An Analysis of the United States of America International Trade in Ornamental Fish

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SYNOPSIS

Households in the United States of America, Canada, Europe, and Japan are the principal keepers of ornamental fish in the world. Trade figures on the U.S.A. ornamental fish imports and exports indicates that this industry is consistently expanding. As import and export numbers and value of ornamental fish increase, the net trade deficit also continues to rise. Recently released figures, indicate imports of ornamental fish into the U.S. totalled $45.2 million in 1993, a 10% increase from 1992. Exports of ornamental fish totalled $17.3 million (5% higher than the previous year) for a net trade deficit of $27.9 million. This latter value is approximately a 13.9% net trade deficit increase from 1992.

Most ornamental (aquarium) fish sold through the pet trade are farm-raised freshwater species and imported from Southeast Asia. The second largest source of ornamental fish is South America where most species are collected from the wild. Florida is considered the major domestic source of farm-raised ornamental freshwater fishes.

Collection from the wild is the principal source of saltwater ornamental fishes. The Philippines and Indonesia are the main exporters of marine omamentals. In the U.S. saltwater ornamental fishes are primarily collected from the coastal waters of Florida and Hawaii.

Approximately 201 million fish valued at $44.7 million were declared as ornamental (tropical) imports during the year 1992. Freshwaster fishes account for approximately 96% and 80%, respectively, of the total volume and value of U.S. ornamental fish imports. Although marine fish have a high market value (20% of the declared value of the imports), the volume of these fish in the trade appears to have stabilized at around 4 % .

Of 1,539 species declared as ornamental fish, only 32 species dominate the trade. These are all of freshwater origin. The neon tetra and the guppy are the most popular ornamental fish kept in U.S. households. However, as more species become available (or cultured) a greater variety of species tend to penetrate the market. The average prices paid for imported ornamental freshwater fishes were 45 cents (egg layers) and 22 cents (live bearers).

Patterns of import and export trade activities indicate that Los Angeles (39% of all trade activity), Miami (22 %), New York (16%), Tampa (6 %), and Honolulu (6 %) are the major ports for distribution of ornamental fish in the United States of America.

Keywords: ornamental fish, imports, exports, value

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INTRODUCTION

Few studies and statistics exist to document the trade of the domestic or international market for ornamental (aquarium) fish (Andrews 1990, Ramsey 1985, Hemley 1984, Conroy 1975). The United States of America, however, is considered the largest market for ornamental fish in the world (Hemley 1984 and Conroy 1975). In 1993 the pet trade industry in the U.S. was worth an estimated $3.6 billion (Pet Dealer 1993). In 1992, the largest number of animals kept in American households were ornamental freshwater and marine fish (approx. 89 million), followed by cats and dogs (approx. 62 and 53 million, respectively). Of the present estimated 54 million pet-owning households, growth in ownership of ornamental freshwater and marine fish aquariums was the most impressive, from approximately 7 million households in 1988 to 10 million households in 1992 (Pet Business 1992; Pet Age 1992). The number of households owning cats and dogs (35 million) has leveled off. The canine population declined from approximately 54 million in 1990 to 53 million in 1992.

In this report trends in total import and export value of the U.S. trade of ornamental fish are reported. The number and value of the ornamental fish species most commonly imported into the U.S. are also examined.

The first part of the report details data sources and the problems in the data collection process over the time period of analyses. Trends in import and export trade activities are then discussed in two subsequent sections. A summary and inferences for future developments in the U.S. trade in ornamental fish are offered in each section.

DATA SOURCES

The data in this report were obtained from two major sources: 1) Trade information of U.S.A. import and export data compiled by the Bureau of the Census in the U.S. Department of Commerce, available in microfiche copies or CD-ROM files in the University of Florida library archives and 2) Analyzing the information recorded in the U.S. Fish and Wildlife Service Form 3-177, "Declaration for Importation or Exportation of Fish or Wildlife". The declaration of shipments (Form 3-177) to U.S. Custom's officials were obtained from the U.S. Department of the Interior, Fish and Wildlife Service, Division of Law Enforcement, through a Freedom of Information Act request.

Microfiche and CD-ROM files

The recording of import and export data for the United States has been, at least since 1982, the responsibility of the Bureau of the Census. These data are obtained from the declarations of shipments (e.g. Form 3-177) recorded with U.S. Custom's officials, as required by law for nearly all overseas transfers (U.S. Department of Commerce). Prior to 1989, the Bureau classified commodities and commodity groups using a 7-digit coding system. During this period, however, no specific category was establish to represent the imports and exports of ornamental fish. Rather, according to the Bureau, ornamental fish data were grouped in a more general category: "fish or shellfish-live-other than for human consumption" (7-digit code: 0340094). Also included in this grouping were live trout, live carp, live eels, and live fish. Based on data after 1989, when these other commodities were assigned separate codes, the import and export value of these commodities were relatively small when compared to ornamental fish. Therefore, while we cannot be certain of the actual numbers for ornamental fish

in the pre-1989 period, we can reasonably assume that imports and exports of ornamental fish accounted for the majority of the totals for this grouping. All of the data for the period 1982-1987 were obtained from microfiche copies of the monthly reports of imports and exports distributed by the Bureau, found in the University of Florida library archives.

The year 1988 was one of transition for the Bureau as a new, more complete lo-digit commodity coding system was being readied for use in the coming year. Using a modified 7-digit system, ornamental fish data for this year, were placed in the extremely broad category: "live animals- NSPF" (Code: 1009640). This grouping was apparently comprised of several different species. Because of the impossibility of obtaining an accurate measure of ornamental fish totals within this group, the data for 1988 was eliminated from our investigation.

In 1989 the Bureau employed the more detailed l0-digit coding system, with ornamental fish data now being placed in a separate category: "fish-ornamental-live" (10-digit code: 0301100000). Data for this period was obtained either directly from the Bureau (1989) or downloaded from CD-ROM files kept at the University library (1990-1992).

Form 3-177

Specific fish species entries were obtained directly from the U.S. Fish and Wildlife Service Form 3-177, "Declaration for importation or Exportation of Fish or Wildlife". A copy of one of the 3-177 forms is found in the Appendix. The declaration form 3-177 distinguishes if the fish are for import or export, and identifies the exporter and importer agents; the port of export and entry are also given. The form also identifies the quantity, scientific name, common name, domestic value, and country of origin of the fish species being traded. Data declared in a given shipment, however, was in many cases troublesome to interpret. The most difficulty was

in identifying the fish being traded. The scientific names, traditional common names and regional synonyms (for common names) were used to distinguish a particular fish species. Not all import declaration forms indicated if the species were cultured or collected from the wild so it was not possible to discern the culture origin of each species. Furthermore, the country of origin of the shipments was not always known since transhipments were often common.

Included in the declaration forms were invertebrates such as shrimps, corals, sea urchins, crabs and live rock. The total number and monetary value of these invertebrates were significantly low and not included in the analyses.

The species entry forms (3-177) analyzed for this report included only those for the month of October 1992. Ramsey (1985) conducted a similar study of ornamental fish imported by the United States of America during October 1971. This month, therefore, provided a comparison period for detecting major shifts in the trade after a 20 year period. Also, in terms of fish numbers and monetary values of the shipments, October represents an average season (Figure 3).

After the data collection process had been completed, monthly totals for each country and fish species were manually recorded in table form. The data was subsequently grouped by geographic regions (see Figure 1) to aid in determining the areas of the world most active in the ornamental fish trade. Prices for individual fish were derived from shipping invoices attached to each declaration of importation form. An overall average mean price and confidence limits (at the 95% interval level) for a species were calculated from the mean value attributed to each shipment box containing a given number fish. All data discussed in the text and tables represent import and export values, and are given in terms of value (nominal US. dollars).

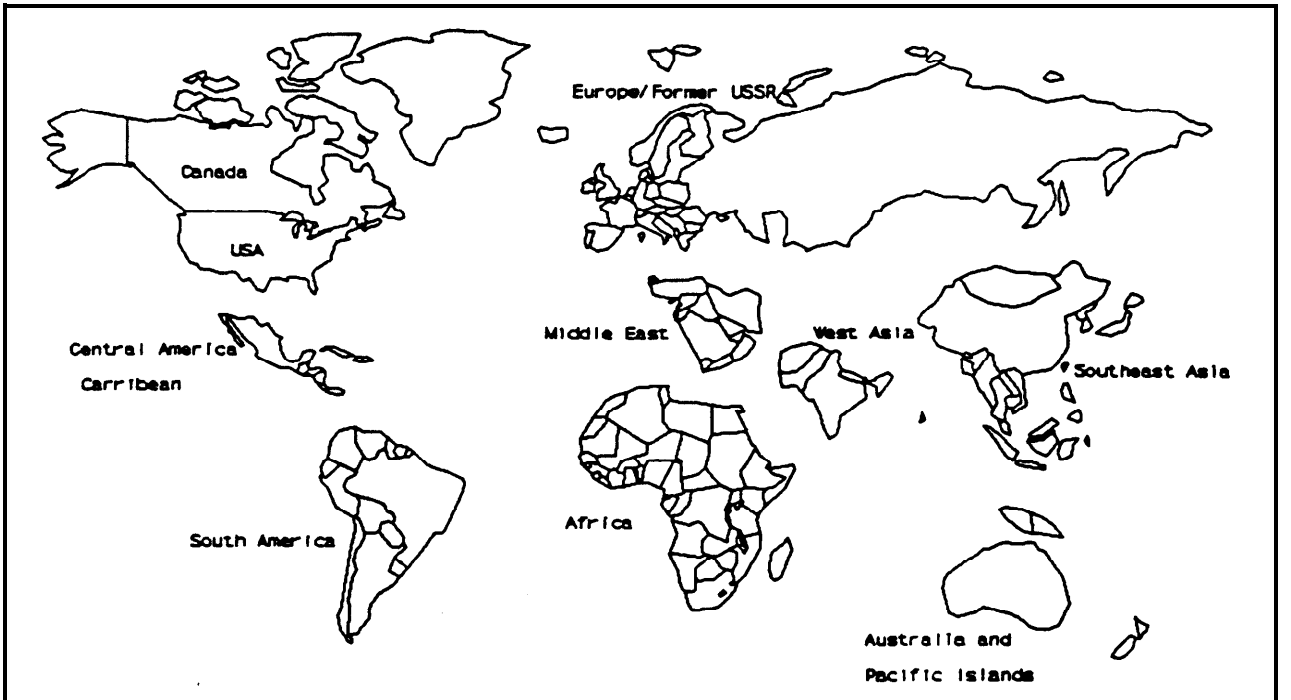

Figure 1. Geographical Data Collection Regions

U.S.A. ORNAMENTAL FISH IMPORTS

Value of Ornamental Fish Imports

Ornamental fish imports into the U.S. continue to grow (Figure 2). The value of imports increased by approximately 34 percent from the 1982-83 to 1984-87 period. Over the latter time period, the annual value of imports remained relatively stable, ranging from $25.7 million to a high of $29.2 million. Although falling in 1991 to $36.1, annual imports over the 1989-92 time period rose to $40.1 million in 1990 and 1992. In 1993 ornamental fish imports rose again and reached a record high of 45.2 million dollars, an increase of 10% from 1992. The relatively large increase in the annual value of imports during the 1989-92 time period as compared to 1984-1987 is likely to be an artifact of changes in the harmonized codes that were implemented in 1988. The reason for the sharp decline in imports during the year 1991 is not known.

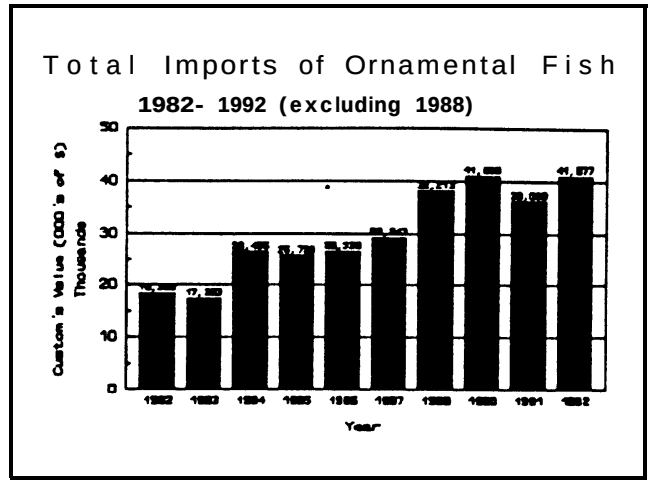

Figure 2. Import Values of Ornamental Fish.

The monthly pattern in the value of ornamental fish imports (1989-92) is depicted in Figure 3. **Average** monthly values are depicted with the asterisks and solid line, while standard deviations are depicted with vertical bars for each month. Over the period of analysis, monthly average imports in terms of value peaked in January, March, and August. The largest volume of imports in terms of value occurred in March but fell steadily through June. Import value then increased through August followed by a general downward trend through December. The

downward trend through the Fall season was broken, however, as January imports increased sharply from December to January. The monthly value of ornamental fish imports, however, exhibited some variability across different years. The months of February, March, and August showed the most variability in total imports. By comparison, imports during the months of June, September, October, and December were relatively constant over the 1989-92 time period. The remaining months, (January, April, May, July, and November), exhibited moderate volatility in import value.

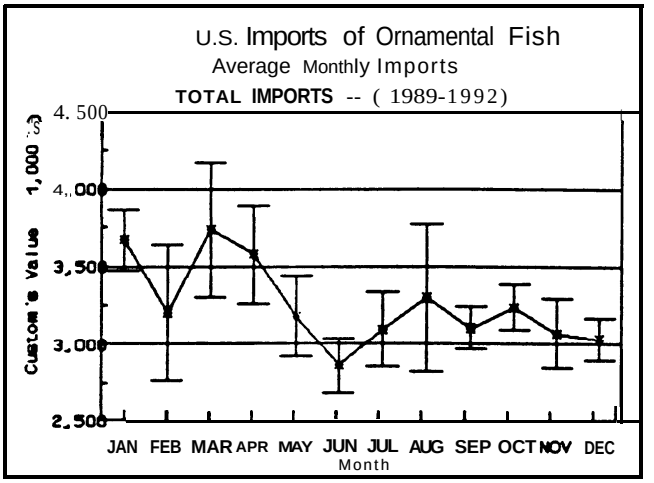

Figure 3. Monthly Values of Ornamental Fish Imports.

The apparent rise in imports during March and April is probably associated with a temporary increase in demand for fish during this time. Also in early spring, U.S. domestic supply of ornamental fish is low due to delayed production during the cold winter months. Domestic farmers import fish to supply the demand until their production increases. There are indications that only the commonly imported species arebeing traded in great numbers at this time. For example, in Florida production of angelfish and tiger barbs (indoors and continuous) remains the same, but imports rise during the early spring to meet the increased demand for these fish.

Sources of Imported U.S. Ornamental Fish

Figure 4 shows the major world suppliers (in percent value) of ornamental fishes to the United States of America. During the period of 1989-92, over 78% of all U.S. ornamental fish imports arrived from Southeast Asia (including Japan). Singapore, Thailand, the Philippines, Hong Kong, and Indonesia were the top five nations exporting fish to the U.S. The second largest region supplying ornamental fish to the U.S. was South America accounting for 1496 of the total annual value of U.S. ornamental fish imports; Colombia, Brazil and Peru being the major suppliers of ornamental fish in the region. The remaining **8%** percent of ornamental fish imports came from other regions of the world. Prominent ornamental fish exporting countries in these other regions included Costa Rica, Trinidad, and Haiti in Central America, and Nigeria and Zaire in Africa. A few imports arrived from Australia and other Pacific Islands (primarily the Marshall and Fiji Islands). At the present time, Europe appears to play a minor role in ornamental fish exports to the U.S.

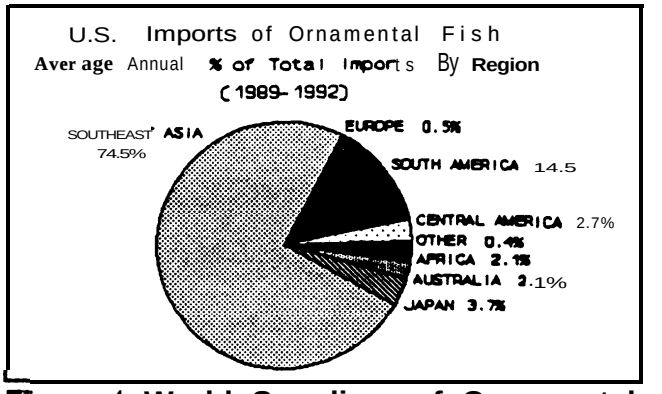

Figure 4. **World Suppliers of Ornamental Fishes to the U.S.A.**

A more detailed analysis of U.S. ornamental fish imports by region is summarized in our previous report entitled “Trends in U.S. International Trade in Ornamental Fish, 1982-1992 (Thunberg et al. 1993)” and found in Appendix B.

Ornamental Fishes Imported into the United States

Approximately 201 million individuals valued at $44.7 million were imported by the U.S. during the year of 1992. Of these, approximately 15.4 million ornamental fish valued at $3.1 million were imported during the month of October 1992 (Table 1). At least 730 freshwater and 809 saltwater species were declared as ornamental fish. The freshwater fishes accounted for approximately 96% of the total imported individuals and 80% of the total value of the imports. Saltwater fishes made up only 4% of the total import numbers but their dollar value amounted to some 20% of the total imports for the sampled month.

Table 1. Total number and value of freshwater and saltwater fishes imported into the United States of America in October 1992.

Origin	Number	%	Value	%
Freshwater	14,790,727	95.8	$2,524,442	79.8
Marine	650,487	4.2	$637,754	20.2
Total	15,441,214	100.0	$3,162,396	100.0

Although a variety of ornamental fish species are available from fish wholesalers, only a few species are preferred by home aquarists. Comparison of our data to that of the previous study conducted by Ramsey (1985) indicates that, with a few exceptions, the species of ornamental freshwater fish imported into the U.S. are the same (Table 2). Likewise, the trade volume of marine fishes appears similar to that from a decade ago (Hemley 1984); approximately 4% of the total volume of U.S. imports. In 1971, saltwater fishes made up only approximately 1% of the total number of fish imported.

Table 2. Principal species of ornamental freshwater fish imported into the U.S.A.

common name	Species	Percentages of total fish imported	
		1992	1971
Guppy	Poecilia reticulata	25.8%	4.3%
Neon tetra	Paracheirodon innesi	11.3%	14.8%
Platy	Xiphophorus maculatus	5.4%	0.9%
Siamese fighting fish	Betta splendens	2.7%	2.1%
Goldfish	Carassius auratus	2.4%	0.5%
Chinese algae-eater	Gyrinocheilus aymonieri	2.4%	5.0%
Shortfinned molly	Poecilia sphenops	2.0%	1.2%
Cardinal tetra	Paracheirodon axelrodi	1.5%	8.4%
Glassfish	Chanda lala	1.5%	0.0%
Tiger barb	Barbus tetrazona	1.3%	1.7%
Red Oscar	Astronutus ocellatus	1.2%	0.9%
Yucatan molly	Poecilia velifera	1.1%	0.0%
Redtail black shark	Labeo biocolor	1.0%	1.1%
Coolie loach	Acanthopthalmus kuhlii	1.0%	1.5%
Sucker catfish	Hypostomus plecostomus	0.9%	3.2%
Harlequin rasbora	Rasbora heteromorpha	0.9%	1.5%
Angelfish	Pterophyllum scalare	0.8%	5.2%
White-cloud	Tanichthys albonubes	0.5%	0.5%
Green corydoras	Corydoras aeneus	0.2%	1.6%
Leopard corydoras	Corydoras julii	0.1%	1.3%
Marbled hatchetfish	Gasteropelecus strigatus	0.0%	2.0%
Common hatchetfish	Gasteropelecus sternicla	0.0%	1.5%
Total		64.0%	59.2%

The list of declared freshwater and saltwater ornamental fish imported into the U.S. in October 1992 is provided in Appendix A. Of the 1,539 declared ornamental fish species, only 32 accounted for import values of more than $10,000 each for the sample month. The list of these most valuable ornamental fish imported during October 1992 is depicted in Table 3. These top species are all of freshwater origin and account for approximately 58% (or $1.82 million) of the total value of fish imported in the sample month. The remaining value, $1.34 million (or 42% of the total declared value), was accounted for by 698 freshwater species ($0.7 million or 22%), and 809 saltwater species ($0.64 million or 20%). Each freshwater and saltwater species not included in Table 3, contributed less than 1% to the total declared number and value of ornamental fish imported. There are no indications that seasonally (in one year) any one species will change their relative position in regards to their demand or that those species not considered in the survey (1,400 plus) will comprise a significant portion of the trade.

The two most popular ornamental fish species imported into the U.S. were the live bearer guppy, Poecilia reticulata and the egg layer, neon tetra, Paracheirodon innessi (Table 3). These two species accounted for 37% of the total number of fish imported and were valued at approximately half a million dollars. Together with the guppy and neon tetra, the platy (Xiphophorus maculatus), betta (Betta splendens), Chinese algae-eater (Gyrinocheilus aymonieri), and goldfish (Carassius auratus) accounted for half (50%) of the total number of ornamental fish imports. In addition, the top five species of these ornamental fish (except for the algae-eater) were valued at above 100,000 dollars each, for the sampled month.

Table 3. The most valuable species of ornamental fish imported into the United States of America in October 1992. The list represents those species with a total declared value of **$10,000** or above for the sample month.

Species name	Number or volume of fish imported	Percentage of fish volume	Declared value ($ U.S.)	Percentage of declared value
Poecilia reticulata	3,986,675	***25.8%***	$341,483	10.8%
Paracheirodon innesi	***1,748,435***	***11.3%***	$174,768	5.53 %
Carassius auratus	***362,390***	***2.4%***	$171,206	5.41%
Betta splendens	***423,234***	***2.7%***	$108,030	3.42%
Xiphophorus maculatus	***837,016***	***5.4%***	$105,543	3.34%
Botia macracantha	***94,764***	***0.6%***	$93,300	2.95%
Astronutus ocellatus	***185,515***	***1.2%***	$90,676	2.87%
Pterophyllum scalare	***127,534***	***0.8%***	$72,411	2.29 %
Symphysodon discus	12,948	0.1%	$52,213	1.65%
Apistogramma ramirezi	***101,380***	0.7 %	$48,245	1.53 %
Xiphophorus helleri	***150,053***	1.0%	$44,442	1.41%
Colisa lalia	***100,842***	0.7 %	$41,199	1.30%
Poecilia velifera	***167,255***	1.1%	$39,217	1.24%
Poecilia sphenops	***314,900***	2.0%	$38,124	1.21%
Barbus tetrazona	***202,222***	1.3%	$35,708	1.13%
Balantiocheilus melanopterus	***146,017***	1.0%	$34,538	1.09%
Hypostomus plecostomus	***135,683***	0.9%	$33,289	1.05 %
Kryptopterus bicirrhis	***58,676***	0.4%	$30,711	0.97 %
Pimelodus pictus	***103,430***	0.7%	$30,224	0.96 %
Osteoglossum bicirrhosum	***16,368***	0.1%	$23,130	0.73 %
Labeo bicolor	***153,242***	1.0%	$22,323	0.71%
Poecilia latipinna	***78,503***	0.5%	$22,223	0.70 %
Chanda lala	***224,437***	1.5%	$21,700	0.69 %
Pelmatochromis kribensis	***42,272***	0.3%	$20,043	0.63 %
Acanthopthalmus kuhlii	***147,215***	1.0%	$19,483	0.62%
Pangasius sutchi	***136,011***	0.9%	$18,712	0.59 %
Labeo erythrurus	***121,825***	0.8%	$18,050	0.57 %
Rasbora heteromorpha	133,910	0.9%	$17,758	0.56 %
Telmatherina ladigesi	22,544	0.2%	$15,488	0.49 %
Gyrinocheilus aymonieri	363,355	2.4%	$14,758	0.47 %
Paracheirodon axelrodi	225,495	1.5%	$12,220	0.39 %
Brachygobius xanthozon	108,930	0.7 %	$10,256	0.32%
Total	11,033,076	71.9%	$1,821,471	57.62 %

From the invoices attached to each declaration of importation form we calculated mean average prices for commonly imported freshwater fishes. The scientific name along with their relative abundance and declared average price for each fish species are computed in Table 4. With the exception of a few fish that had significant price ranges, (e.g. arowana, discus, goldfish, Celebes, and oscar), the average priced declared for an imported fish was between 26 and 28 cents. The average prices paid for imported egg layer and live bearer fishes were 45 and 22 cents, respectively. However, the most commonly imported fish, the guppy (a live bearer) and neon tetra (an egg layer) were valued similarly at about 14 cents. The neon tetra, however, had less price variability. The most highly priced ornamental freshwater fishes were all egg layers and included the goldfish, discus, arowana, clown loach, black ghost knife-fish, and Celebes rainbowfish. The least expensive (commonly) imported freshwater fish was also an egg layer, the Chinese algae-eater (Gyrinocheilus aymonieri) with an estimated value between 5 and 7 cents.

Table 4. List of commonly imported ornamental freshwater species along with their relative abundance and declared **average** price for October 1992.

Species name	Number or volume of fish imported	Percentage of total fish imports	Declared value	Percentage of declared value	Average declared price	Standard deviation
Poecilia reticulata	3,986,675	25.82%	$341,483	10.8%	$0.14	0.116
Parecheirodon innesi	1,748,435	11.32%	$174,768	5.53%	$0.14	0.071
Xiphophorus maculatus	837,016	5.42%	$105,543	3.34%	$0.16	0.250
Betta splendens	423,234	2.74%	$108,030	3.42%	$0.32	0.839
Gyrinocheilus aymonieri	363,355	2.35%	$14,758	0.47%	$0.06	0.055
Carassius auratus	362,390	2.35%	$171,206	5.41%	$1.06	5.777
Poecilia sphenops	314,900	2.04%	$38,124	1.21%	$0.16	0.102
Parecheirodon axelrodi	225,495	1.46%	$12,220	0.39%	$0.16	0.240
Chanda lala	224,437	1.45%	$21,700	0.69%	$0.11	0.055
Barbus tetrazona	202,222	1.31%	$35,708	1.13%	$0.22	0.208
Astronutus ocellatus	185,515	1.20%	$90,676	2.87%	$0.82	2.305
Poecilia velifera	167,255	1.08%	$39,217	1.24%	$0.32	0.307
Labeo bicolor	153,242	0.99%	$22,323	0.71%	$0.23	0.294
Xiphophorus helleri	150,053	0.97%	$44,442	1.41%	$0.33	0.477
Acanthopthalmus kuhlii	147,215	0.95%	$19,483	0.62%	$0.14	0.099
Balantiocheilus melanopterus	146,017	0.95%	$34,538	1.09%	$0.36	0.369
Pangasius sutchi	136,011	0.88%	$18,712	0.59%	$0.20	0.233
Hypostomus plecostomus	135,683	0.88%	$33,289	1.05%	$0.42	1.281
Rasbora heteromorpha	133,910	0.87%	$17,758	0.56%	$0.14	0.079
Pterophyllum scalare	127,534	0.83%	$72,411	2.29%	$0.67	0.517
Labeo erythrurw	121,825	0.79%	$18,050	0.57%	$0.22	0.215
Brachygobius xanthozona	108,930	0.71%	$10,256	0.32%	$0.11	0.062
Pimelodus pictus	103,430	0.67%	$30,224	0.96%	$0.30	0.139
Apistogramma ramirezi	101,380	0.66%	$48,245	1.53%	$0.51	0.309
Colisa lalia	100,842	0.65%	$41,199	1.30%	$0.50	0.639
Botia macrantha	94,764	0.61%	$93,300	2.95%	$1.29	0.639
Tanichthys albonubes	82,711	0.54%	$4,831	0.15%	$0.09	0.046
Poecilia latipinna	78,503	0.51%	$22,223	0.70%	$0.37	0.478
Gasteropelecus levis	77,575	0.50%	$8,107	0.26%	$0.16	0.156
Brachydanio rerio	70,715	0.46%	$4,405	0.14%	$0.10	0.073
Hemigrammus armstrongi	68,450	0.44%	$3,133	0.10%	$0.06	0.039
Hyphassobrycon serpae	63,230	0.41%	$6,997	0.22%	$0.16	0.125
Gymnocorymbus ternetzi	61,257	0.40%	$7,720	0.24%	$0.16	0.199
Kryptopterus bicirrhis	58,676	0.38%	$30,711	0.97%	$0.52	0.127
Hemigrammus erythrozonas	54,450	0.35%	$4,538	0.14%	$0.10	0.050
Hyphessobrycon herbertaxelrodi	45,549	0.29%	$4,342	0.14%	$0.12	0.072
Acanthophthalmus semicinctus	44,460	0.29%	$5,973	0.19%	$0.14	0.172
Hemigrammus nanus	44,234	0.29%	$3,580	0.11%	$0.12	0.162
Otocinclus affinis	42,730	0.28%	$2,396	0.08%	$0.14	0.207
Pelmatochromis kribensis	42,272	0.27%	$20,043	0.63%	$0.49	0.430
Moenkhausia oligolepis	38,640	0.25%	$3,347	0.11%	$0.10	0.042
Hemigrammus ocellifer	32,180	0.21%	$2,531	0.08%	$0.12	0.093
Corydoras aeneus	31,580	0.20%	$5,263	0.17%	$0.19	0.130
Hyphesssobrycon erythrostigma	30,700	0.20%	$1,544	0.05%	$0.06	0.021
Corydoras punctatus	30,067	0.20%	$2,629	0.08%	$0.48	1.618
Carnegiella strigta	28,960	0.19%	$1,519	0.05%	$0.08	0.104
Puntius schwanefeldi	24,400	0.16%	$2,981	0.09%	$0.22	0.233
Metynnis schreitmuelleri	23,919	0.15%	$7,450	0.24%	$0.20	0.261

Table 4 (continued). List of commonly imported ornamental freshwater species along with their relative abundance and declared average price for October 1992.

Species name	Number or volume of fish imported	Percentage of total fish imports	Declared value	Percentage of declared value	Average declared price	Standard deviation
Telmatherina ladigesi	22,544	0.15%	$15,488	0.49%	$1.04	4.306
Hyphessobrycon flammeus	20,465	0.13%	$1,596	0.05%	$0.09	0.052
Corydoras paleatus	22,097	0.13%	$5,243	0.17%	$ 0.31	0.183
Corydoras metae	16,640	0.11%	$2,539	0.08%	$0.17	0.074
Osteoglossum bicirrhosum	16,368	0.11%	$23,130	0.73%	$7.23	4.789
Morulius chrysophekadion	14,568	0.09%	$2,815	0.09%	$0.21	0.139
Corydoras julii	14,425	0.09%	$1,375	0.04%	$0.15	0.203
Puntius nigrofasciatus	14,280	0.09%	$3,501	0.11%	$0.27	0.206
Thayeria obliqua	14,215	0.09%	$2,070	0.07%	$0.16	0.066
Symphysodon discus	12,948	0.08%	$52,213	1.65%	$4.42	2.252
Helostoma temminckii	12,870	0.08%	$2,969	0.09 %	$0.44	1.313
Corydoras agassizii	11,720	0.08%	$1,633	0.05%	$0.19	0.241
Cyprinus carpio	7,720	0.05%	$4,875	0.15%	$0.67	0.582
Mimagonistes microlepis	7,200	0.05%	$369	0.01%	$0.06	0.006
Corydoras elegans	6,700	0.04%	$440	0.01%	$0.08	0.084
Toxotes jaculator	6,558	0.04%	$2,439	0.08%	$0.41	0.159
Chilodus punctatus	6,462	0.04%	$3,035	0.10%	$0.42	0.612
Sternarchus albifons	5,971	0.04%	$6,672	0.21%	$1.48	0.719
Epalzeorhyncus kallopterus	5,945	0.04%	$1,537	0.05%	$0.28	0.153
Nannostomus marginatus	5,800	0.04%	$95	0.00%	$0.02	0.012
Bunocephalus coracoideus	5,517	0.04%	$1,157	0.04%	$0.42	0.168
Hyphessobrycon pulchrippinis	5,370	0.03%	$657	0.02%	$0.13	0.054
Hoplosternum thoracatum	5,110	0.03%	$2,294	0.07%	$0.48	0.464
Copeina arnoldi	4,800	0.03%	$210	0.01%	$0.05	0.007
Puntius conchonius	4,763	0.03%	$1,398	0.04%	$0.33	0.192
Geophagus jurupari	4,207	0.03%	$1,746	0.06%	$0.55	0.433
Nannostomus harrisoni	3,465	0.02%	$260	0.01%	$0.13	0.131
Metynnis maculatus	3,395	0.02%	$1,471	0.05%	$0.73	0.854
Sphaerichthys osphronemoides	2,890	0.02%	$758	0.02%	$0.27	0.065
Gasteropelecus sternicla	2,660	0.02%	$133	0.00%	$0.05	n.a.
Botia sidthimunki	2,550	0.02%	$1,530	0.05%	$0.60	n.a.
Nannacara anomala	1,700	0.01%	$116	0.00%	$0.18	0.282
Leiocassis siamensis	1,528	0.01%	$475	0.02%	$0.41	0.607
Hemiodus semitaeniatus	220	0.00%	$27	0.00%	$0.12	0.022
Aequidens portalegrensis	100	0.00%	$25	0.00%	$0.25	n.a.
Subtotal	12,169,687	78.8%	$1,960,215	62.00%		
Other (647) freshwater species	2,621,040	17.0%	$564,427	17.80%		
Saltwater (809) species	650,487	4.2%	$637,754	20.20%		
Total	15,441,214	100.00%	$3,162,396	100.00%		

n.a. = Same price declared for all shipments or not available.

Most of the commonly imported freshwater fish species are of South American, Asian, and African origin. In South America, little attention has been given to raise ornamental freshwater fish in captivity. It is presumed, therefore, that the South American export trade of ornamental fishes is based on the collection of fish from the wild (Conroy 1975). On the other hand, Southeastern Asian countries have long been famed for the culture of ornamental freshwater fishes. Consequently, Singapore and Hong Kong have become worldwide centers for the purchase and transhipment of ornamental fishes. In-country visitations, conversations with government officials, fish collectors, and owners of fish wholesale houses confirm these observations. Table 5 contains a list of the most popular ornamental freshwater species and their countries of export origin.

Table 5. Regional sources of commonly imported ornamental fish into the U.S.A.

Scientific name	country of Origin	Total number of fish	Specimens (W)
P. reticulata	Hong Kong	27,050	0.7%
	Indonesia	15,385	0.4%
	Jamaica	96,000	2.4%
	Malaysia	59,040	1.5%
	South Africa	20,799	0.5%
	Singapore	2,219,026	55.7%
	Thailand	7,200	0.2%
	Trinidad	1,542,175	38.7%
P. innesi	Colombia	82,300	4.7%
	Hong Kong	1,498,484	85.7%
	Indonesia	43,700	2.5%
	Singapore	124,951	7.1%
C. auratus	China	97,990	27.0%
	Hong Kong	145,861	40.2%
	Indonesia	1,797	0.5%
	Japan	60,674	16.7 %
	Korea	4	0.0%
	Malaysia	9,012	2.5%
	Peru	550	0.2%
	Singapore	36,488	10.1%
	Thailand	10,014	2.8%
B. splendens	Hong Kong	150	0.0%
	Indonesia	54,290	12.8%
	Malaysia	3,765	0.9%
	Singapore	42,218	10.0%
	Thailand	322,811	76.3%
X. maculatus	Hong Kong	8,400	1.0%
	Indonesia	49,110	5.9%
	Malaysia	145,955	17.4%
	South Africa	1,743	0.2%
	Singapore	631,808	75.5%
B. macracantha	Hong Kong	900	0.9%
	Indonesia	73,352	77.4%
	India	75	0.1%
	Malaysia	10,832	11.4%
	Singapore	9,599	10.1%
	Thailand	6	0.0%

Table 5 (continued). Regional sources of commonly imported ornamental fish into the U.S.A.

Scientific name	Country of origin	Total number of fish	Specimens (%)
A. ocellatus	Colombia	100	0.1%
	Hong Kong	160	0.1%
	Indonesia	4,935	2.7%
	Singapore	8,174	4.4%
	Thailand	170,346	91.8%
	Trinidad	1,750	0.9 %
	Venezuela	50	0.0%
P. scalare	Brazil	60	0.0%
	Colombia	3,209	2.5 %
	Guyana	515	0.4%
	Hong Kong	2,968	2.3%
	Indonesia	1,992	1.6%
	Jamaica	60	0.0%
	Sri Lanka	2,202	1.7%
	Malaysia	2,710	2.1%
	Peru	590	0.5%
	Singapore	75,958	59.6 %
	Thailand	23,050	18.1%
	Trinidad	13,820	10.8%
	Venezuela	400	0.3 %
S. discus	Brazil	2,264	17.5 %
	Hong Kong	120	0.9%
	Singapore	256	2.0%
	Thailand	10,308	79.6%
A. ramirezi	Colombia	1,100	1.1%
	Hong Kong	1,275	1.3%
	Indonesia	24,810	24.5 %
	Peru	3,600	3.6%
	Singapore	70,595	69.6%
X. helleri	Hong Kong	3,590	2.4%
	Indonesia	2,015	1.3%
	India	750	0.5 %
	Malaysia	2,450	1.6%
	Singapore	140,698	93.8%
	South Africa	550	0.4%

Table 5 (continued). Regional sources of commonly imported ornamental fish into the U.S.A.

Scientific name	country of origin	Total number of fish	Specimens (96)
C. lalia	Hong Kong	1,010	1.0%
	Indonesia	2,280	2.3%
	India	150	0.1%
	Malaysia	27,910	27.7%
	Singapore	64,362	63.8%
	Thailand	5,130	5.1%
P- velifera	Hong Kong	780	0.5%
	Indonesia	14,920	8.9%
	Jamaica	1,165	0.7 %
	Malaysia	27,850	16.7 %
	Singapore	122,540	73.3%
P. sphenops	Hong Kong	2,659	0.8%
	Indonesia	18,211	5.8%
	Jamaica	10,870	3.5%
	Malaysia	240	0.1%
	Singapore	282,920	89.8%
B. tetrazona	Hong Kong	18,055	8.9%
	Indonesia	50,460	25.0%
	Malaysia	9,465	4.7 %
	South Africa	2,825	1.4%
	Singapore	115,965	57.3%
	Thailand	3,852	1.9%
	Trinidad	1,600	0.8%
B. melanopterus	Hong Kong	322	0.2%
	Malaysia	26,571	18.2%
	Singapore	611	0.4%
	Thailand	118,513	81.2%
H. plecostomus	Brazil	30	0.0%
	Colombia	4,285	3.2%
	Hong Kong	350	0.3%
	Indonesia	110	0.1%
	Jamaica	46,637	34.4%
	Malaysia	623	0.5%
	Peru	130	0.1%
	Singapore	20,114	14.8%
	Thailand	17,441	**12.9%**
	Trinidad	45,963	**33.9%**

Table 5 (continued). Regional sources of commonly imported ornamental fish into the U.S.A.

Scientific name	Country of origin	Total number of fish	Specimens (W)
K. bicirrhis	Indonesia	5,170	8.8%
	Malaysia	2,900	4.9%
	Singapore	2,005	3.4%
	Thailand	48,686	82.9%
P. pictus	Colombia	100,810	97.5%
	Peru	980	0.9%
	Venezuela	1,640	1.6%
O. bicirrhosum	Brazil	55	0.3 %
	Colombia	534	3.3%
	Guyana	5	0.0%
	Hong Kong	194	1.2%
	Peru	15,580	95.2%
L. bicolor	Indonesia	1,282	0.8%
	Malaysia	32,947	21.5%
	Singapore	515	0.3 %
	Thailand	118,498	77.3 %
P. latipinna	Hong Kong	2,990	3.8%
	Indonesia	585	0.7%
	Malaysia	1,360	1.7%
	South Africa	2,645	3.4%
	Singapore	70,923	90.3 %
C. lala	Hong Kong	400	0.2%
	Indonesia	10,040	4.5%
	India	750	0.3 %
	Malaysia	850	0.4%
	Singapore	725	0.3%
	Thailand	211,672	94.3%
P. kribensis	Colombia	40	0.1%
	Hong Kong	720	1.7%
	Indonesia	4,050	9.6%
	Malaysia	1,010	2.4%
	Nigeria	685	1.6%
	Singapore	35,767	84.6%

Table 5 (continued). Regional sources of commonly imported ornamental fish into the U.S.A.

Scientific name	Country of origin	Total number of fish	Specimens (%)
A. kuhlii	Indonesia	13,830	9.4%
	Malaysia	40,140	27.3 %
	Singapore	22,655	15.4%
	Thailand	70,590	48.0%
P. sutchi	Hong Kong	300	0.2%
	Indonesia	1,100	0.8%
	India	300	0.2%
	Malaysia	13,725	10.1%
	Singapore	1,890	1.4%
	Thailand	118,696	87.3 %
L. erythrurus	Hong Kong	400	0.3 %
	Indonesia	100	0.1%
	Malaysia	29,830	24.5 %
	Singapore	855	0.7%
	Thailand	90,640	74.4%
R. heteromorpha	Hong Kong	4,950	3.7%
	Indonesia	5,250	3.9%
	Malaysia	26,650	19.9 %
	South Africa	750	0.6 %
	Singapore	87,610	65.4%
	Thailand	8,700	6.5%
T. ladigesi	Hong Kong	350	1.6%
	Indonesia	16,462	73.0%
	Malaysia	2,430	10.8%
	Singapore	3,302	14.6 %
G. aymonieri	Hong Kong	1,600	0.4%
	Indonesia	300	0.1%
	Singapore	8,100	2.2%
	Thailand	353,355	97.2%
P. axelrodi	Brazil	189,550	84.1%
	Colombia	35,600	15.8%
	Hong Kong	100	0.0%
	Singapore	245	0.1%
B. xanthozona	Indonesia	80,360	73.8%
	Malaysia	2,895	2.7%
	Singapore	11,475	10.5 %
	Thailand	14,200	13.0%

The most commonly imported saltwater fish include a list of approximately 809 species which belong to a varied list of families. Saltwater ornamental fish species with high monetary value were principally imported from the Philippines (44.1%), Indonesia (25.5 %), and the Marshall Islands (6.2%). Nigeria (3.7%) and Costa Rica (3.6%) were the largest exporters of highly prized marine fish in Africa and Latin America, respectively. Other valuable marine species were imported from Sri Lanka (3.2%) and Australia (2.6%). Due to the great variability in individual prices, average prices for marine fish were not estimated.

To our knowledge, little is known on the culture of marine ornamental fishes. Conversations with government officials, fish collectors, and owners of fish wholesale houses indicate that ornamental saltwater fishes are collected, almost exclusively, from the wild.

Ports of Entry

The U.S. Fish and Wildlife Service, Division of Law Enforcement has designated domestic ports of entry for imports of live ornamental (tropical) fish. Currently designated ports of entry are: Los Angeles, Baltimore, Chicago, Dallas/Fort Worth, San Francisco, Honolulu, Miami, New Orleans, New York, Portland and Seattle. Shipments originating in Canada and Mexico may enter other specified ports (U.S. Regulations 1992).

Import shipments of ornamental fish during the year 1992 totalled 12,720 and arrived primarily through the ports of: Los Angeles (39 %), Miami (22 %), and New York (18 %). The ports of Honolulu, San Francisco, and Chicago received a smaller amount of shipments, approximately 4% each. A smaller percentage of shipments entered through other designated ports. The ports of major trade activity for ornamental fish in the United States are shown in Table 6.

Table 6. U.S.A. ports of major trade activity for ornamental fish during 1992.

Trade ports	Number of shipments	IMPORTS		EXPORTS	
		Total number of fish	Declared value of fish ($)	Total number of fish	Declared value of fish ($)
Los Angeles, CA	7,892	**118,626,139**	**24,552,930**	15,051,348	**6,909,433**
Miami, FL	4,390	25,669,279	**5,511,538**	**9,181,411**	**3,837,952**
New York, NY	3,159	40,013,014	8,312,753	1,451,046	487,754
Tampa, FL	1,206	2,793,321	789,734	3,236,883	1,043,118
Honolulu, HI	1,156	1,405,306	1,024,117	102,467	708,863
San Francisco, CA	746	5,563,527	1,427,901	566,631	254,692
Chicago, IL	640	4,792,237	**1,538,814**	449,134	120,881
Detroit, MI	302	622,426	960,016	19,563	16,093
Newark, NJ	177	199,610	67,675	51,680	20,334
Dallas/Fort Worth, TX	122	295,556	146,395	8,954	9,822
Seattle, WA	111	986,741	261,290	44,902	26,916
Buffalo, NY	107	4,492	8,678	7,618	5,659
Portland, OR	75	37,060	26,539	4,176	5,383
Minneapolis/St. Paul, **MN**	65	23,678	15,238	111,538	13,475
Port Huron,. MI	52	28,583	11,712	200	90
Agana, GUAM	26	108,273	25,285	**n.e.**	**n.e.**
Blaine, WA	6	9	54	**62,928**	**8,756**
Atlanta, GA	6	3,452	1,714	**n.e.**	**n.e.**
Baltimore, MD	3	1,030	2,651	**5,135**	510
New Orleans, LA	2	645	400	100	191
Champlain, NY	2	20	n.d.	**n.e**	**n.d.**
TOTAL	**20,245**	**201,174,398**	**44,730,434**	**30,335,714**	**13,469,922**

n.d. = no value was declared
n.e. = no export activity

U.S.A. ORNAMENTAL **FISH** EXPORTS

Value of Total Exports

The total annual value of ornamental fish exported from U.S. to overseas ports is shown in Figure 5 for the 1982 to 1992 time period. From 1989 to 1992 the total annual value of exports grew at an average annual rate of 16%. In 1986 total export value was approximately **$4.8** million **and in 1992 export value had** more than tripled to **$15.1** million. In 1993, U.S. ornamental fish exports rose another 5% to **approximately** 17.3 million dollars. Given the data limitations there **is no way to** determine **whether** this increase in export value came from ornamental fish **produced** domestically or whether the increase in U.S. exports simply reflects increased transhipment activity.

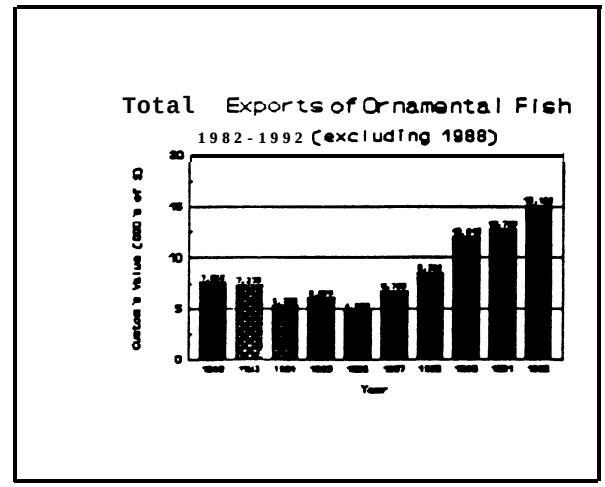

Figure 5. Annual Export Values of Ornamental Fish.

Figure 6 shows the annual share of exports to each of the different geographic regions considered in this study. On average, annual exports have been greatest to Canada (29.1%), followed by Southeast Asia (25.3%), Europe (20.3 primarily to England, The Netherlands, and Germany), Japan (17.6%), Central America (6.4%) and **South** America (1.0%). Annual exports to the Middle East, Africa, and

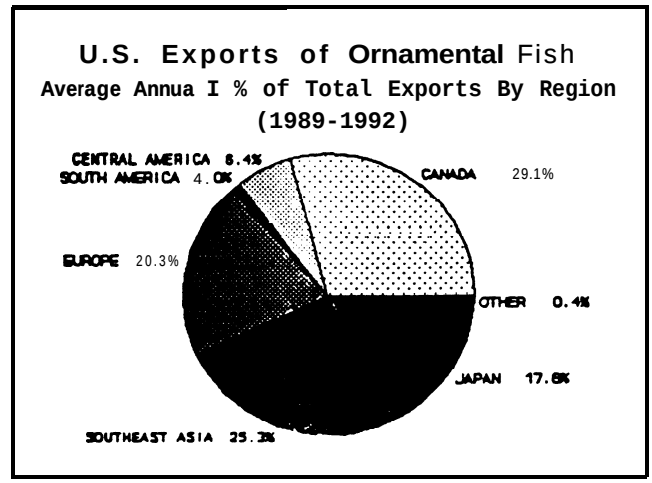

Figure 6. U.S.A. Exports of Ornamental Fish to Different Regions.

Pacific Islands combined were less than one percent of the total export value.

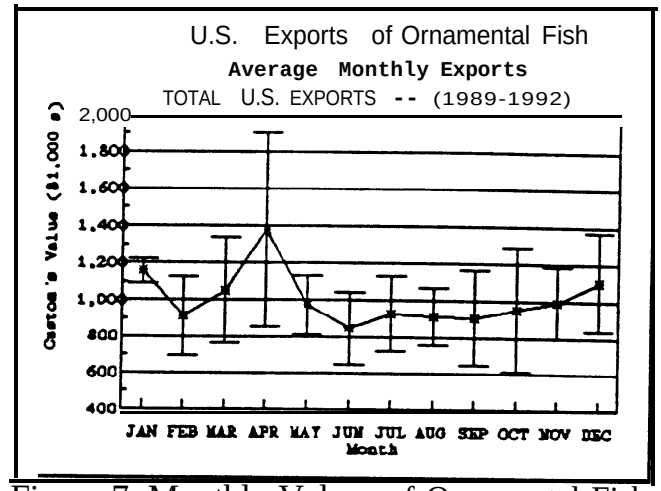

Figure 7. Monthly Values of Ornamental Fish Exports.

The seasonal pattern of average total monthly exports from the U.S. is shown in Figure 7 for the 1989 to 1992 period. With the exception of four months (January, March, April, and December), average monthly exports were within a $200,000 range from $800,000 to $1,000,000. Total monthly average exports peaked in April, dropped in May and June but increased gradually through January. After January, another drop occurred followed by sharp increases in both March and April. In the latter month, average export value was nearly $1,400,000. Over the four year period monthly export values showed considerable variability during April, but were only moderately volatile for the rest of the year.

A comparison between the monthly pattern in total value of ornamental fish imports and exports (Figures 3 and 7), indicates that U.S. trade flows may include a substantial amount of transhipments of ornamental fish. For example, the largest volume of ornamental fish imports in terms of value occurred in March but the export values peaked in April. Thus, a portion of the value of U.S. exports is produced domestically while the remaining product is imported/or exported, for example, from/to Singapore, repackaged and exported to other parts of the world.

The summary of ornamental fish export data by U.S. to other countries worldwide appeared in our previous report entitled "Trends in U.S. International Trade in Ornamental Fish, 1982-1992 (Thunberg et al. 1993)" and is reprinted in the Appendix B.

Domestic Sources of Ornamental Fish and Species Exports

Domestic production of freshwater ornamental fish is predominately **practiced in the** State of Florida. Most of the ornamental fish in Florida are of freshwater origin and raised in outdoor ponds. Newly released figures indicate that Florida ornamental fish sales totaled $46.7 million in **1993** (F.A.S.S.). The **1993** survey showed that egg layers contributed $28.7 million and livebearers $18.0 million in net sales value.

The more prominent cultured ornamental fish include guppies, mollies, swordtails, platies, gouramies, barbs, tetras, armored catfishes, and a variety of cichlid species. Ornamental marine fish are primarily collected from the wild and originate from the coastal waters of Florida and Hawaii. Only a handful of marine fish species are culture and only those of the genus **Amphiprion** were exported in great numbers. From the declaration forms we could not distinguish if the ornamental fish were bred and raised domestically or imported for later resale.

Ports of Trade Activity

Los Angeles (34 %), Miami (32 %) and Tampa (13 %) are domestic ports of major export activity for ornamental fishes (Table 6). Honolulu (7%) and New York (7%) share similar export movements.

Although there are numerous import and export business houses, the Los Angeles, Miami, New York, and Tampa ports are residence to the broker-wholesale enterprises where most of the ornamental fish shipments are traded from. Ramsey (1985) suggested these large broker-wholesale houses serve small operators at nearby population centers and as distribution centers to larger distributors at other major cities. The other less used ports (Chicago, New Orleans, San Francisco, etc.) may serve large pet dealers and wholesalers in the immediate vicinity of their respective city.

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APPENDIX A

List of freshwater species declared as imported into the U.S.A. during October 1992.

Abramites hypselonotus
Acanthophthalmus anguillaris
Acanthophthalmus javanicus
Acanthophthalmus kuhlii
Acanthophthalmus myersi
Acanthophthalmus pangia
Acanthophthalmus semicinctus
Acanthopsis choirorhynchus
Acarichthys geayi
Acarichthys heckelii
Acestrorhynchus falcatus
Achirus lineatus
Adioryx diadema
Aeoliscus strigatus
Aequidens curviceps
Aequidens latifronszi
Aequidens maroni
Aequidens portalegrensis
Aequidens pulcher
Aequidens rivulatus
Aequidens viridis
Agamyxis chaestoma
Agamyxis pectinifrons
Agmus lyriformis
Ambassis reticulata
Amblydoras hancocki
Amphipnous cuchnia
Ancistrus dolichopterus
Ancistrus lineolataus
Ancistrus sp.
Ancistrus triradiatus
Anguilla bicolor
Anomalochromis thomasi
Anostomus anostomus
Anostomus trimaculatus
Aphyocharax anisitsi
Aphyocharax feligera
Aphyocharax rubripinnis
Aphyosemion amieti
Aphyosemion australe
Aphyosemion gardneri
Aphyosemion striatum
Apistogramma agassizi
Apistogramma borelli
Apistogramma cacatuoides
Apistogramma inconspicua
Apistogramma ortmani
Apistogramma ramirezi
Apistogramma steindachneri
Apistogramma trifasciatum
Aplocheilus dayi
Aplocheilus panchax
Apteronotus albifrons
Apteronotus leptorhynchus
Arnoldichthys spilopterus
Astronotus ocellatus
Astyanax fasciatus
Astyanax mexicanus
Aulonocara nyassae
Aulonocara sp.
Aulonocranus dewindti
Badis badis
Bagrichthys hypselopterus
Bagrichthys sp.
Balantiocheilos melanopterus
Barbichthys laevis
Barbus arulius
Barbus oligolepis
Barbus schuberti
Barbus tetrazona
Barbus titteya
Beaufortia kweichowensis
Beaufortia levertti
Bedotia geayi
Belontia signata
Betta brederi
Betta imbellis
Betta pugnax
Betta smaragdina
Betta splendens

Biotodoma cupido
Blennius pavo
Boehlkea cochui
Boehlkea fredcochui
Botia beauforti
Botia berdmorei
Botia dario
Botia horae
Botia hymenophysa
Botia lecontei
Botia lohachata
Botia lucas
Botia macracantha
Botia modesta
Botia morleti
Botia rostrata
Botia sidthimunki
Botia striata
Boulengerella maculata
Brachydanio albolineatus
Brachydanio frankei
Brachydanio rerio
Brachygobius doriae
Brachygobius nunus
Brachygobius xanthozona
Brienomyrus brachyistius
Brochis britskii
Brochis coerulius
Brochis splendens
Brycinus longipinnis
Brycinus taeniurus
Brycon dentex
Brycon sp.
Bunocephalus amaurus
Bunocephalus coracoideus
Bunocephalus kneri
Butis butis
Callichthys callichthys
Campylomormyrus cassaicus
Campylomormyrus rhynchophorus
Carassius auratus
Carassius carassius
Carinotetraodon somphongsi
Carnegiella marthae
Carnegiella myersi
Carnegiella strigata
Catoprion mento
Chaca bankenensis
Chaca chaca
Chaetostoma thomasi
Chalceus erythrurus
Chalceus macrolepidotus
Chalinochromis ndobhoi
Chanda baculis
Chanda buruensis
Chanda lala
Chanda wolfii
Channa argus
Channa asiatica
Channa marulius
Channa micropeltes
Channa orientalis
Channa striatus
Chanos chanos
Charax gibbosus
Chela laubuca
Chilatherina bleheri
Chilodus fasciatus
Chilodus punctatus
Chilotilapia rhodesii
Chrysichthys ornatus
Cichla ocellaris
Cichla temensis
Cichlasoma alfari
Cichlasoma aureum
Cichlasoma carpinte
Cichlasoma citrinellum
Cichlasoma cyanoguttatum
Cichlasoma festae
Cichlasoma festivum
Cichlasoma labiatum
Cichlasoma managuense
Cichlasoma meeki
Cichlasoma nicaraguense
Cichlasoma nigrofasciatum
Cichlasoma octofasciatum
Cichlasoma salvini
Cichlasoma severum

Cichlasoma synspilus
Cichlasoma temporalis
Cobitis taenia
Cochliodon hondae
Colisa fasciata
Colisa labiosa
Colisa lalia
Colisa sota
Colomesus asellus
Colomesus pgitticus
Colossoma bidens
Colossoma brachypomum
Colossoma macropomum
Copeina guttata
Copella arnoldi
Copella nigrofasciatus
Corydoras aeneus
Corydoras agassizii
Corydoras arcuatus
Corydoras atropersonatus
Corydoras blochi
Corydoras caudimaculatus
Corydoras columbianae
Corydoras decker
Corydoras delfax
Corydoras elegans
Corydoras garbei
Corydoras haraldschultzi
Corydoras hastatus
Corydoras julii
Corydoras leucomelas
Corydoras melanistius
Corydoras melanotaenia
Corydoras melini
Corydoras metae
Corydoras nanus
Corydoras paleatus
Corydoras panda
Corydoras punctatus
Corydoras rabauti
Corydoras reticulatus
Corydoras robineae
Corydoras sangama
Corydoras sanjuan
Corydoras schwartzi
Corydoras sterbai
Corydoras sychri
Crenicara maculata
Crenicichla geayi
Crenicichla lepidota
Crenicichla maculata
Crenicichla saxatilis
Crenicichla sp.
Crenicichla strigatta
Crossocheilus oblongus
Crytocoryne balansae
Ctenobrycon spilurus
Ctenolucius hujeta
Ctenopoma ansorgii
Ctenopoma nobilis
Cyathopharynx furcifer
Cynoglossus microlepis
Cynolebias boitonei
Cyphotilapia frontosa
Cyprinus carpio
Danio malabaricus
Datnioides microlepis
Datnioides quadrifasciatus
Dermogenys indonesiensis
Dermogenys pusillus
Dianema longibarbis
Dianema urostriata
Distichodus affinis
Distichodus sexfasciatus
Dormitator maculatus
Eigenmannia goajira
Eigenmannia virescens
Electrophorus electricus
Eleotrides strigata
Eleotris marmoratus
Eleotris picta
Eleotris sp.
Epalzeorhynchus kalopterus
Epalzeorhynchus siamensis
Eretmodus cyanostictus
Erpetoichthys calabaricus
Esomus danricus
Etroplus chromide

Etroplus maculatus
Etroplus surantensis
Eutropiellus debauwi
Exodon paradoxus
Farlowella acus
Farlowella gracilis
Fugu sp.
Gagata cenia
Garra ceylonisis
Garra taeniata
Gasteropelecus maculata
Gasteropelecus sternicla
Gastromyzon boreneensis
Geophagus balzanii
Geophagus hondae
Geophagus jurupari
Geophagus pelligrini
Geophagus steindachneri
Geophagus surinamensis
Glossolepis incisus
Glypotothorax callopterus
Glypotothorax sp.
Gnatholepis knighti
Gnathonemus abadii
Gnathonemus moorei
Gnathonemus petersi
Gnathonemus tamandua
Gnathonodon speciosus
Goeldiella eques
Gymnarchus niloticus
Gymnocorymbus ternetzi
Gymnocorymbus thayeri
Gymnothorax polyuranodon
Gymnotus anguillaris
Gymnotus carapo
Gyrinocheilos aymonieri
Hampala macrolepidota
Haplochromis burtoni
Haplochromis compressiceps
Haplochromis electra
Haplochromis fuscotaeniatus
Haplochromis johnstoni
Haplochromis livingstoni
Haplochromis mloto
Haplochromis moorii
Haplochromis rostratus
Haplochromis venustus
Haplochromis virginalis
Hara hara
Hara jerdoni
Hassar inheringi
HAssar richter
Helogenes marmoratus
Helostoma temmincki
Hemichromis bimaculatus
Hemichromis elongatus
Hemichromis paynei
Hemidoras microstomus
Hemigrammopetersius caudalis
Hemigrammus bleheri
Hemigrammus boesemani
Hemigrammus caudovittatus
Hemigrammus erythrozonus
Hemigrammus hyanuary
Hemigrammus levis
Hemigrammus nana
Hemigrammus ocellifer
Hemigrammus pulcher
Hemigrammus rhodostomus
Hemigrammus rodwayi
Hemigrammus ulreyi
Hemiodopsis goeldi
Hemiodopsis gracilis
Hemiodopsis immaculatus
Hemiodopsis semitaeniatus
Hemiodus unimaculatus
Hemistichodus vaillanti
Herotilapia multispinosa
Heterocharax macrolepis
Heteropneustes fossilis
Homaloptera orthogoniata
Homaloptera plecostomus
Homaloptera zollingeri
Hoplerythrinus unitaeniatus
Hoplias malabaricus
Hoplosternum thoracatum
Husu huso
Hypancistrus zebra

Hyphessobrycon bentosi
Hyphessobrycon copelandi
Hyphessobrycon erythrostigma
Hyphessobrycon flammeus
Hyphessobrycon herbertaxelrodi
Hyphessobrycon loretoensis
Hyphessobrycon pulchripinnis
Hyphessobrycon roberti
Hyphessobrycon serpae
Hyphessobrycon socolofi
Hyphessobrycon sp.
Hypopomus artedi
Hypopomus brevirostris
Hypoptopoma gulare
Hypostomus plecostomus
Hypostomus punctatus
Ictalurus melas
Inpaichthys kerri
Iodotropheus sprengerae
Iriatherina werneri
Jordanella floridae
Julidochromis dickfeldi
Julidochromis marlieri
Julidochromis ornatus
Julidochromis regani
Julidochromis transcriptus
Kryptopterus bicirrhis
Kryptopterus limpok
Kryptopterus macrocephalus
Labeo bicolor
Labeo calbasa
Labeo erythrurus
Labeo *frenatus*
Labeo numensis
Labeo tropheus trewasse
Labidochromis sp.
Labiobarbus festiva
Lamprologus brichardi
Lamprologus buscheri
Lamprologus calvus
Lamprologus caudopunctatus
Lamprologus compressiceps
Lamprologus daffodil
Lamprologus leleupi
Lamprologus mocquardi
Lamprologus signatus
Lamprologus tetracanthus
Lamprologus tretocephalus
Lasiancistrus punctattissimus
Lates calcarifer
Leiocassis mystus
Leiocassis siamensis
Lepidocephalus guntea
Lepidocephalus thermalis
Lepisosteus spatula
Leporinus arcus
Leporinus fasciatus
Leporinus maculatus
Leptobarbus hoeveni
Leptobotia elongata
Leptobotia guilinensis
Leptobotia pellegrini
Leptolucania ommata
Loricaria parvae
Luciocephalus pulcher
Luciosoma bleekeri
Luciosoma setigerum
Macrognathus aculeatus
Macrognathus circumcinctus
Macrognathus siamensis
Macropodus cupanus
Macropodus opercularis
Malapterurus electricus
Marcusenius angolensis
Marcusenius isidori
Mastacembelus arcus
Mastacembelus armatus
Mastacembelus circumcintus
Mastacembelus erythrotaenia
Mastacembelus freaoli
Mastacembelus frenatus
Mastacembelus pancalus
Mastacenbelus maculatus
Megalamphodus megalopterus
Megalamphodus sweglesi
Melanochromis auratus
Melanochromis johanni
Melanotaenia boesemani

Melanotaenia fluviatilis
Melanotaenia lacustris
Melanotaenia maccullochi
Melanotaenia nigrans
Melanotaenia sexlineata
Melanotaenia splendida
Melanotaenia trifasciata
Merodontotus tigrinus
Metynnis albonubes
Metynnis argenteus
Metynnis hypsauchen
Metynnis luna
Metynnis maculatus
Microgeophagus altispinos
Microglanis inheringi
Microglanis paraphyboe
Microglanis poecilus
Microphis boaja
Mimagoniates microlepis
Misgurnus anguillicaudatus
Misgurnus fossilis
Misgurnus mizolepis
Moenkhausia lepidura
Moenkhausia oligolepis
Moenkhausia pittieri
Moenkhausia robertsi
Moenkhausia sanctaefilomenae
Monocirrhus polyacanthus
Monodactylus argenteus
Monodactylus sebae
Monopterus albus
Mormyrops boulengeri
Mormyrus longirostris
Morulius chrysophekadion
Myleus pacu
Myleus rubripinnis
Mylossoma aureum
Mystus cavasius
Mystus micracanthus
Mystus nemurus
Mystus tengara
Mystus vittatus
Myxocyprinus asiaticus
Nannacara anomala
Nannostomus auratus
Nannostomus beckfordi
Nannostomus espei
Nannostomus harrisoni
Nannostomus marginatus
Nannostomus trifasciatus
Nannostomus unifasciatus
Nanochromis nudiceps
Nanochromis parilus
Nanochromis sp.
Nematobrycon lacortei
Nematobrycon palmeri
Neosilurus ater
Neosilurus sp.
Nomorhamphus celebensis
Nomorhamphus liemi
Nothobranchius patrizii
Notopterus afer
Notopterus chitala
Notopterus mikereedi
Ompok bimaculatus
Ompok pabda
Ompok sabanus
Ophisternon sp.
Ophthalmotilapia nasutus
Ophthalmotilapia ventralis
Opsaridium christyi
Opsariichthys platypus
Oryzias javanicus
Oryzias melanostigma
Osphronemus goramy
Osteochilus hasselti
Osteoglossum bicirrhosum
Osteoglossum ferreirai
Otocinclus acus
Otocinclus affinis
Otocinclus arnoldi
Oxyeleotris marmoratus
Panaque nigrolineatus
Panaque suttoni
Pangasius larnaudi
Pangasius micronzma
Pangasius sutchi
Pantodon buchholzi

Paracheirodon axelrodi
Paracheirodon innesi
Paracrossocheilus vittatus
Paragoniates alburnus
Parambassis gulliveri
Parapocryptes serperaster
Pecklotia pulcher
Pecklotia vittata
Pelmatochromis kribensis
Pelteobagrus ornatus
Pelvicachromis taeniatus
Pelvicachromis thomasi
Periophthalmus barbarus
Periophthalmus koelreuteri
Periophthalmus regius
Petitella georgiae
Petrocephalus simus
Petrochromis trewavasae
Phenacogrammus aurantiacus
Phenacogrammus interruptus
Phractocephalus hemiliopterus
Pimelodella gracilis
Pimelodella lineatus
Pimelodus albofaciatus
Pimelodus clarias
Pimelodus omatus
Pimelodus pictus
Platydoras costatus
Platystomatichthys sturio
Platytropius siamensis
Plecostomus atabapo
Plecostomus trinidad
Poecilia latipinna
Poecilia reticulata
Poecilia sphenops
Poecilia velifera
Poecilobrycon auratus
Poecilocharax weitzmani
Pollimyrus castelnaui
Polycentrus schomburgki
Polynemus paradiseus
Polypterus delhezi
Polypterus laprad
Polypterus ornatipinnis
Polypterus palmas
Polypterus retropinnis
Polypterus senegalus
Poptella orbicularis
Potamorrhaphis goctos
Potamorrhaphis guianensis
Potamotrygon hystrix
Potamotrygon laticeps
Potamotrygon leopoldi
Potamotrygon motoro
Potamotrygon reticulatus
Prionobrama filigera
Pristella maxillaris
Pristella riddlei
Protopterus annectens
Protopterus dolloi
Pseudacanthicus spinosus
Pseudobagrus fulvidraco
Pseudodoras holdeni
Pseudodoras niger
Pseudogastromyzon fasciatus
Pseudogastromyzon myersi
Pseudomugil signifer
Pseudoplatystoma fasciatum
Pseudorinelepis pelegrini
Pseudotropheus atherinoides
Pseudotropheus auratus
Pseudotropheus brevis
Pseudotropheus cobalt
Pseudotropheus eduardia
Pseudotropheus elongatus
Pseudotropheus johanni
Pseudotropheus kenyii
Pseudotropheus livingstonii
Pseudotropheus lombardoi
Pseudotropheus sp.
Pseudotropheus tropheops
Pseudotropheus zebra
Pterolebias zonatus
Pterophyllum altum
Pterophyllum scalare
Pterotilapia tridentiger
Pterygoplichthys ansitsi
Pterygoplichthys gibbiceps

Puntius *altus*
***Puntius** bimaculatus*
***Puntius** conchonius*
***Puntius** cummingi*
***Puntius** daruphani*
***Puntius** everetti*
***Puntius** fasciolatus*
Puntius ***filamentosus***
***Puntius** hexazona*
***Puntius** lateristriga*
***Puntius** lineatus*
***Puntius** nigrofasciatus*
***Puntius** orphide*
***Puntius** phutunio*
***Puntius** pinnauratus*
***Puntius** sahyadriensis*
***Puntius** schwanenfeldii*
***Rachovia** brevis*
***Rasbora** argyrotaenia*
***Rasbora** borapetensis*
***Rasbora** caudimaculata*
***Rasbora** danicontus*
***Rasbora** dorsiocellata*
***Rasbora** einthoveni*
***Rasbora** elegans*
***Rasbora** heteromorpha*
***Rasbora** kalochroma*
***Rasbora** maculata*
***Rasbora** meinkeni*
***Rasbora** pauciperforata*
***Rasbora** trilineata*
***Rasbora** vaterifloris*
***Rhamphichthys** rostratus*
***Rhaphiodon** vulpinus*
Rhinogobius wui
Rhinomugil corsula
***Rhodeus** ocellatus*
***Rineloricaria** fallax*
***Rineloricaria** hasemani*
***Rineloricaria** lanceolata*
***Sawbwa** resplendens*
Scleropages jardini
***Scleropages** leichardti*
***Semaprochilodus** squamilentus*
***Semaprochilodus** taeniurus*
***Semaprochilodus** theraponura*
***Serrasalmus** nattereri*
***Serrasalmus** notarus*
***Serrasalmus** sp.*
***Siniperca** chuatsi*
***Sinogastromyzon** wuiifang*
Sorubim lima
***Sphaerichthys** osphromenoides*
***Steatocranus** casuarius*
***Steatocranus** mpozoensis*
***Steatocranus** ubangiensis*
***Stigmatogobius** sadanundio*
***Sturisoma** aureum*
***Sturisoma** panamense*
***Symphysodon** aequifasciata*
***Symphysodon** discus*
***Synbranchus** marmoratus*
***Synodontis** acanthomias*
***Synodontis** angelicus*
***Synodontis** brichardi*
***Synodontis** caudilis*
***Synodontis** contractus*
***Synodontis** decorus*
***Synodontis** flavitaeniatus*
***Synodontis** granulosus*
***Synodontis** greshoffi*
***Synodontis** multipunctatus*
***Synodontis** nigriventris*
***Synodontis** notatus*
***Synodontis** schoutedeni*
***Synodontis** soloni*
***Tanganicodus** irsacae*
***Tanichthys** albonubes*
***Telmatherina** celebes*
Terapon jarbua
***Tetragonopterus** sp.*
***Tetraodon** cutcutia*
***Tetraodon** fluviatilis*
***Tetraodon** mbu*
***Tetraodon** miurus*
***Tetraodon** nigropunctatus*
***Tetraodon** palembangensis*
***Tetraodon** schoutedeni*

Tetraodon somphongsi
Thayeria boehlkei
Thayeria gymnocorymbus
Thayeria obliqua
Thayeria santaemariae
Thoracocharax stellatus
Thoracocharax strigatta
Thoracochrax securis
Tilapia mariae
Toxotes chatareus
Toxotes jaculator
Trichogaster leeri
Trichogaster microlepis
Trichogaster pectoralis
Trichogaster trichopterus
Trichopsis pumilus
Trichopsis vittatus
Triglachromis otostigma
Triportheus albus
Tropheus duboisi
Tropheus moorii
Uaru amphiacanthoides
Wallago attu
Xenentodon cancila
Xenomystus nigri
Xenotilapia melanogenys
Xiphophorus helleri
Xiphophorus maculatus
Xiphophorus variatus

APPENDIX B

Excerpts from "Trends **in** U.S. **International** Trade **in** Ornamental Fish, **1982-1992** (Thunberg et al. 1993)".

U.S.A. Ornamental Fish Imports Bv Region

Canada: total annual imports from Canada are shown in Figure 5. The **1982-1987 time series shows a dramatically different pattern in terms of the magnitude of the total value of imported ornamental fish as compared to 1989-1992. The large discrepancy between these two periods is probably due to adoption of a ten-digit code in 1989. Thus, the 1989-1992 time period provides a more accurate picture of the importance of Canadian ornamental fish imports.**

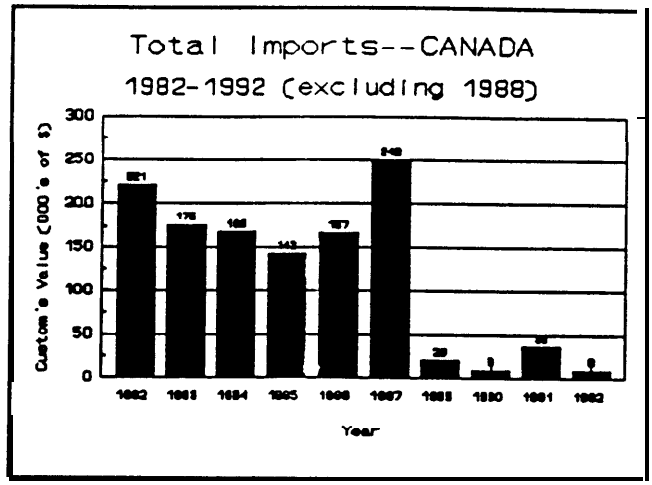


Figure 5. Annual Value of Imports from Canada.

The value of imports from Canada peaked in 1991 at **$36,000** but average **approximately half that over the four year period. As compared to imports from other countries, Canada** is **only a minor**

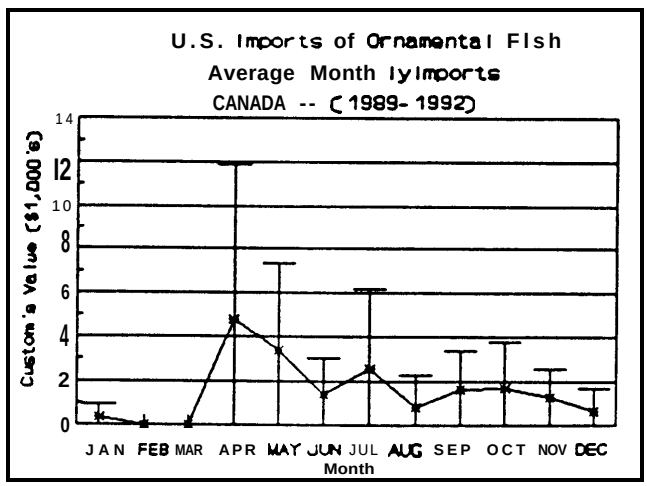


Figure 6. Monthly Value of Imports from Canada.

source of ornamental fish for the U.S. The seasonal pattern of Canadian imports is shown in Figure 6.

As was the case for total U. S. imports, imports from Canada are greatest in April followed by another small peak in July. After July average Canadian imports decline in August and rise slightly in September before gradually declining to less than $1,000 during the winter months. On average, monthly imports are greater than $2,000 during only April, May, and July and fall to less than that for the rest of the year. However, over the 1989-1992 time period, average monthly imports exhibited substantial variability.

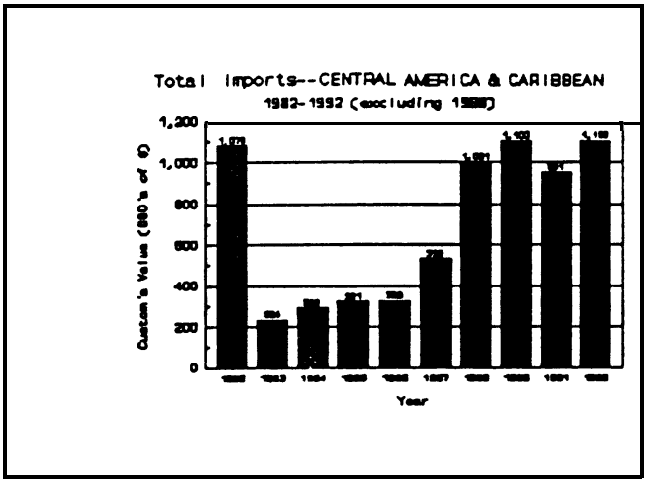


Figure 7. Annual Value of Imports from Central America and Caribbean.

Central America and Caribbean: total imports from the Central America and Caribbean region are shown in Figure 7. Recorded imports of ornamentals from Central America increased steadily from 1983 to 1987. However, from 1989 to 1992 imports were nearly constant at approximately $l,OOO,OOO. Data from this later time period suggest that the increasing trend in

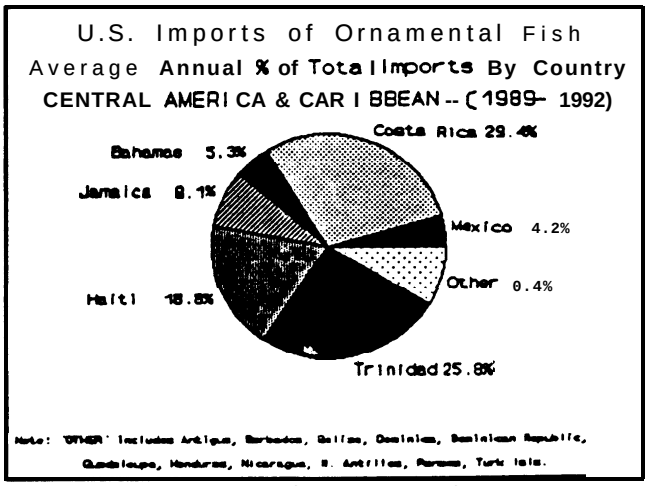


Figure 8. Origin of Imports from Central America and the Caribbean.

imports of commodities listed under the seven digit code used prior to 1989 may have come from sources other than growth in ornamental fish trade.

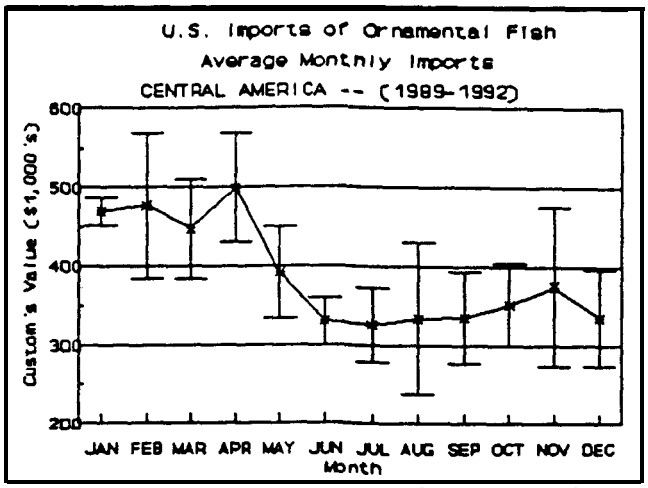


Figure 9. Monthly Value of Imports from Central America and Caribbean Regions.

Average annual shares of imports for individual countries are shown in Figure 8. Overall, the majority of imports originate in Costa Rica followed by Trinidad, Haiti, Jamaica, the Bahamas, and Mexico. This ranking does not fully reflect current conditions due to the political upheaval in Haiti and the subsequent drop in Haitian imports after 1991. The proportions shown in Figure 8 were calculated using only 1989-1991 data for Haiti. This was done to show the importance of Haitian imports and to highlight the potential impact on ornamental fish trade when Haiti is able to return to its pre-1992 production levels.

The monthly pattern of Central American and Caribbean imports shown in Figure 9 exhibits distinct seasonality. During the months of January through April average imports range between $450,000 and $500,000 while for the rest of the year imports range between $400,000 and $325,000 on an average monthly basis. Over the 1989-92 period monthly imports peaked in April and were at their lowest during June, July, August, and September.

The pattern of average monthly imports exhibited varying degrees of variability. Imports during January and June were relatively stable while trade volume during the

months of July, September, October, and December seemed to be slightly more **variable. Trade volume during the remaining months,** exhibited **a higher degree of volatility with August, November, and January being** particularly variable.

South America: **over the time period represented by the data, South America was the second largest importing region, averaging approximately $5,000,000 per year (1989-1992). The annual value of South American imports is shown in Figure 10. From 1982 to 1992 the value of imports showed varying levels of growth and contraction. Imports during 1984 and 1985 were particularly large but since the pre-1989 data included** commodities **other than ornamental fish it is not possible to determine whether the large import value was due to increases in ornamental fish or some other commodity. From 1989 to 1992 import value declined by approximately 25 percent, falling from a high of $6,306,000 in 1989 to a low of $4,570,000 in 1991. Import value rebounded slightly** (7.2 **percent) in 1992**

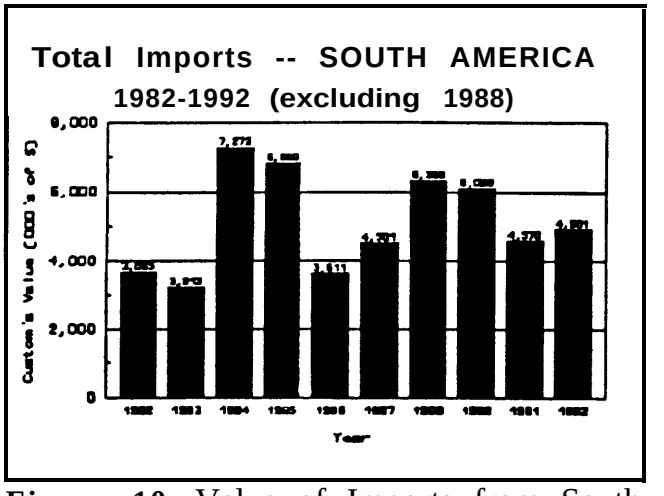


Figure 10. Value of Imports from South America.

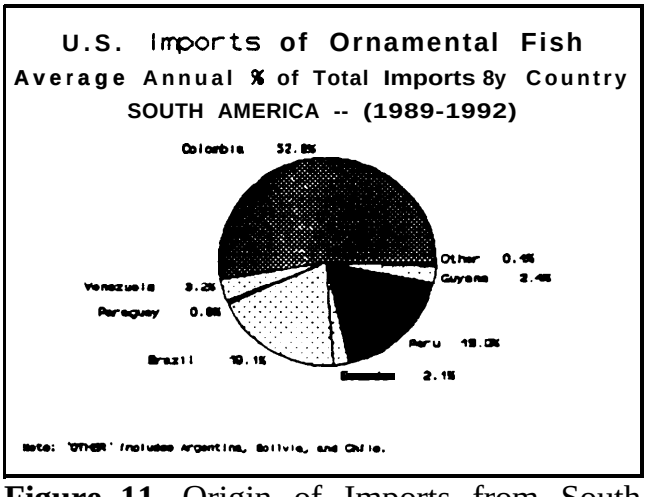


Figure 11. Origin of Imports from South America.

but there is not possible to determine whether this increase will continue into 1993 and beyond.

The average annual distribution of South American imports by country of origin is shown in Figure 11. From 1989-1992 ornamental fish from Colombia comprised more than half of the total value of imports from South America. When Brazilian and Peruvian imports are added to Colombia's total, these three countries comprised approximately than 91 percent of the value of South American ornamental fish imports to the U. S. Countries such as Ecuador, Guyana, Venezuela, and Paraguay averaged 2.1 percent of the total value of imports from the region. Thus, if the value of ornamental fish imports from the region are to return to 1989 levels, the majority of that growth will depend upon favorable economic and political conditions in Colombia, Peru, and Brazil.

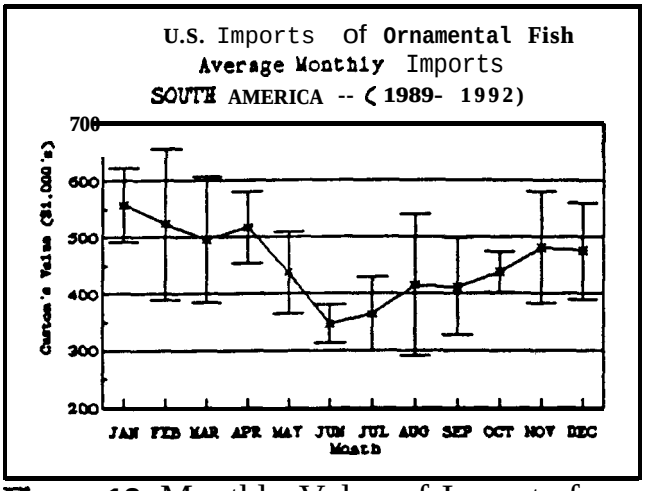


Figure 12. Monthly Value of Imports from South America.

The seasonal changes in South American monthly import value is shown in Figure 12. From 1989 to 1992, average monthly import value showed a distinct seasonal pattern, with imports increasing to the highest level of $550,000 in January to the lowest levels in June. The variability of imports was lowest in June and October and greatest in February, March, and August. During the rest of the year the values of imports exhibited moderate variability.

Europe: as a source of imported ornamental fish, Europe plays a relatively minor role. As shown in Figure 13, the value of European imports to the U. S. peaked in 1987 at $336,000. Over the 1989-1992 period, European imports exhibited no consistent pattern falling from $318,000 in 1989 to $130,000 in 1990 and 1991 then increasing to $278,000 in 1992. The majority of ornamental fish imports from Europe may be transhipments from other parts of the world. If transhipments do represent the majority of import volume, this relatively low value of imported ornamentals (as compared to other commodities) may be due to the obvious need for live shipment. The time delay in transhipping a commodity through Europe, and the availability of air transport within the major producing regions may make transhipment through European ports a relatively unattractive option.

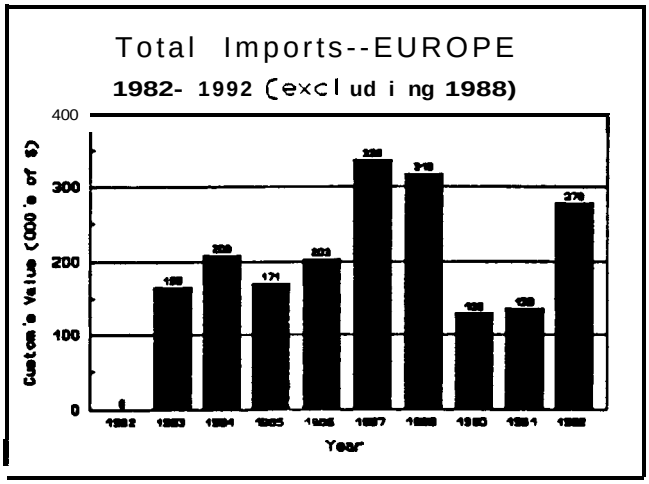


Figure 13. Annual Value of Imports from Europe

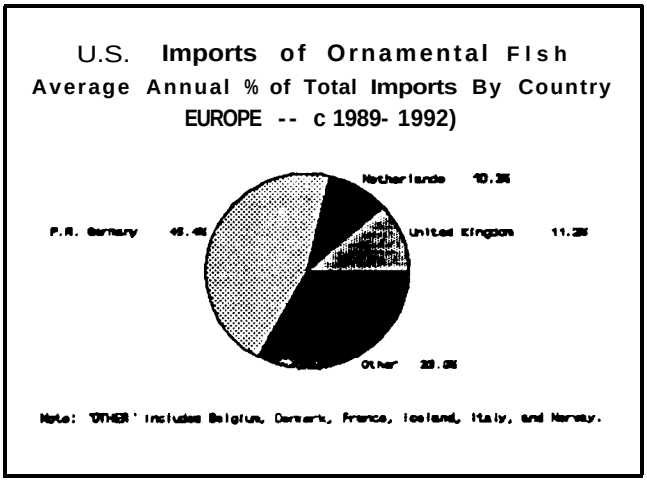


Figure 14. Origin of Imports from Europe.

Of the ornamentals that are shipped through European ports, the majority may be highly specialized products

destined for the advanced aquarium market. Such products are likely to be high in value, but are traded in small quantities.

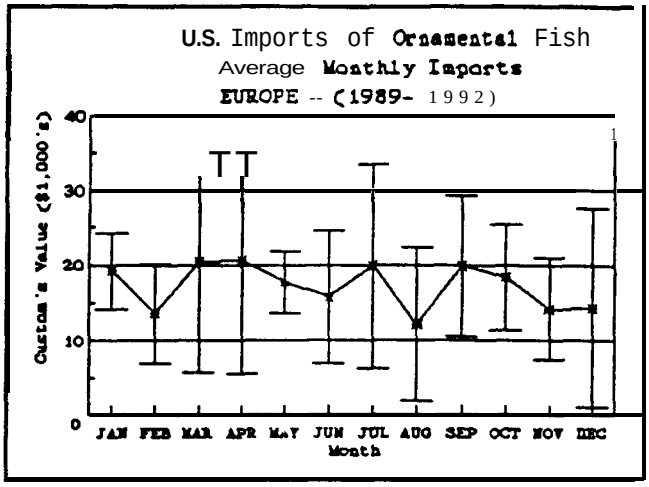


Figure 15. Monthly Imports from Europe.

The distribution of average annual European imports by country is shown in Figure 14. In terms of import shares Germany leads all other European countries with an average annual share of 45.4 percent. Of the remaining countries only the Netherlands (10.3%) and the United Kingdom (11.2%) had an import share greater than 5 percent.

The seasonal pattern of European imports is illustrated in Figure 15 for the 1989-1992 time period. On average, European imports fluctuated within a relatively narrow range of between $21,000 and $12,000 throughout the year. No particular seasonal pattern can be discerned although seasonal highs in March and April do correspond to similar peak months in other regions.

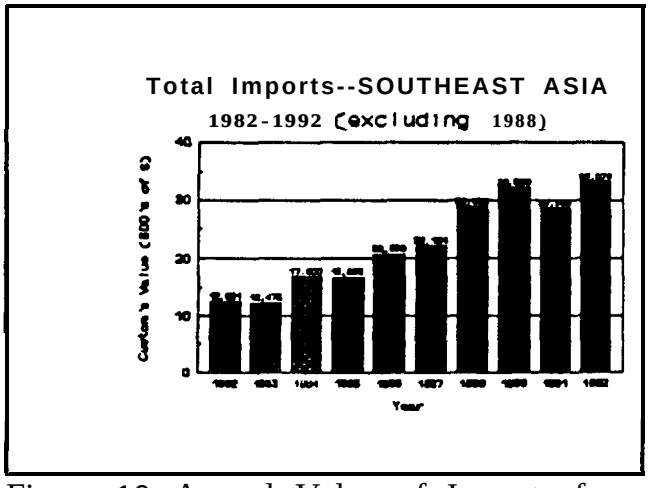


Figure 16. Annual Value of Imports from Southeast Asia.

Southeast Asia: the total value of imports from Southeast Asia had been on a general upward trend from 1982 to

1992 (Figure 16). This upward trend has continued since 1986 interrupted only by a small decrease in import value in 1991. The value of imports was $33,070,000 in 1992, which represents an increase of approximately 60 percent compared to the 1986 level.

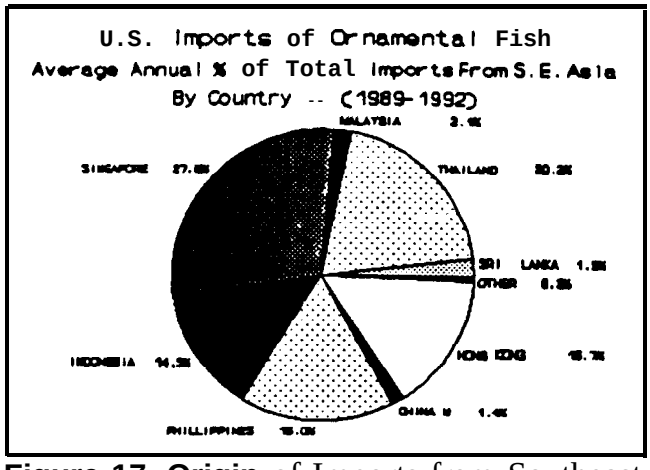


Figure 17. Origin of Imports from Southeast Asia.

Figure 17 shows the distribution of Southeast Asian imports by country. For all Southeast Asian countries, Singapore's share of average annual imports from 1989-1992 was the largest (27.9%) followed by Thailand (20.2%), the Philippines (16%), Hong Kong (15.7%), and Indonesia (14.5%). Average annual imports from the remaining countries accounted for less than 7 percent of total value.

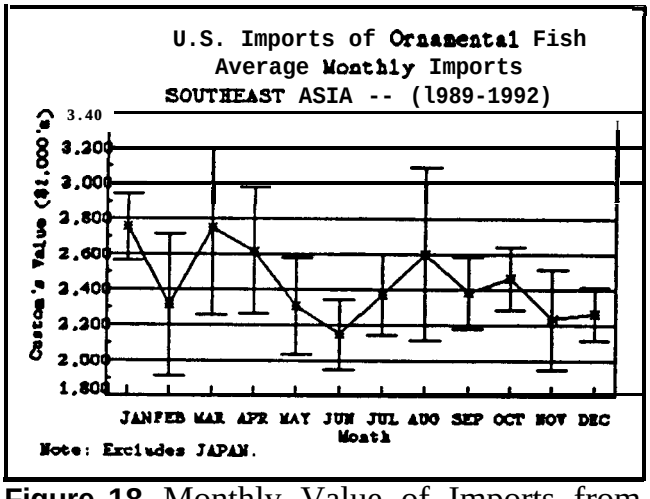


Figure 18. Monthly Value of Imports from Southeast Asia.

Average monthly import value for the 1989-1992 period is reported in Figure 18. Average monthly imports fluctuated between $2,750,000 and $2,150,000 on an annual basis. On average, June exhibited the lowest amount of import activity. Average imports peaked during January, March, and August.

Average Southeast Asian import values exhibited substantial variability over the year particularly during the months of February, March, and August. In each of these months, the standard deviation about the mean was approximately $500,000. In the remaining months the standard deviation was consistently less.

Australia and Pacific Islands: total imports from Australia and the Pacific Islands increased substantially over the 1982 to 1992 time period (Figure 19). Growth in annual imports was particularly dramatic from 1989-1992 as compared to the earlier time period. Much of the growth can be attributed to increases in imports through Australian, Marshall Islands, and Fijian ports.

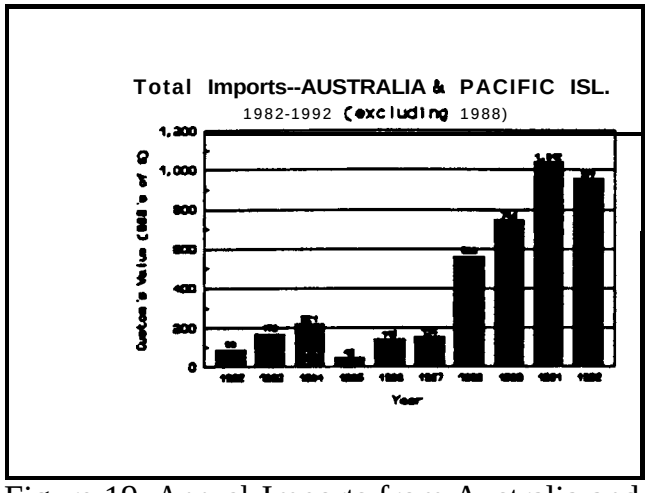


Figure 19. Annual Imports from Australia and Pacific Islands

Imports of ornamental fish increased slightly more than 25 percent from 1989 to 1991, before dropping 9 percent in 1992. The total value of imports from the region peaked in 1991 at $1,042,000.

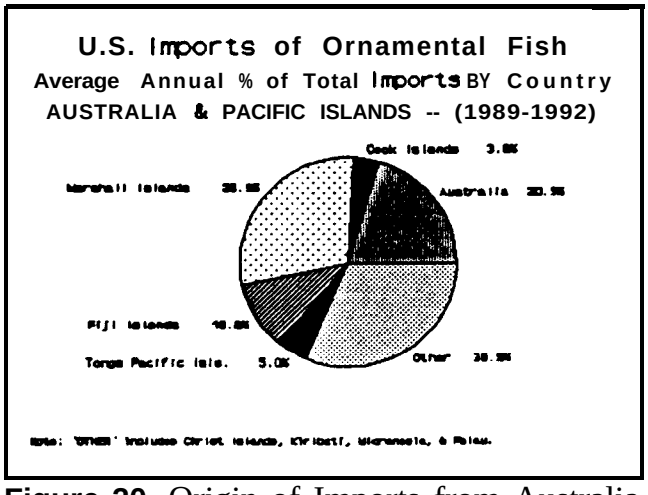


Figure 20. Origin of Imports from Australia and Pacific Islands.

The relative share of average annual import value by country is shown in Figure 20. Average annual import value is greatest from the Marshall Islands

(28.9%) followed by Australia (20.5%), Fiji Islands (10.8%), Tonga Islands (5%) and Cook Islands (3.8%). Import value in the "Other" category represents nearly one-third of the region's total value. The countries in the "Other" category exhibited either an erratic pattern of imports or the data only showed import values for one or two years from 1989 to 1992. For example, Palau had less than $10,000 per year in import value for 1989 and 1990. In 1991 and 1992, however, Palau's imports increased ten-fold to $110,OO per year.

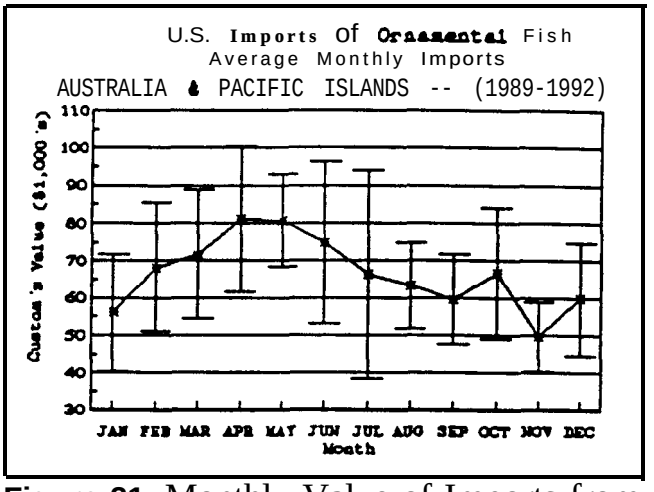


Figure 21. Monthly Value of Imports from Australia and Pacific Islands.

The monthly pattern of imports from Australia and the Pacific Islands is shown in Figure 21. Over the 1989-1992 period, monthly import value peaked in April and May, followed by a general downward trend through December. Over the year, monthly imports rang from a low of $49,000 in November to a high of $81,000 in April and May. The variability in import value was greatest during June and July and lowest in August, September, and November. During the remaining months, variability in import value was relatively moderate with standard deviation of approximately $15,000.

A frica: the total value of ornamental fish imported from Africa is shown in Figure 22 for 1982 to 1992. The total annual value of imports has declined steadily since 1989. Imports were valued at $1,046,000 in 1989 and $638,000 in 1992. Annual import value fell more than 20 percent from 1989 to 1990 and fell even more (nearly 29%) from 1990 to 1991. By comparison, 1992 imports were only 5 percent less than 1991.

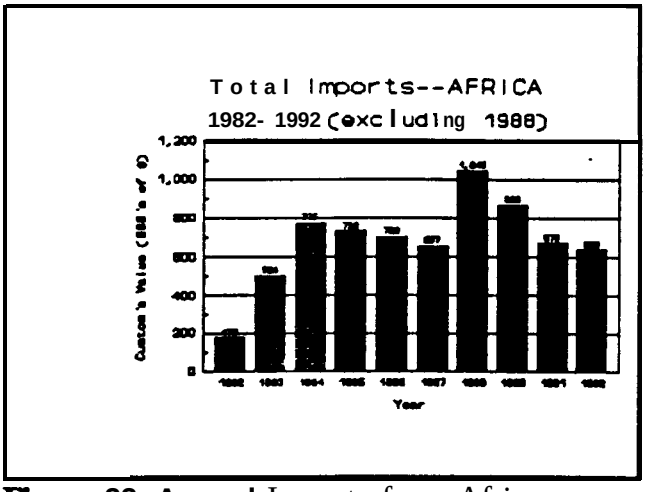


Figure 22. Annual Imports from Africa.

The share of total annual average import value is shown in Figure 23 for countries in the African region. As Figure 23 shows, from 1989 to 1992, Nigeria (51.7%) and Zaire (24.9%) accounted for approximately 75% of the total value of ornamental fish imported to the United States from the African region.

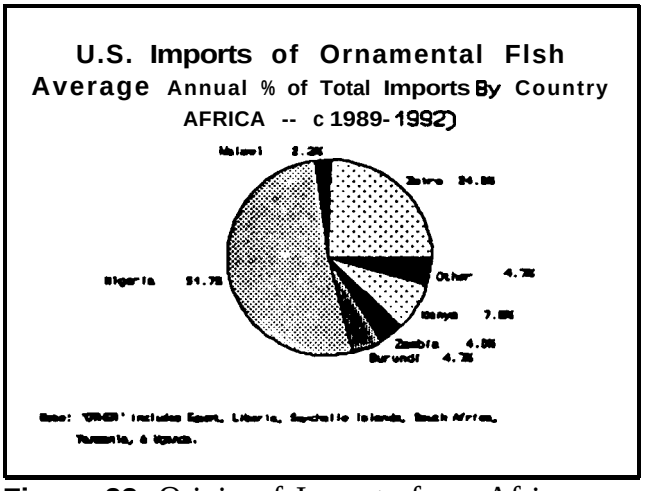


Figure 23. Origin of Imports from Africa.

Kenya is the only other country that had an import share greater than 5 percent. For the entire region, many countries showed somewhat erratic patterns of imports having at least some, but highly variable, imports in each of the four years or showing imports in only small amounts in only three or fewer years. Even countries with high

import values showed considerable variability in import value. For example, the import value for Nigeria declined from $617,700 in 1989 to nearly half of that amount in each of the next three years.

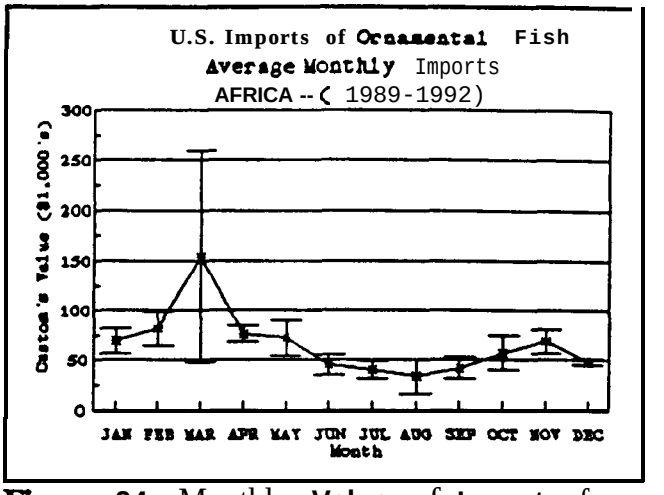
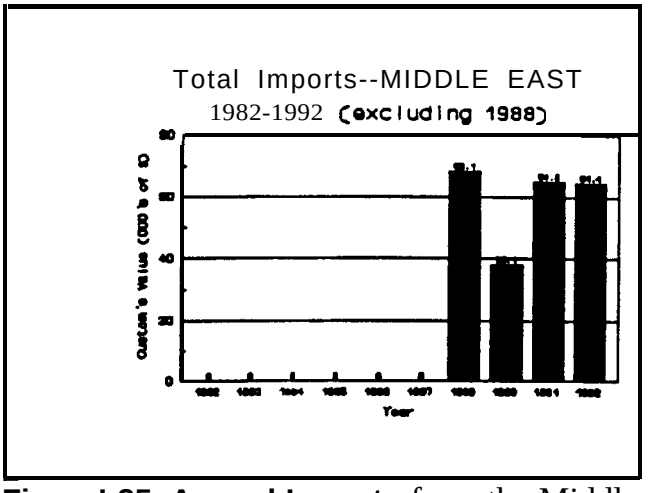


Figure 24. Monthly Value of Imports from Africa.

The seasonal pattern of monthly import values from the African region are shown in Figure 24. Monthly African imports are notable for two reasons. First, average' monthly import value peaks sharply in March (more than $150,000) as compared to the rest of the year. March imports, however, show substantial variability with a standard deviation of nearly $125,000. Second, for the rest of the year, there is very little variability in monthly import value. The standard deviation for all months other than March is only slightly more than $50,000. After March, import values decline steadily through August. After August, imports rise steadily to a moderate peak in November, decline slightly in December, and rise over January and February to the March peak.

Middle East: **the total annual import value from Middle Eastern countries is shown in Figure 25. The Custom's data showed no imports of ornamental fish or other commodities falling into the ornamentals category prior to 1989. However, with the exception of 1990, Middle Eastern imports have remained nearly constant ranging from $68,100 and $64,900 per year. Of the countries that for the Middle Eastern region only Israel and Bahrain had non-zero export values over the 1989-1992 period. Of these two countries, Bahrain was 54% of average annual imports, with Israel making up the balance of total imports. Average monthly import values from the Middle East showed no particular pattern and were highly variable in most months.**



Figure! 25. Annual Imports from the Middle East.

U.S.A. Ornamental Fish Exports By Region

Canada: **total annual U.S. exports to Canada are shown in Figure 29. Total annual exports reached a low of $993,000 in 1987, but more than doubled from 1989 to 1990 by increasing from $1,796,000 to $4,181,000. Since 1990, the total value of exports to Canada has remained nearly constant, averaging $4,105,000 per year. The pattern of average monthly export value is shown in Figure 30. With the exception of May and June, average monthly U.S. export values to Canada range from a high of $330,000 and $280,000. Average export value during May and June drops** below $250,000. **Otherwise, average monthly export value is nearly constant. However, the standard deviation of $100,000 for most months indicates that over a period of analysis, U.S. export trade with Canada exhibited a fair amount of volatility.**

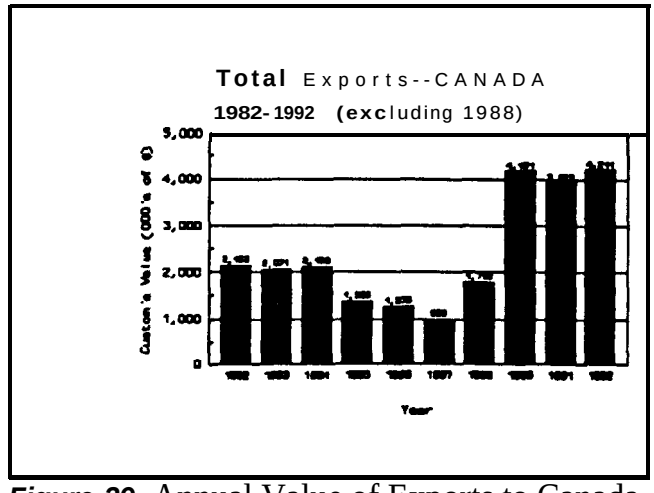


Figure 29. Annual Value of Exports to Canada.

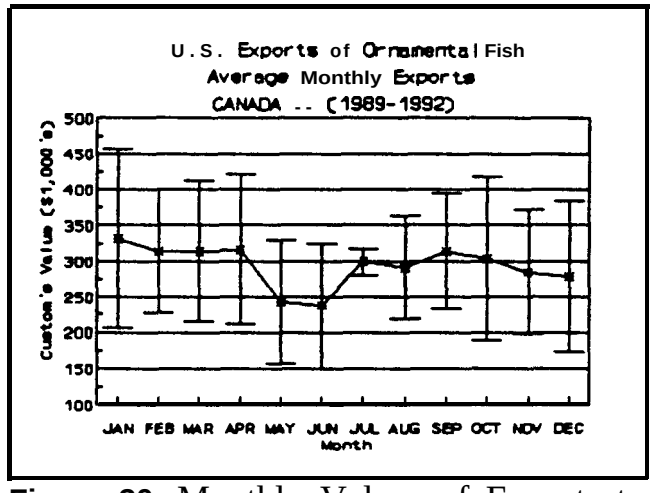


Figure 30. Monthly Values of Exports to Canada.

Southeast Asia: total annual U.S. exports to the Southeast Asian region are shown in Figure 31 for 1982 to 1992. Total annual exports to Southeast Asia show a generally increasing trend from 1984 through 1992. From 1989 to 1992 (the time period over which the data are potentially more reliable) annual exports exhibited an alternating pattern of decreases and increases beginning with a decrease in export value **in 1990. Over the four years, total export value ranged from a high of $3,559,000 in 1991 to a low $2,679,000 in 1990.** Average annual exports during this period were $3,065,500.

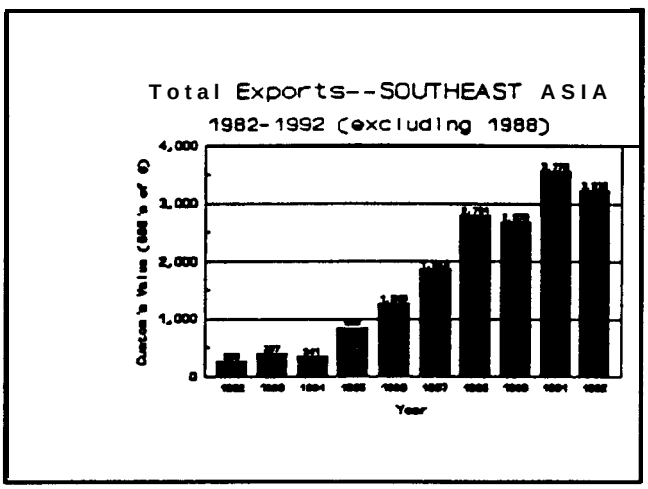


Figure 31. Value of Exports to Southeast Asia.

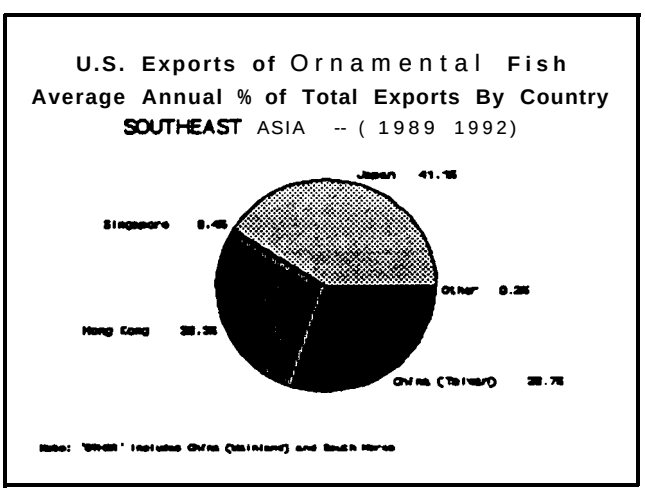


Figure 32. U.S.A. Exports to Southeast Asia.

The average annual percentage shares of export value among Southeast Asian countries are shown in Figure 32. As compared to other countries in the region the majority of U.S. exports go to Japanese markets (41.1%). The value of exports to Hong Kong (28.5%) and Taiwan (29.7%) are about equal. To demonstrate the importance of exports to Japan, total annual exports are shown in Figure 33. Unlike

that total annual export value in the region, the value of exports to Japan has increased steadily from 1989 to 1992. In fact, the export value has increased by $ 1 ,OOO,OOO every year since 1990.

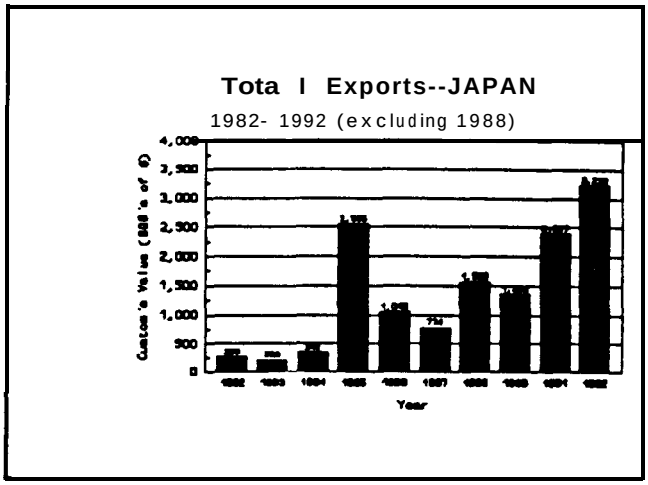


Figure 33. Annual Exports to Japan.

The monthly pattern of U.S. exports to Southeast Asia is shown in Figure 34 for 1989 to 1992. The value of average monthly exports exhibited a distinct pattern beginning with a decline in value from January to February. After February, however, average exports increase in March, and reach a seasonal peak in April. After April monthly export value exhibits a steady decline each month through July. After July, average monthly export values rise steadily to an annual peak in December. Over the year, average monthly export value fluctuates within a relatively wide range from $280,000 in July to $630,000 in December. Given the large export value to the Southeast Asian region, the variability in monthly exports was not particularly large. However, the standard deviation for April and September to December were larger than that for the rest of the year.

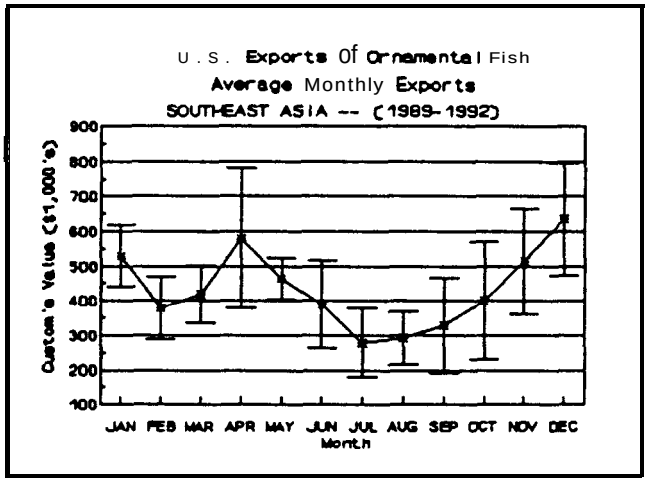


Figure 34. Monthly Value of Exports to Southeast Asia.

Europe: the total value of U.S. exports to European countries is shown in Figure 35. From 1989 to 1992, total U.S. exports increased from $1,623,000 in 1989 to $3,791,000 in 1992. Over this period, total export value exhibited gradual growth from 1989 to 1991, but increased by approximately one-third from 1991 to 1992.

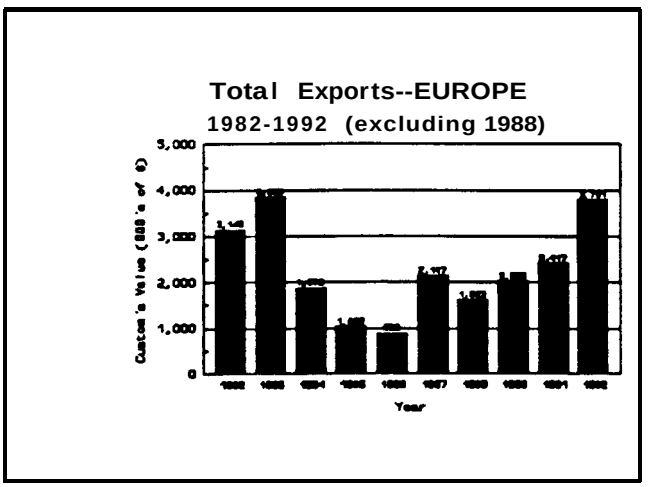


Figure 35. Value of Exports to Europe.

The relative distribution of export value among various European countries is shown in Figure 36. As a percentage of the total, average export value was greatest for the United Kingdom (32.4%), followed by the Netherlands (20.6%), France (16.4%), and Germany (12.5%). The remaining countries comprised about 19 percent of the total export value. The large increase in total export value observed in 1992 was due to large increases in exports to the United Kingdom (+ 39%), Germany (+ 41%), Italy (+ 25%), and France (+ 300%).

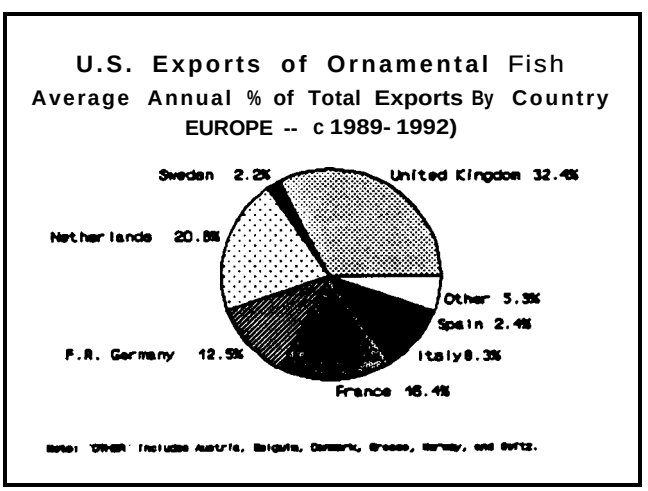


Figure 36. U.S.A. Exports to Europe.

The monthly pattern of export value from 1989 to 1992 is shown in Figure 37. With the exception of April, average monthly export values fluctuated within a range

from $260,000 to $120,000. Average monthly export values peaked in April at over $400,000, and with the exception of that month, export values exhibited a standard deviation of approximately $50,000. During April, however, the standard deviation was nearly $200,000. Other than a distinct peak in April, average monthly export value appeared to be nearly constant over all other months.

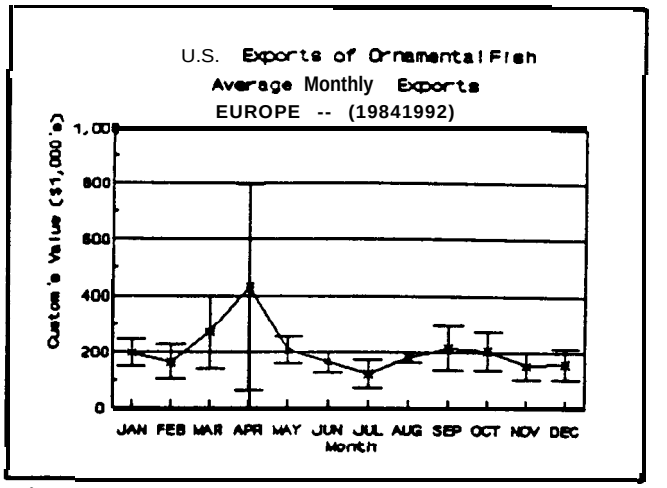


Figure 37. Monthly Value of Exports to Europe.