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## Seafood Product Quality Code



Southeastern Fisheries Association, Inc. (SFA) is dedicated to educating U.S. seafood consumers, harvesters, wholesalers, processors, distributors and retailers concerning high quality, nutritious and safe fishery products. These "SFA Seafood Standards" have been recognized around the world by seafood companies and by numerous state and federal fishery regulators. We hope you learn from the collective work of a great number of SFA members and friends.

Bob Jones  
Executive Director

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## **Southeastern Fisheries Association Seafood Product Quality Code**

The Southeastern Fisheries Association Seafood Product Quality Code (SPC) is an educational and promotional concept, which originated in 1984. The intent was to catalog the industry's recommended measures for product quality, which can be used to better inform buyers thus building confidence in domestic seafood production. This Code encourages more industry quality compliance through facilitating communications between buyer and seller.

Every pertinent State and Federal seafood program and complimentary trade association has had an opportunity to participate in some phase of developing the SPC Code. Participation came through preliminary group meetings, invited testimony during formal SFA Product Quality Committee meetings, surveys, unsolicited letters of opinion, and regional workshops. Existing NMFS, FDA and State regulations and guidelines have been referenced on all pertinent issues. The proposed Code is intended to increase quality and safety awareness for seafood.

The SFA Product Quality Committee developed the Code in accordance with the voting regime and guidelines in the by-laws. Prior group meetings were organized by the Committee Coordinator to gather input per species and/or product(s) forms. Group participation included SFA members, invited industry members from other trade associations or regions, and invited government support groups, both academic and regulatory. Their cumulative input was condensed into one Code entry per species and presented to the standing product Quality Committee for final action. All approved entries are compiled in this SPC Code.

Quality, by Code definition, includes any product attribute (sensory, microbial, chemical, packaging, labeling, forms, size, etc.) which can influence the buyer's judgement for accepting or utilizing a southeastern seafood item. Such attributes must be based on actual experience and/or documented re- search and/or regulations. The Code is not intended to be more lenient or in conflict with any existing regulations. Use of this Code is entirely voluntary and in the sole discretion of individual buyers and sellers involved in particular transactions. Southeastern, by Code definition, will include any domestic species or seafood products, which are produced and/or landed, processed, or sold in and about the coastal waters of Texas, Louisiana, Alabama, Mississippi, Florida, Georgia, South Carolina and North Carolina.

This seafood Quality Code can be valuable to all users of seafood products. With the implementation of mandatory federal regulations (Hazard Analysis Critical Control Point CFR 121), seafood safety became more important at every step of harvesting, processing and distribution. Southeastern Fisheries Association believes any person who insists on their products meeting standards set forth in this code, provides a very safe, high quality product to their customer.

## Raw (Headless) Shrimp

### PRODUCT DESCRIPTION:

This "Quality Code" can be applied to the vast array of shrimp species marketed in a raw, headless form. Although, this description is primarily based on the dominant Penaeid species produced in the southeast, it outlines quality attributes common to most shrimp. Differences in species color, size, taste and texture should be discussed with individual firms. These differences are usually subtle, especially when cooked, and firms rarely mix species per saleable unit.

### PRODUCTION:

Shrimp are fished with trawls, which are open mesh nets towed near the bottom in waters out to 30 fathoms. Considering the habitat and habits of shrimp, trawling is most effective, but some estimates have indicated one gallon of diesel fuel is required to harvest one pound of shrimp. Shrimp is the most valuable fishery in the United States.

Domestic production from Texas through North Carolina is year round. Prices can be influenced by imported

product and regional availability. For example, the largest production of U.S. white shrimp (*Penaeus setiferus*) occurs in summer and fall along the Louisiana coast. The pink shrimp (*P. duorarum*) is primarily a south-west Florida fishery most active in winter. The largest Penaeid fishery, brown shrimp (*P. aztecus*) is most productive along the Florida panhandle through Texas during summer and fall. This general seasonal pattern does not preclude availability throughout the southeast, North Carolina to Texas.

### PRODUCT TYPES:

Penaeid shrimp are sold fresh or frozen, but a larger portion of shrimp is sold frozen. Proper freezing and careful thawing and refreezing does not compromise shrimp quality. The edible, shrimp muscle tissues retain their texture, color and flavor such that properly frozen and thawed shrimp can be indistinguishable from fresh shrimp. Poor quality usually denotes poor quality prior to freezing, improper freezing and/or damage due to improper thawing or excessive trawling time per tow.



## PRODUCT FORMS:

This SFA Code primarily focuses on the quality attributes for **raw, headless shrimp**, or tails with the shell intact. Other forms such as peeled also known as (shell removed), deveined, split, and pieces can result from further processing.

## YIELDS:

	*Average Percent Yield from Heads-on Weight
Whole, heads-on shrimp	100%
Headless	62-64%
Headless and peeled	49%
Headless, peeled and deveined	48%

■ Table 1 - Shrimp Yields<sup>1</sup>

## SIZE GRADES:

Shrimp are customarily sold by the count or number of individual headless, shell-on shrimp per pound. Buyers should not order shrimp by descriptive names, i.e., jumbo, large, medium. Ordering by counts is more precise and understandable. Any count or size mix can be ordered, but common commercial counts begin in units of five counts. The listed counts are most common for the packinghouse or dockside. Processor counts can also include 36-42's, 43-50's, 51-60's, etc.

### Common Commercial Counts (number of headless, shell-on shrimp/pound)\*

Under 10	31-35	56-60
10-15	36-40	61-70
16-20	*41-45	71-80
21-25	46-50	81-100
26-30	*51-55	Over 100

■ Table 2 - Shrimp - Common Commercial Counts<sup>2</sup>

**Note:** peeling and/or deveining would alter these counts. Specified size grades for peeled and deveined forms (p & d) should list the actual counts as in the p & d form or reference the "made from" counts of the initial headless, shell-on forms.

## QUALITY ATTRIBUTES:

Shrimp should be processed in accordance with the existing "Good Manufacturing Practices," GMP's specified by the U.S. Food and Drug Administration (reference 2). Additional quality attributes are recommended by the National Marine Fisheries Service (reference 3) and the International Codex Alimentarius Commission (reference 4). SFA's Code is equivalent, and in some instances more stringent than these regulations and recommendations.

**Color** variation per species will depend on shrimp shell color as influenced by age (size), harvest season and location, diet, etc. White shrimp come in varying shades of grayish-white and aqua with tints of green, blue and red. Brown shrimp can be reddish to gray-brown with occasional blue-purple hues. Pink shrimp vary from light to rose pink and can darken to resemble light brown shrimp. Red to rose colored shells are typical for royal-red shrimp and other deepwater and cold water species. Despite this variation in shell color, the basic entire meat color is white.

<sup>1</sup> Source (Reference 1); \*Average for all species

<sup>2</sup> \*Commercial grades for 41-50's and 51-60's are also common

**Discolorations** may indicate improper handling and poor quality. Excessive yellowing or orange-reddish tints can result from thermal abuse and exposure. Prolonged handling may impart a bleached appearance. **Blackspot** is the most common discoloration. This reaction is called **melanosis** appearing as blackened strips between the shell segments. This reaction is not caused by bacterial growth, it does not pose any health hazard, and it may not denote spoilage.

**Blackspot (melanosis)** is primarily an aesthetic concern resulting from natural chemical reactions uniquely related to the shell and molting cycle for shrimp and other crustaceans. It begins to occur first on the shell, and if allowed to progress will taint the surface of the meat. Blackspot can be controlled, thus an excessive amount should not be present. The SFA Code recommends a **top quality package of shrimp should not exceed 5% obvious blackspot** measured by weight of the individual discolored shrimp per pack. Blackspot can exceed this top quality designation and still represent an acceptable product relative to the intended use, but if blackspot has progressed such that it also discolors the underlying shrimp meat, this is considered excessive and probably unacceptable.

**Flavor and Odor** are best described as mild, pleasant shrimp. Spoiled shrimp begin to emit an ammonia smell. An iodine odor or flavor is common for shrimp and will vary per species and harvest location and season. The iodine does not denote spoilage.

**Uniformity** is a measure of the variation in individual shrimp size within a specified size grade or count. Uniformity is best measured with a comparison of the largest and smallest (individual) shrimp in a package.

$$\text{Uniformity ratio (UR)} = \frac{\text{Weight of 10\% of the largest}}{\text{Weight of 10\% of the smallest}}$$

The SFA Code recommends that a **(UR) typically runs about 1.50**. Higher ratios can still represent an acceptable pack. The UR ratio tends to be larger for higher count (smaller) shrimp. If uniformity is not a major concern, the order can specify "boat-run." Boat-run shrimp can have a determined mixed count, but they are not graded (variable sizes and variable uniformity). Boat-run shrimp are more common in local situations at the packinghouse or dockside when buying fresh shrimp. Refer to the appendix for UR examples.

**Damaged and broken shrimp** should not constitute more than **5% by weight** in a package. Obvious damage means a shrimp that is crushed or mutilated. Minor nicks or cuts should not be considered as obvious damage, but a whole, unbroken shrimp should have 5 distinct segments (4 segments if smaller shrimp, greater than 70 count).

**Extraneous material**, including shrimp heads, loose shell, attached legs (due to improper removal of heads) and other non-harmful debris should not exceed **one instance per pound of shrimp**. There is no allowance for harmful debris, i.e. staple, wood chip, etc.

**Dehydration** results when shrimp loses excessive water obvious as a chalky appearance on the surface and edge of the shrimp meat. This condition can result due to improper packaging and poor glazing, and/or excessive exposure to frequent freeze-thaw or temperature fluctuations while in frozen storage. Glazing (ice coating) is necessary to protect frozen shrimp from dehydration.

## **PACKAGING:**

Shrimp can be packaged in any size unit depending on customer preference, but the buyer should be mindful that the volume and configuration should be suitable for proper thawing. The 5-pound

box packed ten boxes to the master carton (10/5's) is the most common package. The 5-pound box should not be confused with the smaller 2 kilogram box (approx. 4.4 pounds). Smaller, 2 and 3 pound units are available.

## **LABELING:**

Every packaged unit of shrimp should be properly labeled. The intent is to assure each unit can be traced to the original distributor or processor. The labeling format and placement is determined by Federal regulations specified by the U.S. FDA (reference 5). The SFA Code recommends each label should designate:

**Name and address** of the manufacturer, processor or distributor.

**Common name** of the product, i.e., brown, pink, white, royal-red, etc. shrimp,

**Size grade** specified by count.

**Net Weight** (pounds) of the total shrimp contents excluding the weight for glaze and packaging materials. **Note:** net weight determinations should reference a standard deglazing procedure (appendix) which does not allow complete thaw of the product.

**Ingredients**, when used, listed in descending order according to the amount (weight) present.

**"Caught in the United States"** if the shrimp is produced in domestic waters.

**SPECIAL NOTE:** other forms available on request

**Peeled, undeveined (pud)** are headless shrimp with the shell removed

**Peeled and deveined (p & d)** are headless shrimp with the shell and "vein" removed. The "vein" refers to the visible intestinal tract. The tail fin can remain attached.

**Split (butterfly)** shrimp are peeled, deveined and cut apart laterally except for a remaining attachment above the tail- fin. The final shell segment and tail fin may or may not be attached.

**Pieces** may result during handling and processing. Although this form is only a portion of the original shrimp, it represents a wholesome, nutritious selection. Pieces can be ordered by sizes.

## **REFERENCES:**

1. National Marine Fisheries Service Fishery Statistics of the United States (Annual). U.S. Department of Commerce, NOAA, Washington, DC.
2. Code of Federal Regulations. Title 21. Part 10 - Good Manufacturing, Processing, Packaging, or Holding Human Food. (Revised 6/19/86).
3. Code of Federal Regulations. Title 50. Part 265, Subpart A - United States General Standards for Grades of Shrimp.
4. Codex Alimentarius Commission. 1976. Recommended International Standard for Quick-Frozen Shrimps or Prawn. FAO/WHO Food Standards Programs, Rome Italy.
5. Code of Federal Regulations. Title 21. Part 101 - Food Labeling.

## Rock Shrimp

### PRODUCT DESCRIPTION:

Rock shrimp (*Sicyonia brevirostris*) derive their common name from their distinct tough, rigid shell. They are a type of shrimp with a flavor and texture between that of lobster and southern (Penaeid) shrimp. The raw meat color is somewhat transparent and the shell color can vary from a pinkish-cream to grayish-brown shade depending on the harvest location.

### PRODUCTION:

Rock shrimp are harvested at night with customary trawls fished in depths (20-30 fms) along the coasts of the South Atlantic and Gulf of Mexico. This fishery occurs through all seasons.

### PRODUCT FORMS:

Fresh or frozen, whole or headless, shell-on or peeled, and round or split and deveined.

### YIELDS:

Whole to headless  
 --- Approx. 55%  
 Whole to headless and deveined  
 --- 50%

### SIZE:

Customary counts (number individual shrimp per pound) vary depending on product form and do not include shrimp pieces. Uniformity within size categories should be discussed with the supplier. Note! "Boat run" shrimp denotes a mix of variable sizes.



Whole Shrimp	Headless	Peeled & Deveined
-----counts/pound-----		
16-20	16-20	
21-25	21-25	
26-30	26-30	

31-35	31-35	50-60
36-42	36-42	60-70
43-50	43-50	70-90
50-60	50-60	90-110
60-70	60-70	110-130
70+	70+	130+

■ Table 3 - Rock Shrimp Sizes

## QUALITY ATTRIBUTES:

**Color** for raw, fresh and frozen (thawed) **meat** should appear somewhat transparent to slightly opaque. **Shell** color can vary from a pinkish-cream to grayish-dark brown shade with some slight purple hues. Occasionally a little greening can appear along the back or crown of the shell. The back greening is normal.

**Odor** for good rock shrimp should have a mild, pleasant raw shrimp odor. Detection of ammonia-like odors, especially between shell and meat denotes poor quality and probable spoilage.

**Texture** for raw rock shrimp should be firm and flex to the touch. Soft, mushy shrimp with no tone denotes poor quality.

**Glazing** (ice coating) is necessary to protect frozen product. A flooded or completely submerged glazing procedure (frozen block) is recommended over a light spray glazed product. No more than 5% of the packaged product should be without glaze or be obviously dehydrated (dry to chalky external appearance).

**Extraneous materials:** Packages of rock shrimp should not contain excessive amounts (more than 5% by weight) of shrimp pieces, or damaged shrimp. Pieces are broken tail portions with less than 4 segments. Damage means crushed, cut or torn shrimp. Improperly headed shrimp may contain tail segments with portions of the head, and/or legs still attached. Improperly peeled and deveined shrimp may contain tail segments with pieces of shell and vein still attached. The package should not contain excessive amounts (more than 1% by weight) of leg fragments, loose shell, antennae, heads, or other foreign debris. A chalky dense white meat color is characteristic of an 11 "cotten" shrimp which results from a muscle disorder unique to the shrimp. This condition is not harmful to consumers, but can be objectionable. The "cotten" condition is not common and should not exceed 1% (by weight) in the package. If "cotten" shrimp are sold as an acceptable product then it should be labeled as such.

## PACKAGING AND LABELING:

Common units are 5-pound boxes although variable units are available and can be arranged. SFA Code recommends packaged units should contain the following information on the label:

**Name of Product** (form optional)

**Net Weight** - total weight (lbs.) of shrimp, excluding any water added as protective glaze and excluding weight of the carton or package. Net weights should only include total weight of shrimp in package. Net weight determinations for frozen shrimp can be influenced by the thaw procedure (thaw time and temperature, and drain time) per different size shrimp. Prior discussion with suppliers should establish procedures and tolerance.

**Ingredients** - if used or added during processing, then listed in descending order of amount present by weight.

**Manufacturer, Processors, or Distributors Name and Address**

**Country of Origin (Harvest)** when possible

**REFERENCES: (not cited)**

1. Recommended International Standard for Quick Frozen Shrimps and Prawns. 1976. Codex Alimentarius Commission CAC/RS 92-1976, 15 p.
2. United States General Standards for Grades of Shrimp. 1982. Code of Federal Regulation, Title 50. Wildlife and Fisheries, U. S. Standards for Grades of Fishery Products, Subpart A, 265. 1 00 through 265.106 (U. S. Dept. of Commerce).

## Breaded Shrimp

### PRODUCT DESCRIPTION:

Breaded shrimp include a variety of shrimp, which are headless and peeled (shell-removed) then coated with a mixture of batter and breading. The finished product is typically raw and frozen, although cooked forms are available. The most common shrimp used are the tropical varieties of Penaeid shrimp, which include white, pink and brown shrimp. Likewise, rock shrimp and certain other shrimp species are available in breaded form.

### NUTRITION:

The basic nutritional composition in raw Penaeid shrimp assures a high content of easily digestible protein with a full complement of amino acids, low fat content and a full assortment of minerals and vitamins common in most meats. The addition of breading will increase the carbohydrate content, thus slightly increasing the total calories per serving. When cooked (frying), the breading helps retain nutrients while the cooking oil will be absorbed. Thus frying adds flavor and more

calories in proportion to the amount of oil absorbed. The quality of the oil can influence taste and nutritional composition of breaded shrimp.



### PRODUCT TYPES:

Breaded shrimp are available in three basic types:

**Round** (or whole) is breaded shrimp with only the surface shell removed or peeled. The intestinal tract is usually removed from all raw, headless shrimp larger than a 70 count individual shrimp per pound.

**Butterfly** (or fantail) are breaded shrimp in which the original round body has been cut into two sections which remain attached on the ventral side, thus appearing as a "butterfly" form when layed open.

**Split** (western or cowboy) are breaded shrimp in which the original round body-has been cut into two separate halves only attached at the tail fin.

## PRODUCT FORMS:

Each of these breaded shrimp types can be prepared in various forms:

**Tail-on or off** is self-explanatory. The traditional tail-on form provides an attractive, convenient feature, while the tail-off form is more common for smaller shrimp.

**Clean or Breaded Tail** refers to the option of breading the tail-on forms. The fully clean tail is commonly associated with hand breading operations while the pinch tail (tail is pinched to remove breading) is usually machine breaded.

**Hand breaded and machine breaded** shrimp refers to breading processes used for different products. Hand breading is commonly associated with a premium grade product requiring extra care, while machine breading includes more mechanical application to assure a uniform and consistent coating.

Special breaded forms include:

**Mini-or basket shrimp** usually consist of small round, undeveined shrimp (40-50 breaded shrimp/pound). Basket shrimp or mini-rounds can include tail-on.

**Pieces** are breaded shrimp pieces, which result during handling and processing. Although this form is only a portion of the original shrimp, it is processed such that it still represents a wholesome, nutritious selection.

**Fabricated or Engineered** forms can include breaded items made from shrimp which have been laminated, molded or extruded from a mixture of minced shrimp and other ingredients. The fabricated items may contain all shrimp or portions of shrimp mixed with specially prepared minced fish (i.e. surimi) which can impart favorable texture.

## BREADING:

Shrimp "breading" refers to two components - the batter and/or breading. The *batter* is the inner wet adhesive phase followed by the dry breading application. Conventional batters are primarily used to hold the breading on the product. Tempura or puff batters are used as a single coating with no breading. The breadings can be classified by composition (special dough formulations) and granulation - fine, medium and coarse. For example, Oriental-style breading is made from wheat flour by a special process, which provides elongated particles for a crispy, crunchy texture. The batter and breading can be customized for color and numerous flavors. Some pre-toasted breadings are suitable for oven reconstitution or microwaves.

Percent Breading on raw breaded shrimp is specifically defined by Federal "Standards of Identity" (Reference 1):

	Minimum % Shrimp Material*
Breaded Shrimp	50%
Lightly Breaded Shrimp	65%

■ Table 4 - Breaded Shrimp - Percent Breading

\* Percent means on a per weight basis, where amounts are determined by a specific regulatory procedure (Reference 1). By FDA guidelines an average determination of 45% or 60% respectively, for a number of sub-samples could constitute misbranding (Reference 2). **Note:** Fabricated Shrimp is not covered by this standard. Breaded shrimp, which is prepared outside the

Federal "Standards of Identity" (less than 50% shrimp material), are considered "Imitation" and should be labeled such. "Imitation shrimp" represent a good, wholesome selection, but they may be formulated with more breading or fabricated shrimp (Reference 2). Likewise, breaded shrimp made from comminuted shrimp (minced) must be labeled such (Reference 3).

## SIZE:

Breaded shrimp can be sized according to the following counts (number of individual shrimp per pound):

Individual Breaded Shrimp/Pound	
<u>Common Institutional Sizes</u>	<u>Common Retail Sizes*</u>
8-10	40-50
10-12	50-60
12-15	60-70
16-20	* also called
21-25	mini or
26-30	"basket" sizes

■ Table 5 - Individual Breaded Shrimp/Pound

## QUALITY ATTRIBUTES:

The U.S. Department of Commerce's (USDC) Volunteer Inspection Program administered through the National Marine Fisheries Service (NMFS) recommends guidelines for the breaded shrimp industry. This program has followed specific U.S. Standards for Grades of Frozen Raw Breaded Shrimp (Reference 4). The intent is to produce U.S. Grade "A" shrimp according to the following guidelines. Also, all breaded shrimp must be processed in compliance with "Good Manufacturing Practices" (Reference 1) enforced by the U.S. Food and Drug Administration. Quality attributes include:

**Ease of separation** is judged by how easily the individual breaded items can be separated. A four-minute exposure to room temperature should allow sufficient time for separation of the unpackaged items.

**Uniformity** implies the weight of each breaded unit should be very similar. Specific ratios are cited for regulatory guidance.

**Condition of coating** should be uniform and consistent with minimal to no balling up, halo, or holidays. Halo means accumulation of breading about the edges of shrimp, balling up refers to lumping on the surface, and holidays are bare or naked spots.

**Damaged breaded shrimp** includes broken and crushed shrimp, which should not constitute more than 5% (by count) of the total packaged unit.

**Extraneous material** such as shrimp parts, shell fragments, or other debris should be absent.

**Color** will depend on the type of breading, but it should be free from any discoloration due to mold or "greening." Greening is a rare problem caused by contaminants in the breading and/or thermal abuse.

**Odor** is difficult to judge without appropriate experience. In general, the breaded shrimp should be free of any obvious off-odors or staleness.

## PACKAGING AND LABELING.

Common institutional packs for breaded shrimp are 2-1/2, 3, and 4-pound net weight units. Retail packs are commonly sold as 8, 10, and 16-ounce units. **Note:** net weight only refers to the total edible contents in the pack excluding any glaze, packaging material or extraneous items.

The SFA Code recommends each label should designate:

**Name and Address** of the manufacturer, processor or distributor.

**Name of the Product** (i.e., breaded, lightly breaded, imitation, etc.).

**Net Weight** for the edible contents.

**Ingredients** listed in order of prominence.

Only products manufactured and/or processed in the U.S. can be labeled as "Products of the United States."

**SPECIAL NOTES:** Frozen raw breaded shrimp must be stored below 0°F and preferable at -10°F or below. Freezers which allow partial thawing or periodic thawing and refreeze during frequent defrost cycles can compromise product quality.

## REFERENCES:

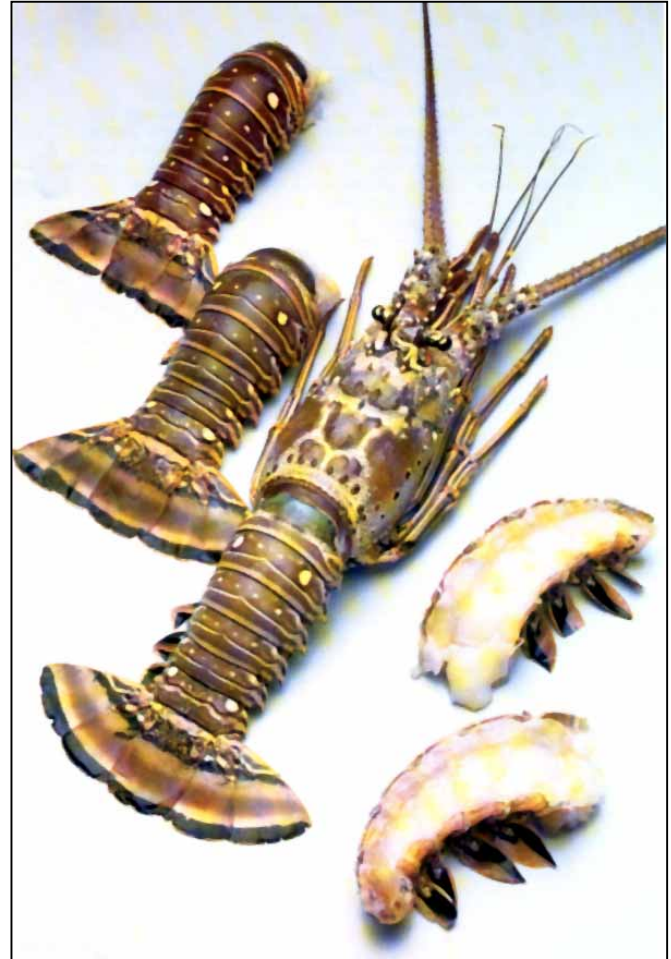
The breaded shrimp industry is one of the more regulated segments of the seafood processing industry.

1. Code of Federal Regulation. Title 21.
  - a) Part 123 - Frozen Raw Breaded Shrimp Note, Title 21, Part 123 was recently (11/18/86) revoked by FDA in lieu the revised (6/19/86) Current Good Manufacturing Practices, Title 21, Part 110.
  - b) Part 161.175 - Frozen Raw Breaded Shrimp (Standard of Identity)
2. Food and Drug Administration Compliance Policy Guides
  - a) Guide 7108.12 (10/1/80) Shrimp - Frozen, Raw Breaded or Lightly Breaded, Misbranding involving Non-compliance with Standard.
  - b) Guide 7108.14 (10/1/80) Imitation Breaded Shrimp.
3. Code Federal Regulation, Title 21, Subpart 102.55 - Non-standardized breaded shrimp units.
4. Code Federal Regulations, Title 50, Part 265, Subpart B - United States Standards for Grades of Frozen Raw Breaded Shrimp.

## Spiny Lobster

### PRODUCT DESCRIPTION:

This code describes the spiny lobster, *Panulirus argus* and lesser known, incidental *Panulirus* species caught in similar regions. These species usually take on the name of their respective harvest location or market origin, thus the common term "Florida spiny lobsters." Also referencing harvest location, the spiny lobsters are known as warm water lobsters in contrast to the cold water rock lobsters, taken from South Africa, Australia, etc. The product forms and quality attributes for spiny and rock lobsters are somewhat similar and distinct from the common American (clawed) or Maine Lobster, (*Homarus americanus*). Spiny lobsters should not be called crayfish or crayfish.



### PRODUCTION:

Spiny lobsters are primarily harvested from U.S. waters (south Florida) with special traps fished on the bottom in depths ranging from 6 to 300 feet or more. Traps are tended daily and the catch is usually landed alive. The legal

harvest season in south Florida waters is from July through March, with maximum production during August through November. Complemented with harvest from foreign waters, spiny lobsters are available year round. Although legal restrictions do not allow harvest of spiny lobsters in Florida during the closed season (April-June), Florida spiny lobsters can be sold from existing inventory caught during the open season.

### PRODUCT TYPES:

#### *Appearance*

Spiny Lobsters have a colorful, smooth shell surface with distinct white spots on a background of dark-reddish brown, tan, and light green shell color, which can vary depending on bottom habitat. The shell coloration is not obvious after cooking. The cooked shell color is red-orange.

Spiny and rock lobsters do not have edible claws, but the meat yield from spiny lobster tails is larger than from clawed or American lobster tails.

## PRODUCT FORMS:

**Whole - raw** ("green"); Available fresh, but usually frozen. Shipping live spiny lobsters is impractical for distant markets.

**Whole - cooked;** Available fresh, but usually frozen. Includes the Carapace (head) and attached tail (body).

**Tails - raw** ("green"); frozen and usually deveined shell-on. The term "green" is not a color description, it implies the tail is raw or uncooked. Deveining involves removing the intestinal tract with a special procedure, which leaves the meat and shell intact.

**Split tails** - deveined tails cut longitudinally in half can be ordered by special requests; raw or cooked, fresh or frozen.

**Meat** - raw or cooked fresh and frozen. Taken from the body and or carapace (head) often used in soups, newbergs, etc.

## SIZE (Grades):

Spiny lobsters are graded by tail weight. By Florida law, the minimum tail length is 5-1/2 inches, not including any protruding meat. Thus in terms of weight, tail size can vary from 5 ounces and larger. Tail size can be graded to customer specifications, but 1-ounce increments are common and 2-ounce increments are used for the larger size tails (example-Table 6).

Avg. Size Tail Weight (oz.)	Size Range (oz.)	Average Count Per 10# Box	Count Range Per 10# Box
5	4.5-5.5	32	29-36
6	5.5-6.5	27	25-29
7	6.5-7.5	23	21-25
8	7.5-8.5	20	19-21
9	8.5-9.5	18	17-19
10	9.5-10.5	16	15-17
11	10.5-11.5	14	14-15
12	11.5-12.5	13	13-14
13	12.5-13.5	12	12-13
14-16	13.5-16.0	11	10-12
16-18	16.0-18.0	9-10	9-10
18-20	18.0-20.0	8-9	8-9
20-24	20.0-24.0	7-8	7-8
24-over	24.0-over	6	5-7

■ Table 6 - Typical Spiny Lobster Tail Chart

## QUALITY ATTRIBUTES:

**Color** of the shell should be clean and blemish free. The raw meat is somewhat translucent with a pink, cream or whitish-gray tint depending on the lobster diet. The cooked shell color is red-orange and the cooked meat is more opaque and white.

**Discoloration** or blackening on the abdomen about the anus or along the edge of the shell, particularly where cut from the carapace is called "black-spot." This condition is not harmful, but excessive "blackening" is a poor quality attribute.

**Damaged** shell on the tails (cuts, cracks or scars penetrating the shell or crushed shell) should not exceed 5% by count in a 10 pound or larger pack- aged unit of lobsters. The shell should be hard. This quality attribute does not apply to the fragile tail fin. Clipping or trimming of the tail fin is not considered a damage defect. Also, on whole lobsters, the non-meat containing portions (antennae and legs) may be slightly scarred, trimmed or broken, but the Carapace and tail should be firmly attached.

**Tailing** should be done in a manner to provide a clean "break". The exposed tail meat surface should be protruding and clean. The tail should be full of meat. "Light" or partial filled tails can result due to the lobster's natural molting process. The tail meat should be firm.

**Uniformity** is a measure of similarity in lobster size (weight) per packaged unit. Table 6 provides an expected range in tail counts per 10-pound package per a variety of tail sizes (weight/tail).

**Glazing** (ice coating) can be used to protect frozen individual lobster. When used, the glaze should be applied in a manner and amount to completely cover the entire product. **The amount of glaze can vary but should not be included as part of the product weight (net weight).** In some instances, the weight of the added glaze is included in the product net weight ("wet" tails). This unscrupulous practice is illegal (misbranding). Tails can also be placed in individual plastic bags or wraps for proper protection.

**Shelf-life** for properly thawed spiny lobsters (raw or cooked) can range about 3 to 4 days if the product is continually stored moist below 35°F (2°C). Quality lobsters, properly frozen and packaged can be held for 12 months if stored continuously below -10°F (-23°C).

## **LABELING:**

Common packaged units contain 10 pounds of total product with four 10 pound units per master packs. The SFA Product Code recommends each packaged unit should include the following information on the label.

**Product Name** - Spiny lobster, Florida spiny lobster, or similar designation for *Panulirus* species. The U.S. Food and Drug Administration does not recognize "crayfish" or "crawfish" used alone to designate lobsters (1).

**Name and Address** of the processor, packer or distributor.

**Net Weight** -The actual product (shell and meat) weight excluding the weight of any glaze or packaging materials. **Note:** net weight determinations for frozen lobster can be influenced by the deglazing method for different size lobsters. Prior reference to established procedures is recommended (appendix).

**Size** for individual tails.

## **REFERENCES:**

1. U.S. Food and Drug Administration. Compliance Policy Guide No. 7108.23 Chap. 8. Fish & Seafood, Subject Common and Usual Names for Crustaceans (10/1/80).

## **ADDITIONAL REFERENCES: (not cited)**

Codex Alimentarius Commission. 1978. Recommended International Standard for Quick Frozen Lobsters. FAO/WHO Food Standards Programs, Rome, Italy.

Codex Alimentarius Commission. 1983. Recommended International Code of Practice for Lobsters. FAO/WHO Food Standards Programs Rome, Italy.

Williams, A.S. 1986. Lobster - Identification, World Distribution, and U.S Trade. *Marine Fish Review* 48(2) 1-36.

## Blue Crab

### PRODUCT DESCRIPTION:

This Code only pertains to crab meat removed from blue crabs. The most common species is *Callinectes sapidus*. Other lesser species of *Callinectes* sp. are only caught as rare incidentals in domestic harvests and in some foreign harvests, and they are also considered blue crabs. Blue crab production is primarily a domestic fishery.

### PRODUCTION:

Most crabs are harvested alive with bottom traps (crab pots) fished in estuarine and shallow coastal waters. They are caught throughout the southeast region during May through October. Thus most fresh product is available during this period, but pasteurized, canned and frozen product is available year round.

### PRODUCT TYPES:

**Fresh** Crabmeat (Cooked)

**Pasteurized** Crabmeat (Cooked, and heat treated for extended refrigerated shelflife)

**Frozen** Crabmeat (Pre-cooked)

Items not included in this "Code" but listed for comparison:

Canned Crabmeat (retorted for "sterile" preservation at room temperature)

Fabricated/Engineered Crabmeat (can be formulated from crabmeat and/or other ingredients)

### PRODUCT FORMS AND TERMINOLOGY (Picked Meat and Claws):

Meat can be recovered from cooked crabs by **handpicking and/or machine picking**. Meat from either picking method can be equal in quality. The more traditional handpicked meat is often considered the premium grade because the yield can contain larger pieces or chunks of meat. Salt brines are sometimes used with mechanical separation of shell and meat.

Traditional terminology identified the forms of crabmeat as taken from different sections of the crab body, i.e., **backfin** (the larger muscle segment adjacent to the backfin appendage), general **bodymeat**, and **clawmeat**. These terms are still common, but blue crab meat is packed and priced



according to the size and integrity of meat pieces or chunks. The meat size and integrity can vary by crab size relative to location, season, etc., thus a variety of terms have evolved. (See "Uniformity" for explanation of size.)

**Jumbo** - largest, white pieces or chunks of crabmeat typically from the backfin.

**Lump or Backfin** - large, white pieces or chunks of crabmeat, which can include backfin.

**Special, Flake, Regular, or Deluxe** - smaller, white pieces or chunks of crabmeat, which usually exclude backfin.

**Claw** - only includes meat from the crab claw. This meat has a darker, brownish tint than the other forms of meat taken from the crab body.

**Minced** - crabmeat removed and or separated from the shell by a physical process that actually minces the meat.

**Mixed** - Any combination of meat as requested.

**Cocktail Claws** - clawmeat intact on the claw with the shell removed except for the forward tip to be used as a handle.

## QUALITY ATTRIBUTES:

**Fresh crabmeat** should have a glistening white to off-whitish or creamy color, with a firm, but fragile texture, mild crab aroma and delicate flavor. The clawmeat has a darker color, brownish in tint, and has a more distinct nut-like flavor.

**Pasteurized crabmeat** should have a firmer texture and a slight, non-objectionable heated aroma. The meat color may be slightly darker than fresh. A very light bluish tint is not unusual.

**Uniformity and size** of pieces or chunks of meat within a pack is an important, but difficult quality attribute to measure. Due to the fragile nature of the crabmeat, there is no physical method to accurately determine meat size. A simple, subjective measure is to compare the cross-sectional area of meat pieces and chunks to coins. **Jumbo** and **lump** crabmeat range in cross-section from the size of a quarter to a nickel. For example, a larger size grade of "lump" would have a larger portion of pieces and chunks approximating the size of a quarter; whereas, a smaller grade of jumbo would have a larger portion of pieces and chunks approximating the size of a nickel. This is a rough measure, but it does provide a common reference for comparison.

**Discoloration** is not a typical quality problem. Occasionally, pasteurized crabmeat may have a distinct bluish-gray color appearing uniformly or in blotches, which may result from over-processing. This discoloration is a natural chemical reaction caused by excess heating during processing. It does not denote any health concern, but may lack aesthetic appeal. During reproductive periods, the inclusion of crab roe can impart a yellow to orange discoloration to the meat that is neither harmful nor distasteful.

**Extraneous material** in crabmeat usually refers to fragments of shell, gill or internal tissues. Shell fragments are most common and unavoidable, but they should not be excessive. Foreign debris such as sand, grit, etc. should not be included in any pack.

**Packaging** includes metal and/or plastic cans, cups, tubs or bags. Common sized units are 8, 12 and 16 ounce. Some slight water can be expected in different packs, depending on the processing (cook) method, but it is rarely excessive.

**Storage** (Recommended): Fresh or pasteurized crabmeat should be stored in ice (32°F) or below 35°F. In this condition, fresh crabmeat can be expected to have a shelf-life of 10 to 14 days from the day of packaging. Provided proper pasteurization and constant recommended refrigeration, pasteurized crabmeat can be stored for at least 6 months. Improper storage or higher and fluctuating temperature can compromise shelf-life of pasteurized meat. When

opened, pasteurized crabmeat can be expected to have a shelf-life similar or slightly less than that for fresh crabmeat.

## **PROCESSING AND REGULATION:**

Blue crab processing is one of the most extensively regulated segments of the seafood industry. Recognizing cooked crab products may not receive further cooking prior to consumption, processors must comply with specific State and Federal regulations for quality and sanitation. First they must comply with the Federal "Good Manufacturing Practices" (GMP's - Reference 1) and the various state certification programs. Further recommendations, particularly pasteurizing guidelines have been developed by the National Blue Crab Industry Association, which meets annually to update their practice.

## **LABELING:**

SFA recommends every packaged unit of blue crabmeat should be properly labeled to include:

**Common Name of Product** indicating crabmeat or blue crabmeat. According to FDA's guideline (Reference 2) relative to domestic products, the term "crabmeat" implies blue crabmeat. This term is usually accompanied with a figure depicting the blue crab.

**Product Type and Form** indicating fresh, frozen or pasteurized, and Jumbo, Lump, Special, etc. **Note:** Pasteurized products should always include, "Perishable - Keep Under Refrigeration."

**Net Contents** in ounces of edible product. **Ingredients** when used, listed in descending order according to the amount (weight) present. This usually refers to "11 salt added" when salt brines have been used with mechanical separation of the meat.

**Code Number** as required by respective States relative to the pasteurization process time and batch.

**Certification Number** as required by respective States indicating the supplier has been certified to process blue crabs.

**Name and Address** of the manufacturer, processor or distributor.

**Country of Origin** should be listed if other than U.S.A.

## **REFERENCES:**

1. Code of Federal Regulations. Title 21. Part 110. Good Manufacturing, Processing, Packaging, or Holding Human Food. (Revised 6/19/86)
2. Food and Drug Administration (10/1/80) Compliance Policy Guide No. 7108.04, Chapter 8 - Fish and Seafood Industry, Crabmeat - Product Name.

## Oysters

### PRODUCT DESCRIPTION:

Oysters harvested in southeastern waters are commonly known as the American Oyster (*Crassostrea virginica*). This oyster is a bivalve mollusk, most often found accumulated in beds in tidal waters of bays and estuaries. Usually, the oysters are named for the area from which they are harvested; i.e., Louisiana oysters, Apalachicola oysters, etc.

### PRODUCTION:

Most southeastern oysters are taken by hand or tongs. The harvest can be year around depending on location, thus oysters are available and can be eaten during all months. The most productive season is fall through winter or the "R" months. Oyster flavor, color and texture will vary per location and season.

### REGULATIONS:

Oyster production receives more regulatory scrutiny than any segment of the U.S. seafood industry. All southeastern oyster producing states comply with local rules based on the harvesting and processing regulations listed by the U.S. Food and Drug Administration's (FDA), National Shellfish Sanitation Program (NSSP; reference 1). These regulations are annually reviewed and amended by the Interstate Shellfish Sanitation Conference (ISSC). The primary concern is to assure oysters, which are commonly eaten raw, are harvested from clean waters and processed in a sanitary manner.

**Harvest** must be from waters "approved" relative to bacterial content and other contaminants. In some instances oysters may be relayed, moved from non-approved to approved waters, for a specified duration prior to final harvest.

**Processing** must be conducted by a certified dealer in compliance with all pertinent State and Federal regulations. A list of certified dealers is published monthly by the FDA (NSSP; reference 2). Processing can include packing shellstock, shucking and packing raw oysters, and/or repacking shucked oysters. Hand shucking with special oyster knives is the most common and traditional method of processing (reference 3). A few processors use a mild thermal shock with steam or hot water to assist the shucking process. The final product is a raw oyster, called oyster "meats."



## PRODUCT TYPES:

**Fresh**, live shellstock should be stored between 38° and 42°F (3-6°C). Raw shucked oysters should be stored below 35°F (1.7°C) for maximum shelflife.

**Frozen**, shucked oysters are best frozen in their own liquor (body fluids) stored below 0°F (-18°C). Frozen shellstock is rare, but can be obtained on request.

## PRODUCT FORMS:

**Shellstock** are live oysters in the shell. The shellstock can come as clusters (more than one oyster, all attached) or individual oysters called "singles." "Culled" shellstock implies picking singles, or sorting clusters by size (doublers or small and large clusters). Also, the shellstock can be "washed" (surface mud and debris rinsed off).

**Shucked** refers to oysters removed from the shell, often called oyster "meats." The shucked oysters are packaged wet.

Other specialty products, including breaded oysters are available, but not described in this code.

## SIZE and YIELDS:

**Shellstock** is sold by shell size (count) and/or weight. Thus, shellstock can be purchased by count and/or weight per bag or box. The shell size and meat yield per shell size varies greatly per location and season, thus there is no standard box or bag size, count or weight. A purchaser should state and label the requested amount; i.e., 30,40, or 50 lb. bag or box. Any size can be packed as requested.

**Shucking yield** and size of individual oyster meats also varies greatly per location and season. For example, the summer oyster is often leaner or thinner than from the winter harvest; and oysters from high salinity waters are thinner than from low salinity. This variability can only be learned through inquiry with the processors.

**Shucked** oysters are commonly packed in 8, 10 and 12 ounce (volume) plastic containers. Gallon units are packed in plastic or metal containers. In increasing order by size, the shucked oysters are graded as **standards, selects, extra selects, or ... counts.** The largest meat size, "counts" should not be confused with the common grading term - count. Again, the number or count of oysters per volume can vary by season and location. Thus the buyer should inquire or specify the number of oysters per packaged unit. For example, a low count (larger oysters) is not always preferred. A high count (smaller oysters) may suit a particular use or demand. It is also common to specify the weight of shucked oysters per packaged unit.

## QUALITY ATTRIBUTES

**Color, Odor and Texture** will vary by location and season. In general, the oyster should appear cream to beige in color, packed in a somewhat transparent liquor. The preferred flavor is a mild oyster with a slight salty taste. An excessive opaque or cooked appearance may denote too much heat used in a heat-shock assisted shucking process.

**Discoloration's** are not uncommon but are usually removed during processing. Rarely, a shade of pink, green or black can develop after packing. These seasonal discoloration's are related to the oyster's diet and composition. They are not harmful, but should be communicated to the processor.

**Damaged** meats appear cut, torn, or can have remaining shell attached. Damaged meats should be avoided especially when whole meats are required for display, but they can still represent a wholesome product for other recipes.

**Uniformity** is a measure to assure all oysters in the same pack are of similar size. This attribute should be checked allowing tolerance since oysters are still graded by eye. Remember, larger is not necessarily better. Size preference depends on intended use.

**Extraneous material** such as shell fragments, sand and other debris should be absent. Some processors use a cleansing process called "blowing" to rinse debris from the shucked oysters prior to draining and packing. The term "blowing" refers to the air bubbling process used to gently agitate the oysters.

**Water content** in a volume pack of shucked oysters should routinely be less than 15% by weight of the entire packaged contents. Slight variations in excess of 15% are possible in seasons and locations, which influence the salinity of the harvest waters. An official method has been recommended for checking the drain weight or % water content in raw packed oysters (appendix).

**Bacterial standards** for shucked meats can vary per state, but should reference the national guidelines (NSSP, reference 3).

## **LABELING:**

The SFA Product Code recommends each packaged unit of oysters should include the following information on the container and/or on the accompanying "tag." A shippers tag bearing this information should accompany every shipment of shellstock to document the shellfish are certified and that they can be traced back to the source area and the original harvest. These tags should contain a traceable serial number and the dates of harvest and sale (and/or sale invoice or bill of lading number). This information protects the buyer and consumer, thus tags should be retained for at least 90 days.

**Product Name** - oysters (common or local name optional; i.e., Louisiana or Apalachicola Bay)

**Processors Name** - Processor or distributors name, address, and *certification number*.

**Frozen** -if the product has been previously frozen. [**Note:** thawed oyster should not be repacked].

**Contents** - *volume and/or weight designation* for fresh, shucked oysters. Weight declaration for a box or bag of shellstock, i.e., 30, 40, or 50 pounds.

**Terminal Sale Date** for shucked oysters (not required by all States) which indicates the 14th day after the actual day of shucking and packaging. Frozen product should be code dated for date of packing.

**Product of the United States**

## **REFERENCES**

1. National Shellfish Sanitation Program. 1988 (Revisions). Manual of Operations Part 1. Sanitation and Shellfish Growing Areas. Part 11. Sanitation of the Harvesting and Processing of Shellfish. U.S. Dept. Health and Human Services, Food and Drug Administration, Washington, DC.
2. Interstate Certified Shellfish Shippers List (Monthly). Available: Chief, Shellfish Sanitation Branch (HFF-344), Food and Drug Admin., 200 "C" Street, SW, Washington, DC 20204; (202) 405-0149.
3. Otwell, W.S. 1982. Oyster Production: Plant Workers. Florida Sea Grant College, MAP Bulletin 21.

## Hard Clams

### PRODUCT DESCRIPTION:

Southeast hard clams are primarily marketed as live shellstock. The clams from North Carolina through Texas represent a mixture of species (*Mercenaria* spp.) including the northern quahog (*M. mercenaria*), the southern quahog (*M. campechensis*), and probably subspecies and hybrids. The market is supplied primarily by the northern quahog which is the dominant species along the Atlantic coast, but far less abundant along the Gulf coast. Visual distinction of species is difficult; thus, they are collectively marketed as hard clams.



### PRODUCTION:

Hard clams (*Mercenaria* spp.) can be harvested from brackish to high salinity coastal waters throughout the Gulf and South Atlantic region. Since 1984, the major clam area in the southeast has been the Indian River in Brevard County, Florida. The Cedar Key region has become a major clam area since the Florida Gillnet ban in 1999. The traditional "bullrake" or individual hand-raking is the most common method for harvesting in the Indian River, while surface dredging is used to remove clams from the muddier bottoms along Florida's panhandle region.

### PRODUCT FORM:

Live hard clams are customarily packaged in bags and sold by the count (number of individual clams) and weight per bag. Counts can vary from 125 to 500 or more clams per bag depending on clam size and weight. For example, a 500 count bag of littleneck clams could weigh from 45 to 60 pounds (see commercial sizes). Customized and mixed-size units can be provided on request.

### SPECIAL REGULATIONS:

Harvest, processing and distribution of hard clams is strictly regulated by State and Federal requirements based on the original guidelines in the National Shellfish Sanitation Program (Reference 1) which is continually reviewed and supplemented by recommendations from the Interstate Shellfish Sanitation Conference (ISSC). All clam production is certified and regulated in accordance with these specific regulations.

**Harvest Regulations:** Commercial hard clam harvests are restricted to "approved" waters, which comply with State and Federal regulations and guidelines (reference 1). State regulatory authorities continually monitor their waters to assure compliance within specific guidelines for bacteria types and amount, and any potential toxins, which could contaminate the shellfish. State authorities also certify clam processing facilities. This assures the buyer that shellfish are being handled and stored in a sanitary environment. Certified shellstock shippers (SS) are listed by State in monthly editions of FDA's "Interstate Certified Shellfish Shippers List" (reference 2).

**Depuration Guidelines.** Depuration is a special cleansing process used to treat live clams harvested from closed waters as allowed by a special permit. The depuration plants are designed in reference to specific regulatory guidelines (references 1 and 3). The process involves providing "bacteria-free" seawater to the clams for a period of not less than 48 hours. In order to insure effective purification, continuous and intensive quality control monitoring is conducted by a State-approved laboratory (Florida Regs., reference 4). The depuration process yields a safe, grit-free, and sand-free certified product.

### QUALITY ATTRIBUTES:

**Color** of the clamshells and meats will vary depending on bottom types, water conditions, diet, size, etc. Attempts to use color or shape to distinguish clam species or harvest location can be confusing. Exterior shell color can range from white to varying shades of gray, with occasional blue-purple to black bands along the concentric ridges (growth rings). Interior shell color is primarily white, but can be marked with attractive purplish hues. Meat color is a blend of cream and beige.

**Odor and flavor** of the clam meat will also vary by harvest location. A mild, pleasant shellfish aroma and slight sea taste are most common.

**Commercial sizes** are based on clam weight and hinge width. Use of the hinge width has evolved with mechanical sorting which uses rollers to separate individual clams based on the longest perpendicular distance from shell surface to shell surface as measured across the hinge. This distance is called the hinge width.

Consumer preference often relates to clam length or diameter (width). The relationship between clam widths, length and weight is variable depending on harvest location, water conditions, shell thickness, etc. Thus, commercial clam sizes can be confusing, especially when comparing clams from separate locations. This situation has hampered attempts to establish recognized size designations or grades, but traditional practice refers to common size categories. Table 7 lists common size categories by increasing hinge width. Some dealers may offer intermediate categories not listed. The minimum legal harvest size in Florida is 1-inch hinge width. This legal designation may vary slightly per state.

Size Categories	Hinge Width
Littlenecks	> 1 inch
Top necks	
Cherry stones	
Chowders	> 2 inch

■ Table 7 - Common commercial sizes for hard clams

**Uniformity** in clam size per container or bag denotes a careful sorting process. If requested, bags can be packaged as mixed sizes. Likewise, Uniformity can be designated on a count per pound basis.

**Broken and dead clams** should not exceed 2% (by count) of the entire packaged unit at the time of shipment.

## **LABELING:**

A container, or bag of live clams must be accompanied with some labeling, commonly a securely fastened tag (water-proof material) bearing important information on the product source. This label or tag is the buyer's assurance that the clams can be traced back to the original harvest area. Thus, the tag must identify the name and address of the shipper (certification number - reference 2), date of sale, and type and quantity of clams. In some instances, the label may identify the date and area of harvest, or this information is recorded by the respective shippers. Depurated clams should be identified by lot number as well. Buyers should also maintain a record of these labels (for at least 90 days) in the event of any consumer complaints.

## **STORAGE:**

The Atlantic coast clam or northern quahog typically has a longer shelf-life(live) in refrigeration than the Gulf coast clam (reference 5). Dry, refrigerated storage with a continuous flow of cool air (fan) is thought to prolong clam survival by forcing the clams to remain shut for moisture retention. Live clams must be stored in refrigeration less than 50°F (10°C) (reference 1). During summer months when water temperatures exceed 80°F, clams survive best when stored in refrigeration above 40°F.

## **REFERENCES**

1. National Shellfish Sanitation Program - Manual of Operations, U.S. Food and Drug Administration. 1. Sanitation of Shellfish Growing Areas, and 11. Sanitation of Harvest and Processing of Shellfish (Original drafts 1965; drafts currently in review July 1985). Available from Superintendent of Documents, U.S. Gov. Printing Office, Washington, D.C. 20204.
2. Interstate Certified Shellfish Shippers List (monthly editions) U.S. Food and Drug Administration. Available from Shellfish Sanitation Branch, (HFF-344), Food and Drug Administration, 200 "C" Street SW, Washington, D.C. 20204.
3. Furfari, S.A. 1966. Depuration Plant Design. National Shellfish Sanitation Program. U.S. Dept. Health and Human Services, Washington, D.C. Available from Superintendent of Documents, U.S. Gov. Printing Office, Washington, D.C. 20204.
4. Rules of the Florida Department of Natural Resources, Chapter 16R-7 (Previously 16B-28), "The Comprehensive Shellfish Control Code." Available from Florida DNR, Division of Marine Resources, 3900 Commonwealth Blvd., Tallahassee, FL 32303.
5. Otwell, W.S., J.A. Koburger and S.W. Andree. 1986. "Survival of Southern Hard Clams in Refrigerated Storage." Florida Sea Grant Extension Bulletin No. 10.

## Calico Scallops

### PRODUCT DESCRIPTION:

Calico scallops (*Argopecten gibbus*) derive their common name from their distinct calico colored shell. The shell size is usually less than three inches in



diameter, which is typical for varieties of small scallops. Shellstock refers to the whole scallops with shell, meat and viscera intact. The scallop meat or adductor muscle is the edible portion. The meat represents 5 to 8% of the whole scallop weight. Calico scallop meat is separated from the shell and viscera by a unique mechanical shucking process. The shucked meats require no further processing prior to preparation and consumption, thus they represent a 100% yield in purchase form.

### PRODUCTION:

Harvesting occurs in open marine waters distant from coastal estuaries and bays. Commercial beds have been located in waters adjacent North Carolina and Florida's east and west coasts, but the dominant and consistent production is from beds running parallel to the coast from Jacksonville to Ft. Pierce, Florida. Thus the primary center for production is Cape Canaveral, FL. Live shellstock is harvested with trawls fishing depths ranging from 100 to 200 feet which are approximately 12 to 15 miles offshore. Production is daily and annual, depending on weather and catch rates.

### NUTRITION (Raw Meats):

The delicate flavor is, in part, related to the carbohydrate content which is typically higher in scallops than in other seafood. The particularly low fat content is suitable for low calorie, low fat diets, and assures flavor stability during fresh and frozen storage. Use of additives or preservatives is not required.

### PRODUCT FORMS:

Calico scallop meats are marketed as a fresh or frozen product. Fresh packs are more feasible for calico's than for most seafood because the final product can be shucked, packaged and refrigerated within 24 to 36 hours after the moment of harvest. The fresh shelf-life after processing and in refrigerated storage below 35°F (2°C) can exceed 14 days. Likewise, the low fat meats retain their quality during frozen storage (below 0°F). Breaded forms are not common but can be obtained through request. Calico scallops are not fabricated, engineered, molded, or extruded from any other form or parts of other seafood or alternate protein sources.

## SIZE:

Meat size is based on the count or number of individual, whole meats per pound. The count will vary with season, location, etc. such that selective harvest is impractical and unpredictable.

## QUALITY ATTRIBUTES:

All calico scallop firms are subject to regulations under the "Good Manufacturing Practices" (GMP's) for food processing as monitored by the respective States and U. S. Food and Drug Administration (Reference 1). Recognizing there were no specific regulations for calico scallop processing and marketing, SFA cooperated in formulation of a specific "Self-Regulatory Guide" containing guidelines developed through investigations conducted by the University of Florida and the National Marine Fisheries Service (References 2 and 3). These reports and accompanying training assure consistent product quality and safety based on actual processing conditions. These guidelines address the following attributes:

**Color** for fresh meats should appear as a combination of translucent, ivory- white transcending with opaque shades.

**Flavor and odor** has a pleasant, mild shellfish character, which can be described as slightly sweet to bland which will not dominate a recipe.

**Texture** of the individual meats should be moist and firm rather than slippery or spongy.

**Extraneous materials** are defined as any remaining attached viscera visible as fragments of discolored tissue on the surface. This material is not harmful, but cosmetically displeasing. Meats with extraneous material should not exceed 2% (per weight bases) of the entire package.

**Weepage** is the natural accumulation of fluids seeping from the meats during storage. Weepage is very minimal from fresh calico scallops, but is more evident after prolonged storage (greater than two weeks). Fresh production does not add any water during the processing or packaging of the meats. Freezing procedures, particularly IQF - individually quick frozen procedures may impart a protective glaze.

**No additives or preservatives** are used in processing or packaging calico scallops.

## PACKAGING AND LABELING:

Calico scallop meats can be packed to the buyers specifications, but 1 gallon containers are the most common units. The gallons are sturdy, plastic resealable containers. The gallons are packed with drained and pre-chilled meats, then sealed, immediately iced and stored in refrigeration below 35°F (2°C). Similar procedures would be used to pack different sized units. SFA recommends label information on the packages should include:

**Name of Product** - Calico Scallops (*Argopecten gibbus*), not to be confused or substituted for similar species such as bay scallops (*Argopecten irradians*), or Peruvian scallops.

**Contents or Net Weight** depending on package unit refers only to the actual volume or total weight, respectively, of the edible meats in a labeled unit. For example, 1 gallon of calico scallop meats refers to the total quantity of meats that fill one standard U. S. gallon container.

**Note:** one gallon typically has a net weight of approximately 8 pounds.

**Manufacturer's name and address** assures the scallops were processed and packaged by the listed firm.

**Country of origin** will confirm the location of primary harvest and processing - United States.

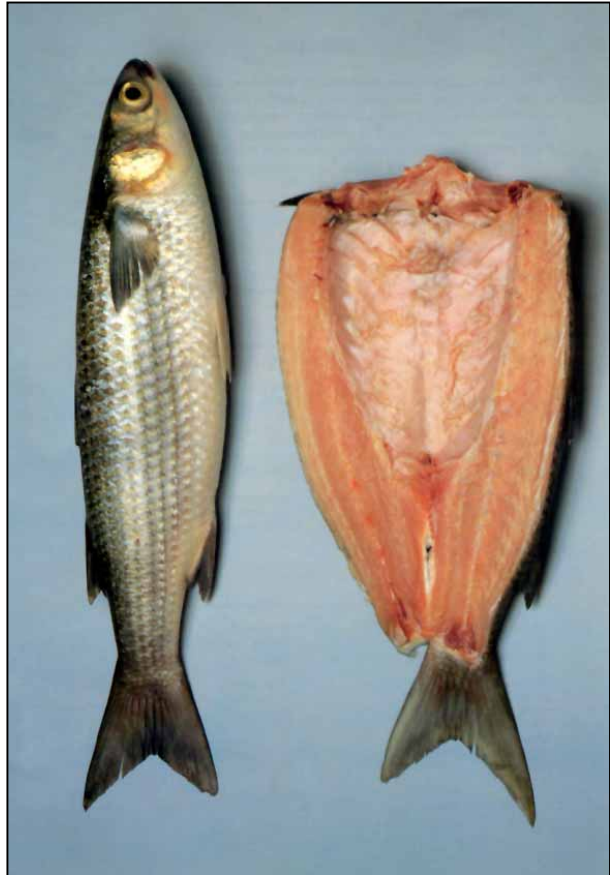
## REFERENCES:

1. Code of Federal Regulations, Title 21, Part 110 - Current Good Manufacturing, Processing, Packing, or Holding Human Food. (Revised 6/19/86).
2. Florida Sea Grant Report No. 69, "Quality Control in Calico Scallop Production," University of Florida, Gainesville.
3. Florida Sea Grant Extension Bulletin No. 6, "Self-Regulation Guide for Calico Scallop Processing," University of Florida, Gainesville.

## Mullet

### PRODUCT DESCRIPTION:

The black mullet (*Mugil cephalus*) also called the striped mullet is a primary food fish produced in coastal waters of the southeastern states from Texas through North Carolina. Within this region, a similar species with far less production is white mullet (*Mugil curema*), also called the silver mullet. At least 8 other mullet species have been identified from this region, yet they represent no significant commercial production. Although scientific references (1, 2, and 3) attempt to distinguish the individual mullet species, their common assigned nomenclature is not necessarily consistent with regional commercial terms. The most common terminology used by regional producers is black and silver mullet, and the general term "jumping mullet" which describes the unique swimming behavior of these schooling fish. In foreign commerce, these mullet are known as black, silver or gray mullet, and many Spanish speaking countries use Lisa. Florida's Gillnet ban has reduced mullet harvest by 75%.



The "true" mullets from genus *Mugilidae* should not be confused with the freshwater suckers and/or buffalo fish, which are popular in the Midwest and recognized as "mullet" by Canadian producers. Likewise, mullet should not be confused with the goatfish popular as "red mullet" from the Mediterranean.

### PRODUCTION:

Mullet production is annual with peak harvest in October to January. Florida and Louisiana are the primary producing states followed by the Carolinas. The fish are landed alive with small boats using shallow water nets. The fish are immediately iced onboard and off-loaded at the dock on the day of catch. Thus, mullet production is considered a nearshore, day fishery.

### PRODUCT TYPES:

This code primarily describes fresh and frozen raw mullet. Other product types not described in this code are smoked, pickled, canned and salted mullet. The most popular smoked form is hot smoked, butterflied with skin and bones intact. Likewise, the scales can remain intact to prevent sticking to a grill or other cook surface. Chunks or fillets are pickled and canned. The salted product

is head-on or off and butterflied. These special product types are common because mullet has a relatively high, favorable fat content and comparatively low price.

The roe (egg sacs) from female mullet are highly prized as an export item. Production of this product can influence the availability of whole mullet and various types. A limited regional market exists for white "roe" (semen sacs). Likewise, a true mullet connoisseur craves the mullet "gizzard", a special organ unique among fish which accommodates digestion of their "vegetarian" based diet.

## PRODUCT FORMS:

**Whole** - The whole form means the entire fish intact as it comes from the water. It is the most traditional and common product form. Use of whole mullet has evolved from the common knowledge that a cut or split mullet has less shelf-life than a whole form which retains its natural package as a barrier against exposure to oxidative rancidity. This practice is possible because the "vegetarian" mullet is less subject to "belly burn" or internal spoilage common to more carnivorous fish.

**Whole (H & G; headed and gutted)** - H & G is not common product form but can be provided on request particularly for certain uses, i.e., smoking, salting, etc.

**Butterflied** - A whole butterflied mullet has been cut and laid open with the skin intact as a hinge at the back (dorsal) or belly (ventral). Respectively, these forms are butterflied, belly to back or back to belly. In either form, the viscera and belly lining are removed, and the head, scales, and some fins may be removed. The backbone usually remains in place.

**Split** - Split mullet are cut in half from back to belly. The resulting "fillets" can be backbone in or out. Scales can be removed and skin is left intact.

**Fillets** - Fillets are not common due to low yield. Boneless and skinless fillets may represent an unexplored product option.

**Chucks** - Whole sections or steaks of mullet are not a common commercial form.

**Note:** All mullet forms can be provided with or without the head, scales, skin, backbone, etc., but the buyer must anticipate a higher cost for the degree of processing.

## SIZE AND FAT CONTENT (WHOLE FORM)

Whole mullet typically range in size from 3/4 to 3 pounds per fish (Table 1). A 6 or 7 pound mullet is possible, but rare. The females are usually larger, yet the edibility of females and males is similar. The most common size category is 1 to 1 and a 1/2 pound fish becoming available in May. The onset of roe season, October through January, can influence the availability of sizes and sex since the larger females carry the preferred roe.

Likewise, the fat content, which adds flavor, will vary per season. A high fat content ranges over 6 to 8 percent of the total edible weight. A low fat content ranges less than 5 to 6 percent.

Month	Avg. Whole Mullet Size	Average Fat Content	Roe Season
	-pounds-		
January		Low (spent & young)	
February	3/4 to 1 1/4	Low	
March		Low	
April		Low	
May	1 to 1 1/2	Low (increasing)	
July	1 1/4 to 2	Med. To high	
August		High	
September		High	
October	1 1/4 to 3	Med. To high	X
November		Med. (decreasing)	X
December		Low	X
January		lowest	X

■ Table 8 - Size and Fat content for mullet

### GRADES:

(Whole Fish) There are no legal references specifying grades for mullet, but traditional practice dictates:

small = less than 1 pound  
medium = 1 to 1 1/2 pounds  
large = 1 1/2 to 2 pounds  
v. large = over 2 pounds

These grades can vary according to customer preference. Buyers can specify a "count" or number of individual mullet per 100 pounds. The buyer should expect some variance within the count. For example, an order for 1 to 1 1/2 pound mullet can count from 75 to 90 individual fish per 100 pounds.

When ordering mullet for smoking, whole or butterflied, the buyer again should refer to the original whole fish weight. For example, designate a "cut- from" weight if purchasing the butterflied form.

### YIELDS:

Yields will vary per sex and size due to seasonal variations in body weight and roe content. On the average, a split mullet with head, viscera and roe removed should yield from 60 to 65 percent of the original whole weight. The lower percent is more common for fish with roe.

### STORAGE:

Fresh mullet should be well rinsed in clean water then packed in direct contact with an ample amount of ice in a clean container. This condition should provide an internal body temperature near 32°F. Fresh mullet should never be stored to exceed internal body temperatures above 40°F. Properly cleaned and iced the best quality can be maintained for 7 to 10 days depending on variables in harvest and landing. The maximum fresh shelf-life is approximately 14 days. Buyers should inquiry for the prior history of their purchase.

Frozen mullet is preferably stored below -10°F and never above 0°F Blast freezing is most common to impart a rapid freeze. Practice has shown that freezing in the whole form provides maximum shelflife. Mullet are not carnivorous fish, thus they are not subject to rapid, internal spoilage.

**Note:** Many variables influence the quality of fish after it leaves the supplier, thus buyers must eventually assume some responsibility.

## QUALITY ATTRIBUTES:

**Appearance** for fresh whole mullet should be clean with clear, full eyes, pink to red gills with no excessive slime or debris, and the dorsal portion of the body is firm to the touch. Scales should be clean and intact. There should be no strong fishy odors.

When butterflied or split the "blood line" or kidney running along the backbone should be removed. Likewise, the viscera and black belly lining should be removed.

**Packaging** should demonstrate careful handling. Fresh or frozen whole mullet should be placed or layered in a container rather than randomly tossed. For larger fish, the preferred position is belly down. Fresh packs commonly come in 50 or 100 pound iced units, which can be wooden, corrugated, or water impermeable boxes. Styrofoam containers can be requested. Regardless of the container type, fresh mullet should not be soaking in melt water, but rather exposed to the rinse of slowly melting ice.

Frozen mullet can be packed in 25 and 50 pound units with poly (plastic) liners and overwraps. Kilogram units can be ordered but they should not be confused with pounds.

## LABELING:

Packaged units and/or accompanying invoices should contain at least the following information.

**Product Name** or identity, such as mullet, Florida mullet, black mullet, etc. as appropriate per contents. This identity can also list the product form, i.e., whole, butterflied, split, etc.

**Quantity** designation, which usually refers to the total or net weight of the mullet in the container. Pounds are the common unit of designation and kilograms have been used in foreign commerce. In addition, counts (number of individual fish per 100 pounds) can accompany the net weight declaration.

**Name and Address** of the manufacturer, packer or distributor.

**Ingredients** (rarely used with mullet) if present, then listed in descending order according to the amount (weight basis) present.

## REFERENCES:

1. American Fisheries Society. 1980. A List of Common and Scientific Names of Fishes from the United States and Canada (4<sup>th</sup> ed.). AFS Special Publication No. 12, 174 pp.
2. National Marine Fisheries Service. 1987. Personal Communications. (Tentative nomenclature listing.) NMFS National Seafood Lab., Pascagoula, MS.

## ADDITIONAL REFERENCES

1. National Marine Fisheries Service. 1986. STRIPED MULLET FISH FAX Information System. Vol. V, No. 1. NMFS National Seafood Lab., Pascagoula, MS.

## Tuna

### PRODUCT DESCRIPTION:

This code describes tunas harvested in the Gulf of Mexico and South Atlantic waters destined for the fresh and frozen market. This information will apply to tuna purchased for cooking, but inference can be applied to tuna used in raw or sashimi markets. The principle specie of concern is yellowfin tuna with some comparisons to bluefin, bigeye, and albacore tuna.

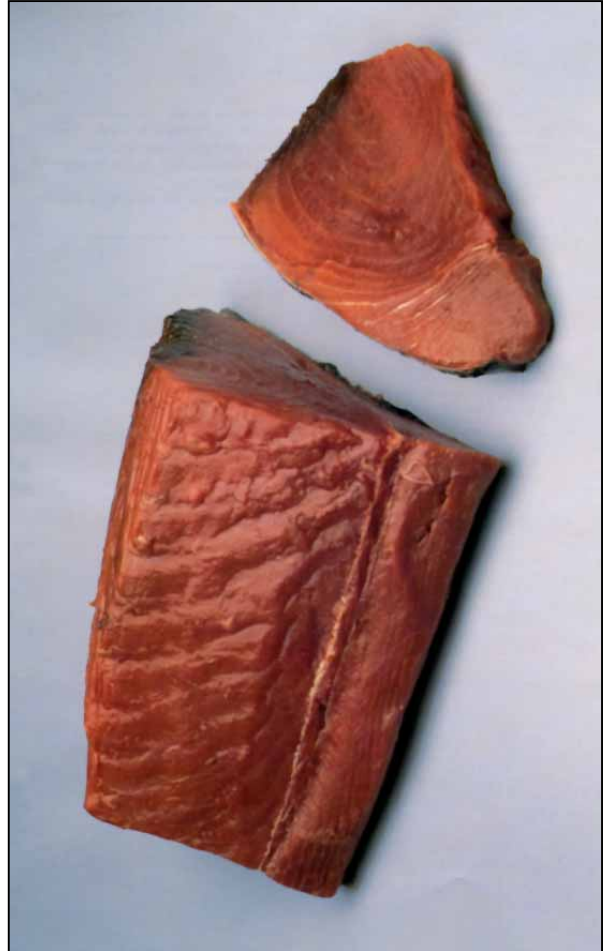
### PRODUCTION:

The most productive tuna fishery in the southeastern region is yellowfin tuna (*Thunnus albacores*), followed by bigeye (*Thunnus obesus*), northern bluefin (*Thunnus thynnus*), and albacore (*Thunnus alalunga*). Originally harvested for the raw market, yellowfin has increased in popularity as a broiled, baked or grilled entree. Bigeye and bluefin tunas are preferred for the raw market and are excellent cooked. Tuna is under strict management guidelines to limit harvest. Albacore harvest in the southeast is along the Atlantic coast of Florida. Harvest for all species is annual with some noticeable decrease in production occurring in March-April and winter months depending on weather.

Live tuna are, harvested with pelagic longline gear which deploys a line of baited hooks at variable depths. The lines are retrieved the same day of setting. Thus, each tuna receives immediate and individual attention. This practice continues as each fish is bled, butchered, and chilled immediately after landing on the deck. Individual attention from catch, through butchering and eventual delivery is a necessary quality attribute for these large fish. It is very important to keep tuna cold at all times after harvest, to prevent histamine development.

### PRODUCT TYPES:

The tunas can be purchased fresh or frozen. Certain suppliers can provide smoked tuna, which typically comes fresh. Unlike most fish, the edible meat of tuna has a more distinct ruby-pink to red and some dark red color (see picture).



## PRODUCT FORMS:

**Whole (carcass);** commonly purchased fresh with head, gills and viscera removed. A small belly cut at the anus assist removal of the viscera yet assures a closed belly cavity to retain ice for internal chilling. One pectoral or lateral fin may be removed to identify one side used for positioning the carcass during storage. This practice is thought to improve meat quality and color due to drainage of blood from the elevated side and limits any slight body deformation to the down side. The skin and "collar" bone should remain intact to protect the flesh, prevent gaping within the meat, and avoid textural problems caused by rigor or shrinkage of the muscle tissues.

**Loins (quarters),** a quarter portion of the whole tuna or half of one side portion, can be provided as full loins which run the full length of the carcass, or half loins which are half of the full loin, All loins, fresh or frozen, usually come with skin-on to protect the flesh and prevent gaping. The skin is easily removed with a knife.

**Steaks (slabs)** are usually cut from loins. They are provided fresh or frozen, usually with skin removed and packaged for protection from air or water exposure and physical damage during handling. Steaks can be cut from the different loin forms or the whole tail portion ("wheels").

## SPECIES IDENTIFICATION:

The tunas are best identified from the whole or carcass form. These whole tunas have a dark blue back without any dorsal striped pattern and no black spots on the body. (**Note:** the pectoral fin is the fin on the lateral side of the fish).

**Yellowfins:** moderate length pectoral fin extending to the front of the mid-carcass position of the second dorsal fin. Second dorsal fin elongated to equal nearly 1/3 to 1/2 the length of the carcass. Finlets yellow.

**Bigeye:** moderate length pectoral fin extending beyond the front of the mid-carcass position of the second dorsal fin. Comparatively, larger eyes per fish size. Narrow white margin on posterior edge of tail.

**Bluefin:** shorter length pectoral fin does not reach mid-carcass position of the second dorsal.

**Albacore:** longer length pectoral fin extending beyond end of the mid-carcass position of the second dorsal fin. Narrow white margin on posterior edge of tail.

Identification from loins or steaks can be confusing and depends on color differences per species which is influenced by region, season of harvest, and fish age (chronological and post-harvest). In general the albacore has a paler or whiter meat color, the bigeye and bluefins have a richer or darker meat color, and yellowfin meat appears intermediate within this color range.

## SIZE:

### Carcass Weight (average observed)

Yellowfin	Gulf of Mexico - 50-100 lbs.; and catches have exceeded 100 lbs./fish. East Coast - 20-50 lbs.; smaller than in Gulf
Bigeye	50-200 lbs.; catches have exceeded 500 lbs./fish
Bluefin	300-600 lbs.; catches have exceeded 1000 lbs./fish
Albacore	10-50 lbs.; along Florida's southeast coast

## YEILDS:

Based on the original whole, headless carcass weights, the total weight yield of loins (skin-on and no trimming) can range from 65-70%. The yield is less for smaller tuna and depends on careful cutting and trimming. Trimming may be requested to remove bones (primarily ribs from belly loins). Skin should remain on loins to protect the meat. Skinless steaks should be properly packaged for protection. Trimming and skinning require extra labor thus increasing wholesale costs.

## GRADES:

Current grading of tuna is a consequence of the traditional judgements used for the purchasing of fresh tuna for sashimi (raw fish) markets. This form of subjective evaluation has been carried over to judgements for tuna destined for a "to be cooked" market. Although the methods for judgement are the same, the implications for eventual use are substantially different.

Grading is based on sensory evaluations of raw meat samples cored (plugs) or cut from the tuna carcass. The true number 1 tuna has the distinct clarity, color and texture expected by the raw fish connoisseur. Likewise, iridescence and fingered-feel suggest the preferred higher oil content, which denotes flavor.

TUNA GRADES			
	No. 1	No. 2	No. 3
Color	Pink ruby	Darker shades	Red and/or some noticeable initial beige
Clarity	More transparent	Less transparent	More opaque
Sheen	Iridescent	Pale	Paler
Moist	Firm with sectioning	Softer	Softer moist
Odor and taste	Clean	Obvious	More obvious

■ Table 9 - Subjective evaluations used in reference to the grades for raw, fresh tuna meat.

In general, the number 1 grade can be considered the "sashimi grade," although number 2 grade is used for sashimi. All grades can be used for the so-called "cooked-grade." A true number 3 cooked tuna can be difficult to distinguish from so-called number 1 grade tuna. **IMPORTANT!** A true number 3 grade can represent a good edible selection. Any inferior connotation is a consequence of the sashimi grading system.

Naturally, the chemical attributes responsible for the perceived grade difference will likewise yield a longer shelf-life for the number 1 vs. number 3 grade tuna. As for all seafood, the method and length of storage will influence the duration of the grade. A shift in grades is more likely for a number 2 or 3 fish, especially if mishandled or stored at elevated temperatures.

**Special Note!** As long as a grading system is dependent on subjective evaluations, the grades are liable to human error, inexperience, and manipulation. Since there are no definitive guidelines by which to gauge these grades, buyers must learn from experience and the experienced, remembering a distinction between "sashimi" and "cooked" grades.

## QUALITY ATTRIBUTES:

**Color and Taste** of the tuna meat depends on species and condition of the meat per species (see Identification). All tuna species have a darker lateral strip of muscle. This energy rich muscle used for sustained swimming power has a higher portion of minerals, fats (including omega-3 fatty

acids), and blood pigments, which impart the distinct color, stronger flavors and a more rapid tendency to change color and flavor. This meat can be trimmed from the loins or steaks, but it does represent a nutritious portion.

The meat should be protected during fresh storage to minimize the progressive changes in color or development of off-flavors. The culprits are exposure to air (oxygen) and warm temperatures. Oxidation can darken blood pigments and alter flavor of the fats. Tuna should never be stored above 40°F and preferable below 35°F. Ice or water should not come in direct contact with the meat; otherwise, the water soluble blood pigments are leached from the meat resulting in a washed-out or watery bleached appearance.

In frozen storage the meat should be tightly packaged to prevent exposure and stored below -10°F and never above 0°F. A rapid freezing method will assure better quality and maintenance of grades.

**Texture** for raw tuna meat should be firm and there should be no gaping between the sections (*myomeres*) of muscle. When cooked these sections are called "flakes." Tuna looks and can feel very similar to beef steaks, but it will cook much faster than beef. Over-cooking is often the cause for complaints of "dry texture." Despite the high oil or fat reputation for tuna, the meat is relatively lean and will have a dry taste if overcooked or cooked well done. Properly cooked tuna meat has a firm pork-chop consistency, which is firmer than that of canned tuna. Leftovers are ideal for tuna salads.

**Odor** from fresh or fresh-frozen tuna is not strong, fishy or oily. It does not emit the same odor associated with other fatty fish, i.e., mackerels, etc.

**Damage** can occur if the fish is mishandled. Cuts and large punctures in the skin, and distinct areas of flesh discoloration and separation indicate poor handling and bruising of the whole fish. The skin, although easily removed, should be firmly attached to the carcass or loins.

## PACKAGING:

Fresh tuna should be packaged to maintain temperatures below 40°F, preferably below 35°F. Plastic bags or linings should prevent direct meat contact with water or ice. Frozen tuna must be packaged to prevent exposure to air and to minimize partial thaw. A -10°F frozen storage is recommended when possible.

## LABELING:

Tuna are packaged as individuals (whole, carcass), groups or portions depending on the order, packaging and destination. Labeling information on the package and/or accompanying invoice should include:

**Product Name** specifying tuna species, i.e., Bluefin, Yellowfin, Bigeye, etc.

**Name and Address** of the manufacturer, packer or distributor. The seller is advised to maintain records of source traceable to the vessel as an internal reference for variations in quality.

**Net Weight** as specified with reference to the original order.

**Origin** (optional or provided on request) to indicate approximate location of harvest. Recognizing tuna as a worldwide fishery, designated origin can be useful relative to regional and seasonal changes in quality attributes.

## Groupers

### PRODUCT DESCRIPTION:

"Grouper" refers to the premium food fish from the fish family of sea basses, *Serranidae*, harvested from the Gulf of Mexico and South Atlantic Waters. Individual species (Table 1) have unique identifiable characteristics, yet they are commonly described as lean, white flesh fish with a taste and texture which is popular and distinct from most common white flesh fish.

### NOMENCLATURE PROBLEMS:

Grouper species are extensive, yet with the exception of only a few species, the groupers are easily distinguished. Buyers should note that the Black and Red Groupers are the most popular, and the Red Grouper and Gags are the most abundant. The edibility of most groupers is similar with slight differences in flavor and texture depending on fish size. Although classified in the sea bass family, *Serranidae*, as a food fish the groupers can be distinguished from basses, perch, and snappers.



### PRODUCTION:

Methods used for grouper production assure each fish receives individual attention from the moment of catch through primary butchering and handling. The common fishing gear is some form of hook and line such as individual reels or a longline of hooks suspended on the bottom of the ocean. Certain regions still employ bottom traps. Caught fish are immediately eviscerated, washed and iced. An initial bath in an ice-slush provides beneficial, rapid chilling.

Production is annual, although sudden shifts in production and price should be expected due to weather conditions, which restrict harvest. The most productive period is during calm summer weather. Groupers typically congregate in relatively small regions per species, season, and depth.

### PRODUCT TYPES:

The primary product types are **fresh and frozen**. One important distinction from snappers is that grouper fillets are usually marketed with skin-off.

**PRODUCT FORMS:**

**Whole, drawn** means the grouper is purchased with head, scales, fins and gills intact, and the viscera or guts have been removed (preferably immediately post-harvest). Whole, ungutted groupers are not commonly available and could be of questionable quality depending on post-harvest age and handling conditions.

**Fillet**s can be provided on request and are typically taken from larger fish. The most common fillet form is skin-off and rib bones out. The thick grouper skin is easily removed, and if allowed to remain intact some grouper skin could impart tough texture. For additional cost, buyers can request removal of the pin bones.

**Special cuts** can be taken from larger fillets. Cuts can be any portion of a fillet. A common cut is "fingers" or "grouper fingers" which are segments of boneless, skinless grouper meat.

<b>Common Name*</b>	<b>Scientific Name</b>	<b>Other Names</b>
Black Grouper	<i>Mycteroperca bonaci</i>	
Coney	<i>Epinephelus fulvus</i>	
Gag	<i>Mycteroperca microlepis</i>	
Graysby	<i>Epinephelus cruentatus</i>	
Jewfish	<i>Epinephelus itaiara</i>	
Marbled	<i>Epinephelus inermis</i>	
Misty Grouper	<i>Epinephelus mystacinus</i>	
Mutton Hamlet	<i>Epinephelus afer</i>	
Nassau Grouper	<i>Epinephelus striatus</i>	
Red Grouper	<i>Epinephelus morio</i>	
Red Hind	<i>Epinephelus quttatus</i>	Strawberry or Calico Grouper
Rock Hind	<i>Epinephelus adscensionis</i>	
Scamp	<i>Mycteroperca phenax</i>	
Snowy Grouper	<i>Epinephelus niveatus</i>	
Speckled Hind	<i>Epinephelus drummondhayi</i>	Strawberry, **Kitty Mitchell, Calico Grouper
Tiger Grouper	<i>Mycteroperca tigris</i>	
Warsaw Grouper	<i>Epinephelus nigritus</i>	
Yellowedge Grouper	<i>Epinephelus flavolimbatus</i>	
Yellowfin Grouper	<i>Mycteroperca venenosa</i>	
Yellowmouth Grouper	<i>Mycteroperca interstitialis</i>	

■ Table 10 - Common groupers (family Serranidae) commercially harvested from the Gulf of Mexico and/or South Atlantic waters.

\* Species identification is based on references 1,2,3 and 4, plus the experience of the SFA members.

\*\* Kitty Mitchell is regionally used to refer to larger (greater than 5 pound) Speckled Hinds.

**SPECIES IDENTIFICATION:**

The groupers are best identified first through the advice of experienced, dependable suppliers, plus helpful descriptive references (nos. 1-7). Descriptive information in this Code is based on these references which also contain useful pictures. Legal identification is time consuming, involving electrophoretic techniques, thus it should only be used as a last resort.

In general, the following references to whole fish sizes mean **small** is less than 5 pounds, **medium and large** can range from 5 to 20 pounds with distinction, by species, and large to very large is for whole grouper greater than 20 pounds.

### **Most Production:**

**Black Grouper** - dark colored grouper with body marked with rows of dark blotches. Can be confused with gag and yellowfin grouper. Medium to large sizes.

**Gag Grouper** - the most widely distributed grouper. Coloration usually dark but variable depending on depth and fish size. White first rays on the ventral fins can be helpful for distinction from black grouper. Lacks the orange fin tips common to yellowfin grouper. Has less extended tail fin rays (caudal fin) as on scamp. Medium to large sizes. **Note!** Due to the negative name, gag grouper are often sold as black grouper. This practice is not misleading because both species have similar edibility and value.

**Red Grouper** - dark brownish-red grouper. May have small, white spots irregular about the body and black dots on the cheek. Small to large size.

**Yellowedge Grouper-deep** water grouper commonly taken from depths exceeding 450 feet. Caught with tilefish and snowy groupers. Distinguished by yellow margin on the dorsal fin. Small to moderate size.

### **Less Production**

**Jewfish and Warsaw Grouper** - large groupers common to southern Florida and adjacent tropical waters. The jewfish is the largest grouper reported to reach 700 pounds. Warsaw grouper are reported to reach over 300 pounds, and commonly exceed 40 pounds. Large to very large sizes. It is illegal to sell or catch Jewfish in the Gulf of Mexico.

**Nassau Grouper** - Medium to large sizes, yet have been reported to exceed 50 pounds. Have a distinct saddle pattern color on tail. Small sizes can be confused with red grouper.

**Misty Grouper and Snowy Grouper** - two distinct deep-water grouper species, taken from depths exceeding 400 feet. Snow grouper have been taken from waters exceeding 1000 feet. Medium to large sizes.

**Scamp** - very popular food fish, yet rare relative to red and black grouper production. Distinct broad caudal fin with elongated terminal rays. Small to large size.

**Yellowfin Grouper** - caught in south Florida and about adjacent tropical islands. Name related to the yellow margin on the pectoral fin (on body side). Small to large sizes.

**Yellowmouth Grouper** - Irregular net pattern of coloration with small brownish blotches. Easily distinguished from yellowfin and yellowedge groupers. Small to medium sizes.

**Red Hind, Rock Hind and Speckled Hind** - very colorful grouper each with differing body color covered by red or reddish-brown spots. Size ranges from small to medium sizes.

### **SIZES AND GRADES:**

There are no legal designations for size and grades for groupers. Variability amongst species and with supply limit the specifications a supplier can apply to sizes or grades for grouper. The SFA Code recommends reference to 3 size categories for whole, drawn (eviscerated) grouper:

**Small** - grouper less than 5 pounds

**Medium to Large** - greater than 5 pounds and up to 20 pounds. Distinction of medium vs. large is relative to the species in question. For example, a 10 pound hind would be considered large while a 10 pound red grouper would be medium.

**Very Large** - grouper in a range of weights common for the particular grouper species usually larger than 20 pounds.

Fillets are not marketed by distinct size categories. A buyer can request fillets "cut-from" a whole fish, but fillets are not commonly purchased by weight per fillet. Cuts can be fillet portions, halves, quarters, etc. and "fingers." Some buyers prefer to purchase whole, large fillets or fillet portions, which they can cut to desired sizes and shapes. Thus their order would specify total pounds to be cut from larger grouper.

## YIELDS:

Fillet yields for grouper will vary for each species, size of fish, and ability of the cutter. For most grouper a skinless, rib bone out fillet will yield from 38 to 50% of the original whole, drawn weight of the fish. This yield is lower than reported for snappers because snapper fillet weight includes the skin. Larger groupers provide a higher yield.

	<b>Whole, drawn fish size</b>	<b>Skinless fillet yield (approx.) (belly flap on)</b>
Red Grouper	less than 5 lbs.	40-42%
	more than 5 lbs.	42-48%
Black Grouper	less than 5 lbs.	45-48%
	morethan5lbs.	48-50%

## QUALITY ATTRIBUTES:

The best method for judging quality in whole grouper and grouper fillets is subjective evaluations (nose, eye and touch). Prior to these evaluations the fish should be rinsed and allowed to "breathe." This preparation is most important for packaged and wrapped fillets. As for all seafood's initial packaged odors and appearance do not always signify quality, but result from the static atmosphere in the packaging material.

**Appearance** is based on the color, clarity, and shape of the eye, gills and skin. The eyes should appear full. Eye clarity is good, but not always evident since direct contact with cold melting ice can cause some initial clouding. Bulging eyes can be evident in some species due to pressure changes as the fish are harvested from deep water. Dehydrated eyes may denote questionable quality and mishandling. Although the brilliant tropical skin colorations may fade, the skin should appear clean, intact, and firmly attached to the meat. Meat color is white to pink-white.

Gills are not a sure sign of quality, although browning and excessively slimy gills denote questionable quality. Moisture on the gills should appear clear and thin, as opposed to discolored and tacky. Most domestically caught grouper are sold with gills intact. Some imported groupers are sold with gills removed. In some countries gill removal is traditional practice providing good quality fish, but such practice has been used as a deceptive means to hide poor quality. If the gills are absent, buyers should carefully scrutinize other quality attributes and question the supplier relative to source and tradition.

Grouper fillets are usually thicker than from similar sized snappers. A thicker fillet is thought to have a longer fresh shelflife, but this would depend on prior handling, packaging and storage conditions.

Appearance also includes **workmanship** or how well the fish is cleaned and fillets out. Drawn fish should have all viscera removed and fillets should be cut smooth with no ragged edges, surfaces, or gaping.

**Texture** for the meat should be firm. All size grouper yield tasteful, firm textured meat, but whole fish size can influence meat texture and taste. This difference is not objectionable and is

usually only discernible between small vs. larger grouper. Smaller grouper can have a more delicate texture. The meat will feel wet, but it should not feel extra slimy.

**Odor** of the whole fish, gill and belly cavity, and meat should be clean and distinctively fresh fish. Sour or putrid odors denote advanced spoilage.

## PACKAGING:

For local and trucked distribution, fresh whole groupers are packaged in direct contact with ice. Fish can be sorted by size prior to pack-aging. Units or boxes vary from wooden and corrugated, to styrofoam and plastic. Air freighted shipments must be packed with some form of packaged "dry" (non-wet), or dissipating refrigeration which is packed in such a manner to prevent leakage, odor emission, or product dehydration. Vacuum packaging can be used for grouper if the production and packaging schemes assure compliance with effective, safe guidelines. Regardless of packaging methods, the internal product temperature for the fish or fillets should be close to 32°F and never above 40°F. Vacuum packaged grouper should be continually maintained below 35°F. Product carefully maintained between 28° to 32°F is considered superchilled. Frozen product should be stored below -10°F, and never above 0°F

## LABELING:

Labeling for whole grouper and fillets is usually listed on the invoice and on a card or slip accompanying the product, i.e., labeled card in a bag of grouper fillets. The following information should be included on the label.

**Product Name** or identity assuring proper species identification, i.e., red grouper, black grouper, etc. Use of accompanying species names is encouraged, i.e., red grouper *Epinephelus morio*; black grouper *Mycteroperca bonaci*, etc.

**Quantity** designation, which usually refers to the total pounds of whole, drawn fish or fillets in the container. Weight of the container, ice, refrigerant, or any packing materials are excluded from this quantity designation.

**Name and Address** of the manufacturer, packer, or distributor

**Ingredients** (rarely it ever used with grouper) if present, then listed in descending order according to the amount (weight basis) present.

**Frozen** if the product has been previously frozen.

**Country of Origin** - SFA encourages suppliers to list the foreign country where the groupers were caught and/or landed.

## REFERENCES:

1. American Fisheries Society 1980. A List of Common and Scientific Names of Fishes from the United States and Canada. ASF Publication No. 12, 174 pp.
2. Hoese, H. D. and R. H. Moore. 1977. Fishes of the Gulf of Mexico. Texas A&M Univ. Press, College Station, 327 pp.
3. Manooch, C.S., III. 1984. Fishes of the Southeastern United States. North Carolina State Museum of Natural History, 362 p.
4. Food and Drug Administration, 1989. "The Fish List," Available from FD.A., Center for Food Safety and Applied Nutrition, Washington, D.C., 20204
5. McClare, A.J. (ed.). 1978. Saltwater Fishes of North America. Holt, Rinehart and Winston, Inc., NY, 283 pp.

6. Dore, 1. 1982. Frozen Seafood, The Buyer's Handbook. Osprey Books, NY, 310 pp.
7. Dore, 1. 1984. Fresh Seafood, The Commercial Buyer's Handbook. Osprey Books, NY, 375 pp.

## Snappers

### PRODUCT DESCRIPTION:

"Snapper" refers to the premium food fish from the fish family, *Lutjanidae* harvested from the Gulf of Mexico, Caribbean Sea and South Atlantic waters. Individual species (Table 11) have unique identifiable characteristics, yet they are commonly described as lean, white flesh fish with a taste and texture which is more delicate than other common white flesh fish.

Similar species from this family are caught in tropical and subtropical waters about the world. This SFA Code is based on experience in handling and marketing the snappers in Table 11.

### NOMENCLATURE PROBLEMS:

The term "Snapper" has been used to identify other fish species from different fish families. For example, small bluefish (*Pbmatomussaltatrix*) are sometimes called 'snappers or snapper blues', and some West Coast rockfishes (*Family Scorpanenidae, Genus Sebastes and Sebastolobus*) are locally

known as Pacific snappers or red snappers. This terminology may be accepted within the traditional, localized region, yet the U.S. Food and Drug Administration (FDA) would not permit use of these terms in interstate commerce. (See Appendix for further explanations for legal fish nomenclature.)

Even more confusing is the illegal practice of fish substitution, whereby one species of fish (non-snapper) is labeled or sold as a more expensive snapper. Likewise, fictitious or nontraditional names (i.e. cherry snapper, silver snapper, white snapper, pink snapper, etc.) have been assigned to less expensive fish. Common substitutes are grunts, porgies, tilapia, etc. In either case, this practice (contemplated or unintentional) can be considered economic fraud thus constituting **misbranding**. Fish substitution is definitely illegal and deceptive nomenclature will require further legal scrutiny **This SFA Code only recognized the term "snapper" when referencing those species in the family Lutianidae as listed in Table 11 and/or as harvested from other tropical and subtropical waters of the world.**



Imported snappers have introduced terms such as Brazil snapper, Taiwan snapper, Thailand snapper, Thailand red snapper, etc. With proper handling these fish can be of good quality, but they should be distinguished from domestic production (See references 5 and 6).

Common Name*	Scientific Name	Other Names
Black Snapper	<i>Apsilus dentatus</i>	
Blackfin Snapper	<i>Lutjanus buccanelia</i>	Hambone
Cardinal Snapper	<i>Pristipomoides macrophthalmus</i>	
Cubera	<i>Lutjanus cyanopterus</i>	Cuban Snapper
Dog Snapper	<i>Lutjanus iocu</i>	
Gray Snapper	<i>Lutjanus griseus</i>	Mangrove Snapper
Lane Snapper	<i>Lutjanus synagris</i>	
Mahogeny	<i>Lutjanus mahogoni</i>	
Mutton Snapper	<i>Lutjanus analis</i>	
Queen	<i>Etelis oculatus</i>	Silk, Ballbat
Red Snapper (Northern)	<i>Lutjanus campechanus</i>	**
Red Snapper (Southern)	<i>Lutjanus purpureus</i>	**
Schoolmaster	<i>Lutjanus apodus</i>	
Silk Snapper	<i>Lutjanus vivanus</i>	Yelloweye
Vermilion Snapper	<i>Rhomboplites aurorubens</i>	Beeliner
Wenchman	<i>Pristipomoides aquilonaris</i>	
Yellowtail Snapper	<i>Ocyurus chrysurus</i>	

■ Table 11 - Common snappers (family Lutjanidae) commercially harvested from the Gulf of Mexico and /or South Atlantic waters.

\* Species identification is based on references 1,2,3,4 and 5, plus the experience of the SFA members. The "Common and Scientific Names" are legally recognized by the U.S. FDA as official nomenclature based on references 1 and 2. The 'Other Names' are commonly used as market nomenclature or vernacular for the same species. **Note!** Similar terminology can cause confusion for queen, silk and yelloweye snappers, yet edibility is similar.

\*\* The international reference 4 recognizes two very similar species as "red snappers" Some scientists consider *L. purpureus* and *L. campechanus* as two different forms of the same species. Visual distinction is difficult, yet more obvious when the fish are compared. Geographic distinction is more definite in that *L. campechanus* occurs primarily in the Gulf of Mexico and South Atlantic north of the 20° latitude, and *L. purpureus* occurs south of the 20° latitude in the Caribbean Sea and south. Thus *L. purpureus* is commonly known as the Caribbean red snapper, and confusingly called the Mexico, Venezuela, Surinam red snapper, etc., depending on port of landing. The northern species *L. campechanus* has been called the Florida, Gulf or American red snapper. Fortunately, both species can have identical edibility thus for all practical purposes they should be marketed as red snapper.

## PRODUCTION:

Methods used for snapper production assure each fish receives individual attention from the moment of catch through primary butchering and handling. The common fishing gear is some form of hook suspended on the bottom of the ocean. Certain regions still employ bottom traps. Caught fish are immediately eviscerated, washed and iced. An initial bath in ice slush provides beneficial, rapid chilling.

Production is annual, although sudden shifts in production and price should be expected due to weather conditions, which restrict harvest. Snappers typically congregate within a relatively small region per species, season, and depth. Although snappers are harvested in waters about all southeastern states, Texas through North Carolina, the most productive regions are within the northern Gulf of Mexico.

## **PRODUCT TYPES:**

The primary product types are fresh and fresh frozen. Snappers freeze well and can represent a good quality frozen choice.

## **PRODUCT FORMS:**

**Whole, drawn** is the primary product form for snappers. It means the fish is purchased with head, scales, fins and gills intact, and the viscera or guts have been removed (preferably immediately post-harvest). Whole, ungutted snappers are not commonly available and could be of question- able quality depending on post-harvest age and handling conditions.

**Fillets** can be provided on request and are typically taken from larger fish. The most common fillet form is skin-on, rib bones out, and scales removed. For additional costs, buyers can request removal of the skin and pin bones. SFA recommends purchasing with skin-on to better aid in species identification and to assure more protection for the fillets. The skin prevents gapping between the muscle sections (caused by excessive handling) and provides a barrier to oxidation and dehydration.

**Special cuts** can be taken from larger fillets. Cuts can be any portion of a fillet. A common cut is "fingers" or "snapper fingers" which are segments of boneless, skinless snapper meat.

## **SPECIES IDENTIFICATION:**

When confronted with a suspicious fish, a buyer should first confer with the supplier to question identification and source. Was the fish handled directly from the vessel to buyer, or was the supply indirect involving a third or fourth party? Where and when were the fish caught? If further confirmation is necessary a fresh sample of the fish should be retained for legal identification.

The snappers are best identified first through the advice of an experienced, dependable supplier, plus helpful descriptive references (nos. 1-8). Descriptive information in this Code is based on these references which also contain useful pictures. Legal identification is time consuming, involving electrophoretic techniques, thus it should only be used as a last resort.

Legal confirmation of fish species depends on an electrophoretic test, which distinguishes species by their unique protein composition. Buyers can contact the local or regional FDA office and/or the equivalent authorities in the respective state governments. In Florida, the latest electrophoretic techniques and a "library" of identified fish species is maintained by the Florida Department of Agriculture and Consumer Services (Tallahassee). The regulatory authorities usually act on complaints rather than routine surveillance for fish misbranding.

## **Most Production**

**Gray or Mangrove Snapper** - typically inhabit shallower waters in the southeastern coasts, thus the term mangrove. Body color can appear gray, gray-green to brown on the upper body portion, and reddish tint on lower portion and belly. More obvious teeth can cause confusion with the Cubera Snapper.

**Mutton Snapper** can be confused as a small Lane Snapper or a Red Snapper when larger. They can be distinguished by a black spot nearly the same size as the eye, located above the lateral line and below the soft, second portion of the dorsal fin. Fins are reddish, the back can be greenish, and blue wavy lines may appear about the eye.

**Red Snapper** - Florida, Gulf or American red snapper is primarily produced in the Gulf of Mexico, and a substantial harvest occurs in the South Atlantic. A description taken from reference no. 4 state, "back and upper sides are scarlet to brick red, and the lower sides and belly are lighter. Small red snapper have a dark spot on the upper sides just below the soft (second portion) of the dorsal fin. Southern red snapper may have a dark spot at the upper pectoral fin base. Adult red snapper are easily distinguished... (being) deeper bodies than the vermilion snapper and are not as streamlined. Red snapper have a bright red iris (eye), whereas the silk snapper (yelloweye snapper) has a yellow iris. Red snapper lack the prominent black spot at the base of the pectoral fin, which is characteristic... in the blackfin or hambone snapper.

**Silk or Yelloweye Snapper** (*L. vivanus*) - occurs in the Gulf of Mexico but primarily harvested in the South Atlantic waters, commonly in water deeper than for red and vermilion snappers. Distinguished by the distinct yellow iris of the eye. May have a distinguishable yellow margin on the edge of the tail (caudal fin).

### **Moderate Production**

**Blackfin Snapper** - can be confused with red snapper, yet distinguished by black pectoral fins (lateral position near head).

**Lane Snapper** - relatively smaller commercial snapper distinguished by longitudinal yellow stripes and black spot (size of the eye) on the lateral side. Eye is dark red, Pelvic and anal fins may have orange-yellow tint.

**Vermilion or Beeline Snapper** - common in the range for red snapper. Body is more streamlined than similar snapper and the body color flows from a rich red (vermilion) upper portion to a silvery-white lower portion and belly. Dorsal fins are rosy with yellow tint. Caudal fin more forked and may have distinguishable black margin.

**Yellowtail Snapper** - distinct deep yellow stripe running from the snout, through the eye to the tail. Blue spots on upper body Large forked tail (caudal fin).

### **Least Production**

**Black, Cubera, Cardinal, Dog, Mahogany, Queen (Ballbat), Schoolmaster and Wenchman Snapper** - are the least commercially abundant in the southeastern, South Atlantic region.

### **SIZE AND GRADES:**

Whole, drawn (eviscerated) snappers vary considerably in size, thus they are not as easily grouped in size categories typically for the common fish like cod, perch, or salmon. In general the smaller snappers are sold in 2-pound increments. For example, whole red snapper can be sorted as whole individual fish ranging from 1 to 2 pounds, 2 to 4 pounds, 4 pounds and up, and as large as 15 to 20 pounds. The 4 pound size and up particularly 4 to 8 pounds, is most common. Larger sizes are species dependent.

Fillets are not marketed by distinct size categories. A buyer can request fillets cut from 2 to 4 pound whole fish, but fillets are not commonly purchased by weight for individual cut fillets. The 1 to 2

pound snappers are usually not filleted. The cuts can be fillet portions, halves, quarters, etc. and 'fingers'. Some buyers prefer to purchase whole, large fillets or fillet portions, which they can cut to desired sizes and shapes. Thus their order would specify total pounds to be cut from larger snappers.

## **YIELDS:**

Fillets yields from snapper will vary by species, size of fish, and ability of the cutter. For most snappers, skin-on scaled and rib bone out fillets will yield from 48 to 52% of the original whole, drawn weight of the fish. Larger fish provide the larger yields.

## **QUALITY ATTRIBUTES:**

The best method for judging quality in whole snapper and snapper fillets is subjective evaluations (nose, eye and touch). Prior to these evaluations the fish should be rinsed and allowed to 'breathe'. This preparation is most important for packaged or wrapped fillets. As for all seafoods, initial packaged odors and appearance do not always signify quality, but result from the static atmosphere in the packaging material.

**Appearance** is based on the color, clarity, and shape of the eye, gills and skin. The eyes should appear full. Eye clarity is good, but not always evident since direct contact with cold melting ice can cause some initial clouding. Bulging eyes can be evident in some species due to pressure changes as the fish are harvested from deep water. Dehydrated eyes may denote questionable quality and mishandling. Although the brilliant tropical skin colorations may fade, the skin should appear clean, intact, and firmly attached to the meat. Meat color is white to pink-white.

Gills are not a sure sign of quality, although browning and excessively slimy gills denote questionable quality. Moisture on the gills should appear clear and thin, as opposed to discolored and tacky. Most domestically caught snapper are sold with gills intact. Some imported snappers are sold with the gills removed. In some countries gill removal is traditional practice providing good quality fish, but such practice has been used as a deceptive means to hide poor quality. If the gills are absent, buyers should carefully scrutinize other quality attributes, and question the supplier relative to source and tradition.

Appearance also includes **workmanship** or how well the fish is cleaned and fillets cut. Drawn fish should have all viscera removed and fillets should be cut smooth with no ragged edges, surfaces, or gapping. During temporary storage or thawing, the fillets should not be allowed to soak in melt water, which can result in off-flavors.

**Texture** for the meat should be firm and the skin should be firmly attached to the meat to prevent any gapping in the flesh. Some separation is expected between various segments of the fillet meat, but lack of integrity or excessive gapping within segments may be a result of poor handling. Skinless fillets are more subject to gapping. The meat will feel wet, but it should not feel extra slimy.

**Odor** of the whole fish, gill and belly cavity, and meat should be clean and distinctively fresh fish. Sour and putrid odors denote advanced spoilage.

Some skin-on snapper fillets will curl when heated. This is not a sign of poor quality, but rather an indication for true snapper. The curling is prevented by scoring the skin to prevent tension caused by heat shrinking of connection tissue in the skin.

## PACKAGING:

For local and trucked distribution, fresh whole snappers are packaged belly down in ice in 100-pound units. Fish can be sorted by size prior to packaging. Units or boxes vary from wooden and corrugated, to styrofoam and plastic. Air freighted shipments must be packed with some form of packaged "dry" (non-wet), or dissipating refrigeration which is packed in such a manner to prevent leakage, odor emission, or product dehydration. Vacuum packaging can be used for snappers if the production and packaging schemes assure compliance with effective, safe guidelines. Regardless of packaging methods, the internal product temperature for the fish or fillets should be close to 32°F and never above 40°F. Vacuum packaged snapper should be continually maintained below 35°F. Product carefully maintained between 28° to 32°F is considered superchilled. Frozen product should be stored below 10°F, and never above 0°F.

## LABELING:

Labeling for whole snapper and fillets is usually listed on the invoice and on a card or slip accompanying the product, i.e. labeled card in a bag of snapper fillets. The following information should be included on the label.

**Product Name** or identity assuring proper species identification, i.e. Red Snapper, Mutton Snapper, etc. Use of accompanying species names is encouraged, i.e. Red Snapper *Lutjanus campechanus*; Mutton Snapper *Lutjanus analis*, etc. (see table 1).

(Note, use of the single name "snapper" as general terminology for all *Lutjanus* species with an option to use other specific names is under FDA consideration).

**Quantity** designation, which usually refers to the total pounds of whole, drawn fish or fillets in the container. Weight of the container, ice, refrigerant, or any packing materials are excluded from this quantity designation.

**Name and Address** of the manufacturer, packer, or distributor.

**Ingredients** (rarely if even used with snappers) if present, then listed in descending order according to the amount (weight basis) present.

**Frozen** if the product has been previously frozen.

**Country of Origin** - SFA encourages suppliers to list the foreign country where the snappers were caught and/or landed.

**FINAL "RULE OF THUMB":** Quality should follow price, thus learn to ask the right questions:

1. Name of the fish? Size of the whole fish? Amount of fish in the order?
2. Price per pound of fish?
3. Where were the fish caught and landed?
4. Are you subscribing to the SFA Code?

## REFERENCES:

1. Food and Drug Administration 1989. "The Fish List." Available from FDA Center for Food Safety and Applied Nutrition, Washington, D.C., 20204
2. American Fisheries Society. 1980. A List of Common and Scientific Names of Fishes from the United States and Canada. AFS Publication No. 12,174 pp.

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4. Manooch, C.S., III. 1984. Fishes of the Southeastern United States. North Carolina State Museum of Natural History, 362 pp.
5. FAO Species Identification Sheets for Fishery Products. 1978. Western Central Atlantic Fishing Area 31. Food and Agricultural Organization of the United Nations.
6. Dore, I. 310 pp. 1984. Frozen Seafood, The Buyers' Handbook. Osprey Books, NY
7. Dore, I. 1984. Fresh Seafood, The Commercial Buyers' Handbook. Osprey Books, NY, 375 pp.
8. McClane, A.J. (ed.) 1978. Saltwater Fishes of North America. Holt, Rinehart and Winston, Inc., NY 283 pp.

## Catfish

### PRODUCT DESCRIPTION:

This code primarily refers to the pond-raised (cultured) channel catfish, *Ictalurus punctatus* grown in ponds throughout southeastern sector of the United States. Cultured catfish can include other catfish such as the blue catfish, *I. furcatus* and developing hybrids, all have similar product characteristics. These fish cultures were developed from the domestic stocks native to the southeast yet they are distinguished from bullhead catfish and other wild (non-cultured) catfish, domestic or imported. They are produced under controlled conditions to provide a firm, white flesh fish.

### PRODUCTION:

Cultured catfish production is basically a farming operation common throughout the southeastern United States with major efforts in Alabama, Arkansas, Louisiana and Mississippi. The catfish are grown in ponds, raceways, cages and/or tanks, All

systems depend on a clean supply of well water and properly formulated diets. The diets consist of natural grains (i.e. soybean, corn, mylo, wheat, etc.) which provide high protein and all essential nutrients. Average time for grow-out from stocked fingerlings to market size is approximately 18 months. During this period the fish receive constant attention for water quality, growth rates and health. Production is staggered at large enterprises such that harvest occurs daily through all seasons. Fresh pond-raised catfish are available all year.

Typically, the harvest is held alive until the moment of processing. The harvest is transported and held alive in special tanks that provide necessary aeration. This procedure is the unique link in catfish production and processing that assures consistent freshness and quality Initially, an electrical shock stuns the fish to prevent product damage, yet allows necessary bleeding when processed. Processing involves basic butchering with various combinations of mechanized and hand labor. All procedures are designed for speed and temperature control. In less than 30 minutes from the initial shock, the butchered catfish are ready for packaging, further processing, and/or distribution. All processing procedures must comply with FDA "good manufacturing practices" and basic USDA and USOC guidelines for processing fishery products (see references).



## PRODUCT TYPES:

This code primarily describes **fresh, ice pack** and **fresh, frozen** raw catfish products. Fresh production typically employs ice packaging and/or chill packaging from the moment of primary processing. Frozen products are usually frozen individually either through continuous blast freezing, carbon dioxide tunnels, or similar methods designed for rapid freezing.

This code does not describe specialty product types, but notes catfish texture and mild flavor is ideal for use in a variety of specialty products (i.e. breaded, smoked, pre-seasoned, stuffed, etc.) These products can be provided on request.

## PRODUCT FORMS:

Any product form can be provided on request with pricing to account for extra processing and handling costs.

**Whole** -The whole form can refer to catfish in the "round", gutted, or headed and gutted forms. All of these forms can come skinless or skin-on. The "*round*" form is the entire catfish as it is harvested. This form is rarely marketed, but can be provided on special request. The catfish should be gutted to extend shelf-life and protect flavor. The most popular whole form is *headed and gutted* (H&G), skinless. The typical de-heading cut removes the pectoral (side) spines. All of these forms can be provided with or without the dorsal spine intact.

**Fillets** - Catfish fillets are usually cut to be skinless and boneless. The "rib" bones are removed with a special cut, which leaves the flank or flap of belly meat intact. Catfish fillets do not have the troublesome pinbones, which are more obvious in other fish. "Shanks" refer to fillets with the belly flaps or "nuggets" removed with an angled cut. Thus fillets can be purchased with or without the nugget.

**Nuggets** - The boneless flank or flap of belly meat is known as the nugget. When cut from the fillet they are sold as separate pieces of catfish meat.

**Strips** - Strips are diagonal cuts from the boneless fillets. They appear as longitudinal pieces or fingers of catfish meat.

**Chunks** - Any cut of catfish meat can be provided on request.

**Steaks** - A whole, H&G catfish can be cut into cross-sections or steaks, which vary in thickness depending on customer preference. Steaks are usually cut from larger whole fish, 4 pounds and up.

## YIELDS:

The percentages in parentheses represent the remaining weight of the product form relative to the initial weight of the whole, live catfish (100%).

Whole (100%) round form	Whole (55-62%) H&G, skinless	Fillets (40-42%)	Shank (30-35%)
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## SIZE AND GRADES:

Catfish can be graded for size at the moment of harvest depending on the growth rate, fish age and mesh sizes (openings) in the harvest net.

<b>Typical Product Forms</b>			
<i>Whole, H&amp;G, Skinless Sizes (oz.)</i>	<i>Avg. Count/10lbs.</i>	<i>Fillets (shank without nugget) sizes (oz.)</i>	<i>Avg. Count/10lbs.</i>
2-5	44	2-3	63
5-7	27	3-5	40
7-9	20	5-7	27
9-11	16	7-9	20
11-13	13	9-12	16
13-15	11	12+	13
15-17	10		

■ Table 12 - Typical Product Forms for Catfish

\*Count in this table is the number of fish or fillets per 10 pounds

*Nugget size* can range from 0.5 to 3.5 oz. per piece and are usually mixed for use as hors d'oeuvres, kabobs, soups, etc.

*Strips* are sized to customer preference, typically between 0.5 to 1.5 oz. cuts often used as basket pieces.

## QUALITY ATTRIBUTES

**Appearance** for fresh catfish meat is a natural white to ivory color with some noticeable translucency and iridescence on the surface of the flesh. Freezing can dull the surface appearance but the frozen meat color should remain natural as for fresh meat.

All processed forms should be cleanly cut and free of blood discoloration or spots, which can denote poor handling and bruising.

The meat (raw and cooked) should be free of any objectionable aromas or flavor. The raw odor is best described as neutral or mild. Some aromatic descriptions, best noted in the cooked form, are nutty, buttery, boiled chicken-like, grainy (corn), vegetable-like. Off-odors or flavors have been associated with the growing water (i.e. algae-like, musty, woody, etc.), but these sensory attributes should not be confused with the odors typically noted for spoiling fish (i.e. putrid, fishy, etc.). Catfish producers have the ability to check and influence the odor and flavor of the catfish prior to harvest. Realizing this unique feature, the U.S. Department of Agriculture has conducted schools in descriptive flavor analyses for catfish producers and processors (see reference). Generally, representative fish samples from ponds are checked several weeks before the harvest, one to two days before harvest, and prior to unloading the harvest for processing. Suppliers can provide further information.

**Packaging** and shelf-life should demonstrate careful handling. Fresh catfish is packed in ice (ice pack) or pre-packed and chilled at 28° - 34°F (chill-pack). With prompt and continuous chilling, the average fresh shelf life for catfish is 10 days. When quick frozen and stored at or below -10°F the average shelf-life is 6 to 9 months. Current rapid production and (I.Q.F) freezing techniques are structured to recommend a top quality frozen product for use within 3 months. IQF units are usually 15 lb. boxes. The ice pack product is bulk packed, in bags placed in corrugated wax cartons for a net weight of 15 or 30 lbs. per bag in ice. The chill pack product is individual tray packed retail sizes in 15 or 30 lb. master cartons with no ice.

## LABELING:

Packaged units and/or accompanying invoices should contain at least the following information:

**Product Name** or identity, such as farm raised catfish, channel catfish, blue catfish, etc. as appropriate per contents. This identity can also list the product form, i.e., whole H&G skinless, fillets, nuggets, etc.

**Quantity** designation should only refer to the total or net weight of the catfish forms in the container. Pounds are the common unit of designation and kilograms have been used in foreign commerce. Also counts (number of individual fish forms per a designated weight) can accompany the net weight declaration.

**Name and address** of the manufacturer, packer or distributor.

**Ingredients** if present, then listed in descending order (weight basis) according to the amount present.

## REFERENCES

1. Code of Federal Regulations. Title 21, Part 110 - Good Manufacturing, Processing, Packaging or Holding Human Food. (Revised 6/19/86).
2. Code of Federal Regulation. Title 50. Part 267. Interim U.S. Standards for Grades of North American Freshwater Catfish and Products made thereof.
3. Catfish Farmers of America. 1987. Descriptive flavor analysis of pond-raised catfish. Proceedings for a two-day intensive workshop for personnel engaged in sensory evaluation of pond-raised catfish. By U.S. Agricultural Research Service, Southern Regional Research Center, New Orleans, 42 pp.

## Florida Stone Crab (Claws)

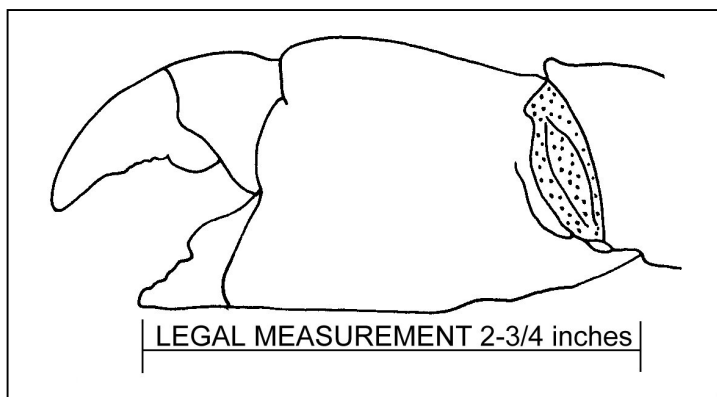
### PRODUCT DESCRIPTION:

Stone crabs derive their common name from their thick, hard shell traditionally touted as hard enough to break stones. This reputation is further evidenced by the distinct oval body profile and prominent claws. Cooked claws are currently the only product form available from stone crabs as produced primarily in Florida. Stone crabs can survive having their claws removed and can regenerate new claws, even if both claws are harvested. Thus returning live properly declawed stone crabs assures a perpetual fishery, which has been substantiated by research and over 20 years of commercial practice. This production scheme is possible because the stone crabs have the ability to regenerate their claws and continue reproduction through an average life span of 5 to 7 years. Fishery protection is further provided by regulations for season and legal claw size (ref. 1).



### HARVEST REGULATIONS:

Florida regulations limit production to stone crab claws measuring  $2\frac{3}{4}$  inches in length of the forearm, (Fig. 1 - distance from tip of pincers to the hinge with the attached claw segment). Likewise, these regulations stipulate the open season for harvest is from October 15 until May 15 of the following year. More specific state regulations concern gear types and handling requirements to assure survival of the declawed crab (Ref. 1). Likewise, a federal fisheries management plan is in effect to protect the stone crab stocks.



■ Figure 1 - Legal Measurement - Stone Crab claws

## PRODUCTION:

The stone crab, *Menippe mercenaria* is the primary commercial stone crab species harvested in Florida. Harvest occurs with special crab traps placed in coastal waters southward from St. Marks, Florida throughout the Florida Keys. Minor production has occurred along the perimeter of the Gulf of Mexico and along the southeastern coast of the United States, and at least 2 additional stone crab species have been distinguished from these regions, but *Menippe mercenaria* in southwest Florida is the dominant and most consistent resource. Annual production of stone crab claws ranges from 1.8 to 2.5 million pounds. Production varies per region and month.

## PRODUCT TYPE:

The true *Menippe mercenaria*, stone crab claw has a smooth shell surface with distinct black tip pincers. The main body of the claw shell can be dark to reddish brown or tan with purple shadowing. The whole claw has 3 separate sections; the large forearm with pincers and two consecutively attached segments commonly referred to as "knuckles". All segments contain edible meat.

Certain crab claws from other regions have been used to mimic the true stone crab claw. Common substitutes include claws from the Jonah crab (*Cancer borealis*) or the Chilean crab, (*Jaiba mola*). These claws are easily distinguished by their appearance and they lack the flavor and texture of the true stone crab. The Jonah crab claws are more elongated with a rough margin and pebbly-ridged surfaces in contrast to the smooth, rounded stone crab claw. The more similarity shaped Chilean claw is comparatively smaller and the shell color is more reddish, and lacks black spots at the end of the claws. Also, the Chilean claw shell surface has a slight sandpaper texture. These mimics should not be sold or purchased as true Florida stone crabs, and any inference through such labeling (i.e. Jonah "stone" crab claws) could be deemed mislabeling.

## PRODUCT FORM:

Cooked stone crab claws are available fresh or frozen. Fresh cooked claws are available in season, Oct. 15 through May 15, and frozen cooked claws can be available year around. Cooking immediately post- harvest is necessary to maintain the integrity and quality of the meat. Refrigeration or freezing of raw, uncooked claws yields an unacceptable product with sticking, fragmented texture.

## SIZE:

There are no state and federal guidelines or regulations for the market sizes for stone crab claws, except the minimum legal size for harvest (2 3/4 inch forearm length). Commercial practice and SFA's code recommends the following size designations.

<u>Category</u>	<u>Weight/Cooked Claw</u>	<u>Count/pound</u>
Medium	less than 3.0 ounces	6-8
Large	3.0 to 6.0 ounces	3-5
Jumbo	over 6.0 ounces	2-3

## QUALITY ATTRIBUTES:

Cooking of the raw claws is scheduled immediately post-harvest. The recommended method of cooking is boiling for 8 to 10 minutes in non-treated, non-salted water, followed by direct immersion in an iced slush to stop cooking and remove heat from the claws prior to refrigeration. The average cook yield is 90 to 98% of the initial raw claw weight. Refrigeration and proper freezing does not reduce the cooked claw weight. Note, steam cooking is not recommended because it tends to dehydrate the claw meat.

**Cooked meat texture** should be firm and intact as a whole edible portion. The forearm and two knuckle segments of the claw all contain edible meat. The preferred cooked claw is completely filled with meat. Partially filled claws, which result due to the natural crab molting process, are known as "lights" or "floaters". "Lights" are an inferior product, which are usually culled from the production by reputable dealers.

**Meat color** will vary slightly from white to off-white fibers covered with a cream to pinkish sheath. Any black discoloration on the meat or at the soft, flexible hinge segments of the claw may denote poorly handled product. Any dark discoloration's, pitting and scars on the shell do not affect the meat quality. These shell discoloration's are simply changes that occur due to shell damage while in the natural environment.

**Meat flavor** should be a mild and pleasant crab taste easily complemented with sauces and dips. Any strong fishy or ammonia flavors or aroma denotes poor handling. A strong odor is usually accompanied by some discoloration and slippery or slimy feeling shells that indicate excessive shelf life.

### Recommended shelf-life:

- Fresh Cooked (Refrigerated, below 35°F) - 3-5 days
- Frozen cooked and Glazed (below 0°F) - at least 12 months
- Thawed, Previously Frozen Cooked (35°F) - 1-3 days (Best to serve immediately after thawing)

**Glazing** cooked claws with a coat of water is recommended to seal the claw with additional protection.

**Cracking the claws** is best performed just prior to serving. Each segment should be pre-cracked. Special instruments, crab crackers, with fulcrummed hinges are easy to use and require less effort. Also, use of wooden hammers is recommended as opposed to metal hammers that are more difficult to control and can damage the meat. The cracking sequence is "knuckle, knuckle, claw" with pressure or hammer applied to the outside or arched surfaces.

**Preparation and serving** are essential keys to maintaining stone crab claw quality. The pre-cooked claws are typically served pre-cracked and chilled. Prior to serving, the fresh or frozen claws should remain intact, not cracked. Frozen, glazed claws should be slowly thawed prior to cracking and serving. Twenty-four hours prior to serving put frozen claws into a draining basket and run cold water through claws for one hour. In room temperature allow claws to drip dry and drain for 30 to 45 minutes. After drainage, cover with ice and store in a walk in cooler. Make sure that the water can drain out of the bottom so that the claws do not lie in water.

Do not store fresh claws in closed plastic bags, which can cause development of off-flavors.

## PACKAGING:

Stone crab claws are commonly bulk packed by graded sizes in ploy-bag liners in waxed boxes. Common box sizes are 20 and 40 pounds. Fresh claws are packed with ice, and frozen claws are best stored with a glaze for additional protection. Frozen claws can also be packed in plastic bags for additional protection.

## LABELING:

Labeling and source information should accompany the primary packaged unit (i.e. box) and invoice. SFA recommends the label information should include:

**Product name**, Florida Stone crab claws with *Menippe mercenaria* optional. **Fresh** if cooked then refrigerated. **Frozen**, if cooked and frozen.

**Quantity designation** in net pounds of actual product less the weight of any ice, glaze or packaging materials.

**Size declaration**, i.e., medium, large or jumbo, optional.

**Name and address** of the manufacturer, packer or distributor

**Product of USA** if landed in the United States.

## REFERENCES:

1. Florida Department of Natural Resources, Marine Fisheries Commission Rule 46-13 and Section 2a [legal harvest size for Florida stone crab claws].

## Crawfish (Freshwater Crayfish)

### PRODUCT DESCRIPTION:

This code pertains to the red swamp crawfish or crayfish (*Procambarus clarkii*) and the White River crawfish (*Procambarus acutus acutus*). Both are native to the southeastern United States, but the red swamp crawfish accounts for the majority of the production. Although similar in cooked flavor and texture, the meat from the red swamp crawfish is thought to be preferred for the more reddish color (1). The red swamp variety has dark red sides and a reddish black upper portion in contrast to the light to brown shell coloration on the White River crawfish. The shell on both species turns red when cooked. For all practical purposes both species are harvested and marketed together as freshwater crawfish or crayfish.

### PRODUCTION:

Although harvested and farmed in many states, over 90% of the domestic crawfish production occurs in southern Louisiana and the Florida panhandle. Future production in Florida and other regions may introduce additional commercial species. It is important to note that farmed culture of the red swamp crawfish is not allowed east of the Apalachicola River in Florida.



The majority of commercial crawfish are caught in the wild, but due to the increasing demand, more of today's crop is being farm-raised. The season usually begins in December and runs through June with peak production months in March, April and May. Development for a year-round production system is underway and frozen products are available through all seasons. Crawfish from wild sources or farms are trapped in mesh cages placed on the bottom of a river or pond. Daily the traps are manually emptied into sacks (plastic mesh bags) that usually hold between 30-40 pounds. This initial form of packaging has proven most effective in preventing product damage due to the aggressive action of the crawfish. The mesh bag also allows proper airflow and refrigeration to prolong live shelflife.

The daily harvest is delivered alive for immediate processing. Basic processing steps can include washing, grading, cooking, cooling, peeling and packaging. These procedures require plant

certification by the respective state food processing authorities, which rely on their specific regulations and supplements from the FDA code for "good manufacturing practices" (2).

## PRODUCT TYPES:

**Live crawfish** are packed in mesh bags and graded for regular or select sizes

**Fresh or frozen** crawfish are available cooked (usually boiled) as whole forms or tailmeat, or whole, raw soft-shell crawfish. Frozen, uncooked product can be provided, but buyers should carefully judge for off-flavors and mushy cooked texture as a sign of prolonged storage.

## PRODUCT FORMS:

Daily harvest of live product and farmed production allows custom processing to suit buyer preference.

### **Common market forms and terminology:**

**Live Purged:** For purging after harvest, crawfish are placed in raceways of running brackish or fresh water without feed for 24-48 hours. This allows the crawfish to cleanse the digestive system for a more prolonged shelf life.

**Live Unpurged.** Live crawfish can be shipped directly from the pond; also known as pond run. This product form allows for immediate market response for fresh, ready-to-cook crawfish.

**Cooked:** Cooked crawfish are available with or without seasonings, as pond run, regular or select grades, either fresh or frozen.

**Tailmeat:** Cooked peeled and deveined tailmeat is available with or without "fat".

**Fat on Tailmeat:** Unwashed or 'fat on tailmeat' is available fresh or frozen during season and frozen for a limited time out of season. The "fat" is used as a flavoring ingredient for traditional recipes. A common pack contains approximately 100 tails per pound.

**Washed Tailmeat:** This common form can be sold fresh or frozen in season and frozen out of season. The most popular form is frozen washed tailmeat. A common pack contains approximately 125 tails per pound.

**Fat:** The so-called 'fat' is not a separate product form, but preferred as a flavoring portion with the tailmeat. The "fat" is really the hepatopancreas located in the head (cephalothorax) of the crawfish. This organ functions similar to the liver in other animals. The rich yellow-orange color and distinct flavor are traditionally expected in Cajun recipes, but mishandling or undercooking can lead to spoilage problems (see Quality Attributes).

**Soft-Shells:** Soft-shell crawfish are the whole crawfish recently shed from their hard exoskeleton. Shedding operations are designed to hold potential "shedders" until they molt, then they are removed from the water to stop the re-hardening process. The product yield is completely edible and the shedding process actually purges or cleans the product. Seasonal production is December through July, and frozen products are available year around. The dressed form is prepared by a cut behind the eyes to remove calcium deposits found near the front of the crawfish head. Whole forms should be dressed before preparation and consumption.

## SIZE AND GRADES:

The disproportional body to head growth for crawfish means the smaller and medium sized crawfish yield a higher amount of meat, relative to body size or weight, than the larger crawfish. This disproportional growth can vary depending on the sexual maturity of the crawfish.

Market size for red swamp crawfish is usually considered to be 3 inches and larger, measured from the end of the tail to the pointed rostrum on the head. This measurement does not include the length of the claws. An inch difference in measurement can distinguish a select, choice or giant sized crawfish from a regular or average size. Sizing by inches is not recommended in market selection.

Customary market orders are based on a count or number of whole crawfish to the pound (e.g., a 15 count is equal to 15 crawfish per pound; a 20-29 count averages 24 crawfish per pound). The average adult crawfish ranges from a 15 to 24 count. Crawfish larger than a 15 count (6-14 count) are usually considered choice or selects. Pond run is the term used to describe an ungraded product.

Crawfish larger than 24 count are considered "potential shedders or peelers" often used for the production of tailmeat.

Soft-shelled crawfish come in four basic sizes \*.

Count/pound	Soft shell crawfish terminology
13-19	jumbos, jumbo premiums
20-29	selects, premiums
30-40	primes, mediums
Fryers	Miscellaneous sizes and/or crawfish missing claws

■ Table 13 - Crawfish count/pound & terminology

\* Smaller subcategories may be offered by certain companies

## QUALITY ATTRIBUTES:

**Color** - Usually red swamp crawfish have dark red sides with a reddish black upper portion running the length of its body. When cooked it will turn bright red.

**Odor** - A fresh, clean smell should be evident. Crawfish with a musty or decomposed odor are of poor quality.

**Condition** - Crawfish are aggressive, especially to each other such that live crawfish should be shipped in containers that restrict movement. The mesh sacks commonly used are excellent. In addition, live crawfish should always be kept cool (40-45 degrees), with plenty of fresh air. They should not be stacked in a way that will restrict air circulation, and very importantly crawfish need a high level of humidity. Air in the cooler should be saturated with moisture or crawfish gills may dry out causing pre-mature mortality. Live crawfish should become more active at room temperature.

**Fresh meat** should be packaged and stored in ice. The packaging should prevent the melting ice from damaging the meat due to soaking or "water logging" the meat.

**Frozen crawfish** should be packaged in a way that will not allow air to enter or moisture to escape the package. Oxygen greatly increases the chance of spoilage. Also, prolonged frozen storage could result in some rancid-like flavors due to the high oil content (30-35%) in the 'fat'.

**Whole cooked crawfish** should have their extremities intact with their tail. Meat should be firm and intact. This is a sign of proper handling and denotes they were alive when cooked.

**Influence of 'fat'** - Avoid prolonged un-refrigerated exposure (can be within less than one hour) of the raw meat to the so-called 'fat' which can result in soft, mushy meat, raw or when cooked, due to natural active enzymes contained in the 'fat'.

**Live, Fresh, Frozen** - Experienced buyers will refuse substantial amounts of dead or poor quality crawfish. Crawfish that have been inadequately fed will have brown or black 'fat' or liver. Another sign may be that their tails are not fully filled out. High quality crawfish have bright yellow-orange fat and are greater than 3.0 inches in length.

## **LABELING:**

Product names should distinguish Red Swamp vs. White River, wild harvested vs. farmed, and domestic vs. foreign. Use of the FDA accepted market name, crawfish and correct scientific name, *Procambarus clarkii* is recommended.

**Quantity designations** should declare counts and must accurately state the net weight of the packaged contents.

**Name and Address** of manufacturer, packer or distributor must be clearly displayed.

**Ingredients**, if present as spices any preservatives, etc., then listed in descending order (weight basis) according to the amount present.

## **REFERENCES:**

1. Marshall, G.A., M.W. Moody and C.R. Hackney. 1988. Differences in color, texture and flavor of processed meat from Red Swamp crawfish (*Procambarus clarkii*) and White River crawfish (*P. acutus*). J. Food Science 53(1) 280-281.
2. Code of Federal Regulations. Title 21, Part 110-Good Manufacturing, Processing, Packaging or Holding Human Food, (Revised 6/19/86).

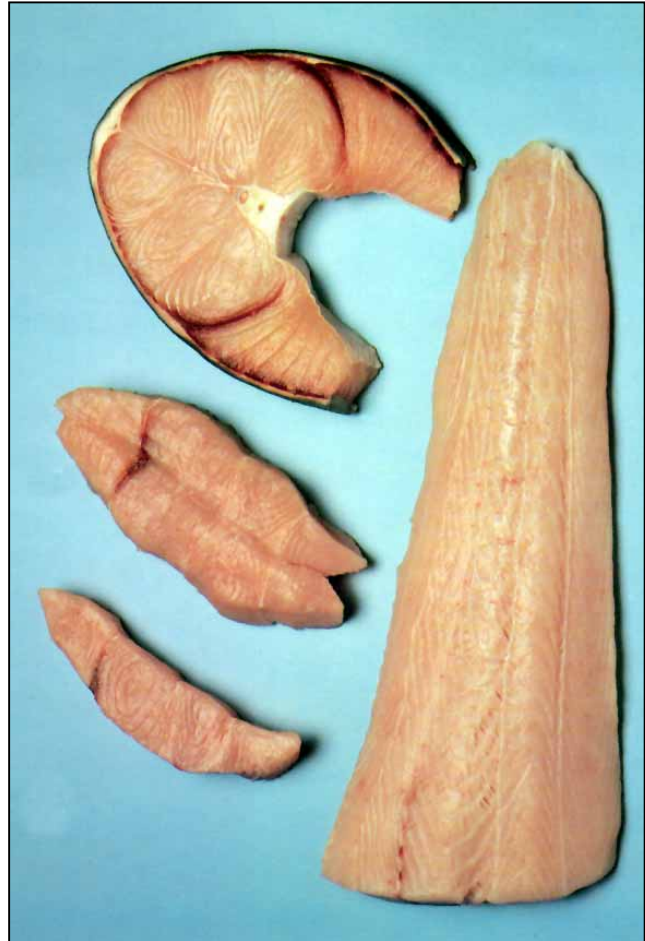
## Shark

### PRODUCT DESCRIPTION:

In this code, sharks refer to the large elasmobranches caught in the South Atlantic and Gulf of Mexico. Individual species (Table 14) have identifiable characteristics, yet they are collectively described as lean, white fleshed fish with a unique taste and texture (usually firmer) that differs from other white-fleshed fish.

### PRODUCTION:

Sharks are taken throughout the world with a variety of different gear types. The most common types of gear utilized are gill nets and longlines, although they are also harvested with seines, trawls, handlines and as an incidental catch in other fisheries. Because of the special handling required to ensure quality products, buyers are encouraged to inquire about the fishing gear utilized to harvest the shark. Typically, sharks should be landed alive to ensure good initial quality.



### NOMENCLATURE PROBLEMS:

Shark species are extensive, yet with the exception of only a few species, they are easily distinguished from other types of fish. Buyers should note that mako sharks command a higher price in the marketplace because of their similarity to swordfish. Mako sharks can be distinguished from swordfish by the blood line which is oval shaped in whole steaks from mako's and shaped like a lazy "Y" in swordfish steaks.

Popular southeastern shark species and common nomenclature used to distinguish the various markets types. FDA's guide to acceptable market names for fish recommends the use of the listed market or common names.<sup>1</sup>

Common Name	Scientific Name	Market Name
<b>Small Inshore/Shelf Sharks</b>		
Atlantic sharpnose shark	<i>Rhizoprionodon terraenovae</i>	Shark
Blacknose shark	<i>Carcharhinus acronotus</i>	Shark

<sup>1</sup> Food and Drug Administration, 1989. "The Fish List". Available from FDA Center for Food Safety and Applied Nutrition, Washington, DC 20204

Blacktip shark	<i>Carcharhinus limbatus</i>	Shark
Finetooth shark	<i>Carcharhinus isodon</i>	Shark
Smooth dogfish	<i>Mustelus canis</i>	Shark
Spinner shark	<i>Carcharhinus brevipinna</i>	Shark
<b>Large Offshore Sharks</b>		
Longfin mako shark	<i>Isurus panucus</i>	Mako shark
Shortfin mako shark	<i>Isurus oxyrinchus</i>	Mako shark
Night shark	<i>Carcharhinus signatus</i>	Shark
Oceanic whitetip shark	<i>Carcharhinus longimanus</i>	Shark
Silky shark	<i>Carcharhinus falciformis</i>	Shark
Thresher shark *	<i>Alopias vulpinus</i>	Thresher shark
White shark	<i>Carcharodon carcharias</i>	Shark
<b>Large Inshore/Shelf Sharks</b>		
Bull shark *	<i>Carcharhinus leucas</i>	Shark
Dusky shark	<i>Carcharhinus obscurus</i>	Shark
Lemon shark	<i>Negaprion brevirostris</i>	Shark
Sandbar shark	<i>Carcharhinus plumbeus</i>	Shark

■ Table 14 - Popular Southeastern Shark Species

\* Market preference less than 100-pound carcass weight.

## PRODUCT TYPES:

Sharks are available both fresh and frozen and in a variety of market forms depending on buyer preference.

**Whole carcasses** are commonly purchased fresh with head, gills, viscera, fins and belly flap removed. They are also available as frozen whole butchered carcasses.

**Fillets** are usually one whole side of the shark with the backbone removed. They are usually provided with the skin to off because the large amount of blood vessels found immediately adjacent to the skin can cause quality problems.

**Steaks or wheels** are usually cut from fillets or whole fish and usually have the skin attached. Steaks are cross-section cuts of fillets or loins. Wheels are cross-sectional cuts of the entire carcass.

## YIELDS:

Based on whole butchered carcass weights, the yield of fillets (skin off, backbone removed) can range from 60 to 70% depending on the species and size of the individual fish.

## SIZE AND GRADES:

There is no legal grading requirements for sharks, however, buyers should be aware of the fact that smaller carcass sizes typically have lower yields and very large sharks can suffer from textural problems associated with a large amount of connective tissue. Generally, whole carcass weights of 30 to 100 pounds are preferred depending on the species purchased.

Species identification is almost impossible on sharks, particular in butchered forms. Identity by species is not critical for most species because the popular sharks have similar edibility characteristics (Table 14). Knowledgeable buyers should not accept certain sharks. These include

hammerheads, bonnetheads, tigers, nurse and large bull sharks. These are usually distinguished by the pinkish color of their meat, tougher texture and off flavors.

## **QUALITY ATTRIBUTES:**

Unlike most food fish, the muscle and blood of elasmobranchs has a higher concentration of non-protein nitrogen compounds (NPN) (i.e., urea, trimethylamine oxide (TMAO), creatine, certain amino acids, etc.). These NPN compounds are also produced by the boney fishes, but in most fish these compounds are less concentrated and eliminated as waste products. The more primitive kidney system in the shark retains some of these compounds to increase the body salt levels such that the shark can survive in a saltwater environment.

When a shark dies, the NPN compounds can be rapidly changed into odorous compounds with objectionable taste. Urea is converted to ammonia and TMAO is reduced to trimethylamine (TMA). These changes are caused by the chemical action of specific enzymes, urease and TMAO reductase, respectively. Studies have shown that only minute quantities of these enzymes are present in the muscle tissue. Thus, before spoilage begins certain types and amounts of bacteria, which begin to grow on the surface of the shark must produce these specific enzymes. These bacteria can include certain psychrotrophic types (cold temperature tolerant) which continue to slowly grow and produce the enzymes even in the presence of ice.

Experienced fishermen know to bleed the sharks immediately after harvest so as to reduce the amount of troublesome NPN compounds in the edible muscle. This is one primary reason a live harvest is preferred.

If urea and TMAO has not been partially removed from the flesh and initial spoilage has begun, freezing cannot preserve the quality of the shark. The products of enzyme activity will continue to accumulate causing odors, which could contaminate the freezer and other frozen products.

As spoilage progresses, the accumulation of ammonia and other spoilage products will cause the pH of the shark flesh to increase. The muscle pH of fresh caught, well-iced shark is near 6.0, whereas the ammoniated, spoiled shark has a muscle pH equal to or greater than 9.0. The first detectable changes in pH occur at cut surfaces, mainly where the head has been severed from the body. Using this basic information, researchers have tried to develop simple pH scales for monitoring shark quality.

Organic acid solutions (i.e., lactic acid, citric acid [lemon juice] and acetic acid [vinegar]) are thought to neutralize the basic ammoniation compounds, remove urea, decrease bacteria and prevent enzyme activity. These acids also provide some firming of the flesh. When using such acids, excessive concentrations or prolonged soak time could impart bitter tastes. Thus, acid soaks can offer advantages, but they are not recommended without careful applications to yield an acceptable product.

The preferred shark meat is white and tender. The color of shark meat will vary per species. The pink-red or darker colored flesh has a higher concentration of NPN compounds, stronger taste and spoils more rapidly. If the darker colors cannot be leached from the flesh, then fishermen may want to avoid harvesting such species. Similarly, the texture of shark meat will vary with species and size. Larger sharks typically have a slightly tougher texture, but not necessarily an objectionable texture. Regardless of species or size, careless handling can cause adverse textural changes. Tossing, bruising, gauging and excess pressure on the carcass can cause meat separation known as gapping. This problem is further accentuated with poor icing and/or improper freezing, thawing and refreezing practices.

## PACKAGING:

Fresh shark should be packaged to maintain a meat temperature of 32°F. Frozen shark should be packaged to prevent exposure to air and stored at -10°F and never above 0°F. Package units or boxes vary from wooden and corrugated to styrofoam and plastic. Air freighted shipments must be packed with some form of dry or dissipating (dry ice) refrigeration which is packed in such a manner to prevent leakage, odor emission or product dehydration. Vacuum packing can be used with shark; but care should be taken to ensure a 32°F shipping temperature. Vacuum packed shark should be opened and allowed to breathe before organoleptic evaluations for quality.

**SPECIAL NOTE:** The U.S. Food and Drug Administration has established maximum levels for methylmercury occurring in fish as one part per million (1.0 ppm). Prior data suggest some larger sharks may exceed this federal action level, but there has never been an incident of mercury poisoning resulting from consumption of shark. Likewise the safety assessments used to set the 1.0-ppm limit assure the typical consumer should not be alarmed by methylmercury in shark. FDA agents can request samples of fish to test for mercury. If there is a confiscation of fish because of alleged methylmercury contamination, buyers should contact their suppliers for information.

## LABELING:

Labeling for whole carcasses, fillets and steaks is usually listed on the invoice and on a card or slip accompanying the product. The following information should be listed on the label:

**Product name** or identity assuring proper species identification (i.e., lemon shark, silky shark, longfin mako shark, etc.). Use of scientific names is also encouraged.

**Quantity designation**, which refers to the total net weight of whole carcasses, fillets and steaks, contained in the package.

**Name and address** of the packer or distributor.

**Ingredients** (rarely used with shark) if present, then listed in descending order according to the amount (weight basis) present.

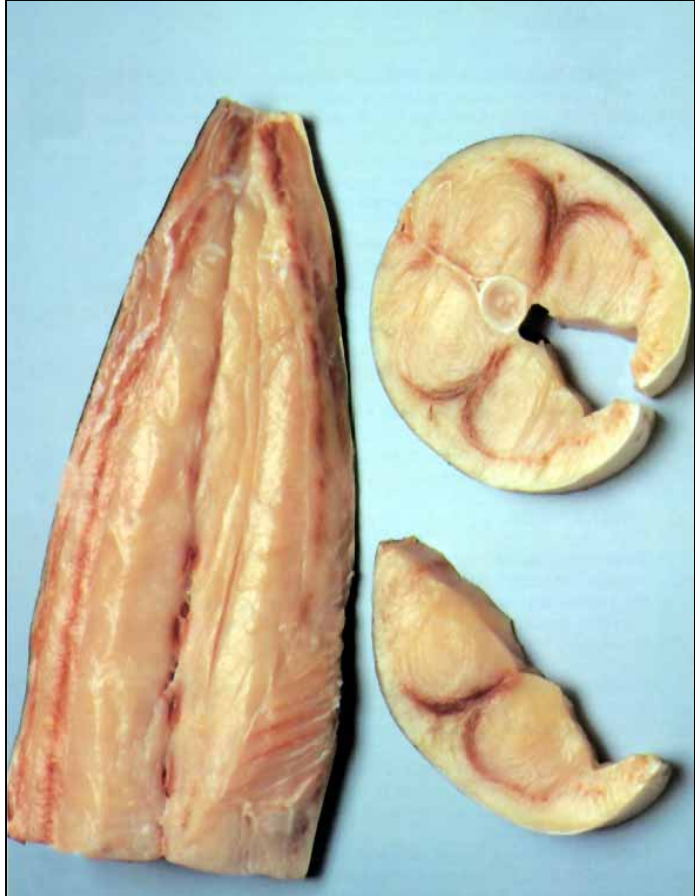
**Fresh or frozen** to indicate if the product was previously frozen and/or thawed.

**Country of origin** - SFA encourages suppliers to list the country where sharks were caught and/or landed.

## Swordfish

### PRODUCT DESCRIPTION:

Swordfish (*Xiphias gladius*) is considered a single species over its worldwide distribution in temperate and tropical areas of the world. In the Atlantic, they range from Newfoundland to Argentina including the Gulf of Mexico and Caribbean Sea. The body is dark above and pale below with a silvery iridescence of the unscaled skin. The caudal peduncle (narrow body portion before the tail) has one broad horizontal keel. This keel is useful in distinguishing a cut swordfish carcass from a similar tuna carcass.



### PRODUCTION:

Live swordfish are harvested with pelagic longlines, harpoons and entanglement nets, however, the majority of swordfish in the South Atlantic and Gulf of Mexico are caught with longline gear.

Longlines used for swordfish are basically a mainline placed over several miles which is supported in the water by floats and lines from which a number of baited hooks are suspended. The lines are retrieved within the day they are set and each swordfish receives immediate individual attention. The fish are butchered and chilled immediately after landing on deck. Individual attention from catch through butchering and eventual delivery is essential for these relatively large fish.

### PRODUCT TYPES:

Swordfish can be purchased fresh or frozen in a variety of forms and packaging methods.

### PRODUCT FORMS:

**Whole carcasses** are commonly purchased fresh with head, gills and viscera removed, and the belly cavity split and anus removed. The skin and "collarbone" at the head of the carcass should remain intact to support the body meat, thus preventing gaping within the meat during rigor or shrinkage of the muscle tissues.

**Chunks or sections** are longitudinal sections cut from the whole carcass usually of larger fish. Available fresh or frozen, the chunks are further distinguished as front, center or tail cuts.

**Halves** are one half of the whole fish with the backbone and "collarbone" removed. Halves are available fresh or frozen and further subdivided as full halves, front, center and tail sections. All sections have skin-on.

**Loins** (quarters) are a quarter portion of the whole swordfish or half of one side portion which can be provided as full loins which run the length of the carcass, or half loins which are divided into top, bottom and front or rear sections. All loins, fresh or frozen, can come with the skin attached to help identify the product and to prevent gaping in the meat.

**Wheels** are longitudinal cross-sectional cuts from the whole fish, available fresh or frozen. They can be provided in various thicknesses depending on buyer preference. They come with skin attached to protect the meat texture.

**Steaks** are usually cut from halves or quarters of the swordfish carcass depending on buyer preference. They are provided fresh or frozen and should be packaged for protection from air, water exposure, and physical damage during handling. Steaks are available in various thicknesses depending on buyer preference.

### **SIZE AND GRADES:**

Swordfish range in whole body or carcass size up to 1,000 pounds. Whole swordfish are generally graded according to weight with larger sizes commanding a premium price. The terminology used for size descriptions is based on 100-pound increments for large fish. Thus, 100-pound carcasses are called markers, 200-pound carcasses double markers, etc. Likewise, common commercial grades include 25 pounds increments for fish under 100 pounds (i.e., 0 to 25, 25 to 50, 50 to 75, 75 to 100).

### **YIELDS:**

Based on the original whole carcass weights, the total yield of halves and loins is 70-85%. The yield is less for smaller swordfish and depends on careful cutting and trimming.

### **QUALITY ATTRIBUTES:**

Color and taste of swordfish depends on prior feeding habits, the fish age, and product handling from the water to the table. Swordfish flesh can be orange, pink or white in color. Some people feel the pink or orange flesh is superior, however, after cooking, all properly handled swordfish flesh has the same taste and colors (off-white).

The skin is always left on swordfish and can be used to judge quality iridescent silvery colors on the skin tend to be washed off as the fish ages. Careful attention should be given to the evaluation of the skin when product is received. Damage can occur if the fish is mishandled. Cuts and punctures in the skin, distinct areas of discoloration, and bruising indicate poor handling.

Odor from fresh or frozen swordfish is not strong, fishy or oily. It should have a smell associated with fresh seawater.

Swordfish have a pronounced blood line, obvious in whole steaks or wheels, which is shaped like a lazy "Y" Good quality halves, loins and steaks will have a pink to reddish colored blood line. As the fish ages or is improperly handled the bloodline becomes darker and brownish in appearance.

The texture of swordfish should be firm, and cut surfaces should be clean and clear of ragged edges. Swordfish are susceptible to certain parasites and these should be removed before cooking. Rarely, a percentage of swordfish appear to have meat with a rubbery, jelly consistency. The meat in fish with this condition appears to be translucent with a texture like set gelatin. This is

thought to be caused by a natural infection with a unique type of microbial organism. Allowances should be sought from suppliers on the rare occasion that a jellied fish is received. Easy detection usually assures these fish will not be sold.

## **PACKAGING:**

Fresh, whole swordfish should be packed to maintain internal meat temperatures of 32°F and the belly cavities need to be packed with ice to maintain this temperature. Air freighted shipments must be packed with some form of dry or dissipating (dry ice) refrigeration which is packed in such a manner to prevent leakage, odor emission or dehydration. Vacuum packaging is often used for halves, chucks, loins and steaks. Steaks can be portion-controlled, but expect to pay more for this service. Vacuum packed swordfish should never be maintained above 35°F. Product carefully maintained between 28°F and 32°F is considered super-chilled. Frozen product should be stored at -10°F and never above 0°F.

## **LABELING:**

Labeling for whole swordfish and its various alternative product forms is usually listed on the invoice and a card or slip accompanying the product. Additionally, whole fish are individually labeled with net weights and a code for the vessel of harvest. The following information should be included on the label:

**Product name or identity** - Swordfish (*Xiphias gaidius*). Use of the correct common name is required and the scientific name is recommended.

**Quantity designation** refers to the total net weight of the packaged contents and may list the individual net weights of each individual fish or section. Weight of the container, ice, refrigerant or any packing material is excluded from this quantity designation.

**Name and Address** of the packer or distributor

**Ingredients** (rarely, if ever, used with swordfish) if present, then listed in descending order according to the amount (weight basis) present.

**Fresh or frozen**, if the product has been previously frozen.

**Country of origin** - SFA encourages suppliers to list the country where the swordfish were caught and/or landed.

**SPECIAL NOTE:** The U.S. Food and Drug Administration has established maximum levels for mercury occurring in fish as one part per million (1.0 ppm). While there has never been an incident of mercury poisoning resulting from consumption of swordfish, some very large swordfish may be above this action level. FDA agents may request samples of fish to test for mercury. If there is a confiscation of fish because of alleged mercury contamination, buyers should contact their suppliers for information.

## Spanish Mackerel

### PRODUCT DESCRIPTION:

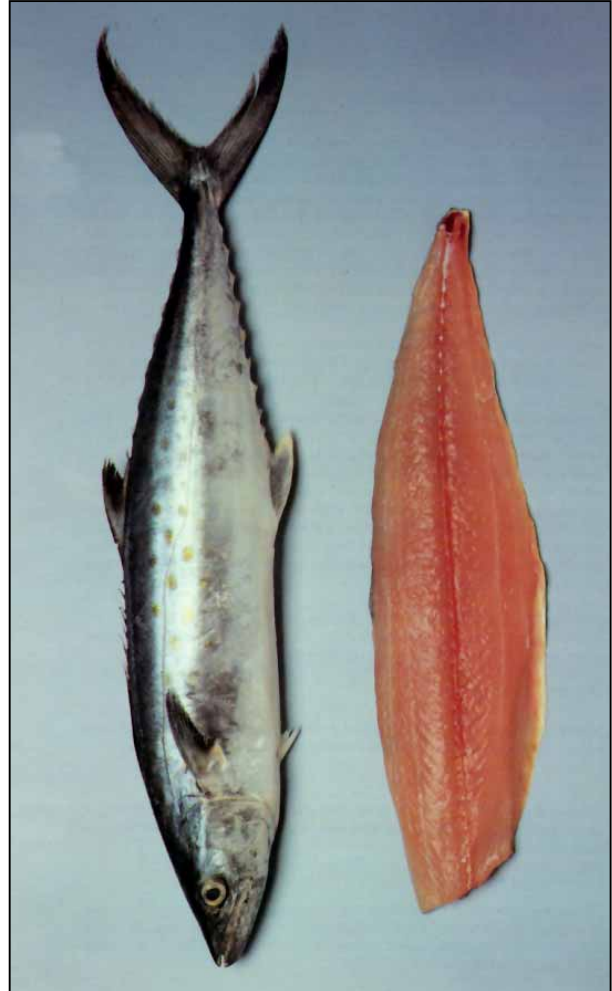
Spanish mackerel (*Scomberomorus maculatus*) are semi-tropical mackerels closely related to king mackerel (*Scomberomorus cavalla*) and cero mackerel (*Scomberomorus regales*). While they have a relatively high fat content, they do not have the strong mackerel flavor associated with temperate mackerel species such as the Atlantic mackerel, (*Scomber scomberus*). The fish is bluish above and silvery to whitish below with many large dark brown and brassy spots. It has a pronounced lateral line that slopes evenly downward across the length of the fish. This slope distinguishes the Spanish mackerel from the king mackerel, which has a lateral line with a marked downward incline below the second dorsal fin.

### PRODUCTION:

Spanish mackerel production is considered a nearshore, day fishery. The fish are harvested from the Chesapeake Bay to Florida in the South Atlantic and in the entire Gulf of Mexico. Most commercial production occurs on the Atlantic and Gulf coasts of Florida; however, smaller amounts are harvested in the Carolinas, Texas, Louisiana, Mississippi and Alabama. Gill nets are the primary method employed to harvest Spanish mackerel, although hook and line also take a small amount of usually larger individuals. The fishery for Spanish mackerel is usually practiced in relatively shallow coastal waters and the fish are iced immediately onboard and off-loaded at the dock on the day of the catch. The minimum legal size is set at a 12 inch fork length (tip of the nose to the fork in the tail) and the fishery is regulated under a quota system with production in late fall and early winter months. This species receives considerable regulatory, management attention; thus buyers should inquire about available supply.

### PRODUCT TYPES:

Spanish mackerel are available both fresh and frozen, however, because most of the production occurs seasonally, large quantities of the Spanish mackerel quota are usually frozen.



## PRODUCT FORMS:

**Whole** forms are the entire fish intact as it comes from the water. They are usually available as frozen products during the fall and winter months.

**Whole, drawn** forms have the head, fins and gills intact, and the viscera or guts removed. These are usually available fresh; however, some product may be available frozen.

**Fillets** are the most common market form for large institutional buyers and are available fresh or frozen. Fillets are usually sold with skin-on and rib bones out. For additional costs buyers can request removal of pin bones which are not a problem in mackerel.

**Steaks** from Spanish mackerel can be cut as cross-sections of the whole fish. Steaks can vary in thickness depending on customer preference. Steaks are usually cut from larger whole fish.

## YIELDS:

Form	% of original whole fish weight
Whole drawn form	90%
Steaks	80%+
Fillets	67%

■ Table 15 - Spanish Mackerel Yields

## SIZES AND GRADES:

Whole Spanish mackerel usually range in size from 1 pound to 6 or more pounds. The most common size category is 1 to 2 pounds. While there is no legal size designations, whole Spanish mackerel are usually graded by size in half-pound increments (i.e., 1 to 1 1/2 pounds, 1 1/2 to 2 pounds, etc.). Fillets can be ordered as distinct size categories usually in 2-ounce increments (i.e., 4-6 ounces, 6-8 ounces, 8-10 ounces, etc.). Fish yielding fillets larger than 12 ounces are usually cut for steaks.

## QUALITY ATTRIBUTES:

The best method for judging quality in whole Spanish mackerel and fillets is subjective organoleptic evaluations (nose, eye and touch). Prior to these evaluations the fish should be rinsed and allowed to "breathe." This preparation is most important for packaged or wrapped fillets. As for all seafood, initial packaged odors and appearance do not always signify quality, but result from the static atmosphere in the packaged material.

Appearance for fresh whole or drawn Spanish mackerel should be clean with clear full eyes, pink to red gills with no excessive slime or debris. The skin should appear brightly clean, fins should not be dehydrated. There should be no fishy odors and the flesh should feel firm to the touch. Fresh or frozen fillets should be cut smooth with no ragged edge surfaces or gaping and should be trimmed of all viscera and belly flaps. During temporary storage or thawing, the fillets should not be allowed to soak in melt water, which can result in off flavors. The meat should be firm and skin should not feel extra slimy. The color of the meat is grayish, however, chalky meat can indicate spoilage and dehydration (freezer burn).

## PACKAGING:

Fresh, whole Spanish mackerel are placed or layered in containers in direct contact with ice. Units are commonly packed with 50 or 100 pounds of fish and can be wooden, corrugated or water impermeable boxes. Fresh mackerel should not be soaking in melt water, but exposed to the rinse

of slowly melting ice. Air freighted shipments must be packed with some form of dry or dissipating (dry ice) refrigeration which is packed in such a manner to prevent leakage, odor emission or product dehydration.

Frozen, whole Spanish mackerel can be packed in 25 to 50 pound units with poly-liners, an ice glaze and overwrapped.

Frozen fillets are usually individually wrapped and packed in 10, 15 or 20 pound shatter-pack containers, while fresh fillets are usually packed in 10 pound poly-trays. The fillets can be packed in cellophane or plastic poly-wraps. Regardless of packaging methods, the internal product temperature for the fish or fillets should be close to 32°F. and never above 40°F Frozen product should be at -10°F. never above 0°F

## **LABELING:**

Packaged units and/or accompanying invoices should contain at least the following information:

**Product name or identity** - FDA approved market name is Spanish mackerel, and use of the scientific name, *Scomberomorus maculatus* is recommended with the market name.

**Product form** - label as whole, fillets, steaks, fresh or frozen

**Quantity**- list total net weight, usually in pounds. Also counts (number of individual fish per 100 pounds) or size grade for whole fish (1 to 1 1/2 pounds, 1 1/2 to 2 pounds, etc.) or fillets (4-6 ounces, 6-8 ounces, etc.) can accompany the net weight declaration.

**Name and Address** of the packer or distributor.

**Ingredients:** if present, then listed in descending order (weight basis) according to the amount present.

**Country of Origin** - domestic vs. foreign sources

## King Mackerel

### PRODUCT DESCRIPTION:

King mackerel (*Scombermorus cavalla*), also called kingfish and kings, are the largest mackerel in the western Atlantic. They can reach a maximum length of 5 feet and a maximum weight of 100 pounds. The size of the fish led to the species name, cavalla, derived from the Spanish word for horse.

The fish is iron-gray along the back, silvery on the sides and belly with pale to dusky fins. Small king mackerel (approximately 2 pound whole weight) may have spots along the sides like Spanish mackerel (*Scombermorus maculatus*); however, the king mackerel can be distinguished by the lateral line which declines sharply below the second dorsal fin and also the color of the anterior dorsal fin, which is gray instead of black.

### PRODUCTION:

King mackerel is usually considered a nearshore day fishery. The fish are harvested from the Chesapeake Bay to Florida in the South Atlantic and in the entire Gulf of Mexico and Caribbean. Commercial production is centered in the Carolina's, the Atlantic and Gulf coasts of Florida and along the Louisiana Gulf coast. King mackerel are harvested using gill nets and hook and line. The fishery usually occurs in relatively shallow coastal waters and the fish are immediately eviscerated, iced onboard and offloaded at the dock after one or two days fishing. The minimum legal size is set at 12-inch fork length. The fishery is regulated under a quota system with major production occurring from October to May. However, some fish are usually available in the summer months as well.



### PRODUCT TYPE AND FORMS:

**Whole drawn:** Head fins, gills and roe intact with guts removed. These are available either fresh or frozen and are most common product forms in the fishery.

**Steaks & Fillets:** Both fresh and frozen types can also be ordered, however, because the fish holds up better in storage with the head and body intact, these cuts are usually considered specialty items.

### YIELDS

**Whole drawn (gutted):** 100% of original body weight

**Steaks:** 80%+

**Fillets:** 60-65% depending on workmanship, season and size of fish

## SIZES AND GRADES

While kingfish can range in size from 1 pound to 100 pounds, they are usually broken down into three size categories: whole fish less than 20 pounds, fish weighing 20-40 pounds, and fish over 40 pounds (locally in Florida called "smokers").

## QUALITY ATTRIBUTES

The best method for judging quality in whole king mackerel is subjective, organoleptic evaluations (appearance, odor and taste). Prior to these evaluations the fish should be rinsed and allowed to "breathe". As for all seafood, initial packaged odors and appearance do not always signify quality, but result from the static atmosphere in the packaged material.

Appearance for fresh drawn king mackerel should be clean with clear full eyes, pink to red gills with no excessive slime or debris. The skin should appear bright and clean, and the fins should not be dehydrated. There should be no fishy odors and the flesh should feel firm to the touch. The meat should be firm and the skin should not feel slimy. The color of the meat is grayish, however, a chalky and dehydrated appearance on the meat surface or edges can indicate spoilage and freezer burn. Frozen whole drawn king mackerel should remain solidly frozen during storage. Again check for freezer burn or product damage which may result from mishandling.

## PACKAGING

Fresh, whole king mackerel are placed or layered in containers in direct contact with ice. Units are commonly packed with 60 to 100 pounds of fish in wooden, corrugated or water impermeable boxes. Fresh king mackerel should not be left soaking in melt water, but exposed to the rinse of slowing melting ice. Air freighted shipments must be packed with some form of dry (i.e. gel packs) or dissipating (dry ice) refrigeration which is packed in such a manner to prevent leakage, odor emission or product dehydration. Frozen, whole king mackerel can be packed in 60 pound units with poly-liners and an ice glaze. The internal product temperature for fresh fish should be close to 32°F and never above 40°F. Frozen product should be at -10°F and never above 0°F.

## LABELING

Packaged units and/or accompanying invoices should contain at least the following information:

**Packaged name or identity:** FDA approved market name, King mackerel. Use of scientific name, *Scomberomorus cavalla* is recommended with the market name.

**Product form:** Whole, fillets, steaks, fresh or frozen.

**Quantity:** Total net weight - usually in pounds, size grade for whole fish can accompany the net weight declaration.

**Name and address:** Packer or distributor.

**Ingredients:** If present, then listed in descending order according to the amount present (weight basis).

**Country or origin:** SFA recommends listing for the domestic vs. foreign sources.

## Striped Bass

### PRODUCTION DESCRIPTION:

Farm-raised hybrid striped bass are a cultured variety of a genetic cross between striped bass (*Morone saxatilis*) and white bass (*Morone chrysops*). The resulting hybrids retain the attractive appearance and edibility of the traditional, popular striped bass with the hardier, fast growing character of the deeper bodied white bass. This desirable cross was originally developed in the 1960's to help enhance the decreasing commercial and recreational catch for striped bass. Now increasing demands for flaky, white flesh fish and improving culture technologies are advancing the farmed production of the hybrid striped bass. The hybrids are easily distinguished from their ancestral striped bass due to the deeper body profile and unique broken line pattern of dark strips along each side. Likewise, the edible character of the hybrid is suitable to a wider market demand than for the limited supply of traditional striped bass.

### PRODUCTION:

Although some wild harvested striped bass are available, the major consistent commercial source will continue to be farm-raised hybrids. Initially production was centered in California, but now exists throughout the southeast from Texas through Maryland and in a few state locations outside the southern region. Currently, production depends on farm stocking with fingerlings (juvenile fish) produced annually during the natural spring and early summer spawning season for striped bass and white bass. The increasing availability of fingerlings supports production of an annual supply of edible fish. Culture methods include tanks, raceways and/or ponds of vary sizes all located, designed and monitored for consistent water quality. The fish are fed special diets formulated to promote growth and to yield desired flavor, color and aroma. As the fish grow they are periodically sorted by size and separated to assure product size uniformity.

### PRODUCT TYPES:

This code primarily describes fresh, ice packed and fresh, frozen hybrid striped bass products. Currently, purged fresh-harvested and ice-packed bass is the primary product type provided by farmers. Purging prior to harvest involves holding the live fish without feeding for 24 to 48 hours or



more so as to cleanse the digestive tract. This condition is more conducive to handling and storage in the whole, noneviscerated form.

The live harvest is killed by an immediate, direct submersion in an ice slush that chills and washes fish. This procedure is ideal for further processing to fresh or truly fresh-frozen product forms.

This code does not describe specialty product types, but notes the hybrid striped bass texture and mild flavor is ideal for use in a variety of specialty products (i.e., breaded, smoked, pre-seasoned, stuffed, etc.)

## PRODUCT FORMS:

**Whole fish**, noneviscerated is the principal market form provided by the farmer. It is recommended that the noneviscerated form should be purged prior to harvest so as to help extend fresh shelf-life. The eviscerated, whole form can be provided with head-on or headless depending on intended use. A head-on whole form is recommended for retail displays that want to show the eye clarity and characteristic bass body form.

**Fillets** can be cut with skin-on or skinless, and rib-bones in or removed. Skin-on fillets can be useful in species identification and they provide an attractive striped appearance. Additional product forms can be provided on request with pricing to account for extra processing and handling costs.

## YIELDS:

The percentages represent the approximate remaining weight of the product form relative to the initial weight of the whole, live hybrid striped bass (100%). Yields will vary due to fish size and workmanship. Larger yields can be expected for the larger fish.

	Yields
Whole, round form noneviscerated	100%
Whole, round form eviscerated	90-95%
Whole, headless eviscerated	75-80%
Fillets, skin-on	38-42%
Fillets, skin-off	30-34%

■ Table 16 - Striped Bass Yields

## SIZE AND GRADES:

During the grow out phase of culture the hybrid striped bass can be sorted and segregated by size to assure uniform growth and product size. This practice allows custom sizing to suit buyer preference. The common range in whole fish size is 1 to 3 pound fish usually sold in 1/4 or 1/2pound increments. These whole fish will yield fillets ranging in size from 3.5 to 10 ounce, but the popular fillets sizes are 6 to 8 ounce.

## QUALITY ATTRIBUTES:

**Appearance** for whole hybrid striped bass should be clean, full bodied with firm skin, clear eyes, pink to red gills with no excessive slime or debris. Scales should be clean and intact. The surface should be free of any gouges or breaks in the skin. The skin and muscle tone should be firm and returning to shape when indented with finger pressure.

The distinct broken, black strips along each side will vary in pattern and the skin colors and hues will vary per farm. These variations are expected and do not denote inferior products.

**Packaging** for whole bass is common boxing with ice and/or chill packs depending on the size of the order. Likewise, hybrid striped bass, fresh or frozen are conducive to all customary forms of packaging, i.e., boxed, styrofoam, wrapped, bagged, vacuumed, etc. In all cases the packaging should demonstrate careful handling.

## NOMENCLATURE

Nomenclature of hybrid striped bass can be confusing. The U.S. Food and Drug Administration chose "Bass" as the recommended acceptable market name for these hybrids and "sunshine bass" as the recognized common name. According to their "official" Fish List (1) these hybrids can be labeled by their market name and/or their actual scientific name (*Morone chrysops* and *saxatilis*). Commercial practice and some company trademarks have introduced additional names, e.g., golden sunshine bass, mountain bass, etc. These common names introduce product descriptions and regional preferences but should not be confused as separate species.

## LABELING:

Packaged units and/or accompanying invoices should contain at least the following information.

**Product name** or identity, as recommend by this SFA code, should be stated as hybrid striped bass. By FDA guidelines (1) the official market name for hybrid striped bass can be simply 'bass' and the designated common name is "sunshine bass". FDA advises use of either the acceptable market name or common name in labeling these fish products.

**Quantity** designations should only refer to the total or net weight of the hybrid striped bass forms in the container. Pounds is the common unit of designation and kilograms have been used in foreign commerce (exports). Also counts (number of individual fish forms per a designated weight) can accompany the net weight declaration.

**Name and address** of the manufacturer (farmer), packer or distributor. (In some instances state regulations may require listing the aquaculture permit number).

**Ingredients** if present, then listed in descending order (weight basis) according to the amount present. Hybrid striped bass are usually free from any residues or additives that would require labeling.

**Special labeling** may be required in certain states to distinguish the cultured hybrids from wild bass caught by commercial or recreational fishermen. The labeling may be as tags or marks to deter illegal trade in poached wild stripers or similar species. This special labeling assures the quality associated with cultured hybrids.

## REFERENCES

1. FDA "Fish List", 1988, FDA Division of Regulatory Guidance, 200 C Street, SW, Suite 5001, Washington, DC 20204.

## Tilapia

### PRODUCT DESCRIPTION:

Tilapia (Ti-la-pe-a) is a diverse group of fish common to most subtropical and tropical countries of the world. Although Tilapia have been produced in some natural harvest, certain tilapia species are ideal food fish for farm-raised production. These fish exhibit hardy, disease resistant growth when fed grain-based, pelleted diets under the high stocking rates typical of ponds, raceways or tanks. Some farms are introducing a variety of natural feeds to reduce production costs, thus utilizing the versatile diets of tilapia. Culture of tilapia with managed water quality, feeding, harvest and spawning programs guarantees the buyer consistent size, flavor, wholesome- ness, nutritional value and freshness. In most instances farmers custom harvest to satisfy buyer preference for product form and weight. Tilapia production through custom harvest can provide buyers a dependable supply of a food fish with quality assurance. Both natural harvest and farm raised tilapia can be excellent selections, but they should be distinguished in requests.



### PRODUCTION:

Natural tilapia harvest occurs about inland waters where the fish have become established in lakes and other freshwater habitats. They are primarily harvested with cast nets. Annual production has been nearly 6 million pounds.

Farmed-raised tilapia production includes both pure, single species and hybrids of several species. A popular pure species is the blue tilapia (with bluish, black skin color). Current production trends are striving to increase edible yield, weight gain and attractive appearance through the development of hybrids. Most hybrids are distinguished by golden or red skin colorations.

Domestic farmed tilapia production in 1990 is expected to range from 6 to 10 million pounds (whole fish weight). (1). Future predicted production in the U.S. alone has been estimated to exceed 120

million pounds. Established farms are favored by the warmer regions of the southeast where culture operations are staged to produce edible fish through all seasons. The average time for growth from fry to edible fish is 8 to 9 months. Constant monitoring of the diet and water quality are essential to assuring efficient growth and product quality. A "purge" or exposure (3 to 10 days) to clean water with limited or no feeding prior to harvest is a common industry practice that provides the better flavor and shelf-life typical for farm-raised tilapia,

Processing is arranged immediately post-harvest. On farms, the live harvest is stunned with an ice bath and all subsequent butchering involves careful hand labor through packaging, usually completed within minutes after the harvest. All processing procedures must comply with U.S. Food and Drug Administration (FDA) "good manufacturing practices" (2) which are most often -enforced and supplemented by the respective state agencies. Likewise, this farmed fish production is further assisted by product quality advisories issued by the U.S. Department of Agriculture.

## NOMENCLATURE:

Despite some taxonomic confusion (3), this product code recommends "Tilapia" as the most practical common name for these fish. This recommendation is consistent with FDA's recently published list of official, commercial fish names (4). The natural harvest are typically *Tilapia aurea*, whereas cultured varieties include many species and some hybrids. More specific names in table 1 can be used to distinguish the pure, single species, but the increasing production of hybrids has complicated tilapia nomenclature.

Market	Scientific	Common	Spawner	Pure Culture	Natural Harvest
Tilapia	<i>Tilapia mossambica</i>	Tilapia, Mozambique	Yes	Yes	----
Tilapia	<i>Tilapia nilotica</i>	Tilapia, nile	Yes	Yes	----
Tilapia	<i>Tilapia aurea</i>	Tilapia, blue	Yes	Yes	Yes
Tilapia	<i>Tilapia honorum</i>	Tilapia	Only	----	----
Tilapia	<i>Tilapia zillii</i>	----	Only	----	----

■ Table 17 - Recommended product nomenclature for Tilapia and their source and use (spawners) in farm raised production.<sup>1,2,3</sup>

Again this product code recommends the hybrids should retain the nomenclature of their parental stock or spawners, thus reinforcing the FDA's guideline for the general market name, tilapia. Accompanying common names may arise to describe the hybrids and/or encourage sales, but they should not mimic or confuse species or product identity. Tilapia should not be sold as snappers, perch, bream or other establish commercial species. This recommendation does not discourage descriptive comparisons in appearance and edibility characteristics, but simply recognizes value in product distinction for tilapia.

## PRODUCT TYPES:

Tilapia can be ordered alive, fresh or frozen. Fresh and frozen products can be processed directly from live stock or taken from previously processed inventory. Immediate processing from live stock is ideal for "fresh-frozen" products. The excellent shelf-life for properly "purged" tilapia allows

<sup>1</sup> In accordance with FDA's advisory (5) fish sold in interstate commerce should be labeled or identified by either the "Market" or "Common" names, and use of the "scientific" names is optional. Use of regional or fanciful names is discouraged.

<sup>2</sup> This listing is not inclusive for all tilapia in international commerce, but rather focuses on domestic production.

<sup>3</sup> Typical hybrids result from crosses between all the above species.

processing to anticipate demand. Properly packaged and frozen tilapia should have an acceptable shelf-life beyond 12 months.

This code does not describe further processed product types, but notes tilapia texture and mild flavor is ideal for use in a variety of special products (i.e., breaded, smoked, pre-seasoned, stuffed, etc.). These products can be provided on request.

## **PRODUCT FORMS:**

Any product form can be provided on request with pricing to account for extra processing and handling costs.

**Whole fish, alive** - Live tilapia are used in retail and restaurant displays that cater to ethnic demands and growing public interest for the live market form that assures freshness. Orders can be arranged to suit retail use such that feeding or prolonged maintaining of the fish is not necessary.

**Whole fish, eviscerated or drawn** - Whole tilapia are usually sold with the head and scales intact for product distinction and quality

**Fillets** - Tilapia fillets are sold skin-on or skinless depending on customer preference. The more popular red-skin varieties are typically ordered skin-on. The cooked skin is edible. Bone content in the fillets also depends on customer preference. A "bones out" tilapia fillet implies the rib bones have been cut separate from the belly portion.

## **YIELDS:**

The percentages in parentheses represent the remaining weight of the product form relative to the initial weight of the whole, live tilapia. Variations in yields reflect differences per type of tilapia and workmanship of the processor.

Whole, drawn (90%)

Fillet, skin-on, no rib bones or pin bones (35 to 40%)

Fillet, skinless, no rib bones or pin bones, and no belly flap (28-33%)

## **QUALITY ATTRIBUTES:**

Recognizing some variation in Tilapia species and farming practices, buyers should request to view samples to judge skin and meat color, and cooked meat flavor. The judgement should look for consistency per fish or fillet size, and note color, odor and flavor. Buyers should follow the organoleptic evaluation procedures outlined in the SFA Code.

Appearance for fresh tilapia meat is a natural white to ivory color with some noticeable translucency and iridescence on the surface of the flesh. Tilapia may have a thin layer of darker muscle tissue on the surface of the meat just below the skin side of the fillets. Freezing can dull the appearance, but the frozen meat color should, remain natural as for fresh fish meat.

All processed forms should be cleanly cut and free of blood discoloration or spots, which- can denote poor handling and bruising.

The meat (raw and cooked) should be free of any objectionable aromas or flavor. The raw odor is best described as neutral or mild. Off-odors or flavors have been associated with the growing water (i.e. algae-like, musty, muddy, etc.), but these sensory attributes should not be confused with the odors typically noted for spoiling fish (i.e. putrid, fishy, etc.). Off-odors and flavors are more

common for tilapia taken from wild resources or if the fish have been mishandled or exposed to spoilage temperatures. Suppliers can provide further information.

Packaging and shelf-life should demonstrate careful handling. Fresh tilapia is packed in ice (ice pack) or prepacked and chilled at 28-34°F (chill-pack). With prompt and continuous chilling, the average fresh shelf-life for tilapia is approximately 10 days. When quick frozen and stored at or below -10°F the average shelf-life can be over 12 months.

## **SIZES AND GRADES:**

Tilapia are graded by size of whole fish throughout their growth in culture and just prior to harvest.

Typical Sizes by Product Form (based on farm-raised recommendations):

**Whole, alive** - edible size, 1 to 1 1/2 pounds and smaller or larger depending on market preference

**Whole, drawn** - 1 to 1 1/2 pounds, based on the efficiency in current production systems

Fillet Size	Avg. Count/10 lbs.
1-2 oz.	100
2-3 oz.	65
3-4 oz.	45
3-5 oz. (most common size)	40
4-5 oz.	35

■ Table 18 - Tilapia - Fillets, skinless and boneless.

## **LABELING:**

Packaged units and/or accompanying invoices should contain at least the following information.

**Product Name** or identity should specify "tilapia." Pure species and hybrids should be further distinguished by the appropriate "common name." Accompanying use of scientific names is encouraged as an optional quality attribute. Proper nomenclature should carefully avoid use of any designation that mimics or confuses product identity for another commercial fishery product.

**Quantity** designations should only refer to the total or net weight of the tilapia forms in the container. Pounds is the common unit of designation and kilograms have been used in foreign commerce. Also counts (number of individual fish forms per a designated weight) can accompany the net weight declaration.

**Name and address** of the manufacturer, packer or distributor.

**Ingredients** if present, then listed in descending order (weight basis) according to the amount present. At present there are no chemical ingredients used in packaging tilapia.

**Country of Origin** must accompany any foreign source of tilapia whether they are wild or farmed, pure species or hybrids.

**Farm-Raised in the U.S.** declaration is recommended to distinguish domestically farmed tilapia.

## **REFERENCES:**

1. U.S. Department of Agriculture, 1990. Aquaculture: Situation and Outlook Report, September 1990. AQUA-5 USDA, Commodity Economics Div., Economic Research Service, Rockville, MD.
2. Code of Federal Regulations. Title 21, Part 110 - Good Manufacturing, Processing, Packaging or Holding Human Food. (Revised 6/19/86).
3. Trewavas, E. 1983. "Tilapiine Fishes of the Genera Sarotherodon, Oreochromis and Danakilia." British Museum of Natural History, Comstock Publishing Assoc., Div. Cornell University Press, Ithaca, NY
4. Food and Drug Administration. 1989. "The Fish List". Available from FDA Center for Food Safety and Applied Nutrition, Washington, D.C., 20204.

## **SOURCES OF ADDITIONAL INFORMATION:**

Florida Food Fish, Gamefish and Aquatic Bait Farmers Association, Inc, (FGBA), PO. Box 817, Hastings, FL 32145

Florida Aquaculture Association, RO. Box 3989, Tallahassee, FL 32315

Department of Fisheries and Aquaculture, IFAS, University of Florida, Gainesville, FL 32611.

Aquaculture Program, Florida Department of Agriculture and Consumer Affairs, Mayo Bldg., Tallahassee, FL 32399-0300

## Appendix A - Terminology and Standards

### NET WEIGHTS OF FROZEN SEAFOODS

Net weight of frozen seafood products as ordered and declared in mandatory labeling should be determined by some standard procedure. By definition the net weight for frozen seafoods, such as shrimp and spiny lobsters, is the actual product weight excluding the weight of any frost, glaze, packaging materials or extraneous materials. Thus net weight determinations require product separation, deglazing and partial thaw. The specific procedures are outlined in Official Methods of Analysis of the Association of Official Analytical Chemists (AOAC, 1984, 14th Edition). These AOAC procedures have been modified by the National Marine Fisheries Services relative to use with frozen shrimp (Code of Federal Regulations, Title 50, Part 265A, U.S. General Standards for Grades of Shrimp). Both sources of procedures should be referenced to develop methods that minimize variation and allow a common test for comparisons. These procedures are designed to deglaze and separate the product without initiating internal thaw. If the product was thawed or partially thawed, variation in water loss complicates the analysis and could represent lost product.

#### AOAC, SEC. 18.002 - **Glazed Seafood**

Remove package from low temperature storage, open immediately, and place contents under gentle spray of cold water. Agitate carefully so product is not broken. Spray until all ice glaze that can be seen or felt is removed. Transfer product to circular No. 8 sieve, 20 cm (8 inch) diameter for product less than or equal to 0.9 kg (2 lb.) and 30 cm (12 inch) diameter sieve for product greater than 0.9 kg (2 lb.). Without shifting product, incline sieve at angle of 17-20° to facilitate drainage and drain exactly 2 minutes (stop watch). Immediately transfer product to tared (pre-weighed) pan (B) and weight,(A). Weight product = A - B. **\*Note:** the intent is to deglaze the product not initiate internal thaw.

#### CFR Title 50, Part 265.106 - **frozen peeled shrimp...** modified from AOAC, Sec. 18.016 & 13.017

Place contents of individual package in wire mesh basket and immerse in container of fresh water so that top of basket extends above water level. Introduce water at  $26 \pm 3^{\circ}\text{C}$  ( $80 \pm 5^{\circ}\text{F}$ ) at bottom of container at a flow rate of 1-3 quarts per minute. As soon as the product thaws so that the glaze can be removed and the shrimp separated easily, transfer all material to 30 cm (12 inch) no. 8 sieve, distributing evenly tilt the sieve to above 20 degrees and drain for exactly two minutes. Immediately transfer shrimp to a tared (pre-weighed) container and weight. This total weight minus the weight of the empty tared container equals the net weight of the shrimp.

#### CFR Title 50, Part 265106 - **(frozen) cooked shrimp...** modified from AOAC, Sec. 18.018

Weigh product free of all wrapping and record weight. Place product in a container containing an amount of fresh potable water  $26 \pm 3^{\circ}\text{C}$  ( $80 \pm 5^{\circ}\text{F}$ ) equal to 8 times the weight of the product. If product is block frozen, turn block over several times during thawing. If frozen shrimp are caked together they may be parted manually provided they are not injured in the process.

When all the ice has melted, empty the shrimp into a 30 cm (12 inch) No. 8 sieve, distributing evenly. Tilt the sieve to about 20 degrees and drain for exactly two minutes. Immediately transfer

shrimp to a tared (pre-weighed) container and weight. This total weight minus the tared weight of the empty container equals the net weight of the shrimp.

**IMPORTANT!** These procedures require experience to determine when glaze is removed and product separates without initiating internal thaw of the product. Although more specific for shrimp, similar procedures can be developed for lobsters, crab, etc. Careful attention to water temperatures, flow rates and product retention is essential. The best rule of thumb is to be consistent with procedures and maintain accurate records for comparison.

**Equipment: Scales** for determined weights should be certified to provide a sensitivity of 0.01 ounce for packages up to 5 pounds and 0.025 ounce for packages over 5 pounds (AOAC, Sec. 32.059). Special sized **sieves** and **mesh baskets** (enlarged test-tub baskets) can be ordered through scientific supply firms.

## FISH (SEAFOOD) NOMENCLATURE

Federal and State food laws require all foods in commerce must be labeled with their "common and usual names". This requirement presents a problem for the seafood industry because the numerous varieties of fish complicate the use of terminology to distinguish individual fish species. This problem is compounded by variation in traditional and regional names for the same species. Recognizing differences in production cost, food value and quality, and consumer/buyer expectations, seafood species distinction can be important. Thus, the U.S. Food and Drug Administration and National Marine Fisheries Service are attempting to develop nomenclature lists for all seafoods. The intent is to promote quality and combat "species substitution" which if intentional or by accident can constitute economic fraud.

Confronted with such diversity the legal authorities turned to historical scientific nomenclature. Currently, the legal reference of official nomenclature for domestic fish species is the 1980 publication no. 12, "A List of Common and Scientific Names of fishes from the United States and Canada" by the American Fisheries Society (Bethesda, MD). This list is being updated and supplemented with international listings for more fish and the crustaceans and mollusks. These lists do provide a sound organized benchmark for reference, yet many of the scientific assigned common names are inconsistent with traditional commercial practice and/or project a negative product image. Thus FDA and NMFS are compiling a complimentary listing of "market names." In most instances, the scientific common names are used for the market names. In a few exceptions market names have been assigned with reference to commercial practice and recommendations. The intent is to allow the option to use the scientific common name and/or specific market name.

These proposed nomenclature schemes will offer some order for labeling declarations, but true species verification will always require experience. When species can not be verified from inspection of the product, electrophoretic analysis is necessary to differentiate the species relative to differences in the respective protein contents.

Occasionally, the FDA must intervene to determine the usual and common name for a species. For example, in 1980, the FDA issued a "compliance Policy Guide" 7108.04 to resolve concerns for selling Pacific coast rockfish (family Scorpaenidae) as red snappers. The Guide verbiage stated:

"BACKGROUND - the name 'red snapper' has been preempted by many years of consistent consumer usage as meaning only fish *Lutjanus campechanus*. Because of high esteem in which this fish is held by consumers, and the relatively limited catch, there have been numerous attempts to substitute other, less expensive fishes for this species. Substitutes of less desirable species have included members of the family Lutjanidae, groupers, a number of West Coast rockfishes of the genus *Sebastes*, and other species. The West coast rockfishes have, until relatively recently, been distributed mostly locally, and thus have been beyond the reach of the Federal Food, Drug, and Cosmetic Act. Some of the states on the West Coast have officially sanctioned 'red snapper' as an alternative name for such members of the *Sebastes* genus, although these fishes are quite different in appearance, flavor, and texture, and are generally regarded by consumers familiar with *Lutjanus campechanus* as inferior.  
**POLICY** - The labeling or sale of any fish other than *Lutjanus campechanus* as 'red snapper' constitutes a misbranding in violation of the Federal Food, Drug, and Cosmetic Act."

Also, to prevent continuing substitutes and encourage more seafood consumption, the NMFS is attempting to initiate "fish edibility profiles" which could be used as labeling to denote a variety of species with similar edible characteristics. If eventually adopted the industry could refer to catfish, cobia, or white flounder as white meat fish with light to moderate flavor. Advantages and disadvantages of this system are still in debate, which will require more edibility profile work for

various species and further economic marketing consideration. The concept is fine, the practice remains unproven.

For additional and updated information on seafood nomenclature contact: Industry Activities Section, Center for Food Safety and Nutrition; Food and Drug Administration, Washington, D.C. 20204. Phone 202-485-0251.

Inquire about the "FDA Guide to Acceptable Market Names for Food Fish Sold in Interstate Commerce."

## PERCENT WATER CONTENT FOR OYSTERS

The percent drain weight or percent water content (weight basis) in a package in shucked oysters should be determined by the standard procedure recommended in the Official Methods of Analysis of the Association of Official Analytical Chemist (AOAC), 1984,14th Edition. Numerous studies have demonstrated water content in a package of shucked oysters will vary during storage due to 'bleeding' or water leaching from the meats and water absorption. Water loss or uptake depends on the osmotic condition of the oyster meats. This condition can be influenced by the salinity and temperature of harvest waters, seasons, rainfall, and processing/storage conditions. Properly shucked and packed containers of raw oysters should routinely have less than a 15% water content. Occasionally environmental factors can cause higher water loss. In some instances a higher percent water content may denote water additions when packaged. This situation should be discussed with the supplier with reference to the prevailing state and federal regulations.

Procedure (AOAC Secs. 18.014-.015): Weigh tared (known weight) container with shellfish meats (entire contents of one package or container of oysters), transfer the contents to a special skimmer tray and quickly distribute meats evenly over the draining surface with a minimum of handling. Drain for 2 minutes, then return meats to the tared container and reweigh. Calculate loss of weight as % drained liquid (or % water content). This procedure should be conducted with product temperature near  $7 \pm 1^{\circ} \text{C}$  ( $45 \pm 2^{\circ} \text{F}$ ).

**Equipment:** The skimmer tray or strainer should be a flat-bot- tom metal pan or tray with bottom area greater than or equal to 1900 CM<sup>2</sup> (300 sq. inch) for each gallon of oysters to be poured on the tray. The tray should have smooth edged holes 0.6 cm (0.25 inch) diameter and 3.2 cm (1.25 inch) apart in a square pattern, or holes of equivalent area and distribution. The tray should be supported over a slightly larger tray so the liquid drains into the larger tray.

## UNIFORMITY RATIOS FOR SHRIMP

Uniformity ratios (UR) provide a measure for the size composition within a designated count for a package of shrimp. The lower the ratio then the more uniform the count. For example a UR= 1.0 means all shrimp in the package are the same size. Realizing a 1.0 UR is impractical, higher ratios (i.e. 1.5, 1.75, etc.) allow some tolerance for natural variation.

**UR Procedures:** Visually select and weigh not more than 10 percent by count (10% of the total number of individual shrimp in one package) of the largest shrimp. Do the same for 10 percent by count of the smallest shrimp. The shrimp selected should be whole, unbroken and undamaged. Calculate the UR.

$$\text{UR} = \frac{\text{Weight for 10\% (by count) of largest}}{\text{Weight for 10\% (by count) of smallest}}$$

Table 19 represents a theoretical example of probable mix for different uniformity ratios for a 5-pound package of 16 to 20 count shrimp. The example is arranged to show the possible variation in the size or count for the smallest shrimp assuming the large shrimp are at maximum grade (16 count) or minimum grade (20 count).

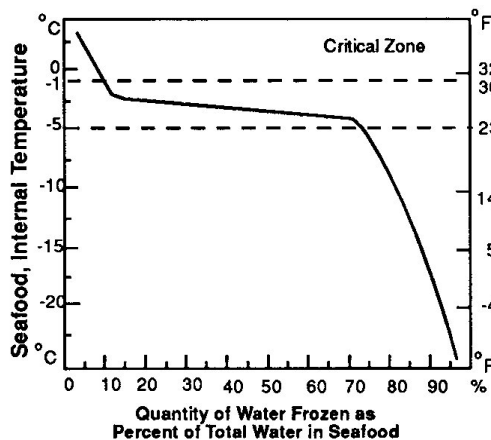
For 10% largest		Different UR's	10% smallest	
Count	Weight		Count	Weight
16	8 oz.	1.25	20	6.40 oz.
16	8 oz.	1.50	23	5.33 oz.
16	8 oz.	1.75	28	4.56 oz.
20	8 oz.	1.25	25	6.40 oz.
20	8 oz.	1.25	25	5.33 oz.
20	8 oz.	1.75	35	4.56 oz.

■ Table 19 - Variations in Shrimp Size & Count

## Appendix B - Frozen Seafood Code

### PRODUCT DESCRIPTION:

This code is SFA's description of any seafood product raw or cooked, whole or processed, which has been subject to low temperatures that completely freeze the entire item. Complete freeze implies a frozen state through the entire mass of the food. These products are usually labeled as "frozen." Optional labels "fresh frozen" or "frozen fresh" can be used to denote products quickly frozen while still fresh (ref. 1), but these terms can be ambiguous depending on the original quality or freshness of the sea- foods. The intent of SFA's frozen seafood code is to assure quality in all frozen seafoods.



■ Figure 2 - Typical freeze pattern for seafood

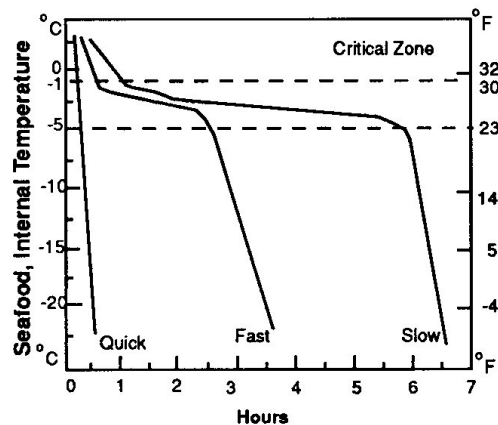


Figure 3 - Typical freeze rates for seafood

### PRODUCTION:

Thermal treatments to freeze seafood vary primarily in the rate for attaining the frozen state and as required for particular product characteristics. The rate of freezing can be judged by the time required for the internal product temperature to decrease through the "critical freezing zone", 30°F to 23°F (1°C to -5°C). This thermal transition is considered critical because it is when most of the water in seafood changes from the free liquid to solid crystalline form (Fig. 2). Rapid freezing rates reduce internal product temperature through the critical zone in less than 2 hours (Fig. 3). A more rapid freezing rate results in smaller ice crystal formations that cause less product damage. Product size and shape, initial product temperature and method of freezing determine the freezing rate.

### PRODUCT TYPES (FREEZING METHODS):

All freezing methods require some form of cold refrigerant to remove heat from the seafood products. The refrigerant can be applied indirectly by first chilling air or metal surfaces for product storage or directly by immersing or spraying the products. Choice of refrigerants depends on product types, packaging, desired freezing rates and costs. Each method has useful features, but

performance depends on the rate for thermal transition within the seafood's products. The freezing rates will vary depending on the refrigerant, product temperatures and operating procedures.

**Still air freezing** is simply placing prepackaged seafoods in a refrigerated room or cabinet. The freezing rate depends on the temperature of the room and products, and the amount of products. Still freezers are used for frozen product storage more so than the actual freezing process. This is a slower freezing method typically used for pre-chilled products with a thin profile that allows a more rapid, uniform freezing rate. Products selected for freezing in this manner are usually those less subject to freezer damage and destined for short-term storage. The freezer should be equipped for humidity control, defrosting and some airflow. Still air freezing is the least desired freezing method for seafoods.

**Blast (air) freezing** uses fans to blow and circulate cold air over product placed in trays or racks. The circulation of cold air increases the freezing rate, thus proper racking is important to allow cold air flow all about the products. The blast freezer is usually a separate room or tunnel maintained near -25°F or as low as -40°F. After blast freezing the product is moved to a storage freezer. A batch type operation is most common, and continuous operations are available with rotating belts or spiral screens. Blast freezing can be used to freeze prepacked items or individual and irregular shaped products that would require further packaging prior to frozen storage.

**Plate freezing** uses cold refrigerant flowing through hollow metal plates that are in direct contact with the prepackaged seafoods. Typically the plates are moveable so as to sandwich the products between two chilled surfaces. A slight compression assures contact with the product and a more efficient, uniform freeze. Plate temperatures range about -28°F (-33°C). The products are usually prepacked in a uniform shape less than 5 inches thick. In some instances, plate freezing has been used to describe the contact freezing of prepackaged seafoods placed on a rack of immovable plates or shelves.

**Immersion freezing** uses direct contact of the seafood products in the refrigerant. The refrigerant can be applied as a bath or spray, in batch or continuous type freezing operations prior to packaging for subsequent frozen storage. The U.S. Food and Drug Administration approves a limited number of refrigerants for this type of application. For example, brines made from salt solutions, or mixtures of salts and sugars are commonly used on vessels ("freezer boats") and in plants to freeze shrimp and certain whole fish. A properly maintained brine of sodium chloride (NaCl) depresses the freezing point of water to provide a refrigerant with a freezing temperature near -6°F (-21°C). **Cryogenic fluids** such as freon-12 (-21°F; -29°C), liquid carbon dioxide (-108°; -78°C), and liquid nitrogen (-320°F; -196°C) can provide some of the most rapid freezing rates. Liquid nitrogen tunnels are usually operated above -150°F. Choice and cost of refrigerants for direct immersion freezing depend on availability, product characteristics and methods of application.

## PRODUCT FORMS:

Each freezing method yields different products forms. The frozen forms range from a solid block to individually frozen items. The **block frozen** items are frozen as a unit and must be handled and thawed as a unit. They are held together in a block or glaze of ice depending on the application and how much water was used in the freezing process. The addition of water provides beneficial support and covering to protect the products. The block can be solid, segregated or shatter packed (see Ease of Separation). Individual frozen items are self-explanatory. The individually frozen items can also be individually glazed for protection. Individually quick frozen (I.O.F) is commonly used in reference to individually frozen items. This reference is usually helpful in describing that the seafoods (i.e. shrimp, fish fillets, etc.) can be handled and thawed as separate items, but the "quick" terminology or how "quick" depends on the methods of freezing.

## QUALITY ATTRIBUTES:

Frozen seafood quality should be judged when frozen, thawed and cooked. General guidelines for judgement include:

Temperature, both on the surface and internally should be checked on arrival. Special, rigid internal probe thermometers are available to provide adequate readings ( $\pm 2^{\circ}\text{F}$ ). Note! Temperatures inside the containers or freezers do not always represent the internal temperature of the product. Frozen product received with an internal temperature above  $10^{\circ}\text{F}$  ( $-12^{\circ}\text{C}$ ) should be carefully examined before accepting.

### Recommended Frozen Product Temperatures

- Preferably at or below  $0^{\circ}\text{F}$  ( $-18^{\circ}\text{C}$ ), common for short-term storage (1-3 months depending on products).
- Better at  $-10^{\circ}\text{F}$
- Best at  $-20^{\circ}\text{F}$  ( $-29^{\circ}\text{C}$ ) for long-term storage (up to 1 year depending on product type).

**Thermal tolerances** ( $\pm$  degrees) must be allowed for variability in freezer capability and some necessary defrost cycles, but the protective influence of cold temperatures is enhanced by proper packaging and minimum temperature fluctuations during storage and distribution. For example, wholesale storage at  $-20^{\circ}\text{F} \pm 5^{\circ}$  can be compromised in short time by a retail or home freezer operating at  $10^{\circ}\text{F} \pm 5^{\circ}$ .

**Package integrity** is a good indication of care in original handling and any potential product damage or exposure (see PACKAGING). Collapsed, torn, wet or loose packs require specific scrutiny. Package labeling should be legible and complete (see LABELING). Some record of total unit and bulk pack weights should be maintained to compare with the final net weight of the seafood items (Appendix, SEAFOOD PRODUCTS SPECIFICATION LISTS).

**Ease of separation** for IQF and other unique items should be checked for compliance with prior specifications. Individual and loose packed items should not require any additional treatments to separate each seafood item.

Layer packed items should easily separate into units as segregated by product arrangement, package dividers, parchment, etc. Note, layer packs can also refer to block frozen forms in which the items are specifically positioned prior to freezing as a whole unit.

Shatter packed items should separate with minimum physical agitation, which is necessary to break the ice holding the individual items or layers together without damaging the seafood.

**Frozen product appearance** should be clean, undamaged and free of 'freezer burn'. **Freezer burn** appears as a white, chalky surface dehydration most common on corners or narrow edges of the product. In the initial stages, slight freezer dehydration can be confused with natural product coloration or crust freezing which is common for some rapid I.Q.F products. These features do not indicate poor quality and should be distinguished from definite, excessive freezer burn. Excessive freezer burn indicates exposure to cold air. Excessive ice crystals inside containers and wrappings denotes moisture migration during temperature fluctuations which may have involved a partial thaw.

**Condition of the glaze** on frozen seafoods must be checked to assure effective protection of the product. The glaze should be uniform, and completely encapsulating the seafood. Cracks in the glaze or 'holidays' (non-glazed surface) may denote improper glazing and the necessity for a reglaze. Reglazing is customary and necessary during prolonged storage that can diminish the

original glaze. Troublesome cracking or holidays should be distinguished from occasional hairline fractures.

**Frozen product odor** should be minimal with a pleasant, characteristic seafood aroma. Strong off-odors, i.e. rancidity, ammonia-like and sourness are a sure sign that the product was bad prior to freezing and/or spoiled in 'frozen' storage. Final confirmation of odor and taste problems will require examination of thawed and possibly cooked product.

**Product Integrity** should be checked to assure proper species identification (ref. 2), product standards, grades, sizes, uniformity per size, ingredients, workmanship and other attributes pertinent for the particular seafoods. Use of product specification checklists are most useful in assuring compliance with prior orders. Specification sheets should be developed in consultation with the supplier. If properly designed, they serve as instructive support for the quality control staff. The checklist can include frozen and thawed evaluations.

**Product weight** (and volume) should be checked with reference to the ordered and declared net weights (or volume contents). Net weights only include the weight of the actual seafood product(s). Weight of packaging materials, glaze and any extraneous matter is not included in net weights. Net weight determinations require specific thawing procedures, which only remove the glaze without completely thawing the entire seafood item (Appendix, Net Weights of Frozen Seafoods). A complete thaw, particularly under forced conditions (i.e. warm air or hot water), may release natural juices, which represent a portion of the net weight.

**Approved Chemicals** can be used to protect the quality of seafood during frozen storage. They are typically applied in formulations, as glaze ingredients, or as pre-soaks or dips. Ingredients can include antioxidants (i.e. BHT, citric acid, blends, etc.) to maintain flavor, or water binding agents (i.e. phosphates, soy proteins, etc.) to retain moisture and favorable textures. Use of these ingredients must be in compliance with current state and federal regulations and be stated in the label ingredients statement if they become an integral part of the product. The primary authority to regulate use and levels of these ingredients is the U.S. Food and Drug Administration and equivalent state agencies.

## ORGANOLEPTIC EVALUATIONS:

Organoleptic or sensory evaluations remain the best methods by which to judge the general quality of most seafood. These evaluations can include assessments for appearance, odor, texture and taste. The assessments can range from simple "acceptance" or "don't accept," to structured hedonic scales with declarations for level of acceptance or specific product attributes. Regardless of the system used these subjective evaluations will require experience and communication with the judgments of the suppliers.

SFA recommends a basic organoleptic scale of acceptance that can be structured for individual seafood items. It can be used in part, or in complete form, depending on the particular seafood, but it is most effective if comparable for both supplier and buyer.

Acceptance Pts.	Color	Odor	Texture	Taste	Comments & Descriptions
	R C	R C	R C	C	
1 Excellent					
2					
3					
4 Average					
5					
6					
7 Reject					

■ Table 20 - SFA Organoleptic Scale for Seafood Quality Evaluations

R = Raw; C = Cooked, 160°F

**Cooking Evaluations** are best judged without the influence of additional ingredients or dilutions. The recommended method is to boil the seafood samples in a closed boilable pouch or bag until the seafood reaches an internal temperature of 160°F (71°C). Remove the bag from the boiling water and open to release the cooked aromas. Carefully smell for odor judgments, then remove product and temper to room temperature prior to judging texture and taste. Taste and texture can also be judged from the warm product, but room temperature assessments assure a standard procedure for comparisons.

## SAMPLING:

Sampling to monitor for quality attributes must assure a representative sample and enough samples taken in a manner that assures a more accurate evaluation of an entire order or lot of frozen seafood products. A sample can be one item, a package of items, a master carton of packages, etc. depending on the size and composition of the order. Likewise, the character of the order will influence the number of samples that should be taken. For certain quality assessments, all items can be sampled, yet limited sampling is necessary if the quality assessment compromises the condition or value of the product. A good rule is to randomly sample an order with sampling from portions near the front, end and sides of orders, plus sampling from interior portions of the order. The U.S. Department of Commerce provides one example for the number of recommended samples for containers of frozen fishery products (Table 1).

<b>Individual Container</b>			
<b>Size Groups</b>	<b>Lot Size (no. Containers/lot)</b>		
4 to 10 lbs.	900 or less	901-3600	3601-10800
10 to 100 lbs.	200 or less	201-800	801-1600
more than ... 100 lbs.	25 or less	26-80	81-200
Recommended Sample Units/lot	3	6	13
Acceptance No.	0	1	2

- Table 21 - An extracted portion of the National Marine Fisheries Service's guidelines for sampling frozen fishery products during volunteer lot inspections. Source: Code of Federal Regs. Title 50, Part 260.61

Acceptance number is the number of samples that can deviate from the specifications without failing the entire lot. Acceptance numbers in excess of these figures could determine failure or rejection.

The NMFS lot sampling guideline may be somewhat lenient relative to smaller sized orders. Thus some sampling must be based on product form and buyer concern. Regardless of the sampling scheme chosen, the number and location of each sample should be carefully recorded for explanation in the event of any adverse findings.

**SHELF LIFE:** Quality seafood properly packaged and frozen can have an acceptable frozen shelf-life from 6 to 12 months, and in some instances longer. The variation in shelf-life is due to the particular composition of the various seafoods. In general, the higher fat content items (greater than 5% fat) are more prone to oxidative and hydrolytic changes in flavor. Other seafoods have unique protein, proteolytic enzyme activity and/or other chemical precursors, which can eventually alter texture, flavor and color. Most of these changes are retarded by cold temperatures, thus justifying recommendations for storage below OOF. Experienced suppliers can advise on specific storage requirements and expected shelf-lives for respective seafood types.

**THAWING:** Frozen seafood quality can be compromised by improper thawing. As with freezing, thawing requires thermal transition through the "critical temperature zone", but unlike freezing the thaw transition should be more gradual. A forced or rapid thaw in warm air or hot water can damage the seafood tissues thus causing excess loss of fluids and weight (i.e. shrinkage or drip loss). A prolonged thaw at room temperatures invites bacterial and enzymatic spoilage in the initially thawed surface layers. Thus the recommended thaw procedure is in either cool (less than 70°F, 21°C) running water with packaging to protect the product from direct water contact, or in still air refrigeration (less than 45°F, 7°C) with packaging to prevent surface dehydration. Note, the thaw temperature recommendations for running water are higher than refrigeration because running water is recommended as a continually attended procedure to be completed immediately after initial thaw.

**SHRINKAGE:** Thawed seafoods will naturally lose weight due to seepage or free fluids draining from the product. This loss is known as drip loss or shrinkage. The amount of shrinkage will vary per type of seafood, method and duration of frozen storage, and thaw procedure. The amount of shrinkage should be monitored to assure reasonable loss.

**PACKAGING:** Proper package materials and methods are necessary to protect frozen seafoods from physical damage, discoloration, dehydration, chemical and microbial contamination, and other forms of spoilage. The primary problem is exposure to air which can draw moisture and colors from the product surface and initiate oxidative reactions that can lead to rancidity and other off-flavors.

One or combinations of the following package methods are recommended. Selection will depend on product configuration, composition and intended storage scheme. Likewise, packaging should be sized for convenient handling, rate of use, and proper freezing and thawing.

Common package terminology for most frozen seafoods is 10/5's or 5/10's implying 50 pound master cartons containing 5 pound boxed units of seafood or a master with five 10 pound units of seafood. This terminology will differ per product type and source, i.e., 10/2 kg., 12/2.5 lbs., etc..

Important! Package method or frozen storage condition only preserves quality, thus complete quality evaluations for frozen seafood should also consider reference to the condition of the products prior to freezing.

### **INTERNAL PACKAGING:**

**Glaze** is a liquid coating frozen on the surface of pre-frozen seafoods to limit exposure to oxygen and prevent dehydration or freezer burn. The liquid is typically water, but can include thickening agents (i.e. sugars, colloids, etc.) to impart a more viscous and durable glaze, and/or preservatives (i.e. organic acids, antioxidants, etc.) for additional protection. The pre-chilled glaze can be applied by spraying or dipping the pre-frozen seafoods. The amount of glaze should be sufficient to completely encapsulate the seafoods. Theoretically, glazing can never be excessive, but economically it does add bulk and weight to the package. The guideline is to provide protection within reason and distinguish the net weight of the actual product from that of the added glaze.

**Wrapping** with paper and/or plastic films and bags can supplement or replace the protective action of a glaze. Protection depends on the exclusion of air by elimination of air space (tightness of fit), minimum transmission of gas (film thickness and permeability character) and durability.

Polyester bags and sleeves offer strength and a good, tight fit. Saran (polyvinylidene chloride) and polyvinyl chloride wraps offer less strength and durability, but excellent fit. The polyethylene wraps and cellophane do not provide the tightness of fit as the aforementioned materials.

**Modified atmospheric packaging** alters the gas surrounding the frozen items. The modification can be a vacuum to remove all the air or a vacuum followed by a backflush with nitrogen, carbon dioxide or mixture of these gases to replace the air. The intent is to reduce the oxygen exposure that can cause oxidative spoilage. Note, vacuum packaged frozen seafoods should be refrigerated below 35°F when thawed and/or immediately opened for use so as to avoid any potential adverse microbial consequences.

### **EXTERNAL PACKAGING:**

**External packaging** should provide support to protect the frozen items from physical damage. Individual packaged units and master containers should be selected for strength, resistance to moisture and ease of handling. Packaging impregnated and/or coated with wax, plastics or similar approved materials help retard moisture and air exchange and prevent product sticking to the surfaces. The external packaging materials can include insulation features, but the application should be careful to retain frozen temperature of the product rather than retarding the freezing rate for the product. Likewise, the size of the external container must account for freezing and thawing rates. Less bulk and narrow profiles freeze more rapidly and require less time to thaw.

## LABELING:

The SFA Frozen Seafood Code encourages compliance with all federal (ref. 3) and state regulations that require specific information (\*) to appear on packaged units of seafood. Likewise, SFA recommends additional, yet optional label information (\*\*) should be considered to better inform buyers. The following information should appear, conspicuously and legibly on all units packaged for the ultimate buyer.

\* **Product name** or identity, and when particular species are involved the product name should be specified by the approved market, common and/or scientific nomenclature (ref. 2).

\*\* SFA recommends the common or market names for seafood species should be accompanied by the scientific name on or with the packaged units.

\* **Not quantity** of contents, usually as a weight declaration, should be stated separately and accurately in a uniform location upon the principal display panel. Weight of the container, glazing, refrigerant, or packing materials are excluded from this quantity designation.

\* SFA recommends label information should also declare product sizes, grades, forms, etc. that inform the buyers and facilitate inventory.

\* **Name and place of business** (address) of the manufacturer, packer or distributor. This information can also be accompanied with the processors permit number.

\* **Ingredients**, if present, listed in descending order according to the amount (weight basis) present in the seafood.

\* **Frozen** to signify the product has been previously frozen.

\*\* SFA recommends an additional statement to advise proper storage; "Keep Frozen Below 0°F"

\* **Country of origin** statements, in English, are required on imported items as they enter the United States and if they are repacked without substantial transformations (ref. 4). This label information must be conspicuous on the outermost container received by the ultimate purchaser, defined as the last person in the U.S. who will receive the article in the form in which it was imported. For example, peeled and deveined shrimp is not considered substantially transformed from the originally imported form, thus it would have to be labeled as to the country(s) of origin.

SFA recommends labels on imported seafood products that are processed, yet not substantially transformed, could state "Products of [foreign country(s)]-Processed in the U.S."

\*\* **Coding** should be used to identify the lot, pallet or unit of products so as to aid in stock rotation.

## REFERENCES:

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3. U.S. Food and Drug Administration, Code of Federal Regulations, Title 20, Part 101, Food Labeling.
4. U.S. Department of Treasury Customs Service, Code of Federal Regulations, Title 19, art 135, Country of Origin Marking.

### **Additional References**

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2. Codex Alimentarius Commission. 1978. Recommended International Code of Practice for Frozen Fish, Volume B, CAC/RCP16-1978, 55 p. FAO Liaison Office for North America, 1325 C St., SW, Washington, DC 20437.
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## Appendix C - Nutritional Values

### NUTRITIONAL ATTRIBUTES OF SEAFOOD PRODUCTS

Like other quality attributes, the nutritional value of seafood products can influence a buyer's decision. Not only should buyers be familiar with the nutrient content of different species, but they should also understand how seafoods conform to the dietary guidelines affecting consumers' food choices.

Numerous agencies and health organizations are encouraging Americans to strive for a healthier diet: one that is lower in fat (particularly saturated fat), lower in cholesterol and sodium, and higher in complex carbohydrates (1,2). As consumers respond to this advice, they are finding a new appreciation for seafood's nutritional advantages.

### BASIC COMPOSITION:

Seafood's major components (also referred to as proximate composition) are listed in Table 22. The range of values for these components depends on species, season of harvest, and a variety of natural factors.

COMPONENT	% of weight
Water	70-80%
Protein (finfish)	17-23%
Protein (shellfish)	7-20%
Fat	0.5-15%
Ash	1-2%
Carbohydrate (shellfish)	0-4%

■ Table 22 - Proximate Composition of Seafoods (3)

### PROTEIN:

Seafood has long been regarded as a source of top quality protein, meaning that it provides all the essential amino acids (building blocks of protein) required by the body. The protein in fish is comparable to the amount and quality of protein in chicken, beef and other animal products (3,4). Some shellfish, especially mollusks, are slightly lower in protein, although still complete in terms of the basic amino acids, the protein building blocks.

### FAT:

Dietary fat is the most concentrated source of food energy, with each gram of fat providing 9 calories. By comparison, a gram of protein or carbohydrate provides only 4 calories. Because seafood is relatively low in fat, it is also fairly low in calories.

Although the body does require small amounts of fat, too much fat in the diet is linked to obesity, heart disease, certain types of cancer and other illnesses. Thus, current recommendations suggest reducing fat intake to 30% of total calorie intake (1,2). That would equal approximately 50-75 grams of fat per day for adults, depending on the number of calories a person eats each day. Table 23 compares approximate fat and calorie values for different sources of Protein.

Food *	Calories	Fat (gm)
6 oz. Grouper or shrimp	175	3
6 OZ. chicken (w/o skin)	205	5
6 OZ. top sirloin (trimmed)	250	11
3 tbsp. Peanut butter	285	25
Ash	340	28
Carbohydrate (shellfish)	400	29

■ Table 23 - Approximate Fat and Calorie Content of Selected Foods (3,4)

\* Weights represent uncooked portions

### **FATTY ACIDS (SATURATED & UNSATURATED):**

Simply put, fatty acids are the building blocks of fat. Depending on chemical structure, fatty acids can be **saturated**, **monounsaturated** or **polyunsaturated**. Most fat-containing foods have a combination of all three, although one type usually predominates.

Fats containing mostly saturated fatty acids are associated with higher blood cholesterol levels; thus saturated fats are the main type of fat to reduce in the diet. Examples include lard, butter and bacon fat.

Unsaturated fats, which contain mostly monounsaturated and/or polyunsaturated fatty acids, are associated with lower blood cholesterol levels, and are preferable to saturated fats. However, because they are fats, they should still be consumed in moderation. Examples include safflower oil, olive oil and most other vegetable oils.

Keeping in mind that seafood has relatively little fat to begin with, another clear advantage is that most of the fat in seafood is unsaturated. In fact, on the average, 68% of the fat in southeastern species is unsaturated.

### **OMEGA-3 FATTY ACIDS:**

Seafood attracted a great deal of attention in the 1980s as a result of widely published reports about the potential health benefits of omega-3 fatty acids. Omega-3s are polyunsaturated fatty acids that are found primarily in seafood, and are believed to reduce risk for heart disease and other illnesses. After numerous studies, researchers have learned that omega-3s have little effect on total blood cholesterol levels, but they do appear to have certain positive effects on blood vessels, blood flow, triglyceride levels and certain immune responses (2,6,7).

While researchers still have more to learn about these unique fatty acids, they do encourage consumers to rely on real seafood products as a source of omega-3s, rather than fish oil supplements. In fact, the Food and Drug Administration discourages manufacturers of fish oil supplements to make health claims about their products because of insufficient scientific evidence to support certain claims.

### **CHOLESTEROL:**

Dietary cholesterol is a fatty substance present in all foods of animal origin (plant products do not contain cholesterol). All animal products contain the same form of cholesterol, so the terms "good" and "bad" cholesterol do not apply to foods, but rather to cholesterol in the bloodstream.

With regard to lowering risk for heart disease, many recommendations suggest eating less than 300 milligrams of cholesterol per day, in addition to limiting fat and saturated fat. **In fact, it appears**

**that for most people, reducing total fat and saturated fat is more important than limiting cholesterol.**

Most seafood contains only moderate levels of cholesterol, with southeastern finfish having an average of 70 milligrams for a 6-ounce serving. Mollusks, except for squid, are extremely low in cholesterol, with approximately 60-80 milligrams in 6 ounces. Even most crustaceans, which are often avoided by cholesterol conscious consumers, have acceptable levels of cholesterol. While it is true that shrimp and squid contain more cholesterol than other seafoods, the key point is that both of these shellfish are **extremely low in total fat and saturated fat**, both important dietary factors in reducing risk for heart disease. Table 24 compares the cholesterol and saturated fat content of various foods.

<b>Food *</b>	<b>Saturated fat (gm)</b>	<b>Cholesterol (mg)</b>
6 oz. Snapper	0.3	77
6 OZ. Shrimp (approx. 1 doz., 21-25 count)	0.3	260
6 OZ. Oysters (approx. 1 doz.)	0.9	81
6 oz. Chicken (w/o skin)	1.4	120
1 egg yolk	1.7	213
6 oz. Top sirloin (trimmed)	4.5	106
6 oz. Chicken (w/skin)	7.4	128
6 oz. Lean ground beef	11.7	118

■ Table 24 - Approximate Cholesterol and Saturated Fat Content of Selected Foods (3,4)

\* Weights represent uncooked portions

## **SODIUM:**

On the average, Americans consume 4000-6000 milligrams of sodium per day, far above the estimated 500 milligrams per day required by the body (3,8). However, research suggests that only some individuals are sensitive to excess sodium in the diet. Thus current dietary guidelines for healthy individuals simply recommend using salt and sodium-containing products in moderation (1).

Many consumers mistakenly believe that seafood is high in sodium because it is harvested from a saltwater environment. On the contrary, fresh and frozen finfish is relatively low in sodium content. Shellfish, on the other hand, do contain higher levels of all minerals, and therefore are slightly higher in sodium compared to finfish. But as Table 25 indicates, even shellfish compare favorably to many common processed foods with regard to sodium content.

<b>Food *</b>	<b>Sodium (mg)</b>
6 oz. Salt water bass *	113
6 oz. chicken (w/o skin) *	132
6 oz. Oyster meat (approx. 1 doz.) *	279
6 oz. Shrimp (approx. 1 doz.) *	290
2 oz. Luncheon meat	670
2 oz. American cheese	675
1/2 tsp. salt	1150

■ Table 25 - Approximate Sodium Content of Selected Foods (3,4,5)

\* Weights represent uncooked portions

## **OTHER NUTRIENTS:**

Seafoods offer certain vitamins, most notably B., B12 and niacin. These vitamins participate in various chemical processes related to fat, protein and energy metabolism. Also, some species, especially fattier fish, provide moderate amounts of the fat-soluble vitamins A and D (3,6,7).

Seafoods also provide certain essential minerals, such as phosphorous, selenium, iodine and fluoride. Also, some mollusks offer substantial amounts of iron, copper and zinc. For example, eight medium oysters provide approximately 1/2 the RDA (Recommended Dietary Allowance) for iron (3,8).

## **PREPARATION:**

It's clear that seafoods offer certain nutritional advantages - especially with regard to reducing total fat and saturated fat in the diet. However, all of these nutritional qualities can be drastically changed by preparation methods and added ingredients. Thus, many consumers who are eating more seafood are also choosing healthier preparation methods and recipes, both at home and when dining out. Buyers who have control over final preparation of their seafood products should keep in mind that ultimately; the recipe makes the difference.

## **REFERENCES**

1. Dietary Guidelines Advisory Committee. 1990. Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 1990. U.S. Department of Agriculture, Human Nutrition Information Service, Hyattsville, Maryland, 19 pp.
2. US Dept. of Health and Human Services Public Health Service. 1988. The Surgeon General's Report on Nutrition and Health. Superintendent of Documents, U.S. Gov't Printing Office, Washington DC (GPO stock # 017-001-00465-1), 712 pp.
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**APPROXIMATE NUTRIENT VALUES FOR SOUTHEASTERN SEAFOODS (For 100 gram (3.5 oz) raw, edible portions)**

This table lists the approximate nutrient content for species described in the Seafood Product Quality Code, as well as other species common to the southeast. Be aware that nutrient values for seafoods can vary dramatically, depending on season, location, size, water salinity, etc. To illustrate this variability, ranges for fat, cholesterol and sodium have been included in parenthesis, when available. These ranges reflect the highest and lowest analytical values and therefore may or may not represent the true variability for that particular nutrient and species. 'NA' indicates unavailable data, however general estimates can be made by referring to similar species.

Seafood	Kcal	Pro (g)	Fat (g)	Sat'd (g)	Mono (g)	Poly (g)	W3 (g)	Choles (mg)	Sodium (mg)
<b>FINFISH</b>									
Amberjack, Greater	106	NA	1.8 (1.5-2.0)	NA	NA	NA	NA	44	36 (33-38)
Bass, Saltwater	93	18	1.9 (0.6-3.0)	0.3	0.4	0.5	0.4	80	66 (56-69)
Butterfish, Butterfish	111	18	4.0 (0.9-22.2)	0.8	1.1	0.7	0.4	61 (48-70)	89 (81-96)
Catfish (cultured)	113	18	4.2 (0.1-7.7)	0.9	1.7	0.9	0.3	83	66 (30-102)
Catfish (wild)	84	17	1.2 (0.3-3.6)	0.4	0.4	0.3	0.1	NA	NA
Dolphin (fish)	90	19	0.8 (0.6-1.1)	0.2	0.1	0.2	0.2	73	88
Drum (multi-species)	96	19	1.8 (0.6-2.8)	0.3	0.3	0.3	0.1	64 (60-68)	87
Flounder (multi-species)	90	20	0.7 (0.1-1.5)	0.2	0.2	0.3	0.2	60 (57-66)	49 (22-67)
Groupers (multi-species)	101	20	1.6 (0.4-7.4)	0.5	0.4	0.4	0.3	49 (42-57)	55 (35-96)
Grouper, Black	94	NA	1.0 (0.4-1.6)	0.1	0.1	0.1	0.1	54	66 (58-73)
Grouper, Gag	103	21	1.5 (0.6-3.6)	0.6	0.5	0.5	0.4	44	35
Grouper, Jewfish	97	NA	1.3	0.3	0.3	0.4	0.3	49	NA
Grouper, Red	100	22	0.8 (0.8-0.9)	0.2	0.1	0.2	0.2	NA	63 (47-96)
Grouper, Scamp	102	20	1.8 (0.8-3.0)	0.7	0.5	0.6	0.4	42	55
Grouper, Snowy	93	20	1.0 (0.6-1.1)	0.2	0.2	0.2	0.2	NA	NA
Grouper, Speckled Hind	128	21	4.4 (1.2-7.4)	1.5	1.1	0.8	0.6	NA	NA

Seafood	Kcal	Pro (g)	Fat (g)	Sat'd (g)	Mono (g)	Poly (g)	W3 (g)	Choles (mg)	Sodium (mg)
Grouper, Yellowedge	89	19	0.9 (0.5-1.6)	0.2	0.2	0.3	0.2	49 (45-53)	75 (62-88)
Grouper, Yellowmouth	103	NA	1.9 (1.5-2.2)	NA	NA	NA	NA	56	34 (31-36)
Mackerel, King	105	21	1.7 (0.8-2.6)	0.4	0.4	0.5	0.3	53	158
Mackerel, Spanish	132	20	5.3 (0.5-13.8)	1.9	1.5	1.5	1.1	76	49 (28-63)
Mullet, Striped	112	19	3.7 (0.2-11.8)	1.2	1.0	1.1	0.6	49	73 (65-81)
Perch, (multi-species)	99	20	1.7 (0.6-5.1)	0.3	0.4	0.5	0.2	85 (79-90)	50
Pompano, Florida	130	19	5.4 (1.7-9.5)	2.0	1.8	1.0	0.5	50	65
Seatrout, (multi-species)	98	19	2.0 (0.6-4.2)	0.6	0.6	0.4	0.3	NA	50 (41-59)
Shark, (multi-species)	86	19	0.6 (0.3-0.8)	0.1	0.1	0.1	0.1	35	71 (53-82)
Snappers (multi-species)	94	20	0.8 (0.1-2.3)	0.2	0.1	0.3	0.2	41 (28-56)	45 (33-70)
Snapper, Gray	91	NA	0.6	NA	NA	NA	NA	47	53 (50-55)
Snapper, Lane	96	NA	1.2 (1.1-1.2)	NA	NA	NA	NA	53 (50-56)	44 (33-55)
Snapper, Red	98	21	1.1 (0.1-2.3)	0.3	0.2	0.4	0.3	NA	62 (53-70)
Snapper, Silk	91	NA	0.6	NA	NA	NA	NA	30	35
Snapper, Vermilion	92	20	0.6	0.1	0.1	0.2	0.1	30	38 (37-38)
Snapper, Yellowtail	NA	NA	NA	NA	NA	NA	NA	NA	39 (36-42)
Swordfish	116	20	3.4 (2.6-4.0)	0.8	1.2	0.9	0.6	50 (39-60)	90
Tilefish, (multi-species)	96	19	1.6 (0.8-4.8)	0.3	0.3	0.3	0.3	47 (42-49)	65 (53-69)
Tuna, Albacore	160	NA	6.8 (4.9-12.8)	1.7	1.7	2.4	1.8	41 (27-54)	30 (26-34)
Tuna, Bigeye	105	NA	0.8	NA	NA	NA	NA	44	69
Tuna, Bluefin	197	23	10.8 (4.7-23.1)	1.3	1.4	1.5	1.2	38	39

Seafood	Kcal	Pro (g)	Fat (g)	Sat'd (g)	Mono (g)	Poly (g)	W3 (g)	Choles (mg)	Sodium (mg)
Tuna, Yellowfin	116	23	1.8 (0.5-4.2)	0.6	0.9	0.7	0.6	42 (32-45)	54 (37-87)
<b>Crustaceans</b>									
Crab, Blue	82	17	1.1 (0.8-1.5)	0.2	0.2	0.4	0.3	72 (49-104)	281 (252-429)
Crab, Stone	NA	NA	0.4	NA	NA	NA	NA	54	350 (340-360)
Lobster, Spiny	82	16.2	1.4 (0.6-2.1)	0.2	0.2	0.6	0.3	105 (70-140)	NA
Shrimp, (Penaeid species)	99	20	1.5 (0.8-2.2)	0.2	0.2	0.5	0.3	152 (89-201)	169 (91-238)
Shrimp, Rock	103 (96-113)	NA	0.8	NA	NA	NA	NA	122 (114-129)	330 (320-340)
<b>Mollusks</b>									
Oyster, Eastern	66	8	1.9 (0.6-4.1)	0.5	0.2	0.7	0.4	47 (23-63)	163 (57-496)
Quahog, Northern	36	7	0.6	0.1	0.1	0.1	0.1	57 (31-86)	56
Scallop, Calico	81	16	0.7 (0.1-1.1)	0.1	0.1	0.3	0.2	NA	NA
Squid (multi-species)	79	15	1.7 (1.1-2.0)	0.4	0.1	0.7	0.6	201 (81-450)	44

■ Table 26 - Nutrient content for species

**Reference:** Data presented in this table is based on the University of Florida's Nutrient Database for Southeastern Seafoods, as compiled by Ann Sullivan, RD, Florida Dept. of Natural Resources, and Dr. W. Steven Otwell, Extension Seafood Specialist, IFAS and the Florida Sea Grant College Program. This database was supported in part by a grant from the Gulf and South Atlantic Fisheries Development Foundation, Inc.

## Appendix D - Organoleptic Evaluations

Organoleptic evaluations for seafood quality are subjective, sensory judgments based on the experience of the evaluator. They can involve eyeing, feeling, chewing and tasting of the products to judge product appearance, color, integrity, texture and flavors. The value in these judgments depends on the experience of the evaluator with the specific products in question. This experience is obtained in handling specific seafood items in a variety of conditions and with repetitive reinforcements over time. Specific product experience is necessary because sensory attributes for seafood quality can vary per product and species. In a commercial setting control samples for comparison are not always practical, thus the evaluator must learn and reinforce a memory for comparable judgments.

Sensory judgments can be scaled for "acceptance" or "likeability" or specifically described with special terminology (Tables 27-29). A scale can be used to rate the overall quality of the seafood or specific quality attributes such as color, appearance, texture (mouthfeel), and taste. These judgments can be for seafoods as fresh, frozen, thawed or cooked.

For beginners and routine use, an acceptance scale is most common. With experience, the evaluator can add descriptive terms, which may be unique for a certain product. Regardless of the sensory scale used, it must be communicated between the supplier and buyer in advance of the evaluation to assure more cooperation and understanding.

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AA - Top of Catch		
A - Good	A - Good	A - Slight Defects
B - Fair	B - Reasonably Good	B - Moderate Defects
C - Poor	C - Poor	C - Excessive Defects

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■ Table 27 - A variety of common "letter" scales sensory judgments for seafoods.

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1 - Top Quality	1 - Excellent	1 - Excellent
2 - Good	2	2
3 - Poor	3 - Moderate	3
	4	4 - Avg., Neutral
1 - Best	5 - Poor	5
2 - Excellent		6
3 - Very Good		7 - Reject, Dislike Extremely
4 - Good		
5 - Fair		
6 - Just Acceptable, Avg.		
7 - Rather poor		
8 - Poor		
9 - Very poor		
10 - Inedible		

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■ Table 28 - A variety of common "numbered" scales used in sensory judgments for seafoods.

Descriptive Scale		
Rating	Odor	Flavor
10	Meaty, oniony, fresh salt butter or margarine, Worcester Sauce slight caramel.	Meaty, very slight bitter, shell- fish, slightly garlic flavored
9	Oily, slightly aromatic, slightly peppery, boiled clothes	Oil, rather herring-like, metallic but still meaty.
8	Curry, still oily, peppery, damp clothes, blackened smell.	Curry, seasoned meat, oniony spicy, peppery, canned meat.
7	Caramel, boiled potatoes, musty, butterscotch.	Neutral flavor, only slightly sweet and meaty.
6	Metallic, slightly sour, acrid sweaty, boiled string	Slightly rancid, slightly sour, slightly bitter.
5	Sour bread, lower fatty acids rancid butter, singed milk, smoky	Rancid oil, rancid butter, fishmeal.
4	Slight amines, slight ammonia, sour beef, spoiled cheese.	Bitter, woody, sour, little flavor.
3-1	Ammonia, very sour, slightly fecal.	Very bitter, rotten fruit.

- Table 29 - Descriptive scale used in sensory judgments for overall freshness (quality) for cooked fish.<sup>1</sup>

### SFA's RECOMMENDED PRODUCT ACCEPTANCE SCALE

For routine, daily product evaluation SFA recommends a basic 7 point organoleptic number scale (Table 30) for product acceptance. This scale allows judgements between the excellent (1), average (4) and rejection (7) points for acceptance. The scale can be used to judge color, odor, texture and cooked taste for most fresh or previously frozen seafoods. Cooked evaluations are best judged without the influence of additional ingredients or dilutions. The recommended method is to boil the seafood samples in a closed boilable pouch or bag until the seafood reaches an internal temperature of 160° F (71° C). Remove the bag from the boiling water and open to release the cooked aromas. Carefully smell for odor judgements, then remove product and temper to room temperature prior to judging texture and taste. Taste and texture can also be judged from the warm product, but room temperature assessments assure a standard procedure for comparisons.

Acceptance Pts.	R = Raw		C = Cooked, 160°				Comments & Description	
	Color		Odor		Texture			Taste
	R	C	R	C	R	C		C
1 Excellent								
2								
3								
4 Average								
5								
6								
7 Reject								

- Table 30 - Seafood Product Organoleptic Acceptance

### SFA's SEAFOOD PRODUCT SPECIFICATION LISTS

Preparing a seafood product specification list should be the first step taken before ordering any seafood. The list should include product identity, economic concerns and quality considerations. A list should be prepared for each seafood item then communicated with the supplier to allow

<sup>1</sup> Source: Training a Torry Style Freshness Panel, INFOFISH MARKETING DIGEST No. 6/64 pp. 42-43

necessary changes and flexibility. This prior communication is essential to avoiding surprises and building a quality relationship. This same list can serve as the check list by which to monitor incoming purchases. Also, structured checklists can serve to educate and remind the buyer's staff.

The checklist can be as specific as the buyer or product requires (Short form and Long form below). Note: each SFA recommended specification list includes an organoleptic judgement for product acceptance.

**Common seafood product quality checklist (short form)**

**Product Quality Checklist**

Date: Ordered \_\_\_\_\_

Arrived \_\_\_\_\_

Product:: \_\_\_\_\_

\_\_\_\_\_

Content: \_\_\_\_\_

\_\_\_\_\_

Grade: \_\_\_\_\_

\_\_\_\_\_

Spec. Attributes: \_\_\_\_\_

\_\_\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_

Checked By: \_\_\_\_\_

\_\_\_\_\_

Overall Sensory Check (1 = excellent; 4 = Average; 7 = Reject) \_\_\_\_\_ pts.

**Common seafood product quality checklist (long form)**

**Product Quality Checklist**

Product Code: \_\_\_\_\_ Source: \_\_\_\_\_

History: \_\_\_\_\_

In Date: \_\_\_\_\_ Check Date: \_\_\_\_\_

Product name: \_\_\_\_\_

Sci. \_\_\_\_\_ Common: \_\_\_\_\_ Market: \_\_\_\_\_

Product Type/Form: \_\_\_\_\_

Packaging: \_\_\_\_\_

Labeling: Source: \_\_\_\_\_

Product Name: \_\_\_\_\_

Contents: \_\_\_\_\_

Ingredients: \_\_\_\_\_

Other: \_\_\_\_\_

Weight or Volume:

Unit: \_\_\_\_\_

Gross (w/package) \_\_\_\_\_

Net Fresh/Frozen \_\_\_\_\_

Net Thawed \_\_\_\_\_

Other \_\_\_\_\_

Grade or Size/Unit: \_\_\_\_\_

Uniformity: \_\_\_\_\_

Special Attributes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Quality Attributes:

Organoleptic      appearance                      odor                      texture                      taste

(1 = Excellent; 4 = Average; 7 = Reject)

Fresh

Frozen

Cooked

Descriptions \_\_\_\_\_

Workmanship \_\_\_\_\_

Damage \_\_\_\_\_

Dehydration \_\_\_\_\_

Extraneous Material \_\_\_\_\_

Bones \_\_\_\_\_

Parasites \_\_\_\_\_

Comments: \_\_\_\_\_

Checked by: \_\_\_\_\_

Shipped to: \_\_\_\_\_ Date: \_\_\_\_\_

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Bob