

SUSTAINABLE MARINE FISHERIES PRODUCTION IN THE PHILIPPINES

Jonathan O. Dickson and Lainie C. Tiongson
Bureau of Fisheries & Aquatic Resources
860 Arcadia Bldg., Quezon Avenue, Quezon City
e-mail: bfammfd@info.com.ph

Abstract

The fisheries sector plays an important role in the economy of the country. In the coastal and marine waters as well as aquaculture, it provides substantial benefits to the Filipino nation, in terms of food and essential nutrients, substantive employment and sustenance, and valuable foreign exchange. The total fisheries production comprises three sectors, namely: the aquaculture sector, municipal sector and commercial sector. In 2001, marine landings were about 66% or 1,946,074 MT of the total fisheries production. Fishermen (small-scale and commercial) use various types of gears, with heavy concentration in inshore/municipal waters where production is highest. Despite the stable figures of catch and exports of the fisheries, this sector faces serious challenges in the management of fisheries. Overexploitation of coastal resources still continues. This paper gives an overview of the fisheries resources and discusses the contribution of fisheries by sector, the major problems of the industry, sustainable fishing technologies, and fisheries management approaches and key recommendations. Sustaining the country's fisheries and coastal resources requires urgent and concerted action by responsible authorities and the wider participation of stakeholders at all levels. Interventions are required for the effective implementation of a wide range of measures as well as shifts in management perspectives.

Key words: fisheries, marine, sustainable development

Introduction

The Philippines is an archipelago that consists of 7,107 islands. It comprises of marine and inland resources. For the marine resources, total territorial water area including the EEZ covers about 2,200,000 sq. km. The coastal area is 266,000 sq. km and the oceanic is 1,934,000 sq. km. The shelf area is 184,600 sq. km and the coral reef area and length of the coastline is 27,000 sq. km and 17,460 km, respectively. The inland water resources comprise of the swamplands, existing fishponds and other inland resources such as lakes, rivers and reservoirs with a total area of 246,063 ha, 253,854 ha and 250,000 ha, respectively. Thus, the fisheries sector plays a very important role in the economy of the country providing food, essential nutrients as well as employment and substantial foreign exchange. This paper gives an overview of the fisheries resources and discusses the contribution of fisheries by sector, the major problems of the industry, sustainable fishing technologies, and fisheries management approaches and key recommendations.

Fisheries Resources

Pelagic Resources

Philippine marine waters although extensive in area have narrow and steep insular shelves which are the seat of the fisheries. Large portions of the shelf cannot be trawled due to the growth of coral reefs and rough bottom. Fishing for pelagic fish species takes place in shallow waters during weak monsoon winds and in most open waters during calm weather.

More than 25 species of pelagic fishes are caught in commercial quantity. Besides the roundscads, *Decapterus* sp., other species commonly taken are sardines, *Sardinella sirm* and *Sardinella fimbriata*, chub mackerels, *Rastrelliger* sp and *Scomber* spp. Spanish mackerel, *Scomberomorus commersonii*, anchovies, *Stolephorus* spp. and *Engraulis*; several species of cavallas, *Caranx*, big-eyed scads, *Selar crumenophthalmus*, yaito tuna, *Euthynnus yaito*, skipjack, *Katsuwonus pelamis*, and frigate mackerel, *Auxis*.

The major fishing grounds of these pelagic species are those concentrated in coastal and shallow seas between the islands throughout the country. The principal fishing grounds are Northern Palawan-Mindoro Area, Southern Sulu Sea, Visayan Sea, Turtle Island area, Sibuguey Bay, Ragay Gulf, Tayabas Bay, Davao Gulf, Lamon Bay, Jolo-Basilan Area and off-San Miguel Bay.

Demersal Resources

Usually, these species are caught by trawlnets, modified Danish seine, bottom gillnets, longlines and handlines. Ecologically speaking, the demersal spe-

cies main habitat is located in the layer near the bottom/sea bottom. The major demersal fishes are *Nemipterus* spp., *Leiognathus* spp., *Upeneus* spp., *Mugil* spp. and *Secianidae* sp. Most of the large crustaceans (shrimps and crabs) are caught by trawlers and bottom gillnets along with other demersal fishes such as squids and cuttlefishes.

Contribution of Fisheries by Sectors

Fisheries is divided into three (3) sectors, namely aquaculture, municipal fisheries and commercial fisheries. Aquaculture can be defined as fisheries operations involving all forms of raising and culturing fish and other fishery species in fresh, brackish, and marine water areas. Municipal fisheries refers to fishing within municipal waters using fishing vessels of three gross tons or less or fishing not requiring the use of fishing vessels while commercial fisheries is defined as the taking of fishery species by passive or active gear with fishing boats above three gross tons for trade, business or profit beyond subsistence or sports fishing. It is further classified into small scale, medium scale and large scale commercial fishing. The percentage contribution of various sectors in 2001 are 38.54 % for aquaculture, 30.62% for municipal fisheries and 30.84% for commercial fisheries out of the total production of 3,166,530 MT. The volume of fish production in MT by sector from 1992-2001 is shown in Table 1.

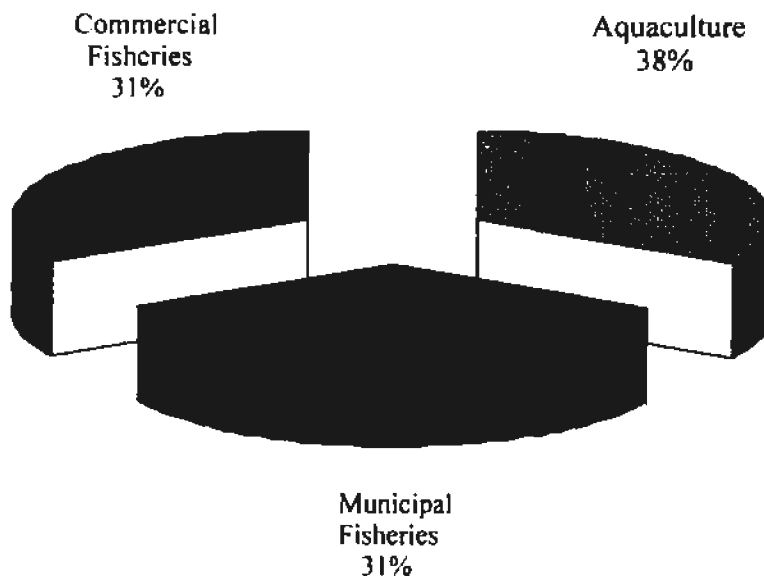


Figure 1. Percentage contribution of each fisheries subsector

Table 1. Fish production, by sector, 1992-2001.

Year	Aquaculture	Municipal	Commercial	Total
2001	1,220,456	969,535	976,539	3,166,530
2000	1,100,902	945,945	946,485	2,993,332
1999	1,048,679	926,339	948,754	2,923,772
1998	997,841	891,146	940,533	2,829,520
1997	984,439	924,466	884,651	2,793,556
1996	1,007,676	909,248	879,073	2,795,997
1995	940,589	972,043	893,232	2,805,864
1994	869,083	992,578	859,328	2,720,989
1993	793,620	1,013,969	824,356	2,631,945
1992	736,381	1,084,360	804,866	2,625,607

Source: BFAR Profile, 2001

Fishes Caught

Marine municipal fish catch is topped by frigate tuna, followed by fimbriated sardines, anchovies, squid, Indian sardines, yellowfin and big-eye tuna, roundscad, blue crabs, big-eyed scad and Indian mackerel (Table 2).

Table 2. Marine municipal fish catch by major fish species, 1995

Major Species	Total (in MT)	% to Total
Frigate tuna	51,899	6.8
Fimbriated sardines	45,978	6.0
Anchovies	43,160	5.6
Squid	41,207	5.4
Indian Sardines	38,639	5.1
Yellowfin and Big-eye tuna	36,387	4.8
Roundscad	32,290	4.2
Blue crabs	28,786	3.8
Big-eyed scad	28,765	3.8
Indian mackerel	27,418	3.6
Others	390,198	51.0
Total	764,727	100.00

Source: BFAR Profile, 2001

For marine municipal fisheries production, the major fishing grounds are in the Visayan Sea, followed by Moro Gulf, East Sulu Sea, Bohol Sea, Guimaras Strait, Leyte Gulf, West Palawan Waters, South Sulu Sea, Lamon Bay, Samar Sea, Davao Gulf, Cuyo Pass, Tayabas Bay and others (Table 3).

Table 3. Marine municipal fisheries production by major fishing grounds, 1995.

Fishing Grounds	Total (ln MT)	% of Total
Visayan Sea	86,616	11.28
Moro Gulf	73,938	9.41
East Sulu Sea	71,486	9.10
Bohol Sea	70,756	9.01
Guimaras Strait	51,332	6.54
Leyte Gulf	49,901	6.35
West Palawan Waters	46,948	5.98
South Sulu Sea	42,019	5.35
Lamon Bay	41,862	5.33
Samar Sea	40,236	5.12
Davao Gulf	33,743	4.30
Cuyo Pass	25,587	3.26
Tayabas Bay	17,498	2.23
Others	131,447	16.74
Total	785,369	100.00

Source: BFAR Profile, 2001

Commercial fisheries production in 1995 had roundscale catch at 196,522 MT, followed by Indian sardines, skipjack, fimbriated sardines, frigate tuna, anchovies, slipmouth, yellowfin and big-eyed tuna, Indian mackerel, big-eyed scad and others for a total of 884,651 MT (Table 4).

The major fishing grounds for commercial fishery production are in West Palawan Waters, followed by South Sulu Sea, Visayan Sea, Moro Gulf, Lamon Bay, International Waters, Bohol Sea, Samar Sea, Manila Bay, Guimaras Strait, Sibuyan Sea, East Sulu Sea, Tayabas Bay and Others (Table 5).

Table 5. Commercial fisheries production by major fishing grounds in MT, 1995.

Fishing Ground	Total	% to Total
West Palawan Waters	187,728	21.02
South Sulu Sea	180,532	20.21
Visayan Sea	120,267	13.46
Moro Gulf	83,352	9.33
Lamon Bay	55,325	6.19
International Waters	44,140	4.94
Bohol Sea	36,161	4.05
Samar Sea	25,602	2.87
Manila Bay	25,046	2.80
Guimaras Strait	24,163	2.71
Sibuyan Sea	20,065	2.25
East Sulu Sea	18,994	2.13
Tayabas Bay	17,140	1.92
Others	54,717	6.13
Total	893,232	100.00

Source: BFAR Profile, 2001

The two major sources of production for marine fisheries, namely, municipal and commercial fisheries and their production are shown in Table 6.

Table 6. Marine fisheries municipal and commercial production, by region, 2001 (in MT).

Region	Marine Municipal	%	Inland Municipal	%	Total Municipal	Total Commercial	%
NCR	4,166	0.50	0	0.00	4,166	140,933	14.43
CAR	0	0.00	1,150	0.84	1,150		
I	21,583	2.59	831	0.61	22,414	2,525	0.26
II	14,176	1.70	4,981	3.65	19,157	14,297	1.46
III	9,893	1.19	2,902	2.13	12,795	14,091	1.44
IV	154,247	18.51	87,635	64.27	241,882	128,408	13.15
V	86,408	10.37	1,070	0.78	87,478	32,585	3.34
VI	134,247	16.11	1,681	1.23	135,928	122,210	12.51
VII	44,653	5.36	83	0.06	44,736	61,361	6.28
VIII	41,640	5.00	630	0.46	42,270	36,169	3.70
IX	120,574	14.47	349	0.26	120,923	156,008	15.98
X	26,616	3.19	861	0.63	27,477	34,264	3.51
XI	27,705	3.33	222	0.16	27,927	11,355	1.16
XII	23,528	2.82	13,093	9.60	36,621	142,425	14.58
XIII	64,936	7.79	3,105	2.28	68,041	4,774	0.49
ARMM	58,816	7.06	17,754	13.02	76,570	75,224	7.70
Total	833,188	100.0	136,347	100.0	969,535	976,539	100.0

For the municipal marine fisheries production, Region IV had the highest production, followed by Region VI and IX in 2001. For commercial fish production, Region IX had the highest production, followed by Region XII, NCR, IV and VI in 2001.

Fishing Boat and Gear

Municipal. Pertaining to the number of municipal fishing bancas, Region IV posted the highest individual units, followed by Region VIII and VII. Region IV also indicated a significant number for both motorized bancas and non-motorized bancas.

Table 7. Number of municipal fishing bancas by Region in 2000.

Region	Total	Motorized	Non-Motorized
CAR	660	49	611
I	17,678	11,641	6,037
II	3,304	1,502	1,802
III	27,038	18,375	8,663
IV	69,927	26,569	43,358
V	54,715	19,453	35,262
VI	41,808	16,234	25,574
VII	56,142	19,100	37,041
VIII	58,068	16,255	41,813
IX	45,650	13,280	32,370
X	9,041	2,472	6,569
XI	24,099	11,382	12,717
XII	10,759	2,671	8,088
XIII	31,283	11,202	20,081
ARMM	19,635	7,442	12,193
Total	469,807	177,627	292,180
Percentage (%)	100	38	62

In terms of fishing gear production, the gillnet and hook and line contributed about 56% as these are the gear mostly used by small-scale fishermen.

Table 8. Total municipal production by gear, 1995

Fishing Gear	Production (in MT)	%
Gillnet	258,021	32.85
Hook and Line	187,502	23.87
Beach Seine	40,101	5.11
Fish Corral	31,056	3.95
Ring net	40,516	5.16
Baby Trawl	23,517	2.99
Spear	27,910	3.55
Long Line	24,885	3.17
Danish Seine	11,776	1.50
Fish pot	16,532	2.10
Bagnet	8,663	1.10
Crab Lift net	6,148	0.78
Purse Seine	14,576	1.86
Others	94,166	11.99
Total	785,369	100.00

Commercial. On the other hand, the number of commercial fishing vessels totaled 3,601 units with the highest number in NCR, followed by Region XI and VI (Table 9).

Table 9. Number of commercial fishing vessel, by Region in 1999 (Catcher and Accessory boat)

Region	Number	Gross Tonnage
NCR	1,351	158,509.59
I	113	1,832.99
II	64	717.94
III	40	1,080.67
IV	221	3,857.38
V	160	4,385.85
VI	404	25,674.39
VII	94	2,053.81
VIII	124	1,740.27
IX	392	22,758.66
X	43	1,215.10
XI	555	45,893.86
XII	7	85.09
XIII	26	293.86
ARMM	7	181.94
Total	3,601	270,281.40

In Table 10, the purse seine contributed 51.41%, followed by the ringnet (16.31%), the Danish seine (10.45%) and the bagnet (8.72%).

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Table 10. Total commercial production by gear, 1995

Fishing Gear	Production (in MT)	%
Purse Seine	459,229	51.41
Ringnet	145,676	16.31
Danish Seine	93,325	10.45
Bagnet	77,891	8.72
Trawl	66,089	7.40
Hook and Line	24,270	2.72
Others	26,752	2.99
Total	893,232	100.00

Fisheries Exports

In terms of value, shrimp posted the highest in export, followed by tuna, seaweeds, crab/crab fat, octopus, grouper, cuttlefish/squid, cultured pearls, roundscad and live ornamental fish (Table 11).

Table 11. Major fishery exports in terms of value, 2001.

Commodity/Kind	Quantity (in MT)	FOB Value (P 000)	FOB Value (\$ 000)
Shrimp/Prawn	12,737	6,226,503	125,732
Fresh/Chilled/ Frozen	12,737	6,226,503	125,732
Tuna	56,752	5,871,128	118,557
Fresh/Chilled/Frozen	22,072	2,351,090	47,476
Smoked/Dried	771	112,789	2,278
Canned	33,909	3,407,249	68,803
Seaweeds	41,267	3,540,460	71,492
Seaweeds and other Algae	31,644	1,612,057	32,552
Seaweeds and algae used for food	28	1,905	38
Carrageenan	8,648	1,912,428	38,618
Kelp Powder	947	14,070	284
Crab/Crab Fat	5,632	1,524,925	30,792
Frozen	96	14,914	301
Other than frozen	4,815	945,693	19,096
Prepared/Preserved	741	564,318	11,395
Octopus	11,806	1,430,478	28,886
Fresh/Chilled	176	19,072	385
Frozen/Dried/Salted	11,630	1,411,406	28,501
Grouper	4,905	574,978	11,611
Cuttlefish/Squid	1,687	437,859	8,842
Fresh/Chilled	33	7,559	153
Frozen/Dried/Salted	1,612	422,925	8,540
Prepared/Preserved	42	7,375	149
Cultured Pearls	1	392,361	7,923
Roundsad	3,838	322,817	6,519
Fresh/Chilled/frozen	3,712	302,136	6,101
Smoked	126	20,681	418
Ornamental Fish	5,535	320,500	6,472

Source: BFAR Profile, 2001

The major destinations for fisheries exports are Japan, USA and Hong Kong with 33,497 MT, 37,043 MT and 24,061 MT, respectively (Table 12).

Table 12. Fishery export, by Major Country of Destination, in terms of value, 2001.

Country/Destination	Quantity (MT)	FOB Value (P 000)	FOB Value (\$ 000)
Japan	33,497	6,382,362	158,382
USA	37,043	4,415,437	109,571
Hongkong	24,061	2,368,752	58,782
Singapore	8,047	770,930	19,131
Korea	5,577	619,945	15,384
United Kingdom	4,783	590,644	14,657
Denmark	4,586	566,683	14,062
Canada	5,242	499,491	12,395
France	18,060	496,456	12,320
Taiwan	6,918	456,274	11,318
Total Major Countries	147,814	17,166,974	426,002
Other Countries	11,255	5,556,234	32,848
Grand Total	159,069	22,723,208	458,850

Source: BFAR Profile, 2001

Imports of Fish and Fishery Products

Flours, meals and pellets of fish, crustaceans and mollusks unfit for human consumption were the major imports to the country (Table 13).

Table 13. Import of fish and fishery products by kind, quantity and value, 2001.

Commodity	Quantity (In MT)	FOB Value (P 000)	FOB Value (\$ 000)
Fresh/Frozen/Chilled	72,927	1,431,175	28,399
Flour, Meals and Pellets of Fish Crustaceans and Mollusks unfit for human consumption	84,546	1,585,071	31,453
Canned	1,179	68,390	1,357
Salted, Dried, Smoked, etc.	284	16,932	336
Other Commodities	21,058	713,642	14,161
Grand Total	179,994	3,815,210	75,706

Source: BFAR Profile, 2001

Problems of Marine Fisheries including Aquaculture

Commercial Fisheries

The numerous benefits derived from the country's fisheries and coastal resources are seriously threatened by a host of problems, namely; (1) overfishing or depletion of fisheries resources; (2) degradation of coastal habitats and environment; (3) post harvest losses and inefficient marketing; (4) inequity and (intra/inter) sectoral conflicts; (5) Poverty among coastal fishers and resource users; (6) Information and research inadequacy; (7) Institutional weaknesses and constraints (international, national, regional and local).

The depletion of commercially important fish stocks due to excessive fishing activities has been one of the major problems faced by many countries around the world. This is especially a major concern to ensure that fish stocks are exploited on a profitable but sustainable basis and among fisheries scientists involved in their assessment and enhancement.

The fisheries sector needs to maintain a delicate balance between the requirements for increased production to contribute to food security against the need to conserve and protect the resources for long-term sustainability. Interrelated key issues and concerns should address the following:

1. Resource management and environmental issues and concerns
 - a. Resource depletion in marine areas and coastal inland waters
 - b. Overfishing/destructive fishing
 - c. Siltation/pollution/mine tailings/agricultural wastes
2. Socio-economic Issue and Concern
 - a. Poverty among fishworkers
3. Policy Issues and Concerns
 - a. Need for strong fisheries law enforcement
 - b. Need for useful and timely fisheries information
 - c. Revision of lease and licensing fees
4. Institutional Issues and Concerns
 - a. Need for institutional strengthening
 - b. Need for human resources development
 - c. Access to credit
5. Industry Issues and Concerns
 - a. Post-harvest
 - b. Marine productivity
 - c. Fishery inspection and quarantine

Municipal Fisheries

The fish stocks in the coastal waters of the region are generally depleted for various reasons. Environmental degradation of habitat is caused by the use

of harmful fishing gear and methods and by pollution from domestic, industrial and agricultural sources. Ineffective enforcement of fisheries management systems and regulations further aggravate the situation, which is further complicated by the fact that fishery resources are still widely regarded as a common property with free and open access.

1. Resource Sustainability

The sustainability of fisheries resources in the Philippines is a critical issue. Most fisheries in the Philippines are based on extensive, multi-species stocks; detailed stock assessment is limited. However, existing information as well as the experience of those with long association with the fisheries sector in the Philippines indicates that most of the fisheries resources are not sustainable under current arrangements. The cause of this problem is attributed primarily to the number of fishers and efficiency of gears. The problem is compounded by degradation of productive habitats such as coral reefs, mangroves and seagrass areas; as well as by the difficulties in achieving compliance with existing fisheries management laws.

2. Law Enforcement

The level of compliance by fishers with the rules, laws etc., which govern their fishing activities, is at present a critical issue. It is generally thought that compliance should be much higher and a great deal of attention should be given to this problem.

3. Need for Information

The need to obtain and disseminate various types of information on fisheries and fisheries resources is an important issue. Reliable, accurate, up-to-date information on catch statistics and on the fisheries resources are important particularly for fisheries management. This information has other uses and can be provided to others such as policy makers, local governments, fishers groups and Non-Government Organizations.

4. Management Responsibility of Local Governments

The Local Government Code of 1991 devolved certain responsibilities for fisheries resources and powers for their management to local governments. The areas over which local governments have responsibility extend from the shoreline, offshore for a distance of 15 km. However, there are some legal uncertainties over the 15 km distance. Within this area, the local government units are responsible for licensing of small-scale fishers, for monitoring fishing activities and for enforcement. Local governments units are having difficulties in their role in fisheries management due to limitations on the resources and skills needed to carry out this responsibility.

5. Conflicts and Disputes

There are conflicts between fishers over who should have access to fishing area and the types of gears to be used. There are also international problems and disputes over national boundaries. The conflicts occur predominantly in the inshore (municipal) fishing areas and involve the small-scale fishers and the commercial fishers. There are also some conflicts between small-scale fishers in bordering municipal areas. These types of conflicts relate to the areas under the control and jurisdiction of local governments.

6. Environmental Degradation

There has been an alarming trend in the degradation of coastal aquatic habitats, which provide the basis for the inshore fisheries. The areas of mangroves and coral reefs and seagrass beds have been significantly reduced and degraded. In addition, in many areas there has been deterioration in water quality associated with urban and industrial growth. This degradation of coastal aquatic habitats is thought to have reduced the extent and abundance of associated inshore stocks.

7. Well Being of Small Scale Fishers in Coastal Areas

The plight of small-scale fishers in coastal areas is another critical issue. This is the largest sector of the fishery in the Philippines in terms of population of fishers. Traditional fishing grounds are overfished. Small-scale fishers have very low incomes. They traditionally do not travel very far to carry out their fishing activities as they use simple vessels and small fishing gears. However, in total they provide a significant level of fishing effort on the inshore/coastal fisheries resources.

Aquaculture

Major issues of aquaculture development in the regions are the prevention of conflicts in land use and control of further destruction of mangrove forest for aquaculture expansion, prevention of saltwater seepage into agricultural land, the need to maintain the water quality of the farms and the prevention of pollution in the surrounding waters from farm effluents and other environmental aspects such as reduction in the natural spawning and nursery grounds of coastal organisms and coastal biodiversity of fauna and flora. Technological aspects such as the development of standardized techniques for cultivating species like penaeid shrimps, groupers, snappers and mudcrabs, development of breeding, hatchery and nursery techniques for their fry, production of high quality feed supply and control and prevention of epidemics and diseases etc. also need to have prioritized attention.

The major issues and problems of aquaculture and inland fisheries are as follows:

1. Technical Issues and Problems

- **Inadequate and poor quality seeds or fry for aquaculture from commercial broodstock, hatchery and nursery operations coupled with shortage or difficulty of obtaining wild fry and spawners/broodstock of major cultured species.**
- **Environmental degradation from intensive aquafarming systems in ponds and open waters and conflicts of aquaculture with other resource uses in inland and coastal waters.**
- **The high production cost of intensive aquaculture due to inefficient farming systems and poor quality feed.**
- **Inadequate properly trained manpower in extension service in aquaculture and inland fisheries**
- **Lack of management of fisheries resources in inland waters resulting in overfishing and the depletion of fish stocks. The absence of integrated inland water management further worsens lake management.**
- **The conservation and protection of the natural resource heritage of the country in inland waters through proper fisheries regulations that are based on results of research and studies.**

2. Institutional Issues and Problems

- **The negative impact of introduced exotic species for aquaculture on the environment and indigenous / endemic species**
- **Unreliable statistical data and information on aquaculture and inland fisheries used in planning and policy-making**
- **The absence of monitoring and dissemination of fish marketing information to fish producers and non-promotion of fisheries export products**
- **The high cost of commercial feeds and chemicals used in aquaculture due to high tariff/taxes on imported feed ingredients, chemicals, encapsulated feeds, brine shrimp cysts/eggs, etc.**
- **Unregulated construction of pens and cages in lakes resulting in the reduction of fishing areas, conflicts with fishing and ineffective lake management**
- **Inadequate credit and financial support to aquaculture and inland fisheries, especially to small scale operations**
- **Agencies are unresponsive to the needs of coastal and lake stakeholders and in the protection of the aquatic environment**

- The absence of participatory planning and management from stakeholders in inland waters and the need to include such participation in the integrated coastal and inland water management
- The inability to transform brackishwater aquaculture areas from the traditional, low input, low producing farming system to more intensive, higher input and higher producing farming system with acceptable environmental effects because of poor technology transfer and extension service in aquaculture
- The need to promulgate a national policy or law to protect and conserve the natural resource heritage in inland waters including penal provisions for the destruction of such heritage.

Sustainable Technologies for Marine Fisheries Production

The concept of sustainability is an important aspect for fisheries management. Sustainable use is the manner of exploitation at the rate that does not lead to the long term decline of the size and diversity of aquatic animals, thereby maintaining their potential to meet the needs and aspirations of present and future generation. This indicates that the sustainability issue should be addressed for better management of fisheries and aquatic resources.

Responsible Fishing Technologies and Practices

Lines. A line is a device consisting of baited hooks attached to a line or lines which fish on the principle that fish fall victims to bait.

Handlines. A handline is a long simple line with a series of baited hooks requiring constant attention. There are five types of handlines namely, simple handline, multiple handline, jig, pole and line and troll line. In conjunction with payao, handlines are used in Davao, General Santos City, Zambales, Palawan, Quezon, Mindoro, Antique, Bohol, Samar and others.

Longlines. There are extremely longlines with a series of baited hooks, either set or drifting and requiring periodical attention at more or less fixed intervals of time. Set longlines are anchored or in some way attached to the bottom so that they are not free to move with the current. Drift longlines are longlines without a fixed attachment to the bottom which are free to drift with the current or tide. They are operated in Samar Sea, Tayabas Bay, Camotes Sea, Davao Gulf, Lingayen Gulf, and East Sulu Sea, Leyte Gulf, Casiguran Sound and part of Moro Gulf.

Bottom Vertical Longline. The bottom vertical longline has a primary mainline which is suspended horizontally above the sea bottom. It is held in place by two buoylines at both ends. The buoylines are tied to a float at one end and to a weight at the other. The secondary mainline hangs vertically from the primary mainline. It is held vertically in place with a float at the upper end and a

weight which touches the seabed. Each secondary mainline holds a series of seven hooks, distributed equidistantly along it. The hooks are attached to the secondary mainline with a branchline, which consists of a 0.3 m cord, attached to a 0.9 m stainless steel wire which in turn is attached to the hook.

The bottom vertical longline can be used both in moderately deep and in shallow and rough fishing grounds where other fishing gears cannot be operated. The bottom vertical longline can be operated in any type of bottom because it has a lesser chance of getting entangled under the seabed. This is its advantage over the traditional bottom set longline. Experimental fishing was already conducted in Lamon Bay. Based on the data collected, the bottom vertical longline is a selective fishing gear in catching demersal fishes. It could be operated in rough fishing grounds.

Squid Jig. These are lines which have a multiple hooked device which are jerked up and down under a bright light making the hooked lures attractive to the squids. They are found in Tayabas Bay, Ragay Gulf, Sogod Bay and other squid fishing areas.

Pots. The cover pot is an entrapping device devoid of a non-return valve with the opening lowermost to cover fish. On the other hand, fish pots are usually baited enticing devices made of bamboo, rattan or chicken wire in the form of regular receptacles with a non return valve which provides easy entrance but difficult exit. Many kinds are used such as shrimp pots and fish pots. It is found in Carigara Bay, Sorsogon Bay, San Pedro Bay, Panguil Bay, Ragay Gulf, Ilocos Coast, Lingayen Gulf, Zambales Coast, Malampaya Sound, Polillo Island, Antique, Visayan Sea, Bohol and Basilan Waters.

Traps. These are fishing gears which are either temporarily or permanently fixed to the bottom, and in which fish are caught in an area they have entered after having been led, enticed or attracted to it. They are found in Lingayen Gulf, Zambales Coast, Manila Bay, Polillo Waters, Batangas Bay, Tayabas Bay, Ragay Gulf, Antique, Sorsogon Bay, Bohol, Murcielagos Bay, Davao Gulf and Lamon Bay.

Lambaklad. This consists of a net fixed by anchors to the bottom and buoyed to stretch hold vertically. A leader net is commonly provided in setting across migration paths of pelagic species in guiding into the playground, slope, and finally into the bag. It is preferably set in coves, bays, or inlets with moderate water current. It is found in Ilocos Norte, Ilocos Sur, La Union, Bataan, Zambales, Mindoro, Quezon, Albay, Camarines Sur, Iloilo, Antique, Aklan, Southern Leyte, and Zamboanga del Norte.

Fisheries Management Approaches and Key Recommendations

To address fisheries issues, management objectives should focus on environmental objectives, economic objectives, social objectives and institutional objectives for sustainable utilization of Philippine marine fisheries.

To address the issues, we should formulate key recommendations. Firstly, we need to recover fisheries resources including coastal environment and critical fisheries habitats; increase the value of catch/ reduce opportunity losses and promote equity in distribution of benefits from resource use and minimize intersectoral and intrasectoral conflicts.

Such actions shall reduce fishing efforts to sustainable levels, prevent harvesting immature/undersized fish; minimize destructive fishing; conserve mangroves; minimize siltation and pollution; minimize post harvest losses; improve marketing efficiency and provide supplemental/alternative livelihood options.

Another aspect to focus on is the need for capacity building and institutional strengthening. The proper authorities should develop/improve systems and structures for fisheries management; develop/improve human resources and provide infrastructure /equipment.

The implementation and introduction of selective devices are very critical in the Southeast Asian countries because of the over fishing of the marine resources of both demersal and pelagic fish. The Juvenile and Trash Excluder Devices (JTED) is one of the size selection devices that can be used to release small sizes of fish and catch only the large sizes. The principle of using this device is that the target species or large size of fish, shrimp or squid/cuttlefish should be retained in the codend and the small juvenile should be released. From a previous experiment, the 12 mm bar spacing JTED may be a suitable device to release the juvenile and small fishes including trash fish for sustainable fishing. Detailed studies must be carried out to confirm this conjecture. Other factors like easy installation and operation for fishermen must also be considered. A design review and improvement of the devices to fulfill these factors are essential.

Policies and Programs in Capture Fisheries

Fishing communities worldwide are seeking to build and maintain sustainable fisheries. To achieve this, there must be a move away from increasing fishing activities in most fisheries and an increased emphasis on the development of conservation measures and implementation of selective gears. Such gears should capture only those sizes and species of fish targeted, ideally releasing all non-targeted species unharmed.

Sustainable fishing technology can be defined as "activities that theoretically allow indefinitely the same level of catch with a constant level of fishing effort,

under constant environmental condition." However, the definition should be widened to include economic and social considerations. Although there are fluctuations in factors such as resources and environmental conditions and there are scientific uncertainties, indicators of sustainability are still necessary, and should be defined according to the local conditions in each particular fishery.

A number of sustainable fishing practices that reduce the catch of juvenile fish and non-target species have been developed for fixed and mobile gears in recent years. The Nordmore Grid that reduces fish bycatch in shrimp trawls and square meshes and grids that efficiently size select organisms. Immobile gears are examples of such successful developments. Many of these have been developed jointly by industry and government using commercial fishing vessels.

The sustainability of marine resources and the marine environment requires not only a reduction of catches of non-targeted fish species but also a reduction of the incidental catch of endangered non-fish species such as some seabirds. Several techniques, including gear and equipment modifications (such as the use of bird scaring lines) and practices (such as night and / or underwater setting) have already been proven effective. Research on the matter is continuing and various options have been considered.

Government should apply the precautionary approach where the marine environment and/or habitats are considered to be at risk. The prohibition of certain gears should be considered in certain areas.

Due to the multi-species composition of fisheries resources, particularly for coastal and demersal stocks in tropical areas, including the ASEAN Region, the concept of target catch (meaning a target of marketable size or species) is not clearly perceived by resource users in their fishing operations, and is hard to apply for regulatory purposes. What this means is that fishers are generally not targeting specific species, whether their catches are used for local markets or for household use.

Related to the notion of target species, the term by-catch has been universally accepted as a negative component of catch in normal fisheries practices. Many large industry fishers have tended to discard by-catch throughout their operation due to economic and management reasons. In tropical areas, the issue of bycatch is more complicated, as fisheries depend on multi-species resources.

In order to distinguish and clarify the different fisheries problems in the Southeast Asian region from those common in temperate regions, the term "unwanted and incidental catch" has been used instead of by-catch. Required research and demonstrations works have been conducted, with the application of appropriate selective fishing gear technologies.

By-catch reduction exercises in the ASEAN region, meaning the reduction of unwanted and incidental catch, have focused on trawl fishing gear and devices, in recognition of the environmental impact of this form of fishing.

Fisheries Administrative Orders (FAOs) Approved

There are various Fisheries Administrative Orders which contribute to sustainable marine fisheries production (Table 14). These are being formulated by the Bureau of Fisheries and Aquatic Resources as basis for policy formulation.

Table 14. Fisheries Administrative Orders

Number	Title
112	Prohibiting the use of Pantukos, under certain conditions in Fishing
155 and 155-1	Regulating the use of fine meshed nets in fishing
163	Prohibiting the operation of Muro-Ami and Kayakas in all Philippine water
170	-Prohibiting the operation of sudsud in Panguil Bay
184	Guidelines on the experimental collection of precious and semi-precious corals in Philippine waters
188	Regulations governing the operation of commercial fishing boats in Philippine waters using Tuna Purse seine nets
190	Regulations governing pa-aling fishing operations in Philippine waters
193	Ban on the taking, or catching, selling, purchasing and possessing, transporting and exporting of whale sharks and manta rays
194	Moratorium on commercial fishing vessels in Lingayen Gulf
198	Rules and regulations on commercial fishing
200	Guideline and procedure in implementing Section 87 of RA 8550
201	Ban on fishing with active gear
202	Ban on coral exploitation and exportation
203	Banning fishing by means of muro-ami and the like destructive to coral reefs and other marine habitats
204	Restricting the use of superlights in fishing
206	Disposal of confiscated fish and other items in fishing through explosives and noxious or poisonous substances
208	Conservation of rare, threatened and endangered species
211	Requirements for pre-processing and processing plants, the SSOP thereof and the processing and quality requirements for shellfish
212	Guidelines on the implementation of HACCP System
214	Code of practice for aquaculture

Implementation of the Code of Conduct for Responsible Fisheries (CCRF)

The CCRF is a comprehensive and global guiding principle to achieve sustainable fisheries. However, global and non-discriminatory application of the global CCRF to the specific regions or countries may require some modification in order to be effectively implemented in specific circumstances. In the Southeast Asian Region, the three following specific regional situations namely, cultural, fisheries structure and ecosystem, are needed.

- **CCRF Responsible Fishing Operations**

It is stated under the Code of Conduct for Responsible Fishing Operations that States with relevant groups from industry should encourage the development and implementation of technologies and operational methods that reduce discard. The use of fishing gear and practices that lead to the discarding of catch should be discourage and use of fishing gear and practices that increase survival rates of escaping fish should be promoted.

In addition, States should require that fishing gear, methods and practices to the extent practicable are sufficiently selective so as to minimize waste, discard catch on non-target species, both fish and non-fish species, and impacts on associated or dependent species and that the intents of related regulations is not circumvented by technical devices. In this regard, fishers should cooperate in the development of selective fishing gear and methods. States should ensure that information on new development and requirements is made available to all fishers.

They should also consider that in order to improve selectivity, states should when drawing up their laws and regulations, take into account the range of selective fishing gear, methods and strategies available to the industry.

- **CCRF Responsible Fisheries Management**

Under this guideline, it is mentioned that States and all those engaged in fisheries management should, through an appropriate policy, legal and institutional framework, adopt measures for the long term conservation and sustainable use of fisheries resources. Conservation and management measures, whether at local, national, sub-regional, or regional levels, should be based on the best scientific evidence available and be designed to ensure the long term sustainability of fishery resources at levels which promote the objective of their optimum utilization and maintain their availability for present and future generations; short term considerations should not compromise these objectives.

Likewise, recognizing that long term sustainable use of fisheries resources is the overriding objective of conservation and management,

States and sub-regional or regional fisheries management organizations and arrangements should, *inter alia*, adopt appropriate measures, based on the best scientific evidence available, which are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualifies by relevant environmental and economic factors, including the special requirements of developing countries.

On responsible fishing, the performance of all existing fishing gear, methods and practices should be examined and measures taken to ensure that fishing gear, methods and practices which are not consistent with responsible fishing are phased out and replaced with more acceptable alternatives. In this process, particular attention should be given to the impact of such measures on fishing communities, including their ability to exploit the resources.

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