

Fish and Shellfish

SECTIONS

21.1 Fish Basics

21.2 Shellfish Basics

21.3 Cooking Fish and Shellfish

WRITING ACTIVITY

Classification

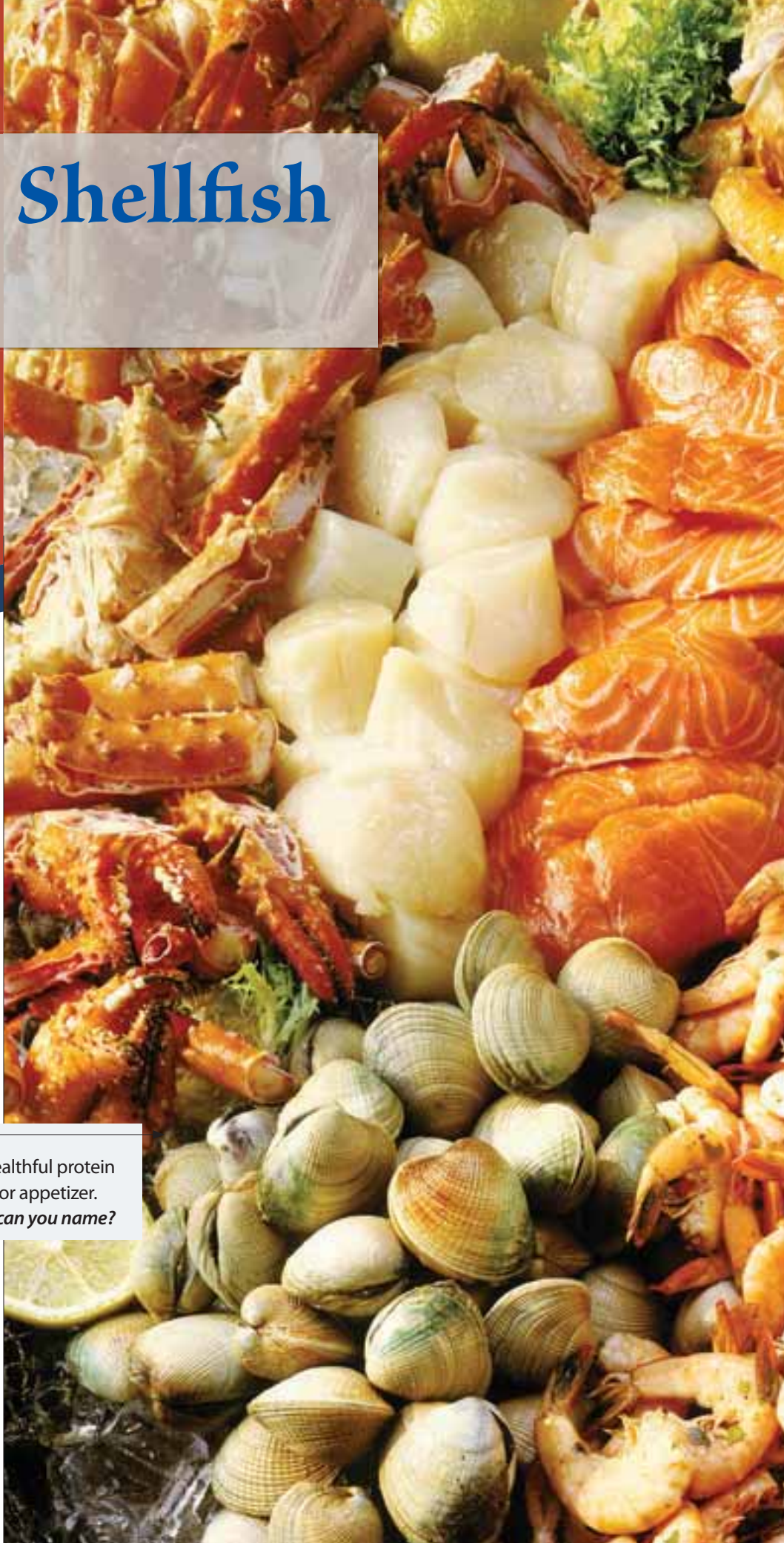
Classifications help to break down and explain the parts of something that make up a whole. Write a classification of different types of fish or shellfish that you know, as an introduction to the subject.

Writing Tips

- 1 Begin with an introduction that defines the broad topic.
- 2 Describe each category and provide supporting details.
- 3 Keep it simple. Do not use too many categories.

EXPLORE THE PHOTO

Fish and shellfish are healthful protein choices for a main dish or appetizer.
What types of shellfish can you name?



Fish Basics

Reading Guide

Before You Read

Understanding It is normal to have questions when you read. Write down questions while reading. Many of them will be answered as you continue. If they are not, you will have a list ready for your teacher when you finish.

Read to Learn

Key Concepts

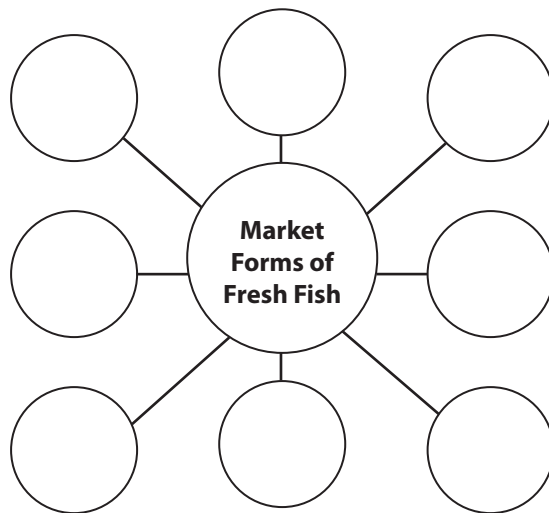
- **Describe** the composition and structure of fish.
- **Distinguish** between the different market forms of fish.

Main Idea

Fish is a low-fat, healthful protein that is popular with diners. Selecting high-quality fish is an important skill for foodservice professionals.

Graphic Organizer

As you read, use a web organizer like this one to list the eight different market forms of fresh fish.



Graphic Organizer Go to this book's Online Learning Center at glencoe.com for a printable graphic organizer.

Content Vocabulary

- fatty fish
- lean fish
- flat fish
- round fish
- boneless fish
- drawn
- dressed
- fillets
- butterflied
- freezer burn
- drip loss
- vacuum packed

Academic Vocabulary

- classify
- keep

Fish is a popular choice in most restaurants.

ACADEMIC STANDARDS

English Language Arts

NCTE 7 Conduct research and gather, evaluate, and synthesize data to communicate discoveries.

Mathematics

NCTM Data Analysis and Probability Select and use appropriate statistical methods to analyze data.

Social Studies

NCSS VII F Production, Distribution, and Consumption Compare how values and beliefs influence economic decisions in different societies.

NCTE National Council of Teachers of English

NCTM National Council of Teachers of Mathematics

NSES National Science Education Standards

NCSS National Council for the Social Studies

Structure of Fish

More than 30,000 species of fish live in oceans or freshwater sources. These cold-blooded animals are important to the food-service industry. Approximately 75% of all the fish eaten in the United States is eaten in restaurants. Customers looking for a tasty, low-fat, healthful alternative to meat often choose fish. Knowing how to select, purchase, and store fish will allow a foodservice operation to serve fish of the highest quality.

Like poultry and meat, fish is made up of protein, fat, water, and vitamins and minerals. Fish can be divided into two broad categories. Some fish are called fatty fish. **Fatty fish** have a relatively large amount of fat. Salmon is a popular type of fatty fish. Fish with little fat are known as **lean fish**. Haddock is a common example of lean fish. A major difference between fish and meat is that fish has very little connective tissue. Because of this, fish:

- Are naturally tender.
- Cook rapidly, requiring low heat.
- Can be cooked using moist cooking techniques to keep its natural moistness.
- Will fall apart when cooked, if not handled carefully.

Fish have backbones, an internal skeleton of cartilage and bones, gills for breathing, and fins for swimming. Fish may be divided into three categories, based on their skeleton type. (See **Figure 21.1**.)

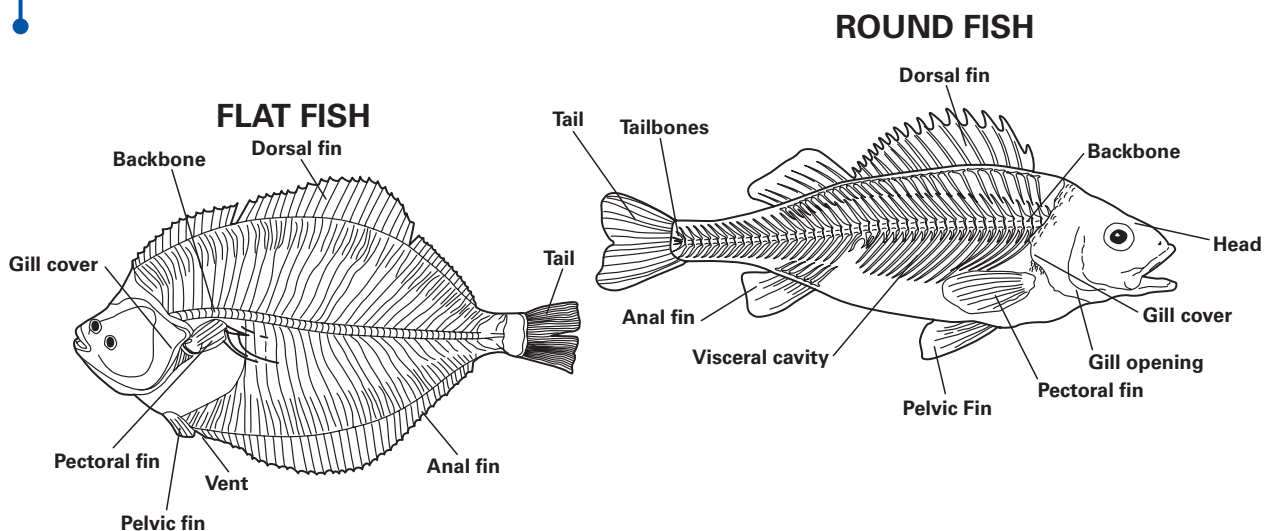
- **Flat Fish** **Flat fish** have a backbone running horizontally through the center of the fish. They swim horizontally and have both eyes on the top of their heads. Flounder and halibut are examples of flat fish. Generally, flat fish swim along the bottom of the ocean. They have dark skin on the upper side of their bodies to hide from predators.
- **Round Fish** **Round fish** are fish that have a backbone on the upper edge of their bodies. They have an eye on each side of their heads, and they swim vertically. Trout, bass, and cod are common types of round fish.
- **Boneless Fish** **Boneless fish** are fish that have cartilage instead of bones. Sharks are boneless fish. Many boneless fish also have smooth skin instead of scales. Some chefs will **classify**, or sort, boneless fish with round fish.

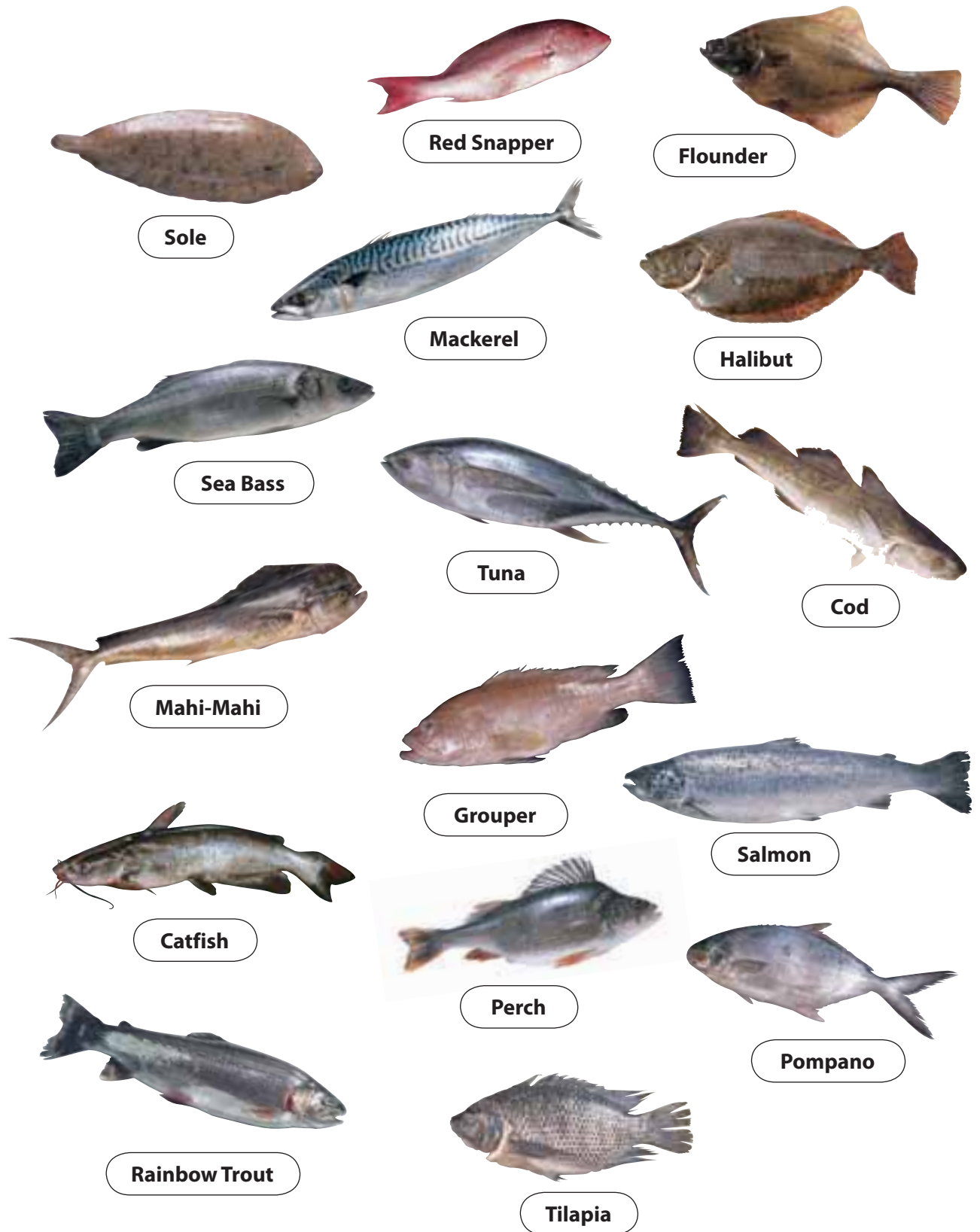
Reading Check **Compare** What is the major difference between fish and meat?

FIGURE 21.1 Flat and Round Fish

Fish Structure Flat fish and round fish have slightly different bone structures.

What are the characteristics of flat fish?





An Ocean of Fish Most foodservice operations serve only a portion of the types of fish that exist worldwide. *Which of these fish are flat fish?*

Market Forms of Fish

As the demand for fish has increased and the supply has decreased, fish have become more expensive. Fish were once available only to those living along the coasts or near fresh-water sources. Now, fish can be preserved and shipped to any location quickly and safely. However, the names used for different fish may vary from one region of the country to another. For example, bluefish are sometimes called blue snappers.

Fish may be purchased whole or in the form in which it will be cooked and served. (See **Figure 21.2**.) The available options may vary depending on whether the fish is purchased fresh, frozen, or canned. Generally, restaurant owners find it less expensive to buy fish that is already processed because of processing time that is required to prepare fish for cooking.

Inspection and grading of fish is not required by law like it is for meat and poultry. However, it generally is still inspected. See Section 21.2 for more information on inspection and grading of fish.

Fresh Fish

Before most fresh fish is made available for purchase, it is usually processed in some way. The unwanted parts of the fish, such as heads and fins, are often removed. There are eight forms of fish that can be purchased.

- **Whole** Whole fish refers to the entire fish as it comes out of the water. Because the internal organs are not removed, this form has the shortest shelf life.
- **Drawn** Fish that have had their gills and entrails removed are called **drawn** fish. This form has the longest shelf life. Whole fish are often purchased drawn.
- **Dressed** Drawn fish that have had their fins, scales, and sometimes their head removed are called **dressed** fish.
- **Fillet** The sides of fish are called **fillets**. These are the most common cut offered in restaurants. Fillets can be cut with or without bones and skin. Round fish produce two fillets, one from each side. Flat fish produce four fillets. Two large fillets are cut from the top and two are cut from the bottom of the fish.

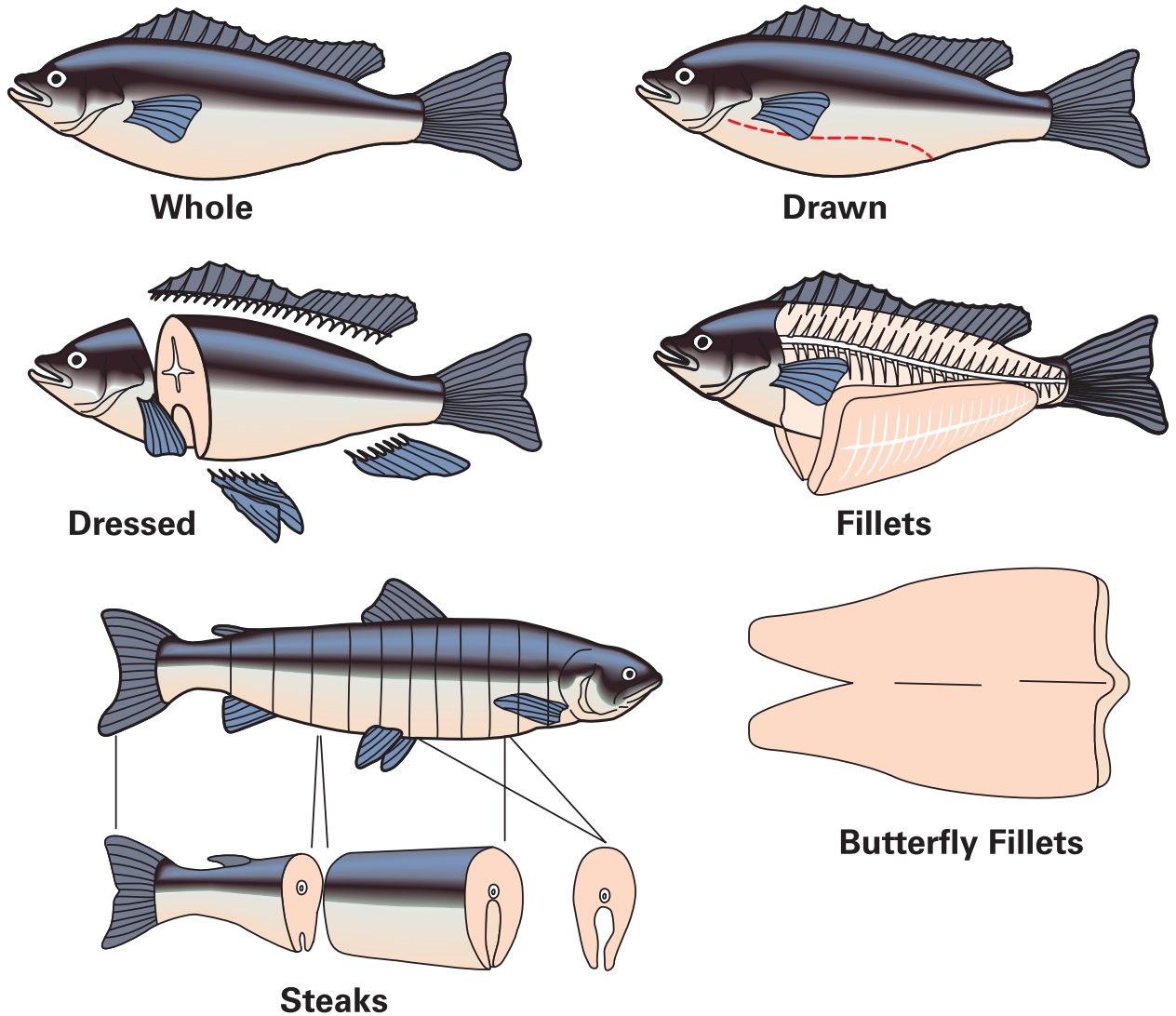


A Popular Choice Fish is a popular choice in restaurants today.
Why do you think fish is so popular?

FIGURE 21.2 Fish Market Forms

Fish Forms Fish is available either whole or in the form in which it will be cooked.

Why is it usually less expensive to purchase processed fish?



- **Butterflied** A **butterflied** fish resembles an open book. The fish is dressed, then cut so the two sides lie open, yet are attached by skin.
- **Steaks** Cross-section cuts of dressed fish are called steaks. The backbone and skin may still be attached. When the cuts are from a large fish, such as swordfish, they are boneless.
- **Cubes** Leftover pieces from large fish are called cubes. They are often used in stir-fries, stews, or kebabs.
- **Sticks** Small, leftover pieces of fish that are pressed together form fish sticks. They are breaded or battered and sold frozen.

Purchase and Store Fresh Fish

Because fresh fish is not usually graded, the person who receives a shipment of fish must check it for freshness. (See **Figure 21.3** on page 546.) Fresh fish spoils more quickly than fresh poultry or meat. Whole fish should be stored on ice. Fillets should be kept on ice in watertight containers.

From the time fish is caught to the time it is cooked and served, maintaining proper storage temperatures is critical to the quality and safety of the fish. The shelf life of fish decreases one day for every day it is stored above 32°F (0°C).

Frozen Fish

Some people believe that frozen fish is not as tasty as fresh fish. However, modern processing methods often mean that frozen fish is less likely to be contaminated. More frozen fish is served in restaurants today than fresh fish.

Quality Characteristics

Use the following quality checks when you purchase and receive frozen fish.

- Frozen fish should not be thawed.
- Fish should not have freezer burn. **Freezer burn** is the discoloration and dehydration caused by moisture loss as a food freezes. Fish also should be kept well-wrapped.
- Fish should have a thin layer of ice as a glaze. This glaze should not have evaporated or melted.
- Fish should not have a fishy smell. A fishy smell results from improper handling.

Thaw and Handle Frozen Fish

Frozen fish products are usually raw or battered and breaded. Follow these guidelines to handle it safely:

- Never thaw fish at room temperature. Always thaw fish in the refrigerator. Allow 18 to 36 hours for frozen fish to thaw in the refrigerator. If you are in a hurry, keep fish in its original packaging, and run it under cold water at 70°F (21°C) or lower.
- You can cook small pieces of fish while they are frozen. This makes for easier handling and less drip loss. **Drip loss** is the loss of moisture that occurs as fish thaws.
- Fish may be partially thawed, then prepped and cooked. Partially thawed fish will handle more easily than completely thawed fish.
- If frozen fish is already breaded or prepared in some way, be sure to follow the package directions for cooking.
- Do not refreeze fish.

Because fish spoils quickly, it is important to store and use it carefully. If a fish tastes strong, it has already begun to spoil. Always check for quality before you prepare fish.

FIGURE 21.3 Quality Tests for Fresh Fish

Fresh Fish Fresh fish is not usually graded, so foodservice workers must check it for freshness. *What happens to fresh fish if it is not stored at the correct temperature?*

Look	Feel	Smell
Does the meat separate when the fillet is bent? This is a sign of deteriorated connective tissue between the muscles.	When the fish is pressed, is there a fingerprint left? Fish should be firm. If a dent is visible after the fish is pressed, the fish has begun to decay.	Does the fish smell bad? Fresh fish should smell like seaweed or the ocean. If the fish smells like ammonia, it has gone bad and should not be used.
Are there blood spots in the flesh? Is the fish dry? Fish should be moist and free of blood.	Is the fish slimy? This can be a good sign in whole fish, but a bad sign in fillets.	
If the gills are still attached, are they pink or grayish brown? Fresh fish will have red gills.		
Are the eyes sunken or cloudy? Fresh fish generally have round, clear eyes.		

Purchase and Store Frozen Fish

When you buy frozen fish, be wary of ice inside the fish. This shows that the fish was partially thawed and then refrozen. Be sure that there are no white spots or dry spots, which are signs of freezer burn.

Frozen fish can be kept safely frozen for up to six months, if stored at 0°F (18°C). To prevent freezer burn, keep fish vacuum packed or wrapped tightly in plastic. **Vacuum packed** fish are fish that have been placed in airtight containers from which the air has been removed to prevent the growth of bacteria.


Some fish is frozen and then vacuum packed prior to being sold. These fish are sometimes canned or sold in pouches. Fish sold in pouches are often packaged in individual servings.

Canned Fish

The most common varieties of canned fish are tuna and salmon. Tuna may be packed in oil or water.

Some canned salmon may contain skin and edible bones that add nutrients and flavor. The label should tell you if it is skinless and boneless. Canned salmon generally has no added liquid and comes in chunk style.

Do not purchase cans that are dented or damaged. As with other canned goods, store canned fish on shelves in a cool, dry place. When opened, transfer any unused fish to a covered container. Label and date the container and refrigerate. The fish will **keep**, or stay fresh, for two to three days.

 **Reading Check** **Explain** How should fresh fish be stored?

SECTION 21.1 After You Read

Review Key Concepts

1. **Describe** the composition and structure of flat fish.
2. **Distinguish** between fish fillets and fish steaks.

Practice Culinary Academics

English Language Arts

3. Fish is a protein with many health benefits, but there are also some issues to remember when you select fish. Research and design a brochure that explains the health benefits of eating fish as a protein, as well as issues to remember when choosing fish.

NCTE 7 Conduct research and gather, evaluate, and synthesize data to communicate discoveries.

Social Studies

4. Research the different ways we get fish, including the issues of overfishing and sustainability in fishing, and the environmental and health issues associated with farming. Write a report on your findings, and decide whether these methods are sustainable for the future.

NCSS VII F Production, Distribution, and Consumption
Compare how values and beliefs influence economic decisions in different societies.

Mathematics


5. Charlie is responsible for purchasing squid for appetizers for the restaurant where he works. Charlie has purchased 15 squid tubes ranging in size: 4, 8, 5, 6, 5, 6, 7, 5, 8, 6, 7, 6, 7, 4, and 6 inches. What is the median length of the tubes? What is the mode?

Math Concept Finding the Median and

Mode Given a series of values, the mode is the value that occurs most frequently. The median is the middle number in the series, when the numbers are arranged in ascending order.

Starting Hint Arrange the lengths in order from lowest to highest. Identify the length in the middle of the range. This is the median. Count how many times each number appears. The one that appears most often is the mode.

NCTM Data Analysis and Probability Select and use appropriate statistical methods to analyze data.

 Check your answers at this book's Online Learning Center at glencoe.com.

Shellfish Basics

Reading Guide

Before You Read

Think of an Example Look over the Key Concepts for this section. Think of an example of how or when you could use one of the skills from the Key Concepts. Thinking of how you might apply a skill can help motivate your learning by showing you why the skill is important.

Read to Learn

Key Concepts

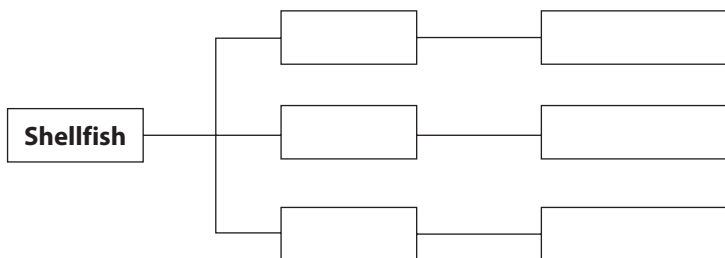
- **Explain** the structure, composition, and grading of shellfish.
- **Differentiate** between types of mollusks.
- **Distinguish** between types of crustaceans.
- **Identify** other types of seafood.


Main Idea

Shellfish meat is expensive and often considered a luxury. Shellfish is versatile, however, and can be used in appetizers and soups as well as main courses.

Graphic Organizer

As you read, use a category tree like the one shown to organize the categories of shellfish. In the first set of boxes, fill in the three types of shellfish. In the next set of boxes, fill in examples of each type.



 **Graphic Organizer** Go to this book's Online Learning Center at glencoe.com for a printable graphic organizer.

Shellfish is a tasty treat that can be used in many dishes.

ACADEMIC STANDARDS

Mathematics

NCTM Number and Operations Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

NCTM Problem Solving Apply and adapt a variety of appropriate strategies to solve problems.

NCTE National Council of Teachers of English

NCTM National Council of Teachers of Mathematics

NSES National Science Education Standards

NCSS National Council for the Social Studies

Shellfish Basics

Shellfish are often considered a **luxury**, or expensive and extravagant, food. Shellfish meat is expensive because much of the body of the animal is not used for special dishes. However, shellfish appear in many places on the menu. They can be found as appetizers, in soups, and as entrées. Every foodservice professional should know how to select and prepare shellfish.

Structure of Shellfish

Unlike fish, shellfish have no bones. They have hard shells that cover their bodies. Shellfish are found in both fresh water and salt water. Two types of shellfish are mollusks (*ˈmä-ləʊks*) and crustaceans (*ˌkræs-ˈtā-shens*).

People eat many different parts of shellfish. Muscles, legs, tails, claws, and tentacles are all used in various dishes. Sometimes shellfish are eaten whole, with or without the shell. Most shellfish are lean and composed primarily of water, vitamins, minerals, protein, and fats.

Learning to prepare shellfish takes time and practice. Each type has special physical characteristics that must be taken into account. For example, some need to be removed from the shell before cooking, while others are cooked in the shell.

Inspection and Grading

Fish and shellfish are inspected, just as meat and poultry are. Although grading is not required, the U.S. Department of Commerce (USDC) will inspect and grade fresh fish and shellfish for a fee. The inspection of frozen and canned fish is **mandatory**, or required.

Fish are inspected for accurate labeling, safety and cleanliness in preparation, and wholesomeness. Grading is done to be sure that the fish meet standards for flavor and appearance. Because there are so many kinds of fish, the USDC has set criteria for only the most common types of fish.

Inspection

The USDC inspects fish and shellfish in one of the following three ways:


- Type 1 inspection covers processing methods and the processing plant itself. The product receives a PUFIs mark if it is safe, clean, accurately labeled, and has a good flavor and odor. A **PUFI mark** means Packed Under Federal Inspection. (See **Figure 21.4**.)
- Type 2 inspection covers things such as labeling, weight, and packaging.
- Type 3 inspection is for sanitary conditions only.

Grading

Fish are graded based on standards for flavor and appearance. Only fish inspected under Type 1 criteria can be graded. Fish may be judged as Grade A, B, or C. Processed or canned products are either B or C quality.

- **Grade A** Highest quality, no physical defects, good odor and flavor
- **Grade B** Good quality
- **Grade C** Fairly good quality

 **Reading Check** **Describe** What is Type 3 inspection of shellfish?

 **FIGURE 21.4 Fish Inspection**
PUFI Mark The Packed Under Federal Inspection mark given by the USDC covers processing methods and the processing plant. *What does this mark mean when seen on a package of shellfish?*



Mollusks

A **mollusk** is a shellfish that has no internal skeletal structure. Instead, it has a shell that covers its soft body. Mollusks are classified in three major groups. The groups are divided according to the kind of shell the mollusk has.

A **univalve** ('yü-ni-valv), such as conch, has a single shell. A **bivalve** ('bī-valv) has two shells that are hinged together. Common examples of bivalves include mussels, oysters, and clams. Instead of an outer shell, a **cephalopod** ('se-fə-lə-päd), such as squid or octopus, has a thin internal shell. Cephalopods have tentacles, or false legs, attached to the head near the mouth.

Oysters

Oysters can be purchased any time during the year, but they are best to eat in the fall, winter, and spring. Oyster meat is very delicate and has a high percentage of water. Because the salts, nutrients, and minerals of the water flavor the meat, oysters within the same species may taste different, depending on where each was harvested. Also, the flavor can be watery and bland during warmer months when oysters reproduce.

Market Forms

Oysters may be purchased live, shucked, or canned. A shucked oyster has had the meat removed from the shell. Shucked oysters can be purchased either fresh or frozen and range in size from very small to extra large. They are graded by size, as shown in **Figure 21.5**. Canned oysters are rarely used in commercial kitchens.

Handling and Storage

When you purchase live oysters, check that the shells are tightly closed or that they close quickly when they are tapped. If they do not move, they are dead and should be thrown away. Oysters should have a clear appearance and be plump. Both shucked and live oysters should have a sweet, mild odor.

Store live oysters in cardboard containers in the cooler. They should be draped with seaweed or damp towels. Check oysters daily, and throw out any dead ones. If the oysters have already been shucked, keep them in containers surrounded by ice on all sides, and keep the harvesting tag. Fresh oysters should keep for up to a week in the refrigerator.

Before you open oysters, scrub their shells. Then, place them on a sheet pan in a hot oven until the shells open. The oysters can then be removed from the shell. If a shell does not open, throw away the oyster. Oysters can also be removed raw from the shell but this can be dangerous and takes skill and practice.

Clams

Clams are harvested from both the West Coast and the East Coast. Types of clams from the West Coast include the razor clam, rock clam, and butter clam. Clams from the East Coast are known by their shells. They either have a soft shell or a hard shell. Soft-shell clams may be called steamers or longnecks. Hard-shell clams are also called quahogs ('kō-hògs) and are classified according to size. Chowder clams are the largest clams. Cherrystone clams are the second largest. The smallest clams are called littlenecks.

FIGURE 21.5 Oyster Grades

Purchase Oysters Oysters are graded by size, and are best eaten during the fall, winter, and spring. *Why do you think summer harvested oysters are not as popular?*

Grade of Oysters	Number per Gallon
Very Small	more than 500
Small or Standards	301-500
Medium or Selects	211-300
Large or Extra Selects	161-210
Extra Large or Counts	160 or fewer

Market Forms

Like oysters, clams should be purchased live for the greatest freshness. They should smell fresh and sweet. Clams may be purchased in three forms:

- Whole, in the shell
- Shucked, either frozen or fresh
- Canned, either chopped or whole

Handling and Storage

Treat clams carefully so that their shells do not break. Store live clams in cardboard containers or in their original containers in the refrigerator for up to one week. Do not store in a sealed environment. Like oysters, they must be kept damp.

Scrub hard-shell clams before you open or cook them. Soft-shell clams can be sandy inside. Some chefs like to soak soft-shell clams in water for a few hours with salt or cornmeal. The clams eat the salt or cornmeal and expel the sand. However, clams can die due to lack of oxygen so they must be kept in large amounts of water or the water must be changed every 30 minutes.

Gourmet Math

Bulk Discounts

Shellfish is typically sold in bulk. Many vendors offer quantity discounts.

Mai Ling's seafood supplier sells medium oysters at \$75 per gallon. The supplier offers several quantity discounts: a discount of 5% off the total price for buying at least 10 gallons of oysters, 10% for at least 15 gallons, and 20% for at least 20 gallons. Mai Ling's restaurant needs 9 gallons of oysters per day. What is the average daily cost if she buys a one-day supply each day? If she buys a two-day supply every two days? If she buys a three-day supply every three days?

Math Concept Calculate Discount Price

Calculate the discount price by multiplying the original price by (100% minus the discount percentage).

Starting Hint When she buys a two-day supply, or $2 \times 9 = 18$ gallons, Mai Ling will receive a 10% discount. The new price will be $100\% - 10\% = 90\%$ of the regular price. Multiply $0.90 \times 18 \times \$75$ to find her two-day price, and divide by 2 for the average per day.

NCTM Number and Operations Understand numbers, ways of representing numbers, relationships among numbers, and number systems.



Mollusk Varieties There are many different varieties of mollusks available. *How are clams classified?*



◀ **Many Mussels**
Blue mussels and greenshell mussels can be used in a variety of dishes. *Why should fresh mussels be alive just before they are cooked?*

Mussels

Mussels come from around the world. Mussels look like small, dark blue or black clams. Their meat generally ranges from yellow to orange in color and is tender but firm when cooked.

Mussels from Southeast Asia and New Zealand have a green edge to their tan or light gray shells, and white or orange meat. Flavor is not affected by the color. These mussels are generally more expensive.

Market Forms

Mussels may be sold live, shucked, vacuum packed, or frozen in the shell. The shells of live mussels should be closed or should close when tapped lightly. Throw out any mussels that seem hollow or are very lightweight. If the mussels are too heavy, they are most likely filled with sand, and should also be thrown away. If mussels have been shucked, they are generally packed in brine to preserve them, or sold frozen. Live or fresh shucked mussels must be used quickly because they can become toxic after they die.

Handling and Storage

When you prepare mussels, scrub the shells under cold running water. Use a clam knife to scrape off any barnacles ('bär-ni-kəls) that have attached themselves to the shells. A **barnacle** is a crustacean that attaches itself to rocks, boats, or other sea life. Just before cooking, pull off the mussel's "beard," which sticks out between the two shells. If the mussel is sandy, soak it in water and cornmeal to get rid of the sand.

Keep mussels in the refrigerator and away from light. Store them in the paper sack or cardboard box they arrive in, and keep the container damp.

Scallops

Scallops are available year-round and are sweet in flavor and white in color. They generally are sold already shucked. The muscle that closes the shell is the only part of the scallop that is commonly eaten in the United States. If scallops smell fishy or strong, they have spoiled or aged.

Sea scallops and bay scallops are the two most common kinds of scallops. Sea scallops are the largest, with about 10 to 40 per pound. Bay scallops are small and more delicately flavored, and range from about 50 to more than 150 per pound.

Market Forms

Scallops are sold fresh and shucked by the pound or the gallon. They may also be sold frozen, in five-pound blocks, or IQF. **IQF (individually quick frozen)** fish or shellfish have been quickly frozen piece by piece. The freezing happens quickly, so few ice crystals form. This improves the quality.

Handling and Storage

Remove the little side muscle that is attached to the large adductor muscle on the sides of scallops. The adductor muscle opens and closes the valves on a bivalve mollusk. Although scallops can be prepared with the side muscle attached, this muscle tends to be very tough. Cover and refrigerate scallops. Do not place them directly on ice or they will become watery and lose their flavor. Sometimes large sea scallops are cut into smaller pieces before they are cooked.



Reading Check **Summarize** What is the proper way to store mussels?

Crustaceans

A **crustacean** has a hard outer shell and a jointed skeleton. Examples include lobster, shrimp, crab, and crayfish. Crustaceans tend to be expensive because so much work is needed to produce a small amount of meat. Restaurants often purchase crustaceans already processed to save preparation time. This will also save restaurant money in labor costs for chefs to prepare the meat. Crustaceans can be prepared in almost any way, as long as they are not overcooked. Overcooking makes them tough.

Lobsters

Northern lobsters may be considered the most valued seafood delicacy. This animal has two large claws, four pairs of legs, and a flexible, large tail. The lobster shell, which turns red when cooked, is actually bluish or dark green. Lobster meat from the tail, legs, and claws is sweet and white. Lobsters can weigh up to about 20 pounds. Rock, or spiny, lobsters are warm-water lobsters. They are sold only as IQF lobster tails.

Cooked lobster meat smells sweet and fresh. If a lobster is in the process of dying, it is called a **sleeper**. Sleepers should be cooked at once so that the meat will still be good. Once lobster meat has been cooked, cover and refrigerate it. The meat will keep only for a day or two.

Market Forms

Lobsters are sold live, frozen, or as fresh-cooked meat. Uncooked lobster tails are also available IQF.

Handling and Storage

The lobster must be split and cut for some preparations, such as broiling or cubing for use in stews or sautés. When you cook live lobster, plunge it head first into boiling water.

Live lobsters should be stored in special saltwater tanks. They can also be kept in a cool location, wrapped in seaweed or heavy, wet paper.

Shrimp

Shrimp are classified by the count per pound. The smaller the shrimp, the higher the count. It takes less work to peel and devein large shrimp, but they are more expensive. To **devein** ((,dē-'vān) a shrimp means to remove its intestinal tract, located along the back. Deveined shrimp cost more and are sold either raw or cooked. It takes about a pound of raw shrimp to make a half-pound of peeled and cooked shrimp.

Peel and Devein shrimp

- 1** First, use your forefinger to remove the legs.



- 2** Use your fingertips to gently peel and remove the shell.



- 3** Leave the tail on if the shrimp will be broiled or deep-fried. Remove the tail for most other preparations.



- 4** Cut down the back of the shrimp with a paring knife and remove the vein just below the surface.



- 5** Make the cut deeper to butterfly the shrimp.



Market Forms

Shrimp may be purchased raw in the shell, either fresh or frozen. These are called green shrimp. They may also be purchased P/D. This is an abbreviation for peeled and deveined. The third form available is PDC. This is an abbreviation for peeled, deveined, and cooked. Both P/D and PDC shrimp are usually individually quick frozen and have a glaze of ice on them. Some shrimp may also be battered and breaded.

Handling and Storage

Keep frozen shrimp frozen until they need to be used. To thaw shrimp, place them in the refrigerator. Keep thawed or fresh shrimp wrapped and on crushed ice. Unwrapped shrimp will lose flavor and nutrients.

If serving shrimp cold, they can be peeled after they are cooked. If shrimp are to be served hot, they should be peeled and deveined before cooking. Shrimp can also be butterflied to reduce their thickness so that they cook faster.

Crab

Popular in casseroles, curries, and chowders, crab are plentiful along North America's coasts. Crab may be shipped canned, fresh, or frozen. The following types of crab are used in restaurants:

- **Blue Crab** A small, 4- to 6-ounce crab from the East Coast. Most frozen crabmeat comes from blue crabs.
- **Soft-Shell Crab** A blue crab that has just molted, or shed its shell. Because the shell has not had time to harden, it is eaten as well as the meat. Only the head and the gills must be removed before frying or sautéing the crab.
- **Alaskan King Crab** This is the largest type of crab. They can weigh between 6 and 20 pounds. Even though they are expensive, king crab are popular in restaurants because large chunks of meat can be easily removed.
- **Alaskan Snow Crab** Alaskan snow crabs are also called spider crabs. Snow crab can be used as a less expensive substitute for king crab.

- **Dungeness** (*dən-jə-,nes*) **Crab** Found along the West Coast, they range from 1½ to 4 pounds and have very sweet meat.
- **Stone Crab** The claws of stone crab are popular in the Southeast. To protect the species, people fishing can harvest only one claw per stone crab. They twist off the claw and put the crab back in the sea. The crab will grow a new claw within 18 months.

Market Forms

Although crab taste best fresh, picking the meat is an involved and lengthy process. Most crab are purchased in the shell, already cooked and frozen. Soft-shell crab are sold whole, while king crab legs are sold both split and whole. Snow and stone crab claws are also sold whole.

Handling and Storage

Frozen crabmeat spoils rapidly when it is defrosted. It should be kept frozen until it is ready to be used. Keep live crab cool and packed in damp seaweed until it is ready to be cooked.



Stone Crab



Blue Crab




Dungeness Crab



Soft-Shell Crab



Alaskan King Crab

 **Types of Crab** There are a variety of crabs available for cooking. *What type of nutrients can be found in crab meat?*

Crayfish

Crayfish are freshwater crustaceans that look like miniature lobsters. They generally range from 3½ to 7 inches in length. Crayfish are sometimes called crawfish and crawdads in the southern United States. Their tail meat is lean, sweet, and tender. Whole crayfish and peeled tail meat are sold both live and frozen. They are available year-round.

As with lobsters and crabs, live crayfish should be kept in a cool location and wrapped in seaweed. If purchased live, keep them alive until ready to cook. Wash them several times in cool water before cooking. Frozen crayfish should be thawed in the refrigerator and cooked within a day.

Crayfish are served in French restaurants and used in Cajun and Creole cooking. Whole crayfish are often boiled and served on top of rice. Crayfish tail meat is usually deep-fried and used in soups and sauces.



Reading Check

Give Examples

What types of crabs are used in restaurants?

Other Seafood

Some types of seafood, such as frogs and snails, spend part of their lives on land, but are still classified as seafood. These seafood products are often sold smoked, pickled, or in brine to preserve the seafood and add flavor. These products need to be refrigerated.

Squid

On some menus, squid goes by its Italian name, **calamari** (ˌkɑːlə-ˈmār-ē). Squid have 10 tentacles and look somewhat like an octopus. It is the tentacles and the hollowed-out body that are eaten. Squid is cut into small pieces, which may be either simmered in a seasoned sauce or liquid, or quickly fried. Squid can be used as an appetizer, as a protein on salads, or as part of a main dish, such as pasta.



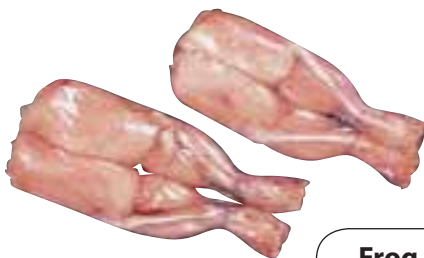
Squid



Escargot



Surimi



Frog Legs



Eel



Other Seafood These seafood products are often found smoked, brined, or pickled.

Which of these seafood spend part of their lives out of the water?

Frog Legs

Frog legs are from frogs that are farm raised. Frog legs are only sold in pairs. Foodservice operations use only the rear legs. They can be served poached with a sauce, deep-fried, or sautéed.

Escargot

Imported from France, where they are called **escargot** (es-kär-'gō), snails are generally served as appetizers in the shell, with garlic butter. Snails are usually removed from the shells, prepared, and cooked before being poured back into the shells to serve. It takes about 32 snails to equal 1 pound of meat. Commercial farming of snails in the United States is becoming more popular, since fresh snails taste better than canned snails.

Surimi

Surimi (sù-'rē-mē) is a combination of different kinds of white fish and flavoring, minced and formed into different shapes.

While many types of white fish are used to make surimi, Alaska pollock is the most common. Two of the most popular forms of surimi are imitation crab and lobster. To make these imitations seem more real, color is added. Surimi is a widely used substitute for lobster and crab in North America because of its lower cost. Surimi is often used to make a cold imitation crab salad, with a mayonnaise-based dressing.

Eel

Eels are long, thin fish that have a sweet, mild flavor. They are very popular in Europe and Asia and in some ethnic communities in the United States. They are usually sold fresh, smoked, and pickled. Eels should be frozen only if they are first gutted and cleaned, and then quick-frozen. Eels also make a popular sushi dish, although they are used cooked, not raw.

 **Reading Check** Name What are two popular forms of surimi?

SECTION 21.2 After You Read

Review Key Concepts

1. **Explain** the meaning of the different grades of shellfish.
2. **Differentiate** between univalves, bivalves, and cephalopods.
3. **Describe** the characteristics of a crustacean.
4. **Identify** methods of cooking squid.

Practice Culinary Academics



Mathematics

5. You need to purchase five king crabs for your restaurant, and would like the crabs' average weight to be 15 pounds. If you have already selected four crabs weighing 12, 14, $16\frac{1}{2}$, and 17 pounds, how much should the fifth crab weigh?

Math Concept **Calculating Mean** A mean is an average of a set of terms. When you have a series of values, calculate the mean by finding the sum of all of the values, and dividing that sum by the number of values.

Starting Hint You know that the sum of five values, divided by 5, equals 15. Write an algebraic equation to find the missing value: $(12 + 14 + 16\frac{1}{2} + 17 + x) \div 5 = 15$.

NCTM Problem Solving Apply and adapt a variety of appropriate strategies to solve problems.



Check your answers at this book's Online Learning Center at glencoe.com.

Cooking Fish and Shellfish

Reading Guide

Before You Read

Be Organized A messy environment can be distracting. To lessen distractions, organize an area where you can read this section comfortably.

Read to Learn

Key Concepts

- **Summarize** the methods for cooking fish and shellfish.

Main Idea


There are several methods for cooking fish and shellfish. These can include moist cooking, deep-frying, baking, and sautéing.

Graphic Organizer

As you read, use a matrix like the one shown to record the guidelines for determining the doneness of fish and shellfish for each cooking method.


Determining the Doneness of Fish and Shellfish


Baking	Broiling & Grilling	Sautéing & Pan-Frying	Deep-Frying


 **Graphic Organizer** Go to this book's Online Learning Center at glencoe.com for a printable graphic organizer.


Cook fish so that it retains its delicate flavor and texture.

ACADEMIC STANDARDS

 **English Language Arts**
NCTE 4 Use written language to communicate effectively.

 **Mathematics**
NCTM Measurement
 Understand measurable attributes of objects and the units, systems, and processes of measurement.

 **Science**
NSES B Develop an understanding of chemical reactions.

 **Social Studies**
NCSS VIII B Science, Technology, and Society
 Make judgments about how science and technology have transformed human society.

NCTE National Council of Teachers of English

NCTM National Council of Teachers of Mathematics

NSES National Science Education Standards

NCSS National Council for the Social Studies

Fish and Shellfish

Cookery

You have many methods from which to choose when you cook fish and shellfish. Dishes may be simple or elaborate, low-fat or rich. Moist cooking methods and deep-frying, baking, and sautéing, offer a number of ways to prepare seafood. Fish and shellfish are also sometimes served raw. **Sushi** ('sü-shē) is a Japanese dish of raw or cooked fresh fish or seafood and rice. There are many different forms of sushi, from rolled, to topped on rice, to served scattered over rice.

Fish has little connective tissue, so a long cooking time is not needed to tenderize it. When you cook fish, you must pay attention to time, temperature, and the cooking process. Cook fish until its internal temperature is 145°F (63°C) or above for 15 seconds.

Fish is also usually low in fat. This means it can quickly dry out when it is overcooked. To prevent this, chefs sometimes use moist cooking techniques, such as steaming or poaching. Fish flesh will **flake**, or break away in small layers, when it is done. Remember that fish retains heat, even when removed from a heat source. Therefore, it continues to cook, and can easily overcook.

Like fish, shellfish can easily be overcooked. Overcooking and excessively high heat will cause shellfish to dry up and shrink or become rubbery and tough. Clams or mussels cooked in the shell will open as they cook. **Discard**, or throw away, any shells that do not open, because the meat will not be safe to eat. To prevent dryness, moist cooking methods are most often used.

Bake Fish and Shellfish

Fish steaks and fillets, as well as small fish and shellfish, can be baked in an oven. Combination cooking methods are sometimes used to bake fish. For example, fish may be initially browned in a small amount of oil in a sauté pan to give it color and flavor, then

baked to finish cooking. When you bake lean fish, you should baste it frequently with oil or butter to prevent the fish from drying out.

Fish or shellfish may also be baked in a sauce, such as curry or tomato. Baking in a sauce also helps prevent the meat from becoming dry.

Baking Guidelines

Fatty fish, such as pompano or salmon, are not as likely to dry out. These types of fish are the best fish for baking. Generally, fish and shellfish are baked between 350°F (177°C) and 400°F (204°C). Large fish will bake more evenly at the lower temperature. Cook fish until its internal temperature at its thickest part is 145°F (63°C) or above for 15 seconds.

Moist Baking Adding vegetables and liquid to a large piece of fish or a whole fish is called **moist baking**. Other moist cooking techniques used for fish and shellfish include simmering, poaching, and steaming. Liquids from moist cooking are often used for sauces that go with the fish or shellfish. Wrapping fish or shellfish in parchment paper with vegetables, herbs, and sauces or butters is a type of steaming called **en papillote** (ən ,pā-pē-'yō).

Sanitation Check

✓ Serve Raw Fish and Shellfish

Many restaurants offer raw fish or shellfish on the menu, such as sushi or raw oysters. Many health officials advise against serving raw fish or shellfish because of the danger of parasites and contamination from polluted water. However, if you do serve these items, follow these guidelines:

- Buy fish from reputable vendors.
- Choose only the highest quality fish because it will not be cooked.
- Handle the fish as little as possible.
- Follow state-mandated guidelines concerning the serving of raw fish and shellfish.

CRITICAL THINKING *Why do you think you should handle the fish as little as possible?*

Steam Fish en Papillote

- 1 Fold the parchment paper in half and crease the folded edge. Cut the parchment paper into the desired shape and size to prepare the fish.



- 2 Butter the parchment paper on both sides.



- 3 Add the fish, vegetables, and butter to one side of the parchment paper. Fold the other side of the parchment over the fish.
- 4 Seal the edges of the paper by crimping, or pinching and pressing them together around the entire paper.



- 5 Bake until the package is puffy and lightly browned. Cut the package and fold back the top to serve.



These cooking methods add little or no fat, keep the meat from drying, and preserve nutrients and natural flavors.

Broil and Grill Fish and Shellfish

Because of the high heat used, broiled, grilled, and barbequed seafood dishes can be prepared quickly. Many diners view broiled and grilled dishes as more healthful than dishes cooked with other methods.

The appearance of broiled or grilled fish or shellfish may be enhanced by a relish or

side sauce. Grilled vegetables are also a natural accompaniment. Citrus garnishes, such as lemon, lime, or orange, are generally served with broiled or grilled seafood. Sometimes lemon and herb butters are served instead.

Broiling and Grilling Guidelines

The high heat of broiling or grilling gives fish and shellfish a smoky flavor. Brush butter or oil over the fish before broiling to keep the meat from sticking. This also keeps lean fish moist.

To cook a thicker cut of fish or shellfish evenly, turn it once during broiling. Thin pieces are broiled on one side only.

A TASTE OF HISTORY

1896

The state of Utah enters the Union

1899

Oysters Rockefeller is created in New Orleans

Oysters Rockefeller

Oysters have been cultivated worldwide for more than 2,000 years. They have long been a popular food in the United States. Native Americans once considered oysters a staple in their diet. Early Colonial settlers ate oysters by the gross (144) instead of the dozen (12).

New Orleans, Louisiana, is the birthplace of several famous oyster dishes, including Oysters Rockefeller. Named after business tycoon John D. Rockefeller, the dish was created in 1899 when a shortage of snails from Europe prompted Jules Alciatore to substitute oysters as the main ingredient in a dish for Antoine's, his father's restaurant.

History Application

Research the history and problems of the oyster population in the United States. Write a short report about your findings.

NCSS VIII B Science, Technology, and Society Make judgments about how science and technology have transformed our understanding of human-environment interactions.

Fatty fish, such as swordfish or trout, are a good choice for broiling. Many types of shellfish are broiled on the half shell or on skewers to make them easier to handle.

Lean Versus Fat All varieties of fish may be broiled. However, fatty fish is the best choice. Lean fish can become dry very quickly. Before you broil either lean or fatty fish, you may wish to coat the fish with butter, oil, or a vegetable oil spray.


Use Fish Steaks or Fillets Fish steaks thicker than 1½ inch and whole fish are not the best choices for broiling. The high heat used in broiling will finish cooking the outside of thick fish before the inside is done. When grilling thicker steaks and fillets you may have to start cooking them over high heat and move them to a cooler part of the grill to finish cooking.

Avoid Overcooking Broiling and grilling require high temperatures, which cook fish and shellfish quickly. Overcooking will make fish dry and shellfish tough.

Sautéing and Pan-Frying

Sautéing and pan-frying are often mistaken as the same thing. Sautéing will add flavor to the food because the food's surface is lightly browned. Pan-frying uses more fat



 **Grilled Fish** Grilled salmon is a popular dish in many restaurants. *Why is salmon a good choice for grilling?*

Safety Check

✓ Frying Fat

Always take special care when you work with hot fat. It can easily spatter and burn you. Drain and serve deep-fried foods immediately after cooking.

CRITICAL THINKING *What are some potential consequences of leaving the food sitting in the fat after frying?*

than sautéing does, and the food is coated with seasoned batters, flour, or breading before cooking. This creates a flavorful crust that protects the fish during cooking.

Be sure that the pan and the cooking fat are both hot before you add fish or shellfish. Because only a short cooking time is needed, use high heat to brown the surface when you sauté thin slices of fish or small pieces of shellfish. Thicker pieces may require lower heat so that they do not get too brown. Adding too much fish or shellfish to the pan at the same time causes the fat to cool. The food will then simmer in its own juices instead of sauté.

Sautéing and Pan-Frying Guidelines

Because both sautéing and pan-frying use oil or clarified butter, they work well for lean fish. Usually just enough fat to cover the bottom of the pan is **sufficient**, or enough, for sautéing. Pan-frying requires more fat.

To keep fish from sticking, use flour or breading to form a crust. For better appearance, brown the presentation side first. This is generally the thicker side of a fillet. Turn pan-fried fish or shellfish only once during cooking to help prevent fillets from breaking. Sautéed or pan-fried items will cook quickly over a high heat.

Dredging and Breading To dredge a food is to evenly coat it with a bit of flour or cornmeal. Make small batches if there are several pounds of fish to prepare. For a better crust, soak the fish in milk and drain it before breading. Dredge the fish or use large shakers with handles to sprinkle the breading onto the fish.

Deep-Frying

Deep-frying is the most common method used to fry fish in the United States. Although the foodservice industry often uses frozen, breaded fish for deep-frying, fresh fish or shellfish may also be deep-fried. To protect both the fat and the fish, coat the item with batter or breading before cooking. This will provide an attractive coating and a crispy texture. The best shellfish to deep-fry are scallops, oysters, shrimp, and clams. Lean fish, usually in sticks or small fillets, are also a good choice.

Deep-Frying Guidelines

When you prepare frozen breaded fish, cook the fish without first thawing it. If the portion thaws, the fish will be soggy. Review the guidelines for breading and frying in Chapter 15. Batter recipes for vegetables can also be used for fish or shellfish.

Determine Doneness

Because fish and shellfish are naturally tender, it is critical to avoid overcooking. Remember that overcooking results in dry fish and tough shellfish. Use the following guidelines to help you determine when fish and shellfish are done cooking:

- Fish starts flaking. Cooking fish causes the muscle fibers to begin separating from each other.
- Flesh pulls away from the bones or shell of the fish easily.
- Flesh springs back when pressed. Uncooked seafood is soft and mushy instead.
- Flesh becomes opaque. Light cannot be seen through the flesh.

Small Bites

Fat Quality To maintain the quality of frying fat, heat oil only to the temperature needed. Once a day, filter all the oil through a strainer and replace 20% of it with fresh oil.



▲ **Steamed Shellfish** Shellfish such as clams will open when they are cooked in their shells. *What should you do with clams or mussels that do not open during cooking?*

In addition, use these guidelines with each specific cooking technique:

- **Baking** Bake fish until the internal temperature is 145°F (63°C) or above for 15 seconds. Also check that the flesh flakes, pulls away from the bones or shell, springs back when pressed, and is opaque.
- **Broiling and Grilling** When broiled or grilled, the outside of fish and shellfish should be slightly browned and crispy. The inside should be juicy and tender.
- **Sautéing and Pan-Frying** Sautéed and pan-fried fish and shellfish are done cooking when their surfaces are slightly browned or crispy. As in broiling and grilling, the insides should be juicy and tender.
- **Deep-Frying** If the oil has reached the proper temperature, deep-fried fish and shellfish are done when their batter is a rich golden brown. When you use prepackaged frozen items, follow the package guidelines. The package will generally give a range of times and temperatures for correctly cooking these items.

Plate Fish and Shellfish

Serving seafood attractively is an important part of preparation. Because seafood tends to be pale, adding colorful side dishes is a must. The contrasting color and texture make the overall meal appealing. For example:

- A mix of steamed carrots and broccoli brightens the plate and is low in fat.
- If shellfish is served chilled, a cocktail sauce and fresh lemon slices usually accompany it.
- Some seafood dishes are served on beds of sautéed leeks or seaweed.
- Colorful sauces can be plated underneath seafood to add color and flavor.

Garnish Fish and Shellfish

Tartar sauce may be the most familiar sauce that accompanies seafood. **Tartar sauce** is a sauce made of mayonnaise and chopped pickles. However, other sauces, such as hollandaise or a caper sauce, work just as well for steamed or poached items. A **caper** is a flower bud of a Mediterranean shrub, used for seasoning.

Citrus wedges, such as lemon or orange, often accompany grilled or broiled seafood items. If an item has been broiled with a seasoned butter, an additional serving of the butter may be used for garnish. Common garnishes such as parsley or chives may also be used.

 **Reading Check** **Determine** What garnishes are commonly used with different types of fish and shellfish?

✧ Nutrition Notes ✧

Fish and Shellfish Nutrition

Both fish and shellfish are high in protein, as well as vitamins A, B, and D. Fish are also a good source of minerals such as iron, potassium, calcium, and phosphorus. Fatty varieties like salmon and mackerel are high in omega-3 fatty acids, which may help prevent some forms of heart disease. Most fish and shellfish are low in sodium, fat, and calories.

CRITICAL THINKING *What types of people might consider eating fish to meet special dietary needs?*

SECTION 21.3 After You Read

Review Key Concepts

1. **Summarize** the methods for sautéing or pan-frying fish and shellfish.

Practice Culinary Academics

Science

2. **Procedure** Find a recipe for a shrimp marinade that contains a citrus such as lemon, orange, or lime juice. Divide shrimp into three groups. Marinate one group of shrimp for a long period of time, at least an hour. Marinate another group for around 10 minutes. Do not marinate the third group at all. Prepare all of the shrimp.

Analysis Compare the textures of the three groups. What do you observe about the textures of the different shrimp? Create a chart that shows the differences. Hypothesize what causes those differences.

NSES B Develop an understanding of chemical reactions.

English Language Arts

3. Follow your teacher's instructions to form into small groups. Each group should choose one method of cooking fish or shellfish and create a poster listing guidelines to remember when using that cooking method. Include artwork to illustrate each guideline. Share the posters with the class and display them in the foods lab.

NCTE 4 Use written language to communicate effectively.

Social Studies

4. Study how the industry of fishing has changed in modern times. What types of equipment do commercial fishermen use to help them catch large quantities of fish and to save time? How has this changed from traditional methods of fishing? Create a five minute presentation of your findings.

NCSS VIII B Science, Technology, and Society Make judgments about how science and technology have transformed human society.

Mathematics

5. To cook a red snapper en papillote, a restaurant uses a 24-inch-long sheet of parchment paper. If a roll of parchment paper is 40 yards long, how many sheets can the restaurant get from each roll?

Math Concept Equivalent Lengths There are 3 feet in one yard, so multiply yards by 3 to convert to feet. There are 12 inches in one foot, so multiply feet by 12 to convert to inches.

Starting Hint The question asks you to divide 40 yards by 24 inches. To do so, convert the yards into inches by first multiplying by 3 to convert yards to feet, then multiplying by 12 to convert feet to inches.

NCTM Measurement Understand measurable attributes of objects and the units, systems, and processes of measurement.



Check your answers at this book's Online Learning Center at glencoe.com.

Chapter Summary

Fish is similar to poultry and meat in that it has protein, fats, and water. Fish have very little connective tissue. Fresh, frozen, or canned fish are available whole or in the form in which they will be cooked, such as fillets or cubes.

Inspect fresh fish closely for quality characteristics before purchasing. Fresh fish should be stored on ice and used quickly. Keep frozen fish

well wrapped and in the freezer. You must know the different handling and storage methods for each type of shellfish.

There are many options for cooking fish and shellfish, including baking, grilling, and moist cooking techniques. Garnishes for fish and seafood might include sauce, citrus wedges, or seasoned butter.

Content and Academic Vocabulary Review

1. Arrange the vocabulary terms below into groups of related words. Explain why you put the words together.

Content Vocabulary

- fatty fish (p. 542)
- lean fish (p. 542)
- flat fish (p. 542)
- round fish (p. 542)
- boneless fish (p. 542)
- drawn (p. 544)
- dressed (p. 544)
- fillets (p. 544)
- butterflied (p. 545)
- freezer burn (p. 546)
- drip loss (p. 546)
- vacuum packed (p. 547)
- PUF1 mark (p. 549)
- mollusk (p. 550)
- univalve (p. 550)
- bivalve (p. 550)
- cephalopod (p. 550)
- barnacle (p. 552)
- IQF (individually quick frozen) (p. 553)
- crustacean (p. 553)
- sleeper (p. 553)
- devein (p. 553)
- calamari (p. 556)
- escargot (p. 557)
- surimi (p. 557)
- sushi (p. 559)
- flake (p. 559)
- moist baking (p. 559)
- en papillote (p. 559)
- tartar sauce (p. 563)
- caper (p. 563)

Academic Vocabulary

- classify (p. 542)
- keep (p. 547)
- luxury (p. 549)
- mandatory (p. 549)
- discard (p. 559)
- sufficient (p. 562)

Review Key Concepts

2. **Describe** the composition and structure of fish.
3. **Distinguish** between the different market forms of fish.
4. **Explain** the structure, composition, and grading of shellfish.
5. **Differentiate** between types of mollusks.
6. **Distinguish** between types of crustaceans.
7. **Identify** other types of seafood.
8. **Summarize** the methods for cooking fish and shellfish.

Critical Thinking

9. **Draw conclusions** about how healthful cooking techniques for fish and shellfish can help people on a low-fat diet.
10. **Imagine** that you are a health inspector. Describe what you might do if you found that a sushi restaurant was not choosing the best quality fish.

Academic Skills

**English Language Arts**

- 11. Design a Menu** Imagine that you are in charge of planning the menu for a foodservice operation. You want to plan creative dishes using both fish and shellfish. Create a clear, descriptive menu that includes at least two items made with fish or shellfish in each category: appetizers, soups, salads, sandwiches, and entrées. Be sure to describe the type of seafood used in each dish, as well as the cooking method.

NCTE 12 Use language to accomplish individual purposes.

**Social Studies**

- 12. Fish Around the World** People in other countries eat fish dishes that are not as well known in the United States. For example, *gravlax* is a Scandinavian appetizer consisting of raw salmon cured in salt, sugar, and dill. Research a dish from a culture other than your own that contains fish or shellfish. Prepare a presentation that includes a recipe, the country or region of origin, a description, and an explanation of how it is served and eaten.

NCSS I A Culture Analyze and explain the way groups, societies, and cultures address human needs and concerns.

**Mathematics**

- 13. Determine Fish Weight** The largest wholesale fish and seafood market in the world is the Tsukiji fish market in Tokyo, Japan. Six days a week, freshly caught seafood products from around the world are brought into the market, auctioned to wholesalers, and then shipped to purchasers in dozens of countries. More than 2,000 metric tons of fish are handled every day in Tsukiji. How many pounds of fish does the market handle per day, to the nearest 1,000 pounds?

Math Concept Converting Weights A metric ton is not the same as a customary (U.S.) ton. A metric ton equals 1,000 kilograms, while a customary ton (also known as a short ton) equals 2,000 pounds. There are about 0.4536 kilograms in one pound.

Starting Hint First, you will need to convert the 2,000 metric tons into kilograms by multiplying by 1,000. Then, convert kilograms into pounds by dividing by 0.4536. Round your answer to the nearest thousand by changing all digits to the right of the thousands place to zeros. But if the digit to the right of the thousands place was 5 or greater, add one to the thousands place.

NCTM Number and Operations Compute fluently and make reasonable estimates.


Certification Prep

Directions Read the questions. Then, read the answer choices and choose the best possible answer for each.

- 14.** What are the sides of the fish called?
- fillets
 - steaks
 - cubes
 - sticks
- 15.** What is a mollusk that has two shells hinged together called?
- univalve
 - bivalve
 - cephalopod
 - crustacean

Sharpen your test-taking skills to improve your kitchen certification program score.

Test-Taking Tip

When you learn a new vocabulary word, practice using it right away. Try to use it in conversation or in your writing with someone.

Real-World Skills and Applications

Self-Management Skills

- 16. Quick and Nutritious Entrée** Imagine that you work in a restaurant and your manager has asked you to develop a nutritious entrée using either fish or shellfish. The entrée must be prepared quickly during busy lunch and dinner shifts. What type of fish or shellfish would you choose? Which cooking methods would you use and why? What would you add to increase nutritional value?

Interpersonal and Collaborative Skills

- 17. Make a Cooking Show** Follow your teacher's instructions to form into groups or work together as a class to create a cooking show. Your show should demonstrate how to prepare a fish or shellfish dish. Perform your group's show for the class, and film it if possible. If you worked as a class, try to present it to another class.

Technology Applications

- 18. Design a Web Site** Design a Web site that shows readers simple and creative ways to prepare fish and shellfish. Include several recipes, descriptions of cooking methods, and photos. Recipes should be clear and easy to follow. Descriptions of cooking methods should show individual steps of that cooking method. As a class, choose the best design and post it on your school's Web site.

Financial Literacy

- 19. Choose a Market Form** Imagine that you need 10 pounds of salmon to make it through your next dinner service. Whole salmon weigh 5 pounds each, and you can get a 50% yield from the whole fish. How many whole fish will you need to buy to get 10 pounds?

Culinary Lab

Prepare Fish Dishes

- 20. Work in a Team** Break into teams at the direction of your teacher. In this lab, you will work together to process and prepare a fish dish.

- A. Process fish.** First, practice processing fish into these forms: drawn, dressed, fillets, steaks, butterflied, and cubed. Be sure to follow safety guidelines and use safe knife handling techniques.
- B. Prepare your fish.** After processing the fish, choose one of the following techniques and prepare the fish: baking, broiling, grilling, sautéing, pan-frying, or deep-frying.
- C. Determine doneness.** Determine the doneness of your fish using tips from this chapter.
- D. Present your fish.** Plate and garnish your fish to make it appealing, and share your creation with other teams.

Use the culinary skills you have learned in this chapter.

Create Your Evaluation

Taste each team's fish and answer the following questions:

- Was the form of each team's fish recognizable even after cooking? Why or why not?
- Was the cooking method for each team's fish appropriate to the market form? Why or why not?
- How would you rate the visual appeal and flavor of each team's fish on a scale of 1 to 5?