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Seafood Savvy

A Consumer's Guide to Seafood Nutrition, Safety, Handling, and Preparation

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What Is Seafood?

Seafood has become more popular and important in the American diet as consumers have become aware of the variety of products available, their great taste, and their nutritional benefits. Some consumers, however, still lack confidence in their ability to select, handle, and prepare seafood and are confused about recent reports on seafood safety. This bulletin was written to help you understand seafood nutrition and safety issues and use seafood confidently.

Seafood is the general term used for all edible aquatic organisms whether or not they actually come from the sea (ocean). At least 1,000 different species of fish and shellfish are harvested from the wild or raised by aquaculture. At any given time, 50 to 100 different fish and shellfish can be found in the marketplace. These products include

- well-known marine, or saltwater, fish like cod, flounder, sole, salmon, and tuna
- less widely known, and less expensive, fish like hake, cusk, pollock, mackerel, and whiting
- freshwater fish like trout and catfish
- shellfish like clams, oysters, and scallops
- crustaceans like crabs, lobsters, and shrimp or prawns

Most commercial fish and shellfish come from wild stocks that live in the world's oceans or freshwater lakes, ponds, or rivers. Aquaculture, which is a general term for fish and shellfish farming, is becoming an important contributor to the world's seafood supply. In fact, some farmed products such as catfish and trout are more common than wild products, and the

amount of farm-raised salmon and shrimp in the market also has increased.

Today's typical seafood market contains both wild products—harvested either locally, from other regions of the country, or from distant parts of the world—and farm-raised products. As seafood harvesting, processing, and distribution have become more sophisticated, the quality and variety of fresh and frozen seafood available to consumers have increased dramatically.

In addition to the commercial seafood supply, significant amounts of fish and shellfish are harvested by individuals for their personal consumption. The National Academy of Sciences has estimated that one-fifth of all fish and shellfish eaten in the United States are caught by recreational and subsistence anglers.

Overall, the amount of seafood consumed in the United States increased steadily during the 1980s, and many industry analysts predict that this trend will continue. Seafood's popularity has increased as people have become more aware of its positive attributes, but Americans still consume about ten times more red meat and poultry than seafood.

A recent analysis of consumer attitudes showed that consumers are unsure about how to prepare seafood, have concerns about the cost, and worry about its safety. The following information will help you better understand health and safety issues related to fish and shellfish and select and use seafood to meet the needs and preferences of you and your family.

Seafood Nutrition

Food and nutrition professionals have known for years that seafood is a high-protein food that is lower in calories, total fat, and saturated fat when compared with most other protein-rich animal foods. In addition, a large proportion of the fat in seafood is polyunsaturated. There also is increasing scientific evidence that a particular type of polyunsaturated fat in seafood, called omega-3 fatty acids, provides additional health benefits.

Although no single food alone can make a person healthy, good eating habits based on moderation and variety can help maintain and even improve health. Because of its nutrient composition, eating more seafood is one way you can follow four of the dietary guidelines currently recommended by the U.S. Departments of Health and Human Services and Agriculture:

- Eat a variety of foods.
- Maintain a healthy weight.
- Choose a diet low in fat, saturated fat, and cholesterol.
- Use salt and sodium only in moderation.

Calories

Seafood is generally considered to be a low-calorie food when compared with other protein-rich foods such as meat and poultry. Most lean or low-fat species of fish, such as cod, flounder, and sole, contain less than 100 calories per 3-ounce cooked portion, and even fattier fish like mackerel, herring, and salmon contain approximately 200 calories or less in a 3-ounce cooked serving. With seafood, you can consume fewer calories to meet your daily protein needs. That is why seafood is a good choice for diets designed to help you lose or maintain an ideal weight.

Protein

The protein in seafood contains all the essential amino acids, the building blocks that the body needs to make protein. A 3-ounce cooked serving of most fish and shellfish provides about one-third of the average daily recommended amount of protein. The protein in seafood is also easier to digest because seafood has less connective tissue than red meats and poultry. That is why fish flakes easily when cooked and can be eaten without further cutting or slicing. Seafood is a good way for elderly persons and others who have difficulty chewing or digesting their food to obtain their daily protein.

Fat

Seafood is generally considered to be a low-fat food. Current dietary recommendations suggest that people reduce their total consumption of fat and limit their intake of certain kinds of fat. Specific recommendations suggest reducing total fat intake to less than 30 percent of the calories eaten.

Most fish and shellfish contain less than 5 percent total fat, and even the fattiest fish, such as mackerel and king salmon, have no more than 15 percent fat. Lean fish have significantly less fat than other protein-rich foods, and the fattier fish contain less fat than most ground beef, some processed meats, and the fattiest portions (skin and dark meat) of some poultry products.

To get a general idea of the fat content of most fish species, look at the color of the flesh. Lower-fat species such as cod and flounder have a white or light color, and fattier fish such as salmon, herring, and mackerel usually have a much darker color.

The fat content of fish and shellfish varies depending on when and where they are caught and other factors. Use table 1 to compare the fat content of common seafood choices.

When evaluating a food, it's important to consider both the total amount of fat and the kind of fat that it contains. The two major kinds of fat are saturated fats (usually solid at room temperature, like butter and lard) and unsaturated fats (usually liquid at room temperature, like vegetable oils). Monounsaturated and polyunsaturated fats are two types of unsaturated fat. Current dietary recommendations suggest that people decrease the amount of saturated fat and increase the proportion of unsaturated fat in their diet.

A large proportion of the fat in seafood is polyunsaturated. Seafood contains a particular kind of polyunsaturated fat—called omega-3 fatty acids—which provides additional health benefits. Because of the amount and kind of fat in seafood, it is a good choice to help you follow current dietary recommendations.

The Omega-3 Advantage

Scientific evidence suggests that omega-3 fatty acids can help reduce the risk of heart disease, the leading cause of death in most Western countries. Researchers have found that omega-3 fatty acids can make blood less likely to clot and block blood vessels and that consuming omega-3 fatty acids can decrease levels of some blood fats and possibly cholesterol. Possible relationships between omega-3 fatty acids and other disorders such as cancer, arthritis, and asthma are being studied.

Omega-3 fatty acids are found almost exclusively in aquatic organisms, although smaller amounts are found in some plants and plant oils. Seafood is considered the best dietary source of

Table 1. Fat Content of 3-Ounce Cooked Portions of Fish and Shellfish

Very low fat—less than 2.5 grams total fat

Clams	Haddock	Pike (Northern)	Red snapper
Cod	Halibut	Pike (walleye)	Snow crab
Cusk	Northern lobster	Pollock (Atlantic)	Sole
Blue crab	Mahi-mahi	Ocean perch	Squid
Dungeness crab	Monkfish	Orange roughy	Tuna (skipjack)
Flounder	Perch (freshwater)	Scallops	Tuna (yellowfin)
Grouper	Ocean perch	Shrimp	Whiting

Low fat—more than 2.5 grams but less than 5 grams total fat

Bass (freshwater)	Croaker	Salmon (pink)	Swordfish
Bluefish	Mullet	Shark	Rainbow trout
Blue mussels	Oysters (Eastern)	Smelt	Sea trout
Catfish	Salmon (chum)	Striped bass	Wolffish (ocean catfish)

Moderate fat—more than 5 grams but less than 10 grams total fat

Butterfish	Salmon (Atlantic)	Lake trout
Herring	Salmon (coho)	Tuna (bluefin)
Mackerel (Spanish)	Salmon (sockeye)	Whitefish

Higher fat—more than 10 grams total fat

Mackerel (Atlantic)	Salmon (king)

Table 2. Omega-3 Fatty Acid Content of 3-Ounce Cooked Portions of Common Fish and Shellfish

Higher level (more than 1.0 gram)

Herring	Mackerel (Spanish)	Salmon (king)	Tuna (bluefin)
Mackerel (Pacific and jack)	Salmon (Atlantic)	Salmon (pink)	Whitefish

Medium level (between 0.5 and 1.0 gram)

Fish			*Shellfish*
Bass (freshwater)	Salmon (coho)	Swordfish	Blue mussels
Bluefish	Salmon (sockeye)	Rainbow trout	Oysters
Mackerel (Atlantic)	Smelt	Whiting	
Salmon (chum)	Striped bass	Wolffish	

Lower level (0.5 grams and less)

Fish		*Shellfish*
Cod (Atlantic)	Ocean perch	Clams
Flounder	Pike (Northern)	Blue crab
Grouper	Pollock (Atlantic)	Dungeness crab
Haddock	Rockfish (Pacific)	Snow crab
Halibut	Red snapper	Northern lobster
Mahi-mahi	Sea trout	Spiny lobster
Mullet	Tuna (skipjack)	Scallops
Freshwater perch	Tuna (yellowfin)	Shrimp

Note: All fish and shellfish were cooked by dry (baking, broiling, or microwaving) or moist (boiling, poaching, or steaming) cooking methods.

omega-3 fatty acids, and all fish and shellfish contain some. Fatty fish generally contain more omega-3 fatty acids than lean fish, but the amount varies. Use table 2 to compare the relative amounts of omega-3 fatty acids in various fish and shellfish.

Cholesterol

Most animal foods including seafood contain cholesterol. Americans generally consume too much cholesterol, and current dietary recommendations suggest reducing cholesterol intake to less than 300 milligrams per day. Almost all fish and shellfish contain well under 100 milligrams of cholesterol per 3-ounce cooked serving, and many of the leaner types of fish have less than 60 milligrams.

For many years it was thought that most shellfish contained high levels of cholesterol, but this has been proven to be untrue. Earlier methods for measuring cholesterol produced artificially high results because other sterols frequently found in shellfish were being measured in addition to cholesterol. Nutritionists now know that most shellfish contain less than 100 milligrams of cholesterol per 3-ounce cooked serving.

Shrimp contain somewhat higher amounts of cholesterol, more than 150 milligrams per 3-ounce cooked serving, and squid averages up to 400 milligrams of cholesterol per 3-ounce cooked serving. Fish roe, caviar, the internal organs of fish (such as livers), and the livers of lobsters (tomalley) and crabs (mustard) contain high amounts of cholesterol.

For specific information about the amount of cholesterol in commonly available fish and shellfish, see the nutrient composition guide in the Appendix.

Sodium

Current dietary recommendations suggest using salt and sodium only in moderation because some people, by reducing their sodium intake, can decrease risks associated with high blood pressure. Fish are naturally low in sodium, and even those species with the highest sodium levels contain less than 110 milligrams per 3-ounce cooked portion, which is less than 5 percent of the current daily recommended maximum sodium intake. Most shellfish generally have more sodium, ranging from less than 100 milligrams to more than 500 milligrams per 3-ounce cooked serving.

Some processed and frozen seafood products also contain more sodium. Products that are frozen in brine, such as crab legs, may contain as much as 800 to 1,000 milligrams of sodium per serving. Surimi or imitation shellfish products, smoked fish, and canned products that have salt added during processing also contain more sodium. It's a good idea to check the nutritional or ingredient labels on processed products to determine

their sodium content or if salt has been added.

For specific information on the amount of sodium in unprocessed cooked fish and shellfish, see the nutrient composition guide in the Appendix.

Vitamins and Minerals

Seafood is generally considered to be a reasonable but not a particularly rich source of vitamins. The amount of B vitamins in most fish and shellfish is comparable to many other high-protein foods. Fatty fish like mackerel and herring are good sources of vitamin D, and sardines provide a reasonable amount of vitamin A.

Most fish and shellfish contain moderate to small amounts of minerals, and some products are a good source. Canned salmon and sardines, which contain bones softened during the canning process, are good sources of calcium when the bones are eaten. Clams and oysters are good sources of iron, zinc, magnesium, copper, iodine, and other trace minerals.

Nutrient Composition Information

Consumers frequently have questions about the nutritional composition of various kinds of seafood. Because seafood is commonly sold from bulk displays in retail markets, nutrition information usually found on a package label isn't available. Some retailers provide nutrition brochures or charts that can be used to compare one type of fish or shellfish with another.

Traditionally, nutrient charts provided the amounts of various nutrients in 3 1/2-ounce or 100-gram portions of raw seafood. In 1990 Congress passed legislation requiring the U.S. Food and Drug Administration (FDA) to examine and make changes in the nutritional labeling of foods. The FDA decided that retailers must voluntarily provide nutrition information for fresh seafood, fruits, and vegetables by displaying or giving customers access to nutrient charts for the twenty most frequently consumed products in each category. The FDA also determined that, for seafood, the amounts of nutrients provided must be for a 3-ounce cooked portion.

The nutrient composition guide in the Appendix is consistent with the new FDA guidelines, and it can be used to help you estimate and compare the nutrients in 3-ounce cooked portions of popular fish and shellfish.

It's important to remember that the way foods are prepared has a significant impact on their nutritional composition. Suggestions for preparation methods and recipe substitutions that help maintain seafood's natural nutritional advantages are provided in the section "Seafood Preparation."

Seafood Safety

Almost all daily activities involve some risk. Individuals attempt to manage risks by gathering information that will help them make informed choices that are appropriate for their own values, needs, preferences, and life-style. Although Americans enjoy one of the safest food supplies in the world, health risks may still be associated with some foods. For seafood, potential health risks are related either to specific fish or shellfish or to the way they are handled, stored, or prepared.

Several recent studies have helped put seafood safety issues into perspective. A 1991 study by the National Academy of Sciences concluded that "most seafood available to the U.S. public are wholesome and unlikely to cause illness." The study did, however, identify areas of risk and priority needs for research and education, and it recommended improvements in the seafood surveillance system.

The FDA also recently reviewed seafood safety issues and concluded that "the vast majority of seafood in the marketplace is safe to eat, and overall, American shoppers can be confident that the fish they buy will provide a healthful meal."

A recent FDA study estimated that the risk of illness from seafood was 1 illness in 250,000 servings. The same study estimated a risk of about 1 illness in every 25,000 servings for chicken.

While scientists agree that the seafood supply generally meets acceptable safety standards, potential health risks can be associated with bacterial or viral contamination, naturally occurring toxins, and chemical contaminants.

The following information is provided to help you understand specific seafood safety issues and avoid potential risks.

Improperly Handled Seafood

Most food safety experts believe that improper food handling is the most important safety concern and the leading cause of foodborne illness in the United States. Seafood is one of the most perishable foods, and proper handling and preparation are essential to maintain quality and ensure safety. All raw foods contain bacteria, which can grow and multiply rapidly if food is left for several hours at room temperature. The tips on page 11 will help you handle seafood properly.

Eating Raw Seafood

Some seafood is traditionally eaten raw, even though eating raw foods is considerably riskier than eating cooked foods. Cooking seafood properly is necessary to destroy disease-causing organisms that occur naturally or that can be introduced during handling, storage, or preparation. When seafood or any other

Observe the following handling tips to maintain seafood quality and avoid illness:

Keep seafood cold at all times.
Always keep seafood at a temperature as close to 32° F as possible. Get seafood home as quickly as possible. Store fresh seafood in the coldest part of the refrigerator (meat or vegetable compartments or on open shelves close to the back) and frozen seafood in the freezer, and keep it there until it's needed.

Avoid cross-contamination.
Don't transfer bacteria from one food or food contact surface (your hands, utensils, knives, cutting boards) to another when handling, storing, or preparing seafood. Thoroughly wash your hands, utensils, containers, and any food preparation surfaces after touching or preparing raw seafood, meat, or poultry.

Store raw seafood in leakproof containers or bags when possible.
Prevent seafood from dripping or splashing onto other foods and prevent seafood from being contaminated by other foods.

Handle and store raw and cooked seafood separately.
It's especially important to prevent raw foods from touching, dripping, or splashing onto foods that won't be cooked again before being eaten.

Cook seafood properly to ensure safety.
Most experts suggest cooking seafood to an internal temperature of at least 145° F. A temperature of 160° F or higher is recommended to kill bacteria, but excessive exposure to high temperatures can easily cause seafood to be overcooked and become dry and tough. Properly cooked fish should be opaque, moist, and flake easily.

Cool cooked seafood as rapidly as possible.
When preparing large amounts of cooked seafood (such as a large pot of clam chowder), put the cooked product into small, shallow containers, which will cool faster in the refrigerator.

Thaw seafood properly.
Frozen seafood should be thawed in the refrigerator or under cold, continuously running and draining water. Never thaw seafood in warm or standing water or at room temperature—environments that allow bacteria to grow.

food is eaten raw or partially cooked, the risk of illness is significantly increased.

Bivalve Molluscan Shellfish

Bivalve molluscan shellfish like clams and oysters are commonly eaten raw or partially cooked. Because of where they live, how they feed, and how they're eaten, they could contain bacteria or viruses that can cause illness.

Bivalves live in coastal areas close to the shore. Bacteria and viruses from human and land animal sources can be carried into coastal waters with runoff from the land, in sewage discharges, or from other sources. These shellfish, which obtain food by pumping water through their digestive system and filtering out small organisms, may collect bacteria and viruses from the waters in which they live. People can ingest these organisms when they eat these products raw. For these reasons, potential health risks associated with eating raw bivalve shellfish are usually directly related to the quality of the waters in which they have lived.

The FDA and coastal state governments oversee the National Shellfish Sanitation Program, which sets standards for waters in which shellfish are grown and requires that they are tested regularly. The program is designed to ensure that shellfish are harvested from certified waters and meet safety standards. Because of this program, large amounts of raw clams and oysters are eaten each year without incident.

Some shellfish-related illnesses, however, do still occur, and many of the reported illnesses are believed to be the result of "bootlegging," or the illegal harvesting of shellfish from uncertified waters. States like New York have greatly increased penalties for bootleggers, and the FDA has made the elimination of bootlegging a priority. To minimize potential individual risks, use the tips on page 13.

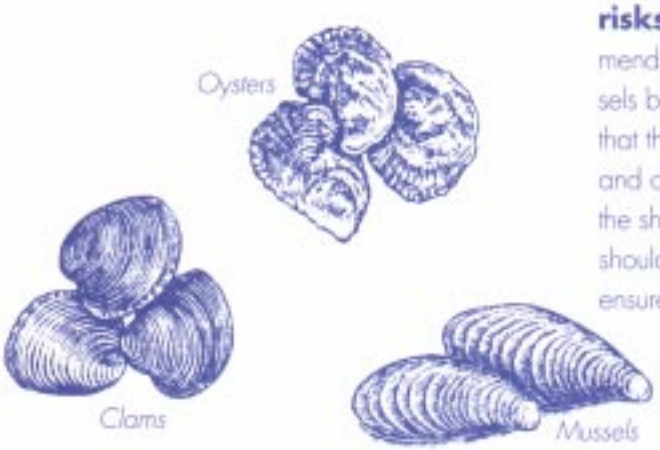
Raw Fish

Raw fish dishes such as sushi and sashimi and uncooked marinated dishes like ceviche have become popular in the United States. Disease-causing bacteria and viruses don't normally occur in the muscle of a whole fish, or the part that is usually eaten. However, fish fillets and steaks can be contaminated by improper handling. Because raw fish dishes aren't heated to a temperature that would normally kill bacteria, only high-quality or sushi grade products should be used. If you choose to eat raw or uncooked fish, purchase the fish from reputable establishments that have high standards for quality and sanitation.

Parasites, which occur naturally in some fish, are another potential safety concern when raw fish are eaten. The National Academy of Sciences found that parasitic infections from seafood are rare in the United States, and as yet there is no evidence of a significant increase due to the growing popularity of raw fish dishes. While sushi chefs are

The following tips can help those who choose to eat raw bivalve molluscan shellfish reduce potential risks:

- **Always buy clams, oysters, and mussels from a reputable dealer.**
- **If you harvest clams, oysters, or mussels yourself, obey all posted warnings and verify with local authorities that the waters are certified for shellfish harvesting.**
- **Don't use dead shellfish,** whose shells don't close tightly when tapped or agitated. (Soft-shell clams can't completely close their shell, but should move when touched.)
- **Handle and store shellfish properly.** Keep shellfish cool and damp. Rinse when necessary to remove dirt or debris, but avoid prolonged contact with freshwater, drastic temperature changes, and airtight containers. Don't allow other foods to drip on shellfish during storage, and prevent contamination by using clean containers and utensils for storage, preparation, and serving. Food handlers should wash their hands with warm, soapy water before and after preparing and serving shellfish.
- **High-risk individuals who are vulnerable to bacteria and viruses should avoid raw or partially cooked bivalve shellfish.** This includes people with the following conditions: compromised immune systems, AIDS, cancer (especially during chemotherapy), liver disease, diabetes, chronic kidney disease, inflammatory bowel disease, steroid dependency, and achlorhydria.
- **Consider cooking shellfish properly to reduce potential risks further.** The FDA recommends that oysters, clams, and mussels be steamed for 4 to 9 minutes or that they be placed in boiling water and cooked for 3 to 5 minutes after the shells have opened. Shellfish should be cooked in small batches to ensure thorough cooking.



trained to detect and remove parasites, home chefs can eliminate potential health risks from parasites only by proper cooking or freezing.

Cooking fish to an internal temperature of at least 145° F for at least 1 minute will kill parasites. Even though preparing raw fish dishes at home is not encouraged, if you choose to do so use frozen fish. The FDA recommends that fish be frozen to an internal temperature of −10° F for 7 days. It's best to use commercially frozen fish because many home freezers are not able to reach and maintain that temperature.

The seafood industry inspects fish and removes parasites using a procedure called candling. Even the most diligent operations, however, may not find all parasites. Always conduct a quick visual check of your food before you cook it to avoid unpleasant surprises. Most retailers will replace products if parasites are found.

Seafood Toxins

Toxins can be produced by naturally occurring marine algae and can accumulate in fish and shellfish that inhabit the same marine environment. Unlike bacteria and parasites, toxins are not destroyed by cooking. To reduce potential health risks, purchase seafood from reputable sources, handle it properly, and exercise caution when eating fish and shellfish that you've caught in unfamiliar waters.

Ciguatoxin is a marine toxin that can accumulate in some tropical saltwater reef fish, and poisoning can occur when those fish are eaten. Commercial fishers are generally able to avoid areas that contain ciguatoxic fish. Recreational anglers who aren't familiar with local fishing areas are more likely to catch toxic fish unknowingly. More than 90 percent of the reported cases of ciguatoxin poisoning in the United States from 1978 to 1987 occurred in Puerto Rico, Guam, the Virgin Islands, and Hawaii. Visitors to tropical areas should patronize only reputable dealers and restaurants and should be prudent about the recreationally caught reef fish they eat.

Several types of **shellfish toxins** are produced by marine algae during periods of excessive growth, or "blooms." A common algae bloom is the "red tide." Waters in which shellfish are harvested are monitored and tested, and waters are closed to shellfish harvesting when toxins that can cause illness are likely to be present. To minimize the risk of illness further, individuals who harvest their own shellfish should check with local authorities and heed all warnings regarding shellfish harvesting restrictions.

Scombrotoxin is caused by improper fish handling rather than by naturally occurring marine algae. Scombrotoxin is produced when fish such as tuna, mackerel, bluefish, mahi-mahi, and amberjacks begin to spoil. When these

fish are exposed to temperatures that allow rapid bacterial growth, histamine is formed, which can cause an allergic reaction when the fish is eaten. This illness, called scombroid poisoning, isn't severe for most people, but it can be uncomfortable. Because the toxin is not destroyed by cooking, this illness must be prevented by handling and cooling fish properly. Scombrotoxin can be rapidly produced when fish are allowed to remain on the deck of a fishing boat or a dock for long periods in warm weather. Recreational anglers should plan ahead and have plenty of ice available to keep their catch cold. When purchasing fish, avoid products that are not adequately chilled. Store fish at temperatures as close to 32° F as possible, and avoid exposing it to warmer temperatures for a long time.

Chemical Contaminants

Potential health risks from chemical contaminants in fish have been more difficult to quantify. The long-term health effects of PCBs, mercury, and pesticides have not been clearly demonstrated in humans, but there is evidence that exposure to these chemicals over time may affect reproduction, growth and development in children, and lifetime cancer risk. Recreational and subsistence anglers, pregnant women, and children who eat large amounts of sport fish caught from contaminated waters are at greatest risk.

The FDA sets action and tolerance levels for chemicals that are suspected to pose a potential health threat. These levels are intended to protect consumers from foodborne chemical hazards. Federal and state government agencies monitor contaminant levels in fish and shellfish. When levels exceed tolerance or action levels, contaminated bodies of water are closed to commercial fishing or an individual species of fish is banned from the commercial marketplace.

Contaminant levels in most commercial species that have been tested are well below established limits. Ocean species that spend their entire life far from the shore are less likely to have contaminants than those that stay in near-shore areas. Large predatory fish that live for a long time, like swordfish, can accumulate higher levels of contaminants such as mercury. These species are tested more frequently to ensure that the commercial supply meets government standards.

Twenty percent of the fish and shellfish eaten in the United States are harvested by individuals for their personal consumption. Recreational and subsistence anglers may catch fish from waters that are known to contain elevated levels of chemical contaminants, even though commercial fishing in those waters is banned. Those individuals who consistently consume fish from contaminated waters are at greatest risk.

When contaminant levels in recreational fish exceed the tolerance or action limits, health authorities issue fish consumption advisories, which advise anglers and higher-risk individuals to limit their consumption of certain types and sizes of fish or fish from specific bodies of water. In New York, advisories are produced annually by the state Department of Health and published in the *New York State Fishing Regulations Guide*. These sport fish advisories are not intended for commercial products.

The following guidelines can help individuals concerned about chemical contaminants in fish and shellfish manage potential health risks:

- **Eat a variety** of different fish and shellfish.
- **Avoid eating excessive amounts of any single type of fish or shellfish.**
- **Avoid eating the internal organs** of fish, the tomalley of lobsters, and the mustard of crabs. They can contain significantly higher amounts of contaminants than the flesh.
- **When catching your own fish, check and follow all applicable health advisories.** Advisories are available from local and state health departments, state fisheries agencies like the New York State Department of Environmental Conservation, and Sea Grant offices.
- **High-risk individuals,** including pregnant women, women of child-bearing age, and children under age 15, should limit their consumption of species known to have elevated levels of contaminants.
- **If you choose to eat sport fish that may contain elevated levels of contaminants,** trim away fatty areas and use cooking methods like baking or broiling, which allow fats and juices to drain away.

Seafood Inspection

Despite the public perception that seafood is not inspected, seafood, like all other food, is subject to federal, state, and local government regulations and inspections.

At the federal level, the FDA is primarily responsible for the regulation of seafood. The FDA inspects seafood processing plants and imported seafood, oversees the National Shellfish Sanitation Program, samples and tests seafood products, and enforces labeling requirements. The FDA works with the individual states to implement these regulatory programs.

State agencies also conduct regular inspections. In New York, for example, the Department of Agriculture and Markets inspects and licenses seafood processing plants and regularly inspects retail stores. The Department of Environmental Conservation monitors shellfish-growing waters, licenses and monitors shellfish harvesters, processors, and distributors, and collects and tests fish and wildlife for chemical contaminants. The Department of Health collects and interprets available information about chemical contaminants in sport fish and other safety concerns, evaluates health risks, and issues advisories when necessary. Local health departments also regularly inspect restaurants.

In addition to mandatory federal and state programs, another federal agency, the National Marine Fisheries Service (NMFS), coordinates a voluntary seafood inspection program.

Several initiatives designed to strengthen and update the current regulatory system are under way. The FDA has expanded its regulatory program and is working with the NMFS and the seafood industry to develop a new system for food safety control called HACCP (pronounced hassup), which stands for Hazard Analysis Critical Control Point.

Designed to control potential hazards in food production, HACCP-based systems are already being used by the space program to produce food for astronauts and the canned food industry, and they are being studied for use with meat and poultry. Pilot tests of HACCP programs for seafood processors, retailers, overseas producers, and molluscan shellfish are being conducted, and new voluntary HACCP-based inspection programs coordinated by the FDA and NMFS are expected to become available in 1993.

Additional changes in the regulatory system are likely to occur as the public debate on this issue continues, and both consumers and the seafood industry are likely to benefit from programs that provide additional cost-effective and practical safety controls.

Seafood Buying and Selection

Most people are familiar with a few well-known kinds of seafood such as cod, flounder, sole, salmon, and shrimp, but there are many alternatives to these traditional favorites. Lesser-known fish and shellfish species are usually less expensive and can be prepared just as easily. Instead of limiting your selections to fish and shellfish specified in particular recipes, consider basing your selections on the quality and price of products that are available locally, and then ask your retailer to suggest a simple recipe or preparation method.

Selecting Alternatives

Many fish and some shellfish can be successfully substituted for one another. When substituting, consider the color, flavor, texture, market form, and nutritional content.

In general, it's best to use the same market form when making substitutions. For example, if a recipe calls for cod fillets, you can easily use haddock, pollock, or other white fish fillets, but not a whole fish.

If nutritional considerations are important, check nutrient charts such as the one in the Appendix to compare the nutrient composition of your substitution with a more familiar fish or one specified in a recipe.

To refine your substitutions further, compare color, flavor, and texture. Table 3 will help you identify species that have a similar flavor and texture.

Market Forms

Fish and shellfish are sold in a variety of different forms just as red meat and poultry are sold in a variety of cuts. For fish, fillets and steaks are most common, but whole and dressed fish (fish with the head, tail, and fins removed) are also available. Shellfish market forms include whole live products such as clams, oysters, crabs, and lobsters as well as the meat and various parts of each.

The price per pound for various market forms generally increases in proportion to the amount of product that is edible and the amount of work needed to convert a product from its original to its final form. Fish fillets and shellfish meat usually cost more per pound than whole fish or shellfish, but there is virtually no waste.

Fresh versus Frozen Seafood

Many people, confused about the term fresh as it's applied to seafood, have a general perception that fresh is always better than frozen. The term fresh is not necessarily equivalent to "high quality." In reality the word fresh can be used for any product that hasn't been frozen. Both fresh and frozen seafood products can be of high quality if they have been

handled and stored properly. For example, the quality of a seafood product that has been harvested in a remote location and frozen while in top condition may be superior to that of a similar unfrozen, or "fresh," product that has spent many days en route to its final destination. Products that have been frozen and then thawed before sale should be labeled "previously frozen."

Purchasing and Seafood Quality

Perishable foods like seafood should be purchased from reputable businesses that always use proper sanitation and handling procedures.

Temperature control is extremely important to maintain quality. Fresh seafood should always be kept at temperatures as close to 32° F as

Table 3. Seafood Alternatives: Common Fish and Shellfish Grouped by Flavor and Texture

	Flavor		
Texture	**Mild Flavor**	**Moderate Flavor**	**Full Flavor**
Delicate	Cod Crab Flounder Haddock Hake Pollock Scallops Sole	Butterfish Lake perch Whitefish Whiting	Mussels Oysters
Moderate	Crayfish Lobster Pike (walleye) Orange roughy Shrimp Tilapia	Mullet Ocean perch Shad Smelt Surimi products Trout Sea trout (weakfish) Tuna (canned)	Bluefish Mackerel Salmon (canned) Sardines (canned)
Firm	Grouper Halibut Monkfish Sea bass Snapper Squid Tautog (blackfish) Tilefish Wolffish	Catfish Mahi-mahi Octopus Pompano Shark Sturgeon	Clams Marlin Salmon Swordfish Tuna

Adapted from: "Fish and Seafood Chart" in *Fish and Seafood Made Easy*, National Fish and Seafood Promotional Council, 1989.

possible, and frozen seafood should be kept at temperatures below 0° F.

In the retail store fresh seafood should be properly chilled and well iced in the display case and should feel cold when purchased. Because seafood is highly perishable, purchase it at the end of a shopping trip to ensure that it won't be exposed to warm temperatures for a long time before it is refrigerated. Use a cooler and ask your retailer to provide ice during the warm months of the year if you expect to make other stops. Ideally, seafood also should be wrapped in individual leakproof plastic bags to avoid cross-contamination with other foods.

To evaluate seafood quality, use your senses of smell, sight, and touch. Most experts agree that your sense of smell is your most effective tool for judging quality. High-quality fish and shellfish have a subtle odor, often described as being similar to a sea breeze. An unusual odor or a strong "fishy" smell usually indicates poor quality and sanitation.

Although indicators of quality are difficult to describe and somewhat subjective, with practice most people can learn to select products that meet their individual needs and expectations. The guidelines on pages 22 and 23 will help you judge seafood quality.

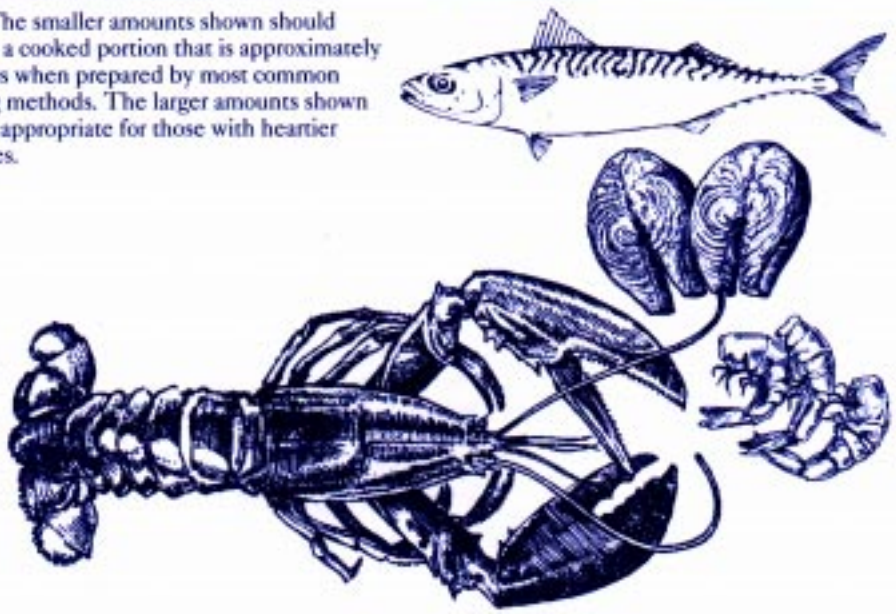
How Much Should You Buy?

The quantity of seafood that you need will vary depending on individual appetites, the market form, and the preparation method. Current dietary recommendations suggest that a 3-ounce cooked serving of meat or seafood is sufficient. Use table 4 on page 21 to estimate the amount of seafood to purchase for each adult serving. Larger amounts may be needed for individuals with a hearty appetite. Smaller amounts may be appropriate for children and when preparing appetizers, salads, casseroles, pasta dishes, or recipes with many other ingredients.

Table 4. Seafood Buying Guide

Type of Seafood	Approximate Amount of Raw Seafood Needed per Adult Serving
Whole fish	3/4 pound (12 ounces)
Dressed or pan-dressed fish	1/2 pound (8 ounces)
Fish fillets	1/4 to 1/3 pound (4–6 ounces)
Fish steaks with bone	1/2 pound (8 ounces)
Fish steaks without bone	1/3 pound (6 ounces)
Live clams and oysters	6 to 8
Shucked clams and oysters	1/3 to 1/2 pint
Live lobsters and crabs	1 to 1 1/2 pounds
Cooked lobster or crab meat	1/4 to 1/3 pound (4–6 ounces)
Scallops	1/4 to 1/3 pound (4–6 ounces)
Shrimp, headless and unpeeled	1/3 to 1/2 pound (6–8 ounces)
Shrimp, peeled and deveined	1/4 to 1/3 pound (4–6 ounces)

Note: The smaller amounts shown should provide a cooked portion that is approximately 3 ounces when prepared by most common cooking methods. The larger amounts shown may be appropriate for those with heartier appetites.



The following guidelines can help you evaluate the quality of common seafood products:

Fresh whole fish

High-quality fish shouldn't have a strong or "fishy" odor and the flesh should be firm and elastic to the touch. The natural firmness of fish flesh will vary from one species to another.

The gills should be bright red or pink with little visible mucous or slime. As a fish ages, gill color fades to light pink, to gray, to dull brown, and the gill may appear slimy.

The skin of high-quality fish appears bright, shiny, and metallic, and scales adhere tightly to the skin. Characteristic colors begin to fade as soon as a fish is removed from the water.

Many people rely on the eyes of a fish to judge quality, but this indicator can be inconsistent. The eyes may be damaged during harvesting and handling even though overall quality is not affected. If undamaged, look for bright, clear eyes that protrude from the head. As quality deteriorates the eyes become cloudy and sink into the head.

Fillets and steaks

It's somewhat more difficult to evaluate the quality of fish fillets and steaks, but with practice consistent judgments can be made. Again, a strong or unusual odor generally indicates poor quality. The flesh should look firm, moist, and translucent and have no traces of drying or browning around the edges. The muscle should not gape or separate, and the flesh in steaks should adhere to the bones. Prepackaged steaks and fillets should be tightly wrapped and should not contain excess liquid.

Shellfish

The shells of live clams, oysters, and mussels should be clean and reasonably free of dirt and debris and should close tightly when tapped or agitated. Soft-shell clams can't completely close their shells but they should move when touched. Don't purchase dead shellfish or live shellfish with cracked shells. The meat of freshly shucked clams, oysters, and mussels should be plump and covered with liquid that is relatively clear, not cloudy or milky, and reasonably free of grit. There should be no strong odor.

Live crustaceans

Live lobsters, crabs, and crayfish should show movement when handled, but they may be sluggish if they've been refrigerated. The tail of a lobster will curl tightly underneath the body when it's alive and hang limply if it's dead. Do not purchase dead products because there is no way to know how long they've been dead. Cooked whole lobsters, crabs, and crayfish should be bright red and have no strong odor. Cooked meat should be moist, have a characteristic color, and have no strong odor.

Scallops

Because scallops die quickly after they're harvested, the part that is commonly eaten, the adductor muscle, is removed at sea. Scallops are usually creamy white, but they may often have a light orange, tan, or pinkish hue. Scallops have a distinct odor that may seem quite strong when a package or container is first opened. Check for strong or unusual odors after the container has been open for a minute or two. Poor-quality scallops also look dry or have yellow or brownish edges.

Shrimp

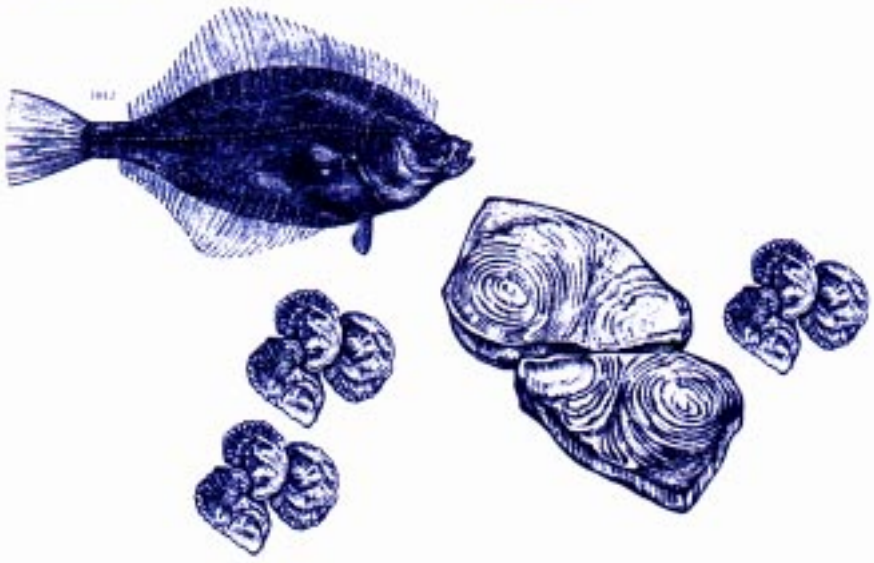
Raw and cooked shrimp should not have a strong odor, and the shell and meat should not be slippery. The color of both the shrimp meat and the shells can vary. Cooked shrimp are reddish to pink and should be displayed and stored separately from raw products.

Smoked fish

Smoked fish should look bright and glossy and should have no signs of mold. There should be no unusual odor. Refrigerate smoked seafood and avoid cross-contamination with raw products because smoked seafood usually isn't cooked before it's eaten. Do not store smoked products directly on ice if they are unpackaged.

Frozen seafood

Frozen seafood should be solidly frozen. There should be no signs of discoloration and drying (freezer burn) and no strong odor. The product should be either wrapped tightly or glazed with a thin layer of ice. Packages should be undamaged and show no signs of thawing, such as water stains or ice crystals that adhere to the inside of the package. Use products with an expiration date on the package by that date.



Seafood Handling and Storage

Maintaining proper temperatures and preventing contamination of seafood by other foods and food contact surfaces are essential to preserve quality and prevent foodborne illness. Always keep fresh (unfrozen) seafood in the refrigerator at a temperature as close to 32° F as possible. Many home refrigerators operate near 40° F, but at this temperature seafood quality can deteriorate rapidly. Store seafood in the coldest part of the refrigerator (in meat or vegetable bins or on open shelves near the back). If you plan to store seafood for more than a day or two, pack it in ice in a container in the refrigerator, or consider freezing it until it can be used.

Pack whole fish directly on ice, but protect fillets, steaks, and shellfish meat from direct contact with ice. Place these products in sealed, waterproof plastic bags or containers that can be buried in the ice. Remove as much air as possible to speed cooling. Empty the water from the melted ice and add more ice as necessary.

Use live clams, oysters, crabs, and lobsters soon after purchase, and do not store them directly on ice or in airtight containers. Freshwater from melting ice will kill them, and they will suffocate in airtight containers. Place live clams, oysters, and mussels in the refrigerator in a shallow dish and cover them with damp paper towels to keep them from drying out. Check live shellfish before cooking and discard dead ones.

During storage always take care to prevent other foods from dripping onto seafood and raw seafood from dripping or splashing onto other foods. Whenever possible, store food in tightly sealed, leakproof containers.

Frozen seafood should be stored immediately in the freezer at temperatures below 0° F. Take care to ensure that your purchases don't thaw before you get them home. Even partial thawing will cause their quality to deteriorate more rapidly during storage.

Seafood must be adequately protected from moisture loss (freezer burn) and from air to maintain quality. Frost-free and self-defrosting freezers cause improperly packaged seafood to dry out quickly. Store commercially frozen products in their original containers.

To freeze your own seafood, rinse it if necessary and wrap it in plastic wrap, forming a barrier or tight "skin" around the product. Then place it in a durable plastic freezer bag and squeeze as much air as possible from the bag before sealing it.

Wrap whole fish tightly in plastic wrap and then wrap it again in freezer paper or foil. Whole fish and shellfish also can be frozen in a block of ice, which protects them from drying out and from becoming rancid. Use a milk carton or

other waterproof container to hold the product and water while it's being frozen.

Because seafood has a limited storage life in most home freezers, it's a good idea to label and date all seafood products before you put them into the freezer. Then use the older seafood first.

When freezing seafood, rapid freezing is important. Place properly packaged seafood in a part of the freezer that allows good air circulation, and do not try to freeze too much at one time. Remember that smaller packages freeze faster. Because temperature fluctuations affect quality, if possible store seafood in freezers that aren't opened frequently.

The length of time that seafood quality is maintained during refrigeration or frozen storage varies depending on the product's initial quality, its fat content, whether it has been properly packaged, and the operating conditions of the refrigerator or freezer. In general, fatty fish can't be stored for as long as low-fat seafood. Poor-quality products always have a very short storage life because even freezing can't stop the deterioration of quality.

Use table 5 as a guide for storing quality seafood products.

Table 5. Seafood Storage Guide

Product	Purchased Commercially Frozen for Freezer Storage	Purchased Fresh and Frozen at Home	Never Frozen, Thawed, or Previously Frozen and Refrigerated at Home
Fish Fillets and Steaks			
Lean			
Cod, flounder	10–12 months	6–8 months	36 hours
Haddock, halibut	10–12 months	6–8 months	36 hours
Pollock, ocean perch	8–9 months	4 months	36 hours
Rockfish, sea trout	8–9 months	4 months	36 hours
Ocean perch (Pacific)	8–9 months	4 months	36 hours
Fatty			
Mullet, smelt	6–8 months	NA	36 hours
Salmon (cleaned)	7–9 months	NA	36 hours
Shellfish			
Crab (Dungeness)	6 months	6 months	5 days
Crab (king)	12 months	9 months	7 days
Crab (snow)	6 months	6 months	5 days
Crab, cocktail claws	NA	4 months	5 days
Blue crabmeat (fresh)	NA	4 months	5–7 days
Blue crabmeat (pasteurized)	NA	NA	6 months
Shrimp	9 months	5 months	4 days
Surimi products	10–12 months	9 months	2 weeks
Clams, shucked	NA	NA	5 days
Oysters, shucked	NA	NA	4–7 days
Lobster, live	NA	NA	1–2 days
Lobster, tail meat	8 months	6 months	4–5 days
Squid	8–9 months	4 months	36 hours
Breaded Seafoods			
Fish portions	18 months	NA	NA
Fish sticks	18 months	NA	NA
Scallops	16 months	10 months	NA
Shrimp	12 months	8 months	NA
Smoked Fish			
Herring	NA	2 months	3–4 days
Salmon, whitefish	NA	2 months	5–8 days

Source:
National Fisheries Institute, 2000 M Street NW, Suite 580, Washington, D.C. 20036

Notes:
NA = not applicable or not advised.

These storage guidelines indicate optimal shelf life for seafood products held under proper refrigeration or freezing conditions. Temperature fluctuations in home refrigerators will affect optimal shelf life as will opening and closing refrigerators and freezers often.

Although the above storage times ensure a fresh product for maximum refrigeration storage life at 32° F, plan on using seafood within 36 hours for optimal quality and freshness of the product.

To determine approximate storage time for species not listed, ask your retailer which category (lean, fatty, shellfish, breaded, or smoked) your purchase falls within and refer to this guide.

Seafood Preparation

Preparing seafood is quick, easy, and safe if you follow a few simple guidelines. Seafood can be successfully prepared by almost any cooking method, but because of the variety of different products and cooking methods available, many people still lack confidence in their ability to cook seafood.

Seafood can truly be called a "fast food" when it comes to preparation. Unlike meat, seafood doesn't need to be tenderized by cooking, and most products can be cooked in 10 to 20 minutes.

The simplest way to cook fresh (unfrozen) fish fillets and steaks is to use the "10-minute rule," which suggests that you cook fish for 10 minutes per inch of thickness at a temperature of 425° F to 450° F. Simply measure the thickest part of the product to be cooked and adjust the cooking time accordingly.

For example, if the thickest part of a fillet is approximately 1/2 inch, it should be cooked for 5 minutes. Since most fillets are thinner at one end, fold the thinner part under the rest of the fillet. The fillet then has a more even thickness, ensuring uniform cooking. As you approach the time specified by the 10-minute rule, check the product to be sure that it won't be overcooked or undercooked. Seafood loses its natural translucent appearance, turns opaque, and flakes easily with a fork when done.

The 10-minute rule works especially well for baking and broiling. When broiling, most fish should be 3 to 4 inches from the heat source and thicker pieces 5 to 6 inches away. When baking, always preheat the oven first or you won't be able to estimate the cooking time accurately.

The 10-minute rule can be adapted to poaching, boiling, and steaming seafood. Just begin the timing after the water returns to a boil. The rule can't be used for deep frying and microwaving, which cook fish faster. If you're cooking fish in foil, in a sauce, or with vegetables or other added ingredients, add about 5 minutes to the cooking time specified by the 10-minute rule. Frozen fish can be easily cooked without thawing; just double the cooking time specified by the 10-minute rule.

The 10-minute rule for cooking seafood is a simple guideline which can be adjusted to your personal taste. Using the rule, your product should reach a temperature between 145° F and 160° F. Check a fillet or steak with a food thermometer if safety is a concern. You can always adjust the cooking time when in doubt, but avoid overcooking because seafood can quickly become dry and tough and lose its natural flavor.

Shellfish can be cooked by poaching, steaming, boiling, sautéing, stir frying, deep frying, baking, broiling, and grilling. Most shellfish are smaller and

more delicate than fish and usually cook faster, so the 10-minute rule is not appropriate.

For live clams, oysters, and mussels, use current FDA recommendations, which suggest boiling for 3 to 5 minutes after the shells have opened or steaming for 4 to 9 minutes. Shucked meats should be boiled for 3 minutes, baked for 10 minutes at 450° F, or fried in oil for 10 minutes at 375° F.

Scallops and shrimp cook rapidly, and the amount of time needed depends on the size, product form, cooking method, and the amount being cooked. Poaching, steaming, and sautéing generally take slightly less time than baking and broiling.

You may need to increase the cooking time when preparing a large quantity or a dish with other ingredients. Although shellfish should be adequately cooked, avoid overcooking because they become dry, tough, and lose their delicate flavor quickly.

Seafood, naturally low in fat, can make a positive contribution to a healthy diet. The way you prepare seafood, however, can significantly affect the nutrient composition of the product you eat. Many traditional seafood recipes involve frying or using rich sauces made with high-fat products like cream, butter, and cheese, which add calories, fat, saturated fat, and sodium.

To maintain seafood's favorable nutritional composition select recipes and cooking methods that limit the amount of added fat. Simple recipes that you create yourself using ingredients like lemon juice and your favorite herbs and spices are easy, low-fat alternatives.

For more detailed guidance, a number of excellent cookbooks that provide low-fat, light, and heart-healthy recipes are available in libraries and bookstores. Recipes also are available from your local Cooperative Extension office and local chapter of the American Heart Association.

To evaluate a seafood recipe, ask whether the recipe

- suggests cooking with oil or other fats
- calls for a sauce that contains ingredients high in fat such as cream, butter, mayonnaise, or cheese
- calls for the addition of salt or seasonings high in salt

If the answer is yes, consider modifying the recipe by identifying the high-fat and high-sodium ingredients and substituting lower-fat and lower-sodium alternatives.

Some suggestions for ingredient substitutions are provided in table 6. When making substitutions, you'll probably need to experiment to find those that are acceptable to you and your family. Any reduction in fat that you can achieve is a positive step.

Table 6. Ingredient Substitutions

Ingredients to Limit	Substitutes to Use When Possible
Butter, lard, shortening	Soft or low-fat margarine, vegetable oil (canola, olive)
Whole milk, light cream	Low-fat milk
Cream	Evaporated skim milk
Sour cream	Low- or reduced-fat sour cream, low-fat plain yogurt
Cheese	Fat-free, low-fat, or reduced-fat cheese
Whole eggs	Egg substitutes, egg whites
Mayonnaise	Fat-free or low-fat mayonnaise
Salt	Herbs, spices, salt substitutes, low-salt seasonings
High-sodium ingredients	Low-sodium counterparts (low-sodium broths, low-sodium soy sauce)
Butter, cream-based sauces	Wine, water- and vegetable-based sauces

Don't forget proper food handling techniques when preparing seafood. The following suggestions will help you handle and prepare seafood safely:

- Before starting food preparation, be sure that the preparation area and all surfaces and utensils are clean.
- Wash your hands thoroughly with soap and warm water **before** preparing food or working with new foods or utensils and **after** finishing food preparation, handling raw meat or poultry, going to the bathroom, changing diapers, petting animals, coughing or sneezing into your hands, blowing your nose, smoking, eating, or taking out the garbage.
- Don't let juices from raw seafood, meat, or poultry come in contact with each other or with other foods, especially foods that are cooked or ready-to-eat.
- Wash the cutting board, the utensils, the counters, the sink, and your hands with hot, soapy water after preparing raw seafood, meat, and poultry.
- Keep your fingernails and dish-washing cloths and sponges clean.
- Use plastic cutting boards instead of wooden boards, which are porous and much more difficult to keep clean.
- Don't taste meat, poultry, eggs, and seafood when they are raw and during cooking.
- Serve cooked seafood on a clean plate, never the same plate that was used to hold the raw product. For example, when grilling seafood don't put cooked items on the same plate that was used to carry the raw product out to the grill.
- Discard cooked seafood that has been held at room temperature for more than 2 hours. For buffets, hot foods should be maintained at temperatures above 140° F, and serving dishes for cold foods can be nestled in a bed of ice to keep them at temperatures below 40° F.

Conclusion

Seafood is an interesting and appealing food choice that contributes to a healthy diet. Although there are a variety of products to choose from, handling and preparing seafood is simple and convenient if you follow a few simple rules.

Remember always to keep seafood as cold as possible and to handle it gently and carefully to ensure quality. Most seafood can be prepared in 20 minutes or less, and preparation methods that maintain its positive nutritional attributes should be used whenever possible.

Although there are potential safety concerns for some products, risks can be managed by eating a variety of products purchased from reputable seafood dealers and handling and preparing them properly. Those who choose to eat higher-risk products like raw seafood or fish caught in areas known to contain contaminants should be aware of the potential health risks and follow available advice to reduce those risks when possible.

Seafood is a smart food choice, so go ahead and enjoy it!

Appendix

Nutrient Composition of 3-Ounce Cooked Edible Portions of Selected Fish and Shellfish

Product	Calories (Kcal)	Protein (Grams)	Total Fat (Grams)	Calories from Fat (Percent)	Saturated Fat (Grams)	Omega-3 Fatty Acids (Grams)	Cholesterol (Milligrams)	Sodium (Milligrams)
Fish								
Bass (freshwater mixed species), baked	121	20	3.9	29	0.8	0.6	72	74
Bluefish, baked	131	21	4.5	31	1.0	0.8	63	64
Butterfish, baked	155	18	8.5	49	2.2	NA	69	94
Catfish, baked	124	19	4.5	33	1.0	NA	62	67
Cod (Atlantic), broiled	87	19	0.7	7	0.1	0.1	46	58
Croaker, baked	111	19	3.4	28	1.1	NA	65	59
Cusk, broiled	93	20	0.7	7	0.2	NA	46	34
Flounder, baked	97	20	1.3	12	0.3	0.4	51	86
Grouper, baked	97	21	1.1	10	0.2	0.2	39	56
Haddock, baked	93	20	0.8	8	0.1	0.2	61	75
Halibut, broiled	116	22	2.4	19	0.3	0.4	34	58
Herring (Atlantic), broiled	167	19	9.6	52	2.2	1.7	64	95
Mackerel (Atlantic), baked	218	20	15.0	62	3.5	1.0	75	95
Mackerel (Spanish), broiled	147	21	6.7	41	1.9	1.1	81	63
Mackerel (Pacific and jack), broiled	190	21	12.0	57	3.0	1.6	60	95
Mahi-mahi, broiled	91	20	0.7	7	0.2	0.1	78	93
Monkfish, baked	80	15	1.6	18	0.0	NA	26	20
Mullet, broiled	124	21	4.0	29	1.2	0.3	53	69
Ocean perch, baked	100	20	1.7	15	0.3	0.3	45	80
Perch (freshwater), broiled	97	21	1.0	9	0.2	0.3	96	66
Pike (Northern), baked	94	20	0.7	7	0.1	0.1	41	51
Pike (walleye), broiled	99	20	1.3	12	0.3	0.3	92	54
Pollock (Atlantic), broiled	98	21	1.0	9	0.1	0.5	75	91
Ocean pout, broiled	84	18	1.0	11	0.3	NA	55	65
Rockfish (Pacific), baked	100	20	1.7	15	0.4	0.4	36	64
Orange roughy, broiled	70	16	0.7	9	0.1	NA	23	71
Salmon (Atlantic), baked	151	21	6.7	40	1.0	1.6	61	46
Salmon (chum), broiled	127	21	4.0	28	0.9	0.7	79	53
Salmon (coho), baked	155	23	6.3	37	1.2	0.9	36	49
Salmon (king), broiled	191	21	11.1	52	2.7	1.5	70	50
Salmon (pink), baked	124	23	3.7	27	0.6	1.1	49	71
Salmon (sockeye), broiled	179	23	9.1	46	1.6	1.0	66	50
Shark, baked	139	22	4.8	31	1.0	NA	54	84
Smelt, broiled	104	19	2.6	23	0.5	0.8	75	64
Red snapper, baked	106	22	1.4	12	0.3	0.3	43	68
Sole, broiled	100	21	1.3	12	0.3	NA	58	89

(continued)

Nutrient Composition of 3-Ounce Cooked Edible Portions of Selected Fish and Shellfish (continued)

Product	Calories (Kcal)	Protein (Grams)	Total Fat (Grams)	Calories from Fat (Percent)	Saturated Fat (Grams)	Omega-3 Fatty Acids (Grams)	Cholesterol (Milligrams)	Sodium (Milligrams)
Striped bass, baked	103	19	2.5	22	0.6	0.8	85	74
Swordfish, broiled	129	21	4.3	30	1.1	0.7	41	109
Lake trout, baked	175	19	10.0	51	1.8	NA	51	45
Rainbow trout, broiled	125	22	3.6	26	0.7	0.6	60	29
Sea trout, broiled	110	18	3.8	31	0.7	0.4	88	61
Tuna (bluefin), baked	153	25	5.2	31	1.3	1.3	40	41
Tuna (skipjack), broiled	110	23	1.1	9	0.3	0.3	50	39
Tuna (yellowfin), broiled	115	25	1.0	8	0.3	0.2	48	39
Whitefish, broiled	143	20	6.2	39	1.0	1.4	64	54
Whiting, baked	96	19	1.4	13	0.3	0.7	71	76
Wolffish (ocean catfish), baked	103	19	2.5	22	0.4	0.7	50	104
Shellfish								
Clams (mixed species), 12 small, steamed	126	22	1.7	12	0.2	0.2	57	95
Blue crab, steamed	93	19	1.1	11	0.2	0.4	83	311
Softshell blue crab, broiled	63	13	1.1	16	0.3	NA	86	507
Dungeness crab, boiled	91	19	1.0	10	0.1	0.3	63	314
Snow crab, boiled	95	20	1.3	12	0.2	0.4	59	572
American (Northern) lobster, boiled	96	20	0.9	8	0.1	0.1	101	323
Spiny lobster, boiled	119	22	1.6	12	0.3	0.4	75	283
Blue mussels, steamed	147	20	3.8	23	0.7	0.7	48	313
Oysters (Eastern), 12 medium, steamed	117	12	4.2	32	1.1	0.7	93	190
Scallops (mixed species), 6 large or 14 small, broiled	150	29	1.3	8	0.1	NA	56	274
Shrimp, boiled	113	22	1.8	14	0.3	0.3	163	157
Squid, boiled	156	27	2.4	14	0.6	NA	396	74

Sources:
Seafood Nutri-Facts, Food Marketing Institute and National Fisheries Institute, 1988.
Composition of Foods: Finfish and Shellfish Products, USDA Handbook No. 8-15, 1982.

Notes:
All cooked fish portions are skinless.
NA means that data were not available in USDA Handbook 8-15 for that species cooked by a dry or moist-heat method.
Omega-3 values were determined by adding the amounts of the two major omega-3 fatty acids (EPA and DHA) for a 3-ounce cooked portion of seafood as reported in USDA Handbook 8-15.

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