by small-scale fisheries, which contribute as much as 60-90% by weight of the production, although in terms of value their contribution is only 30-40%. In contrast, the large-scale fisheries (industrial and semi-industrial) provide less in terms of weight, but greater value. The large-scale fisheries by and large exploit high-value resources, such as shrimp and tuna. Some of the small-pelagics fisheries, especially those attracting large purse-seiners, can be considered large scale.

Shrimp fisheries are coastal and dominated by trawl fisheries, which developed rapidly in the 1970s in most countries of the region. Tuna fisheries developed later and employ diverse gear, including gill-nets, pole-and-lines, long-lines and purse-seines. Other important commodities exported include squid, cuttlefish and some other finfish species, but their overall contribution is less than that of shrimp and tuna.

Population in the region increased steadily after the Second World War, with large concentrations developing in coastal areas. The number of fishers rose in most countries in line

19. [Inter-regional Programme of] Assistance to developing countries for the implementation of the *Code of Conduct for Responsible Fisheries* – Sub-programme C: Assistance to developing countries for upgrading their capabilities in monitoring, control and surveillance (MCS)

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with the general increase in population. The total number of fishers in countries bordering the Bay of Bengal and the South China Sea reached 7.3 million in 1996, an increase of 25% from 1990. Malaysia and Thailand are showing somewhat decreasing trends in number of fishers, and improvements in fishing technology as well as rapid development of shrimp culture may have contributed to this.

This review of the fisheries is from the point of view of resources, and is intended as a reference in addressing the need for monitoring, control and surveillance in the area.

2. CURRENT STATE OF THE FISHERIES

Fisheries in the region are basically coastal fisheries, with a variety of fleet sizes. In general, the large-sized boats spend no more than one week at sea, except for those with deep-freeze facilities, such as the long-line fleets. Some purse seiners targeting small pelagics stay out for more than a week and land a low quality product, as they preserve in brine ice. This kind of catch serves as raw material for the boiled salted product popular for domestic consumption.

Small-scale fisheries are dominant in the region, with their contribution to total landing varying depending on the state of fisheries development in the respective countries. In India, Indonesia and the Philippines, the contribution of small-scale fisheries to total landing is relatively higher than in Thailand, where the industrial fisheries have grown faster than in other countries. Small-scale fisheries, by and large, supply fish for local consumption, while most of the large-scale fisheries supply export outlets.

The industrial fisheries include shrimp trawl fisheries, tuna fisheries (ring-net, purse-seine and long-line fisheries) and the recently developed squid-net fisheries. In general, the fleets fish in their exclusive economic zones (EEZs), but some of the Thai fleets (trawlers, purse-seiners, squid-netters) and the Filipino fleets (tuna purse-seiners) fish in neighbouring EEZs under bilateral agreements.

2.1 THE BAY OF BENGAL

The Bay of Bengal Programme has regularly reviewed the region's resources and their exploitation through the regular sessions of the Committee. The last review was presented to the Tenth Session of the Bay of Bengal Committee, New Delhi, October 1997, a summary of which is presented below.

The Bay of Bengal is one of the productive fishing zones of the Eastern Indian Ocean (FAO Fisheries Statistics Area 57), with a great proportion of the Bay's resources exploited by small-scale fisheries. The Bay is characterized by relatively shallow areas in the northern part, receiving great inflows of fresh water from prominent river systems such as the Gangga-Brahmaputra, Mahanadi, Godavari, Krishna, Irawady and Salween. The Bay is also influenced by the two distinct monsoon seasons, affecting the Bay's hydrographic profile. During the southwest monsoon, water in the coastal area becomes less saline due to heavy rains, while saline water intrudes into the estuarine system during the northeast monsoon. Fisheries in the Bay are strongly influenced by the monsoon regimes.

Fisheries in countries bordering the Bay have shown continuous development since the early 1970s. India's Andaman and Nicobar Islands are located in the eastern part of the Bay, but a large part of Indian catches come from its eastern seacoast. Although some of the fish resources may be able to move across the Bay, information on the Bay's fish distribution is still lacking. An arbitrary division into western and eastern parts of the bay is used in the present analysis in considering the

status of resources and their exploitation in the two sub-regions. Fisheries in the western part of the Bay include those of Bangladesh, India and Sri Lanka, while the eastern part includes Myanmar, Thailand, Malaysia and the northern part of Sumatra, part of the Indonesian archipelago.

2.1.1 Trends in landings

Total landings of marine fisheries production have shown a continuing increase since the 1950s, with higher rates of increase from the 1970s (Figure 1). Total fish landings reached 3.7 million t in 1995, of which 2.4 million t (65%) came from the eastern part of the Bay and the remaining 35% from the western part of the Bay. The average annual increase in total fish landings from 1970 to 1995 was slightly higher in the eastern part (6.4%) than in the western part (4.8%). The rapid development of fisheries – to a great extent in Thailand and to a lesser extent in Indonesia – contributed to this difference.

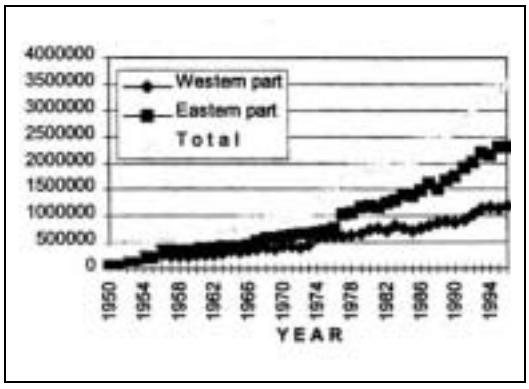

Figure 1 Trends in total landings in the Bay of Bengal

One of the main contributors to total fish landings are the pelagics, and within the pelagic group, tuna landings showed a marked increase from the late 1980s, reaching 150 000 t in 1996 (Figure 2). Landings from the small-pelagic group – mainly mackerels, sardines, anchovies, etc. – increased more slowly. Total landings of this species group in 1996 amounted to 1.3 million t (Figure 3).

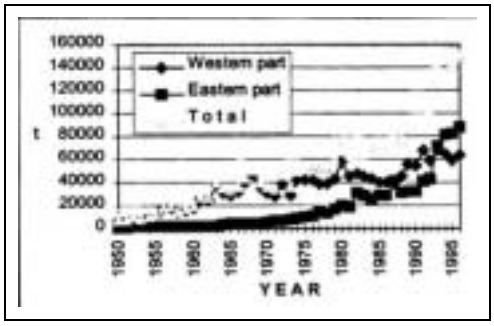

Figure 2 Landings of tuna in the Bay of Bengal

A detailed analysis at the species group level was constrained by the non-availability of uniform groupings in the statistics from the countries bordering the Bay. It could be done only for short mackerels (*Rastrelliger* spp.), sardines (*Sardinella* spp.) and anchovy (dominated by *Stolephorus* spp.). In the case of short mackerels, the Indian landings represents the western part, as no landings are reported from neighbouring countries, while the landings of the eastern part was made up of landings by all countries except Myanmar. Indian landings reached 27 000 t in 1996, or an increase of 14% from the 1970s average level (Figure 4).

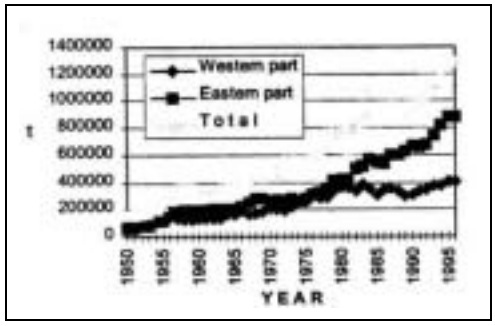

Figure 3 Landings of small pelagics in the Bay of Bengal

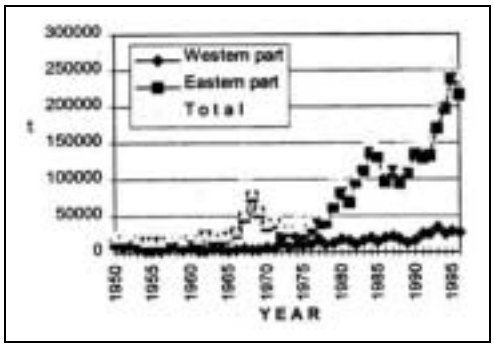

Figure 4 Landings of short mackerels, *Rastrelliger* spp., in the Bay of Bengal

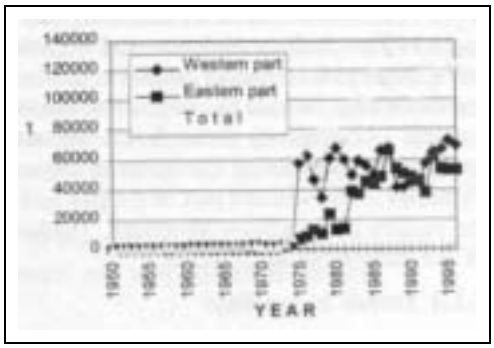

Figure 5 Landings of sardines, *Sardinella* spp., in the Bay of Bengal

In contrast, landings from the eastern part increased from 35 000 t in 1970 to 215 000 t in 1996, an average annual increase of 10%.

In the case of sardines, the landings from the western part were higher, reaching 70 000 t compared to 53 000 t for the eastern part (Figure 5). Whether the explanation for these differences is that the oceanographic conditions in the western part are more suitable for sardine needs further study.

Anchovy is another important species group in the small pelagics. Landings of this group reached 149 000 t in 1996, with most coming from the eastern part of the Bay (91%). Landings from the western part peaked in 1983 at 40 000 t, then fell to a low in 1996 of less than half the 1983 landings (Figure 6). In contrast, landings of anchovy in the eastern part of the Bay showed a decreasing trend in the early 1980s, but were increasing after 1986, with an even faster growth rate since 1991, resulting in 1996 landings of 136 000 t. The use of light-luring purse-seines for anchovy fishing in Thailand during the period seems to have contributed to the large increase in landings (Chullasorn, pers. comm.).

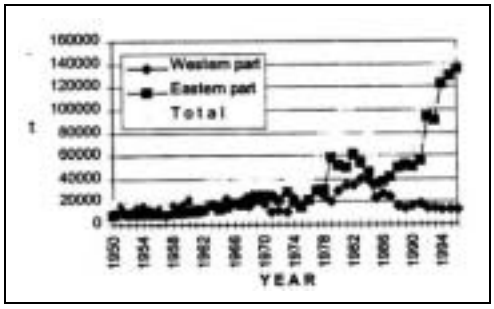

Figure 6 Landings of anchovies in the Bay of Bengal

The landings of demersals were much less than pelagics. Demersal landings in 1996 amounted to 780 000 t, just over half that of the pelagics. The average annual rate of increase in demersal landings was also smaller (3.8%) than that of pelagics (4.1%), with 68% of demersal landings originating from the eastern part of the Bay, which may indicate a relatively higher fishing pressure in this sub-region (Figure 7).

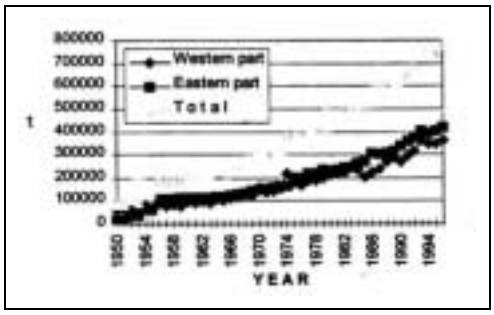

Figure 7 Landings of demersal species in the Bay of Bengal

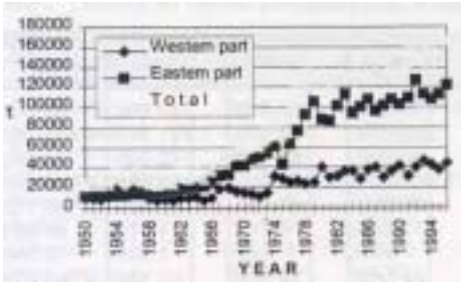

Figure 8 Landings of shrimp in the Bay of Bengal

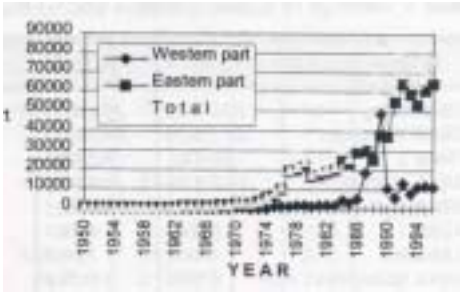

Figure 9 Landings of cephalopods in the Bay of Bengal

Shrimp is another important commodity. They, together with tuna, are the region's main export commodities. Shrimp landing increased from 56 000 t in 1970 to 149 000 t in 1983, then dropped in the succeeding years, with some fluctuations, and was 167 000 t in 1996. Landings from the eastern part contributed 73% of the total. Shrimp landings both sides of the Bay since 1970 have showed similar annual increases of the order of 5% to 6% annually (Figure 8).

Cephalopods represented another emerging group, especially in the eastern part, where landings increased from less than 30 000 t in the mid-1980s to more than 64 000 t in 1992, dropped in the two succeeding years, but apparently increased again, reaching 64 000 t in 1996 (Figure 9). For the western part of the Bay, the cephalopod catches were mainly from India and landings were of the order of 10 000 t. The highest catch ever, 49 000 t, was in 1989, a figure never since repeated.

A typical feature in this tropical region is the high proportion of unidentified groups (miscellaneous fishes). Thus, in 1995, 1.5 million t were lumped together as "unidentified," constituting 37% of total landings (Figure 10), which was slightly more than the total landings of pelagic species. The miscellaneous group landings in the eastern part were more than 1.1 million t and much larger than those in the western part, at only 334 000 t in 1996. However, the weight of this group in the eastern part is also due to the poor statistical system in Myanmar, which categorizes all fishes into "miscellaneous" fish. However, the annual rate of increase of 5.5% in the western part is relatively higher than the 4.4% in the eastern part. One might conclude that more intensive fishing pressure may be occurring in the eastern part. However, additional information is required to substantiate such a conclusion.

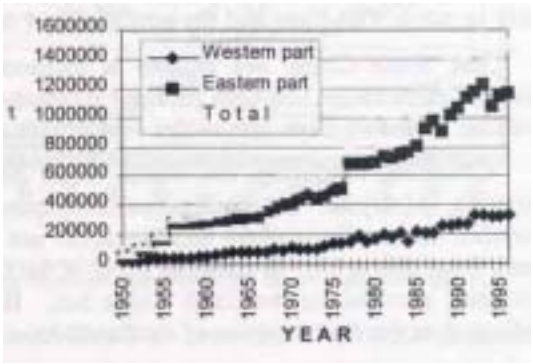

Figure 10 Landings of "miscellaneous" fish in the Bay of Bengal

The above analysis indicates that in a majority of cases the landings of the main marine species groups are still increasing (Table 1). The increasing trend varies according to group; this may reflect different stages of development. Shrimp fisheries may be considered a mature type of fisheries, demersal fisheries is a developed fishery, while tuna is certainly still a developing fishery.

Table 1 Landings by species groups in the Bay of Bengal (1970 - 1996; tonnes)

Species group	1970	1975	1980	1985	1990	1995	1996
Demersals	304 200	384 600	441 000	475 300	606 800	747 800	780 500
Small pelagics	473 500	542 600	789 600	856 500	973 000	1 281 800	1 285 100
Tuna	36 400	52 800	77 000	69 000	86 800	140 900	150 400
Misc. marine fish	519 500	649 400	857 600	1 028 300	1 338 400	1 468 000	1 503 500
Shrimp	56 400	71 400	127 100	130 300	144 400	150 800	166 700
Crabs	2 060	2 757	11 986	11 688	12 716	21 573	20 036
Lobsters	100	162	152	293	382	1 389	2 059
Misc. crustacea	7 900	11 752	13 636	22 549	34 866	40 984	43 678
Cephalopods	4 000	8 802	19 413	27 599	49 365	77 957	84 159
Molluscs	32 830	34 278	161 668	37 925	35 790	41 564	53 970
TOTAL	1 436 890	1 758 551	2 499 155	2 659 454	3 282 519	3 972 767	4 090 102

2.2 THE SOUTH CHINA SEA

The South China Sea embraces a quite extensive area, with its shallow part in the southwest section, which is the main part of the Sunda shelf, and the northwest portion in the area of the Gulf of Tonkin. The shelf area less than 200 m depth is about 1.7 million km^2, or about 99% of the entire area of less than 500 m depth (Marr, 1976). The deeper portions are mostly in the northeastern section, with its deepest basin close to the Philippine archipelago. The South China Sea receives freshwater inputs from various rivers, especially in the north and northeast part of the Gulf of Thailand through runoff from rivers in Thailand, Cambodia and Viet Nam. In the northern part of the South China Sea, the influence of the freshwater outflows come from rivers in north Viet Nam and the southern part of mainland China.

The South China Sea climate is monsoonal, which during the southwest monsoon generates rains in the southern part and increases riverine flow to the ocean, while during the northeast monsoon more freshwater inputs pour into the northern part of the Sea.

Countries bordering the South China Sea include Brunei Darussalam, Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam. Unlike other countries, Brunei Darussalam and Singapore are net importers of fish and most of the import comes from the region. In addition, some of the fleets of China, especially those of its southern provinces, also fish in the South China Sea. However, the present analysis is restricted to landings data for the countries of southeast Asia.

2.2.1 Trends in landings Fisheries in southeast Asia took off in the 1970s and showed a rapid pace of development in the 1980s and 1990s. Total landings of 3.5 million t in 1970 had risen to 7.6 million t in 1996, or a doubling in twenty-six years (Table 2; Figure 11).

Table 2 Landings by species groups in the South China Sea Region (1970 - 1996; tonnes)

Species group	1970	1975	1980	1985	1990	1995	1996
Demersals	368 910	587 362	572 978	665 146	780 588	1 021 712	1 052 172
Small pelagics	1 015 730	1 381 964	1 419 018	1 805 267	2 167 404	2 611 817	2 624 447
Tunas	191 938	304 862	408 562	631 436	854 423	890 980	912 700
Misc. marine fish	1 328 840	1 218 721	1 347 532	1 500 216	1 743 476	2 023 379	1 897 512
Shrimps	179 170	251 170	316 108	289 481	358 765	409 330	408 471
Crabs	46 540	48 752	55 803	66 509	213 423	299 734	279 985
Lobsters	2 900	3 646	2 129	2 898	3 187	4667	4 888
Misc. marine crustacea	4 500	6 076	8 305	15 713	1 745	2 117	3 176
Cephalopods	64 200	117 763	121 553	159 757	219 374	265 373	268 105
Molluscs	278 970	133 367	132 155	167 363	153 956	121 201	131 848
TOTAL	3 481 698	4 053 683	4 384 143	5 303 786	6 496 341	7 650 310	7 583 304

More than 85% of the catch came from five countries: Indonesia, Malaysia, the Philippines, Thailand and Viet Nam. However, only a small proportion of the Indonesian catch originates from the South China Sea proper, as is also the case for the Philippines, since most of the catch originated from their respective archipelagic waters and adjacent waters of the Sulu Sea and the Pacific Ocean. In the absence of detailed statistics from these two countries for the South China Sea proper, the present analysis refers to the entire catch of these countries that falls within the Western Central Pacific (Fisheries Statistics Area 71). Fishing activities in the South China Sea proper concentrate in the south and southwestern parts, which means that the landings of Malaysia, Thailand and Viet Nam can serve as an important indicator of landings for the South China Sea proper.

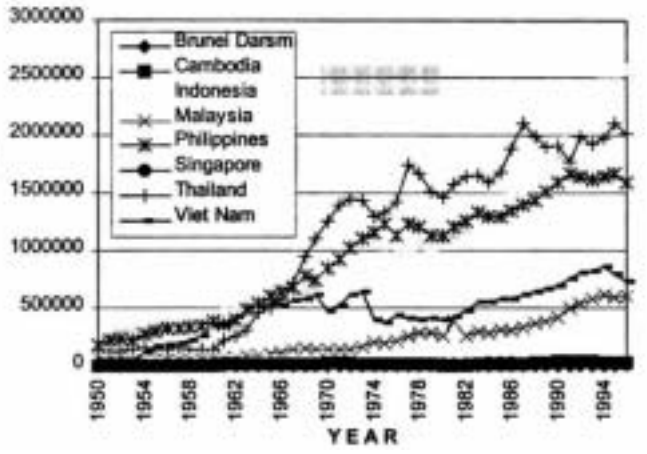

Figure 11 Total landings by countries in the South China Sea region

The pelagic resources in the South China Sea resemble those of the Bay of Bengal, comprising a variety of small pelagic and tuna resources. The small pelagic fisheries are more coastal, employing similar gears to those used in the Bay of Bengal. The extensive shelf area in this region offers high potential of demersal and small pelagic resources.

The small pelagic resources constitute the bulk of catch in this region, with landings going from 1.0 million t in 1970 to 2.6 million t in 1996: 160% increase in 26 years (Figure 12). Indonesia and the Philippines are the main contributors to small pelagic landings. In the absence of detailed grouping of species in the fishery statistics of Brunei Darussalam, Cambodia and Viet Nam, the trend analysis of landing by species groups disregards these countries.

Landings of short mackerel (*Rastrelliger* spp.) (Figure 13) showed an increasing trend, with small fluctuations, from 215 000 t in 1970 to 369 000 t in 1996, or an increase of 72% in 26 years. Only Indonesia showed much increase (147%), while the rest increased more slowly.

The second important species group, round scad (*Decapterus* spp.), showed an increasing trend, from 223 000 t in 1970 to 563 000 t in 1996, thus doubling in the period. Landings in Indonesia and the Philippines showed an increasing trend and 84% of the total catch was from these two (Figure 14),

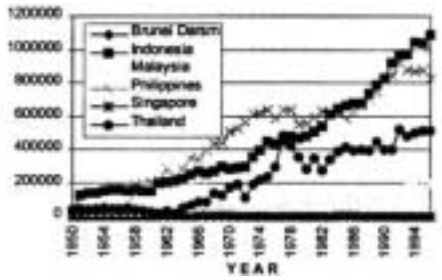

Figure 12 Landings of small pelagics in the South China Sea region

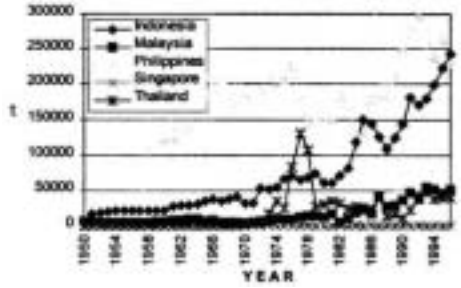

Figure 14 Landings of short mackerels, *Rastrelliger* spp., in the South China Sea region

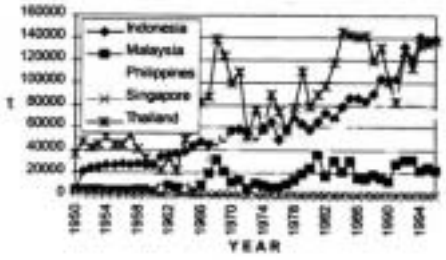

Figure 13 Landings of round scads, *Decapterus* spp., in the South China Sea region

while Malaysia, Thailand and Singapore increased only a little. For sardines (*Sardinella* spp.), again, the landings of Indonesia and the Philippines showed an increasing trend, as opposed to the decreasing trend of Thailand (Figure 15).

Tuna resources are abundant in the waters of high salinity in the northeastern part of the South China Sea close to the Philippines waters and in the eastern part of Indonesia. Therefore, Indonesia and the Philippines are the main producers, although large parts of their catch were not from the South China Sea proper. In total, the catch of tuna in the region increased from 192 000 t in 1970 to 913 000 t in 1996: overall a fourfold increase, but with marked fluctuations (Figure 16). A fall in landings occurred in 1992 and 1993, which was probably related to the condition of the global tuna market at the time.

Trends in landings of demersal groups showed a different picture. They increased from 369 000 t in 1970 to 1 052 000 t in 1996, over 250% increase in 25 years (Figure 17). This increased rate is obviously less than that of the small pelagics and tuna. In fact, only Indonesian landings showed an increasing trend compared to other countries. Heavy fishing pressure on the demersal groups is to blame. A more obvious picture is the flat landing curve of catfish (*Arius* spp.) in the last 25 years for all countries but Indonesia (Figure 18).

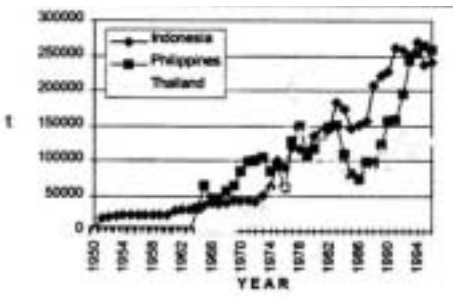

Figure 15 Landings of sardines, *Sardinella* spp., in the South China Sea region

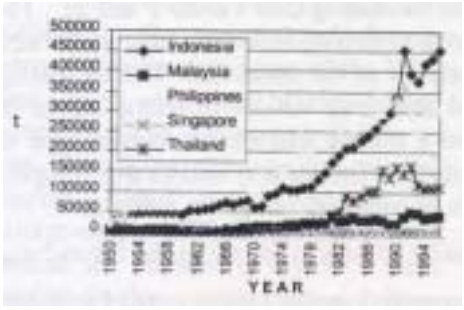

Figure 16 Landings of tuna in the South China Sea region

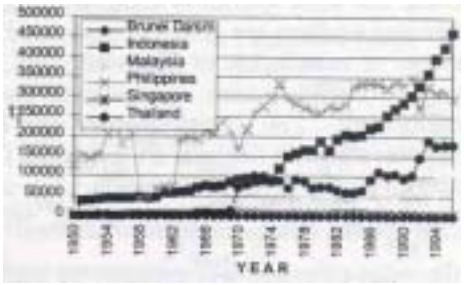

Figure 17 Landings of demersal fish in the South China Sea region

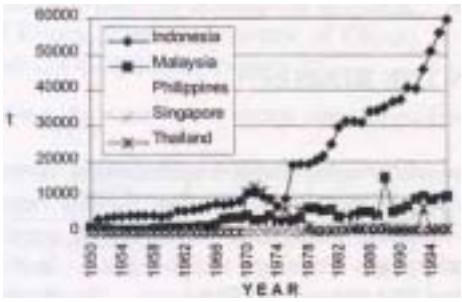

Figure 18 Landings of catfish (*Arius* spp.) in the South China Sea region

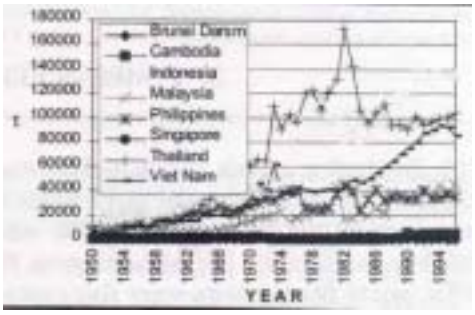

Figure 20 Landings of "miscellaneous" fish in the South China Sea region

For shrimp, the trend of landings resembles that for tuna, and both are the main export commodities in fisheries. Total landings more than doubled in 25 years, from 179 000 t in 1970 to 418 000 t in 1996 (Figure 19). However, landings in Malaysia and the Philippines were relatively flat, while Thailand showed a decreasing trend, from 173 000 t in 1982 to only 105 000 t in 1996. The development of shrimp culture in the region has compensated for the decline of catch for some countries in the region.

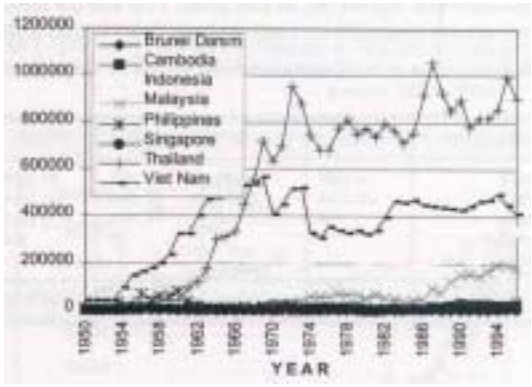

Figure 19 Landings of shrimp in the South China Sea region

For the miscellaneous fish category, the landing showed an interesting trend, whereby the main contribution (44%) was from Thailand (Figure 20). Heavy fishing pressure in the Gulf of Thailand seems to have resulted in the high production of this group. Landings increased relatively slowly after 1970, with some fluctuation, and a peak of 1 million t in 1987, but only 900 000 t in 1996.

The analysis of trends in landings from the Bay of Bengal and the South China Sea indicates that in a majority of cases the landings of the main marine species groups, except for shrimp and some species of demersal resources, are still increasing (see Tables 1 and 2). The increased landings are generally associated with an increased fishing effort (number of fishers, number of vessels, use of improved gears, etc.) in nearly all of the countries. The increasing trend of landing varies according to the group, and this may reflect different stages of development. The shrimp fisheries may be considered a mature and overdeveloped type of fisheries; demersal fisheries are

developed fisheries; while tuna fishery may still be a developing fishery in some parts of the region. The analysis leads to pertinent questions, such as:

(a)will the increasing trend of landings for most species groups continue in the future? and

(b)what measures will probably be adopted by governments in the region toward reducing fishing pressure in the region?

3. FOREIGN FISHING IN THE REGION

With the decline in fish stocks in Thai waters, some of the Thai fleets began fishing in the neighbouring countries in the early 1980s through bilateral arrangements. Thai trawler fleets went as far as the EEZ of India in the west, and to northern Australian waters in the south. This was followed by use of purse-seine fleets in Indonesian waters to fish for tuna. In the 1990s, squid fishing fleets were also sent to the Indian Ocean south of Indonesia. Similarly, by the late 1980s, some Filipino tuna fleets were fishing in Indonesia waters through a similar arrangement, with most in the Sulawesi Sea and Maluku Sea, northeast of Indonesia. It is unfortunate that reports on catches by the Thai and the Filipino fleets fishing outside their home waters are not available, as many of those fleets landed their catch in their respective countries.

Table 3 Tuna landings by distant-water fishing fleets in the eastern Indian Ocean (FAO Fisheries Statistical Area 57) (1970 - 1996; tonnes)

COUNTRY	1970	1975	1980	1985	1990	1995	1996
China (Taiwan)	10 200	1 769	11 251	13 566	14 723	26 337	26 268
Japan	26 300	17 620	19 980	21 944	10 868	38 821	34 195
Korea Rep.	0	11 506	15 315	2 583	2 248	195	718
USSR	0	0	0	53	0	0	0
TOTAL	36 500	30 895	46 546	38 146	27 839	65 353	61 181

Some of the distant-water fishing states have been fishing in the high seas in the eastern Indian Ocean (Area 57) and the western central Pacific (Area 71), with tuna as the main target. Japan, Republic of Korea, Taiwan (Province of China) and the former USSR fished in the Eastern Indian Ocean. The tuna catch of this area fluctuated from 36 000 t in 1970 to 61 600 t in 1996, with the Japanese fleet contributing most to total landing, followed by the Taiwanese fleet (Table 4 and Figure 21).

In the western central Pacific, in addition to the conventional distant-water fishing states, some of the USA tuna fleets expanded their fishing operation from the eastern Pacific to join fishing in the western central Pacific. China also developed its distant-water fishing fleets and started landed its catches in 1995. Tuna catches in this region increased from 108 000 t in 1970 to 764 000 t in 1996, with Japan dominant, but with rapid increases in landings of Republic of Korea, Taiwan (Province of China) and USA

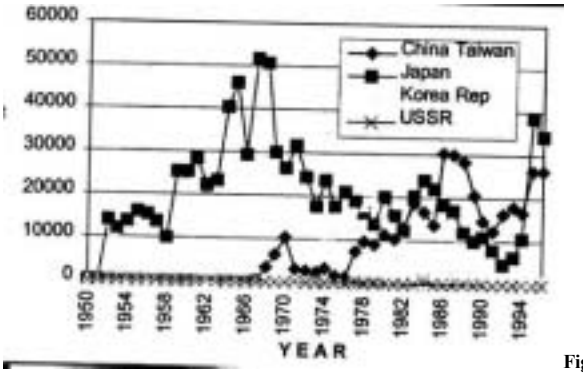

Figure 21 Tuna landings by distant-water fishing states in the eastern Indian Ocean (FAO Fisheries Statistical Area 57)

Table 4 Tuna landings by distant-water fishing states in the western central Pacific (FAO Fisheries Statistical Area 71)

COUNTRY	1970	1975	1980	1985	1990	1995	1996
China (mainland)	0	0	0	0	513	10 190	5 660
China (Taiwan)	7 200	879	9434	35 133	105 762	239 069	231 660
Japan	101 100	199 675	269 345	179 429	277 853	270 382	233 424
Korea Rep.	0	1 096	15 391	16 225	181 920	178 120	150 279
Russian Fed.	0	0	0	0	3 447	4 981	0
USA	0	0	3 759	114 479	158 890	153 840	143 348
USSR	0	0	0	1 991	0	0	0
TOTAL	108 300	201 650	297 929	347 257	728 385	856 582	764 371

(Table 4; Figure 22).

While some of the distant-water fishing fleets fishing in the eastern Indian Ocean used some harbour facilities in the region, such as Pukhet on the west coast of Thailand, and Penang (Malaysia), those fishing in the western central Pacific have largely used the fishing ports of some small island states in the central Pacific.

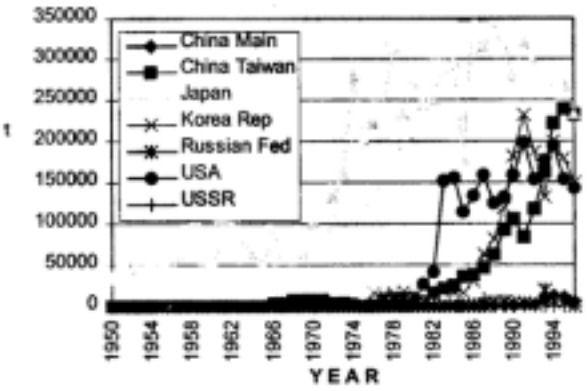

Figure 22 Tuna landings by distant-water fishing fleets in the western central Pacific (FAO Fisheries Statistical Area 71)

4. MONITORING, CONTROL AND SURVEILLANCE

Monitoring, control and surveillance (MCS) is an integral and essential component of fisheries management. One can easily recognize the need for MCS by assessing the status of fisheries development and management in a country. It is well known that fisheries management is bound to the resources, the type of fisheries and the kinds of resource users. In the south and southeast Asian region, multi-species resources, multi-gear fisheries and a large number of fishers are the outstanding characteristics, and they all have significant implications for the development of fisheries management.

4.1 FISHERIES MANAGEMENT INSTITUTIONS

Rapid development of fisheries in the region has resulted in increased landings and exports in a relatively short period. This development, however, has also brought about overexploitation of coastal resources, which very often is followed by conflict among resource users. To cope with the problems, governments of many countries strengthened their fisheries departments by instituting fisheries management units. From a historical perspective, fisheries management institutions in the region are relatively young, while the development of fisheries has been fast, and the issues to be confronted are manifold and complex. Rules and regulations were promulgated and law enforcement units were subsequently established. In some countries, however, MCS units may not exist *per se*, and enforcement responsibility rests in the institutions outside the fisheries department, such as the Navy, Coast Guard or Marine Police. MCS units in Fisheries Departments are in many instances still absent, e.g., in Bangladesh, Cambodia, Myanmar and Viet Nam, while in other countries the unit is still in its infancy, such as in Indonesia and Thailand. The archipelagic states, especially Indonesia and the Philippines, owing to their geographical features of inlets, straits and enclosed seas shared by provinces, demand a special MCS institution that can deal with this peculiar feature. Only Malaysia has an established MCS unit in the Fisheries Department, and it has already established good cooperation with other relevant institutions, including the Navy and Marine Police, for support for successful operation. The MCS system in Malaysia also facilitates easy transfer of fish landing reports to the Fisheries Department in a timely manner through modern communications technology, another advantage of MCS.

Jurisdiction in the marine area in the region varies according to the respective national governance system. In some countries, jurisdiction in marine areas is clearly divided between the central and the local (state or provincial) governments. India, Malaysia and the Philippines have this form, while others still do not have clear jurisdictional demarcation. Nonetheless, the responsibility for fisheries management in most cases still rests with the central government. In some countries, responsibility for the fisheries sector is fully delegated to local government in accordance with the distribution of area jurisdiction, while in others it is only in part. Indonesia is a good example of where fisheries management in the marine area is very much under the responsibility of central government. Only the administration and registration of fishing vessels of less than 30 GT is the responsibility of provincial government (Martosubroto, 1986). In contrast, the Philippines, with Executive Order No. 240/1995, delegated authority for fisheries management to its local governments, with the establishment of Fisheries and Aquatic Resources Management Councils (FARMCs), a process that helps facilitate the strengthening and development of community-based fisheries management (Pollock, 1996).

4.1.1 Constraints to fisheries management

In addition to weaknesses in the legal framework for fisheries management systems in most of the countries, all countries in the region regard the resources as open-access resources. Therefore,

policy on limited entry is by and large absent. A limited-access policy only exists in very exceptional cases, and normally access is according to the traditional arrangements of individual coastal communities. Such a case occurs in Sri Lanka for the lagoon fisheries and in Indonesia for the coastal community in one of the islands of the Maluku province (Attapatu, 1994; Wahyono, 1994). The Philippines recently promulgated the delegation of authority to local-level government to assist the local community in the management of coastal resources.

A trawl through current literature and government reports relating to fisheries management in the region indicates that overexploitation is one of the foremost issues in fisheries management (Menasveta, 1997). This issue seems to be common and will most likely stand for quite a while. The absence of any limited-entry policy in most countries in the region appears to be the underlying obstacle. Nonetheless, establishing a limited-entry policy in a fishery – and especially in an already developed fishery with overcapacity – is by no means an easy task. The relevant question here is, therefore, how could one institutionalize limited-entry policy in such a complex fishery?

An important element in fisheries management is development of management plans. There seems to be a growing awareness among fisheries administration officers in the region of the need to develop a fisheries management plan (Pollock, 1996). With a transparent fisheries management plan, one would be able to address the issue of MCS in a more reasonable manner, and it is in the process of developing a management plan that the issue of limited entry would normally be addressed properly.

Despite the extensive human resources in the region, qualified professionals in fisheries management are few. Training courses on fisheries management are available worldwide, but only a few are specifically designed to cater for issues typical of tropical fisheries. In addition to the availability of training courses in fisheries management, professional skills in fisheries management could also be enhanced through practical experience in the implementation process of actual fisheries management.

Fisheries research in countries of the region by and large focuses on aspects relating to resources and environment, with less attention to the socio-economic aspects. The multispecies nature of the resources and the complications introduced by multigear fisheries have already preoccupied research scientists in their day-to-day activities. The scientists are also confronted with the pressing question of the impact of intra-specific interaction and gear interaction on the dynamics of the resources. At the same time, the generally rapid turnover rate of many tropical fishery resources may have discouraged implementation of fisheries management. This argument also leads to the implementation of MCS of being more applicable to simply dealing with guarding a specific area during a close season.

The high cost of MCS operations is also an inhibiting factor in its development in the region. Some countries hope that with the development of community-based fisheries management in the coastal area, the role of MCS would be gradually transferred to the community concerned, thus reducing the cost to be borne by the higher levels of government.

4.2 CURRENT MCS ACTIVITIES

From a fisheries management perspective, development of a management plan must clearly be in the foreground. Once a management plan of the fisheries concerned is formulated, it will enable one to see the objectives and scope of the plan as they become transparent. A clear management plan facilitates the identification of needs, including, for example, the strengthening of MCS, for which a policy should be developed accordingly. In the present situation, where fisheries management is still in a relatively young stage of development, the MCS activities in the region have been largely focused on limited subjects which are closely related to the current overriding issues in the region, which basically are four:

(i)activities which are meant to deal with illegal fishing practices (poisons, illegal use of chemicals, explosives);

(ii) monitoring activities of the licensed foreign fleets fishing in the national EEZ;

(iii) those concerned with effort in reducing illegal fishing by foreign vessels; and

(iv) activities aimed at reducing conflict among resources users.

It is obvious, therefore, that the activities of MCS have mainly been concerned with activities related to surveillance, and not with the overall spectrum of MCS: S but no MC!

In Malaysia, the MCS programme is relatively advanced compared to neighbouring countries. It embraces several activities, including those dealing with the collection of information on catches by vessels, which is an important data input into stock assessment, which in turn provides support to the formulation of management measures. Furthermore, MCS operations also offer potential assistance in search and rescue operations for missing fishers or boats.

In the context of strengthening MCS in the region, one should take advantage of the lessons learnt from the current effort in developing a community-based management system in the Philippines, in addition to lessons from Malaysian experience. Technology advances in computer- and satellite-based communication will increase the efficiency of MCS and at the same time reduce the cost in future. Prospects for achieving conservation and management objectives will be limited in the absence of effective MCS. A good MCS system will enhance fisheries management systems, while a poor fisheries management plan will be a disincentive for any effort directed to strengthening of MCS. It is thus of high priority for the region to address the strengthening of fisheries management in an effort to counter the increasing trend of resource overexploitation and overcapacity of the fishing industry.

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