FISHERY COUNTRY PROFILE	Food and Agriculture Organization of the United Nations	FID/CP/PHI
PROFIL DE LA PÊCHE PAR PAYS	Organisation des Nations Unies pour l'alimentation et l'agriculture	
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THE REPUBLIC OF THE PHILIPPINES

GENERAL GEOGRAPHIC AND ECONOMIC DATA

Land area:	301 000 km^2
Total marine water area (including EEZ):	2 200 000 km^2
Shelf area (to depth 200 m):	184 600 km^2
Length of coastline:	17 460 km
Population (2003):	81 081 457
GDP at current prices (2003):	US$ 83 284 million
GDP per head (2003):	US$ 1 027.2
Agricultural GDP (2003):	US$ 12 353 million

Fisheries GDP (2003):	US$ 1 832 million

Note: Based on an exchange rate of US$ 1 = peso 51.63 (2003)

FISHERIES DATA

	Production(1)	Imports	Exports	Total supply	Per capita supply
Data for 2003	tonnes live weight				kg/year
Fish for direct human consumption	2 393 659	96 944	155 129	2 335 474	28.8
Fish for animal feed and other purposes	236 735	96 602(2)	1 069(3)	332 268	–

Notes: (1) Excludes 988 888.2 t of seaweed (wet weight). (2) Includes 44 567 t of fishmeal (~89 134 t live weight). (3) Excludes 42 594 t of seaweed (dry weight).

Estimated employment (2002):	
(i) Primary sector (including aquaculture):	2 009 000
(ii) Secondary sector:	Not available
Gross value of fisheries output (2003):	US$ 2 322 million
Trade (2003):	
Value of fisheries imports:	US$ 80.4 million
Value of fisheries exports:	US$ 525.4 million

FISHERIES SECTOR STRUCTURE

Overall Fisheries Sector

The Philippine fisheries industry comprises marine fisheries, inland fisheries, and aquaculture. Marine fisheries can be further divided into municipal fisheries and commercial fisheries. Recreational fisheries have not developed in the country.

Municipal marine fisheries operate in coastal waters within 15 km from the coastline ("municipal marine waters"), using vessels ≤3 GRT, as well as fishing without the use of vessels. Commercial fisheries operate outside municipal waters, using vessels >3 GRT.

Inland fisheries operate in inland waters such as lakes, reservoirs and rivers, including estuaries. Aquaculture involves aquatic organisms in fresh, brackish and marine waters.

The Philippines ranked eleventh among the top fish producing countries in the world in 2003, with production of 2.63 million tonnes of fish, crustaceans, molluscs and aquatic plants (including seaweed).

As an archipelagic state with over 2.2 million km^2 of highly productive seas, the Philippines is fortunate to have vast fishery resources at its disposal. However, all of the country's main fish species and marine organisms are showing signs of overfishing.

Marine Subsector

Catch profile

In 2003, reported marine fisheries production was 2 169 164 tonnes: 45.38% from municipal and 54.62% from commercial fisheries.

Tables 1 and 2 show catches of the major species in municipal and commercial fisheries in 2003.

Table 1. Catches of the main species in the municipal marine fisheries sector in 2003.

Species	Volume (tonnes)	As % of total
Big-eyed scad	64 354	7.0
Frigate tuna	64 326	7.0
Roundscad	55 980	6.1
Indian mackerel	45 083	4.9

Anchovies	42 447	4.6
Indian sardines	40 051	4.3
Yellowfin tuna	39 767	4.3
Squid	37 735	4.1
Slipmouth	33 528	3.6
Blue crab	31 433	3.4
Other	467 147	50.7
Total	921 851	100.0

Source: BFAR, 2005

In the catch from municipal fisheries in 2003, small pelagics, tunas, demersal fishes and invertebrates constituted 54.5%, 22.9%, 7.4% and 15.2%, respectively.

Table 2. Catches of the main species in the commercial marine fisheries sector in 2003

Major species	Volume (tonnes)	As % of total
Roundscad	254 659	22.9
Indian sardines	130 024	11.7
Frigate tuna	114 760	10.3
Skipjack	114 077	10.3
Yellowfin tuna	87 473	7.9
Big-eyed scad	39 621	3.6
Fimbriated sardine	36 358	3.3
Slipmouth	36 313	3.3
Indian mackerel	32 037	2.9
Anchovies	28 654	2.6
Others	235 660	21.2
Total	1 109 636	100.0

Source: BFAR, 2005

The commercial fisheries catch in 2003 comprised small pelagics (59.6%), tunas (36.2%) and demersal fishes (4.2%).

Comparing the catches given in Tables 1 and 2, of the eight top species caught by both municipal and commercial fisheries, almost two-thirds were harvested by commercial fishers compared with one-third caught by municipal fishers. This suggests that, although the commercial and municipal fisheries are purported to be two distinctly different sectors, they are in fact competing directly with each other.

Despite the continued expansion of the country's commercial fishing fleet, total fish catch levelled off at around 1.65 million tonnes in the early 1990s. Indeed, the country had reached the maximum economic yield from its demersal fish stocks as early as the late 1960s, except in the offshore hard bottoms around Palawan, Southern Sulu Sea and the central part of the country's Pacific coast. Studies on pelagic fisheries also indicate overfishing and declining catch per unit effort (CPUE). Exceptions are in lightly fished areas in waters off Palawan, parts of the country's Pacific coast and some parts of Mindanao. Such findings are supported by an observed change in species composition, i.e. anchovies have partially replaced sardines, scads and mackerels in the catch, an indication of gradual stock collapse (Green *et al.,* 2003).

A major fishing ground, Lingayen Gulf, reached its maximum sustainable yield (MSY) more than 20 years ago. The fishery now has four times the optimum effort for the available fish stocks. Catch rates in the gulf are only one-fifth of what they were 15 years ago, compelling fishers to invest more time and money in dwindling catches (Green *et al.,* 2003).

In some areas, not only has the volume of catch been reduced, but also quality. For example, in Central Visayas, there has been an overall shift in catch composition, away from coastal pelagic to oceanic pelagic species and away from demersal to pelagic species. In the Visayan Sea, one of the most productive fishing grounds of the country, a major change in composition of catch took place in the 1980s, with coastal pelagics replacing the demersals as the most abundant catch, and invertebrate species shifting from shrimp-dominant to squid-dominant, reflecting a shift in the ecosystem due to fishing pressure and a shift away from trawling to purse seine and ring net. These changes indicate that the Visayan Sea was exhibiting signs of overexploitation as far back as the 1980s (Green *et al.,* 2004).

Landing sites

Table 3: Fish ports being managed by the Philippine Fisheries Development Authority (PFDA) and their landings in 2003

Fishing port	Location	**Landings (tonnes)**
Navotas Fish Port Complex	Navotas, Metro Manila	185 835
Lucena Fish Port Complex	Lucena City	16 202
Camaligan Fish Port Complex	Camaligan, Camarines Sur	237
Iloilo Fish Port Complex	Iloilo City	28 038
Zamboanga Fish Port Complex	Zamboanga City	20 095
Davao Fish Port Complex	Davao City	6 157
General Santos Fish Port Complex	General Santos City	61 516
Sual Fish Port Complex	Sual, Pangasinan	676

Other fish ports are either jointly managed by the PFDA and the local government units (LGUs) or solely managed by LGUs. The biggest fish port (Navotas Fish Port Complex) had 16.74% of total landings from commercial fisheries in 2003.

Fishing production means

Philippine fishing boats are classified into municipal (≤3 GRT) and commercial (>3 GRT). Municipal fishing boats may further be classified into non-motorized and motorized types. Commercial fishing boats have three categories: small (>3–20 GRT), medium (20–150 GRT) and large (>150 GRT) (Aguilar, 2004).

A majority of boats are double-outrigger craft, consisting of a narrow main hull with two attached bamboo outriggers, commonly called *banca*.

The non-motorized municipal fishing boats use either paddle or sail as means of propulsion, and carry from one to several people, depending on the fishing gear used. During favourable monsoon weather, popular fishing gear used by sail-powered craft include trolling, handlines and gillnets. It is also usual for fishers to sail to *payao* (bamboo rafts, a fish aggregating device), moor their boats to these and fish using handlines.

The motorized municipal fishing boats are equipped with 3–6 hp gasoline or diesel engines. Gillnets, handlines, traps, small ringnets and other small gear are usually operated from these boats.

The small commercial fishing boats are outrigger boats ≥3 GRT and use trawls, skim nets, ringnets, liftnets and Danish seines. Currently, many still operate within municipal waters, depending on the municipality.

Medium commercial boats are mostly outrigger boats, which include the *basnig* or liftnet boats; the large Danish seiners or *super hulbot*; medium trawlers; and old monohulls fitted with outriggers. The monohulls that exist (both wooden and steel) are mostly engaged in ringnet or baby purse seine operations. The operations of fishing craft in this category are those most affected by the 15-km ban on commercial fishing (in terms of number affected and increased cost of operations).

Large commercial fishing boats mainly engage in purse seining, with most catchers targeting tuna or seasonal small pelagic fishes such as mackerels and roundscad. The mode of operation is mostly fleet-type, where a carrier boat is dispatched to several catcher boats located in the fishing grounds. The carrier boat loads fish from the catchers and brings it to a port or processing facility. Large commercial vessels travel all over the archipelago to fish.

A variety of fishing gear is used by commercial and municipal fisheries to exploit the small pelagic resources. Commercial fisheries use mostly purse seines (61.6%), ringnets (15.7%) and bag nets (12.4%). The small pelagic catch of the municipal fisheries is taken using gillnets (45.5%), hook-and-line (15.3%), ringnet (11.5%), beach seine (8.3%), purse seine (3.7%), fish corral (2.9%) and bag net (2.9%), based on 1995 statistics (Zaragosa *et al.,* 2004a).

A variety of fishing gear is used to catch tuna. The purse seines, ringnets and handlines usually account for over 80% of the annual tuna catch, with nearly half the commercial tuna catch in 1995 taken by purse seine. The municipal fisheries employ a variety (over 20 types) of fishing gear for tuna. In 1995, two-thirds of the municipal fisheries tuna catch came from line gear (Zaragosa *et al.,* 2004b).

The *payao* fish aggregating device (FAD) has been singled out as the most important factor triggering the phenomenal development of the tuna fishing industry. The effectiveness and efficiency of *payao* in attracting tuna (especially yellowfin and skipjack) greatly reduced the time spent in searching and fishing for commercial volumes. The extensive use of *payao*, however, may be rapidly removing undersized juveniles from the stocks and altering migration and feeding patterns of tunas in Philippine waters (Zaragosa *et al.,* 2004b).

Bottom trawl was the major fishing gear used for demersal fishes from the late 1940s until the mid-1980s. However, due to increases in fuel prices and depletion of demersal resources, trawl operations dwindled and have been replaced by more fuel-efficient Danish seines (Armada, 2004).

There is a great variety of fishing gear employed in municipal fisheries. In Central Visayas municipal fisheries, for instance, there are about 50 generic types of fishing gear, with about 200 specific variations (Green *et al.,* 2004).

According to the 2002 Census of Fisheries (NSO, 2005) the most common fishing gear used by municipal fishing operators in 2002 was hook-and-line, with 9.45 million sets recorded. Other types of gear, including cast nets, cover pots and crab hook, numbered 4.51 million, with 1.19 million gillnets.

Municipal fishing operators use boats of 3 GRT or less, and rafts. The number of such boats doubled between 1980 (388 200) and 2002 (777 700). Likewise, rafts doubled over the same period, from 13 600 in 1980 to 32 500 in 2002.

In 2002, hook-and-line gear, at 54 900 sets, was also the most common fishing gear used by commercial fishing operators. Second was a group of other types of fishing gear (50 600 sets), followed by gillnets

(22 700 nets).

The number of fishing vessels licensed in the commercial sector tripled in the period 1980 to 2002, from 3 400 to 10 900.

There is evidence of overcapacity in the commercial fishing fleet. For example, in 1988, the total tonnage in the sector was 150 260, but that had increased to 216 090 GRT in 1994 and to 270 281 GRT by 2000. In 1997, the commercial fishing effort in the Philippines, at 2.09 million hp, was estimated to be 192% of the optimum level of 1.14 million hp. The commercial fisheries sector has continued to receive both direct and indirect subsidies, tax breaks and even a rebate on fuel oil tax through the Department of Finance, which are intended to improve their capacity to travel farther offshore and explore underdeveloped fisheries, especially in the Philippine EEZ. Imports of boats over 40 GRT, sonar, fish finders and other fishing equipment are exempt from taxes and other import duties. The owner of a 30 GRT commercial fishing boat pays a minimal "license fee" of P 1 000–3 000 every three years to the government to have access to millions of pesos worth of fish in one of the world's most productive fishing grounds (Green *et al.,* 2003).

Analyses of CPUE in six coastal provinces in the Philippines for the common hook-and-line type of fishing reveal alarming results: fish catch is in some cases less than 5% of the levels of only a few decades ago (Green *et al.,* 2003).

Research conducted by the WorldFish Center in 1998–2001 found that, overall, "the level of fishing in the grossly modified stock [in the Philippines] is 30% higher than it should be". This excess fishing is resulting in economic costs conservatively estimated at about P 6.25 billion (US$ 125 million) per year (Green *et al.,* 2003).

Fishers, getting little or no catch, and believing they have little choice left, use illegal and destructive fishing gear to improve their catch. In the Philippines, illegal and destructive fishing practices include compressor fishing, spear fishing and blast fishing.

Main resources

The principal stocks exploited in the Philippines are small pelagics, tuna and other large pelagic fishes, demersal fishes and invertebrates.

Small pelagic (surface- and mid-water-dwelling) fishes as a group comprise predominantly roundscads (*Decapterus* spp., Carangidae), anchovies (*Stolephorus* spp., Engraulidae), sardines (*Sardinella* spp., Clupeidae) and mackerels (*Rastrelliger* spp., Scombridae). Also included in this group are the round herrings (Clupeidae), flying fishes (Exocoetidae) and halfbeaks (Hemiramphidae).

The small pelagic fisheries comprise an important segment of the country's fisheries industry. Small pelagics are considered the main source of inexpensive animal protein for lower-income groups in the Philippines.

The large pelagic fishes consist of tunas and tuna-like species, such as billfish, swordfish and marlin. The tuna fisheries became the largest and most valuable fisheries in the Philippines during the mid-1970s, when *payao* was introduced. The country became the number one producer of tunas in Southeast Asia in the 1980s. When the catch rate of tunas in the Philippines started declining in the late 1980s, Filipino fishing companies started to fish in international waters. This made the Philippines one of the distant-water fishing nations in the Pacific, in addition to the United States of America, Japan, Republic of Korea, Taiwan (Province of China) and China (Zaragosa *et al.*, 2004b).

Twenty-one species of tuna have been recorded in Philippine waters but only six are caught in commercial quantity and form the basis of the tuna fishing industry. Of the six species, only four form the bulk of catches and are listed in Philippine fisheries catch statistics, namely yellowfin (*Thunnus albacares*), skipjack (*Katsuwonus pelamis*), eastern little tuna or *kawakawa* (*Euthynnus affinis*) and frigate tuna (*Auxis thazard*).

The oceanic large pelagics, such as marlin, swordfish and sailfish, are not fully exploited at present (Barut, Santos and Garces, 2004)

Demersal (bottom-dwelling) fishes include slipmouths, spadefishes, groupers and catfishes. In 2003, slipmouth was the only demersal species included in the top ten species caught, from both municipal and commercial fisheries. The state of demersal stocks in the Philippines is clearly shown by the decline in trawlable biomass during the past five decades. The need to manage exploitation of the demersal fishery resources was already recognized as early as the 1960s, and echoed for several decades afterwards. Since the major cause of overextraction is the high fishing effort, its reduction would have been the logical course of action. In its current state, it will take a long time to re-build the stock of demersal species that have been practically eliminated by uncontrolled fishing (Armada, 2004).

A so-called live reef food fish trade (LRFFT) in the Philippines developed in response to a demand for live food fish, initially from Hong Kong and Taiwan (Province of China), and later on from mainland China. Live food fish is conventionally caught using hook-and-line fishing gear. However, LRFFT has been closely associated with the problem of cyanide fishing, which was first detected in the aquarium trade. In 1999, there were at least 24 species of marine vertebrates and invertebrates being harvested for LRFFT in the Philippines. The leopard coralgrouper (*Plectropomus leopardus*) was dominant in the catch.

Among the invertebrates, crabs are one of the most important invertebrate resources taken, and contribute significantly to global food supply. There are 51 species of swimming crabs reported in the country, but only about 7 are considered marketable. The blue crab (*Portunus pelagicus*) is the main species exploited, comprising over 90% of crab landings. Crab fisheries in the country have shown a boom and bust history (Ingles, 2004a).

Other important invertebrates are squid and *Acetes* shrimp.

The marine aquarium or ornamental fish trade in the country involves harvesting many targeted coral reef fish and invertebrate species that are valued for their aesthetic appeal. The prospects of better resource management in this subsector are considerably brighter than those for many other fisheries. There is now a relatively high level of environmental awareness in the ornamental trade market (Ochavillo *et al.*, 2004).

The deep-sea fisheries resources in the country are in many cases uncharted and unknown, and are believed to be relatively underexploited. The only deep-water fisheries resource that has a documented history of large-scale exploitation is the dogfish shark (family Squalidae). The dogfish shark fishery is another case of boom and bust. There is an urgent need to manage the deep-water fisheries resources because they are the country′s very last marine frontier (Flores, 2004).

There are some specialized fisheries in the Philippines targeting postlarvae or early juveniles of certain fish species that are very marketable since they are considered delicacies, including goby fry; postlarvae or early juveniles of anchovies of the genus *Stolephorus*; and early juveniles of rabbitfish (Siganidae). Others are targeted as seed stock for aquaculture production (e.g. milkfish (*Chanos chanos*) fry). The by-catch of these fry collection activities is usually abandoned on the shore (Hermes, 2004).

The Philippines is located in the most biologically diverse marine area in the world in terms of coral and tropical reef diversity. Aliño *et al.* (2004) gave an integrative assessment of the critical fisheries habitats in the country, such as coral reefs, seagrasses and mangroves. Alava and Cantos (2004) reviewed the status of vulnerable or endangered marine species in the country, such as sea turtles, dugongs, cetaceans, whale sharks, mantas and seahorses. The results from these assessments reflect the combined effects of intense exploitation and habitat degradation on these resources.

Management applied to the main fisheries

In the Philippines, critical issues affecting fisheries (Green *et al.*, 2003) include:

- open access;
- overfishing and excessive fishing pressure;
- lack of management;
- inappropriate exploitation patterns;
- post-harvest losses;
- small- and large-scale fisheries conflicts;
- habitat degradation;
- lack of research and information; and
- inadequacy of technical and human resource capabilities, particularly among managers and the agencies concerned in analysing fisheries

In February 1998, the Philippine Fisheries Code (Republic Act 8550) was signed into law. The Code consolidates all laws pertaining to the fisheries sector and repeals or modifies previous statutes that are inconsistent with it. It declares as a state policy that achieving food security is the main consideration in the development, management, and conservation of fisheries and aquatic resources. Its provisions reflect a strong adherence to long-term sustainability, fully recognizing its multiple dimensions and complex elements in the fisheries context through several prohibitive and regulatory measures seeking to balance protection with reasonable and responsible use (Ingles, 2004b).

Earlier, in 1991, the Local Government Code (LGC) devolved authority over the management of municipal waters to Local Government Units (LGUs) within the parameters set by national fisheries legislation and policies.

The establishment of Fisheries and Aquatic Resources Management Councils (FARMCs) at the national, provincial and municipal levels has established a legal commitment by the government to involve stakeholders in the development and management of the fisheries industry.

The Government of the Philippines' most significant policy shift in the past decade has been the introduction of joint management mechanisms of the fisheries sector, involving both the central government and the municipalities, and the government and the fishers (through the FARMCs). The Philippine Community-Based Coastal Resource Management (CB-CRM) programme has been very successful at awareness building, with notable pockets of success in implementation. The Philippines has been a leader in devolution of authority for coastal resource management through the LGC and has thus become an example for such actions. However, the challenges of managing fisheries resources in a sustainable manner still remain in most areas.

Silvestre and Pauly (2004) outlined seven main categories of management intervention that the authors believed to be appropriate, given the status of coastal fisheries in the developing countries of Asia. These management interventions are:

1) Limited entry and effort reduction.

2) Gear, area and temporal restrictions.

3) Improvement of marketing and post-harvest facilities.

4) Enhancement of awareness and participation of stakeholders.

5) Reduction of environmental impacts.

6) Institutional strengthening and upgrading.

7) Enhancement of research and information.

Some of the fisheries management measures in the Philippines are considered below, using the above categorizations.

Limited entry and effort reduction

Licensing in the Philippines is still generally viewed as a statistical and revenue generating exercise rather than as an effective management tool to limit entry and control fishing effort. The frameworks for municipal and commercial fisheries registration and licensing have now been prepared and efforts have already commenced to put them in place.

Gear, area and temporal restrictions

Measures influencing composition of catches in terms of species and size, and to a certain extent the sex and maturity stage, include: (1) technological controls or limitations, e.g. gear restrictions, including mesh regulations, hook size control and trawl bans; (2) spatial restrictions, e.g. marine sanctuaries and area closures; and (3) temporal restrictions, e.g. seasonal closures.

Table 4. Examples of regulatory instruments influencing selectivity of fishing operations in the Philippines

Regulatory instrument	Legislation	Specifications
Technical controls		
mesh regulation	§ 89. Philippine Fisheries Code of 1998	Prohibition on the use of nets with mesh smaller than that which may be fixed by the Department of Agriculture (DA).
gear ban	§ 90. Philippine Fisheries Code of 1998	Prohibition of fishing in municipal waters and in all bays using "active" fishing gear.
	§ 92. Philippine Fisheries Code of 1998	Prohibition on the use of *muro-ami*, other methods and gear destructive to coral reefs and other marine habitats.
	§ 93. Philippine Fisheries Code of 1998	Prohibition on the use of *superlights* in fishing.
Spatial restrictions		
area closure	§ 95. Philippine Fisheries Code of 1998	Prohibition of fishing in overfished area.
	§ 96. Philippine Fisheries Code of 1998	Prohibition of fishing in areas declared by the DA as reserves, refuge and sanctuaries.
Temporal restrictions	§ 95. Philippine Fisheries Code of 1998	Prohibition of fishing during closed season.
Other	§ 98. Philippine Fisheries Code of 1998	Prohibition on the capture of *sabalo* (full-grown milkfish) and other breeders and spawners.

Improvement of marketing and post-harvest facilities

Post-harvest support facilities (i.e. access to salt, ice and cold storage) are lacking in strategic locations in many areas. There is a need for more private-sector participation in providing such facilities.

Enhancement of awareness and participation of stakeholders

There can be considered to be adequate legislation on fisherfolk empowerment in the country. There are some pockets of success in sustainable coastal resource management (e.g. Apo Island, Cebu, and San Vicente Bay, Palawan), which should be replicated throughout the country.

Reduction of environmental impacts

Laws on the protection of the marine environment are in place and there is growing environmental awareness in the country. However, much still needs to be done.

Institutional strengthening and upgrading

Discussed below.

Enhancement of research and information

Discussed below.

Fishermen communities

Municipal fisherfolk are considered the "poorest among the poor". In 2000, households whose heads were fishers had a significantly higher poverty incidence than households in general. Their daily income was roughly the retail value of 2 kg of fish. Low incomes can be attributed to declining fish catch, estimated to be about 2 kg per day, down from the 20 kg per day that was the average catch during the 1970s.

Households of fishers and those in the fishing industry also had heads with relatively lower education levels compared with households in general. Fishers' households had lower access rates to basic necessities like safe water, sanitary toilets and electricity than other households, and were more likely to live in makeshift houses or were squatting. Also, the average size of households of fishers and of those in the fishing industry was greater than the national average (Israel, 2004).

According to the 2002 Census of Fisheries, there were 1.8 million municipal and commercial fishing operators. This was a three-fold increase from the 584 000 fishing operators recorded in 1980. Municipal fishing dominated the fishing industry in terms of numbers of operators. In 2002, 1.78 million operators (99.6%) were engaged in municipal fishing compared with only 7 800 in commercial fishing operations.

The vast majority of municipal fishing operations (1.752 million or 98.4%) were individual operations. At 1.7 million, male operators accounted for 94.5% of the municipal fishing operators, with a median age of 41 years.

In 2002, out of 7 200 commercial fishing operations, 7 190 were operated by individuals, and almost all (98.6%) were males, with a median age of 39 years.

Women have a role in fisheries and helping in the livelihood of the family (Siason, 2004). Their roles include: (1) fish marketing or vending, (2) fish processing, (3) fry gathering, (4) gear preparation, (5) fishing, (6) net mending, and (7) fishing boat ownership and operation.

Inland Subsector

Catch profile

Government statistics combine production from municipal marine fisheries and inland fisheries. Based on the statistics for the period 2001–2003, inland fisheries contribute an average of 13.3% to the aggregate (marine and inland). In 2003, inland fisheries produced a reported 133 292 t of fish. In spite of its low quantity, inland fisheries provides subsistence livelihood for thousands of marginal fishermen.

Inland fisheries production fell from 229 973 t in 1992 to 136 347 t in 2001. The reduction can be attributed to overexploitation and increasing pollution (Juliano, 1996).

The bulk of production from inland fisheries consists of molluscs (67%), finfish (30%) and crustaceans (3%). Nearly one-third of the finfish catch (31.2%) consists of tilapia species. Other major species are carps, mudfish, goby, silver perch, catfish, freshwater sardines, milkfish, mullet, climbing perch and gourami (BAS, 2005).

Fishing grounds

The bulk of the catch comes from the major lakes in the area – Laguna de Bay (90 000 ha) in Laguna and Rizal provinces; Taal Lake (24 400 ha) in Batangas province; and Lake Naujan (11 000 ha) in Mindoro Oriental province.

The country has almost 500 000 ha of inland bodies of water, comprising 246 000 ha of swamplands, 200 000 ha of lakes, 31 000 ha of rivers and 19 000 ha of reservoirs (BAS, 2005).

Fishing production means

The fishing methods used in inland waters are much simpler than those used in coastal waters (Juliano, 1999). Gear includes snare rake, cover pot, fish trap, lift net, fish trap, pole-and-line, push net, skimming net, cover net, gillnet, dredge, beach seine, cast net and purse seine.

Main resources

Molluscs (e.g. snails) and finfish (e.g. tilapia) are the main inland fisheries resources.

The Philippines is blessed with many fish species that are a natural resource heritage and unique to the country. Foremost of these species are the small freshwater gobies. The smallest fish in the world, *Pandaka pygmaea* or pygmy goby, was found in an estuary, the Dagat-dagatan Lagoon in Navotas, Rizal, which has subsequently been converted and developed into a housing project. The pygmy goby is believed to be extinct.

In Lake Buhi is found the "smallest commercial fish in the world", the *sinarapan* (*Mistichthys luzonensis*). This species is now threatened with extinction. Another small goby, *Mirogobius lacustris*, is found in Laguna de Bay, but its population is on the brink of extirpation (Juliano, 1999).

Inland water bodies of the Philippines suffer from an inherent paucity of ichthyodiversity due to the geological origin and isolation of the archipelago. A number of fish species have been introduced, but it is not at all clear that all of these introductions were appropriate (Bernacsek, 1996).

Management applied to main fisheries

The following are some of the needs in inland water resources management that require the attention of inland water resources managers (Juliano, 1999):

- to prolong the life span of these waters by minimizing heavy siltation from deforested catchments;
- to effectively allow multiple use of inland waters and their catchments with minimum conflicts;
- to prevent further deterioration of inland water environments and water quality resulting from activities with adverse impacts;
- to sustain the maximum sustainable yield possible from freshwater natural resources, including fisheries;
- to consider an inland water body as an ecosystem to be managed under one management umbrella;
- to include the participation of stakeholders in government planning and management; and
- to improve the socio-economic condition of the rural-poor stakeholders of inland waters.

Addressing these needs is not going to be easy, especially in inland waters surrounded by heavily populated areas (urban centres) and where many uses of the inland water body and its basin already compete and conflict with each other.

Laguna de Bay, the largest lake in the country, is the most stressed lake in terms of pressure from large local populations and rapid industrialization. Its problems are probably the most complicated among the inland waters and will be the hardest to resolve in order to provide maximum sustainable yields from resources while minimizing conflicts among the complex, multiple uses of the lake.

Fishermen communities

Socio-economic data on inland fisheries communities are limited in the literature. More data can be found on small-scale fisherfolk in coastal communities. However, it can be assumed that the socio-economics of coastal fishing communities will not differ significantly from those of inland fishing communities (Juliano, 1999).

Aquaculture Subsector

Production profile

In 2003, aquaculture produced 17.70% of total fish production. Marine fisheries produced 77.23% and inland fisheries produced 5.07%.

Seaweed (988 889 t), milkfish (202 973 t), tilapia (109 373 t) and jumbo tiger shrimp (34 997 t) were the main aquaculture species in 2003. Aquaculture production came from seaweed culture (67.99%), brackishwater fish ponds (16.84%), freshwater fish ponds (4.95%), freshwater fish cages (3.63%) and other (4.12%).

Practices and systems of culture

The farming methods for the seaweed *Eucheuma* take two forms: farming in shallow waters and farming in deep waters. The stake or bottom method is used in shallow waters, while monoline, raft and spider web methods are employed in deep waters.

Most of the milkfish production come from brackishwater fish ponds using various methods according to the intensity, namely extensive, shallow-water, straight-run (traditional and improved); modified extensive (deep water, plankton; multi-size stocking; modular or progression); semi-intensive; and intensive.

Most tilapia production comes from freshwater ponds and cages.

Cultured species

The major aquaculture species in the Philippines are:

- seaweed (mainly *Kappaphycus* spp. and *Eucheuma* spp.);
- milkfish (*Chanos chanos*);
- tilapia (mainly Nile tilapia, *Oreochromis niloticus*);
- shrimp (mainly jumbo tiger shrimp, *Penaeus monodon*);
- carp (mainly bighead carp, *Aristichthys nobilis*);
- oyster (slipper-shaped oyster, *Crassostrea iredalei*); and
- mussel (green mussel, *Perna viridis*).

Management

Aquaculture regulations are covered in the Philippine Fisheries Code of 1998 and the Local Government Code of 1991. Some of the Fisheries Administrative Orders so far issued by the Bureau of Fisheries and Aquatic Resources (BFAR) since 1998 concern the granting of Fishpond Lease Agreements for public lands; importation and exportation of aquatic organisms; and food safety. The Fisheries Code and Local Government Code transferred government supervision and the licensing for the construction and operation of fish pens, fish cages, fish traps and other structures for aquaculture to LGUs.

POST-HARVEST USE

Fish Utilization

Espejo-Hermes (2004) provided an overview of the trends in and status of fish processing technology in the Philippines.

Fish is consumed as fresh, fermented, dried, smoked or canned. Data on the disposition of catch in the Philippines are inadequate. Around 70% of the total catch is consumed fresh or chilled, while 30% is processed into cured, canned, frozen products or disposed of live. The bulk of cured fish and fishery products are consumed locally, while only a small quantity is exported as ethnic products. Canned products, particularly tuna, are consumed locally in small quantities compared with the export volume, and most of the frozen products are for export.

There is a growing trend towards increased mechanization in operations in the fish processing industry, brought about by the need to reduce cost and to manufacture products of consistent quality. Most of the processing plants manufacture traditional products, such as dried and smoked fish for both foreign and domestic markets. Several plants are engaged in processing of frozen and canned products, mainly tuna for export purposes. Some manufacture miscellaneous fishery items, including value-added products.

Old ways of handling the catch are still current in many fishing communities. However, in areas where the demand for good quality fresh fish, particularly for export, is high, improved methods of handling (proper icing and use of insulated containers) are widely practiced. In general, aquaculture products are better handled than those caught in municipal fisheries.

There is a growing demand for modern freezing equipment in processing plants that cater to the export market. Contact plate freezers are commonly used for processing shrimps, while air blast and brine freezers are usually employed for tuna. The main frozen products for export are tuna loins, cephalopods and shrimps.

The majority of the canneries in the country meet international standards in terms of product quality, styles of pack and packaging. New equipment is being used in production lines to improve canned products. Variations for canned fish, particularly tuna, that suit the local taste have been made to attract local consumers and to maximize use. By-products from the canning industry find their way into flavouring, pet food and the fishmeal industry.

Value-added products in the form of fillets, comminuted and surimi-based products and ready-to-heat main fish dishes are growing in demand. Locally, comminuted or minced products, such as fish balls, fish sausages, squid balls and fish nuggets, are becoming common in many supermarkets. The industry absorbs by-catch and market surpluses, including farmed species. To date, a shift to the use of farmed species, such as milkfish and tilapia, is occurring due to scarcity of raw materials from capture fisheries. A number of processors of de-boned milkfish are also converting their by-products to value-added products, such as fish rolls and dumplings, to minimize waste. In general, the value-added-product industry needs to upgrade its technology and quality standards, including in-plant hygiene and sanitation.

Processing into traditional products, such as salted, dried, smoked and fermented fish, is still widely practiced. These products are mainly manufactured where there is a guaranteed supply of raw material. The processors are generally small-scale, family establishments that have limited capital and do not receive assistance from government agencies and financing institutions. The processing methods they employ vary considerably, resulting in inconsistent quality and limited shelf-life of finished products. There are very few local processing plants that make use of modern technology (mechanized smokehouses and dryers) and have made progress in improving quality standards. Only those that export their products have improved processing practices, equipment, hygiene and sanitation in the plants.

The primary problem in the industry is shortage of raw material. Other problems of the fish processing industry include poor quality of raw material; inconsistent quality of products; lack of appropriate safety standards for traditional products (e.g. inappropriate use of additives); insufficient capital to improve the enterprise; and lack of appropriate infrastructure (e.g. chilling or cold storage facilities) for product storage.

The extent of losses in the post-harvest phase of fisheries is difficult to quantify. Locally, there is an estimated loss of 25–30% of the total catch due to improper handling.

Fish Markets

The Philippines is an exporter as well as importer of fish and fishery products. In 2003, the balance of trade was positive in terms of quantity and value.

In 2003, total exports of fish and fishery products amounted to 202 016 t, valued at over US$ 525.4 million. The products consisted mainly of fresh and processed fish, crustaceans and molluscs. Leading fishery products were tuna, shrimp and seaweed. The major export destinations of tuna were Japan and the United States of America. The major export destinations of shrimps were Japan, Spain and the United States of America. The major export destinations for dried seaweed were China, France, Republic of Korea and the United States of America, while the major export destinations for carageenan were Denmark, France and the United States of America.

For the past several years, the Philippines has been importing large quantities of pelagic species such as tuna (mainly from Indonesia). Large quantities of fishmeal are also imported (mostly from Peru and the United States of America) for feed preparations.

FISHERIES SECTOR PERFORMANCE

Economic Role of Fisheries in the National Economy

In 2003, the fisheries sector had a total value of US$ 1 832 million, accounting for 2.2% of GDP. The Philippines ranked 11th among the top fish producing countries in the world for 2001, accounting for 2.2% of global production. The Philippines is the world’s largest producer of carageenophyte seaweed.

However, globally in the last 20 years, the Philippines’ ranking in world aquaculture production steadily slid from 4th place in 1985 to 12th at present. From 5% of global farmed fish supply, the Philippines now contributes only a little over 1% of world production.

Demand

Fish demand is robust in the Philippines, with three main uses.

- Domestic human consumption is by far the largest single use (2 335 474 t in 2003). The most important species consumed are roundscad, Indian sardines, frigate tuna, big-eyed scad, fimbriated sardines and anchovies, which originate from marine waters and are augmented by imports and milkfish and tilapia from aquaculture and inland fisheries.
- Fish exports are the second largest use of supply (155 129 t in 2003). The main exported products are tuna, which originate from commercial and municipal marine fisheries, and shrimp from aquaculture.
- The smallest portion of demand (332 268 in 2003) is for non-food uses. This consists mainly of imported fishmeal for animal feeds, and snails caught in inland waters for duck feed.

The supply divides as about 83% for human consumption and 17% for exports and non-food uses.

Supply

Fish contributes around 22.4% of the total protein intake of the average Filipino. It is the main source of animal protein in the diet, contributing 56% to animal protein intake (Espejo-Hermes, 2004). The Philippine per capita fish consumption was 28.8 kg in 2003.

Food Security

Bernacsek (1996), writing on the role of fisheries in food security in the Philippines, stated that:

"There are clear indications that fisheries quantity production is approaching real limits to further growth. Government of the Philippines fisheries policy should re-orient and re-focus to emphasize growth in product value added and increase in profitability, rather than the historical focus on quantity output. A new development climate needs to be created which will facilitate active entrepreneurial exploration of new markets for fish products and new export opportunities. Parallel to this policy shift, sustainability of domestic production needs to be achieved through effective management in order for producers to be able to provide a secure source of raw materials for processors and marketers."

Trade

The foreign trade performance of the sector for 2003 recorded a trade surplus of US$ 445 million. Total fishery exports showed a 3.6% growth in value terms compared with the previous year. Combined, the earnings of the top three fishery exports (tuna, shrimp and seaweed) contributed US$ 363.2 million (69.3%) to total fishery products exports of US$ 524.3 million.

Significant changes in international trade policy, quality and safety criteria have put pressure on the fish processing industry to improve the products that are being manufactured. Many countries, including the Philippines, have adopted the Hazard Analysis Critical Control Point (HACCP) system for food safety management. The Philippines continues to face challenges regarding access of its fishery products in international markets.

Employment

According to the 2002 Census of Fisheries (NSO, 2005), there were 2 009 300 fishing operators and aquafarm operators. Municipal fishing operators, commercial fishing operators and aquafarm operators constituted 88.6%, 0.39% and 11.0%, respectively. Estimates of the employment generated from ancillary industries are not available, but it is accepted that they provide jobs for many people.

Rural Development

Various socio-economic data indicate that the ability of the sea to provide a cheap source of food and income for the Filipino masses has been severely compromised. The Philippines – one of the world's 40 largest fish-producing nations – is also among the 10 low-income, food-deficit countries of the world (Green *et al.,* 2003).

With regard to aquaculture, its full potential for rural development has yet to be realized.

FISHERIES DEVELOPMENT SECTOR

Constraints

In their 2004 paper, Luna *et al.* identified the following issues confronting Philippine marine fisheries today:

- depleted fishery resources;
- degraded coastal environment and critical fisheries habitats;
- low catches and incomes, and dissipated resource rents;
- physical losses and reduced value of catches due to improper post-harvest practices and inefficient marketing;
- inequitable distribution of benefits from resource use;
- intersectoral and intrasectoral conflicts;
- poverty among small-scale fishers; and
- inadequate systems and structures for fisheries management.

Open access is one of the main interconnections among all the issues identified.

Development Prospects and Strategies

Luna *et al.* (2004) recommended six critical actions to reverse the decline in Philippine marine fisheries:

- reduction and rationalization of fishing effort;
- protection, rehabilitation and enhancement of coastal habitats;
- improved utilization of harvests;
- enhanced local stewardship and management of resources;
- supplemental and alternative livelihoods for fishers; and
- capacity building and institutional strengthening.

On the proposed re-structuring of the aquaculture subsector into an efficient and sustainable agribusiness, Bernacsek (1996) recommended that the Government of the Philippines should withdraw from the fish pond ownership business. All ponds should be privatized, with existing landholders having first right of option to purchase at market prices (minus depreciated value of investment).

Research

The Philippine Fisheries Code of 1998 provides for the creation of a National Fisheries Research and Development Institute (NFRDI), to serve as the primary research arm of BFAR. The major project of the interim NFRDI is the National Stock Assessment Project, which has been designed to institutionalize stock assessment so that continuous and reliable time series data will be available for the development of sound fisheries management strategies.

State universities, such as the University of the Philippines in the Visayas (UPV) and the Marine Science Institute (MSI) of the University of the Philippines, Diliman, have active research programmes on marine science and fisheries.

For aquaculture, the presence of the Southeast Asian Fisheries Development Center Aquaculture Department (SEAFDEC AQD) in the Philippines has resulted in the filling of many gaps in Philippine aquaculture research. Through a system of consultation and discussion with the industry and the local aquaculture R&D sector, SEAFDEC AQD prioritizes its research and avoids duplication of work with local institutions. SEAFDEC AQD research outputs are published mostly in international refereed journals.

SEAFDEC AQD has the following ongoing programmes: (1) Broodstock and Seed Quality Improvement; (2) Sustainable Aquaculture Technologies; (3) Collaborative R&D Programme with Philippine's DA-BFAR; (4) SEAFDEC-JIRCAS Collaborative Programme; (5) Promotion of Mangrove-Friendly Aquaculture in Southeast Asia; (6) Fish Diseases Diagnostic Methodologies for Aquaculture; (7) Aquaculture for Rural Development; and (8) Supply of Good Quality Seed.

Fisheries R&D is being coordinated (and funded to some extent) by the Philippine Council for Aquatic and Marine Research and Development Council under the Department of Science and Technology and the Bureau of Agricultural Research under the Department of Agriculture.

The other state universities engaged in aquaculture R&D include the Central Luzon State University (CLSU) and Mindanao State University (MSU).

BFAR has several aquaculture centres and stations throughout the country, which provide aquaculture extension services.

Some private companies (e.g. feed companies) also engage in aquaculture research and extension.

The Philippine fisheries industry is currently preparing a Comprehensive National Fisheries Industry Development Plan (CNFIDP), and among the issues that have been raised are the inadequate programmes of R&D and Extension, and lack of commercial impact. The causes include: (1) limited government funding; (2) limited investment by the private sector; (3) lack of awareness of commercial realities among too many researchers and extension workers; and (4) the blinkered focus of many researchers – too focused on basic research and too publication-oriented. This situation results in: (1) poor adoption of new technologies by industry; (2) loss of competitiveness with other animal farming industries and in the export market; and (3) wastage of valuable R&D and Extension resources. The proposed solution includes: (1) focusing government programmes of R&D and Extension towards immediate needs of the aquaculture sector; and (2) increasing R&D and Extension investments from the private sector.

Education

There are several state universities and colleges engaged in fisheries education in the country. However, only a few (e.g. CLSU, UPV and MSU) have been recognized to have significantly contributed to fisheries education and R&D in the country.

All educational institutions in fisheries are supported by the state. There are more than 40 state colleges and schools of fisheries under the aegis of the Commission on Higher Education (CHED), with seven under the Technical Education and Skills Development Authority (TESDA) (Juliano, 2004).

Foreign Aid

Foreign assistance in the form of loans and grants shifted more to conservation and resource management after the late 1980s.

An ongoing major fisheries project, Fisheries Improved for Sustainable Harvest (FISH) Project, builds upon the foundation and lessons learned from the USAID-funded Coastal Resource Management Project (CRMP) and other projects to achieve the next crucial benchmark in managing fisheries and coastal resources in the Philippines. This benchmark calls for integrated fisheries management driven by informed, disciplined and cooperative stakeholders at national and local levels of engagement.

The FISH Project is a seven-year (2003–2010) technical assistance project funded by USAID and implemented in partnership with BFAR, other national government agencies, LGUs and non-governmental (NGO) and other assisting organizations. The FISH Project activities focus on four target implementation areas: Calamianes Islands (Palawan); Danajon Bank (Bohol, Southern Leyte, Leyte, Cebu); Surigao del Sur; and Tawi-tawi.

FISH is expected to result in a 10% increase in fish stocks by 2010 in the four target implementation areas. To achieve this, national and local activities will be implemented to build capacity, improve the national policy framework and develop an informed constituency for fisheries management.

The Philippine fisheries sector continues to need external assistance, particularly for capacity building.

FISHERIES SECTOR INSTITUTIONS

Fisheries management in the Philippines rests jointly on two authorities: BFAR, that has regional offices in each of the 16 Philippine regions, and the LGUs that operate under the Local Government Code of 1991.

Among the functions of BFAR under the Fisheries Code is the formulation and enforcement of rules and regulations governing the conservation and management of fishery resources, except in municipal waters, and the legal instruments issued are called Fisheries Administrative Orders (FAOs).

National legislation is further supported and amplified through the issuance of Provincial and Municipal Fisheries Ordinance (under the Local Government Code) for more local management rules and regulations within their areas of jurisdiction, which is within 15 km from the coastline for municipalities. Provinces do not have responsibility for the management of a formal physical area of the sea. Their role is the coordination of activities of the municipalities within the province. Through this coordinating function they become involved in the fisheries management process to assist BFAR Regional Offices maintain consistency in policies and implementation of management plans.

Other agencies directly involved or influencing fisheries management include:

- Department of Environment and Natural Resources (DENR) through its coastal environment programmes.
- protection, rehabilitation and enhancement of coastal habitats;
- National Fisheries Research and Development Institute (NFRDI), the legally mandated primary research arm of BFAR.
- Philippine Council for Aquatic and Marine Research and Development (PCAMRD) under the Department of Science and Technology (DOST), for fisheries research coordination.

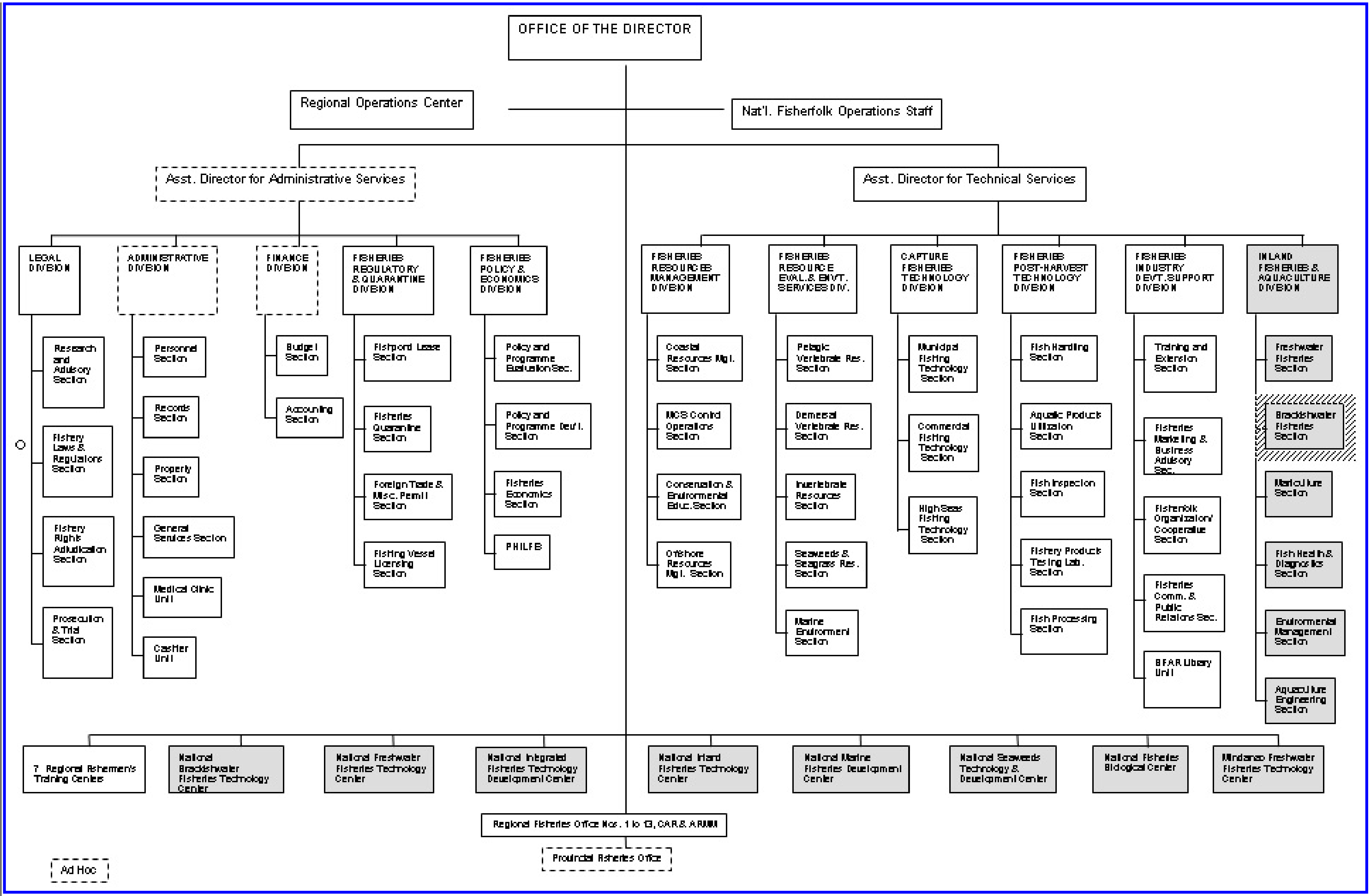
- Bureau of Agricultural Research, for fisheries research coordination.
- Department of Agriculture, of which BFAR is part, through the Agriculture and Fisheries Modernization Act of 1997 (R.A. 8435), which includes fisheries management and coastal development.
- NAMRIA, the mapping agency, responsible for establishing the limit of the EEZ, sea lanes and delineating municipal waters.
- Military organizations (Navy and Air Force) that provide support for Monitoring, Control and Surveillance (MCS) activities offshore when available.
- Philippine Coast Guard, Maritime Police and LGU Enforcement personnel responsible for assisting municipalities and the national agency in coastal and, where possible, offshore enforcement activities.
- Department of Finance and its Bureau of Customs for coordinated offshore management and enforcement.
- Department of Transport and its Maritime Authority (MARINA) for maritime shipping and safety.
- Department of Foreign Affairs for international fisheries affairs.
- LGUs and Municipalities for coastal area management, including compliance monitoring.
- Fisheries and Aquatic Resource Management Councils (FARMCs).
- Many NGOs that are active on various issues in fisheries.

All legislative changes or new proposals for management interventions are subject to an extensive stakeholder review process that involves all levels of government (national, provincial and municipal), the BFAR regional offices and the FARMCs.

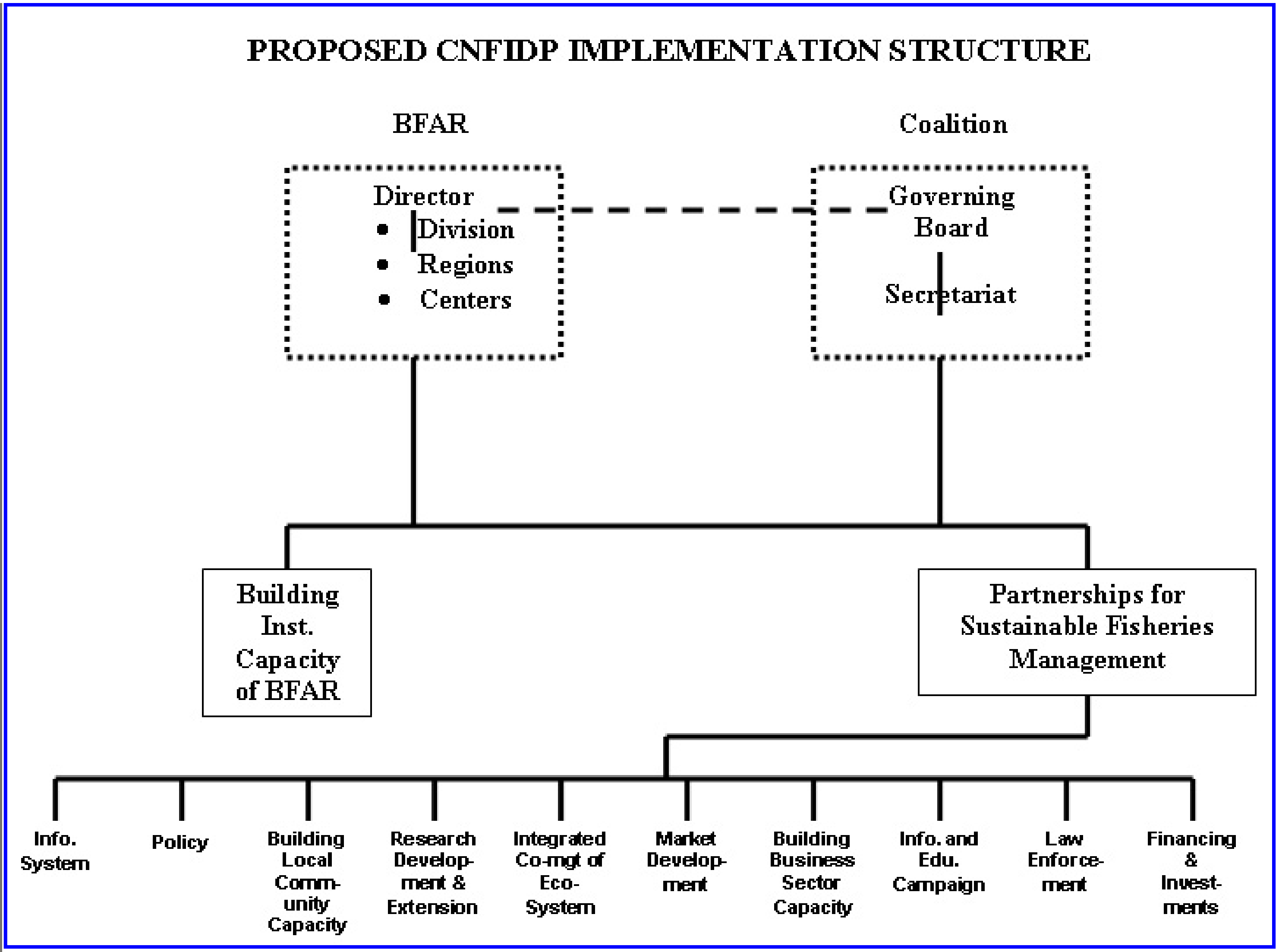
Registration and licensing of fishers, vessels and gear in both the municipal fisheries and commercial fisheries have yet to be strengthened.

National agencies such as the Navy, Air Force and the Coast Guard have the mandate for compliance monitoring outside municipal waters, and can be asked for assistance within municipal waters. The Maritime Police, Coast Guard and LGU-designated/BFAR trained "Deputy Fish Wardens" are mandated to carry out compliance monitoring and enforcement functions in municipal waters.

BUREAU OF FISHERIES AND AQUATIC RESOURCES



As noted earlier, the industry is currently preparing the Comprehensive National Fisheries Industry Development Plan (CNFIDP) and in almost all consultations there has been agitation for increased partnership among government, business sector and civil society to pursue sustainable and competitive fisheries for the country. The diagram below proposes an implementation structure for CNFIDP.



The following are some important Internet links to national administrative and research institutions:

- Bureau of Fisheries and Aquatic Resources (BFAR) <www.bfar.da.gov.ph>
- Philippine Fisheries Development Authority (PFDA) <www.pfda.da.gov.ph>
- Southeast Asian Fisheries Development Center Aquaculture Department (SEAFDEC AQD) <www.seafdec.org.ph>
- Philippine Council for Aquatic and Marine Research and Development (PCAMRD) <www.pcamrd.dost.gov.ph>
- Bureau of Agricultural Research (BAR) <www.bar.gov.ph>
- National Fisheries Research and Development Institute (NFRDI) <www.nfrdi.da.gov.ph>
- University of the Philippines in the Visayas (UPV) <www.upv.edu.ph>

- Central Luzon State University (CLSU) <www.clsu.edu.ph>
- Mindanao State University (MSU) <www.msumain.edu.ph>
- Marine Science Institute, University of the Philippines <www.msi.upd.edu.ph>
- Fisheries and Aquaculture Board of the Philippines <www.aquaboard.org>
- Fisheries Improved for Sustainable Harvest (FISH) Project <www.oneocean.org/fish/the_project.html>
- Department of Environment and Natural Resources (DENR) <www.denr.gov.ph>

GENERAL LEGAL FRAMEWORK

Legal instruments applicable to the fisheries sector include:

• Acts of Parliament, e.g. Philippine Fisheries Code of 1998 (R.A. 8550) for fisheries, and Local Government Code of 1991.

• Presidential Decrees – no longer in use, but until the 1998 Fisheries Code was enacted, PD 704 was the former primary fisheries legislation.

• Executive Orders e.g. EO 240, establishing Fisheries and Aquatic Resource Management Councils (FARMCs).

• Administrative Orders, e.g. AO 201 for the establishment of the Cabinet Committee to coordinate MCS operations (no longer active).

• Fisheries Administrative Orders (FAOs) issued by BFAR pursuant to the Fisheries Code.

In spite of some inadequacy in fisheries management systems and structures, as mentioned above (Luna et al., 2004), the Philippines has a legal and policy framework with a devolved structure down to the municipal level. The process for amending the Fisheries Code to provide an improved legislative environment has now begun. Likewise, the preparation of the Comprehensive National Fisheries Industry Development Plan, which emphasizes partnership among government, the business sector and civil society for sustainable and competitive fisheries, is now underway.

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