PART I: SHELLFISH
I-A: CRABS

Characteristics

Crabs are broad bodied, flattened crustaceans. They are recognized by their hard shells or exoskeletons, and four pairs of jointed walking legs in addition to claws. Most species are found in the sea, from the tide line out to great depths.

There are more than 4,500 species of crabs in the world, ranging in breadth from fractions of an inch to nearly twelve feet. Most are scavengers, though some capture live prey and others filter plankton from sea water.

The female carries her eggs in a mass, called a "sponge", on her underside. In about two weeks they hatch into free-swimming larvae called zoea. After several moltings, zoea become adults.

Crabs generally live three to four years. They may lose one or more legs during their lives, and are able to grow new ones through a regeneration process.

Hard and soft crabs: the molting process

Periodically, in order to grow, a crab sheds its external armor or shell. This process is called molting. Before the molt starts, a new, soft exoskeleton forms inside the old, and the crab backs out of the old shell as it loosens. The new shell is soft and elastic, allowing the crab to grow. It is particularly vulnerable to attack during the soft-shell stage and seeks refuge in a secluded spot until the new shell hardens.

Soft shell crabs are taken during the late spring, summer, and early fall, as the molting process takes place only during warm months. The crab houses which handle these crabs are known in the trade as "shanties" or "shedding houses".
Important Species

Blue Crab

Blue Crab: The blue crab (*Callinectes sapidus*) is found on the Atlantic coast from Massachusetts Bay to South America. When fully grown, it averages 5 to 7 inches across the back of the shell, which is brownish green or dark green. The underside of the body and the legs are white, while the tops of the claws show varying amounts of blue. The tips of the female's claws are bright red.

The blue crab is the most important commercial species. The Chesapeake Bay provides about half the weight and value of United States landings.

Blue crab meat is available in several different forms:

A. Lump (back fin) - the highest quality crab meat, includes all meat from the body portion adjacent to the back fin appendage which substantially remains in sizeable lumps.

B. Flake (regular or white) - all meat from the body portion except the lump.

C. Claw - all meat from the claw appendages.

D. Mixed White (special) - all meat from the body part of the crab in normal proportions (consists of all the lump and flake meat).

E. Deluxe - This term is not an official market standard. Consequently, the type of parts and quality may vary considerably among wholesalers and retailers. The term is usually employed to define a variable mixture of lump and flake.

Stone Crab: The stone crab (*Menippe mercenaria*) ranges from North Carolina to the Gulf of Mexico and to the Bahamas. The oval carapace is dark purplish-blue in young crabs, brownish-red with flecks of gray in adults. The comparatively large claws are smooth, and banded with red
and yellow. The principal fisheries are in Charleston, South Carolina, and Key West, Florida, but are not extensive because of the scarcity of this crustacean. Most meat comes from the claws, and compares favorably in flavor with the blue crab.

Rock Crab

Rock Crab: The rock crab (*Cancer irroratus*) is found on the North Atlantic coast from Nova Scotia to the South Atlantic states. It has a smooth, oval, ivory-colored carapace, with purple or crimson spots. Though moderate in size (5 inches, 7 ounces), its meat is equal to the blue crab in quantity and flavor.

Brownish in color, the meat is picked from both body and claws and is marketed as one grade. Though this species is abundant, it is not fished extensively. It has great future potential.

Jonah Crab: The jonah crab (*Cancer borealis*) resembles the rock crab but is larger with a rougher, brick red carapace. It is found in the same areas as the rock crab, but usually in deeper water. Its flavor is excellent, but it has never been an important article of commerce because of its limited distribution.
Dungeness Crab

Dungeness Crab: The dungeness crab (*Cancer magister*) is the common crab of the Pacific coast from Alaska to southern California. At 9 inches in breadth, it is one of the largest edible crabs in the United States. It is light reddish-brown on the back with a pattern of lighter streaks and spots. It is marketed whole as cooked "dressed" crab, or the cooked meat is sold fresh, frozen, or canned. Fresh cooked meat is picked from both body and claws and packed as one grade. Body meat is white, while claw and leg meat are reddish.
Red Crab: The red crab (*Geryon quinquedens*) is found off the east coast of the United States from Nova Scotia southward to Cuba. The color is usually dark red, the legs are long and slender, and the body is somewhat square. This species reaches a width of 7 inches and may weigh more than 2.5 pounds. It may yield as much as 23% meat, which is approximately twice the yield of the blue crab. The commercial potential of this crab has not yet been realized, though seafood processors in several states have expressed interest in this new seafood resource.

Fishing Methods

Soft shell crabs are usually caught in shallow waters, where they hide at molting time, by dip nets, push nets, or scrapes. A dip net is simply a net on a hoop at the end of a long handle, used by the crabber from his boat. A push net is similar, but larger, and the hoop is flattened on the side opposite the handle. This net is pushed along the bottom by a crabber wading in the shallow water. A scrape is a triangular iron frame two to five feet wide, with a cotton mesh bag about six feet long extending behind. It is dragged along the bottom by small boats.

Soft shell crabs are either caught in that condition or are obtained by holding "peelers", crabs about to shed, until they molt. Crabbers recognize peelers by a pink line that appears on the fourth pair of legs just before molting. These crabs are kept alive in boxes and floats until they "shed out." The majority of soft crabs are obtained in this manner.

Hard shell crabs are caught with scrapes, dredges, and trotlines. A dredge is a larger, modified version of the scrape explained above. A trotline is a rope, from 1/4 to one mile long, with a chain anchor at each end. A buoy is also attached to show the location and the owner. The line is baited about every 18 inches with salt fish or cheap meat. A boat moves along the line and lifts it by means of a roller. Crabs are taken off with a dip net.
Crabs are also caught by the crab pot method. A box about two feet square consisting of wire mesh on a rigid metal frame is used. There are two chambers, and the lower one is baited. The crab swims upwards after grasping at the bait, enters the upper chamber and is imprisoned. A crabber may set 35 to 50 crab pots and fish them from a small boat.

**Market Forms**

Crabs are available in several forms: live, cooked in the shell, cooked and frozen, picked cooked meat, or canned meat. Some hard shell crabs are shipped alive in barrels of ice and sold within comparatively short distances from the point of capture. Soft crabs are shipped alive, carefully sorted and specially packed in wooden trays lined with seaweed, or they may be cleaned cleaned, individually wrapped, and quick frozen for shipping. With careful handling, they can be shipped hundreds of miles.

The most common market form of crabs is the picked cooked meat. It is picked from hard shell crabs which have been steamed, and then is shipped on ice or canned. Meat from the blue, dungeness, king, and rock crabs is available in cans ranging from 3 1/4 to 17 ounces. Pasteurized crab meat is available in some areas. It is produced by heating meat packed in cans to an internal temperature of approximately 185°F. Since the meat is not given a full heat treatment, it must be stored under refrigeration between 32-36°F. When properly refrigerated, a shelf-life of 6 months is usually expected. Sometimes the pasteurized meat may have a bluish or blue-gray color. This is caused by a processing temperature over 190°F. The over-processed product is safe to consume and usually does not contain off-flavor or odors.

**Consumer Inspection**

Fresh crabs bought in the shell should be alive; that is, they should move their legs when touched. Crab shells should not be slippery.
Cooked crabs in the shell should be bright red and should have no disagreeable odor. Odor can be easily detected by slightly lifting the lid under the body section of the crab. Frozen crab should be hard-frozen when bought, with no odor.

**Alaska King Crab**

**Characteristics:** The king crab (*Paralithodes camtschatica*) is found on both sides of the north Pacific Ocean. In Asian waters it is found from the Sea of Japan northward into the Sea of Okhotsk and along the shores of the Kamchatka Peninsula. The species occurs throughout the Aleutian Islands and the southeastern Bering Sea where large fisheries exist. On the western coast of North America, the northern limit for king crab is Norton Sound in the northeastern Bering Sea. The southern limit of king crab in the northeastern Pacific is Southern Canada.

The king crab, one of Alaska's most valuable marine resources, has several distinguishing features: (1) a rough, heavy shell; (2) a reddish carapace and legs covered with spines; (3) a last pair of legs that is small and hidden; and (4) its great size. Sexual maturity is attained at about 5 years when the king crab's carapace length is approximately 39 inches (100 cm), but growth through molting occurs until a maximum size is reached at an average of 14 years of age. Adult females molt annually and average 3/16 inch (4mm) per molt. Adult males molt annually through the eighth year and average 3/4 inch (20 mm) per molt. After eight years, an increasing proportion molts biannually.

**Fishing Methods:** King crabs are mainly caught in pots which are pyramidal in shape measuring 7' by 7' by 2 1/2'. A hydraulic pot hauler is used to ease the manual work of the harvesters who must brave severely adverse fishing conditions during winters in the Bering Sea. Large vessels normally have fish holds with refrigerated sea water circulation systems for holding the crabs alive. This circulation system makes many distant fishing grounds accessible, for dead crabs cannot be accepted by processors and the crabs perish if their water is not changed about every twenty minutes.

**Market Forms:** King crab meat comes from the processor in fresh
frozen form and, in some instances, canned form, with the major wholesale buyer being the restaurant trade. Crab sections, consisting of the natural ratio of four legs and one claw, are the most common product of initial processing at Alaskan plants. The sections leave Alaskan plants in brine-frozen 75-150 pound bulk packages, and are sent to stateside plants for further processing. Frozen meat is the second most common crab product from Alaskan processing plants. The extracted meats are frozen into blocks weighing about 15 pounds and shipped to the lower states.

Alaska Tanner Crab (Snow Crab)

**Characteristics:** The range of the genus is: the Eastern Pacific from the Bering Strait and the Aleutian Islands to Cortex Bank which is opposite the United States - Mexico boundary; Western Pacific from Kamchatka to off Kinkazan, Japan; the Siberian, Alaskan and Canadian Arctic; and the Western Atlantic from the west coast of Greenland to Casco Bay, Maine. Like the king crab, the tanner crab (Chionoecetes opilio) is quite large and has a hard, rough-textured carapace and legs. But unlike the king crab, the tanner crab's last pair of legs is quite visible, though smaller than the other four pair. Like other crabs, the tanner crab grows through the process of molting.
Fishing Methods: Fishing methods employed for tanner crabs are similar to those used for king crabs except that the pot is slightly smaller.

Market Forms: Tanner crab production has become increasingly important and public acceptance has increased so that tanner crab is a viable rival to king crab. Most of the tanner crab available on the market is frozen -- either sections or whole crabs -- and is purchased primarily by institutions like restaurants and grocery chains.

Consumer Inspection: Snow crab should have a fresh odor and no discoloration of the meat which runs from white to white with red.

Picking the Meat from Blue Crabs (Cooked in the Shell)
With the left hand, grasp the body of the crab with the large claws to the right. Break off the large claws (Illustrated on next page; 1). Pull off the top shell with the right hand (2). Cut or break off the legs. Scrape off the gills and remove the digestive and other organs located in the center part of the body (3). Slice off the top of the right side of the inner skeleton, beginning near the front (4), and cut off legs (5). Remove any meat on this slice; then starting with the right back fin pocket, remove the meat from the lower part with a U-shaped motion of the knife (6). Remove the meat from the other pockets by inserting the knife underneath and prying upward. Cut off the top from the left side of the inner skeleton and remove the meat in the same manner as for the right side. Pull the meat out of the claws (7).
Picking Meat from Blue Crab
Color Film, "Picking the Blue Crab", Available

Sea Grant at Virginia Tech has developed an 8 minute, 16 mm color film with narration on the correct method for picking the blue crab. Instruction is given on removing the backfin (lump), flake, and claw meat for both right and left handed individuals. The film can be used as a training aid during or prior to demonstration and practice.

For film loan information call or write: Audiovisual Services, 2 Patton Hall, Virginia Tech, Blacksburg, Virginia 24061 (telephone 703-961-6718). When writing for a film loan, please give a minimum of 30 days notice. For videotape loan information call or write: Instructional Television, 287 Whittemore Hall, Virginia Tech, Blacksburg, Virginia 24061 (telephone 703-961-5149).

For film purchase information, call or write: Extension Division, Sea Grant Program, Food Science and Technology, VPI&SU, Blacksburg, Virginia, 24061. Phone (703) 961-6965.

When ordering a film or videotape for loan, please use the form that follows.

Please send the film ( ) or videotape ( ) "Picking the Blue Crab" on the indicated date(s).

Name __________________________________________________________

Address _______________________________________________________

City __________________________ State ___________ Zip ___________

Telephone Number ___________________________________________

Preferred dates ______________________________ (and, or)

Alternate dates ______________________________ (and, or)

(if possible)

(The film is loaned by Virginia Tech for a one to three day period.)
I-B: LOBSTERS

Characteristics

There are several families and more than 200 species of lobsters. They are crustaceans that live on rocky, sandy, or muddy bottoms from the shoreline to the continental shelf. Lobsters live singly in crevices and burrows, and are most active at night, scavenging for mollusks, sea worms, small fishes, and some plants. They have two claws, a larger one for crushing and a smaller one for cutting, and are capable of swimming backwards swiftly by snapping their abdomens down and under. It is the large muscle of this abdomen that is prized for its flavor. Lobsters' colors range from light green to deep blue.

Northern Lobster
Important Species

**Northern Lobster:** The northern or true lobster (*Homarus americanus*) is found in the waters of Great Britain, Canada, New England, and the middle Atlantic states. Primary production is centered in Maine, and this species is thus often called the Maine lobster. The northern lobster may grow to 25 pounds, though market lobsters average about 1-3 pounds.

**Spiny Lobster:** Spiny or rock lobsters (*Panulirus argus*) are actually sea crawfish, though they are related to lobsters. There are several distinct differences: the spiny lobster does not have the large heavy claws of the true lobster; it is covered with spines on both body and legs; and it has long slender antennae. It is caught off the coasts of Florida, and a similar species (*Panulirus interruptus*) is found off the coast of California.

Fishing Methods

Most lobsters are caught in traps called lobster pots. These are oblong boxes made of wood laths spaced to allow under-sized lobsters to escape. The ends of the pots have netting arranged in a funnel shape which permits lobsters to enter but makes it difficult for them to escape. The lobster pots are baited with fish, weighted, and lowered to the bottom. They are marked with a buoy. Some spiny lobsters are fished from small skiffs with the help of a dip net.

Since most lobsters are sold alive, the catch is often held in underwater cages called holding pounds until marketing. They are shipped alive in barrels, packed in layers of seaweed with surrounding ice.

Market Forms

Lobster may be found in many forms: live, whole cooked in the shell, frozen raw, boiled and frozen, fresh cooked meat, frozen cooked meat, and canned cooked meat. The meat comes from the claws and tail, except spiny lobsters which have no claws. Spiny lobster is often marketed as rock lobster and is usually the source of "lobster tails" available in stores and restaurants.
It has been reported that lobsters frozen raw retain their quality better than those which have been boiled. The deterioration of meat which has been cooked results in a toughening and loss of flavor over long storage. However, frozen whole lobsters suffer considerable breakage because the legs snap off easily unless they are handled with considerable care. In order to reduce breakage, lobsters are usually packed in cartons before they are frozen. Frozen lobsters are sometimes packed in individual waxed cartons.

The cooked meat of the lobster, picked from the shell, is marketed fresh, frozen, and canned. Frozen lobster meat can be purchased in 6, 14, and 16 ounce cans, or in waxed cardboard cartons.

Consumer Inspection

When purchased, lobsters should be alive. If alive, they will show movement in the legs when touched; and their tails should curl under the body and not hang down when they are picked up.

Though the shells of lobsters and spiny lobsters may vary in color, they rapidly change to "lobster red" during cooking. Whole lobsters cooked in the shell should therefore be bright red in color and have a fresh "seashore" odor, not disagreeable. Frozen lobster and lobster tails should be hard frozen and have no odor.

Lobster in the shell varies in weight between 3/4 and 7 or more pounds, and is graded by weight: chickens, 1 pound average; Chinese*, 1 1/8 pounds average; quarters, 1 1/4 pounds average; x-halves, 1 3/8 pounds average; halves, 1 1/2 pounds average; selects, 1 1/2 - 3 pounds; large, 3 - 7 pounds; and jumbos, over 7 pounds. Lobster tails usually run from 4 ounces to 1 pound each. A one-pound lobster will yield 2/3 cup of flaked, cooked meat.

Live lobsters missing one claw are marketed as "pistols" Those missing both claws are marketed as "culls".

* Chinese restaurants are adamant in procuring this size only. There is no indication that U. S. standards are even needed or wanted.
I-C: CRAWFISH

Characteristics

Crawfish are found all over the world on every continent except Africa. Of the more than 300 species, a few species are consumed by a very small percentage of the world population. The remaining harvested crawfish are most often used as bait or lab specimens.

Crawfish have an arthropod body, which means they are invertebrate with jointed legs, and a segmented body. There are 18 true segments which are jointed and arranged in a linear series. The jointing of the body and appendages is necessary for movement, for the whole body is encased in a rigid, impermeable cuticle. This "armor" or exoskeleton acts as a support for internal organs and is used for attachment of muscles.

Important Species

In Louisiana where production surpasses that of all other states combined, the two species of commercial importance are the river crawfish and swamp crawfish. Neither species requires a river or swamp environment, but river crawfish do need a higher oxygen level than swamp crawfish. In size and outward appearance the two are very similar, the differences being the form of their pincers (claws) and legs, and their coloring. The swamp crawfish is dark red and the river species is pinkish.

Fishing Methods

Baited traps and nets are used most often for harvesting. In terms of cost and attention required, the traps are more economical than the nets and are, therefore, used most often.
Market Forms

In southern Louisiana which is one of the few areas where crawfish are consumed in the United States, 65% of the total volume is marketed live. Prepared or processed crawfish may be purchased as peeled tails, precooked meats in a bisque (stuffed crawfish heads in gravy with a roux) or etouffee (tails in a gravy with or without a roux), crawfish patties, or boiled crawfish. Of the above processed crawfish products, 75% is sold as fresh peeled tail meat. The remaining 25% is mostly sold in boiled form.

Consumer Inspection

If purchased live, the crawfish should curl the tail and its appendages should stiffen rather than droop. Boiled and bagged crawfish will have a strong but not a putrid odor. It is reported that a boiled crawfish whose tail is not curled was dead when boiled, and therefore, should not be eaten.

When freezing crawfish, the "fat" should be frozen separately. If crawfish are frozen with their fat, the freezing life is shortened. If crawfish tails or prepared products are stored for a long period of time, the tails may become dark in color and develop an undesirable flavor and odor.
I-D: SHRIMP

Characteristics

There are several hundred species of shrimp. They range from less than an inch to nearly twelve inches in length. Larger shrimp are sometimes called prawns. Shrimp resemble crayfish, having segmented exoskeletons and stalked eyes. Like other crustaceans, they shed their shells and replace them with larger ones in order to grow.

Live shrimp come in a variety of pale colors, including pink, brown, white, and gray; but all turn pink with cooking. Because shrimp are one of the most popular of seafoods, they are among the most valuable marine resources of the United States. They are fished commercially in the Atlantic Coast from Virginia south to Brazil, and in the Gulf of Mexico.

White Shrimp
Important Species

White Shrimp: The white shrimp (Penaeus setiferus) is the common greenish-gray shrimp found in the shallow waters of bays and other inshore areas. The white shrimp fishery is centered in Louisiana. The white shrimp accounted for about 90 percent of shrimp landings prior to 1948, but has now been overtaken by the other varieties.

Brown Shrimp and Pink Shrimp: The brown (Penaeus aztecus) and the pink (Penaeus duorarum) shrimp are often called "grooved shrimp" and are caught in the Gulf of Mexico off Texas, Alabama, Florida, and Mexico. Much larger quantities are caught at night than in the daytime. As the names imply, the brown shrimp is brownish-red in its raw state, and the pink shrimp pink or coral colored.

Macrobrachium Shrimp: The Macrobrachium or Malaysian prawn (Macrobrachium rosenburgii) flourishes in fresh and brackish waters. These prawns are indigenous to the lower reaches of Asian rivers, but are now being cultured (grown) in the United States (Hawaii, Florida, New Jersey, California, Texas, Puerto Rico) with success. The market for Malaysian prawns is unknown in most areas, but in Hawaii, due to a large population of Americans of Oriental extraction who regard seafood highly, the demand is high. Presently, the large prawns (4 to 6 pounds) are sold most often. They are marketed whole and fresh.
Fishing Methods

Although some shrimp are caught in nets and baited pots, most are collected by an otter trawl, which is towed slowly along the ocean floor by a boat. The trawl is a large funnel-shaped bag, sometimes 100 feet across, with boards on the sides to hold it open. It is hoisted aboard the pulling vessel at intervals and the shrimp emptied on deck. Often the shrimp are deheaded on board, and then stored in ice. On the Gulf Coast, butterfly nets are used at night to catch shrimp near the surface. A butterfly net is attached to each side of the boat and is lowered three to four feet into the water. The vessel then trawls through the water collecting the shrimp in the upper water column.

Market Forms

Shrimp are available in most areas of the United States either raw or cooked, peeled or unpeeled, and fresh or frozen. Near production points, they may be purchased with heads, though usually they are found already deheaded. The yield of whole shrimp is approximately 50%. Peeled meats of shrimp, individually quick frozen, may be bought in polybags or rigid plastic containers in a variety of sizes and weights. Shrimp may also be bought by the pound or in convenient, shelf-ready cans. They are also marketed as broken, imperfect pieces for use in salads or mixed dishes where shape is not important. Shrimp are termed "whole" if they consist of five or more segments of shrimp flesh.

Breaded shrimp are also popular. Frozen raw breaded shrimp are made from whole, clean, headless shrimp which have been peeled and deveined. The shrimp are coated with a wholesome batter and/or breading. Many consumers are unaware that frozen raw breaded shrimp are available with different amounts of breading material. "Regular Breaded" contain a minimum of 50% shrimp material. "Lightly-Breaded" contain a minimum of 65% shrimp material.

Two types of breaded shrimp are marketed: "Breaded Fantail Shrimp" and "Breaded Round Shrimp". Both types are available in three forms which vary in the amount of tail fin and shell segments retained. Breaded shrimp are highly suitable for inspection and grading, but not all these products on the market are inspected or graded. (See Part V-E for information on grading and inspection of seafood products).
Consumer Inspection

Fresh shrimp should have a mild odor and firm meat. Meat and shells should not be slippery. The color of the shell may be grayish green, pinkish tan, or light pink, but there is little difference in appearance or flavor when cooked. Cooked shrimp have red shells, and the meat also takes on a reddish tint, possibly with some dark-red spots.

Shrimp are susceptible to a defect called black spot. This brown or black spotting is visually objectionable but is not harmful to the health of the consumer. It is not caused by excessive levels of spoilage bacteria, but is the result of a biochemical reaction called melanosis. This reaction is produced from naturally occurring compounds in the shrimp shell and is similar to the reaction that takes place when a person is suntanned. Black spot is also known as box ring, ice burn, and ringer burn and is a sign of age or of poor handling during the harvesting or processing.

Shrimpers and processors have devised several ways to eliminate or retard black spot on shrimp. First, on the boat, the shrimp are not kept on deck, in the sunshine which would encourage development of black spot. Instead, they are immediately washed thoroughly to remove organic material and the tyrosine (an amino acid) that is necessary for development of black spot. After being washed, the shrimp are stored in melting ice to remove spot-forming materials and maintain a low oxygen level.

A number of chemicals may be used to control black spot, including lemon juice, baking soda, ascorbic acid, sodium sulfite, sodium bisulfite, sodium metabisulfite, and EDTA. The most commonly used of these, sodium bisulfite, is called dip. It is a strong reducing agent which ties up oxygen, and is used in many other foods -- especially wine, beer, and dehydrated fruits and vegetables -- for essentially the same purpose.

As with any other food additive, there are certain precautions which the shrimper or processor must take. Especially important are careful washing, not reusing the dip, and careful washing and icing after frozen shrimp are thawed.

Seafood Extension specialists state that shrimp with black spot but of otherwise good quality are perfectly safe to eat, especially if they are peeled and deveined before cooking. However, if the flesh seems
adversely affected, the shrimp probably should not be eaten. The black spot is, itself, not a quality defect in the shrimp and will not harm the consumer.

Shrimp are customarily sold according to size or grade, based on the number of heads off shrimp to the pound. The count or number designation may also be described by such general terms as jumbo, extra large, large, medium, and small. The largest size or grade runs 15 or fewer to the pound; the smallest size runs 60 or more to the pound. Today, however, most shrimp are sold by count ranges of 5 rather than grade. For example: 16-20, 21-25, and 26-30. The package usually contains the count for the consumer's information.

Since all species may be used interchangeably in cooking, the size of the shrimp assumes more importance if the cost and time required to prepare a recipe are taken into consideration. Jumbo shrimp generally cost the most, but take less time to peel and devein; small shrimp cost the least but take longer to prepare. They have the same fine flavor and food value.

Rock Shrimp

Characteristics: Rock shrimp are indisputably a member of the shrimp family, but because of their tough exoskeleton, the tails, when served, could be easily mistaken for a miniature lobster tail. The texture of the meat, too, is not unlike that of lobster, while the
flavor is between that of lobster and shrimp.

Fishing Methods: Rock shrimp have a life cycle very different from regular shrimp and are harvested differently. Like deep sea lobster, rock shrimp spawn, live and are harvested in 30 to 40 fathoms of water, and only at night; the fishing is also measurably affected by lunar cycles. Harvesting is done with reinforced trawl nets all twelve months of the year.

Market Forms: Rock shrimp are highly perishable and are, therefore, marketed mainly in the raw, frozen state, as either whole or split tails, although some tails are available in fresh form. Rock shrimp, like other shrimp, are sold by "count" -- the largest size generally available being 21-25 per pound.

Consumer Inspection: Properly handled rock shrimp will have transparent or clear white flesh with no discoloration of the meat. The odor of fresh, high quality rock shrimp will be mild, with no objectionable "off-odor". Cooked rock shrimp yield about half the weight of the green tails. One pound of cooked, peeled, deveined rock shrimp will feed six people.

Cleaning: When available, split tails are the easiest to prepare. But if they are not available, follow the directions below according to intended use.

For simmering, frying or baking: To remove meat from the shell, hold the tail section in one hand with the swimmerettes down toward the palm. Using kitchen shears, insert one blade into the sand vein. Open and cut through the shell along the outer curve to the end of the tail. Pull the sides of the shell apart and remove the meat. Wash thoroughly in cold water to remove all the sand vein.

For broiling: Place tail on a cutting board with the swimmerettes exposed. With a sharp knife, make a cut between the swimmerettes through the meat to the hard shell. Spread the shell until it lies flat; wash thoroughly in cold water to remove the sand vein.
I-E: OYSTERS

Characteristics

Oyster is the name for over a hundred species of bivalved mollusks. They occur chiefly between tidal levels or in shallow, slightly brackish water along the coasts of temperate and tropical areas. Sedentary creatures, they attach themselves by a limy secretion to any support and, once located, never voluntarily move again. They feed on minute organisms, both plant and animal, which they filter from the water. They have many natural enemies, including oyster drills and starfish.

True oysters are distinguished by dissimilar lower and upper shells or valves, which are hinged together by a complex elastic ligament. The upper shell is normally flat, while the lower is concave, providing space for the body of the oyster. The two valves fit together to form a water-tight seal when the oyster closes. Near the center of the oyster's body is an adductor muscle, attached to both valves, which controls the opening and closing of the shell.
Important Species

Eastern, Atlantic, or American Oyster: The Eastern oyster (*Crassostrea virginica*) is found along the North Atlantic seaboard from the Gulf of St. Lawrence to the Gulf of Mexico. Commercially, it is by far the most important oyster, accounting for approximately 85 percent of the total production in the U.S.

Pacific, or Pacific King Oyster: The Pacific oyster (*Crassostrea gigas*), which is now the basis of the West Coast industry, was imported from Japan for trial plantings after experimental plantings of the Eastern oyster failed. It is grown in coastal waters from Alaska to Northern California, with the biggest production areas in the state of Washington. The Pacific oyster comprises about 15 percent of U.S. production.

Western or Olympia Oyster: The Western oyster (*Ostrea lurida*) is native to the Pacific Coast. It was of commercial importance until about the turn of the century; but the yield of this species has declined because of over-exploitation, predators, pollution, and increased costs of production. Some are still available, and it is hoped that through conservation methods the cultivation of this species can be increased.
Fishing Methods

The oyster was one of the first seafoods utilized by man. It was easily harvested by hand during low tide. Some oysters are still gathered in this manner, but many more are caught by boatmen with "tongs", long handled rakes joined like the blades of shears. The most economical method of harvesting oysters, which now accounts for two-thirds of the harvest, is power dredging. The oyster dredge is a metal frame with a toothed bar across the front which dislodges the oysters and rolls them back into a chain mesh bag until they can be lifted to the boat.

Sea farming--or mariculture--programs produce most commercial oysters. A likely area is strewn with oyster shells, or other artificial attachment material, and young oysters ("spat") are introduced to the area and attach themselves to the shells. When the spat reach a breadth of about an inch, they are taken up as "seed" oysters and introduced into commercial beds.

This mariculture method was first experimented with by the Romans. The Virginia Institute of Marine Science (VIMS) of the College of William and Mary, University of Maryland, and other agencies are presently studying ways of producing "spat" in laboratories or other non-natural habitats. The James River in Virginia is one of the major producers of seed oysters in the U.S.

Market Forms

Oysters are available in several forms: live in the shell, fresh shucked, frozen, and canned. Oysters in the shell have been washed, chilled, and sometimes chlorinated by the processor. They are generally sold by the dozen, and are served in restaurants as "oysters on the half shell".

Many more oysters are "shucked" or removed from the shell before shipment. The meats are then washed in a "bubbler" or "blower" which churns the meats in fresh water by means of air blown in from the bottom of the tank. This agitation dislodges sand and silt from within the oysters. Meats are then graded for size, sealed in glass or metal containers, and shipped fresh in crushed ice. They are available in 8, 12, and 16 ounce containers.

In recent years, shucked oysters have also been quick frozen, a process which makes them available all year. Fresh shucked oysters are
breaded, packed into cartons, and frozen. Individual meats may be
removed as desired. Oysters are also diced, mixed with other ingre-
dients, and frozen for oyster stew. Or, they may be found among the
precooked foods in the market. Breaded, deep fat-fried, cartoned, and
frozen, they need only reheating in the oven.

Canned whole oysters and oyster stew are prepared from steam-opened
oysters. These have been passed through a steam retort for about ten
minutes, which opens the shell for easy removal. They are then canned
and sterilized in the retort. Ready-made oyster stew, needing only
reheating for table use, is available, as are oysters smoked and packed
with vegetable oil in glass or metal containers.

Consumer Inspection

Shell Oysters: Shell oysters must be alive when purchased. When
alive, they have a tightly closed shell. Gaping shells that do not
close when tapped indicate that the oysters are dead or nearly so and,
therefore, not fit for consumption. The preferred method of storing shell
oysters is to keep them moist with wet cloth or sacks and place them at
40°F. Cold temperature or the use of crushed ice may actually kill or
weaken the oyster. Fresh oysters may be held for several days if stored
properly.

Shucked Oysters: Fresh shucked oysters should be plump and should
have a natural creamy color (some oysters have a natural tan, brown, or
black film over the mantle). The liquid should be clear or slightly
opal escent, free from shell particles, with no sour smell; and there
should not be more than 15 percent liquid by weight in the original
container. The oysters should have a mild odor.

Eastern oysters are generally packed and graded according to the
number of meats to the gallon: very small, over 500; small or standards,
301 to 500; select or medium, 211 to 300; extra select or large, 160 to
210; and counts or extra large, under 160. Grade prices increase with size.

Color Variations: The usual color of a normal, fresh, raw-shucked
oyster is variously described as creamy, gray, brownish, pale yellow, or
some combination of these. However, other colors may not indicate spoilage.
If the oyster is **green** it is still probably fresh and good to eat. In fact, in Europe, gourmets actually prefer green oysters to cream-colored ones, as green oysters are considered more flavorful.

The green color may be chlorophyll from green plants the oyster had been eating before being caught. Or it may be copper, if the oyster came from waters containing high concentrations of copper.

If the oyster is **red**, or if the "liquor" in which the oyster is packed is red, the red may be a dinoflagellate or algae which has been in the oyster's food. The red pigment is water soluble, and appears when the dinoflagellate-eating oyster is cut during shucking or frozen after shucking.

This red pigment will be destroyed when the oyster is heated to only 120°F for a few minutes. Both the Food and Drug Administration and the U.S. Army Quartermaster Corps certify that this red color is a seasonal occurrence -- late fall and early winter -- and is not a health hazard. It has nothing to do with the "red tide" which occurs occasionally in Florida and in North Atlantic waters; red tide has never been reported in the Middle Atlantic.

Several Virginia oyster processors have prepared stick-on labels for their oyster packages, to assure the consumer that the red color is neither abnormal nor a health hazard.

If the oyster has **brown** spots, they are caused by a normal biochemical reaction that sometimes develops in southern oysters.

In the past, oysters or the oyster liquor was occasionally **pink**, a color caused by yeast growth; such a color indicated that the oyster was subjected to unsanitary conditions either on the harvesting boat or in the processing plant. Because of refrigeration on boats and inspection of both boats and plants, this problem seldom occurs now.

The **pink** color, however, might more likely be caused by a strange tiny animal, also a seafood in its own right -- if you get enough of them! This is the pea crab, which lives in the gills of the oyster and feeds on the same foods that the oyster is filtering for itself.

The color comes from a pigment in the pea crab's eggs, but pea crabs apparently do no harm to the oyster, either in its living habits or in its edibility and tastiness, even though one scientist found 262 pea crabs living in one oyster!
The tiny crabs, less than one millimeter in size, invade the mantle cavity of the oyster, usually in late summer or fall. Their growth slows during cold weather -- when oysters are most harvestable -- and does not begin again until spring and warm weather. Male pea crabs usually live only a year or less; females may live two or three years.

If you should be lucky enough to acquire oysters with pea crabs, be sure to save and eat both, as both are tasty and nourishing sea foods.

The "R" Rule

There is a common belief that oysters should not be eaten in months whose names do not contain the letter "R". This rule is not based on fact, however, as oysters can be and are eaten at any time of the year. Their transportation and storage during warm months do require special care, since oysters are highly perishable. Summer is also spawning time for most oysters, leaving them watery, with little flavor or consistency. But frozen and canned oysters are not affected, and there are localities in various states where good quality oysters are available throughout the year.
I-F: CLAMS

Characteristics

Clams are bivalved mollusks found in shallow waters all over the world. There are about 20,000 kinds of clams, all of which are edible; but only about 50 varieties are sufficiently large, tasty, and abundant to be commercially harvested. Depending on the species, they may be round, oval, elongated, or almost rectangular. They are found in both fresh and salt waters, usually buried in the mud or sand. All clams are vegetarians, straining algae from the water. They may live as long as 20 years, and reach maturity in 1 to 3 years. The giant tropical clam has been known to reach a length of 50 inches and a weight of 500 pounds.

Important Species

Surf Clam: The surf clam (Spisula solidissima) is harvested in greater numbers than other species. It is also known as the skimmer, beach, giant, sea hen, or bar clam. Though abundant along Atlantic shores, it is not as valuable as the hard or soft-shell clam. The surf clam is smooth, tan colored, and oval. It reaches a length of 7 inches, and is found from Maine to South Carolina. Most canned clams are surf clams.

Ocean Quahog: The ocean quahog (Arctica islandica) is also called "mahogany clam", "mahogany quahog", and "black quahog". This clam is 3 1/2 to 4 inches long and averages 1/2 pound. The ocean quahog has a hard shell that is extremely difficult to open with a knife, and steaming produces unpleasant effects on the meats. At present, this clam is under investigation to serve as a new resource, and may take the place of the diminishing surf clam.
Hard Clam: The hard clam (Mercenaria mercenaria) or hardshell clam, is commonly known as quahog in New England, where "clam" generally means the soft-shell variety. In the Middle and South Atlantic states, "clam" is the usual name for the hard clam. Hard clams are common from Cape Cod to Texas.

Soft-shell Clam: The soft-shell clam (Mya arenaria) is known in the Chesapeake Bay area as "maminose", "long clam" "long neck", "squirt clam", "sandgaper", or "old maid". These popular clams, unlike the hard and surf clams, have elongated shells that are very thin and brittle. Soft-shell clams cannot close tightly because their long necks extend beyond the shells. The southern limit of these clams is Maryland and some areas of northern Virginia.

Geoduck Clam: A Pacific coast clam, the geoduck (Panope generosa) has been recently utilized as a commercial resource. Geoducks are the most impressive clams in U.S. waters, weighing up to 13 pounds. The average clam weighs 3 pounds, and yields 1 1/2 pounds of meat. The geoduck is mostly neck. Even the mantle bulges out of the shell, which is always far too small to contain the entire clam. This clam burrows
as deep as 4 feet into the sand or mud, and sends its siphon to the surface. Although some scientists disagree, latest opinion is that it takes approximately four years for a geoduck to reach maturity.

Fishing Methods

Clams were first harvested by aborigines who waded into shallow waters feeling for clams with their bare feet. This method is still used by individuals. On the Pacific Coast where outrunning tides leave large beaches exposed, clams are located by their siphon holes and dug by hand. In other areas, tongs similar to oyster tongs are used by boatmen. A "basket rake" is another device used, similar to tongs but with longer teeth and a wire mesh bag to catch and hold the clams as it is dragged along the bottom. Power driven dredges similar to oyster dredges are used in larger operations.

Market Forms

Clams are available alive in the shell, fresh shucked, frozen or canned. Live clams should be stored in the same way as oysters. Shucked clams are the clam meats that have been removed from the shells; they are generally sold by the pint or quart. In recent years, shucked clams have been packaged and quick frozen, a process that makes them available all year. Depending on the variety, shucked clams may be sold as frozen breast steaks, neck steaks, minced meat, or chunks.

Hard, soft, razor, surf, and pismo clams are canned whole, minced, or as chowder, and are packed in various sizes of cans from 3 1/2 ounces to 4 pounds. Canned smoked chunks are also available. Clam juice, broth, and nectar are available canned or bottled.

Consumer Inspection

Clams in the shell are generally sold by the dozen or by the pound. They should be alive when bought. With hard clams, gaping shells that do not close when handled mean that the clams are dead and therefore no longer usable. In other varieties, the siphon or neck should twitch when touched.

The hard clam or quahog is marketed in Virginia in 3 to 6 size grades. However, most dealers use the following four-grade system:
littlenecks, 1.5 to 2.25 inches; cherry stones, 2.25 to 3 inches; sharps 3 to 3.75 inches; chowders, 3.75 inches and larger. Sometimes you will hear the terms New York Nick or Philadelphia Nicks applied to hard clams. New York Nicks are those clams 2 inches or larger, whereas Philadelphia Nicks are less than 2 inches in size.

Shucked clams should be plump, with clear liquor, and free from shell particles. They are sold packed in metal containers or waxed cartons.

Preparation of Gathered Clams

If you decide to obtain the clams from the sea shore yourself, it is important that the clams be handled properly. First wash off all surface sand with sea water. Cover clams with clean sea water or 2 percent brine (1/3 cup salt to 1 gallon tap water) and let stand for 15 to 20 minutes to allow the clams to cleanse themselves of sand. (Salt is necessary if the clams are to open and discharge sand.) The sand will settle to the bottom of the container. Change the water and let stand a little while; repeat two or three times. This step is important if the clams are to be steamed or eaten from the shell. Clams can then be shucked.

Shucking Hard Clams

Wash the shelled clams thoroughly, discarding any broken-shell or dead clams. To open a hard clam, hold it in the palm of one hand with the shell's hinge against the palm. Insert a slender, strong, sharp knife between the halves of the shell and cut around the clam twisting the knife slightly to pry open the shell. Cut both muscles free from the two halves of the shell. To serve on the half shell, remove only one-half of the shell. To use in other recipes, remove and rinse the meat. Since soft clams and surf clams do not have tight-fitting shells, they are easier to open.

An alternate method is to place the shell clams, after washing, in a small quantity of boiling water. Cover and steam 5 to 10 minutes, or until they are partially open. Drain, remove, and wash the meat from the shells. Another method is to first freeze the clams and then wash
them under tap water for several minutes. This removes the sand and causes the shells to open sufficiently wide to permit shucking. This method is probably the easiest and most accepted procedure.
I-G: SCALLOPS

Characteristics

Scallops may be thought of as swimming clams. Like clams and oysters, they are bivalved mollusks, found in every sea. They usually rest on the bottom, but can swim rapidly by opening and closing their shells. The shells are rounded, with scalloped edges and radiating ribs. They vary in color from a yellowish to reddish brown and the meat may be white, gray, or bluish. Sea scallops grow as large as 8 inches in diameter, while the smaller bay scallop is about half as large. Only the excellently flavored adductor muscle or "eye", which opens and closes the shell, is eaten by Americans. Europeans, on the other hand, eat the entire scallop. There are more than 40 species of scallops, but only two are of commercial importance.

Important Species

Bay Scallop: The common shallow-water scallop (Pecten gibbus or P. irradians) is taken from inshore bays and estuaries from New England to the Gulf of Mexico. The adductor muscle is about 1/2 inch across.

Sea Scallop: The large deep water scallop (Placopecten magellanicus) is taken from the waters off the Northern and Middle Atlantic states, with nearly 60 percent of the catch landed at New Bedford. The adductor muscle may be as large as 2 inches in diameter.

Fishing Methods

Scallops in shallow water are sometimes taken with a device known as a "pusher". This
is simply a long handle with a frame and web bag attached to one end. The user wades in shallow water pushing the device ahead of him, and catches the scallops in the bag when they rise from the bottom. But most scallops, especially the deep water variety, are now taken with dredges, several of which are pulled behind power boats. Scallops are usually shucked on board the boat, and the "eye" removed. The remainder may be discarded, or used as bait or fertilizer.

Though scallops are found from Maine to the Gulf of Mexico, the greatest beds known are east of Massachusetts, and the industry is centered in the area from Maine to New York. Scallop fishing is seasonal, since most states enforce a closed season (usually April to October) to protect the scallops from overfishing.

Market Forms

Scallops, especially the smaller variety, are usually "plumped" before they are marketed. They are soaked in water to increase the volume by about 40 percent. This process makes scallops difficult to preserve, and since they spoil very easily, they cannot be shipped to distant markets. Yet, because nearly all consumers demand the large plump "eyes", the practice will probably be continued indefinitely.

Scallops die soon after capture, and therefore are available only in the form of dressed meat. The meat is marketed fresh in 12 and 14 ounce cartons in the chilled display cases. Frozen scallops, both raw and precooked, are also marketed and are usually breaded.

Consumer Inspection

The meat of the sea scallop should be white; that of the bay scallop should be creamy white, light tan, or pinkish. The meat should be firm and, when bought in packages, should be practically free of liquid. Both fresh scallops and thawed frozen scallops should have a sweetish odor.
I-H: ABALONE

Characteristics
The abalone, a mollusk, is a marine snail with an oval ear-shaped shell and a large foot, which is used in attaching to hard smooth surfaces. Abalone are found along the Pacific coast from Alaska to Mexico, in the Indo-Pacific region of Asia and Africa, in the Mediterranean, around the channel islands between England and France, and off the Pacific coast of Chile.

Important Species
There are about 100 species of abalone in the world's seas, of which eight occur along the U.S. Pacific coast. The largest is the red abalone, which grows to a foot in length and may weigh eight pounds. The average is half this size, but still contains a very substantial amount of meat. The other important species of abalone in the U.S. are green, pink or corrugated, black, threaded, northern green, Japanese or pinto, and white abalone.

Fishing Methods
For an individual, abalone may be collected by hand. A diver using a knife or similar tool can pry the abalone loose if the abalone is taken by surprise. Pacific coast (California) harvesting of abalone is strictly regulated due to dwindling numbers, but baited traps are used to harvest in quantity in other parts of the world.

Market Forms
As a fresh food, the abalone is considered a delicacy, but is difficult to obtain. The large muscle or foot is the edible portion and may be eaten raw, sauteed as steak, or chunks may be used in chowder. Fresh abalone is seldom marketed except in California.
California laws prohibit the shipping of fresh abalone as well as the canning of abalone. Small quantities are imported from Mexico in frozen form.

Abalone may be purchased in dried form, shredded (kaiho) or powdered (meiho), for use in soups and vegetable dishes. A variety of dishes may also be prepared using steam-canned abalone, which is minced or diced. The dried and canned products are usually imported from Japan.

The beautiful shell is sold as a souvenir. Buttons, ornamental handles, and inlay make use of the mother-of-pearl lining of the shell.
I-I: CONCH (WHELK)

Characteristics

The names conch and whelk are used interchangeably, though these gastropods are members of different families. The difference, for consumption purposes, is that whelk has a stronger flavor when compared to the refined flavor of the conch. Both are mollusks and have a single spiral-shaped shell and a large muscular foot.

Conch are found on the coasts of Brazil, Haiti, Puerto Rico, the West Indies, Bahamas, United States (North Carolina to Texas), and in the Indo-Pacific region. Whelk are harvested in waters near the British Isles, Italy, Northern Europe, United Kingdom, and may be found along the eastern and southern coasts of the U.S.

The beautiful spiral shell, which has a porcelain-like interior of bright pink, is a distinguishing feature of the conch. Whelks have a similar shell but colors range from brick red to yellowish gray.

Important Species

Conch: Edible pink or queen conch, and the samba conch are limited in the U.S. mainly to the Florida Keys. Other edible conchs are Verrill’s conch, hawking conch, and milk or ivory conch.

Whelk: The waved, knobbed, and channeled whelk are the species that enter the U.S. markets most often. These range in size from 6 to 10 inches. There are other species of whelk which are all edible, but most are smaller.

Fishing Methods

Conch and whelk may be caught by hand in a method similar to the one explained for abalone. When harvesting for large quantities, baited traps similar to lobster pots are used.
Market Forms

The edible portion of conch and whelk is the muscular foot, which is tough and must be tenderized by pounding, grinding, or cooking under pressure. They are marketed in the fresh state or as shelled, cooked meat (semipreserved in vinegar and salt), or canned meat. All forms are difficult to obtain in most areas.

Conch may be used in chowders, salads, and fried fritters. Sometimes the meat is marinated and eaten raw; fried in a batter, or cut into pieces and sauteed in butter, lemon juice, and garlic. Whelk, due to its' stronger flavor, is not used in as many ways (see scungilli marinara recipe).

The shells are sold as souvenirs, etched into cameras, made into beads for jewelry, and in underdeveloped areas, used as horns and tools.
Characteristics

The cephalopods (which include squid, cuttlefish, and octopuses) may be among the most abundant of the underutilized fish resources of the ocean. Accurate estimates on the potential for utilizing this resource are hindered by limited knowledge of cephalopod fisheries, but it has been speculated that the continental shelf areas of the world could yield about 7 million tons of squid annually.

Cephalopods belong to the highest class of the Phylum Mollusca, a group which includes mussels, clams, scallops, sea snails, and oysters. While most of these animals are sedentary, cephalopods such as squid are quite active swimmers inhabiting coastal and oceanic waters. When young, they feed on small planktonic crustaceans and fish larvae. As adults, most are active predators, feeding upon pelagic and bottom living crustaceans, fish, and other living organisms. Squid consume large quantities of herbivorous and carnivorous fishes as well as other squid. Squid in turn are eaten by whales, dolphins, seals, sea lions, sea birds, sharks, and other large fish.

Squid are among the most successful and numerous of all larger animals in the sea, and there are an estimated 350

Squid
species in the world. Some giant squid reach a weight of two tons and a length of 55 to 60 feet.

Cephalopods or "head-footed" animals like squid usually have appendages which are a modification of the fleshy foot of their more primitive ancestors. Squid usually have ten appendages arranged in five pairs around the head. Eight, the arms, are short and heavy, while the fifth and lighter pair, the tentacles, are twice as long as the arms. Equipped with suction cups, the tentacles are used to seize and hold the prey.

The single slender chitinous pen that lines the internal body cavity is all that remains of the shell.

The circulation of water through the mantle or body cavity allows oxygen to be absorbed by the gills, which hang free within the forward part of the mantle.

Squid have a screening or defense mechanism, the ink sac. This sac is a reservoir of brown or black viscous fluid which is ejected through the siphon when the squid is alarmed. This "ink" not only forms an effective screen behind which the squid can escape, but it is believed that the alkaloids in the ink paralyze the olfactory sense of the enemy, thus further aiding the squid's escape.

Squid are ordinarily a milky, translucent color, but when the squid is excited, the color becomes very intense. The squid's unusual coloration is caused by the pigment cells or chromatophores in the skin that contain red, blue, yellow, and black pigments in varying amounts depending upon species. The chromatophores are controlled by muscles which are activated to expand or contract by visual or olfactory stimuli, thus changing the animal's color and allowing it to blend with the surroundings.

Because squid are generally high seas animals, inhabiting the vast waters beyond the continental shelf, little is known about their life cycle. However, we do know that squid grow fast; Loligo reach sexual maturity one year from hatching. The females spawn in their second year, when the mantle reaches a length of up to 18 cm, and then die. The males reach a length of about 30 cm at the end of the first year, and can be 50 cm long when two years old. The life span of squid is seldom more than two to three years.
Important Species

Three species of squid found along the East Coast are: (1) *Loligo pealei* ranging from Cape Cod to Venezuela; (2) *Loligo brevis*, found from Maryland to Argentina; and (3) *Illex illecebrosus*, caught along the continental shelf from north of Newfoundland to the north coast of South America. Another species, *Loligo opalescens*, is found along the west coast.

*L. pealei* inhabit the inshore waters of the continental shelf of the Middle and South Atlantic states in summer and autumn and the outer shelf in winter and spring. *I. illecebrosus* come onto the shelf in early summer to feed. Nearly all the catches of this species is used for bait, primarily for the cod fishery.

Fishing Methods

Squid fishery in the U.S. has traditionally been more of a by-catch nature rather than of a "directed" vessel nature, with the catch being taken primarily in otter trawling that is directed toward groundfish. Some squid are also harvested in trapnets.

A very small domestic food market exists for squid, mostly among ethnic populations -- Italians, Chinese, Spanish, etc. The food market for squid abroad, however, is great and consequently, most squid destined to be eaten is exported to Europe.

Market Forms

The principal market forms available for squid are whole fresh or frozen with or without eyes. Canned squid is commercially prepared with
or without its ink in brine, in oil, or in tomato sauce. Squid prepared in the U.S. for export abroad are frozen, canned, or dried whole. There is a potential for other products such as breaded rings, minces, and squid fillets and blocks.

Squid are also used for bait by recreational fishermen. Most of the bait squid, however, come from the West Coast, so it would appear that a potential for East Coast squid bait fishery also exists.

Consumer Inspection

Fresh and thawed frozen squid should smell clean and fresh; the skin of fresh squid should be creamy in color with tiny red flecks. As the squid begins to spoil, pigments are released into the flesh, causing an apparent change in the color of the skin.
How To Clean Squid

1. Thaw squid if frozen.

2. Hold the tube-like body (mantle) in one hand and twist off the head with the other. The intestines will pull right out with the head.

5. Cut the film over the eye very lightly (do not puncture the eye). Place your fingers on both sides of the eye and squeeze it out.

3. The remnant of a shell, or the pen, inside the body must be removed. Pull out the long, clear shell.

6. Clean out the mantle, wash thoroughly, and drain.

4. Grasp one of the wing-like fins and pull downward to remove the speckled skin. Scrape off the remainder.

7. Squid is now ready for stuffing. To cut strips or pieces, lay the body flat and cut down the center from top to bottom. Spread open and cut into the size strips or pieces desired. To make rings, cut across the body. Arms can be chopped or left whole. Allow about one-half pound squid per serving.
I-K: GENERAL INFORMATION PERTAINING TO SHELLFISH

How Much to Buy

The quantity of shellfish to buy varies considerably with the serving and cooking method to be used, and the size of the shellfish. The following table is a general guide for serving 6 or 100 people.

**SHELLFISH SERVING GUIDE**

<table>
<thead>
<tr>
<th></th>
<th>To serve 6</th>
<th>To serve 100</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crabs:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hard:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live</td>
<td>6 to 12 lbs.</td>
<td>90 to 100 lbs.</td>
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<tr>
<td>(18 to 36 crabs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooked meat</td>
<td>1 to 2 lbs.</td>
<td>15 lbs.</td>
</tr>
<tr>
<td>Dungeness, cooked</td>
<td>4 to 6 lbs.</td>
<td>50 lbs.</td>
</tr>
<tr>
<td>(3 to 6 crabs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alaska King Crab</td>
<td>1 1/2 lbs. of meat</td>
<td>25 lbs. of meat</td>
</tr>
<tr>
<td>Tanner Crab</td>
<td>1 1/2 lbs. of meat</td>
<td>25 lbs. of meat</td>
</tr>
</tbody>
</table>

| **Lobsters:**        |                             |                              |
| Live                 | 4 to 6 lbs.                 | 75 to 100 lbs.               |
| Cooked meat          | 3/4 to 1 1/2 lbs.           | 12 lbs.                      |

| **Oysters and clams:** |                             |                              |
| In shell              | 3 dozen                     | 2 1/2 bushels                |
| Shucked               | 1 quart                     | 3 1/2 gallons                |

| **Scallops:**        | 1-2 lbs.                    | 15 lbs.                      |

| **Shrimp:**           |                             |                              |
| Headless (fresh or frozen) | 1 1/2 - 3 lbs.            | 24 to 30 lbs.                |
| Cooked meat           | 3/4 to 1 1/2 lbs.          | 12 to 15 lbs.                |
| Rock Shrimp (green tails) | 2 lbs.                    | 30 to 32 lbs.                |
Handling and Storing

Fresh shellfish should be stored at a temperature near 32°F. A temperature even a few degrees higher can cause considerable loss of quality in only a few hours. Fresh shellfish may be kept in the refrigerator in cracked ice or in the meat compartment. Fresh or cooked shellfish meats are easily spoiled, and care must be taken that they are not exposed to bacterial contamination. Ideally, fresh shellfish should be cooked within one day.

Frozen shellfish should be maintained at 0°F or lower. Correctly handled and frozen, lobster and crab meat have a shelf life of about two months; shucked oysters, scallops, and clams three to four months; and shrimp six months. Do not refreeze shellfish once it has thawed. (See "Consumer Inspection and Buying" for information on buying frozen seafoods. See "Home Freezing of Seafoods" for seafood thawing methods.)

Shellfish Tips

A. With the exception of scallops, shellfish prices are usually lower in winter than summer.
B. If you harvest oysters and clams yourself, be sure the water you obtain the shellfish from is certified by the State Health Department. If you eat shellfish from closed areas, you may get infectious hepatitis.
C. Crabs are dredged in the middle Atlantic states from December 1 to March 31 each year, but this season is noted for the poorest quality crab meat since sand is usually carried into the final product making it gritty.
D. Usually, oysters obtained in the spring of the year are superior to those obtained in the early fall.
E. The smaller the clam, the higher the price. The larger the shrimp, oyster, or scallop, the higher the price.
F. Oysters, clams, and scallops may be packed in their own liquid in jars, but must be completely covered by the fluid to prevent darkening.
G. Lobsters, crabs, and shrimps can be frozen but tend to become tough with storage.