

# Chapter 4

## *Fisheries: The single largest source of protein in the Philippines*

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[In the past] *“Teach a man to fish and he will have food for the rest of his life.”*

[Now] *“Teach a man to fish and he will resort to unsustainable methods to remain competitive with the overabundance of fishermen.”*

—Anonymous

### IMPORTANCE AND TRENDS OF FISHERIES

The Philippine population is highly dependent on fish food. Recorded per capita consumption of the *“fish, meat and poultry food group”* is 54 kg/year in 1993 of which 67% is comprised of fish and fish products<sup>21</sup>. The food group that includes fish is thus the second most important component of the Filipino diet next to rice.

On a national scale, fisheries contributed 3.5% to the gross domestic product (GDP) and 16% of gross value added (GVA) in the agricultural, fishery and forestry sectors in 1996, both at current prices. In the same year, exports of fishery products amounted to P15 billion (US\$600 million) with the top commodity exports being tuna, shrimp and seaweed, in descending order of importance<sup>22</sup>.

The fishing industry also provides employment to about one million people, roughly 5% of the country’s labor force. Of this, 68% is accounted for by the municipal fishing sector, 28% is accounted for by aquaculture, and the rest by the commercial boats<sup>22</sup>. Because commercial boats account for 30% of the catch and employ only 6% of the fishing labor force, there are strong sentiments being aired about limiting commercial fishing boats to areas outside of municipal waters.

Fisheries production in 1996 totaled 2.8 million t (Table 4.1). This production is divided almost equally between the

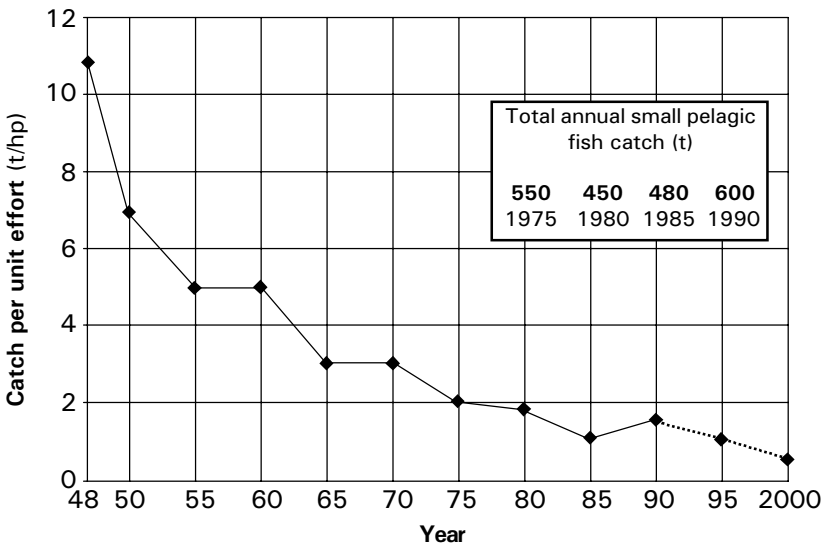
municipal, commercial and aquaculture sectors. Aquaculture production has almost doubled in the last ten years although most of the increase is from farming of non-edible seaweeds. The municipal sector shows a steady downtrend. Its contribution to total production decreased from 57% in the early 1970s to just 30% in 1996. In general, production growth has been very minimal over the last five years, averaging 1.5% per year while catch per unit effort has steadily declined (Figures 4.1 and 4.2).

**Table 4.1. Philippine fish production by sector, 1996<sup>22</sup>.**

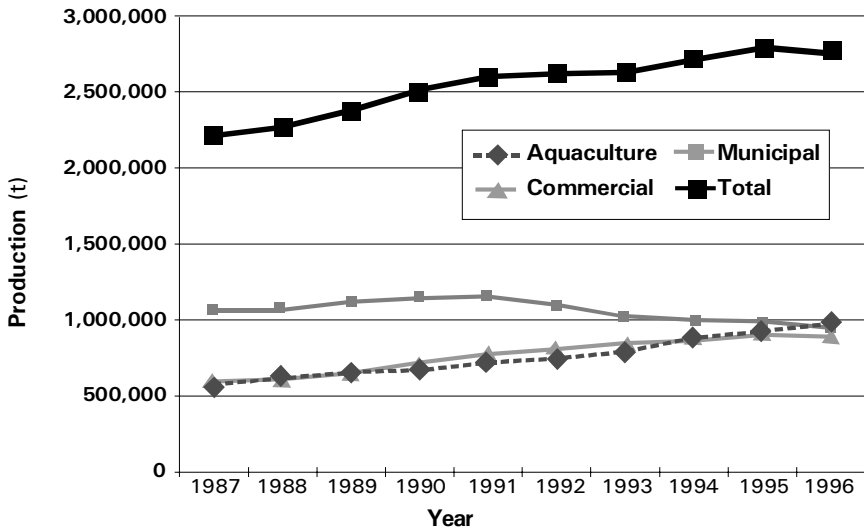
Sector	Quantity (in 1,000 t)	%	Value (in billions of pesos)	%
1. Aquaculture*	981	35.4	33.2	40.0
2. Municipal fisheries	909	32.9	25.4	30.5
3. Commercial fisheries	879	31.7	24.5	29.5
<b>Total</b>	<b>2,769</b>	<b>100.0</b>	<b>83.1</b>	<b>100.0</b>

\*About 60% of aquaculture production is actually seaweeds farmed for industrial processing and export.

**Figure 4.1. Trend of catch per unit effort since 1948<sup>39</sup>.**



**Figure 4.2. Trends in Philippine fish production, 1987-1996<sup>22</sup>.**



There are clear signs that Philippine open-water fisheries have reached their sustainable limits and, as noted, municipal fisheries are declining. One primary reason for the decline of these nearshore and small-scale fisheries is that they are habitat dependent. And, as shown in Chapters 2 and 3, the viable and healthy coral reef and mangrove ecosystem area has decreased significantly over this century. The result is a decrease in fish catch and a drastic decrease in catch per unit effort as shown in Figure 4.1.

## KEY FISHERIES, THEIR CONDITION AND VALUES

### Nearshore fisheries

Nearshore fisheries can correspond to either of two characteristics: spatial and technological. Spatially, the nearshore fishery covers the 0-50 m depth range of the shelf area. Technologically, nearshore fisheries are tantamount to the municipal fisheries or those utilizing vessels less than 3 gross tons (gt) or no vessels at all.

Important municipal fishing gear are gillnet, hook and line, baby trawl and stationary gear (fish corral, filter net) plus many variations. In 1996, the total catch of the municipal sector reached 700,000 t valued at P25.4 billion (US\$1 billion) (the latter including value of the inland catch). The major species caught are sardines (*tunsoy*), squid (*pusit*), anchovies (*dilis*) and frigate tuna (*tulingan*) but the relative contributions of these species to the total catch only range from 3 to 6%. The municipal fish catch is often underestimated because the number of small-scale fishers who consume or sell fish locally is not recorded.

The nearshore area is the most biologically productive area and thus, overexploited (Figure 4.3). Typical trends observed in many nearshore traditional fishing grounds and the types of overfishing as defined in Table 4.2 include:

- A relative increase of cephalopods (squid and cuttlefish) due to reduced predation;
- The disappearance of trevallies (Lactaridae) and sting rays (Dasyatidae) due to recruitment overfishing;
- A relative decrease of snappers (Lutjanidae) and flatfish (Psettodidae) due to growth and recruitment overfishing; and
- A relative increase of “trash” fish due to reduced predation, species replacement, growth overfishing and shifts in the ecological composition of the fishery.

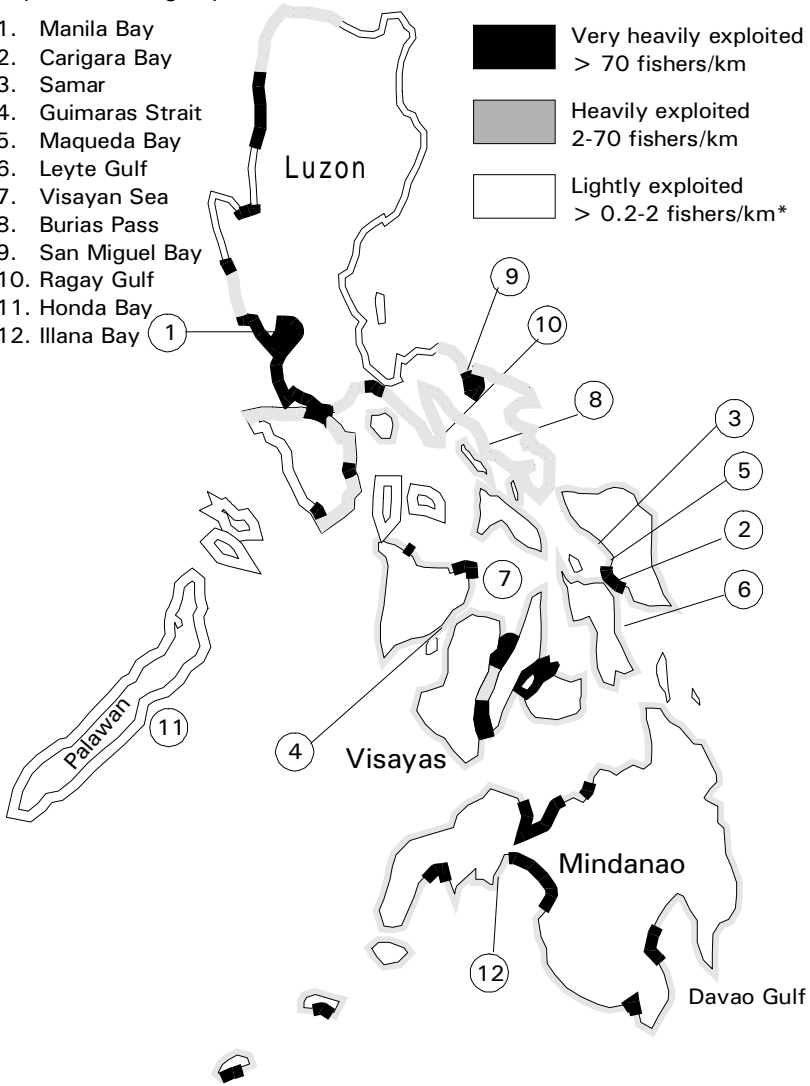
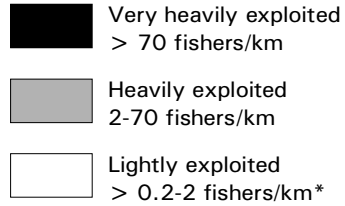
Legally, much of this area, that within 15 km of the shoreline, has been reserved for the use of municipal fishers, by virtue of the Local Government Code. In addition, the Fisheries Code of 1998 reserves up to 10 km of municipal waters for the exclusive use of municipal fishers. Nevertheless, many traditional use conflicts still persist within both the 10 and 15 km limits.

One result of the conflict between the commercial and municipal sectors is decreasing catches. As indicated, the catch from the municipal sector is being overtaken by the catch from the commercial and aquaculture sectors; meanwhile, municipal fishers are growing in number.

**Figure 4.3. Map of heavily exploited areas in the Philippines<sup>106</sup>.**

Important fishing bays

1. Manila Bay
2. Carigara Bay
3. Samar
4. Guimaras Strait
5. Maqueda Bay
6. Leyte Gulf
7. Visayan Sea
8. Burias Pass
9. San Miguel Bay
10. Ragay Gulf
11. Honda Bay
12. Illana Bay



\*The only coastal areas which may not be overfished occur here.

By virtue of both characteristics, it is easy to see that coral reef fisheries are included in this category. Production of coral reef fish of up to 35 t/km<sup>2</sup>/year is very high by open-water fish yield standards. An added important attribute of this fishery is its huge contribution to the incomes of municipal fishers with very little alternative employment<sup>95</sup>. An estimate of the overall contribution of reef fisheries to the Philippines in Chapter 2 shows that almost 20% of the total fish production of the country could be derived from healthy coral reefs.

### Small pelagic and demersal fisheries

Small pelagic fish are a diverse group of marine fishes inhabiting the upper surface layer of the water column, usually above the continental shelf, i.e., in waters not exceeding a depth of 200 m. These fish normally include big-eye scads, mackerels, anchovies, clupeids, halfbeaks and fusiliers<sup>37</sup>.

**Table 4.2. Types of overfishing and their characteristics**<sup>8, 33, 86</sup>.

Types of overfishing	Characteristics
<b>BIOLOGICAL</b>	
Growth overfishing	<ul style="list-style-type: none"> <li>◆ Occurs when the fish are caught before they have a chance to grow</li> <li>◆ Immature fish below the required age for harvest are gathered</li> </ul>
Recruitment overfishing	<ul style="list-style-type: none"> <li>◆ The adult fish population is caught in large numbers so that fish reproduction is gravely impaired</li> </ul>
Ecosystem overfishing	<ul style="list-style-type: none"> <li>◆ Happens when the decline in a once abundant fish stock due to fishing is not compensated for by an increase in the stocks of other species</li> </ul>
<b>ECONOMIC</b>	
	<ul style="list-style-type: none"> <li>◆ Overcapitalization and oversupply of labor</li> <li>◆ Dissipation of economic rent from excess fishing effort and not levying license fees and market controls</li> <li>◆ Loss of consumer's and producer's surplus as prices go up for consumers and profits decline for producers</li> <li>◆ Depreciation of asset value of the resource</li> </ul>

More than 30 types of commercial and municipal gear are used to catch the wide range of pelagic resources. The most important types of commercial gear are purse seine, trawl, bagnet, ringnet and *muro-ami*, which together account for about 98% of the catch with purse seine accounting for 40% of the catch. In the municipal sector, about 40% of the catch comes from gillnets and another 40% from beach seine, bagnet, handline and ringnet. In 1987, average catch rates of municipal gear ranged from 14 to 108 kg/haul consisting mainly of anchovies and sardines. Average catch rates of the commercial sector ranged from 120 to 1,100 kg/haul and species caught were generally higher-priced species, including roundscad and mackerel<sup>37</sup>.

Demersal fish are bottom-living and dependent on the benthic food chain. They may or may not be associated with coral reefs, have relatively short life spans, high growth rates and high natural mortality implying relative high turnover ratios. Demersal fisheries have been severely impacted by fishing techniques which disturb or destroy the bottom habitat, such as commercial and baby trawls.

## WHAT IS LOST AS OVERFISHING INCREASES?

Fisheries scientists have defined overfishing from the biological and economic viewpoints. Biological overfishing may be one of three forms: growth, recruitment and ecosystem overfishing (Table 4.2).

Studies by fishery biologists<sup>37, 38</sup> on the Philippine small pelagic fishery indicate overfishing. Supporting this is 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. Furthermore, since anchovies are the cheapest pelagic fish, the absolute value of total catch is beginning to decline. This vicious cycle of overfishing and deterioration of catch quality directly affects the fishers who rely most on fishing for subsistence and income. This situation drives them to fish even more for an ever declining catch.

An economic analysis of revenues and costs for the Philippine small pelagic fishery showed similar results: that this fishery is economically overexploited (Figure 4.4). The cost and revenue curves provide benchmarks for management: a) maximum economic yield (MEY); b) maximum sustainable yield (MSY); and c) open-access equilibrium (OAE). MEY is the level of effort which maximizes economic profit. MSY corresponds to a higher level of effort; but where profits are less and fish catch is sustainable through time. Lastly, the OAE level is the point where cost and revenues are equal, profits are zero and catch rates are not sustainable. At this point, there are too many fishers (as measured by fishing effort) so that fish catch (and therefore, profits) are dropping. OAE implies that there is too much labor and capital in the fishery which could have been put to more efficient use in other economic sectors. And, the fish stock is most likely being drawn down below sustainable levels.

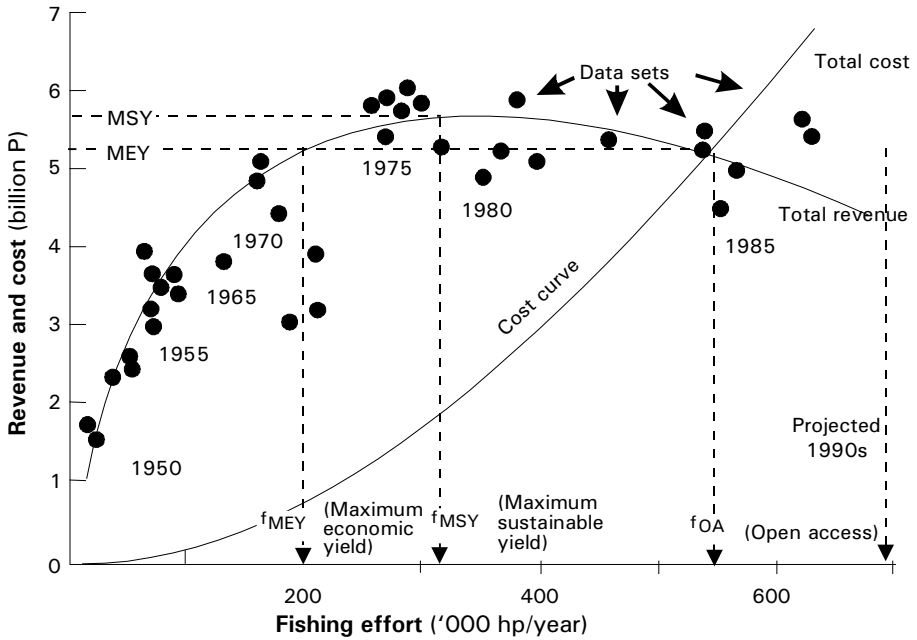
An action derived from this analysis suggests that fishing effort should be decreased by 20 to 30% or more in some areas to attain MSY<sup>110</sup>. By operating at 1985 levels, the estimated annual loss is about P9.4 billion (US\$400 million). In 1998, we are at a point of overfishing more than in 1985. The annual loss could easily be more than US\$0.5 billion.

It is also useful to consider the depreciation of asset value as a result of overfishing. This can be measured using a resource accounting method that considers the resource as natural capital whose value emanates from the stream of benefits capable of being produced over time. An analysis of the Lingayen Gulf fisheries showed that on average, the resource depreciated by P390 (US\$15) million/year from the time that maximum economic yield was reached during the mid-1980s<sup>82</sup>.

Biological and economic overfishing is also evident in the demersal fisheries<sup>102</sup>. Demersal fishes are caught by gear which skim the ocean bottom such as trawlers. The MEY level was probably reached in the late 1960s and was equivalent to about 100,000-125,000 t/year or 40% of the actual fishing effort during the 1983-84 study. The authors do not state whether or not OAE has been reached during 1983-84 but relate the possibility of this level of overfishing to other indicators, namely:



**Figure 4.4. Revenue and cost functions of the Philippine small pelagic fishery<sup>110</sup>.**



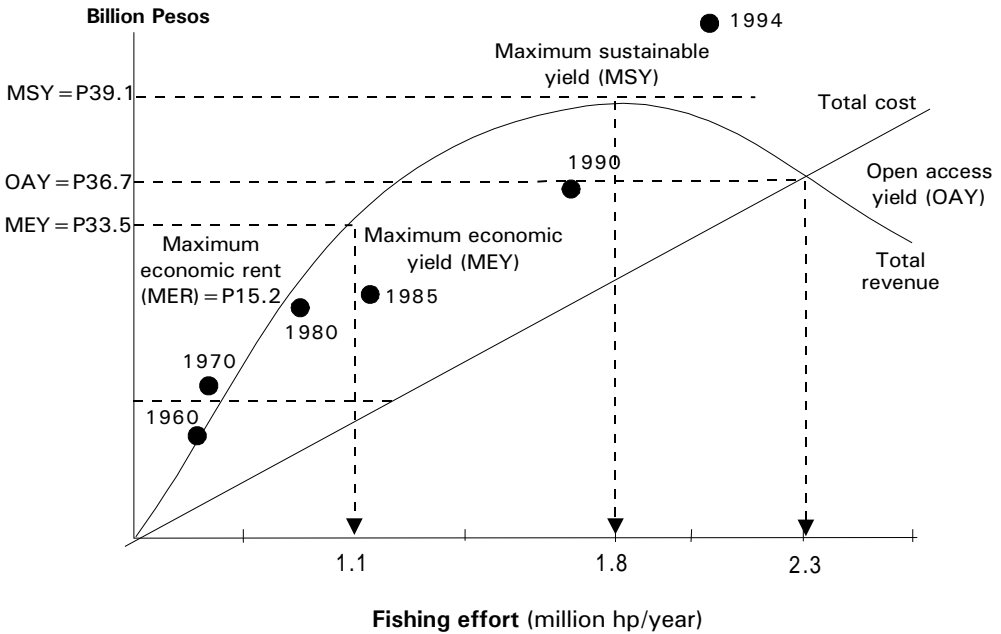
Note: MEY and MSY and the corresponding levels of effort have both been attained in the 1970s. Open-access equilibrium has been reached in the early 1980s. Note the same catch level can be attained at a level of effort corresponding to MEY<sup>110</sup>.

- majority of fishers are below the “official poverty level”;
- low catches and thus, economic returns from both commercial and municipal sectors; and
- increased competition between commercial and municipal sectors.

In 1996, Israel and Banzon<sup>62</sup> estimated the economic rent for all commercial fisheries rather than focusing on particular species groups. A biological surplus model was used to establish the relationship between total commercial fisheries catch and horsepower

(including engine and labor power as converted). The analysis yielded MSY levels at 785,706 t corresponding to a fishing effort level equivalent of 1,833,191 hp and a value of P39.1 billion (Figure 4.5). Meanwhile, the maximum economic rent (MER) at MEY and MSY levels are P15.2 billion and P9.7 billion, respectively. In terms of volume of fish production, the MER corresponds to about 306,000 t of fish. It can further be inferred that the MSY was attained in the early 1990s and the MER during the late 1980s. This means that the degree of overfishing has worsened since 1990 with long-term implications which, although not fully known, will mean a decrease in the total fish production for the country.

**Figure 4.5. Actual (indicated by dots) and estimated (curves) values of all commercial fish production in relation to fishing effort, 1948-1994<sup>62</sup>.**



Note: The estimates also yield three important management parameters: MSY, MEY and OAY. The difference between revenue and cost curves also show potential benefits if the fishery were operating at MEY and the reduction of fishing effort necessary to attain this level which is about 50%.

## WHAT IS LOST FROM USING DESTRUCTIVE FISHING METHODS?

Fishing methods destructive to fish population and habitats include use of cyanide, fine mesh nets, drive in techniques using rocks and poles and blast or dynamite fishing. Cyanide-laced fish are a hazard to the health of prospective consumers while the cyanide also kills much invertebrate life in the coral habitat. Blast fishing physically destroys wide areas of reef habitat and the vertebrae structure of fish as well. Despite the ill effects of these methods and the promulgation of national laws to stop them<sup>41</sup>, these fishing practices persist.

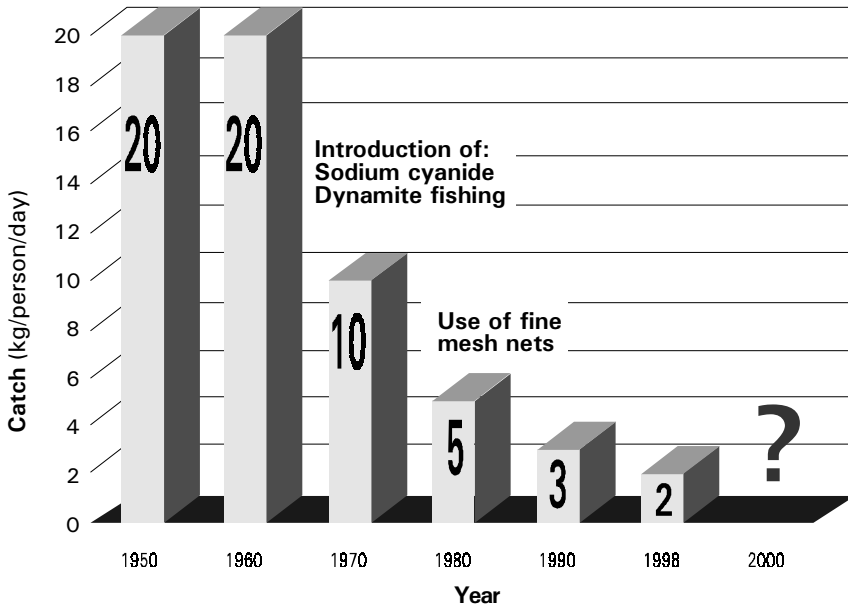
One reason is the “cost-efficiency” of these methods. For example, cost and returns analysis of municipal fishing gear in Lingayen Gulf show the relative efficiency of dynamite fishing compared to other traditional gear (Table 4.3). Moreover, dynamite fishers are known to spend shorter working hours with a maximum of 8 hours at sea compared to bottom set gillnet and dredge net fishers who work 12 hours or more. Thus, short-term financial profitability and labor productivity are relatively higher for dynamite fishers. Of course, the down side of this “efficiency” is that eventually there will be few fish left to catch as shown in Figure 4.6 where for one barangay on Olango Island, Cebu, the catch per person per day has decreased from about 20 kg in 1950 to 2 kg in 1998.

**Table 4.3. Total cost, catch volume and net returns per fishing day for selected municipal fishing gear in Lingayen Gulf, Philippines.**

Gear type	Average total cost (pesos)	Average total volume (kg)	Net returns (pesos)
Bottom set gillnet	88.2	5.6	-4.1
Baby trawl	148.4	9.0	30.4
Lift net	140.1	15.5	17.9
Dynamite	110.7	10.4	62.6

US\$1 = 20 pesos in 1988

**Figure 4.6. Trend of catch per unit effort for one barangay, Olango Island, Cebu, Philippines.**



What does the long-term scenario look like? What are the risks associated with dynamite fishing both for the fisher and for the environment? Cases of fishers being maimed or at worse, dying from dynamite-related accidents are rife. Situations such as these decrease, if not totally eradicate, fisher productivity. Simply put, expected net returns would be zero. The greater risk associated with dynamite fishing is destruction to sensitive habitats such as coral reefs. Assuming a conservative decline of 20% in volume of catch, the net returns would drop by more than 70%<sup>9</sup>.

Dynamite fishing indiscriminately destroys not just fish habitats but juveniles as well. Growth overfishing is the resultant problem which is similar to the case when fine mesh nets are used. BEAR estimates a reduction of 10-20% in potential nearshore fish yield when fine mesh nets are used<sup>21</sup>.

By considering the associated risks of dynamite fishing and use of fine mesh nets on human safety and health of the environment, these fishing practices become much inferior to traditional gear. In areas where all destructive methods have been stopped, fish catch using traditional gear have increased markedly.

Impacts of destructive fishing practices on the environment are felt in the long term. The impacts tend to be irreversible with the continued decline in net returns for dynamite or cyanide fishing. Likewise, the need to integrate fisheries management cannot be overemphasized since no amount of enforcement on dynamite fishing will result in overall benefits if fishing effort is, at the same time, not maintained at rational and sustainable levels.

