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RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA**

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**COUNTRY STATUS REPORT
PHILIPPINES**

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Status and Management of Philippine Pelagic Resources Potentially Shared with Neighboring Countries

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Abstract

The fishery sector contributes significantly to the country's economy and continues to play an important role in providing livelihood and in attaining food security. A significant amount of the sector's contribution comes from pelagic resources that are potentially shared with other countries such as the highly migratory species of tunas, billfishes, oceanic sharks and small pelagics. An average of 1.09 M metric tonnes have been caught from 1993 to 1997 of which a great majority is being taken by commercial fishing boats numbering to about 3,416 in 1998.

In this paper, the status and management of potentially shared pelagic fishery resources are presented including the problems being encountered in research and management and also the past, present and future national resource surveys.

a. Introduction

In 1996, the Philippines is 13th among the top fish producing country in the world. Around 1.8 M metric tons of fish has been contributed by the country to world catch and in terms of aquaculture, it contributed a total of 26.4 M metric tons of fish and shellfish valued at 41.5 M US Dollars. The country is 9th in the world aquaculture production (FAO Yearbook, 1996 as cited in BFAR, 1998a)

Locally, the fishing industry's contribution to the Philippines' Gross Domestic Product (GDP) which is placed at P 2,667.1 B (current price) and P 888.1 (constant price), is P 74.1 B (2.8%) and P 34.7 B (3.9%) at current and constant prices respectively. From 1989 to 1998, the fisheries sector posted positive growths of 4.7% and 4.4% in the aquaculture and commercial sectors respectively while the municipal fisheries declined by 2.3%. In 1998 the Bureau of Agricultural Statistics recorded a total fish production of 2.79 M metric tons valued at P 84.86 B. Also in the same year, total fishery exports amounted to P 20.6 B lead by tuna @ P 8.0 B, shrimp/prawn @ P 5.0 B and seaweed exports @ P 2.6 B (BAS 1998). The industry employs around one million or five percent of the country's labor force, where around 258,480 are engaged in culture, 675,677 in municipal and 56,715 in commercial fisheries (BFAR, 1998a).

While generally the fishing sector has contributed significantly to the country's economy, it is faced by the problem of resource depletion and environmental degradation (Barut et al., 1997). Economical and biological overfishing have already been observed in coastal demersal stocks, small pelagic and tuna fisheries (Silvestre et al., 1986; Trinidad et al., 1993 and BFAR 1995). Because of this, various national and local management interventions and initiatives are being implemented to ensure the sustainability of the fishery resources. However, for resources thought to be shared by 2 or more countries e.g. the highly migratory species of tunas and billfishes, aside from existing management, a higher level of multilateral cooperative management between and among range states is being recommended (Devaraj and Vivekanandan, 1997; MFRDMD, 1998).

In this paper, the status of pelagic fishery resources that are potentially shared by the Philippines with neighboring countries is presented. Various topics on current regional, national and local management interventions, as well as past, present and future research undertakings, and issues are discussed.

b. Pelagic species in the Philippines potentially shared with other countries

Due to very limited information on the extent of the populations of aquatic resources in Southeast Asian region, it is rather difficult to pinpoint which particular species are shared by the Philippines with neighboring countries. Previous workshops (FAO/SEAFDEC, 1985; Yanagawa, 1997) have identified several small pelagic stocks and their extent across the region based on catch data. However, recent genetic studies, although preliminary have indicated the presence of a wider extent of stocks of some small pelagics e.g. with *Euthynnus affinis* (Santos, 1999) and some *Decapterus* spp. (Arnaud et al., 1999)

The Philippines exhibits a high diversity of fish species with a listing of more than 2,200 species (Herre, 1950). Of these, around 27 genera and 2 families of bony fishes and about 4 families and 1 genus of oceanic sharks could be considered as potential transboundary shared pelagic resources as proposed by Isa (1998) in Table 1 and as specified in the Annex I of the United Nations Convention on the Law of the Sea or UNCLOS (Table 2).

Table 1. Small Pelagic Resources of the South China Sea (Potential Transboundary Shared Stocks) as Listed by Isa (1998) and as recorded in the Philippines

| Scientific Name (Isa, 1998) | English Name (Isa, 1998) | Philippine Local Name (Ganaden and Gonzales, 1999) |
|--|--------------------------|--|
| <i>Rastrelliger</i> spp. | Mackerels | Hasa-hasa, Alumahan, Anduhaw, Kabalyas |
| <i>Decapterus</i> spp. | Roundscads | Galunggong, Burot, Budboron |
| <i>Selar</i> spp., | Scads | Matangbaka, Tamarong |
| <i>Atule mate</i> | Scad | Salay-salay, Kalapato |
| <i>Megalaspis cordyla</i> | Torpedo Scad | Oriles, Pak-an, Atulay |
| <i>Sardinella</i> spp., | Sardines | Tamban, Lapad, Tunsoy |
| <i>Dussumieria</i> spp. | Rainbow sardines | Tulis |
| <i>Auxis thazard</i> , <i>Euthynnus</i> spp., <i>Thunnus tonggol</i> , <i>Sarda</i> spp.) | Small Tunas | Tulingan, Pirit, |
| <i>Scomberomorus</i> spp. | Spanish Mackerels | Tangigue |
| <i>Caranx</i> spp., <i>Carangoides</i> spp. | Jacks and Trevallies | Talakitok, Mamsa |
| <i>Stolephorus</i> spp. | Anchovies | Dilis, Bolinao, Tuakang |
| <i>Scomberoides</i> spp. | Queenfish, Leatherskin | Lapis, Talang-talang, Dorado |
| <i>Sphyraena</i> spp. | Barracudas | Torsillo, Baracuda |
| <i>Parastromateus niger</i> , <i>Stromateus</i> spp. | Pomfrets | Pampano |
| <i>Chirocentrus</i> spp. | Wolf-herrings | Parang-parang, Balila |
| <i>Trichurius</i> spp. | Hairtails | Espada, Liwit |
| | Mulletts | Banak, Aligasin, Talilong |

Table 2. Large pelagic marine organisms considered as highly migratory species in the UNCLOS Annex I, which are also recorded in the Philippines.

| Scientific Name (UNCLOS) | English Name (UNCLOS) | Philippine Local Name (Ganaden and Gonzales, 1999) |
|--------------------------------|--------------------------|--|
| <i>Thunnus albacares</i> | Yellowfin Tuna | Tambakol, Bariles |
| <i>Thunnus obesus</i> | Bigeye Tuna | Tambakol |
| <i>Katsuwonus pelamis</i> | Skipjack Tuna | Gulyasan, Budlisan |
| <i>Euthynnus affinis</i> | Kawakawa | Tulingan, Katsorita, Pirit |
| <i>Auxis thazard</i> | Frigate Tuna | Tulingan, Pirit |
| <i>Auxis rochei</i> | Bullet Tuna | Tulingan, Pirit |
| <i>Makaira mazara</i> | Indo-Pacific Blue Marlin | Malasugi, Marlin, Manumbok |
| <i>Makaira indica</i> | Black Marlin | Malasugi, Marlin |
| <i>Istiophorus platypterus</i> | Pacific Sailfish | Malasugi, Kandayan |
| <i>Xiphias gladius</i> | Swordfish | Malasugue, Palmbela |
| <i>Coryphaena hippurus</i> | Dolphin fish | Dorado, Pandawan |
| <i>Bramidae</i> | Pomphrets | Pampanong Laot |
| Oceanic sharks | | |
| - <i>Rhincodon typus</i> | Whale shark | Butanding, Tawiki, Balilan |
| - <i>Hexanchus griseus</i> | Cow shark | Pating |
| - <i>Alopiidae</i> | Thresher sharks | Pating |
| - <i>Carcharhinidae</i> | Requiem sharks | Pating |
| - <i>Sphyrnidae</i> | Hammerhead sharks | Pating |

In addition, based on genetic evidence, no genetic heterogeneity was detected on *Euthynnus affinis* sampled from the Philippines and West Coast Malaysia (Santos, 1999) and so with *Decapterus macarellus*, *D. ruselli* and *D. macrosoma* in the South China and Sulawesi Seas via Java Sea and Makassar Strait (Arnaud et al., 1999) indicating further that these four (4) small pelagic species are shared by countries in the Southeast Asian region.

c. Fishing boats targeting potential shared species

Fishing vessels in the country are generally classified into two: a) Municipal Fishing Boats (MFB's) having a weight of less than 3 gross tonnes (GT) and 2) Commercial Fishing Boats (CFB's) which are 3 gross tonnes and above. CFB's by law are generally restricted to fish inside the 15 km Municipal waters except if allowed by the Municipality to enter the area of 10 to 15 km. Table 3 shows the breakdown of Municipal and Commercial Vessels by region based on available data. All of these gears, directly targets and or indirectly affects the shared species enumerated previously.

In 1998, there were about 3,416 commercial fishing vessels operating in the country with a combined gross tonnage of about 299,886 GT (BFAR, 1998a). This was reflected mainly from the records of commercial fishing licenses being issued by BFAR. A historical account of the total number of commercial fishing vessels by gear type and tonnage in the country from 1967 to 1994 is presented in Barut et al, (1997).

On the other hand, a 1985 survey showed that there are a total of 464,395 registered municipal fishing vessels, 193,976 of which were non-motorized and 270,419 were motorized. Unfortunately this type of survey, has not been conducted mainly due to financial considerations.

Table 3. Number of Municipal and Commercial Fishing Vessels operating in the Philippines by Region (Source: BFAR, 1998)

| Regions in the Philippines | Municipal Fishing Vessels (1985) (< 3GT) | Commercial Fishing Vessels (1998) (= or > 3GT) |
|---|--|--|
| National Capital Region | 3,553 | 1,502 |
| Region I | 12,720 | 60 |
| Region II | 3,085 | 20 |
| Region III | 21,433 | 32 |
| Region IV | 54,617 | 120 |
| Region V | 49,303 | 159 |
| Region VI | 28,327 | 390 |
| Region VII | 64,740 | 98 |
| Region VIII | 40,702 | 102 |
| Region IX | 113,459 | 330 |
| Region X | 20,370 | 49 |
| Region XI | 35,174 | 482 |
| Region XII | 16,912 | 13 |
| Region XIII (CARAGA) | * | 52 |
| Autonomous Region in Muslim Mindanao (ARMM) | * | 7 |
| Total | 464,395 | 3,416 |

* CARAGA and ARMM were only created recently hence the number of municipal fishing vessels would be reflected in Region IX, X, and XII where the former would eventually be formed.

d. Production estimate of fishing boats targeting potential shared species

The total average production of major fish species in the country from 1993 to 1997 was about 1,402,403 metric tonnes, broken down to 804,989 mt by commercial fishing and 597,414 mt by municipal fishing (BAS, 1998). Below is a summary of the average production by potential shared species from 1993 to 1997 although there are other potential spp. that may not be included in the list.

Table 4. Average production (mt) of potential shared resources from 1993 to 1997 (BAS, 1998)

| Species | Total | Commercial | Municipal |
|-----------------------|------------------|----------------|----------------|
| Roundscad | 243,171 | 217,332 | 25,839 |
| Indian Sardines | 172,293 | 137,170 | 35,123 |
| Frigate Tuna | 101,204 | 53,594 | 47,610 |
| Skipjack | 96,567 | 77,598 | 18,969 |
| Fimbriated Sardines | 86,062 | 47,894 | 38,168 |
| Anchovies | 74,102 | 30,759 | 43,343 |
| Yellowfin Tuna | 58,168 | 27,917 | 30,251 |
| Indian Mackerel | 52,779 | 24,356 | 28,423 |
| Big-eyed Scad | 44,911 | 20,186 | 24,725 |
| Indo-pacific Mackerel | 25,591 | 15,311 | 10,280 |
| Cavalla | 21,526 | 3,840 | 17,686 |
| Eastern Little Tuna | 25,922 | 17,726 | 8,196 |
| Crevalle | 18,770 | 11,201 | 7,569 |
| Mullet | 14,288 | 1,270 | 13,018 |
| Flying Fish | 17,949 | 3,479 | 14,470 |
| Round Herring | 16,852 | 15,460 | 1,392 |
| Spanish Mackerel | 10,917 | 1,747 | 9,170 |
| Hairtail | 12,416 | 4,198 | 8,218 |
| TOTAL | 1,093,488 | 711,038 | 382,450 |

The total average production of selected pelagic species that are potential transboundary stocks from 1993 to 1997 amounted to about 1.09 M mt broken down to 711,038 mt for commercial fisheries and 382,450 mt for municipal fisheries. Roundscads posted the highest catch volume at 217,332 mt for the commercial while for the municipal it was the frigate tunas (which would probably include bullet tuna) at 47,610 mt.

e. Problems on potential shared stocks within Philippines

e.1. Problem on the identification of what species are shared

Majority of the highly migratory pelagic finfishes e.g. tunas, billfishes and oceanic sharks, as well as offshore marine mammals could generally be considered as comprising a single stock in the Philippines mainly because of their migratory form of behavior and larval dispersal. Various studies (morphologic, biochemical and genetic) although preliminary would seem to indicate such dynamics in the Philippines (Santos, MD, 1999). However, for other groups there is at present difficulty in identifying which and what are the species exhibiting clades or not. This is evident in small pelagics such as anchovies and demersal fishes which exhibits some form of geographic affinities. The lack of studies and data to identify subpopulations magnify the inability to determine such processes.

e.2. Lack of information on the extent of sharing of populations

Aside from lack of the studies on the extent of sharing among and within populations in the Philippines, the complex network of islands, bathymetry, oceanic processes and a diverse composition of resources add to the problem of studying relationship of populations. These factors affect population dynamics as could be seen from various studies (Graves, 1996).

e.3. Problem of utilization between commercial and municipal fishermen

As mentioned, the country's marine fisheries regime is divided in two: Municipal fishing grounds (shore to 15 km) and commercial fishing grounds (15 km and beyond). This type of management strategy is geared towards the rehabilitation of nearshore areas from the high fishing effort of the commercial vessels. However, a lot of the pelagic fish species tends to dwell in both areas, because of their behavior, such that a need to understand the extent of population mixing between and among these arbitrary fishing zones is important.

Moreover, there is still at present a need to determine the delineating line of these boundaries. Although it is clear that boundary delimitation is a priority work under existing laws, actual ground work has yet to start because of lack of manpower and logistics.

e.4. Problem of utilization between and among municipalities and provinces

By virtue of the Local Government Code (LGC), the local government's political autonomy and decentralization, and resource generation and mobilization was enhanced. The LGU's were tasked to have a greater responsibility in the management and maintenance of areas under their territorial jurisdiction subject to the provisions of the LGC and National Policies. This type of arrangement have important implications to the management of shared resources very similar to the set-up existing among countries having shared stocks. To attain resource sustainability, concerned LGU's are needed to implement a unified and cooperative form of management since they will be managing one population, otherwise collapse of the resource could happen.

e.5. Problem on accurate catch and effort data.

As applicable to the whole fisheries, there is a need to enhance collection of accurate catch and effort data to help in studying the true status of the resource. Furthermore, current management strategies for some aquatic resources require species-specific data that are both cost and labor intensive.

f. Current management interventions affecting shared species

Various management efforts by the national and local government, and by the private sector and NGO's have been placed primarily to help in the rehabilitation of overexploited fishery resources and ensure its sustainability in the future. Since, these interventions are also geared for potential shared stocks, the same are presented in this section.

f.1. Major National Legislations

☞ *Philippine Fisheries Code of 1998 (Republic Act 8550)*

The recently promulgated Philippine Republic Act 8550 otherwise known as the "Philippine Fisheries Code of 1998" has set forth the directions the Government will take towards the utilization, development, management, conservation and protection of the fisheries and aquatic resources to ensure food sustainability and security in the country. This law primarily replaced and enhanced the old and obsolete fishery law, which is the Presidential Decree 704 and integrated other pertinent laws.

The specific objectives which the State shall ensure to attain under RA 8550 are 1) conservation, protection and sustained management of the country's fishery and aquatic resources, 2) Poverty alleviation and the provision of supplementary livelihood among municipal fisherfolk, 3) Improvement of productivity of aquaculture within ecological limits, 4) optimal utilization of offshore and deep-sea resources and, 5) upgrading of post-harvest technology.

Examples of management interventions under the code include the following:

- Ban on illegal and destructive fishing methods e.g. fishing through explosives, noxious or poisonous substance, fine mesh net, Muro-ami etc;
- Reduction of fishing effort in overexploited areas through closed season, catch quota, fishery reserves and sanctuaries, regulation on fishing boats;
- Establishment of Fisheries and Aquatic Resources Management Councils (FARMC's) in all levels of government
- Encouragement of Community Based- Coastal Resource Management
- Monitoring, Control and Surveillance (MCS)
- Ban on taking of endangered and threatened spp. such as corals and other CITES listed species.

☞ *Agriculture and Fisheries Modernization Act (AFMA)*

AFMA was promulgated on December 1997. Its objective was to prepare the country for globalization and liberalization by modernizing the fisheries sector for profitability. Furthermore it also sets the goal of the country to develop the agriculture and fisheries sector in accordance with the principles of sustainable development.

Although little fisheries management provisions has been stipulated in this law (Israel and Roque, 1999), a more important aspect to note, which would have an impact on shared stocks would be a stipulation of an increase in research and development Government funds allocation for agriculture and fisheries to at least 1% of the Gross Value Added (GVA) by year 2001. If materialized, R&D activities in the country particularly on shared resources could be enhanced and be given more emphasis.

☞ *Local Government Code (Republic Act 6975)*

With this law, local governments are tasked to be responsible with the development and management of their area of jurisdiction including municipal waters. Many of the functions of the national government agencies were devolved and decentralized to the local government units such as enforcement of national laws, issuance of permits, boat registrations etc.

f.2. Major Coastal Resource Management Related Projects in the Philippines

☞ *Fisheries Resources Management Project (FRMP) by DA-BFAR/ADB/OECF*

The Fisheries Resources Management Project (FRMP) is a follow-up project for the Fisheries Sector Program (1990 to 1995). It is being funded by the Overseas Economic Cooperation Fund (OECF) and the Asian Development Bank and will be implemented for 6 years from 1998 to 2004. A total of 17 priority bays was targeted by the project, 12 of which were under the Fisheries Sector Program (FSP) and the 7 are additional priority bays (Table 4).

Table 4. List of Priority Bays under the Fishery Sector Program and the Fisheries Resources Management Project.

| Fishery Sector Program (FSP) Priority Bays | Fisheries Resources Management Project (FRMP) Additional Bays |
|---|--|
| 1. Manila Bay | 1. Davao Gulf |
| 2. San Miguel Bay | 2. Lingayen Gulf |
| 3. Tayabas Bay | 3. Gingoog Bay |
| 4. Sorsogon Bay | 4. Butuan Bay |
| 5. Calauag Bay | 5. Honda Bay |
| 6. Panguil Bay | 6. Puerto Princesa Bay |
| 7. Sogod Bay | 7. Sapijan Bay |
| 8. Lagonoy Gulf | |
| 9. Carigara Bay | |
| 10. San Pedro Bay | |
| 11. Ragay Gulf | |
| 12. Ormoc Bay | |

FRMP's objectives are geared towards the principle of Community Based – Coastal Resource Management. It has four (4) main components which are the Fisheries Resources Management Component, Community Base Law Enforcement, Income Diversification Component and the Capacity Building Component.

☛ *Coastal Resource Management Project (CRMP) by DENR/USAID*

The Coastal Resource Management Project is a Philippine government project supported by the United States Agency for International Development (USAID). It is a 5 year project (1996 to 2000) which is being implemented by the Department of Environment and Natural Resources (DENR) in partnership with the Department of Agriculture – Bureau of Fisheries and Aquatic Resources (DA-BFAR), Department of Interior and Local Government (DILG), local government units (LGU's) and non-governmental organizations (NGO's).

The ultimate objective of the project is the widespread and sustainable application of coastal resource management in our coastal communities. To achieve this, the project is implementing the following project activity components: 1) Identification and development of coastal leaders, 2) Development and institutionalization of community-based CRM processes and systems, 3) Local government capacity- building, 4) Building constituency groups and empowerment of coastal communities, 5) Training in skills relevant for CRM implementation, 6) Policy analysis and formulation, 7) Public education and mobilization, 8) Alternative enterprise development and 9) continuing research on and development of community-based CRM approaches.

Six (6) areas were involved in the project namely: Olango Island, Cebu; San Vicente, Palawan; Malalag Bay, Davao del Sur; Negros Oriental; Bohol and Sarangani Province.

☛ *Fisheries Management and Conservation Project for the Sulu-Sulawesi Marine Ecoregion (SSME) by KKP (WWF Philippines)*

The Project covers the general area of the Sulu and Sulawesi Seas with an approximate area of 600 sq.km., and it is bounded by three countries: the Philippines,

Malaysia and Indonesia. Particularly, the areas in Anilao, Batangas; Donsol, Sorsogon; Dimakya Island, Apo Reef; El Nido; Sibuyan; Roxas; Quiniluban Islands; Green Island Bay; Tubbataha Reef; Talisayan; Jessie Beazly Reefs; Pamilacan Island, Bohol; San Miguel Islands; Turtle Islands; Tawi-Tawi Coastal Wetland; Semporna and Sipadan, Malaysia and Bunaken, Indonesia. This is being implemented by Kabang Kalikasan ng Pilipinas or World Wildlife Fund – Philippines, a Non-Governmental Organization (WWF-Philippines, 1999).

The Project is generally aimed to address coastal poverty, resource depletion, overfishing and destructive practices, use conflicts and law enforcement. The objectives of the project includes a) strengthen local government capability and develop self reliant coastal communities, b) develop an effective law enforcement system and resource management with active community participation and strong government support, c) identify protected area sites, d) establish an inter-governmental mechanism to implement SSME. To achieve this, the project will undertake fisheries resource management, capacity building, community development, community-based law enforcement and income diversification.

Relative to this project, a Presidential Executive Order No. 1028 was issued in 20 June 1997, which declared the entire Sulu and Celebes Seas as an Integrated Conservation and Development Zone and created the Presidential Commission for the Integrated Conservation and Development of the area.

☛ Community Based Resource Management Project (CBRMP) by DOF/WB

The Community Based Resource Management Project (CBRMP) is a 3-year project being headed by the Department of Finance (DOF) supported by 4 other government agencies namely the Department of Environment and Natural Resources (DENR), Department of Agriculture – Bureau of Fisheries and Aquatic Resources (DA-BFAR), the Department of Interior and Local Government (DILG) and the National Economic Development Authority (NEDA) (CBRMP, 1999). It is being funded by a World Bank Loan of \$50 M with counterpart funds of \$17.5 M from the Philippine National and Local Governments. The Region's V, VII, VIII and XIII are the areas being covered by the project.

CBRMP's goal is to reduce rural poverty and environmental degradation by supporting locally generated and implemented natural resource management projects. Specifically, it aims to raise the income of rural households by 25% and enhance the environment through the provision of technical and financial assistance for the generation and implementation of natural resources management subprojects to local government units and concerned government agencies.

f.3. Memorandum of Understanding on Fisheries Cooperation

Taking into account the need to ensure sustainable development of the fisheries and following the provisions of the 1982 United Nation's Convention on the Law of the Sea (UNCLOS), the Philippines is currently negotiating into bilateral agreements on fisheries with other countries. To date, there are several bilateral agreements on fisheries cooperation being negotiated with other countries namely: Indonesia, Brunei, Spain, Peru, China, Vietnam, Palau, Malaysia. These arrangements when finalized should provide for an increase

cooperation on joint venture activities, aquaculture, processing, joint fisheries research and joint fisheries conservation and management activities for the benefit of both countries.

f.4. Adherence to International Conventions/ Commitments

The Philippines is also signatory to various international conventions relating to the management and conservation of fisheries and aquatic resources and as such is abiding and implementing the different requirements, rules and regulations set forth by the said conventions. Notable of which are the: United Nations Convention on the Law of the Sea (UNCLOS), Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES), World Trade Organization (WTO), Convention on Biological Diversity (CBD), Convention on Migratory Species (CMS), Brunei-Indonesia-Malaysia-Philippines - East ASEAN Growth Area (BIMP-EAGA), and most recently but still under discussion, the Multilateral High Level Conference (MHLC).

g. Resource survey/ assessment studies

Past, present and future national resource survey and assessment studies in the Philippines are summarized in Appendix I and II. There are an estimated 14 resource surveys conducted from 1900 to 2000 not only in the marine waters but also in lakes as well as surveys on non-fish species like seaweed, corals and other invertebrates. There are also some 45 major and minor trawl surveys recorded to be undertaken in Philippine waters since the pioneering expedition of the Danish Vessel "Galathea" in 1845 (Silvestre and Pauly, 1997).

h. Conclusion

Just like the global problem of resource depletion, which is both complicated and difficult, so is the problem of managing fishery resources that are shared by 2 or more management bodies, whether it be within the country like in the Philippines or between and among countries. For this case, there is a need for a collaborative and cooperative type of research, development, management and conservation of fishery resources between and among management bodies for the resources to be sustained.

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Appendix I. List of Major National Fishery Resource Survey in the Philippines from 1990 to 2000

| Survey Project | Duration | Target Area | Vessel / Gear Used | Implementing Agency | Funding Agency |
|--|-----------------|--|--|-----------------------------|---------------------------------------|
| 1. Resource Assessment and Oceanographic Research of the Philippine Exclusive Economic Zone (EEZ) | 2000 to 2005 | Exclusive Economic Zone (EEZ) | M/V DA-BFAR | BFAR | BFAR |
| 2. Joint Philippines – Indonesia Marine Mammal Survey of the Celebes and Sulawesi Seas | 2000 (proposed) | Celebes and Sulawesi Seas | Modified Patrol Boat | BFAR – RIMF, Indonesia - US | Convention on Migratory Species, BFAR |
| 3. Resource and Sociological Assessment of 7 Bays under the Fishery Resources Management Project (FRMP) | 1999 to present | 7 Bays (Butuan Bay, Lingayen Gulf, Gingoog Bay, Sapien Bay, Davao Gulf, Honda Bay and Puerto Princesa Bay) | Trawl in some areas | BFAR | BFAR |
| 4. Joint Philippines – Indonesia Tuna Stock Assessment of the Celebes and Sulawesi Seas Project | 1998 to present | Celebes and Sulawesi Seas | Major Landing Areas; Pole and Line Vessels for Tagging | BFAR, RP – RIMF, Indonesia | BFAR RI-WB |
| 5. National Stock Assessment Program (NSAP) | 1997 to present | Major Landing Areas in the Philippines | N/A | BFAR | BFAR |
| 6. National Seaweed Assessment Project | 1990 to present | Sorsogon Bay, Carigara Bay, Western Samar, La Union Province, Calauag at Quezon, Southern Leyte, Southern Palawan | N/A | BFAR | BFAR, FSP, UNDP |
| 7. National Survey and Assessment of Invertebrate Resources (crabs, shrimps, spiny lobster, bivalves, cephalopods and crustaceans) | 1990 to present | Sorsogon Bay, Northern Cagayan waters, Negros Occidental/ Guimaras Strait waters, Asid Gulf, Pilar Bay, Maqueda Bay Samar, | N/A | BFAR | BFAR |

| | | | | | |
|---|--------------|---|----------------------------------|--------------------------|--------------------|
| | | Southern Palawan waters | | | |
| 8. Biological Assessment of Major Lakes in the Philippines | 1997 to 1999 | Major Lakes e.g. Laguna de Bay, Lake Paoay, Lake Naujan, Lake Sebu, Lake Mainit, Lake Bato, Lake Wood and Lake Taal | N/A | BFAR | Gov. of Spain |
| 9. Interdepartmental Collaborative Research in Area III: Western Philippines | 1998 | Western Philippines (South China Sea) | MV SEAFDEC | SEAFDEC – BFAR | SEAFDEC |
| 10. Resource and Ecological Assessment of the 12 Priority Bays under the Fisheries Sector Program (FSP) | 1990 to 1995 | 12 Bays (Manila Bay, Sogod Bay, San Pedro Bay, Ormoc Bay, Panguil Bay, Calauag Bay, Sorsogon Bay, Lagonoy Gulf, San Miguel Bay, Tayabas Bay and Ragay Gulf) | Trawl in some areas | DA-PMO Subcontracted | ADB |
| 11. Philippine Tuna Research Project under the Fisheries Sector Program (FSP) | 1990 to 1995 | Major Tuna Landing Areas in the Philippines; Tagging conducted in Sulu Sea, Celebes Sea, etc. | Pole and Line Vessel “Te Tautai” | DA-PMO PRIMEX | ADB |
| 12. Convention on the International Trade in Endangered Species (CITES) Coral Project | 199 | All areas | N/A | UPMSI, BFAR | CITES |
| 13. | | | | | |
| 14. Marine Mammal Distribution and Abundance, and Interactions with Humans in the Southern Sulu Sea | 1996 | Southern Sulu Sea; Northeastern Sabah | Modified Shrimp Trawler | Philippines-Malaysia- US | CMS, WWF, Hongkong |

Appendix II. List of Trawl Surveys conducted in Philippine waters (Source: Silvestre and Pauly, 1997)

| PHILIPPINES (exploratory surveys in different areas) | | | | |
|--|---------------|--|---|---|
| Area/ Survey no. | Period (date) | Vessel | Results/notes | References |
| 1 | 1845-1847 | Galathea Danish vessel | ☞ Survey Manila Bay, Dinagat and Surigao | Warfel & Manacop (1950) Sebastian (1951); Ronquillo (1959) |
| 2 | 1872-1877 | British H.M.S. Challenger Deep Sea Expedition | ☞ Surveyed Philippine Deep Seas | Warfel & Manacop (1950); Sebastian (1951); Ronquillo (1959) |
| 3 | 1907-1909 | Albatross Philippine Expedition Sponsored by the US Bureau of Fisheries | ☞ Extensive investigation of marine life in the Islands | Warfel & Manacop (1950); Sebastian (1951); Ronquillo (1959) |
| 4 | 1909 | English Steam Trawler | ☞ Explored trawlable grounds from Manila to Visayas | Warfel & Manacop (1950); Sebastian (1951); Ronquillo (1959) |
| 5 | 1940 | Experiment of the Philippine Bureau of Fisheries | | Warfel & Manacop (1950) |
| 6 | 1947-1949 | Theodore N. Hill 400 hp and David Star Jordan | ☞ 24 areas Lingayen Gulf, West of Bataan, Manila Bay approach, Manila Bay, Tayabas Bay, Mangarin Bay, Ragay Gulf, Burias Pass, Alabat Sound Tabaco Bay, Samar Sea, Carigara Bay, San Pedro Bay, Leyte Gulf, West Visayan Sea, Guimaras Strait, Panay Gulf, Panguil Bay, Sibuguey Bay and Off Taganak Island | Warfel & Manacop (1950) |
| 7 | 1951-1952 | Danish Deep Sea Galathea Expedition | ☞ Trawled deepest part of Philippine trench | Megia et. Al. (1953) |

| PHILIPPINES (MANILA BAY) | | | | |
|--------------------------|------------------------|--|--|------------------------------------|
| Area/ Survey no. | Period (date) | Vessel | Results/notes | References |
| 1 | 1956 | Fishing craft, 2.5-9 hp | ☞ Manila Bay | Manacop & Laron (1950) |
| 2 | Nov 1956-Oct 1958 | | ☞ Manila Bay between Cavite and Bataan | Tiews and Caces-Borja (1959) |
| 3 | Apr 1957 – Oct 1958 | | ☞ Manila Bay between Cavite and Bataan | Tiews and Caces-Borja (1959) |
| 4 | 1957-1959 | M.V. Ildefonso I 18.77 GT, 80 hp M.V. Ildefonso IV 48.37 GT, 80 hp M.V. Leonor V 60.43 GT, 160 hp M.V. Dona Lina D 83.85 GT, 325 hp | ☞ Manila Bay | Ronqiollo et al. (1960) |
| 5 | 1960-1962 | Commercial trawls | ☞ Manila Bay | Caces-Borja et al. (1972) |
| 6 | Dec 1978 | Commercial Medium-sized Trawlers, 40-44 GT, 225 hp | ☞ Manila Bay | Caces-Borja (1972) |
| 7 | Nov 1970 – Feb 1971 | F.B. Carlos Renato II 44.9 GT, 2x225 hp and F.B. Maria Cynthia II 40.01 GT, 2x250 hp Nonwegian Star Trawl Net Horsenet (locally made) German Trawl (418-160 mm) | ☞ Central Manila Bay | De Jesus (1976) |
| 8 | 15-29 Feb | Fishing Boat | ☞ Manila Bay (Bulacan, Batangas and Cavite coasts) | Bautista and |

| | | | | |
|----|------------------------|---|------------------------------------|--|
| | 1980 | 8.18 GT | | Rubio (1981) |
| 9 | Nov 1992 – Oct 1993 | Baby trawler FUSO 2DR5 LOA: 13.5 m Fishing boat with Outriggers | ☞ Manila Bay: 1782 km ² | MADECOR & National Museum (1994) |
| 10 | Sep 1995 – May 1996 | Commercial trawler FUSO 4DR5 LOA: 13.5 m | ☞ Manila Bay approaches | Pura et al. (1996b) |

PHILIPPINES (SAN MIGUEL BAY)

| Area/ Survey no. | Period (date) | Vessel | Results/notes | References |
|---------------------|---------------|--------|---------------|------------|
|---------------------|---------------|--------|---------------|------------|