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A Review on Trash Fish Production and Fish Feed Requirements of the Philippines

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Introduction

"Trash fish", as commonly defined, is that portion of the catch that by virtue of their small size or low consumer preference has little or no value (Sugiyama *et al* 2004). Still, this definition and the use of the term "trash fish" vary from country to country. Ordońez (1981) in his study of the trash fish caught by otter trawl in the Visayan sea in the Philippines identified "trash fish" as that portion of the bottom trawl catch, mainly composed of the young or juveniles of commercially important fish species, as well as both the young and adults of lesser known food fish species. They belong to the lowest category in the commercial classification of trawl caught fish, hence, having the least market value. In other countries, "trash fish" is also called "scrap fish", "waste fish", or "industrial fish" when processed into products for human consumption and other industrial uses (Ordońez 1981).

In the early days of trawling, large quantity of trash fish were being thrown overboard to free some space in the fish hold of trawlers for the more valuable and highly priced fish species caught. At present, however, because of the decline in biomass of trawlable and commercially important fish species such as the demersal stocks (Armada 2004) and the small pelagic stocks (Zaragoza *et al* 2004), trash fish has gained some degree of importance especially in the third world countries, for domestic/household consumption and as raw material for locally process fishery products (fish sauce, dried fish, etc.) and fish meal.

"Trash fish" are also supplied as fresh feeds to carnivorous species being cultured such as shrimp, grouper, seabass, and crabs. The availability, however, is seasonal and only in certain areas of the country (Cruz 1997). Other finfishes cultured were supplied with fish feeds, whose major feedstuffs, including fishmeal, were mainly imported. There is no record yet of local fishmeal production, which depends mainly on the use of tuna or sardine cannery rejects and by-products (Cruz 1997).

Marine fisheries production

The country's marine fisheries provide various economic and social benefits (Luna *et al* 2004). In 2003, the sector (commercial and marine municipal fisheries) produced 2.03 million tonnes of fish and invertebrates (Table 1), with a total value of P79 billion (BAS 2004). The volume is 56% of the total 2003 fisheries production. The sector also brought in at least P11.5 billion in foreign exchange as export, consisting mainly tuna, octopus, crab and crab fat surged by 7.5% from the 2001 value. In addition, the sector also directly employed more than 700,000 fishers based on the 1997 data. The top 30 species produced in commercial fisheries (similar species found in marine municipal) are listed in Table 2.

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Table 1. Volume (MT) of Production by Sector, Philippines, 2001-2003

Sector	2001	2002	2003
Commercial	976,539	1,042,193	1,109,636
Municipal			
-Marine	833,188	857,292	921,851
-Inland	136,347	131,644	133,292
Aquaculture	1,220,456	1,338,393	1,454,503.4
All Sectors	**3,166,530**	**3,369,524**	**3,619,282.4**

Source: Fisheries Statistics of the Philippines 2001-2003, Vol. 12 (BAS)

Table 2. Commercial Fisheries: Volume (MT) of Production of Top 30 Species, Philippines, 2001-2003

Species	2001	2002	2003
ALL SPECIES	**976,539**	**1,042,193**	**1,109,636**
TOTAL 30 SPECIES	**914,225**	**959,525**	**1,032,441**
% Share of 30 Species	**93.62**	**92.07**	**93.04**
1. Roundscad	250,679	234,230	254,659
2. Indian sardines	153,741	145,879	130,024
3. Skipjack	80,766	83,385	114,077
4. Frigate tuna	60,032	100,958	114,760
5. Fimbriated sardines	50,935	35,110	36,358
6. Yellowfin tuna	49,055	63,051	87,473
7. Anchovies	39,191	33,706	28,654
8. Slipmouth	38,722	37,768	36,313
9. Big-eyed scad	36,596	38,889	39,621
10. Indian mackerel	31,084	30,846	32,037
11. Eastern little tuna	20,634	26,811	27,036
12. Indo-pacific mackerel	15,605	18,389	20,502
13. Squid	14,177	16,616	15,365
14. Crevalle	11,128	14,628	14,077
15. Round herring	10,785	7,655	7,973
16. Acetes	9,031	7,907	5,890
17. Flying fish	7,060	12,539	14,678
18. Threadfin bream	6,931	12,834	13,817
19. Caesio	6,047	5,841	6,062
20. Goatfish	5,992	11,262	10,389
21. Cavalla	3,098	2,370	3,150
22. Hairtail	2,640	3,319	3,427
23. Mullet	1,992	1,954	2,179
24. Spanish mackerel	1,735	2,429	2,790
25. Grouper	1,746	3,441	3,359
26. Snapper	1,202	2,132	2,067
27. Siganid	1,194	947	1,103
28. Blue crab	1,053	1,444	1,587
29. Parrot fish	395	620	656
30. Porgies	259	2,565	2,358
31. Other species	62,314	82,668	77,195

Source: Fisheries Statistics of the Philippines 2001-2003, Vol. 12 (BAS)

Aquaculture production

In 2003, 40% of the total fisheries production of the Philippines was contributed by aquaculture. This sector posted a yearly growth of 9.2% since 2001 (Table 3). Aquaculture production mainly came from various culture systems, as shown in Table 3, involving milkfish, tilapia, and other non-traditional, high value species such as grouper, siganids, snapper, shrimp, mud crabs, spiny lobster, and others. Of the total aquaculture production, however, seaweed culture contributed more than 64 percent.

Table 3. Volume (MT) of Aquaculture Production by Culture System, Philippines 2001-2003

Culture system	2001	2002	2003
Brackishwater fish cage	2,943.0	3,333.0	5,362.4
Brackishwater fish pen	3,909.0	4,437.0	4,382.1
Brackiswater fishpond	261,268.0	246,397.0	244,999.4
Freshwater fish cage	42,061.0	49,657.0	52,832.4
Freshwater fish pen	23,927.0	27,468.0	35,875.7
Freshwater fishpond	57,678.0	70,249.0	71,970.0
Marine fish cage	4,582.0	8,664.9	12,120.5
Marine fish pen	5,738.0	9,113.2	10,073.0
Oyster	19,042.0	12,570.0	14,509.6
Mussel	13,513.0	11,646.0	13,490.1
Seaweed	785,795.0	894,857.0	988,888.2
TOTAL aquaculture	**1,220,456.0**	**1,338,393.0**	**1,454,503.4**

Source: Fisheries Statistics of the Philippines 2001-2003, Vol. 12 (BAS)

Aquaculture feed production

Cruz (1997) generally classified aquaculture feeds in the Philippines into hatchery feeds, growout feeds, and unprocessed feeds. Brine shrimp eggs and microencapsulated larval diets are the most widely used hatchery feeds, with the shrimp industry consuming the bulk of it. All are currently being imported. Growout feeds were further classified into fish feeds, which were locally produced and used primarily for tilapia and milkfish culture, and the shrimp feeds.

Unprocessed feeds are those simple feeds or single ingredient feeds that are usually used in extensive milkfish and tilapia culture. Among them are the rice bran, bakery wastes and rejects of processed cereals for human consumption. Another form of unprocessed feeds is fresh feeds, which is composed of "trash fish" used for the culture of carnivorous species such as shrimp, grouper, seabass and crabs.

Although several aquafeeds are locally produced, majority of the feedstuffs used are imported. This is so despite the country's vast marine fisheries resources (Cruz 1997). For instance, the country's fish meal importation for 2003 was 44,567 metric tonnes. Although there is a significant reduction in this volume based on the 2001 fish meal importation of 84,546 metric tonnes, it remained as the countries top imported fishery product. The country's estimated commercial aquaculture feed use in 1995 is shown in Table 4.

Table 4. Estimated commercial aquaculture feed use in the Philippines in 1995

Species	Annual feed consumption (MT)	Percent of Total
Tilapia	70,000	47.3
Milkfish	50,000	33.8
Shrimp	25,000	16.9
Others[1]	3,000	2.0
Total	**148,000**	**100**

[1] mainly catfish (*Clarias gariepinus* and *Pangasius hypothalamus*)
Source: modified from Cruz (1997)

General Discussion

Limited information on "trash fish"

Although "trash fish" has been widely used as fresh feeds to carnivorous fish species in aquaculture, and to some extent were used to manufacture local fish meal, the information on the volume of "trash fish" being landed and consumed, for whatever purpose, is still very limited. However, the Food and Agriculture Organization (FAO, 2004) estimated that the use of "trash fish" for aquaculture in the Philippines currently stands at 144,638 tonnes, of which 80% is used for marine cage culture. The figure represents 7% of the national marine fisheries production in 2003.

With the present fisheries statistical system, it is difficult to approximate, if not pinpoint, the actual trash fish production in the country mainly because there is no entry as to how much of the landed catch or which particular species caught belong to the category of "trash fish" or can be considered as "trash fish". What was reflected in the National Fisheries Statistics are volumes of major commercially important species landed, irregardless of their physical state or condition as a result of poor state of preservation and handling onboard, or their being juveniles or young, and a particular entry for "other species" (as shown in table 2). The "other species" could be interpreted also as those commercially important species that by virtue of their insignificant volume, were lumped together under the "other species" category, or otherwise assumed as those species with lesser value, hence, "trash fish". This, however, is still not clear.

The study of Ordońez (1981) on the "trash fish" caught by otter trawl in the Visayan Sea revealed that 21.6% of the total trawl catch during the nine-month study period, were "trash fish". The top three "commercially" important species, which were classified as "trash fish" are the flatheads (*Platycephalus* spp.), slipmouths and lizardfishes. The pufferfishes, cardinal fishes and the gurnards topped the list of the "non-commercial" "trash fish" groups. Following this study, another limitation of the present fisheries production data with regards to the determination of "trash fish" production is that there is no readily available information as to how much of the total marine fisheries produced were actually contributed by specific fishing gear such as trawl and other gears that due to their design and mode of operation are inevitably catching "trash fish".

"Trash fish" as raw material for locally produced fishmeal

In the Aquaculture feed and fertilizer resource atlas of the Philippines, Cruz (1997) pointed out that most of the locally produced fishmeal are by-products in the canning of tuna and sardines and consists of heads, internal organs, scraps, black meat, bones, tail, and reject/spoiling fish. However, when compared with imported fishmeal, the quality of local fishmeal, including protein level, quality and freshness, is generally low and inconsistent. Some fishmeal manufacturers use spoiled fish obtained from fish landing sites or fish markets while village level fishmeal is produced from salted sun-dried fish. These quality aspects are very important for aquafeeds, which use between 12-35% fishmeal, hence, the risk of encountering dietary problems when using locally produced fishmeal is high.

There were already attempts, during the 1950s and 1970s, to develop the local fishmeal manufacturing industry using whole fish but due to the high price of raw materials, the plan never materialized. The prospects of a fishmeal manufacturing industry in even more uncertain today with increasingly limiting fish resources and a much higher price of raw materials. These, and the government's thrust in improving handling, processing, and utilization of fish for human consumption, will make the supply of fishmeal even more limited and the growing demand for fishmeal will therefore have to depend upon the imported supplies.

However, the country's importation of fishmeal was seen to have dropped considerably since 1994 when total fishmeal imports reached 111,147 metric tonnes (Cruz 1997) as compared to the 2003 fishmeal importation of 44,567 metric tonnes (BAS 2004). Interestingly, aquaculture production from the different culture systems increased between those periods.

On a global scale, while the demand for fishmeal for the aquaculture industry will continue to increase, the use of fishmeal for poultry industry is projected to drastically reduce, hence, there will be sufficient fishmeal for aquaculture until 2020 and beyond (Hasan 2001).

"Trash fish" no more

Yet, another assertion especially by the developing countries is that almost all fish caught are now being consumed. That could also be true for the Philippines. In recent times, because of the apparent decline in catches of commercially important food fish, the "trash fish", aside from being consumed directly, has attracted greater attention as raw material for locally processed fishery products such as fish sauce, dried fish, and fishmeal. Due to the prevailing poverty incidence in fishing communities, the utilization of "trash fish" has increasingly gained importance among small fishermen and even big processing establishments.

Socio-economic and management implications

The economic benefits on the use of "trash fish" are yet to be comprehensively documented. However, the fact that "trash fish" are already being consumed especially by the poorer segments of the community on the bases of their being cheap yet a good source of protein, implies the need for a sound management measure in order to maintain a delicate balance between the need to ensure continued supply of food especially to that poorer segment of the community, and the need to protect the resources for long-term sustainability.

As elaborated by Ordońez (1981), trash fish is categorized into two groupings. One grouping referred to as "commercial" or temporary members of the "trash fish" component, which is composed entirely of juveniles or early adult stages of commercially important species. The other grouping is referred to as "non-commercial" or permanent component of the "trash fish" catch because it is made up of both the young and adults of lesser known species. The general nature of trawl fishery being a multi-species, therefore, poses difficulties related to management measures. The trawl catch, being composed of fishes having different size, shape and stage and sexual maturity characteristics makes the imposition of mesh size regulation difficult. For instance, while the regulation would allow the catching of marketable sizes of fishes, thus allowing the small once to grow leaves the other species that are naturally small at maturity as unutilized resource. However, to allow the use of smaller meshed nets to catch the small and mature fish would result in the catching of immature sizes of the commercially important species.

In this particular situation, it would be necessary to determine the relative economic value of various sizes of fish caught in the same fishing gear and operation and the role of various species in the entire ecosystem to know the course of resource management.

Recommendations

In the Philippines, before any management measures as regard to "trash fish" can be taken in effect, it is important to have a clearer picture of the status and trend of "trash fish" landings nationwide. Hence, the following activities are recommended to be undertaken:

- comprehensive and systematic data collection and recording of "trash fish" landings nationwide to determine the extent of fishing;
- proper identification of these "trash fish" and when necessary, conduct a research on their biology and behavior;
- inventory of trawl and other gears that are catching "trash fish";
- gather data on the current usage of "trash fish" in aquaculture;
- socio-economic survey and analysis on the benefits and losses of catching "trash fish" for aquaculture and when they are allowed to grow to marketable sizes;
- updating of available information on aquaculture feed production and consumption as it relates to the sourcing of raw materials (trash fish) for the production of local fish meal;

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