

AN OVERVIEW OF THE PHILIPPINE MARINE AQUARIUM FISH INDUSTRY

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ABSTRACT

The Philippine marine aquarium fish industry utilizes 386 species of coral reef fishes belonging to 79 families. Information on the number coral reef fish species utilized, was gathered from export lists and from surveys among marine aquarists and exporters. These were entered in the Philippine Aquaristics Database and were cross checked with the global database of the world's fishes, FishBase for accuracy. The viability of the industry rests on exporters being able to supply a range of species to world markets. The major concern among exporters is the perceived decrease in catches of valuable species and potential loss of variety. Other concerns include post-capture mortality due to handling and transport stresses. A recommendation is presented for a sustainable approach to managing this coral reef fishery. The growth of the market for coral reef aquaria has caused a huge increase in trade of coral reef invertebrates including live corals.

INTRODUCTION

The Philippines is a major exporter of marine aquarium fish, invertebrates and plants for the global aquarium industry and trade, supplying an estimated 75-80% of the market (Rubec 1988). Albaladejo and Corpuz (1981) proposed further assessment of the trade. Since this paper was published, the nature of the international aquarium trade has changed. In 1981, the marine tropical aquarium trade focused almost exclusively on fish. At present there is a larger base of products for the industry, with invertebrates making up approximately 20% of products traded. This paper assesses Philippine marine aquarium fisheries at this time of change.

LOCATION OF PHILIPPINE AQUARIUM FISHERIES AND THEIR METHODS

Marine aquarium fisheries are found throughout the Philippine archipelago, with most on the western side (Fig. 1). Albaladejo and Corpuz (1981) describe the process of capture and trade in three major areas of collection: Bolinao, Pangasinan Province, Pagbilao, Quezon Province and Cebu in the central Visayas region.

The present methods of capture and transport remain essentially as described by Albaladejo and Corpuz (1981). An estimated total of 2500 aquarium fish collectors are employed full-time or part-time in collecting areas (Pajaro 1993). Cyanide use is rampant and has become a routine for many collectors (Hingco and Rivera 1991). Several non-governmental organizations, such as the International Marineline Alliance (IMA) and Haribon Foundation have been involved in training fishers to use fine meshed barrier nets as part of a program to persuade them to abandon using sodium cyanide (Hingco and Rivera 1991; Buhat 1994; Pratt 1996). However, collectors who have shifted to the use of nets admit that they still use cyanide for prime species such as angelfishes.

Hingco and Rivera (1991) described the aquarium fish collecting process in Bolinao, Pangasinan. In Zambales province, shallow water collectors are known as "mano-mano" or hand netters while those operating in deepwater are "compressor" collectors, breathing through airlines from a compressor mounted on a boat. Cyanide use is prevalent in both kinds of operations.

This paper provides an update on the paper of Albaladejo and Corpuz (1981) with information on aquarium fisheries in the country, including the domestic market.

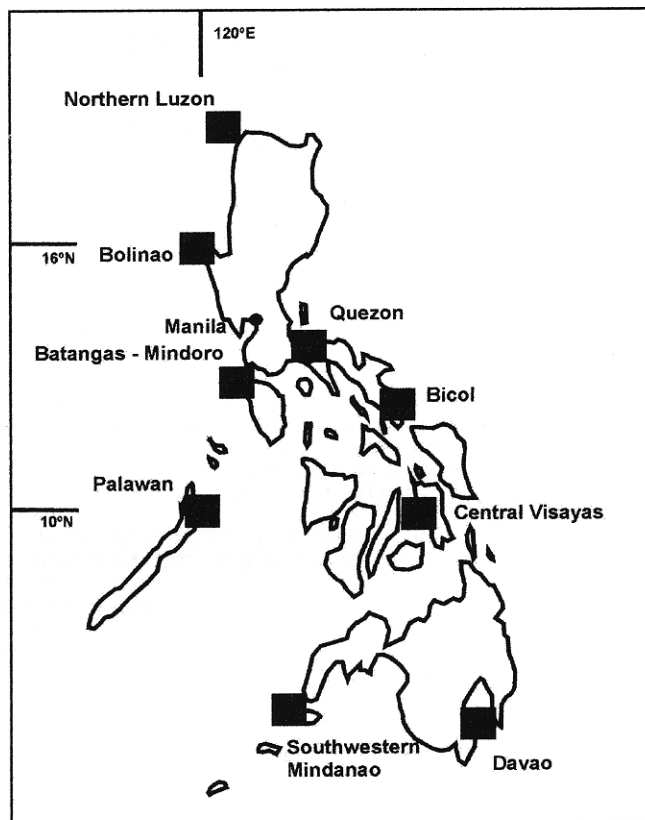


Fig. 1: Major marine aquarium fish collecting areas in the Philippines.

METHODS

Information was obtained from a survey among 65 Philippine marine aquarists, informal standardized interviews with 20 exporters and field buyers and membership forms of the Aquarium Science Association of the Philippines, Inc. (ASAP). Export related statistics were obtained from published statistical reports of the Bureau of Fisheries and Aquatic Resources (BFAR) and the International Marineline Alliance-Philippines (IMA) (BFAR 1994; IMA 1995). Export lists were obtained from known exporters, who cooperated in this study. Marine aquarists provided a list of species of invertebrates and fish they keep. Since exporters and aquarists commonly used English common names, export lists were standardized and scientific and aquarium trade names verified and cross checked using FishBase (Froese and Pauly 1995) and the ASAP Philippine Aquaristics Database (Sonido and Vallejo 1994) to estimate the number of species used.

RESULTS

Diversity of species used

Based on the exporters and hobbyist lists, there are 386 species of fish belonging to 79 families utilized by the trade. The major families utilized in the Philippines are the Pomacentridae (59 species), Labridae (46 species), Chaetodontidae (41 species) and Pomacanthidae (25 species).

Exports of marine aquarium fish from the Philippines

Based on the information presented by the IMA, there were 45 active marine fish exporters in 1995, mostly based in metropolitan Manila.

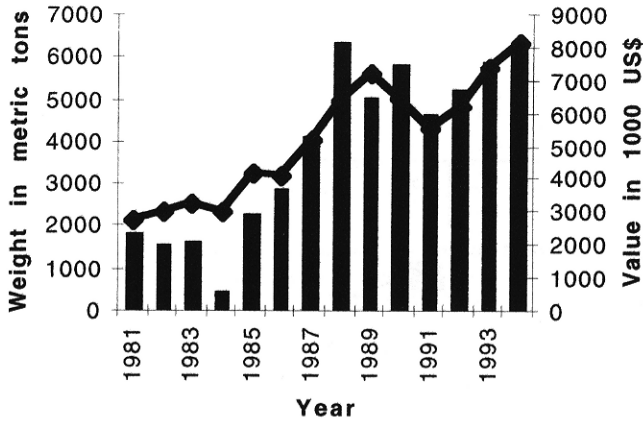


Fig. 2: Exports of marine aquarium fishes from 1981-1994. Bars: exports. Diamonds: value. Source BFAR: (1994).

Information obtained from the Philippine Bureau of Fisheries and Aquatic Resources is presented in Fig. 2. Export dropped in 1984 and then rapidly increased until 1988 when production peaked and then remained stable thereafter. The rapid increase in exports coincided with the increasing popularity of reef aquaria in the late 1980s.

The major export market is still the United States, which amounts for over 50% of total exports. The total export value of marine aquarium fishes averaged 6.76 million US dollars from 1990-1994 (BFAR 1994). Prices of marine aquarium fishes vary with the marine angelfishes (Pomacanthidae) being the most expensive, prime species. Their export prices range from P 50.00 to P650.00 (US\$ 3.00-30.00), with the large angelfish priced in the upper range. The export price of the uncommon majestic angelfish (*Pomacanthus navarchus*) is US\$ 35.00 at present.

Prices are dictated by exporters and middlemen. Export and retail prices range from 100-400% higher than the selling price of the collector. However, collectors have a smaller business risk than the exporters, who risk a large mortality from transport and handling (Abraham 1996). Middlemen bring fishes to exporters in Manila where they are graded upon arrival by size, quality and condition.

Fish are exported within 3 days from arrival in the holding facility. Export lists with scientific and common names are usually required by the importers. Those which are not shipped are commonly sold in retail outlets in Manila to avoid losses.

None of the fish species exported is listed under the Convention on International Trade of Endangered Species (CITES). However, stony corals, octocorals and tridacnid clams are listed and the export of these is prohibited under CITES and Philippine Presidential Decrees 1219 and 1698.

Information provided by the IMA in Manila shows that live fish (serranids and aquarium fish) export volumes tend to decrease during the period of the southwest monsoon, from June to October (Fig. 3). Volumes reported by IMA are live fish weights excluding packing water. The reason is that most collecting grounds are located in the western side of the archipelago and are exposed to these weather conditions. Export volumes peak during the dry season months from November to April.

The domestic aquarium market

Albaladejo and Corpuz (1981) observed that the domestic aquarium market has great potential. Their prediction has proven true as many new aquarium stores have been proliferating in metropolitan Manila and in the major urban centers such as Cebu, Bacolod, Batangas City and Davao.

Eighty people responded to the hobbyist surveys. In 1992 around 35% of the aquarists surveyed maintained inverte-

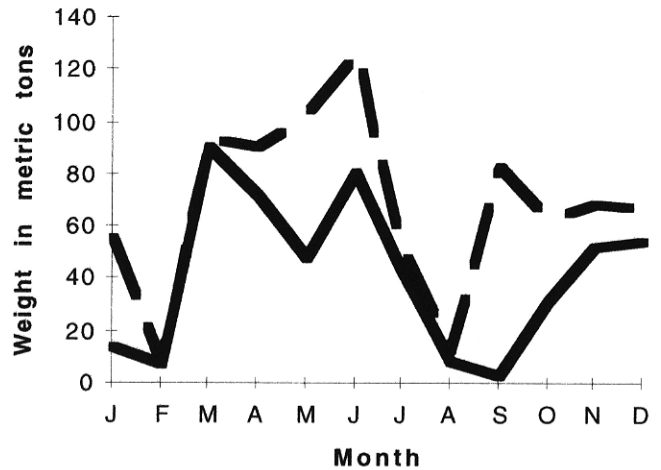


Fig. 3: Exports of live marine fish through the Ninoy Aquino International Airport in Manila during 1994. Serranid data are presented to show similar temporal trends. Solid line: aquarium fish. Dashed line: serranids. Source: IMA (1995)

brate or reef aquaria. In 1993, the number rose to 80% and in 1995, almost all of the aquarists surveyed kept reef aquaria.

These results reflect an increased demand for coral reef invertebrates including live corals. From reports gathered from retailers, the author estimates, that in 1993, in the major market for these products in Manila, the sales of live corals averaged 500-650 kg a week. The 1995 estimate is 1,100 kg per week. Around 100-150 pieces of live corals are marketed every week. The most commonly sold are caryophyllids like *Euphyllia sp.* and *Catalphyllia jardinei*. Local collectors also make a larger profit in the growing domestic market, which demands quality specimens. They sell their products direct to retailers or hobbyists.

The availability of these products is seasonal: as with the export sector, supplies are low during the period of the southwest monsoon, from June to September. Prices of single coral colonies are from P 75.00 - P 150.00 (US\$ 3.00-6.00). Coralline rock is sold by wet weight at P 25.00 (US\$ 1.00) per kg. The trade in corals and coral products is illegal in the Philippines.

The demand for quality reef fishes and invertebrates has led some entrepreneurs to import these from the Red Sea and the Caribbean.

From survey forms and from membership application forms of the ASAP, the average hobbyist is a young male professional, 27 years old with managerial responsibilities and spends an average of P 500.00 (US\$ 25.00) a month on marine aquarium products which is a large sum in the Philippines, to purchase quality products.

Almost all equipment not the corals and the fish needed for a successful marine aquarium are still imported. However, with a more liberalized trade environment, many of these products are now affordable to a greater number of people. This ensures that the market will grow.

MAJOR CONCERNS

Industry concerns

Table 1 summarizes the concerns of exporters and retailers. All exporters interviewed expressed concern about the availability of prime species and the perceived decrease in catches. As prime species like angelfishes become scarce, the prices become higher. Philippine exporters are concerned over the lower prices of Indonesian fish. A blue faced angelfish *Pomacanthus xanthurus* costs US\$ 15.00 in Jakarta versus US\$ 25.00 in Manila.

Table 1: Concerns among Filipino exporters and retailers.

General concerns	Specific concern
1. Lack of supply and varieties	Hard to meet export quotas Prime species are always lacking in supply.
2. Uncompetitive prices	Indonesian fishes are cheaper.
3. Collection and transport	Traffic, poor road conditions.
4. Mortalities	Mortalities in holding facilities. Proper aquarium management.
5. Lack of government assistance and support	Inadequate facilities in the international airport. No tax incentives.
6. Restrictive legislation and ordinances	Proposed bills in the national legislature banning aquarium fish collecting. Local Government Code empowers regional and local governments to restrict collection. Possible restrictions in the aquarium trade overseas.

High mortality rates from capture to the holding facility are a perennial source of concern for most exporters. Mortality rates of 30%-40% in the holding facilities are commonly reported. This is much higher than the 10% estimated by Wood (1985) and the 10%-20% estimate by Sadovy (1992) in other aquarium fish exporting countries. This is the result of transport and handling stresses, poor water quality due to overcrowding and deficient biological filtration, and diseases which result from improper aquarium management. The unavailability of transport from the points of collection and the difficult journey to Manila also are important factors and contribute to the high mortality rates.

Exporters have voiced concern about the lack of government incentives and assistance to the industry. Exporters have identified the inadequacy of cargo handling and weighing facilities in the international airport as a major problem. They have also suggested that the government should give assistance in the form of tax incentives and declare the industry as a priority area for development.

Exporters have expressed concern over conflicts with regard to aquarium fishing grounds. The negative image of the industry, because of the use of destructive methods such as sodium cyanide has prompted several coastal communities to deny aquarium fishers access to their waters. In some cases in the Bolinao-Zambales area, the aquarium fishers are migrants from the Visayas and language and cultural differences have led to conflicts. The political leadership of these communities has taken legal steps to prevent the operations of aquarium fish collectors and exporters. This is within their powers as stipulated in the Local Government Code. Several proposed bills of national application in the Philippine Congress aim to restrict the collection of live fish for export and thus restrict the aquarium fish industry.

Concerns among aquarists

Table 2. summarizes the concerns of Filipino marine aquarists. These concerns are caused by the relatively high mortality experienced by aquarists, which averages from 40% to 50%. As the main concern is to reduce mortality,

aquarists are willing to spend on good equipment and high quality specimens.

The concerns of aquarists focus on proper aquarium management so that mortalities can be minimized. Cox (1967) classified aquarium systems as natural, semi-natural and clinical based on the technology employed in water quality management. The system used by most aquarists surveyed in this study is known as the "Berlin System" a modification of the natural system aquarium (Carlson 1987; Delbeek and Sprung 1992). This system requires the use of high intensity lighting, foam fractionators and the addition of trace elements and calcium carbonate.

The specific concerns of aquarists on aquarium management techniques are on effective lighting, trace element addition and water quality management. Information on these topics is not readily available in the Philippines except through the ASAP.

The quality of specimens on purchase remains a major concern. Aquarists are willing to pay a high price for guaranteed net-caught fish and those which have been properly acclimated and quarantined. Their experience is that these fish survive longer.

Ensuring survival in captivity

The major cause of high mortality is a failure in aquarium management as a result of overcrowding, poor water quality management and disease treatment (Abraham 1996). These may compound the effects of poor handling and the permanent damaging effects of cyanide exposure. Advances in aquarium technology have improved the success rate in keeping marine organisms, but there is still a need for both hobbyists and exporters to standardize techniques. Collection by non-destructive methods, proper handling and packing techniques need to be used in order to improve survival. There is also a need to identify suitable species for aquarium culture. Wood (1992) proposed eco-labeling, a product labeling guide that will assist hobbyists and retailers in making environmentally responsible decisions on purchases. Eco-labeling guarantees that appropriate methods have been used for the capture, transport, and handling of the organisms and assures the purchaser their adaptability to captivity. It also excludes species with little chance of survival in captivity as well as those with conservation problems.

Eco-labeling has not yet been implemented in the Philippines but it is one of the major projects of ASAP for 1996-1997. ASAP is drawing up an eco-labeling criteria that will guide hobbyists and retailers in selling and purchasing of freshwater and marine aquarium specimens.

Education and awareness building are crucial to ensuring success. Education and training programs can be geared to the industry's different sectors with proper emphasis on

Table 2: Concerns among Filipino marine aquarists.

General concerns	Specific concerns
1. Aquarium management	Water quality management. Use of proper equipment.
2. Quality of fish on purchase	Mortalities. Getting cyanide free fish.
3. How to keep marine invertebrates	Recommended corals for the aquarium. What aquarium system to adopt.
4. Diseases and quarantine	The proper quarantine and acclimation protocols.
5. Information on techniques	Effective lighting and trace element addition.

their concerns. An example is a proposed program to improve quarantine and handling in export facilities.

THE FUTURE

Integrating management strategies

The aim of management is to ensure the sustainable use of resources in the manner that does not damage the environment and minimizes user conflict (Sadovy 1992). In the aquarium trade, management must take into consideration the whole range of activities from collection to aquarium rearing by the hobbyist. The main issue with regards to these activities is survival in captivity (Sadovy 1992).

A management plan is needed that would focus on two aspects. The first deals with reducing wastage in all aspects of the trade and hobby and thereby improving aquarium management in all stages of the process. This will include reducing mortality from capture to culture by establishing handling and transport protocols and training handlers and retailers. On the hobbyist and retailing side, educational programs need to be designed to instill a sense of responsibility in using coral reef resources. Central to the success of this is an eco-labeling program.

The second aspect of management deals with the capture fishery itself. Albaladejo and Corpuz (1981) reported stiff competition among exporters. This is true at present and will intensify in the future as some species become harder to obtain. The recommendations of Albaladejo and Corpuz (1981) for a mechanism of accrediting exporters and collectors and for providing government incentives are still valid. Registered collectors should be required to submit monthly reports of catch composition and numbers.

There is a need to be minimum and maximum size limits of fish that can be traded and exported. The author has noted large numbers of juveniles smaller than 2 cm being exported and traded. Fishes of this size are inherently difficult to keep in captivity due to their dietary requirements and low resistance to transport and handling stresses.

There is also a need to provide incentives to all sectors of the industry, from the collector who needs a mechanism to get the best possible price to the exporter who needs better facilities and government export incentives. An accreditation scheme for collectors by organizing them into cooperatives would improve their economic viability and management of resources. On the hobbyist side, a strong network of aquarium societies duly recognized by the authorities and linked to a national aquarium society, such as ASAP, would enable the implementation of conservation and education programs to ensure responsible aquarium keeping.

The possibility of integrating aquarium species collection as an allowable activity in planning marine protected areas needs to be studied. Randall (1987) reported that non-destructive collection methods have very little effect on the populations of target species assuming that these are not recruitment limited. As a low intensity and regulated activity, aquarium fish collection may be allowed adjacent to marine reserves and in areas reserved for non-destructive exploitation. Coral reef species mariculture and sea ranching of juvenile fishes may be integrated with coastal productivity programs provided that a legal framework and assessments of potential environmental effects is in place to govern these activities.

There is a need for information on catch per unit effort, recruitment, abundance and general biology of the various exploited species as well as the long-term effects of collection in order to have an idea of the state of the fishery and the needed strategy for management.

Future prospects for the industry in the Philippines

The growth of a domestic aquarium industry may enable collectors to sell their products directly to hobbyists at a higher price. Although the domestic market still remains small, there is a large possibility that this market will

further increase in the next 3-5 years. The growth of this market and its effects on the whole aquarium industry as a whole needs further study.

While there is no clear evidence of a collapse of an aquarium fishery in any collecting area in the Philippines, there is a need for a countrywide assessment of the fishery, to survey the resources exploited and to evaluate the perceived loss of biodiversity. Whereas Albaladejo and Corpuz (1981) reported 4 main areas of collecting, there are at least 8 areas where aquarium fish are being collected. New areas have been exploited in the eastern side of the country and these provide species with a central Pacific distribution such as *Centropyge shepardii*, *C. loriculus* and *C. colini*. The new collecting areas may have contributed to the increased export volume the industry has experienced in the last 10 years in spite of the perceived decrease in the availability of many species. Localized extinction is possible for species with restricted distributions if fishing reduces populations to levels that do not guarantee successful recruitment (McManus et al. 1992).

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