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# The Potential for Using Florida Shrimp Trawl Bycatch as a Source of Low-Cost Food

by
Chuck Adams[1]

## Introduction

**Sea Share**, a cooperator with Farm Share, Inc, a non-profit 501 (c) (3) charity, has expressed an interest in examining the feasibility of utilizing the shrimp trawler bycatch of finfish as a food source. The goal of **Sea Share** is to utilize finfish bycatch as a source of low-cost protein for human consumption through recipient organizations, such as soup kitchens, food banks, Salvation Army, Florida Food Recovery, and others. As Farm Share, Inc. (in conjunction with Florida DACS Bureau of Food Distribution) has done successfully with surplus agricultural production, **Sea Share** wishes to distribute surplus seafood products to organizations that assist disadvantaged individuals in Florida. Sea Share believes that one potential source of this surplus seafood product might be shrimp trawl finfish bycatch.

It is widely known that many species of edible, albeit small, finfish are discarded in the bottom-trawling process for shrimp in Gulf of Mexico. For a variety of reasons, these discarded finfish are currently not being utilized as a commercially marketable food product for human consumption. The use of finfish bycatch, however, raises a number of questions. These questions are likely

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[1] Marine Economics Specialist, Florida Sea Grant Program, University of Florida, Gainesville.

more pertinent to using bycatch specifically and are of less concern than for the agricultural products Farm Share has traditionally distributed. Questions regarding perishability and availability are foremost. How should bycatch products be handled and processed to ensure a quality and safe food product? What is the likely yield of edible meat from a unit of bycatch? What are the logistics of processing bycatch? And of more basic interest, what edible species of finfish comprise bycatch in Florida? When are these species available and at what volumes? The latter two questions are obviously of fundamental concern. The following discussion presents information that will assist in assessing the availability of certain finfish species from Florida west coast shrimp trawler bycatch.

Another issue of which any effort to utilize bycatch must be mindful is that current fisheries management priorities for the southeast region include eliminating the bycatch that occurs as a result of shrimp trawling. Because of this management objective, and resulting recent technological advances in gear design that successfully reduce bycatch volumes, utilizing bycatch as a food product may have only short-term potential.

**What is Known about Florida Bycatch?**

Bycatch associated with shrimp trawling in the Gulf of Mexico and the southeast Atlantic is estimated to be approximatley ten billion individual finfish annually (Nichols, et al, 1990). This bycatch is composed not only of many different species of finfish, but also many species of shellfish and other invertebrates. The

primary finfish species which comprise this bycatch include croaker, seatrout, porgies and spot. Research has shown that the volume and mix of species found in bycatch is related to fishing location, season of the year, water depth, and trawl type (Lindner, 1936; Nichols, et al., 1990; Bullis and Carpenter, 1968). The National Marine Fisheries Service has been conducting a bycatch characterization program over the past three years. This program utilizes NMFS-trained onboard observers to collect trawl bycatch samples and record the number of species, weight of bycatch, species composition, and species abundance, size, weight, and life history data. A detailed description of the sampling procedures is contained in the NMFS Bycatch Characterization Sampling Protocol (NMFS, 1992). Data were collected for the west coast of Florida, as well as other states. (Very few data were collected for the east coast of Florida and these data are currently unavailable from NMFS). Data on the most prevalent species by total weight, number, and average length were collected. This information will be useful in characterizing Florida bycatch in terms of its usefulness as a low-cost food source.

Composition of bycatch by State

Bycatch composition varies considerably by state. Figure 1 indicates how the species composition changes around the Gulf region. Notice that 72 percent of the Louisiana bycatch is comprised of finfish. Whereas, only 50 percent of the Florida bycatch is finfish. The Florida bycatch contains more invertebrates and crustacea than any of the other Gulf states.

Composition of bycatch by depth and season

The species comprising bycatch also varies with depth of water in which the tow is made. Figure 2 shows how the species composition changes with depth for tow samples made in the Gulf (without reference to individual states). Note that the percentage distribution across broad species groups is relatively unchanged for the two depth categories. However, the mix of individual species does change substantially. And this species mix could have an impact on the feasibility of bycatch utilization. Table 1 shows how the species mix (top five species) changes with depth. Note that the species mix for the two depth zones in Florida (Table 1) is composed primarily of crustaceans. The other states have a larger number of finfish species which dominate the catch. However, the species mix found in the bycatch for each of those states is dependent on water depth.

Species composition of Florida bycatch

Figures 3 and 4 show the top eleven species comprising Florida bycatch by number and weight, respectively. The "other" category is a composite for all the remaining species. Note that the majority of these species are crustaceans. The finfish of importance are fringed flounder, inshore lizardfish, pinfish, and longspine porgy. On a weight basis, inshore lizardfish, pinfish, and fringed flounder comprise 9%, 4%, and 3% of the Florida bycatch.

Size of finfish species comprising Florida bycatch

Utilization of bycatch for a food source will be very much dependent not only on the finfish species which comprise the bycatch, but also on the average size of the individual finfish. Although only three species are found in the dozen most important bycatch species by weight, many other finfish species are found in Florida bycatch. However, these species are characterized by a small average size. Table 2 provides a list of the top 20 species by weight and number found in Florida bycatch. Only a few of these species are currently sold in commercial foodfish markets in Florida (i.e., Gulf Flounder, mojarra, tomtate, sea bream, and sea bass). Table 2 also provides the average length (mm) of the top 20 finfish species (on a weight basis). Note that for most, the average size is less than 200 mm (the sheet of paper you are reading from is 280 mm in length). Gulf flounder is the only currently marketable species that has an average bycatch size in excess of 200 mm (244 mm) (a minimum length of 11 inches applies in Florida for flounder).

Other species with an average size in excess of 200 mm are likely found in Florida bycatch. These species, however, are fewer in number than those listed in Table 2. For some species (such as spotted seatrout, snappers, mackerels, etc.) a minimum legal length also exists. Individuals smaller than this legal length would not be available for utilization, given current regulations. Other species such as croaker, whiting, catfish, and sand/white seatrout, may be utilized at small sizes (no legal minimum size limit exists).

**Past Attempts to Use Finfish Bycatch as a Food Source**

The idea of using shrimp trawl bycatch as a food source is certainly not new. Previous research efforts have examined the feasibility of utilizing the discarded, or "trash", species as a source of human food protein (Cornell, 1948; Baughman, 1950; Vincent, 1951; Harrington, 1992; Keiser, 1976; Blomo and Nichols, 1974). Most findings suggest that the small size of individual finfish and the costs associated with the collection of suitable volumes of bycatch render the process to be commercially infeasible. The relatively low value of bycatch compared to other targeted species provides little financial incentive for shrimp trawlers to utilize limited hold space and expensive ice to haul quantities of bycatch back to home port. Bycatch has been utilized for the production of pet foods and other industrial products. Also, efforts have been made to direct bycatch products toward ethnic markets. However, such a strategy may require a potentially lengthy period of market development. Product donation programs obviously would not be faced with such commercial market development constraints. Product acceptance would, however, be of concern.

**Management Concerns Regarding Bycatch Utilization**

The current management goal related to bycatch is not how to best utilize bycatch, but rather how bycatch can be significantly reduced or eliminated. Thus, the development of bycatch reduction devices (BRD's) is a top research priority for the use of MARFIN and S/K funds in the southeast region. These research directives

are designed to meet the goals of numerous environmental groups, as well as regional marine resource management agencies, who are aware of the effect of bycatch on the overall fisheries resource biomass.

In fact, recent amendments to the Magnuson Act provide testimony to a growing Congressional interest in the shrimp trawling bycatch issue in the Gulf and southeast region (Nance, 1994). The Magnuson Act, as amended by Congress in 1990, expresses as a policy (in Section 2(b)(3)) to "assure that the national fishery conservation and management program ... considers the effects of fishing on immature fish and encourage the development of practical measures that avoid the unncecessary waste of fish" (Greenberg, 1992). This policy, as well as those initiated by the Endangered Species Act and the Marine Mammal Protection Act, will likely result in measures that will significantly reduce finfish bycatch in the future.

However, bycatch will likely never be totally eliminated, although the technological advances associated with BRD's will probably help minimize discards associated with trawler bycatch. Barring the elimination of the use of otter trawls by shrimp vessels, some volume of finfish bycatch from the shrimp trawling process will continue to exist. And management pressure will likely continue to be applied toward the goal of reducing bycatch even further. From the perspective of ecosystem concerns, simply utilizing formerly "wasted" bycatch (as opposed to totally eliminating it) may continue to be viewed as unacceptable. The pervasiveness of such a philosophy could create additional

constraints that may confront even the noncommercial use of bycatch (such as that proposed by **Sea Share**).

**Recommendations**

The above discussion is not intended to suggest that the utilization of finfish bycatch as a low-cost food source is not a worthy objective. The existence of hungry people and the existence of unused edible fisheries products warrants the examination of these resources as a food source. However, the problems introduced by the currently available bycatch characterization data (small size of edible species), previous studies regarding utilization (problems with low yields and product forms), and the current environmental and management concerns regarding bycatch (should be further reduced) offer a healthy set of obstacles to consider.

Previous efforts have suggested that the utilization of bycatch as a human food is not commercially feasible for several reasons. However, when viewed outside the realm of profit making, the concept may have merit on a local or targeted basis. The program proposed by **Sea Share**, for example, allows for significant costs to be reduced or eliminated through donated product supply or volunteer labor. State subsidization, such as enjoyed by Farm Share, is also a possibility. Feasibility then becomes a logistical question. Even so, a considerable number of questions exist regarding the availability and quality of finfish bycatch, and the logistics of handling, processing, and distributing a highly perishable and potentially low-yield product. These questions include:

* What species will be utilized?
* What logistical considerations exist regarding at-sea handling, storage, and offloading?
* How is availability affected by region of the state, season of the year, and current market conditions for shrimp?
* Where and by whom will the finfish bycatch be processed?
* What product forms will be most appropriate if the individual portions of meat are extremely small?
* Can the current Farm Share distribution system be utilized for storage and transportation of seafoods to the various recipients?

To address these questions, it is recommended that **Sea Share**: (1) initiate pilot programs, similar to that already initiated in northeast Florida, with shrimp trawler captains in various regions of the state (decide on which species and sizes will be utilized in each region),

(2) establish minimum threshold levels of finfish bycatch (for a vessel, port, etc.) below which the limited resources of **Sea Share** will not be committed,

(3) find the areas of the state where acceptable amounts of the "target" species exist and develop channels of supply,

(4) consider creating a set of incentives for the trawler captains to cull and store finfish bycatch on board and deliver to dock (including monetary and non-monetary incentives),

(5) find seafood processors with seasonally available processing capacity that might be utilized for processing and storing bycatch,

(6) explore alternative product forms, including highly processed products such as soups, patties, sticks, etc. to increase potential for storage,

(7) consider limiting the list of recipients to those that will enhance the chance of program success (i.e., carefully matching recipient needs with the availability of a highly perishable product), and

(8) fully understand that food use from this source may only be short-term, since the management goal is to eliminate bycatch.

**References and Further Reading**

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# Weight by Statistical Groups

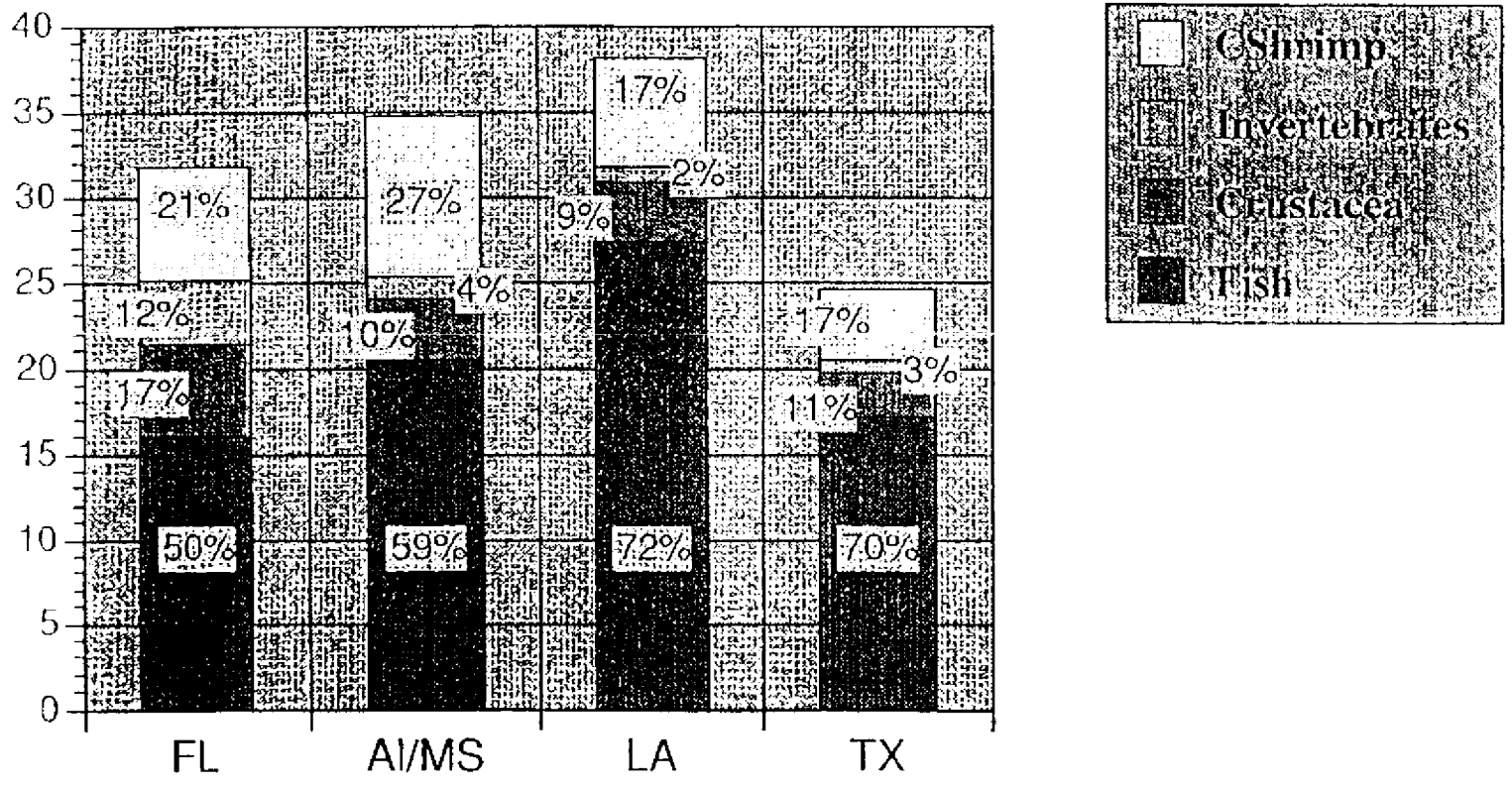


**FIGURE 1: WEIGHT OF BYCATCH BY STATISTICAL GROUPS, BY STATE**

Source: National Marine Fisheries Service, Galveston Laboratory.

# Weight by Statistical / Depth Groups

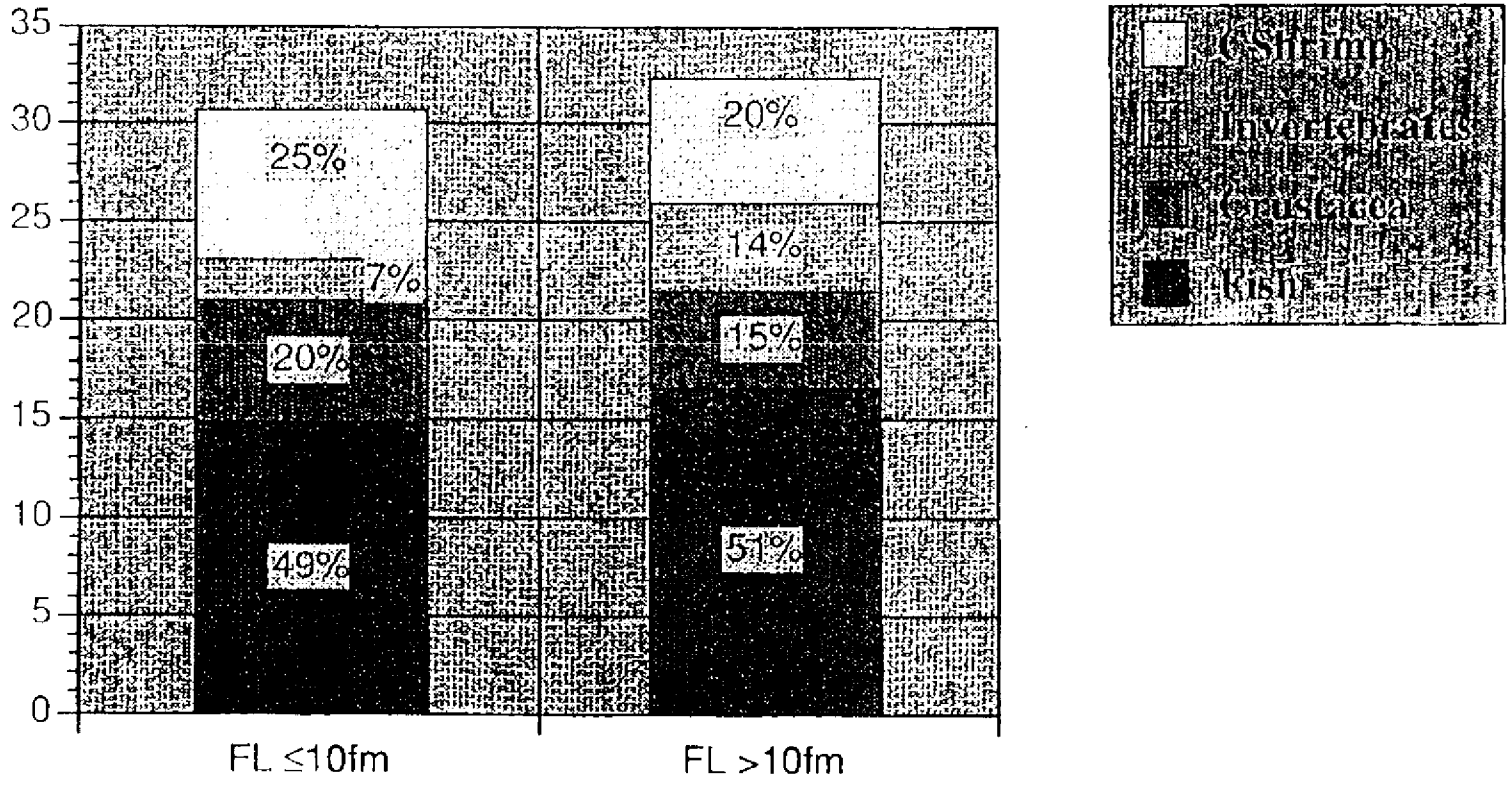


**FIGURE 2: WEIGHT OF BYCATCH BY STATISTICAL GROUPS, BY STATE**

Source: National Marine Fisheries Service, Galveston Laboratory.

# TABLE 2: PROMINANT BYCATCH SPECIES FOR ALABAMA/MISSISSIPPI, BY DEPTH

| | Alabama / Mississippi Weight Data | | |
|---|---|---|---|
| | May-Aug 92 | Sep-Dec 92 | Jan-Apr 93 |
| Depth | | | |
| ≤10fm | Atlantic croaker | Atlantic croaker | hardhead catfish |
| | brown shrimp | mantis shrimp | southern kingfish |
| | spot | sand seatrout | sand seatrout |
| | lesser blue crab | southern kingfish | Gulf butterfish |
| | sand seatrout | lesser blue crab | longspine porgy |
| >10fm | • | Atlantic croaker | • |
| | • | sand seatrout | • |
| | • | lesser blue crab | • |
| | • | inshore lizardfish | • |
| | • | rock seabass | • |

| | Alabama / Mississippi Numerical Data | | |
|---|---|---|---|
| | May-Aug 92 | Sep-Dec 92 | Jan-Apr 93 |
| Depth | | | |
| ≤10fm | brown shrimp | mantis shrimp | sand seatrout |
| | Atlantic croaker | Atlantic croaker | Gulf butterfish |
| | mantis shrimp | lesser blue crab | sugar shrimp |
| | lesser blue crab | irrid. swimming crab | fringed flounder |
| | sand seatrout | fringed flounder | longspine porgy |
| >10fm | • | blackear seabass | • |
| | • | sugar shrimp | • |
| | • | lesser blue crab | • |
| | • | sand seatrout | • |
| | • | mantis shrimp | • |

Source: National Marine Fisheries Service, Galveston Laboratory.

# TABLE 3: PROMINANT BYCATCH SPECIES FOR TEXAS, BY DEPTH

| | Texas Weight Data | | |
|---|---|---|---|
| | May-Aug 92 | Sep-Dec 92 | Jan-Apr 93 |
| Depth | | | |
| ≤10fm | Atlantic croaker | longspine porgy | Gulf butterfish |
| | brown shrimp | hardhead catfish | white shrimp |
| | white shrimp | Atlantic bumper | cutlass fish |
| | spot | Atlantic croaker | Atlantic bumper |
| | cutlass fish | blue crab | Atlantic croaker |
| >10fm | longspine porgy | longspine porgy | inshore lizardfish |
| | brown shrimp | Atlantic croaker | longspine porgy |
| | mantis shrimp | brown shrimp | brown shrimp |
| | hardhead catfish | inshore lizardfish | rock shrimp |
| | lesser blue crab | spot | lesser blue crab |

| | Texas Numerical Data | | |
|---|---|---|---|
| | May-Aug 92 | Sep-Dec 92 | Jan-Apr 93 |
| Depth | | | |
| ≤10fm | Atlantic croaker | longspine porgy | Gulf butterfish |
| | brown shrimp | Atlantic brief squid | Atlantic croaker |
| | Gulf butterfish | brown shrimp | cutlass fish |
| | white shrimp | Atlantic bumper | white shrimp |
| | longspine porgy | hardhead catfish | star drum |
| >10fm | longspine porgy | longspine porgy | brown shrimp |
| | mantis shrimp | brown shrimp | longsine porgy |
| | bay whiff | rock shrimp | lesser blue crab |
| | brown shrimp | longspine swim. crab | longspine swim. crab |
| | rock shrimp | irrid. swimming crab | bay whiff |

Source: National Marine Fisheries Service, Galveston Laboratory.

# TABLE 4: PROMINANT BYCATCH SPECIES FOR LOUISIANA, BY DEPTH

| | Louisiana Weight Data | | |
|---|---|---|---|
| | May-Aug 92 | Sep-Dec 92 | Jan-Apr 93 |
| Depth | | | |
| ≤10fm | Atlantic croaker | white shrimp | sand seatrout |
| | brown shrimp | Gulf menhaden | hardhead catfish |
| | hardhead catfish | Atlantic croaker | white shrimp |
| | longspine porgy | blue crab | sugar shrimp |
| | Gulf menhaden | seabob shrimp | cutlass fish |
| >10fm | longspine porgy | Atlantic croaker | inshore lizardfish |
| | brown shrimp | longspine porgy | longspine porgy |
| | hardhead catfish | brown shrimp | Atlantic croaker |
| | Atlantic croaker | inshore lizardfish | brown shrimp |
| | spot | Gulf butterfish | sand seatrout |

| | Louisiana Numerical Data | | |
|---|---|---|---|
| | May-Aug 92 | Sep-Dec 92 | Jan-Apr 93 |
| Depth | | | |
| ≤10fm | Atlantic croaker | white shrimp | sugar shrimp |
| | brown shrimp | seabob shrimp | sand seatrout |
| | longspine porgy | Atlantic croaker | fringed flounder |
| | seabob shrimp | Gulf menhaden | white shrimp |
| | hardhead catfish | brown shrimp | cutlass fish |
| >10fm | longspine porgy | longspine porgy | sugar shrimp |
| | brown shrimp | Atlantic croaker | longspine porgy |
| | sugar shrimp | longspine swim. crab | longspine swim. crab |
| | mantis shrimp | brown shrimp | irrid. swimming crab |
| | irrid. swimming crab | irrid. swimming crab | flame box crab |

Source: National Marine Fisheries Service, Galveston Laboratory.

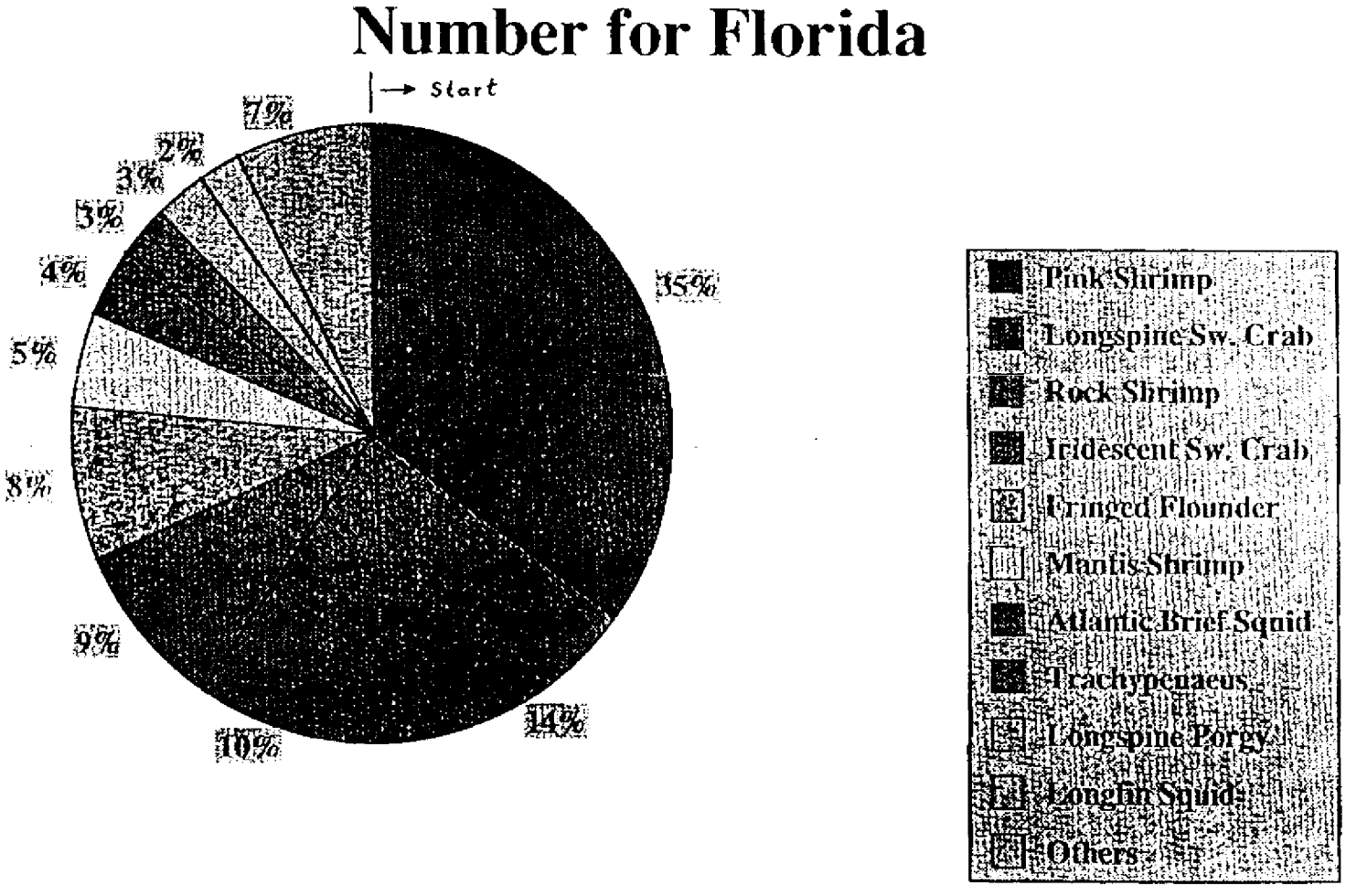


**FIGURE 3: PROMINANT BYCATCH SPECIES FOR FLORIDA, BY NUMBER**

Source: National Marine Fisheries Service, Galveston Laboratory.

# Weight for Florida

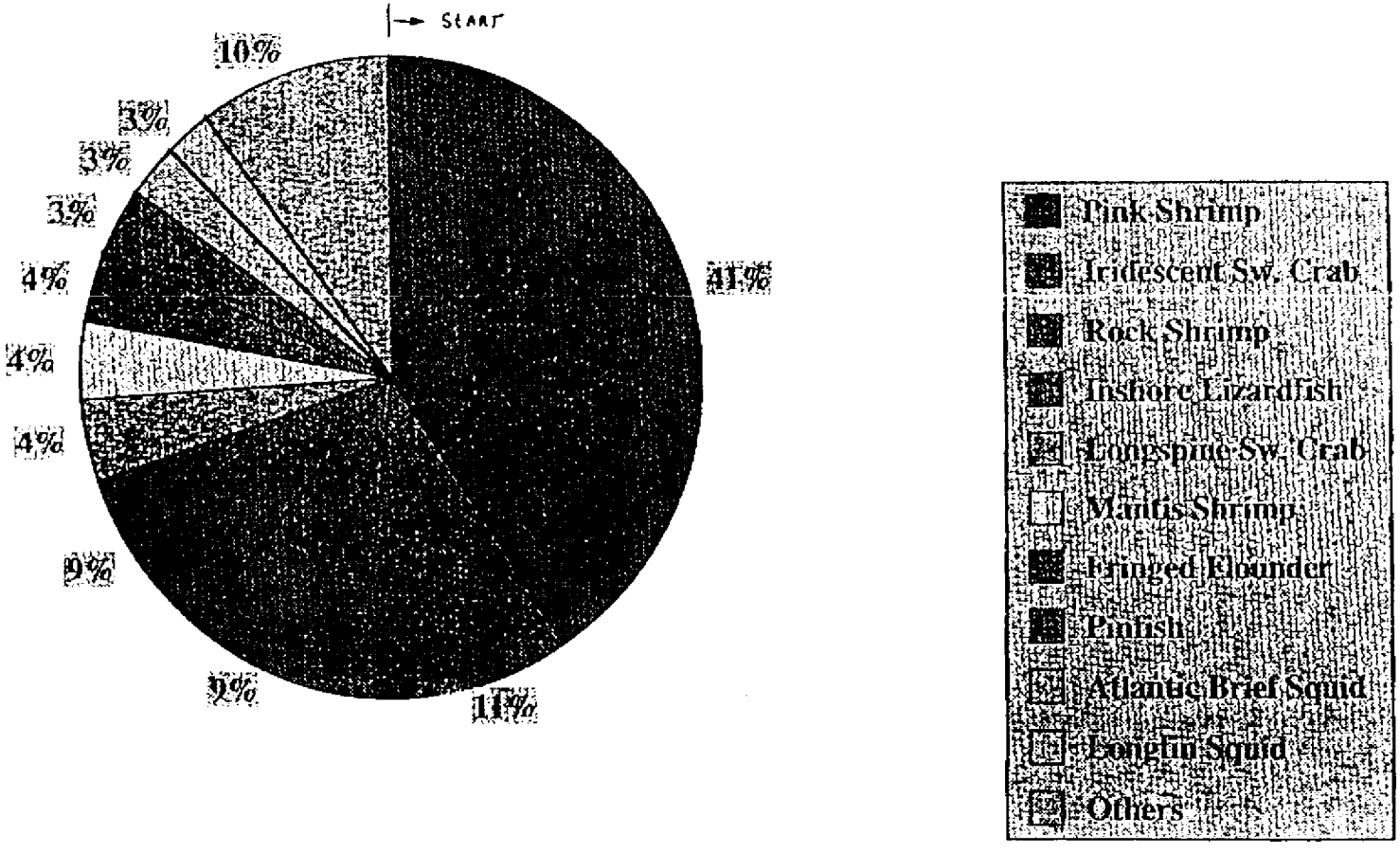


**FIGURE 4: PROMINANT BYCATCH SPECIES FOR FLORIDA, BY WEIGHT**

Source: National Marine Fisheries Service, Galveston Laboratory.

# TABLE 5: TOP 20 SPECIES FOR FLORIDA BYCATCH, RANKED BY WEIGHT (AND AVERAGE LENGTH AND NUMBER

**BYCATCH CHARACTERIZATION**

Top 20 fish species by weight and by number for statistical areas 1-9 for all seasons. Ranked in desecending order.

Ranked by Weight

| GENSP Code | Common Name | Avg Lng(mm) |
|---|---|---|
| DIPLECTFORMOS | Sand Perch | 131 |
| SYACIUMGUNTER | Shoal Flounder | 132 |
| SYNODUSFOETEN | Inshore Lizardfish | 178 |
| PRIONOTSCITUL | Leopard Searobin | 119 |
| ALUTERUSCHOEP | Orange Filefish | 375 |
| RAJA EGLANT | Clearnose Skate | 256 |
| LACTOPHQUADRI | Scrawled Cowfish | 194 |
| ETROPUS | Flounder | 87 |
| LAGODONRHOMBO | Sea Bream | 102 |
| ETROPUSCROSSO | Fringed Flounder | 98 |
| SCORPAECALCAR | Smoothcheck Scorpionfish | 102 |
| HAEMULOAUROLI | Tomtate | 112 |
| OGCOCEPRADIAT | Polka Dot Batfish | 295 |
| EUCINOS | Mojarra | 127 |
| CITHARIMACROP | Spotted Whiff | 127 |
| SCORPAE | Scorpionfish | 97 |
| SPHOEROSPENGL | Bandtail Puffer | 120 |
| SYACIUM | Flounder | 128 |
| STENOTOCAPRIN | Longspine Porgy | 69 |
| PARALICALBIGU | Gulf Flounder | 244 |

Ranked by Number

| GENSP Code | Common Name |
|---|---|
| ETROPUSCROSSO | Fringed Flounder |
| ETROPUS | Flounder |
| SYACIUMGUNTER | Shoal Flounder |
| PRIONOTSCITUL | Leopard Searobin |
| DIPLECTFORMOS | Sand Perch |
| STENOTOCAPRIN | Longspine Porgy |
| SCORPAE | Scorpionfish |
| SCORPAECALCAR | Smooth Check Scorpionfish |
| CITHARIMACROP | Spotted Whiff |
| SYNODUSFOETEN | Inshore Lizardfish |
| HAEMULOAUROLI | Tomtate |
| SYNODUSPOEYI | Offshore Lizardfish |
| SYACIUM | Flounder |
| LAGODONRHOMBO | Sea Bream |
| EUCINOS | Mojarra |
| SPHOEROSPENGL | Bandtail Puffer |
| BOTHUS | Spottail Flounder |
| EUCINOSARGENT | Stripped Mojarra |
| CENTROPOCYURU | Bank Sea Bass |
| DECAPTEPUNCTA | Round Scad |

Source: National Marine Fisheries Service, Galveston Laboratory.