Philippine marine fisheries 101

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Abstract

Fish being an important part of the Filipino protein intake makes fisheries equally an important activity of more than one million Filipinos living in coastal areas. The management of fisheries in the Philippines is, however, beset with chronic challenges, which is exacerbated by the rapidly declining environmental conditions of many of its coastal habitats. One major challenge is the lack of adequate catch data needed for the estimation of, e.g., catch per unit of effort and catch limits. We review some of the history leading to conditions and events that might have contributed to such challenges. We also identify a terminology for use in Philippine capture fisheries equivalent to that used in other parts of the world, and which will be used throughout this report.

Introduction

This introductory chapter was initially entitled as “The history and profile of Philippine marine fisheries”. However, numerous historical overviews of Philippine fisheries have been published (see e.g., Storer 1967; DNR 1976a; BFAR 1978; Smith and Pauly 1983; Poblete 1984; Spoehr 1984; Pauly 1986; Israel 1999; Barut et al. 2003; Cruz-Trinidad 2003; DA-BFAR 2004; Luna et al. 2004; Lachica-Alino et al. 2006; Briones 2007; Muallil et al. 2012; SEAFDEC 2012) and fisheries profiles are also published regularly, if not on an annual basis, in Philippine government websites (e.g., Bureau of Fisheries and Aquatic Resources, BFAR), regional (Southeast Asian Fisheries Development Center, SEAFDEC) and international organizations (the Food and Agriculture Organization of the United Nations, FAO). It would thus be redundant to write a history or profile. Thus, we content ourselves with mentioning the basic information that readers require to understand the intricacies and peculiarities of Philippine marine fisheries, i.e., similar to the content of an introductory first-year university course (‘101’), hence the title. This chapter will describe the important features of and current perceptions on Philippine marine fisheries, and identify the challenges which have plagued the sector over decades of management attempts.

The Philippines, with over 7,000 islands of various sizes, encompasses most of the Sulu-Celebes Sea Large Marine Ecosystem (LME), a world hotspot of marine biodiversity (Randall 1998; Carpenter and Springer 2005; Hoeksema 2007; Carpenter et al. 2011). These islands cover a land area of 300,000 km²,

while the Exclusive Economic Zone (EEZ) that might be claimed by the Philippines\(^5\) covers an area of over 2 million km\(^2\) (ADB 1993; Lugten and Andrew 2008), including parts of the heavily contested Spratly Island group, Scarborough Shoal, and Miangas Island (see also Fig. 1 of Barut et al. 1997; Bautista 2008). About 12% of this sea area consists of productive continental shelf (to 200 m; ADB 1993; Barut et al. 1997)\(^6\) hosting coral reef (27,000 km\(^2\), to depths of <30 m; Rivera et al. 2002), mangrove and algal ecosystems. These ecosystems form the habitats of the large number of species supporting coastal marine fisheries.

Fisheries play an important role in the Philippine economic and social fiber. The Philippine islands are divided into 15 administrative regions with 81 provinces, of which 80% are coastal (Rivera et al. 2002), themselves comprising 1,514 municipalities, of which 65% are coastal (ADB 1993). In 2009, the Philippines reported 4.1 million tonnes\(^7\) of total fish "production" (i.e., including aquaculture), about 59% of which were from marine fisheries (and 54% were catches of mackerels, tunas, herrings, sardines, anchovies, jacks, mullets and sauries) valued at 2.65 billion USD (SEAFDEC 2012). Of the 10 Southeast Asian countries, the Philippines ranked second in terms of fish catches, next to Indonesia, accounting for 17% of the total for the region (SEAFDEC 2012). In 2003, the Philippines ranked 11\(^{th}\) worldwide (FAO 2004-2012).

In 2001, 55% of the 76 million Filipinos lived in coastal municipalities (Costales and Garcia 2009), which increased to 85% in 2005 (WB 2005). If we take the average of the 2001 and 2005 estimates of the ratio of coastal area inhabitants to the total population (70%)\(^8\) and apply that to the 2010 population (over 92 million), we obtain a value of over 64 million people inhabiting Philippine coastal areas. Though not all of these people are directly involved in fishing activities, such a high coastal population is undoubtedly the origin of relatively high exogenous impacts on the relatively shallow water area (Barut et al. 1997), and will generate "an enormous pressure on the fisheries" (Salayo et al. 2008, p. 693). Such impacts may be exacerbated by the high incidence of poverty among these mostly rural coastal populations, i.e., 34% of the about 77 million Filipinos in 2000 (NSO 2012) lived below the poverty line, and of this, over 72% are from rural areas (SEAFDEC 2012). The high population growth in the Philippines (one of the highest in Asia) also implies a bleak future, both in terms of the economic status of these rural populations, and in their use of coastal resources. Fishing and/or gleaning are activities which can be performed without or with very little capital, and is often the easiest food provision option of poor coastal families (Israel and Roque 1999). In the 1990s, over 66% of Filipinos' animal protein consumption was based on fish (Israel and Banzon 2000), with an average per capita fish consumption of

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\(^5\) This tortuous wording is based on the fact that the Philippines’ claim is based not on UNCLOS, as might be expected, but on the 1898 Treaty of Paris, which formalized the transfer of colonial territories from Spain to the United States (Bautista 2008).
\(^6\) see also http://www.seaaroundus.org/eez/608.aspx
\(^7\) 1 metric ton = 1,000 kg, denoted as ‘t’ hereon after.
\(^8\) Over 60 % in the late 1990s (La Vina 1999).
36 kg-person-year\(^{-1}\) (Barut \textit{et al.} 2003). This reportedly increased to 53.4 kg-person-year\(^{-1}\) in 2009 (SEAFDEC 2011).

The fisheries sector employed over 807,000 fishers in 1990, 46 % of whom worked in the small-scale, 44 % in the industrial, and 9 % in the aquaculture sectors (Costales and Garcia 2009). Given the annual population growth rates estimated by NSO (2012) between 1.9 % (2000) to 2.3 % (1990), or an average of 2.1 %, we can estimate about 1 million fishers’ recently employed by all three sectors. This is almost 20 % more than the number of fishers employed by these sectors in 1975, i.e., over 844,000 fishers, 68 % of whom were employed by the small-scale sector (so called ‘traditional’ fishers), reported to contribute 55 % of the 1.3 million t of fish domestic output (BFAR 1978). Note, however, that there was an almost 35 % decrease in the number of small-scale fishers over these two decades, which may be indicative of an evolution that is directly tied to overexploitation of shallow coastal resources, resulting in a move towards industrial fisheries, targeting higher-value species like tuna and small pelagic fishes usually caught in offshore areas. Spoehr (1984, p. 34) recounts the evolution of fishing since the Second World War from a coastal to an offshore activity as boats became motorized with an “increase in fishing range and endurance [which] has resulted in a movement of the fishing pattern offshore with the exploitation of new grounds. However, this has not reduced fishing pressure on inshore and traditional grounds; in fact, the opposite has occurred”.

The 1960s and 1970s saw the rapid expansion of the commercial fleet as small-scale fisheries evolved towards motorized (though small) commercial operations (Cruz-Trinidad 2003, p. 553). This industrialization further led to a productivity-oriented thrust, the consequences of which were felt as early as the 1980s, when “overfishing led to lower returns per unit effort, squeezing dry the profitability of fishing as a livelihood. Moreover, conflicts of resource access and use were heightened by the inducement for large-scale exploitation of aquatic resources” (Briones 2007, p. 29).

In addition, the government’s attempts to “cope with modal shifts [in the fisheries sector] brought about by socio-ecological factors in the last decades” (Lopez 2006, p. 79) led to conflicting policies that may have contributed to inefficiency with regards to managing the sector (Shannon 2002; Lugten and Andrew 2008; Salayo \textit{et al.} 2008). The industrialization boost of the 1970s was fueled largely via the “Integrated Fisheries Development Plan which sets as its goal the attainment of self-sufficiency in fish supply through expanded production and development of import substitutes and promoting exportation of fishery products” (BFAR 1978, p. 10). Foreign aid via several organizations of the United Nations (e.g., UNDP, FAO) and the regional body, SEAFDEC, assisted the government in implementing its expanded fish production program and in “exploratory fishing for schooling fishes such as tuna” (BFAR 1978, p. 10). Government subsidies in terms of loans meant primarily for artisanal fishers to motorize their fishing operations (Green \textit{et al.} 2003) ranged from 2.7 million pesos in 1987 to 10.6 million pesos in 1997\(^{10}\) (Israel and Roque 1999, Table 24, p. 87) with loan to output ratios of 7.4 in 1987 to 13.9 in 1992 (Israel and Roque 1999, Table 23, p. 86). These were in addition to earlier government loans obtained through the World Bank for the National Fisheries Development Project “channelled only to commercial fishermen” (WB 1991, p. 1). The concerted effort to obtain self-sufficiency in fish since the 1970s (Anon 1979) culminating with the “1997 Agriculture and Fisheries Modernization Act [which] is production-oriented [...] and thus] encourage excess capacity [conflicts with] the 1998 Fisheries Code [which] advocates resource conservation” (Salayo \textit{et al.} 2008, p. 698) have not alleviated the chronic problems that have beset the post-war Philippine fisheries industry. In fact, the “social conflicts which have developed between the small-scale fisheries and the commercial fisheries over the years [...] in effect exacerbated excessive fishing efforts, particularly in municipal waters” (Delmendo 1992, p. 35).

\(^{9}\) This might be an underestimate as Briones (2007) reported 1.5 million people with fisheries as their main livelihood in 2004. However, this figure included fishers also employed in the aquaculture sector.

\(^{10}\) In 1987, 1USD=20.6PHP. In 1997, 1USD=29.5PHP (see http://fx.sauder.ubc.ca/etc/USDpages.pdf).
We enumerate further below the major challenges that this particular history and culture of Philippine fisheries has created and we pay particular attention to the facets of Philippine fisheries that are important to one of the major objectives of this report, i.e., the reconstruction of fisheries catches.

Some indispensable definitions

The Philippine Fisheries Act of 1932 classified the sectors of marine fisheries …

“... according to their government and disposition: national, municipal and reserve fisheries. Falling under national fisheries are: 1) deepsea or offshore fishing; 2) marine mollusca fisheries; 3) sponge fisheries; 4) hawksbill turtle fisheries; and 5) inland fisheries. Under municipal fisheries Section 6 defined the extent thereof which is three nautical miles at most from the shoreline of the municipality, while Section 7 dealt on the authority of the municipal council to grant the exclusive fishery privileges of erecting fish corrals, operating fishponds, or taking or catching of bangus fry (kawag-kawag) or fry of other species. For the reserve fisheries, Sections 73 to 73-B provided for the establishment thereof in any of the Philippine waters by presidential proclamation for the exclusive use of the government or of the inhabitants, for the culture of fish and other aquatic animals, for educational and scientific purposes, while communal fisheries may be established by the Secretary of Agriculture and Natural Resources in any municipal waters” (BFAR 2012c).

Presidential Decree No. 704 of July 14 1975 superseded this earlier Fisheries Act and became the basis of all fisheries regulations and rules defining thus:

(i) ‘commercial’ fisheries as operations “for commercial purposes in waters more than seven (7) fathoms deep with the use of fishing boats more than three (3) gross tons […] within a distance of seven (7) kilometers (3.78 nautical miles) from the shoreline”;

(ii) ‘municipal’ fisheries as operations “utilizing fishing boats of three gross tons or less, or using gear not requiring the use of boats”; and

(iii) ‘municipal’ marine waters as “marine waters included between two lines drawn perpendicular to the general coastline from points where the boundary lines of the municipality touch the sea at low tide and a third line parallel with the general coastline and three (3) nautical miles from such coastline.”

This decree gave provisions for the: (a) creation of the Fishery Industry Development Council in Chapter III; (b) regulating the use and exploitation of fishery/aquatic resources in Chapter IV; (c) reserve fisheries and fish sanctuaries in Chapter V; (d) prohibitions (including illegal fishing and gears) and penalties in Chapter VI; and (e) fisheries subsidies and loans in Chapter VII. However, it lacks any mention of subsistence fisheries. In fact, Chapter IV-C Section 29b requires the municipal or city council to issue licenses to all fishing operators, except when it is beyond “… the power of the municipal or city council to impose a license for the privilege of gathering marine mollusca or the shells thereof, for pearl boating and pearl divers, or for prospecting, collecting, or gathering sponges or other aquatic products, or for the culture of fishery/aquatic products”.

Thus, the gleaning of invertebrates is effectively the only form of subsistence fishing considered. The catching of fish, even in small quantities for direct consumption by fishers as stipulated in (ii) above, is considered ‘municipal’ fishing.

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Sea Around Us currently engaged in catch reconstructions for all maritime countries of the world has elaborated a set of definitions which will be used throughout this report, and which are compatible with the definitions of fisheries used in most of the English-speaking world. These definitions, however, differ sharply from those used in the Philippines, but which, we fear, mask rather than identify major differences between different fishery types in the Philippines (Table 1).

‘Commercial’ fisheries

The ‘commercial fleet’, which we call ‘industrial’ (see Palomares and Pauly, this vol.), is directly under the jurisdiction of the national government, i.e., the Fish and Game Administration (Department of Agriculture and Commerce) in the 1930s, Division of Fisheries in the 1940s, post-WWII Bureau of Fisheries, and the current Bureau of Fisheries and Aquatic Resources (BFAR) under the Department of Agriculture (BFAR 2012a). The national government decides on licenses, taxes and levies and the collection of fisheries data via monthly reports from registered (licensed) vessels as promulgated in the Presidential Decree No. 704 and by the Philippine Fisheries Code of 1998 (Delmendo 1992). The Fisheries Code also redefined ‘commercial’ fisheries in three categories, i.e., small-scale (3.1-20 GT), medium-scale (20.1-150 GT), and large-scale ‘commercial’ vessels (>150 GT), respectively.

The average number of ‘commercial’ vessels in the 1960s was about 2,100, peaking at 2,544 in 1966 with an estimated 31,000 fishers in 1967 in both powered and non-powered boats (PFC 1969). The number of ‘commercial’ vessels tripled in 2007 to 6,400 vessels with an estimated 16,500 fishers in 2002 (BFAR 2009). The ‘commercial fleet’ employs trawls12 for demersal species and bagnets13, purse seines14, ringnets15, longlines16 with fish aggregating devices (FAD or ‘payao’) for pelagic species (Barut et al. 1997; Schoppe et al. 1998). Bagnets include muro-ami, an extremely destructive gear/fishing method introduced to the Philippines in the 1930s from Okinawa, and which uses a large bagnet held open by the current, with two detachable wings that guide fish (e.g., reef-associated species such as groupers), which are herded to the net by swimmers using scare lines. An operation may have as many as 7,000 swimmers, grouped in 200-300 individuals led by a master fisher and 4-5 assistant master fishers ferried by ~9 m long non-motorized bancas hosted in one or two ~47 m mothership of ~400 GT, i.e., with a capacity of about 180 t of fish in an operation that may last 2-3 months per trip (Corpuz et al. 1983). Major muro-ami fishing grounds included the Sulu-Celebes Sea and as far as the Spratly Islands in the South China Sea. Fisheries Administrative Order No. 163 amended Sections 4 and 7 of Presidential Decree No. 704 to ban the use of muro-ami and its local versions in 1986.17 However, BFAR permitted the use of muro-ami “... under the guise of a new name and a somewhat re-redesigned, experimental technology that supposedly avoided the traditional muro-ami’s well-known damage to coral reefs. The legality of this permit extended only to three months, but for unknown reasons the “new” muro-ami has continued to be defiantly practiced up to the present day” (Olofson et al. 2000, p. 224-225).

In 1969, these vessels were reported to have landed 0.4 million t, 80 % of which are spread over 11 species topped by round scads (of the genus Decapterus spp, 30 %), sardines (Sardinella spp, 9%) and slipmouths (Leiognathus spp, 8 %), with ‘miscellaneous species’ making up 2 % of the total reported landings (PFC 1969). This fleet’s reported landings increased 2.5 fold in 2007, 79 % of which are spread

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12 In the late 1950s, the otter trawl fishery of Manila Bay was assessed to have reached its maximum capacity and thus, bagnets and twin engine in larger trawlers were introduced to exploit the pelagic stocks outside of the Bay (Ronquillo et al. 1960).
13 Most common gear employed in the 1950s and 1960s (Storer 1967).
14 Gear developed via technical assistance and training from the FAO in the early 1960s because it had the potential to increase the catch of ‘baspigan’ (bagnet) from 3.5 to 35-100 t per trip (Storer 1967).
15 Also used in the ‘municipal’ fisheries to catch tunas and oceanic pelagic species (Olaño et al. 2009).
16 May also be used to catch some demersal species, i.e., lethrinids, poly nemids, priacanthids and nemipterids (Jeremias and Ganaden 1983).
over 9 species topped by Indian sardines (genera *Dussumieria* and *Thryssa*, 21%), skipjack tuna (*Katsuwonus pelamis*, 16%), and round scads (14%), with miscellaneous species making up 17% of the total reported landings (BFAR 2009). In addition, landings of tunas, i.e., yellowfin (*Thunnus albacares*), frigate (*Auxis thazard*), skipjack (*Katsuwonus pelamis*) and bonito (*Auxis rochei*), increased to almost 90 times from the 1960s figures. Also, previously important demersal species, such as lizard fishes (Synodontidae), shrimps (Decapoda) and croakers (Sciaenidae) considerably decreased in reported catches. These statistics (which we assume to be representative of the fleet, for now) help us to infer the following trends of the past 6-7 decades: (a) that there was a 4-fold decrease in the number of fishers per boat, which can be attributed to an increase in the efficiency of boats and gears, and thus loss of employment in many coastal communities; (b) that there was a 5-fold increase in the catch per ‘commercial’ fisher, likely due to the expansion of the fisheries to offshore areas; and (c) that the target species has shifted from predominantly demersal to mainly offshore pelagic, a result of the increasing focus on tuna and tuna-like species (see Morgan and Staples 2006, p. 16).

The increase in efficiency and capacity of motorized banca-type vessels (wooden outrigger boats, traditionally limited to fish in municipal waters) enabled them to reach offshore fishing areas. This was (and still is) facilitated by the government’s incentives in Article II Section 35 of the Fisheries Code of 1998 for ‘commercial’ fishing operators “… to fish farther in the EEZ and beyond, new incentives for improvement of fishing vessels and acquisition of fishing equipment shall be granted in addition to incentives already available from the Board of Investments (BOI)”.

These incentives include long-term loans for vessel and equipment upgrades, tax-exemption on imported vessels, and duty and tax rebates on fuel consumption. Thus, artisanal operations turned industrial and expanded their operations to the outer edges of the Philippine EEZ and even to areas beyond Philippine jurisdiction and/or within disputed zones. However, as many of these 3 GT efficient vessels are allowed within municipal waters, they can also exploit near shore resources (Smith and Pauly 1983). Thus, the fine line that supposedly separated ‘commercial’ from ‘municipal’ became blurred (Delmendo 1992) and may be the origin either of an over-reporting of artisanal catch in offshore waters, e.g., “the attribution of all handline catches as municipal” Lewis (2004, p. 19), or of an under-reporting of ‘commercial’ catch in municipal waters. This issue is recalled in our synthesis chapter (Palomares and Pauly, this vol.)

‘Municipal’ fisheries

The small-scale or artisanal fisheries, referred to as ‘municipal fisheries’ in Philippine parlance, is under the jurisdiction of the municipal government. The Local Government Code of 1991 (Republic Act 7160) mandates “municipal governments to manage their municipal waters [that is within 15 kilometers of the shoreline and states that] Local government units (LFUs) shall share with the national government the responsibility in the management and maintenance of ecological balance within their territorial jurisdiction […]. LGUs were granted powers for effective governance [and] to enact municipal fisheries ordinances and enforce these as well” (Lopez 2006, p. 81-82).

‘Municipal’ fishers traditionally fish from bancas, which may be as small as a one/two person paddle boat to as big as a 3 GT motorized vessel (but with engines of not more than 10 HP), according to conditions identified in item (ii) of the definitions above. The gears usually employed by municipal fishers range from cast/gill nets, hook and line, spear, traps and pots, barriers (Barut et al. 1997; CTI 2012). In the 1960s, “municipal or sustenance fishing [production] is the largest component […] accounting for 51 per cent of the total catch […] but represented …] a somewhat smaller share of value, 43 percent […] and employed] 65 per cent of those directly or indirectly engaged in the industry [260,000 of 400,000 then

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involved in Philippine fisheries, 3% of Philippine labor force ...], but it is never in its individual or mass effect an efficient way of exploiting the resource or of providing a livelihood for its practitioners. [...] The pressures upon these people to fish are tremendous and essentially add up to a complete lack of alternatives [...]” (Storer 1967, p. 367). This condition, unfortunately, has not changed, and in many municipalities, has even deteriorated as evidenced by the various reports cited above.

The development of scaled-down industrial operations (‘baby trawlers’) led to intensive fishing in inshore waters and in waters less than 12.8 m deep, traditionally reserved for artisanal fisheries (Tapiador 1978; Pauly and Smith 1983; Cruz-Trinidad 1998). Thus, the highly heterogeneous municipal sector, which is clearly suffering from dwindling resources, as indicated by a minuscule and declining catch/day of individual fishers (Simpson 1979; Dalzell et al. 1987; Dickson 1987; Munoz 1991; Sunderlin 1994; Shannon 2002; Stobutzki et al. 2006; Muallil et al. 2012), and an ever increasing number of fishers, i.e., the ‘Malthusian overfishing’ of Pauly (2006), is linked to the ever-increasing industrial fleet, which obtains an increasing share of their ill-assessed catches from (mostly illegal) fishing in the waters of their neighbours, especially in Malaysia (Sabah) and Eastern Indonesia (Lewis 2004).

Subsistence or gleaning?

The term ‘subsistence’ was very recently redefined to categorize ‘municipal’ fishers whose livelihood is mainly “fishing and [whose] earnings fall below the food threshold; [who] uses the catch for a combination of purposes – family consumption, barter, and balik puhunan”, i.e., selling the fish caught to regain capital spent on fishing operations (CTI 2012). This amorphous use of the terms ‘municipal’ and ‘subsistence’ exacerbates the already difficult estimation of small-scale fisheries catches. In addition, this recent review by CTI (2012), suggested that ‘gleaning’, which was exempted from what was deemed as fishing in previous definitions by the 1975 Act and the 1998 Code, may be considered as ‘subsistence’ fishing.

Note, however, that in general, with the exception of some areas, such as the Visayas, where gathering shellfish is an established fishery (Floren 2003), or in the Sulu Sea, where sea cucumber fisheries are commercial operations (Subaldo 2011), most gleaned shellfish and invertebrates are either underestimated or not estimated at all. This is due, in part, to the misuse and resulting confusion of the terms ‘municipal’ and ‘subsistence’ (see Table 1) and possibly also because their catch is believed to be small and/or consisting of species of low value. However, there are indications that gleaning provides for fishers affected by the recent decline in many of the municipal fishing operations (del Norte-Campos et al. 2005). Also, the “productivity of subsistence fishers in coral reef regions can be similar to the productivity of artisanal fisheries, although the latter has been considerably more studied” (Baran 2002-2012, p. 5).

Thus, for our purposes, we define subsistence fishing as a part of small-scale fisheries (see Table 1), and we will thus not discuss its separate estimation from that of the ‘municipal’ catch. However, we will consider ‘gleaning’ to be the gathering, for local consumption, of shellfish, invertebrates and shallow water or small fishes from the shoreline to the level of the receding tide, which may be performed with the use of implements or tools but without the use of boats.
To collect statistics or not, is the question ...

Due to the archipelagic nature of the Philippines, with monsoon seasons affecting a huge amount of marine biodiversity (over 3,200 fish species and about 10,000 invertebrates)\(^\text{19}\), no single (or small group of) species dominates its fisheries catches (Barut \textit{et al.} 2003). In fact, even abundant taxa, such as ‘galunggong’ (i.e., ‘round scads’, of the genus \textit{Decapterus}) consists of different species, and different populations, caught in different parts of bays, gulfs and seas, depending on the season (Alix 1976); none of these, even if optimized in terms of increased biomass and lower fishing effort (and hence higher catches), would noticeably affect the total catch (Ronquillo 1975; Calvelo and Dalzell 1987).

The Philippines produces, publishes, and distributes annually immense amounts of extremely precise fisheries statistics (BFAR 2012b) that are readily cited by various non-government organizations (NGOs). However, the real catch of the marine fisheries is essentially unknown. Lack of funds and repeated reorganisations of the government divisions handling fisheries statistics prevented the establishment of a comprehensive fisheries data collection system dealing, to the same level of detail, with the catch of industrial, small-scale and subsistence fisheries (DNR 1976b; FIDC 1979). It took more than seven decades since the creation of the Division of Fisheries by the Philippine Commission under the Department of the Interior in 1901 (BFAR 2012a) before a structured fisheries statistics data collection system could be put in place (Chakraborty 1976). This was implemented after several training workshops for enumerators organized by the South China Sea Fisheries Development and Coordinating Programme in the mid-1970s (Chakraborty and Wheeland 1976). The first of a series of annual fisheries statistics accounting for all sectors was published by BFAR in 1977 (BFAR 2012a). Further changes in the governing institutions in the late 1980s transferred the responsibility of fisheries data collection from BFAR to the Bureau of Agricultural Statistics in 1988 (BFAR 2012a). Again, the continuous problems of funding, which has beset this sector in decades, prevented regular/consistent data collection until the 2000s with the support of foreign government aid (FAO-SEAFDEC 2005; Itano and Williams 2009).

‘Commercial’ landing statistics were collected since 1954 by the Bureau of Fisheries (which later became the Bureau of Fisheries and Aquatic Resources) for ten fishery districts (Simpson 1979), based on monthly catch reports of fishing operators. It was determined that these landings were “inadequate”, and they were summarily corrected by an expansion factor derived from monthly landings collected by enumerators from randomly sampled survey areas to estimate regional and national production values (DNR 1976b). Already then, the problem of obtaining reliable statistics of the catch and effort [...] was very real (Simpson 1979, p. 3). Storer (1967, p. 366) clearly describes one of the major problems besetting data collection in Philippine fisheries, which sadly is still happening today:

‘Formidable difficulties also arise from the fact that most of the data are collected as an adjunct to the taxation system. All commercial fishery vessels are supposed to land their catch at one of the official landings. The boats tend, however, to arrive at about the same time, between 0300 and 0400 hours, in order to take advantage of the early morning retail market. The great number of vessels, most of them small, and the rapidity with which the catch is disposed of, make checking by the few wardens a haphazard affair.

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\(^{19}\) Based on the August 2012 versions of FishBase (www.fishbase.org) and SeaLifeBase (www.sealifebase.org). Though these two online biodiversity information systems probably have the most recent checklists of species for the Philippines, they are by no means complete as work on recent expeditions, e.g., by the Muséum National d’Histoire Naturelle (Paris, France) and the California Academy of Science (San Francisco, California, USA), will add new species descriptions to this list.
Table 1. Types of capture fisheries considered in this study compared with terminology employed in the Philippines and some definitions regarding these.

<table>
<thead>
<tr>
<th>Type of capture fisheries considered in this study</th>
<th>Terminology used in the Philippines</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small-scale</td>
<td>Municipal</td>
<td>The term ‘municipal’ is associated with ‘municipality’, i.e., the local government authority.</td>
</tr>
<tr>
<td>Recreational</td>
<td>Rarely mentioned</td>
<td>Spear fishing (considered a destructive form of fishing along with dynamiting and is prohibited) in conjunction with water sports (snorkeling and diving) is practiced mainly by tourists (especially from Japan and Korea) though not monitored by local authorities. Hook and line fishing from yachts privately operated by individuals or through tourism (may also be associated with diving tourism) also occur occasionally, though again not monitored by local authorities (see Espedido et al. this volume).</td>
</tr>
<tr>
<td>Subsistence</td>
<td>Rarely identified; Usually referred to as ‘sustenance’</td>
<td>Traditionally refer to the catching of fish either with or without the use of outrigger boats and/or canoes. True ‘subsistence fishing’ occurs in the Philippines in the form of reef gleaning (mostly for invertebrates), which is discussed at length in Palomares et al. and Cabanban et al. this volume.</td>
</tr>
<tr>
<td>Artisanal</td>
<td>Small-scale or municipal</td>
<td>Artisanal fishers are small-scale fishers who sell the bulk of their catch; see below</td>
</tr>
<tr>
<td>Large-scale/Industrial</td>
<td>Commercial</td>
<td>The term ‘commercial’ is associated with selling the landed catch, which is conceptually confusing, because artisanal fishers also sell theirs.</td>
</tr>
<tr>
<td>≤ 3 gross tons</td>
<td>Municipal/small-scale commercial</td>
<td>Motorized vessels of 3 gross tons and less have capability to fish offshore, but are also allowed to fish inshore (in municipal waters).</td>
</tr>
<tr>
<td>&gt; 3 gross tons</td>
<td>Small-scale commercial</td>
<td>Before the 1980s, only two categories were used in reporting the catches, i.e., boats &gt;3 gross tons were considered commercial. Recent re-categorizations provide for a gradation of operations, as presented here.</td>
</tr>
<tr>
<td>&gt; 20 gross tons</td>
<td>Medium-scale commercial</td>
<td>Recent categorization.</td>
</tr>
<tr>
<td>&gt; 150 gross tons</td>
<td>Large-scale commercial</td>
<td>Recent categorization.</td>
</tr>
</tbody>
</table>
Operators of such vessels are also required to provide a monthly tally of the catch and to pay on the basis of this, 2 pesos per ton to the Fisheries Commission. In addition, on the basis of the same catch data, they are supposed to pay the Bureau of Internal Revenue a tax of 7 per cent of the value of the catch (ex-vessel price). The pressure of these two tax measures tends to distort the reporting of the data; the underreporting of the volume of the catch and a downgrading of the species of fish caught in order to provide, for the record, a lower value of fish landed. The estimates of the extent of this downward bias vary but they have run as high as 50 per cent on the volume and even higher on the value.

A further problem in obtaining reliable statistics is that the jurisdiction of the fisheries is divided between the federal government and municipalities. (The provincial governments have no authority in this instance.) The federal government licenses all boats of over 3 gross tons [...]. On the other hand, the largest proportion of the total volume of catch is ascribed to the category of municipal or sustenance fishing. Over this fishery there is no effective control or statistical reporting. A tremendous degree of “guesstimating” enters into the statistical development of this component.”

Small-scale fisheries catches were estimated from only six municipal reports since 1951, which was discontinued later on (FIDC 1979). Since the 1960s, the catch of municipal fisheries has been estimated from the same fixed ratio for the relationship between small-scale and industrial catches (FIDC 1979). This ratio most likely originated from the projected increase of fisheries catches to respond to domestic demand, i.e., 6-7 %, needed for self-sufficiency in fish by 1976, and thus, for surplus production by 1977 (DNR 1976b).

Thus, it appears that even before the conjugal dictatorship of Ferdinand and Imelda-she-of-the-shoes-Marcos, the fisheries statistics generated showed regular catch increases, a distortion which has not been addressed since democracy was somehow restored in 1986.

**MSY, CPUE, and what we actually know about catch trends**

Numerous assessments of the status of fisheries in the Philippines were conducted, especially in the 1980s, when the International Center for Living Aquatic Resources Management (ICLARM), then based in the Philippines, was very active. These analyses can be grouped into three categories:

- i) Surplus-yield models pertaining to the demersal and/or pelagic fish of a local fishing ground;
- ii) Single- or multispecies yield-per-recruit analyses pertaining to a given fishing ground;
- iii) Philippine-wide analyses based either on data such as used in (i), (ii), or other approaches.

Though they tend to provide over-optimistic results (Pauly 1986), simple surplus-yield models (Schaefer 1954; Fox 1970) can be, and were used extensively in the Philippines, to assess the status of multispecies stocks and the demersal or pelagic fisheries exploiting them (Dalzell et al. 1987; Culasing 1988; Silvestre and Pauly 1997). These models, in the aggregate, suggested that the majority of fishing grounds in the Philippines, which were extremely productive in the 1950s and 1960s (Butcher 2004), were overfished by the late 1970s and/or 1980s.

This is confirmed by yield-per-recruit analyses, i.e., analyses of the ‘yield’ (or catch in weight) that could be obtained by letting individual fish grow to their optimum size, i.e., by regulating not only fishing intensity, but also mesh sizes, which determines size at first capture (Beverton and Holt 1957; see Figures 17 and 19). Analyses of this sort can be performed without detailed catch time series, given that the size composition of the catch is available (length-frequency data; Pauly 1998a). In fact, methods to analyze length-frequency data were developed throughout the 1980s by ICLARM (Pauly and Morgan 1985, 1987), and were applied to a vast number of stocks (see e.g., Floyd and Pauly 1984). Jointly, these
analyses confirm that from the 1980s onwards, Philippine marine fishes were massively ‘growth overfished’ throughout the country.

Conclusions

Considering the above assessment of the fisheries statistics of the Philippines, the report of which this contribution is a part, we will attempt to re-estimate catch statistics which may better approximate the catch that was actually realized. The methodology applied for this is detailed in the next contribution, by Palomares and Pauly (this vol.) and its applications to 4 groups of regions, each representing about a quarter of the Philippine EEZ (‘subzones’), of different fisheries types (small-scale, industrial and gleaning) in the subsequent contributions. A final contribution by Palomares and Pauly (this vol.) then combines these regional catch estimates into a new reconstruction of the total marine catch of the Philippines, and discusses some of its implications.

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