EP/GLO/201/GEF

**REBYC**

Reduction of Environmental Impact from Tropical Shrimp Trawling, through the introduction of By-catch Reduction Technologies and Change of Management

http/www.fao.org/fi/gefshrimp.htm

# Study on the Socio-Economic Importance of By-catch in the Demersal Trawl Fishery for Shrimp in Trinidad and Tobago

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## Glossary of Fish Species

| Common/Local Name | FishBase Name* | Scientific Name |
|---|---|---|
| Bechine; Bacheen | Guachanche barracuda | *Sphyraena guachancho* |
| Carite | Serra Spanish mackerel | *Scomberomorus brasiliensis* |
| Catfish | - Thomas sea catfish<br>- Crucifix sea catfish<br>- Coco sea catfish | - *Notarius grandicassis*<br>- *Sciades proops*<br>- *Bagre bagre* |
| Conch; Queen Conch | | *Strombus gigas* |
| Crab ; Hairy crab | | *Ucides cordatus* |
| Kingfish | King mackerel | *Scomberomorus cavalla* |
| Lobster | Caribbean Spiny Lobster | *Panilurus argus* |
| Mullet; Mollet | - White mullet<br>- Mountain mullet | - *Mugil curema*<br>- *Agonostomus monticola* |
| Octopus; Common octopus | | *Octopus vulgaris* |
| Pompano | Florida pompano | *Trachinotus carolinus* |
| Racando; Cro-Cro; Rocondo | Whitemouth Croaker | *Micropogonias furnieri* |
| Redfish; Red snapper | - Southern red snapper<br>- Lane snapper<br>- Vermilion snapper<br>- Blackfin snapper | *Lutjanus purpureus;*<br>*Lutjanus synagris;*<br>*Rhomboplites aurorubens;*<br>*Lutjanus buccanella* |
| Shark | Black tip shark | *Carcharhinus limbatus* |
| Salmon<br>- Pan salmon; *Silver salmon*<br>- *German salmon; Rock salmon; Yellow mouth salmon* | - Jamaica weakfish<br>- King weakfish<br><br>- Rainbow runner<br>- Barbel drum<br>- Green weakfish | - *Cynoscion jamaicensis*<br>- *Macrodon ancylodon*<br><br>- *Elagatis bipinnulata*<br>- *Ctenosciaena gracilicirrhus*<br>- C*ynoscion virescens* |
| Shrimp | | |
| - Pink; Southern Pink | | (*Farfantepenaeus notialis*) |
| - White | | *Litopenaeus schmiti* |
| - Red-spotted | | (*F. brasiliensis*). |
| - Ginga; Honey; Atlantic seabob | | *Xiphopenaeus kroyeri* |
| - Brown | | *Farfantepenaeus subtilis* |
| Tuna | - Blackfin tuna<br>- Yellowfin tuna | - *Thunnus atlanticus*<br>- *Thunnus albacares* |

*http://www.fishbase.org

## Executive Summary

Among different kinds of fishing technologies, the highest rate of bycatch is by shrimp trawling. In this regard, given the multi-species nature of fisheries, and the need for sustainable fishing practices, inappropriate harvest methods are likely to result in the over-fishing of by-catch species. In an attempt to assess the effectiveness of the current set of policies that govern the fishery, and to facilitate new policies, this study sought to determine the social and economic importance of the landed by-catch to the Orange Valley and Otaheite communities. This is in terms of: the proportion of households that consume bycatch; the key bycatch species consumed; the mean volume of bycatch consumed per household; the annual value of bycatch to local communities and the value of landed bycatch to fishers.

This project was done under the auspices of the Food and Agriculture Organization (FAO), the United Nations Environmental Programme (UNEP) and the Global Environmental Facility (GEF), via the *Project EP/GLO/201/GEF: Reductions of Environmental Impact from Tropical Shrimp Trawling, through the Introduction of By-catch Reduction Technologies and Change of Management*. A formal Rapid Appraisal Household Survey was conducted among a randomly selected representative sample of the households within the Orange Valley and Otaheite communities in 2005. This was followed by interviews of fishers and processors in 2005 and 2006. For both the Orange Valley and Otaheite communities, shrimp by-catch, which comprised primarily fish, was very important as a source of livelihoods. Forty-five percent (45%) of Orange Valley households and 34% of Otaheite households reported at least one person was employed in the local fisheries. Most of those so employed were as fishers or fish vendors.

In Orange Valley the most popular by-catch species consumed were Carite and Racando. In Otaheite, Bechine was identified as the most consumed single species of seafood. Almost all household obtained fresh fish from the local fish market. A large portion of them bought on a daily or weekly basis. Fresh fish was incorporated in their diet for at least one meal per day in Orange Valley. Although the average household expenditure on meat in Orange Valley was almost twice that of expenditure on seafood, a significant portion of families catch their own seafood (17%), or received seafood as gifts (28%). The portions are similar in Otaheite, where 39 % of households catch their own seafood, and 22% receive seafood as gifts.

The results of this study suggests that the bycatch landed by the shrimp fishers in Orange Valley and Otaheite totals $695,641.52 annually. These are only two of several fishing communities in Trinidad and Tobago at which shrimp are landed. This annual figure therefore, represents a lower bound on the value of shrimp bycatch in Trinidad and Tobago. Further, in 2003, the total value of shrimp bycatch (MALMR 2007b) was $3.70 mil. This means that the bycatch landed in Orange Valley and Otaheite, account for approximately 19% of bycatch value in Trinidad and Tobago. The Total Economic Value of shrimp bycatch in Trinidad and Tobago is comprised of its: Use Value and Non-Use Value. This study captured part of the shrimp bycatch Direct Use Value. Since only ex-vessel prices are assumed to be used in this analysis, the value added component of processing and retailing activities represent an additional component of Direct Use Value that is still to be captured. Therefore, any policies that may be implemented to reduce bycatch in the shrimp fishery, must recognize the enormous importance that it has on the livelihoods of many in the local communities, as well as its serving as a source of protein, which for many residents of these communities may be obtained more cheaply than other sources of protein due to their close proximity to the landing site, their access to cheaper "Mixed Fish", may always be sold at more urban sale centres, and also their ability in some cases to have family members catch fish, or obtain fish as gifts from family members or friends.

# 1.0 Introduction

The shrimp fishery in Trinidad and Tobago is considered to be one of the most valuable fisheries in the country. A large amount of the catch is exported to other CARICOM countries, and the remainder is consumed on the local market. Most of the fishing occurs off the West Coast of Trinidad, in the Gulf of Paria, by artisanal and semi-industrial fleets. Some fishing takes place off the northwest coast and off the south coast, by mainly semi-industrial and industrial trawlers.

The shrimp segment of the economy has faced many challenges over the last few decades. After enjoying a healthy and increasing demand for the local marine shrimp in the U.S.A market, entry of exports ceased due to non-compliance of the requirement for Turtle Excluder Devices (TEDs) in the fishing gears. Furthermore, the conservation and utilization of non-target species from shrimp harvest activities has come into focus within recent years. In this regard, given the multi-species nature of the fishery, and the need for sustainable fishing practices, inappropriate harvest methods are likely to result in the over-fishing of by-catch species. On the other hand, by-catch also has economic and social importance, as it serves as a source of income to fishers, and as a source of affordable protein for the local population. In an attempt to assess the effectiveness of the current set of policies that govern the fishery, and to facilitate the drafting of new ones where needed, this study seeks to determine the importance of by-catch to the local fishing communities.

## 1.1 Bycatch and Its Importance

### 1.1.1 Definitions

Definitions of bycatch are varied, even among fishery managers. The Alaska Fisheries Science Center (2007) defines bycatch as

> "…fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program."

Based on the Magnuson-Stevens Act (MSA) Section 3(2) (1996). This center also defines bycatch as

> "…discarded catch of any living marine resource plus retained incidental catch and unobserved mortality due to a direct encounter with fishing gear."

A more popular definition of bycatch, and the one that is used in this study is "anything that a fisherman does not mean to catch" (Eayrs 2005, p1). According to Eayrs (2005), the main problem is that in many cases, most of the bycatch is discarded. Almost 8 percent of the world's marine fisheries, or almost 7 million tonnes of fish, are estimated by FAO to be discards.

### 1.1.2 Bycatch Incidence

Among different kinds of fishing technologies, the highest rates of bycatch is by shrimp trawling (Clucas, 1997; Weise 2005), sometimes as high as 20 times the shrimp harvest (Eayrs 2005, p1). In the US, shrimp bycatch in the Gulf Coast accounts for up to half of the US's total bycatch (Weise 2005). In order to obtain a clear picture of the impact of bycatch on the environment and local communities, the use of bycatch needs to be assessed for specific countries and fisheries as the fishing behaviour is not generic. In some cases, fish that is not targeted is discarded at sea. The main reasons why bycatch may be discarded are: limited storage space on board the vessels; limited refrigeration on vessels; costs outweighing the price of bycatch; sorting problems on board; increased time at port for unloading bycatch and shrimp contamination (Clucas 1997). However, Clucas (1997) also suggested that more bycatch is being used than previously estimated. New evidence has been provided on Chinese shrimp trawls, for example, which indicates that only a minimal portion of bycatch in their fisheries is discarded. Even in the Caribbean, Clucas (1997) suggests that more of the bycatch is used than previously thought.

The focus of trawl management also differs widely worldwide. In many tropical shrimp trawling which takes place in developing countries, the management of the fishery is more in terms of utilizing the bycatch for human consumption, where food security may be an issue, and less attention is paid to reducing bycatch. Another important aspect of bycatch is that it may contribute to the harvest of juveniles of commercially important species, and therefore lead to overfishing of these species (Clucas 1997). Bycatch also represents lost time and money for fishers who need to capture the highest valued species.

In the Caribbean, shrimp is not largely a significant type of seafood landed. In the Northern Caribbean, Caribbean Spiny Lobster (*Panilurus argus*) is of high importance in terms of value, while large pelagics are more important landed species. The management of shrimp by catch is also varied in the Caribbean. In Cuba, shrimp bycatch is sold at receiving centres at sea when fishermen take multi-day trips, and are fishing away from shore (Clucas 1997). This allows the bycatch to be sorted on-board and sold for human, as well as for use as animal feed. Fishers are given monetary incentives to exceed prearranged quantities and qualities of bycatch on a daily basis.

On the other hand, most of the bycatch from shrimp trawling is discarded in Suriname. A few species of finfish is landed and are sometimes targeted. The quality of this landed fish may not be high, but they are generally sold fresh (Clucas 1997).

## 1.2 Objectives of the Study

As part of their goal of sustainable development, this project was done under the auspices of the Food and Agriculture Organization (FAO), the United Nations Environmental Programme (UNEP) and the Global Environmental Facility (GEF), via the *Project EP/GLO/201/GEF: Reductions of Environmental Impact from Tropical Shrimp Trawling, through the Introduction of By-catch Reduction Technologies and Change of Management*. The general objective is to describe and assess the importance of landed by-catch from the shrimp trawl fishery in Trinidad and Tobago. More specifically, this study aims to assess the social and economic importance of the landed by-catch to the Orange Valley and Otaheite communities. This is in terms of:

- The proportion of households that consume bycatch.
- The key bycatch species consumed.
- The mean volume of bycatch consumed per household.
- The annual value of bycatch to local communities.
- The proportion of bycatch landed by fishers.
- The value of landed bycatch to fishers.
- The reliance on bycatch by processors and vendors.

It is envisaged that the findings of the study would be used to enhance fishery management and initiate policy development for the sustainable use of shrimp and by-catch species.

# 2.0 Literature Review

## 2.1 The Trawl Fishery of Trinidad and Tobago

Since 1953, the shrimp industry in Trinidad and Tobago has evolved significantly, with the introduction of the otter trawl. Between 1966 and 1969, there was a major increase in artisanal trawlers from 66 to 166, contributing to the start of the Demersal Trawl Fishery of Trinidad and Tobago. This early fishery predominantly targeted White Shrimp (*Litopenaeus schmiti*) off the Southwest Coast of Trinidad which comprises the Gulf of Paria and inshore waters of the Orinoco Delta on the coast of Venezuela.

In 1977, the governments of Trinidad and Tobago and Venezuela implemented an agreement, which allowed 60 Trinidadian artisanal trawlers to access the inshore regions of the Delta from December to June annually. In 1985, 10 more artisanal trawlers were allowed to access the same region, however all entry was denied by 1995. A new reciprocal Fishing "Cooperation" Agreement with Venezuela again allowed access to Venezuelan water outside 2 miles from the coast in 1997. However, ongoing disagreements among fishers and the Coast Guards of both countries resulted in underutilized access (Kuruvilla et al 2000). Trawlers are categorized based on vessel size and the level of mechanization. There is an industrial trawling fleet, and two inshore, artisanal fleets, one near-shore semi-industrial fleet and one industrial fleet. In 2000, the shrimp fleet was comprised of 114 vessels. Characteristics for these vessels are given in table 1.

**Table 1.**
Characteristics of the Shrimp Trawl Fleet for Trinidad and Tobago

| Vessel Type | Average Horsepower | Vessel Length (m) | Gear Type | Number of Trawlers (1991) | Number of Trawlers (1998*) |
|---|---|---|---|---|---|
| **I - Artisanal** | 2 × 56 Outboard | 6.7 – 9.8 | 1 stern trawl manually retrieved | 113 | 13 |
| **II – Artisanal** | 137 Inboard | 7.9 – 11.6 | 1 stern trawl manually retrieved | 66 | 71 |
| **III – Semi-industrial** | 176 Inboard diesel | 10.4 – 12.2 | 1 stern trawl retrieved by hydraulic winch | 9 | 9 |
| **IV - Industrial** | 365 Inboard diesel | 17.1 – 22.0 | 2 nets on outriggers, retrieved by hydraulic winch | 21 | 21 |
| **Total Vessels** | | | | 209 | 114 |

Source: Modified from Kuruvilla, Ferreira and Soomai (2000) and Chan A Shing (1999). The number of semi-industrial and industrial vessels are for 2000.

All trawlers function on the West Coast throughout the year, primarily from May to August. The next main fishing area is off the South Coast of Trinidad in the Columbus Channel. Since this area lies between Trinidad and Venezuela, Venezuelan trawlers predominantly exploit it (Kuruvilla, Ferreira and Soomai 2000). Since shrimp move from estuaries as juveniles and slowly migrate to deeper water, the inshore artisanal and off-shore semi-industrial fleets harvest the shrimp at various stages in their life cycle (Kuruvilla et. al. 2000).

The main species of shrimp currently harvested are: Brown (*Farfantepenaeus subtilis*); White (*Litopenaeus schmiti*); Pink (*F. notialis*); Honey or Seabob (*Xiphopenaeus*) and Red-spotted (*F. brasiliensis*). For all shrimp species, the stock is overexploited, so that the stock biomass is in decline. In addition, recent assessments of the Southern Pink shrimp (*Farfantepenaeus notialis*) and Atlantic seabob (*Xiphopenaeus kroyeri*) fisheries indicated that a significant proportion of juvenile shrimp was harvested by the semi-industrial and industrial fleets in the Southern Gulf of Paria (Ferreira and Medley 2005). In the shrimp fishery, a significant amount of finfish bycatch is harvested, based on market demand, or when shrimp abundance falls from July to December (Maharaj, Ferreira and Lum Young 1992).

Regulations introduced in the shrimp fishery have sought to limit participation on one hand, but also provides incentives by reducing fishers' capital and operational costs. In 1998, new trawlers were not allowed to enter the fishery. However, this law had limited implementation only for the industrial fleet (Kuruvilla et. al. 2000). Fishing is permitted in different zones, based on the fleet type. However, there is significant overlap in the areas fished by the semi-industrial and industrial vessels in the main fishing area off the West Coast (Kuruvilla, Ferreira and Soomai 2000). There is a minimum mesh size for the cod-end of the trawl for fish and shrimp, and the use of Turtle excluder devices is required by the semi- industrial and industrial fleets. Registered fishers or vessel owners receive Value Added Tax (VAT) exemption on equipment, engine parts and new fishing vessels. In addition, registered vessel owners who wish to replace their vessels are eligible for a subsidy of 25 percent of the purchase cost of pirogues to a maximum of TT$5000 (US$1=TT$6.3). However, the original vessel is required to be removed from the fishery (MALMR 2007a). Registered vessel owners are also eligible to access subsidies on gasoline and oil, but these are minimal.

In 2005, total shrimp landings were 778.67 tonnes, valued at approximately US$3.4 million. From 1996 to 2005, shrimp landings accounted for an average of 8.8 percent of all annual fishery landings, and 21.0 percent of total fishery revenue earned annually (MALMR 2007b). Overall, the share of shrimp landings fell from 11.9 percent in 1996 to 7.0 percent in 2005. Shrimp's share of total revenue declined almost steadily since 1997 from 30 percent to 16.6 percent in 2005 (MALMR 2007b).

Between 2000 and 2003, there were no significant fluctuations in the share of shrimp landings by fleet type. On average for these years, the artisanal, semi-industrial and industrial fleets accounted for approximately 37, 13 and 50 percent of the total shrimp landings annually (see figure 1). The shares of shrimp revenue largely reflected the shares of shrimp landings for all fleet types (figure 2). In contrast, by 2003, the industrial fleet was responsible for more than 50 percent of all bycatch landings (figure 3). The proportion of bycatch landings, (and associated revenue shown in figure 4), for the artisanal fleet fell sharply from 29 percent in 2000 to 14 percent in 2002. There was a moderate increase in landings for this fleet to 18 percent by 2003 (figure 3). The initial reduction in bycatch landings of the artisanal fleet was captured by the industrial fleet, while the bycatch shares of the semi-industrial fleet remained largely unchanged.

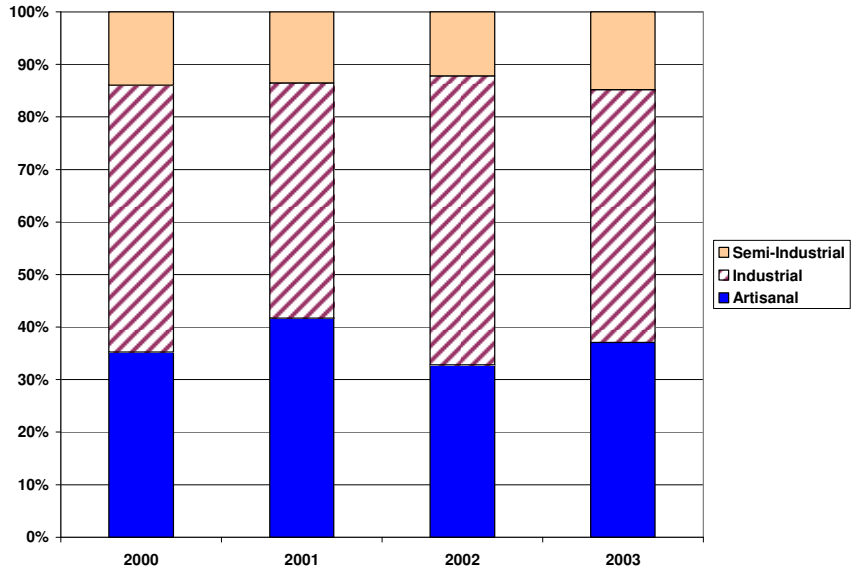


**Figure 1: Share of Shrimp Landings in Trinidad and Tobago, 2000 – 2003**

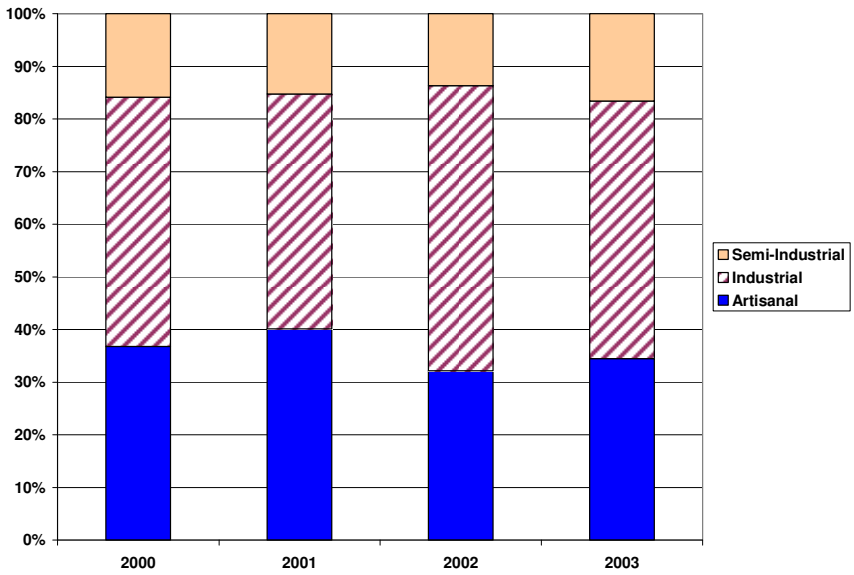


**Figure 2: Share of Shrimp Revenue in Trinidad and Tobago, 2000 – 2003**

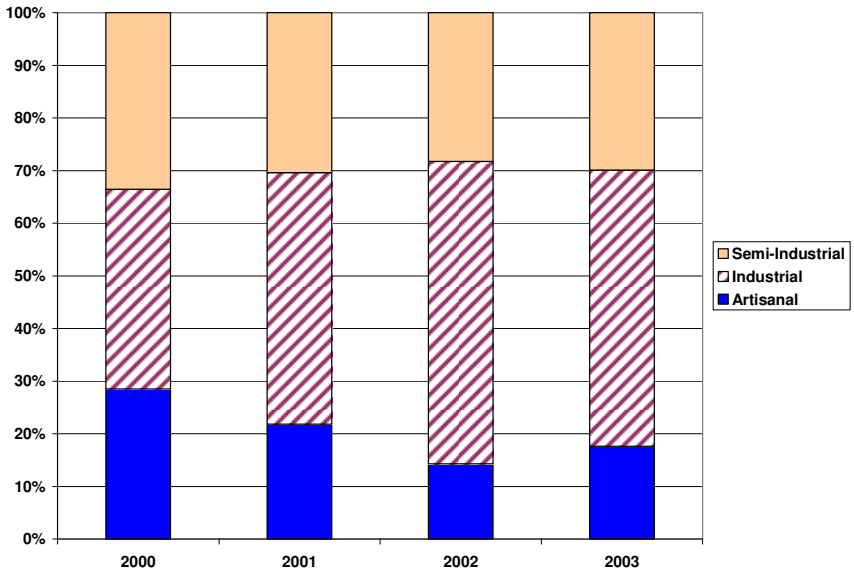


**Figure 3: Share of Bycatch Landings in Trinidad and Tobago, 2000 – 2003**

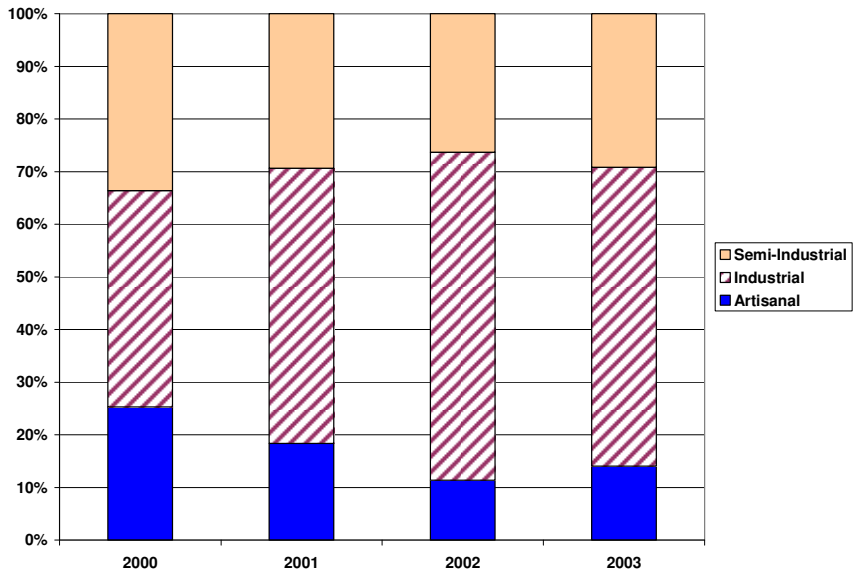


**Figure 4: Share of Bycatch Revenue in Trinidad and Tobago, 2000 – 2003**

In 2003, the volume of bycatch landings for the entire fishery (815.0 tonnes) exceeded shrimp landings (799.3 tonnes) by 2 percent. This underscores the significant value of bycatch in the local fishery. Furthermore, the surplus of bycatch to shrimp landings also occurred in 2000 and 2002 by similar amounts. However, in 2003, shrimp's value of TT$18.68 mil was more than four times the value of bycatch at TT$3.69 mil.

## 2.2 Community Surveys of Orange Valley and Otaheite

Orange Valley and Otaheite are fishing communities on the West Coast of Trinidad (see figure 5). A description of the geographic setting, coastal resources, socio-cultural profiles of the two communities, and their historical development are given in Boodoosingh (1995). Boodoosingh (1995), estimated that there were 25 Type II trawl vessels (artisanal) vessels launched from the Otaheite landing site, usually once per day. The majority of shrimp and fish landings were sold to wholesalers at the landing site, based on three size categories for shrimp: (1) large – mainly Cork/ White shrimp; (2) medium – mainly Pink and Brown shrimp; and (3) small – mainly described as small or Honey shrimp.

Fish was normally sold by species, except in cases where they are small/undersized, in which case they were normally traded as "Mixed Fish". Based on Boodoosingh (1995), of 30 respondents in a survey of

fishers, 30 percent felt that there was too much fishing of juvenile fish and destruction of fishing areas by trawlers, 23 percent felt that there was overfishing as characterized by too many vessels in the fishery, and 20 percent felt that fishing occurred for too many hours a day.

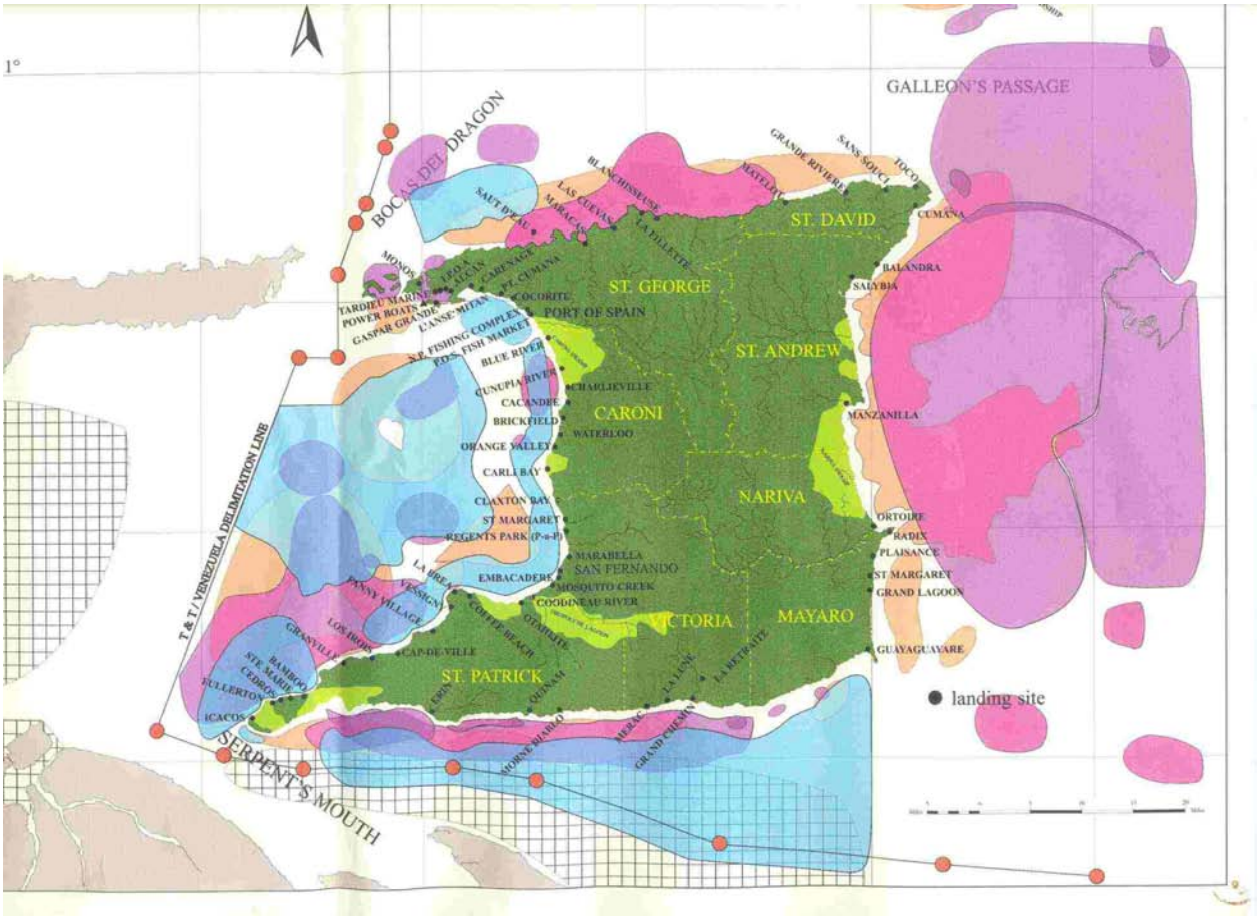


**Figure 5: Map of Trinidad showing Key Shrimp Landing Sites**

In Orange Valley, Boodoosingh (1995) also reported that there were 4 Type I vessels, 10 Type II vessels, 10 Type III vessels and 5 Type IV vessels. For the Type II vessels, a largely informal survey of fishers suggested that catch consisted mainly of medium and large shrimp, of an average of 40 lbs per trip.

Camps-Campins (1995) undertook a socio-economic assessment of the Orange Valley and Otaheite fisherfolk households, mainly to understand the characteristics of fishers and their role in the fishing industry. Based on these surveys that were conducted from December 1994 to January 1995, it was found that the average household size in Orange Valley was 5.6. In half of the fishers' households in both

Orange Valley and Otaheite, the fishers were the only wage earners. Eighty percent of the household sample in Orange Valley cited fishing, off-loading catch or retail sales of fish as the main employment of household members. A similar trend (82 percent of households) was observed in Otaheite. In Otaheite and Orange Valley, the main change in the fishing industry that was observed by the matriarch of the fisher's households was a change in the catch (based on a decrease in fish size, catch volume, area of nursery grounds and a change in the seasonality of catch). These results were based on a sample of 10 and 22 households in Orange Valley and Otaheite, respectively. These samples were very small, and there was a very high incidence of non-response, which suggested that the results obtained may not have been representative of the populations under study.

## 3.0 Methodology

Orange Valley and Otaheite represents two of the largest shrimp fishing communities in Trinidad and Tobago. The majority of the artisanal and semi-industrial fleet is landed at these sites. In order to get a better understanding of the fishing industry and more specifically the Demersal shrimp fishery, formal discussions were held with stakeholders comprising fishers, fish processors and fisheries' officers, the latter who usually collected data on the biological characteristics of landings at that site. Informal interviews were also held with the Market Manager of the Orange Valley Fish Market, as well as fish vendors.

In addition, a formal Rapid Appraisal Household Survey was conducted among a randomly selected representative sample of the households within the Orange Valley and Otaheite communities. The survey was conducted on weekends to reduce bias from those who were not at home during the week due to employment commitments.

A total of 248 and 250 households were identified in the Orange Valley and Otaheite communities, respectively. A total of eighty (80) households were surveyed in Orange Valley and eighty-three (83) households in Otaheite. The choice of sample sizes was based on the use of published statistical tables which indicated that for a population size of 250, a sample size of 72 provided for a +/- 10% Precision Level where the Confidence Level is 95% and P = 0.5. In each village, every third house therefore was

selected for sampling based on numbers assigned to each house on the area map. A pretest of the Household Survey was conducted in Orange Valley from 17th to 18th September 2005. Five households were selected: every 40th house starting with Household #1, and up to the 161st household. Based on the results of the pretest, changes were made to the questionnaire to improve the clarity of the questions. The final survey of the Orange Valley community was done between the 24th September and October 2nd 2005.

For Otaheite and Orange Valley, 13 and 16 fishers were identified, respectively. Convenience samples of these fishers were taken, via interviews at the respective fish markets, or at their homes. In Orange Valley, a total of 5 fishers and 1 processor were interviewed. A visit to Otaheite was undertaken in April 2006 and two fish vendors were interviewed. Following this, researchers again met with a group of fishers and fish vendors on May 14th 2006, as this was their preferred format for having discussions. Two fish processors at Orange Valley and two at Otaheite were also identified by Fisheries' Officers.

## 4.0 Major Findings

This section presents the major findings of the household study. Firstly, the results from the Orange Valley survey are presented, followed by Otaheite. Map 1 shows the location of the Orange Valley and the Otaheite fish landing sites. The shrimp fishery is also shown on the map.

### 4.1 Orange Valley Household Survey

#### 4.1.1 General Demographics

**Age:** In Orange Valley, 30% of the respondents were less than 30 years old, 24% were between 31 to 40 years of age, and 29% between 41 and 50 years old. Additionally, the majority of respondents were females (56%).

**Ethnicity:** Based on the survey, 89% of respondents were East Indian, 5% were Afro Trinidadians and 5% were of Mixed ethnicity.

**Educational Status**: Most of the respondents attained only a primary level of education (46%), while most of the remainder attained only a secondary level of education (41%) as presented in Table 2.

**Table 2.**

**Educational Attainment of Respondents – Orange Valley**

| Educational Attainment | Percent of Respondents |
|---|---|
| Primary | 46 |
| Secondary | 41 |
| Technical/Vocational | 8 |
| Tertiary | 4 |
| No Response | 1 |
| **TOTAL** | **100** |

**Size of Household:** Household size varied from 1 to 14 persons within the community; the mean number of persons was 4.81. The average household had 3.42 adults and 1.29 children. The number of adults per household ranged from 1 to 12 and the number of children from 0 to 7.

**Employment Status**: From the survey (75 responses), 35% of the households had 1 person employed full-time, 21 % had 2 members employed full-time. No household had more than 5 persons employed on a full-time basis. Thirty-one percent had members employed only on a part-time basis.

**Employment Status within the Fishery:** From the seventy-five households that responded, 137 persons were employed. Within this group of respondents, almost one-third was agricultural, forestry or fishery workers, composed almost entirely of fishery workers (98%).

From the survey, 45% of the respondents reported that at least one member of the household was employed in the local fishery. From this group, 86% had only one person so employed, and 6% each with 2 and 3 persons so employed respectively. No more than 4 persons per household were reported to be working in the local fishery.

Of 77 households, 35% had 1 person employed full-time, 31% had no members employed full-time, and 21 % had 2 members employed full-time. No household had more than 5 persons employed on a full-time

basis. Of these same respondents, more than half (53%) had no members employed on a part-time basis, while 35% had 1 person employed on a part-time basis.

### 4.1.2 Seafood Purchase

**Source of Seafood:** The share of households that purchased seafood (shrimp and fish), caught it themselves or obtained it as gifts were 68%, 17% and 28% respectively. For fish separately, an estimated 85% of families in Orange Valley purchased fish from a fresh fish market, compared to other sources such as supermarkets (figure 6). From the group that purchased fish, 93% sourced their fish at the Orange Valley Fish Market while 7% bought at other fresh fish markets. Gifts from friends were the second most important source of fish (11% of households).

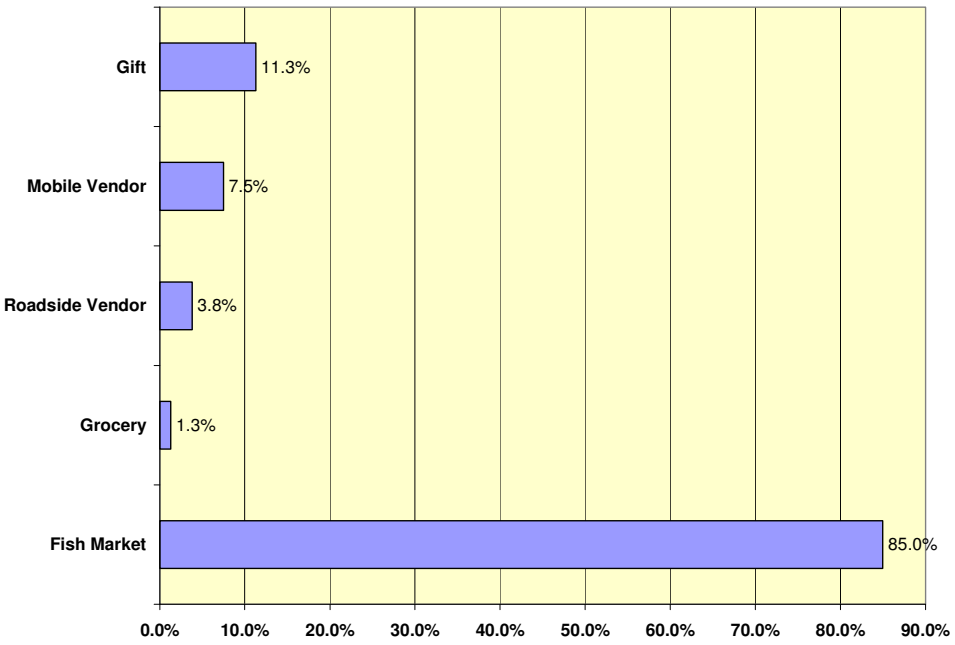


**Figure 6: Source of Fish Purchases – Orange Valley**

**Composition of the Food Basket:** The mean weekly expenditure[1] on food for each household for the three weeks preceding the survey was $537.44. Average expenditure on seafood was reported at $66.83 (12% of total expenditure) compared to meat $105.44 (20%), vegetables and legumes $113.31 (21%), fruit $54.68 (10%) and other foods $197.18 (37%) (see figure 7).

[1] All monetary expenses throughout the report are quoted in TT$. The exchange rate is 1 US$ = TT$6.32.

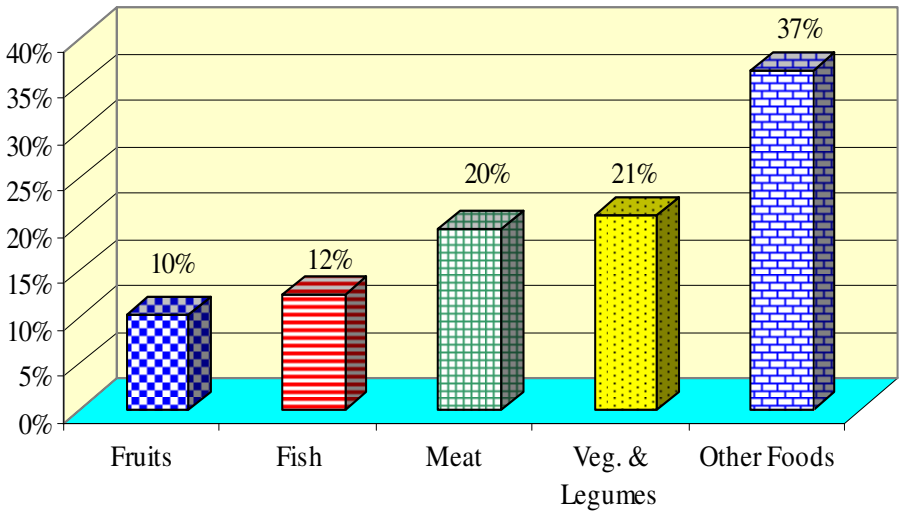


**Figure 7: Composition of Household Average Weekly Expenditure – Orange Valley**

**Composition of seafood purchases:** The study also examined the categories of seafood, including fish, consumed by households. From the survey, 67.5% bought fresh seafood, 2.5% purchased chilled seafood and no household bought frozen seafood. In the case of processed/value added fish, 36.3% of households bought salted seafood and 41.3% bought canned seafood. Many households reported the purchase of more than one form of seafood.

### 4.1.3 Frequency of Seafood Consumption

**Fish:** The study found that some form of fish is consumed at least one day per week. Fresh fish is consumed by all households, on an average of 2.95 days per week. Only 2.5% of homes consumed frozen fish.

With respect to consumption of processed/value added fish, salted fish was used by 30% of the households and canned fish 32.5%. The frequency of processed fish consumption however was much less than that of fresh fish. Frozen, salted and canned fish were each consumed on average 0.04, 0.55 and 0.58 days per week, respectively.

For those family units who ate the respective types of fish, the average number of meals per day which comprised fish was reported as: 1.37 meals of fresh fish, 2.5 meals of frozen fish, 1 meal of salted fish and 1.04 meals of canned fish.

**Shrimp:** In the case of shrimp consumption, fresh shrimp was preferred to frozen. Fresh shrimp was eaten by 71.3 % of households surveyed, compared to only 2.5% of families who used frozen shrimp. On average, fresh shrimp is consumed 1.19 days per week for the entire sample.

**Consumption Quantity and Value:** Fifty six percent of respondents bought an average of 8.1 lbs of fish weekly (worth an average of $61.17) (see table 3). Twenty-five percent (25%) of homes bought fish on a daily basis, but the quantity and values reported may include families who vend, and therefore may not be representative of a household. Very few homes bought fish bi-weekly or monthly. The majority of respondents (51%) bought an average of 11.1 lbs of shrimp on a weekly basis. Similar concerns arise for the daily purchase pattern as expressed for fish in this instance. However, unlike fish, a large portion of families purchased shrimp on a monthly basis (30%), and bought an average of 5.5 lbs valued at $84.64.

**Table 3.**

**Mean Quantity and Value of Fish and Shrimp Purchased**

| Item | Quantity (lb) | Respondents | Value ($) | Respondents |
|---|---|---|---|---|
| **Fish** | | | | |
| Daily | 40.9 | 16 | 40.00 | 9 |
| Weekly | 8.1 | 35 | 61.17 | 30 |
| Bi-Weekly | 8.2 | 9 | 62.78 | 9 |
| Monthly | 5.7 | 3 | 50.00 | 3 |
| **Shrimp** | | | | |
| Daily | 40.2 | 4 | 43.00 | 4 |
| Weekly | 11.1 | 29 | 71.07 | 28 |
| Bi-Weekly | 4.0 | 7 | 38.33 | 6 |
| Monthly | 5.5 | 17 | 84.64 | 14 |

The species of fish consumed in the largest quantities were: Carite (24% of households), “Other fish” (20% of households), Racando (16% of households) and Mixed Fish (11% of households) (figure 8).

Based on size categories, the types of shrimp consumed in the largest quantities were: Small – 23% of households; Medium - 59%; Large – 7%; and Jumbo – 6%. The top two styles of preparing shrimp was Curried – 93 % of the sample, and Fried – 51% of the sample.

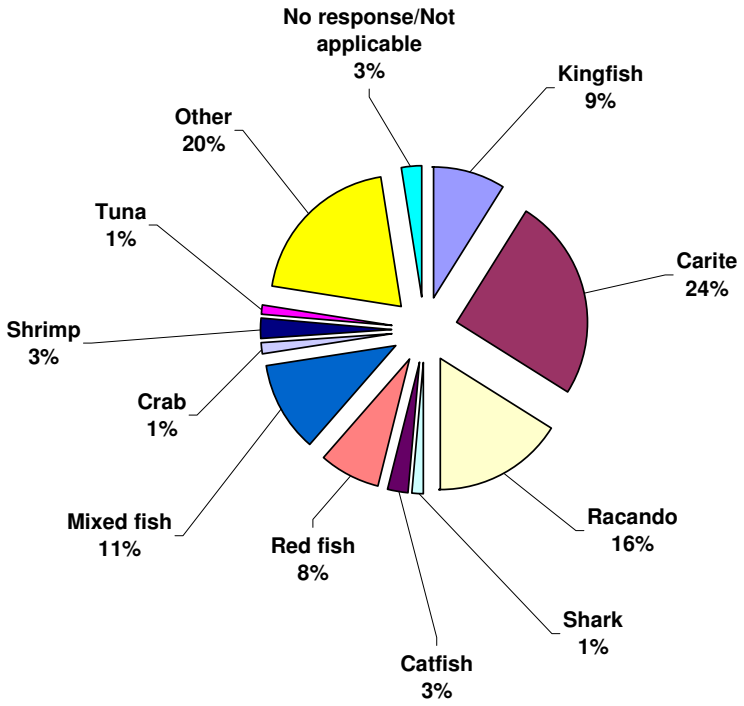


**Figure 8: Fish Consumed in the Largest Quantities – Orange Valley**

**Consumption of Shrimp By-catch:** An estimated 93% of family households reported that all members ate fish, while approximately three-quarter (76%) indicated that all family members ate shrimp. Of the fish species, Carite was the most popular, consumed by 24 % of the sample households; 'other fish' species were consumed by 20% and Racando by 16 % of households.

### 4.1.4 Importance of the Local Fishery to the Community

The study also sought the perception about the importance of the Orange Valley fishery. Overall, the majority of families believed that the local fishery is very important for the community in a number of areas. The positive impacts and the percentage of households with the given view were as follows:

- An important source of food supplies - 75%.
- High importance for health, nutrition and wellness - 69%.
- High importance for employment and income generation - 66 %.
- A positive impact on community lifestyle - 64%.
- Important as a source of recreation - 19 %.

The local fishery, despite its valid contribution to health, income and employment, was also seen as contributing negatively to the local community (see table 4). The main sources of negative impacts were:

- Contributes to drug and alcohol abuse -18 %.
- Contributes to school absenteeism - 14%.

**Table 4.**

**Negative Impacts of the Local Fishery on the Community – Orange Valley**

| Impact | Percent of Households |
|---|---|
| School drop-out/absenteeism/lack of education | 14 |
| Drug and Alcohol abuse | 18 |
| Dumping and Pollution | 8 |
| Obscene language/ Bad manners | 6 |
| Contributes to low incomes | 6 |
| Trawlers | 1 |
| Fishing is a dangerous livelihood | 5 |
| No cooperation/ Lack of culture development | 4 |
| No negative impacts | 14 |
| No response/ No comment | 24 |
| **TOTAL** | **100** |

## 4.2 Value of Bycatch in Orange Valley

Of the 80 respondents in the sample, there was an exceedingly high level of reliance on fish landed at Orange Valley. Since the fish landed here was by trawlers, whose gears are primarily designed to capture shrimp, all fish landed at Orange Valley is considered to be bycatch for the purpose of this study. Ninety-

four percent of the sample purchased fish, while all other households relied exclusively on gifts from friends and family members. **Eighty-three percent of households purchased fish from the Orange Valley Fish Market only.** Only one household bought fish from the grocery only, or from a roadside vendor only. Five percent of the sample purchased from mobile vendors, and 85 percent from fish markets only (those who did not buy from the Orange Valley Fish Market, obtained their fish from the Couva market). In many cases where fish was bought from vendors or obtained from other sources, these sellers were located in Orange Valley. Therefore, overall, approximately 91 percent of the households obtained their fish from Orange Valley sources. Excluding grocery purchases, which may be frozen, this implies that 90 percent of all households in the sample purchased fresh fish that was landed at Orange Valley.

The quantity of fish consumed by households in the Orange Valley community was estimated based on the expected servings of fish in any meal that contained fish. It was recommended that a serving of fish is 3 oz. or 85 grams, cooked weight (University of Illinois 2007; MIT 2007 and Kurtzweil 2007). It was assumed that each person consumed 1 serving of fish in any meal that contained fish. The average number of fresh fish meals per day consumed per household is 1.37, and fresh fish meals are prepared an average of 2.95 days per week per household. Given an average household size of 4.81 persons, the quantity of fresh fish consumed per week, per household, was computed using the following equation:

$$\frac{Quantity\ of\ \ Fresh\ Fish}{Serving} \times \frac{\#\,Servings}{Meal} \times \frac{\#\,Meals}{Day} \times \frac{\#\,Days\ of\ \ Fresh\ Fish\ \mathrm{Pr}\,eparation}{Week},$$

as 58.32 oz., or 3.64 lbs. **Therefore, for all 248 households in the Orange Valley community, the quantity of fresh fish consumed annually is 46, 941.44 lbs**.

The three top identified species or group of fish bought in the largest quantities for Orange Valley were: Carite (24% of households); Racando (16%) and Mixed Fish (11%). The prices of these types of fish were then used to compute a weighted price of a unit of fish in a representative "fish basket" bought by the average household, comprised of these groups of fish, using weights of 5:3:3. The 2005 landed price of these fish groups caught using trawl gear were: Carite - $8.67/lb; Racando - $3.70/lb; and Mixed Fish - $1.66/lb (MALMR 2007c). Therefore, the weighted price of fish in Orange Valley was $5.78/lb. **This therefore implies that the value of bycatch consumed in Orange Valley in 2005 was $271,321.52.**

## 4.3 Otaheite Household Survey

### 4.3.1 General Demographics

**Age:** In Otaheite, 34% of the respondents were less than 30 years old, and thirty percent (30%) or 25 respondents were between 31 to 40 years of age. Additionally, the majority of respondents were male (61%).

**Ethnicity:** Based on the survey, 60% of respondents were East Indian, 28% were Afro Trinidadians and 12% were of Mixed ethnicity.

**Educational Status**: Furthermore, based on table 5, almost half of the respondents have attained secondary level education (42%), while 39% attained only a primary level of education.

**Table 5.**

**Education Level of Respondents – Otaheite**

| Education Level | Percent |
|---|---|
| Primary | 39 |
| Secondary | 42 |
| Technical/Vocational | 7 |
| Tertiary | 12 |
| **TOTAL** | **100** |

**Size of Household:** Of the 83 households sampled, there was a minimum of 1 person and a maximum of 9 persons living in a household. The modal household size was 4 persons, which accounted for approximately 22% of the sample. The mean number of persons was 4.39. The average household had 2.66 adults and 1.72 children. The number of adults per household ranged from 1 to 7 and the number of children from 0 to 7.

**Employment Status**: Of 80 respondents, 39% had 1 person employed full-time, 23% with no members employed full-time, and 25% with 2 members employed full-time. No household had more than 5 persons employed on a full-time basis. Of these same respondents, more than three-quarter (83%) had no members employed on a part-time basis, while 14% had 1 person employed on a part-time basis.

**Employment Status within the Fishery:** Seventy-four households provided occupation data. Using the occupational groups defined by the Ministry of Labour, 19% of respondents work in the Agricultural, Forestry and Fisheries industry. Of these, only one (1) person works in a non-fishing sector.

Of all the households, 66% reported that at no one was employed in the local fisheries. Twenty-eight percent (28%) of households (23 respondents) had at least one person in their household employed in this activity (6% had no response). Of the latter, 81% (of 21 respondents) had only one person so employed, 14% with 2 persons employed, and 5% with 3 persons employed. No more than 3 persons were reported to be working in the local fisheries in any family.

Additionally, twenty six (26) household members work in the Otaheite Fish Market. Of the twenty six (26) individuals working at the Otaheite Fish Market, there were nine (9) owners, all male. Eight (8) worked full-time, one alone worked part-time. Two owners worked 4 days per week, one worked 5 days per week, three worked six days per week, and three worked 7 days per week. All owners worked all year.

Furthermore, according to the data, there were two (2) captains, all male and both worked full time. One owner worked 6 days per week while the other worked 7 days per week. Both worked all year. There were only two (2) net repairers in Otaheite. Both were male. Only one worked full time. One net repairer worked six days per week, the other, seven days per week. Both worked all year. In Otaheite, there was one (1) transporter, who worked 6 days per week, all year.

Furthermore, there were two (2) market intermediaries who operated out of Otaheite. Both were male and worked full time. However, only one worked 5 days per week, the other 6 days per week. Both worked all year. Finally, there were ten (10) fish workers, all male: 6 full-time, 4 part-time. Throughout the year, one of these persons worked 4 days per week, 5 worked 5 days per week, 1 worked 6 days per week, and 3 worked 7 days per week. Based on the sample, no one rented boats at Otaheite. Also, there were no fish vendors or fish processors. Additionally, no one was involved in any other fisheries-related activity.

Table 6 shows the monthly income(s) derived from fishing activities at the Otaheite Fish Market. As can be seen, of the individuals who worked at the Otaheite Fish Market and reported their monthly incomes, the majority obtained between $1001 and $3000 TTD.

**Table 6.**

**Household Monthly Income Derived From Fishing Activity – Otaheite**

| Income ($) | Percent |
|---|---|
| 0 to 500 | 2 |
| 501 to 1000 | 4 |
| 1001 to 3000 | 11 |
| 3001 to 10000 | 6 |
| 10001 to 20000 | 2 |
| Not applicable | 69 |
| No response | 6 |
| **TOTAL** | **100** |

### 4.3.2 Seafood Purchase

**Source of Purchased Cooked Food:** For purposes of this study, there were four (4) sources of purchased cooked food - Fast Food Restaurants, Doubles Vendors, Chinese Fast Food, BBQ Roadside Vendors and Other Restaurants. The data collected from Otaheite is presented below. Of the 83 households surveyed, 66% stated that they purchased cooked food from Fast Food restaurants; 53% purchased cooked food from BBQ outlets/grills; 52% bought from Doubles vendors; 33% bought from Chinese restaurants; and 11% bought from other food outlets/restaurants. Thus, Fast Food restaurants seem to be the popular source of purchased cooked food in Otaheite.

**Source of Seafood:** For fish, an estimated 66% of families in Otaheite purchased fish from a fresh fish market, compared to other sources such as supermarkets. From the group that purchased fish, 96% sourced their fish at the Otaheite Fish Market. The grocery was the second most important source of fish (7% of households), however, none of these were located in Otaheite. The grocery was followed by roadside vendors in Otaheite, and gifts from friends and family members, each accounting for 2% of households. No one obtained fish from mobile vendors.

**Composition of the Food Basket:** The average weekly expenditure on food for the three weeks prior to the survey was $659.19 (see figure 9). Seafood expenses accounted for $81.86 on average (67 respondents), and was exceeded by expenditure on meat ($136.47 based on 68 responses), and other foods ($283.28 based on 38 responses). Seafood expenditure surpassed only expenditure on fruit, which was $86.57 (67 responses), and vegetables and legumes ($71.01 based on 59 responses).

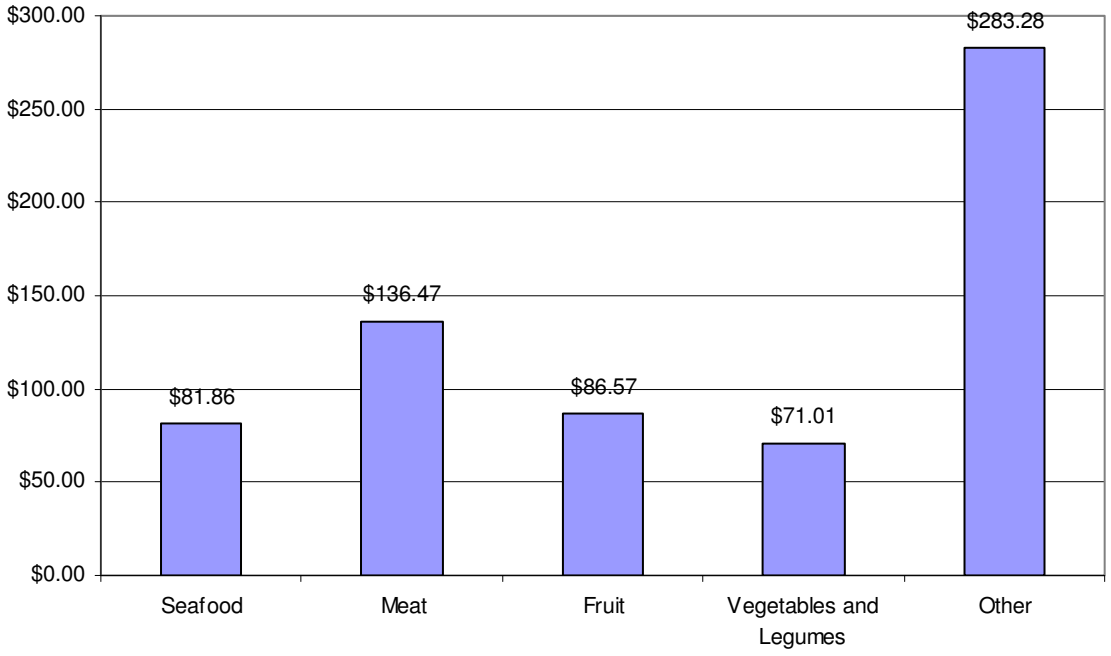


**Figure 9: Mean Household Expenditure on Various Food Categories – Otaheite**

**Composition of Seafood Purchases:** In 92% of the 83 households, all members consumed fish. Of those that did not consume fish, the most popular reason for not consuming fish was a dislike for the taste and/or allergies. Most families, made up of 20% of the respondents, purchased fish on a monthly basis. On the converse, only 7% bought fish daily.

### 4.3.3 Frequency of Seafood Consumption

**Fish:** Of the 17 households who reported on the quantity of fish purchased monthly, the mean amount consumed was 6.2 lbs. Fresh fish was used by 79 households (95%). Additionally, 30 respondents stated that fresh fish was prepared two (2) days per week. Another 17 households acknowledged that fresh fish meals were prepared three (3) days per week.

Frozen Fish was used by only six households (7%). Of the six households, four prepared frozen fish once per week only. Both Salted Fish and Canned Fish were not used by 82 households (99%).

The most frequent form of fish preparation was Stewed. This was closely followed by Fried and Curried. Other forms included Grilled, Roasted and Rotisserie.

**Consumption by Species:** According to figure 10 below, the most frequently consumed fish in Otaheite was comprised of a mix of "Other" fish, by almost half of the survey population (49%). Fifty-four percent of the "Other" fish was made up of Bechine. The second most consumed fish according to the majority of respondents in Otaheite was Salmon.

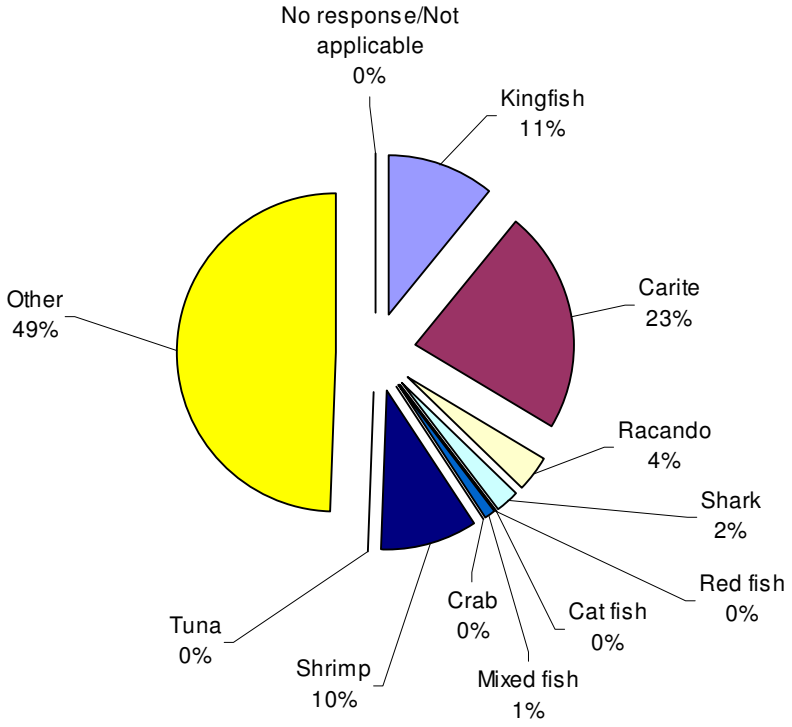


**Figure 10: Distribution of Fish Consumed in the Largest Quantities – Otaheite**

**Consumption of Shrimp:** In 28% of households, all members did not consume shrimp. Of those that consumed shrimp, the majority purchased shrimp monthly. Over 50% of households did not respond to this question. Furthermore, of those who purchased shrimp monthly, six persons bought 4 lbs. Fresh shrimp was used by 7 households (8%). Furthermore, according to 99% of respondents, frozen shrimp was not used.

The most frequent form of shrimp preparation was Curried, with over 50 households using this form. This was followed by Stewed and fried as frequent forms of shrimp preparation. Other included Pepper Shrimp and Tomato Sauce Shrimp.

The most consumed shrimp was Small shrimp, with 38% of respondents. The shrimp consumed in the second largest quantities was Medium shrimp (30%) and third most consumed was Jumbo shrimp, with 30%.

### 4.3.4 Importance of the local fishery to the community

Overall, the majority of families believed that the local fishery was very important for the community in a number of areas. Two-thirds of homes (66%) viewed the local fishery as being of high importance for employment and income generation, while 61% of family units had a similar view of the fishery for its impact on the local economy and as a source of food. Only about half of the respondents (53%) viewed the fishery as being of high importance for health, nutrition and wellness, while only 46% found it of high importance for its impact on lifestyles. Conversely, the fishery was viewed as an important source of recreation by only 13% of the households.

More than one-third of the households (37%) found that the fishery did not have a negative impact on the community (see table 7). For the respondents who felt that there was a negative impact, the main source of this impact was on dumping and pollution (8%), followed by drug and alcohol abuse (5%).

**Table 7.**

**Negative Impacts of the Local Fishery on the Community – Otaheite**

| Name | Percent |
|---|---|
| No response/ No comment | 41 |
| School drop-out/absenteeism/lack of education | 4 |
| Drug and Alcohol abuse | 5 |
| Dumping and Pollution | 8 |
| High prices of fish/shrimp | 1 |
| Trawlers | 1 |
| Limited scope for moving ahead in anything other than fishing | 1 |
| Venezuelan fishing boundaries encroached | 1 |
| No negative impacts | 37 |
| **TOTAL** | **100** |

Most homes (90%) did not participate in any special religious or cultural events associated with the fishery. Moreover, most of the households (85%) had no plans to increase their participation in the local fishing industry. More than one-third of families believed that to enhance the local fish market's contribution to the community, there should be better facilities, especially the provision of cold storage and more general storage space and other infrastructure (table 8). Better security at the market was also seen as a main area which required improvement (13% of respondents).

**Table 8.**

**Suggestions to Enhance the Contribution to the Local Fish Market – Otaheite**

| Suggestion | Percent |
|---|---|
| No response | 26 |
| Code of conduct/Dress code | 2 |
| Sanitation and cleaning | 5 |
| Better facilities, cold storage and infrastructure | 35 |
| Better security, lighting and space | 13 |
| Canning industry to prevent rotting, waste | 1 |
| Cheaper fuel prices | 2 |
| Dredging of the bay | 1 |
| No enhancement necessary | 1 |
| Financial assistance | 2 |
| Sea wall/ repair water front | 7 |
| Proper management | 2 |
| **Total** | **100** |

## 4.4 Value of Bycatch in Otaheite

Similar to Orange Valley, there was a high level of reliance on fish landed at Otaheite. This fish was caught using trawls, and therefore was also considered to be bycatch for the purpose of this study. Of the Eighty-three households surveyed, 14 did not indicate whether they bought fish or obtained it as a gift. Of the 59 respondents, ninety-eight percent purchased fish, while the remainder relied exclusively on gifts from friends and family members. **Eighty-five percent of respondents purchased fish from the Otaheite Fish Market only.** Only one household bought fish from the grocery only, or from a roadside vendor only. None of the sample respondents purchased from mobile vendors, and 83 percent purchased from fish markets only. All grocery purchases were from sources outside Otaheite. Overall therefore, approximately 93 percent of the households obtained their fish that was landed at Orange Valley.

It was also assumed that each person consumed 1 serving of fish in any meal that contained fish. The average number of fresh fish meals consumed per day, per household was 1.67, and fresh fish meals are prepared an average of 2.97 days per week per household. Given an average household size of 4.39 persons, the quantity of fresh fish consumed per week, per household, was computed using the following equation:

$$\frac{Quantity\ of\ \ Fresh\ Fish}{Serving} \times \frac{\#\,Servings}{Meal} \times \frac{\#\,Meals}{Day} \times \frac{\#\,Days\ of\ \ Fresh\ Fish\ \mathrm{Pr}\,eparation}{Week},$$

as 65.32 oz., or 4.08 lbs. **Therefore, for all 250 households in the Otaheite community, the quantity of fresh fish consumed annually is 53,040 lbs**.

The three top identified species or group of fish bought in the largest quantities for Otaheite were: "Other" – 49%, Carite (23% of households) and Kingfish (11%). Fifty-four percent of the "other" group of fish was Bechine. The prices of these types of fish, including Bechine as a representative of the "Other" fish group, were then used to compute a weighted price of a unit of fish in a representative "fish basket" bought by the average household, using weights of 6:2.5:1.5. The 2005 landed price of these fish groups caught using trawl gear were: Bechine - $7.34/lb, Carite - $8.67/lb and Kingfish - $9.50/lb (caught using Banking gear) (MALMR 2007c). Therefore, the weighted price of fish in Otaheite was $8.00/lb. **This therefore implies that the value of bycatch consumed in Otaheite in 2005 was $ 424,320.**

## 4.5. Orange Valley Fishers Survey

### 4.5.1 General Demographics

**Age:** Four fishers were interviewed. Two of the four fishers were between 51 and 60 years of age, and two were between 41 and 50 years of age.

**Educational Status:** One of the four fishers reached a technical/ vocational level of education, and another reached a primary level of education.

**Employment Status Within the Fishery:** The four fishers have been involved in fishing for 25 years (with one year in shrimp trawling), 31 to 40 years, 13 years and 33 years, respectively.

**Size of Household:** One of the four fishers has 5 persons in the household, with the fisher being the only employed adult. Another fisher had two adults employed in the household. Two fishers fish full-time. In addition to fishing part-time, one fisher is a teacher. The other fishers had 4, 7 and 6 persons in the household respectively.

One of the four fishers was not a member of any fishing organization. Two fishers were members of the Orange Valley Fishing Association. All four fishers had no formal training in fishing or ocean navigation.

### 4.5.2 Fishing Operation

**Bycatch Disposal:** Eighty percent of the fishers sold all of their bycatch (fish) landed. The other 20% sold 95% of the landed bycatch, and the rest was given as gifts to family and friends.

**Rank of bycatch by species:** The ranking of landed bycatch species varied widely from fisher to fisher. Mixed fish was ranked first by 40% of fishers. Other fishers did not rank this species in the top three landed species. Cro cro was ranked second by 60% of the fishers, and ranked first by 20%. Red snapper was ranked third by 60% of the fishers.

**Trawling activity in the High Season:** Fishers reported different months as the best time for shrimp trawling. Forty percent of fishers reported January to June as the best period, and another 40% cited

November to March as the best period. The other fishers suggested that the best trawling occurred during January to July. The average weekly value of total landings during the high season for trawling was $4,750 for each 2-day trip taken. In addition, for each trip, an estimated 250 lbs of shrimp was landed, comprising 80 lbs of large shrimp, and the rest, of medium size. The average estimated proportion of bycatch (fish) was 21.25% of the volume of the trip landings.

**Trawling Activity in the Low Season:** Forty percent of fishers reported July to December as the low season for trawling. Twenty percent reported July to October, and another 20% reported August to December. There was no response by the rest of the fishers. The average weekly value of total landings during the low season for trawling was $2,000 for each 2-day trip taken. In addition, for each trip, an estimated 45 lbs of shrimp was landed, together with 650 lbs of fish. The average estimated proportion of bycatch (fish) was 90.88% of the volume of the trip landings.

**Disposal of Bycatch:** All the landed bycatch was sold to vendors at the Orange Valley Fish Market. These vendors did not express any preference for a specific fish species.

**Perceived Importance of Bycatch to Fishers:** Eighty percent of fishers reported that income was highly affected by the availability of bycatch. Sixty percent cited bycatch as being very important for employment, and 40% cited nutrition and food security as being heavily influenced by bycatch.

**Perceived Importance of Bycatch to the Local Community:** Sixty percent of fishers reported that income, nutrition and employment were highly affected by the availability of bycatch. Only 40% cited food security as being heavily influenced by bycatch.

### 4.5.3 Vessel and Trip Characteristics

**Vessel Profiles:** All 7 vessels in the survey were stern drag types, varying from 32 feet to 10 feet. The average length was 35.3 ft. Boats ranged in age from 1 month to 24 years, with an average age of 14.4 years. The average current replacement value of these vessels was $347, 000.

**Maintenance Expenses:** The main activities needed to maintain each vessel were painting and replacement of nets. Painting was estimated at $8,000. Fishers reported that between 7 and 8 nets were

used every year. This required labour ($500 each net), 36 lbs of rope (at $36 per lb) and cork, giving a minimum cost of $12640 for all 8 nets per year.

**Trip Profile:** Seventy-five percent of fishers who responded stated that the average length per trip was 3 days, and rest stated 2 days. In the high season, 80% of vessels had 3 men in the crew (including the captain). The other fishers reported the use of 3 crew members, plus the captain. In the high season, fishing took place for a total of 6 days for half of the respondents, and all week long for the other fishers. In the low season, 40% of fishers still fished every day, with the others fishing an average of 3 days.

**Targeting Behaviour:** In the high season, shrimp was generally targeted. However, when the shrimp catch was poor, or during the low season, the trawling gear was commonly modified to target fish. The weights on the trawl were taken out so that the trawl floats more, and catches top dwellers.

**Discards:** Fishers estimated that 5 to 10% of bycatch was discarded at sea, and was made up primarily of Eelfish, Stingray and Balm eel.

### 4.5.4 Challenges Faced by the Fishery

Many fishers reported that there was a significant amount of shrimp that comes into Trinidad, and sold at Orange Valley. Fishers also faced significant net damage and loss from abandoned oil rigs which had no markers or lights. Increasingly, one of the biggest challenges in the fishing sector was attracting labour. Temporary, short term employment in outdoor clean-up and maintenance by CEPEP has made it very difficult for vessel owners to get crew since this program pays $80 per day. During the high season for shrimp when revenues are high, the competition for labour was not so acute, but during the low season, when revenues were low, competition was fierce, especially since crew members were paid after charges for operating costs and the owner's share is deducted. In some cases where the catch is small, crew payments may be negligible.

## 4.6 Otaheite Fishers Survey

Fishing at Otaheite is a male dominated activity. There were about 50 fishermen actively operating and landing their catch at the Otaheite Fish Market. The fishermen at this location have an informal association called the Otaheite Fishing Community Group. An estimated 60% of the fishers were under the age of 25 years and only about 25% reached the secondary school level of education.

All boats operating at Otaheite were privately owned. Fishing boats and gears were acquired through the fishers own investments. Fishers reported that they experienced great difficulty when trying to acquire funds from the commercial banks and other lending institutions who often asked for up to 100% security. In such cases, they found it easier to invest their own funds, thereby avoiding the stress associated with default of loan repayment.

The majority of the fishers lived within the Otaheite community and few lived in the adjoining villages. They operated in the fishery of the Gulf of Paria, which extends from Port of Spain in the north, to Cedros in the south; from the western coastline of Trinidad to Soldado Rock and Venezuelan waters in the west. Most, however, operated in the waters south of Point Lisas. Shrimp caught in Otaheite were believed to be those that escaped the nets of trawlers operating in the waters between Trinidad, Guyana and Venezuela. These represent a residual catch at the end of their life cycle.

The fishers reported receiving a Boat Engine Repair and Maintenance Course in 1991 conducted by the Fisheries Division of the Ministry of Agriculture. Fishing was done as a full-time activity by all fishers in Otaheite, this source of income representing 100% of the household income. Most fishers owned one boat with a few reporting ownership of three pirogues.

Fishing was done using pirogues, most fishers targeted shrimp during the shrimping season. During periods of low shrimp catch, some fishers utilized line fishing and diving, targeting certain species of fish. Other periods, trawling is done, targeting both shrimp and fish species. It is important to note that given the nature of fishing practiced by the Otaheite fishers, who would come onshore after each day's fishing effort, all catch is brought on board and traded. While shrimp attracted premium prices, some of the fish

caught such as herring and sardines, reportedly do not. Fishers requested that attention be paid to some of these low-priced species to bring it into the commercial basket.

Species of shrimp included the Red, White and Honey Shrimp. Otaheite also represented an important fishing ground for Bechine, sardines and herrings. Most fishers operated Monday to Saturday, using Sunday as their rest day.

The Otaheite fishery employed an estimated 250 persons directly in the fishing activity, and another 50 in various service and allied activities, which included retail sales and dory operators. An estimated 200 persons were also directly employed on a full-time basis by the 50 fishermen who operated at Otaheite. Typically, each boat had a captain, most often the owner of the vessel, and two fishing assistants. The larger trawlers (pirogues) employed up to three fishing assistants. When household dependents of 5 persons (mother and 4 children) were considered, this translated to an estimated 1,500 persons who depended on the Otaheite fishery for their livelihood.

About 100% of the tradable catch is sold to the eight (8) wholesalers who operated at Otaheite. Most of these wholesalers traded at the San Fernando Wholesale Fish Market, and a few also traded at Orange Valley. From the group of wholesalers, six traded both shrimp and fish, and two traded only shrimp. Smaller wholesalers purchased from only 2 to 3 boats.

Boat/pirogue owners received 3-4 shares of the day's catch, while trawler owners obtained 5-6 shares, and each fishing assistant was allocated one share. Due to the shallow waters in the Otaheite Bay, fishers were unable to land their catch directly on-shore. In such cases, a Dory was hired to land the catch, representing an additional expenditure to the fisher.

**Investments and Costs in the Fishery**

As indicated, about 50 boats were moored at the Otaheite landing site. The average capital investments in the Otaheite fishery are presented in Table 9:

**Table 9.**

**Estimated Size of Investments of Fishers at the Otaheite Fishery (Annual)**

| Equipment | Number | Current Value | Replacement Value | Total Current Value | Total at Replacement Value |
|---|---|---|---|---|---|
| Pirogues | 50 | $40,000 | $120,000 | $2,000,000 | $6,000,000 |
| Engines | 50 | $20,000 | $40,000 | $1,000,000 | $2,000,000 |
| Nets | 50 | $3,600 | $3,600 | $180,000 | $180,000 |

Notes:

- New pirogue and in-board engine cost $96,000-$120,000 (100 hp)
- A ten (10) year old pirogue (28 ft- 31ft) cost $40,000 (boat and engine)
- A ten (10) year old pirogue (28 ft- 31ft) cost - $32,000 (empty, unfurnished boat, no engine)
- Cost to recondition an engine ranged between $5,000- $10,000. This engine may remain sea worthy for just about 3 years.
- Nets cost - $1,200 each. Fishers may use an average of 2 – 3 nets per year; and up to 6 nets per year.
- Labour for net repair averages about $500/repair
- Boats are repainted on average every 4 months at a material cost of $800.00/ boat.

**Other Comments from Fishers on Issues Affecting the Otaheite Fishery**

(i) Pollution was believed to be a major problem in the fishing ground. Based on their reports, liquid chemical from the Point Lisas Industrial Estate dissolves in the water of the fishery, impacting negatively on the marine life. Fishers were not compensated for this loss but may be accused for over-fishing.

(ii) No water quality checks were done in the fishery to monitor water quality and levels of pollution.

(iii) The Otaheite River was polluted from poultry waste, household garbage and waste water from processing plants and industrial service providers located at the Otaheite Industrial Estate.

(iv) Otaheite was not a breeding ground for shrimp, but rather the shrimp originate in Guyana and Venezuela waters. In this regard, trawlers would intercept the shrimp in the Otaheite fishery. If they escaped, they would meet the polluted waters close to the western coast of Trinidad such as Point a Pierre, Claxton Bay and Point Lisas where they would be killed.

(v) There was an urgent need for the development of the fish landing site at Otaheite. At the time of the interviews, there was no jetty, no security, no lights, and the bay was never dredged, therefore fishers had to walk up to ½ mile in slush to meet their boats at low tide.

(vi) There was only one narrow slipway to service 50 boats. This did not allow for efficient boat repairs and maintenance.

(vii) Piracy was a problem at sea.

(viii) The low priced fishery imports such as canned and dried fish competed directly with the local fresh herrings and sardines for market share.

(ix) The landing site at Otaheite needed to be upgraded, and fishers needed to be provided with the following:

a) Cold storage and ice making facilities, as well as a fuel station.
b) Processing and value-adding facilities.
c) Security in the mooring area (six engines were lost from the existing locker room).
d) Training in net repair, boat repairs, fish handling and processing.
e) Upgrade to a wholesale market.
f) Report to the fishermen on fish sampling that was done on a regular by the Fisheries' Officers.
g) Subsidies which are easy to access.
h) Prices for fishery materials, equipment and supplies which were no highly variable.
i) More services to the sector, by the Fisheries Division.

## 4.7 Orange Valley Processor Interview

In Orange Valley, the biggest processor was interviewed, with only a few other small-scale processors available in the community. In the high season, 3,000-5,000 lbs of shrimp was processed. Manual de-veining was done. The processor and two other family members were employed in the low season. In the high season, up to ten persons were employed in processing. On average, 80% of the products processed are shrimp, and 20% fish. This processor has been involved in processing for 3 years. The shrimp that was de-veined, was then placed on tray packs and sold to supermarkets and restaurants, especially fast food Chinese restaurants. All the shrimp and fish were sold locally. The fish that was processed was de-boned and tray packed for sale to the same buyers as the shrimp. While all fish can be processed, the processor indicated that there was no demand for processed Mixed Fish.

## 5.0 Discussion and Conclusion

For both the Orange Valley and Otaheite communities, shrimp by-catch, which comprised primarily fish, was very important as a source of livelihoods. Forty-five percent (45%) of Orange Valley households and 34% of Otaheite households reported at least one person was employed in the local fisheries. Most of those so employed were as fishers or fish vendors.

In Orange Valley, almost all families reported that the entire family ate fish (91.3 %), while approximately three-quarter (76.3%) indicated that all family members ate shrimp. In Otaheite, in 92% of the 83 households, all members consumed fish. In Orange Valley, with the exception of Tuna, 50% or more of households indicated that they consumed the main seafood species sold at the local market, with the most popular purchases, in terms of the number of households, being for shrimp and Carite. Of the By-catch species, Carite and Racando were identified as being consumed in the largest amounts. In Otaheite, Bechine was identified as the most consumed single species of seafood.

Almost all household obtain fresh fish from the local fish market. A large portion of them buy on a daily or weekly basis. Fresh fish was incorporated in their diet for at least one meal per day in Orange Valley. Although the average household expenditure on meat in Orange Valley was almost twice that of expenditure on seafood (figure 4), a significant portion of families catch their own seafood (17%), or received seafood as gifts (28%). The portions are similar in Otaheite, where 39 % of households catch their own seafood, and 22% receive seafood as gifts (figure 15).

In Orange Valley, the majority of families believed that the local fishery is very important for the community in a number of areas. As a source of food, the local fishery was seen as very important by a large majority of the community (75 % of the sample). Sixty-nine percent (69 %) of respondents viewed the fishery as being of high importance for health, nutrition and wellness, in addition to the local economy. Sixty-six percent (66 %) of homes viewed the local fishery as being of high importance for employment and income generation, while 64 % of family units had a similar view of the fishery for its impact on community lifestyle. Conversely, recreation was seen as having a high influence by the local fishery for only 19 % of the households.

The local fishery, despite its valid contribution to health, income and employment, was also seen as contributing negatively to the local community. The main source of negative impact as viewed by the community, is on drug and alcohol abuse (18 % of homes), followed by its contribution to school absenteeism (14 % of homes). In Otaheite, 37% of respondents did not fee that the fishery had a negative impact on the community. For the respondents who felt that there was a negative impact, the main source of this impact was on dumping and pollution (8%), followed by drug and alcohol abuse (5%).

Since the range of responses for the various frequency of purchase of fish (daily, weekly etc.), and the expenditure on these purchases, was very wide, and did not appear always reflective of the consumption for the associated household, this data could not be used to analyze any correlations that may have existed between these variables and, for example, the size of the household, or the number of persons employed. Furthermore, the response rate for these questions on quantity of fish bought and expenditure had very low response rates, so the validity of any assessment done with the outcomes would be in question.

Approximately 90 percent of the Orange Valley households purchased fresh fish that was landed at Orange Valley. The average number of fresh fish meals per day consumed per household is 1.37, and fresh fish meals are prepared an average of 2.95 days per week per household. Given an average household size of 4.81 persons, each household consumed 3.64 lbs of fish per week. Therefore, for all 248 households in the Orange Valley community, the quantity of fresh fish consumed annually is 46, 941.44 lbs. The three top identified species or group of fish bought in the largest quantities for Orange Valley were: Carite (24% of households); Racando (16%) and Mixed Fish (11%). Using these fish groups, a weighted price for the representative fish in the household's food basket was estimated as $5.78/lb. This therefore implied that the value of bycatch consumed in Orange Valley in 2005 was $271,321.52.

For Otaheite, the average number of fresh fish meals consumed per day, per household was 1.67, and fresh fish meals are prepared an average of 2.97 days per week per household. Given an average household size of 4.39 persons, the quantity of fresh fish consumed per week, per household, was computed as 65.32 oz., or 4.08 lbs. Therefore, for all 250 households in the Otaheite community, the quantity of fresh fish consumed annually is 53,040 lbs. The three top identified species or group of fish bought in the largest quantities for Otaheite were: "Other" (49% of households), Carite (23%) and Kingfish (11%). The

weighted price of fish in Otaheite was therefore calculated as $8.00/lb. This therefore implied that the value of bycatch consumed in Otaheite in 2005 was $ 424,320.

The interviewers used for the Orange Valley survey were residents of the area. This was done to foster trust, and encourage the households to be more truthful in their responses. For most questions, except those relating to household income, the response rate was very good. However, in Otaheite, there was a general reluctance by households and fishers to answer any of the questions on the questionnaire, especially those relating to income. The interviewers were of the view that for income related questions, respondents under- or over-reported their income. This occurred since offshore geo-chemical surveys were being done by Petro Canada in the Soldado Oil Fields, which are located in the Gulf of Paria west of Orange Valley and Otaheite. Many fishers, therefore were of the opinion that the government wanted to determine their income levels, so as to compensate them for losses in the fishery that would occur as a result of the offshore surveys. In December of 2006, many of the fishers' fears were realized when the Government of Trinidad and Tobago announced plans to construct an industrial island offshore from Otaheite to facilitate the building of an aluminum smelter.

In general, the results of this study suggests that the bycatch landed by the shrimp fishers in Orange Valley and Otaheite totals $695,641.52 annually. These are only two of several fishing communities in Trinidad and Tobago at which shrimp are landed. This annual figure therefore, represents a lower bound on the value of shrimp bycatch in Trinidad and Tobago. Further, in 2003, the total value of shrimp bycatch (MALMR 2007b) was $3.70 mil. This means that the bycatch landed in Orange Valley and Otaheite, account for approximately 19% of bycatch value in Trinidad and Tobago.

The Total Economic Value of shrimp bycatch in Trinidad and Tobago is comprised of its: Use Value and Non-Use Value. The Use Value is the value people obtain from the use of the resources either directly (Direct Use Vale) and via its use by the natural environment that humans benefit from (Indirect Use Value). So that the Direct Use Value in local fishing communities is largely in terms of its value: as a source of food, and as a source of income for fishers, vendors and processors. The Indirect Value of bycatch includes its value as: a source of food for other fish and other ocean dwellers higher up the food chain. Bycatch also has an Option Value, which is the value ascribed to the option of not using the resource now, but leaving it for future use and future benefit. The current generation may also be desirous

of leaving fish resources for use by future generations, even if it is not currently used. This represents the resource's Bequest Value. In addition, bycatch may be allowed to exist because of its intrinsic value, or Existence Value. Together, the resource's Option Value, Bequest Value and Existence Value make up its Non-Use Value.

Non-Use Value, by its very nature is more difficult to measure than Use Value. This study captured part of the shrimp bycatch Direct Use Value. Since only ex-vessel prices are assumed to be used in this analysis, the value added component of processing and retailing activities represent an additional component of Direct Use Value that is still to be captured. Therefore, any policies that may be implemented to reduce bycatch in the shrimp fishery, must recognize the enormous importance that it has on the livelihoods of many in the local communities, as well as its serving as a source of protein, which for many residents of these communities may be obtained more cheaply than other sources of protein due to their close proximity to the landing site, their access to cheaper "Mixed Fish", may always be sold at more urban sale centres, and also their ability in some cases to have family members catch fish, or obtain fish as gifts from family members or friends. The final decision, however, in determining new strategies for conserving the shrimp and fish stock, must ultimately assess the costs and benefits of reducing the harvest of bycatch, not only from a biological view, but from a socio-economic view as well.

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**Appendix #1**
**CONFIDENTIAL**

**QUESTIONAIRE #:……**
**HOUSEHOLD #: ……**

**THE UNIVERSITY OF THE WEST INDIES**
**Faculty of Science and Agriculture**
Department of Agricultural Economics and Extension
St. Augustine Campus, Trinidad, West Indies

## HOUSEHOLD SURVEY

### SECTION A
### GENERAL INFORMATION

1. NAME: ……
2. ADDRESS:……
3. AGE (yrs): □ <30 □ 31-40 □41-50 □51-60 □ >60
4. Gender: □ Male □ Female
5. Ethnic Composition: □ East Indian □ Afro-Trinidadian □ Mixed
6. EDUCATION: □Primary □ Secondary □Technical/Vocational □ Tertiary □ Other
7. SIZE OF HOUSEHOLD**:-** No. of Adults (over 18 yrs): _____

   No. of Children (under 18yrs): _____
8. How many years have you been residing in this community?

…….

9. Are you a member of any community/action group? If yes, what organization and how many years?

□ Yes □ No

……

……

……

10. Have you pursued any training courses in fisheries? If yes please indicate Course Titles

□ Yes □ No

……

……

……...

11. Are you a member of any Fishing Organisation? If so which one?

□ Yes □ No

…….

12. How many members of the household are employed?

□ Full time……..
□ Part time……..

13. What types of occupation are household members involved in? Please List

……

……

…….

14. Are any members of your family employed in the local fisheries? If yes, how many?
**If NO, SKIP to Question # 17**

□ Yes □ No

How many……

15. Are there any members of this Household involved in the following employment / support activities for the fisheries? Please tick where relevant

| Fishing Activity | Male | Female | Full Time | Part time | Average no. of days involved in this activity | All Year | Seasonal * (months occupied) |
|---|---|---|---|---|---|---|---|
| Owner | | | | | | | |
| Captain | | | | | | | |
| Boat rental | | | | | | | |
| Nets (making & repairs) | | | | | | | |
| Transport | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Market Intermediary | | | | | | | |
| Fishing worker/ boat assistant | | | | | | | |
| Sales | | | | | | | |
| Processing | | | | | | | |
| Other | | | | | | | |

**Note**: * Where seasonal, indicate:-
(i) Months occupied
(ii) When not in fishing, what activities involved in? Please List

……

…….

16. What is your average household monthly income range derived from fishing related activities?

□ $0-500
□ $500-1,000
□ $1,000-3,000
□ $3,001-10,000
□ $10,001-20,000
□ >$20,000

**SECTION B**

**FISH / SHRIMP CONSUMPTION**

17. What are your major sources of purchased cooked foods?

□ Fast food Restaurant e.g. KFC, Royal Castle □ Doubles vendor
□ Chinese Fast food Restaurant □ BBQ Roadside Vendors
□ Other Restaurants

18. Of the amount spent on cooked food, what amount ($) is spent on seafood weekly? ……

19. What is the source of your seafood?

□ Purchases □ Own Catch □Gifts

20. **For the last three (3) weeks**, what was the **average weekly** expenditure on the following types of food (inclusive of meals purchased outside the home)?

| TYPE | EXPENDITURE |
|---|---|
| Seafood | |
| Meats | |
| Fruits | |
| Vegetables and legumes | |
| Other Foods | |

21. If seafood purchases are made, which are your sources of supply and location?

| Supply Source (tick relevant option) | Geographical Location |
|---|---|
| □ Fish Market | |
| □ Grocery | |
| □ Roadside Vendor | |
| □ Mobile Vendor (fish van) | |
| □ Gifts from family or friends | |

22. Based on your average weekly expenditure on seafood, what value ($) of your seafood purchases comprise of the following?

| Type | Quantity ($) |
|---|---|
| Fresh | |
| Chilled | |
| Frozen | |
| Salted | |
| Canned | |

23. Could you please tell us how often the household prepares fish?

| Type | Avg. no of days per week prepared | Avg no. of seafood meals per day |
|---|---|---|
| Fresh Fish | | |
| Frozen Fish | | |
| Fresh Shrimp | | |
| Frozen Shrimp | | |
| Salted Fish | | |
| Canned Fish | | |

24. How often do you purchase Fish? Please indicate in what quantities

| Frequency | Quantity | Value ($) |
|---|---|---|
| Daily | | |
| Weekly | | |
| Bi-weekly | | |
| Monthly | | |

25. How often do you purchase Shrimp? Please indicate in what quantities

| Frequency | Quantity | Value ($) |
|---|---|---|
| Daily | | |
| Weekly | | |
| Bi-weekly | | |
| Monthly | | |

26. What type / species of **seafood** does your family consume?

□ Kingfish □ Catfish □ Crab
□ Carite □Redfish □ Shrimp
□ Racando □Mixed Fish □ Tuna
□ Shark □ Conch □ Other ……..

27. Please rank the top three (3) **seafood** items in the list below (**1 =** the one consumed in the largest quantities, **3 =** the one consumed in the third largest quantities)

□Kingfish □ Catfish □ Crab
□ Carite □Redfish □ Shrimp
□ Racando □Mixed Fish □ Tuna
□ Shark □ Conch □ Other ……

28. Does everyone in your household consume **fish**? If no, please indicate the household members who do not and why.

□ Yes □ No

Comment:
……
……..

29. Does everyone in your household consume **shrimp**? If no, please indicate the household members who do not and why.

□ Yes □ No

Comment:
……
……

30. What are the most frequent forms of preparation for **fish**?

□ Curry □ Fry □ Stew □ Other……..
□ Bake □ Broth □ Steam

31. What are the most frequent forms of preparation for **shrimp**?

□ Curry □ Fry □ Stew □ Other……
□ Bake □ Broth □ Steam

32. What type / species of **shrimp** do you purchase?

□ Pink □ Headless □ Small □ White □ Jumbo □ Ginga/ Honey
□ Tiger □ Large Between medium and jumbo) □ Other……
□ Brown □ Medium

33. Please rank the top three (3) **shrimp** items in the list below (**1 =** the one consumed in the largest quantities, **3** = the one consumed in the third largest quantities)

□ Pink □ Headless □ Small
□ White □ Jumbo □ Ginga/ Honey
□ Tiger □ Large Between medium and jumbo) □ Other……
□ Brown □ Medium

34. For the **community**, could you comment on the influence of the local fisheries on the following? (Tick where relevant)

| Factors | High | Medium | Low |
|---|---|---|---|
| Lifestyles | | | |
| Health, Nutrition, Wellness | | | |
| Local Economy | | | |
| Employment | | | |
| Income Generation | | | |
| Food Supply | | | |
| Recreation | | | |
| Others | | | |

Comments:……

……

…….....

35. What have been the negative impacts of the local fishery on the **community**? Please List.

……

……

……

36. Are there any plans by members of the household for further involvement in the local fishing industry?

□ Yes □ No

Comments:……

……

……

37. What do you suggest can be done to enhance the contribution to the local fish market?

……

……

……

……

38. Last year, were any members of your family involved in any special events / religious activities associated with the fisheries? E.g. Boating events, Family days, Good Friday, St. Peters Day?

……

……

……

39. Do you have any additional comments?

……

……

……

END OF SURVEY

9/21/05

**Appendix #2**

**THE UNIVERSITY OF THE WEST INDIES**
**Faculty of Science and Agriculture**
Department of Agricultural Economics and Extension
St. Augustine Campus, Trinidad, West Indies

**FISHERFOLK SURVEY**

**SECTION A: Bycatch**

1. Profile of Operator

| | | | |
|---|---|---|---|
| 1. Size of Boat | | 7. Ave. length of stay at sea | |
| 2. Type of Boat | | 8. No of crew | |
| 3. Age of Boat | | 9. Days/Week fishing | |
| 4. Current Value | | - Average | |
| 5. Replacement Value | | - High Season | |
| 6. Annual Maintenance Cost | | - Low season | |

2. Importance of Landed Bycatch by Specie

| Species of Bycatch | Rank in terms of volume landed annually (top 6) | Disposal % sold | Disposal % Gift | Rank in terms of total sales annually (top 6) | What is the estimated annual total sales for each specie (4) |
|---|---|---|---|---|---|
| Bacheen | | | | | |
| Racando | | | | | |
| Carite | | | | | |
| Red snapper | | | | | |
| Shark | | | | | |
| Cat fish | | | | | |
| Pompano | | | | | |
| Mollet | | | | | |
| Salmon | | | | | |
| Crab | | | | | |
| Conchs | | | | | |
| Octopus | | | | | |
| Other | | | | | |

3. Best season for trawling

   a. What are the best months for trawling? ……..

b. Average weekly value of total landings at this time ($) ……..……

c. What % is landed bycatch? ……..……

4. Low season for trawling

d. What are the best months for trawling? ……..

e. Average weekly value of total landings at this time ($) ……..……

f. What % is landed bycatch? ……..……

5. Disposal of bycatch

| Intermediary | **% of total bycatch sales by volume** | **Prefered species** | **Comments: Reason for preference** |
|---|---|---|---|
| Orange valley households | | | |
| Other households | | | |
| Local vendors | | | |
| restaurants | | | |
| processors | | | |
| exporters | | | |
| Other vendors | | | |

6. What is the importance of bycatch with respect to income, food security, nutrition and employment to:
    a. Your household
        i. Income ……..
        ii. Food security ……
        iii. Nutrition ……
        iv. Employment …….
    b. The orange valley community
        i. Income ……..
        ii. Food security ……
        iii. Nutrition ……
        iv. Employment …….

**SECTION B: Personal**

40. POSITION: □ Captain □ Crew □ Owner of vessel

41. NAME:……..

42. Phone Contact ……..

43. AGE: □ <30 □ 31-40 □41-50 □51-60 □ >60

44. EDUCATION: □Primary □ Secondary □Technical/Vocational □ Tertiary □Other

45. What is the size of your household? (How many Dependents)

……

46. Have you had any formal training in fishing and /or ocean navigation? Specify.

……

47. Are you a member of any Fishing Organisation? If so which one?

……

48. How long (in years) have you been fishing?

……..

49. How many employed adults do you have in your household?

……

50. Are you involved in any other business or occupation? If so, what?.

……

END OF SURVEY