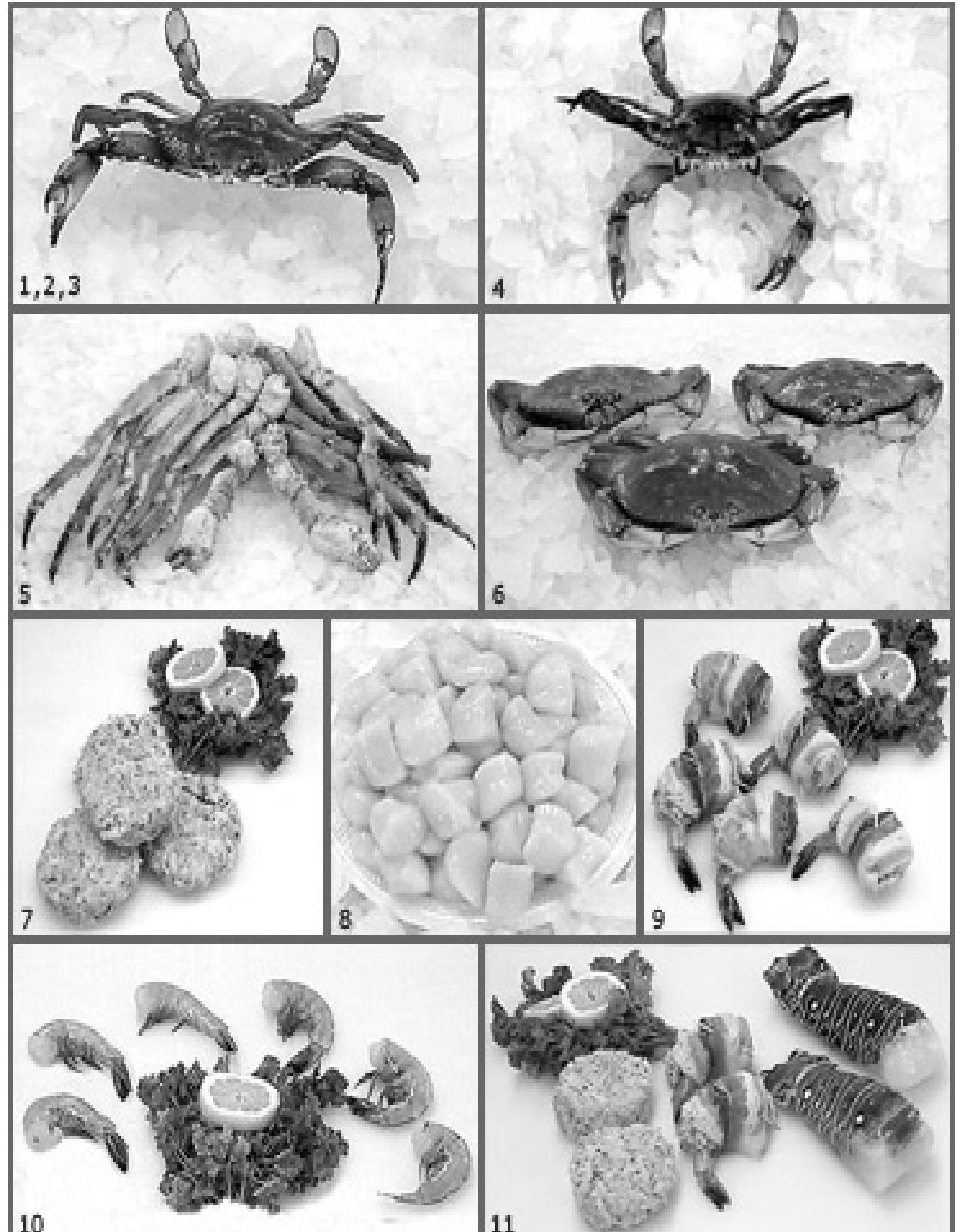


SEAFOODS



Food Material Science 2011/12

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Introduction



SEAFOODS:

- Fish
- Shellfish:
 - Crustaceans
 - Molluscs:
 - Cephalopods
 - Molluscs with external shell (bivalves and gastropods)
- Other forms of aquatic animal (echinoderms) and plant (algae, microalgae)



- **Fish:**

The examples of fish are salmon, tuna, mackerel, herring, *kerapu*, *kakap*, *bawal*, *tigawaja*, *manyung*, etc.

- **Shellfish:**

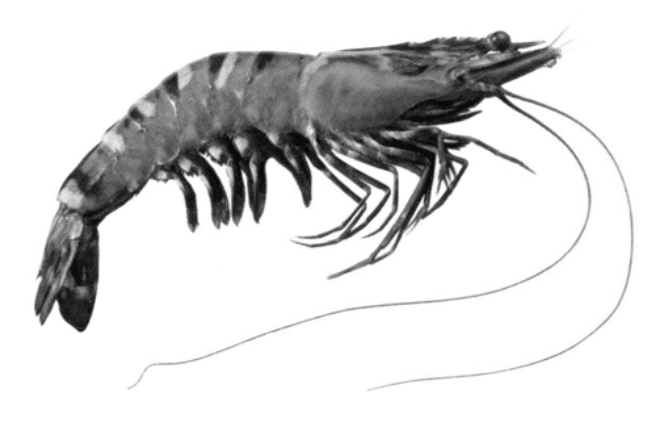
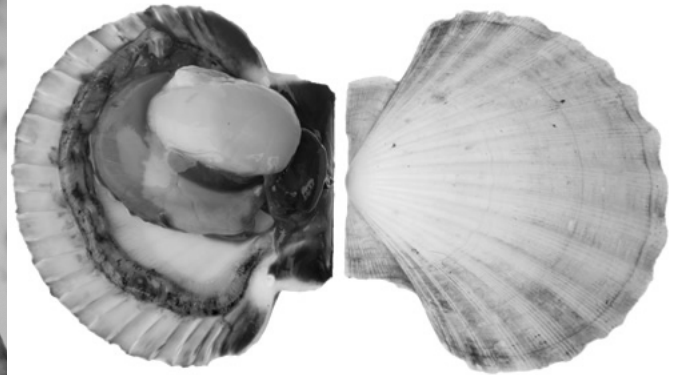
Shellfish is a generic term for invertebrates with external shells. The genus includes crustaceans and molluscs with a shell, such as *bivalves* (oysters, clams, abalone, scallops, cockles and mussels) and *gastropods*. It also encompasses those molluscs which do not have shells (octopus, squid).

○ **Molluscs:**

Molluscs comprise a large phylum of invertebrates which includes at least 100,000 living species. Most have external shells, like clams, oysters, and escargot, or are *cephalopods*, such as squids and octopuses, which have either a reduced internal or external shell, or no shell at all.

○ **Crustaceans:**

They are covered in a crust-like shell and have segmented bodies, including lobster, crab, shrimp, prawns, and crayfish.



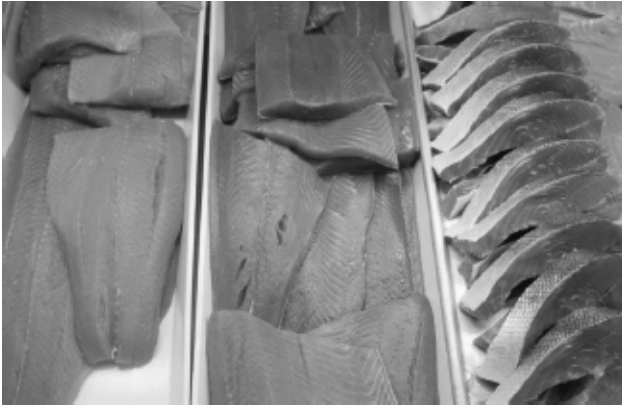
Composition of Fish and Shellfish

- Most fish contains 18-35% total solids, 14-20% protein, 0.2-20% fat and 1-1.8% ash.
- Fish can be classified on the basis of their fat content:
 - Lean --- fat content less than 2%
 - Fat --- fat content more than 5%
- Fish and shellfish are an important part of a healthful diet, due to their highly content of good quality protein and other essential nutrients such as high quality amino acids, low saturated fat (most of the fat is unsaturated fat) and may contain omega-3 fatty acids like *eicosapentaenoic acid (EPA)* and *docosahexaenoic acid (DHA)*.

Composition of Fish and Shellfish

- The cholesterol of most fish is similar to red meat and poultry (about 20 mg/ounce). Some shellfish contain more cholesterol than red meat.
- Fish is also a good source of vitamins B₆, B₁₂, niacin, and biotin. While, vitamins D and A are found mainly in fish liver oils. Vitamin A also can be found in high-fat fish.
- High mineral content, especially calcium, iodine, phosphorus, potassium and zinc.

Good Quality of Raw Fish



- The skin should be shiny, almost metallic, with color that has not faded.
- Scales should be brightly colored and tightly attached to the skin.
- The gills should be red and free from slime
- The eyes should be bright, clear, transparent, and full – often protruding.
- The flesh of whole or dressed fish should be firm, elastic, and not separated from the bones.
- The odor should be fresh or mild, not fishy.

Why Freshness Counts

- Healthwise, it is important to look for freshness when choosing seafood.
- In some species, if the catch has been left out in the sun too long - or the fish haven't been transported under proper refrigeration - toxins known as **scombrototoxin**, or histamine, can develop. Eating spoiled fish that have high levels of these toxins can cause illness.

Selecting Shellfish

- **Discard Cracked/Broken Ones:**

Throw away clams, oysters, and mussels if their shells are cracked or broken.

- **Do a "Tap Test":**

Live clams, oysters, and mussels will close up when the shell is tapped. If they don't close when tapped, do not select them.

- **Check for Leg Movement:**

Live crabs and lobsters should show some leg movement. They spoil rapidly after death, so only live crabs and lobsters should be selected and prepared.

Microbiological properties

- Fish and shellfish are perishable foods. They are more perishable than other animal tissues.
- Although the flesh of live fish is bacteriologically sterile, there are large numbers of many types of bacteria in the surface slime and digestive tracts of living fish.
- When a fish is killed, the bacteria rapidly attack all constituents of the tissues.
- Bacteria in fish tissue can grow and adapt at low temperatures.

Physiological properties

- Fish struggle when caught and use up all of glycogen in their muscles, so little glycogen is left to be converted to lactic acid after death.
- This is contrast to animal meat where animals are rested before slaughter to build up glycogen reserves.
- Thus, fish muscles are more perishable than others.

Chemical Properties

- Fish is rich with phospholipids, which contains trimethylamine (TMA).
- TMA split from phospholipids by bacteria and natural fish enzymes has a strong characteristics of fish odor.
- The fishy odor liberated TMA is further augmented by odorous products of fat degradation.
- The fats of fish are highly unsaturated and become easily oxidized --- rancid odors and off-flavors
- The fishy odor indicates deterioration of fish muscle.

Spoilage

- Fresh fish held at 16°C remains good for only a day or less.
- At 0°C fish may remain good for 14-28 days depend on the species.
- Fish spoil quicker than other meats because bacteria on the skin and in the digestive tract attack all the tissues once the fish is killed and these bacteria often adapted to the cold temperature.

Storage

- Fish and shellfish must never sit unrefrigerated for long. As soon as possible, fish needs to be refrigerated as close to 0°C.
- Fish and shellfish should be cooked within 2 days of purchase.
- If the fish will not be used within a day, it is best to freeze it soon. After rinsing the fish under cold water, pat it dry, wrap it tightly using plastic wrap, remove all the air out and cover it with aluminum foil, then freeze it.

Storage

- When frozen fish is thawed, it is always thawed in refrigerator.
- Thawing at temperature higher than 4.4 °C can cause excessive drips loss and affect after taste, texture, aroma and appearance.
- Live oysters, clams, and mussels are stored in refrigerator at about 1.7°C. They should be kept moist, but not placed on ice.
- Freshly shucked oyster, scallops and clams are stored in the containers and stored in refrigerator at 0°C.

Products and Preservation

- Fresh or frozen fish can be marketed as whole or round, dressed, fillets, steaks, sticks or nuggets.
- Fish are preserved by drying, salting, curing, or smoking.
- Refrigeration, freezing, and canning remain the best methods for preserving the quality of fish.
- Fish with higher fat content like salmon, tuna, sardines are often canned. Additional fish oil, vegetable oil, or water is often added to the can before sealing it closed.

Products and Preservation



- Shellfish may be marketed in the shell, shucked (remove from the shell) and as cooked meat.
- Shrimp can be marketed as headless, peeled, and cleaned.
- Surimi – high protein fish product. Produced by washing the minced flesh fish to remove soluble constituents like pigments and flavors. This leaves and odorless, flavorless high protein product. The product can be combined with other flavors and colors. Then it can be extruded in shapes resembling other products such as crab meat and lobster.

What is scombroid poisoning?

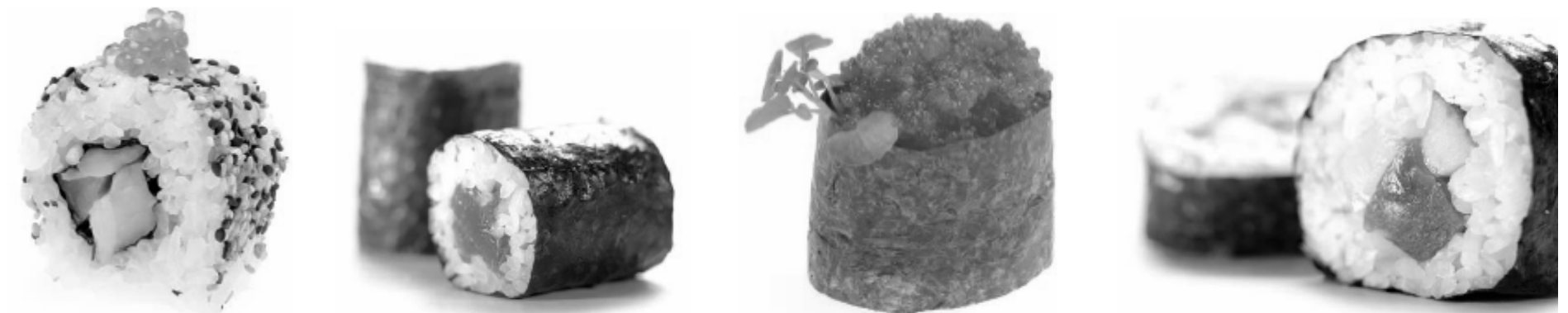
- Scombroid poisoning is a type of food intoxication caused by the consumption of scombroid and scombroid-like marine fish species that have begun to spoil with the growth of particular types of food bacteria.
- Fish most commonly involved are members of the Scombridae family (tunas and mackerels), and a few non-scombroid relatives (bluefish, dolphin or mahi-mahi)

What is scombroid poisoning?

- The suspect toxin is an elevated level of histamine generated by bacterial degradation of substances in the muscle protein. This natural spoilage process is thought to release additional by-products which cause the toxic effect.
- The potential toxins are not destroyed by freezing, cooking, smoking, curing or canning.

Eating Raw Seafood

- It's always best to cook seafood thoroughly to minimize the risk of foodborne illness. However, if you choose to eat raw fish anyway, one rule of thumb is to eat fish that has been previously frozen.
 - Some species of fish can contain parasites, and freezing will kill any parasites that may be present.
 - However, be aware that freezing doesn't kill *all* harmful microorganisms. That's why the safest route is to cook your seafood.



Eating Raw Seafood

- Oysters:

Some oysters are treated for safety after they are harvested. That information may or may not be on the label. However, these oysters should still **not be eaten raw by people at risk** for foodborne illness. The post-harvest treatment eliminates some naturally occurring pathogens, but it does not remove all pathogens that can cause illness.

Thank You...