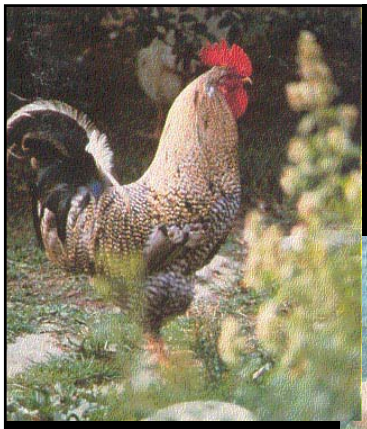
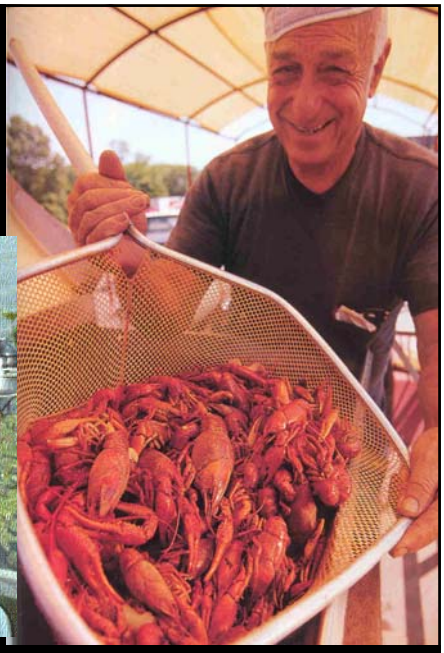
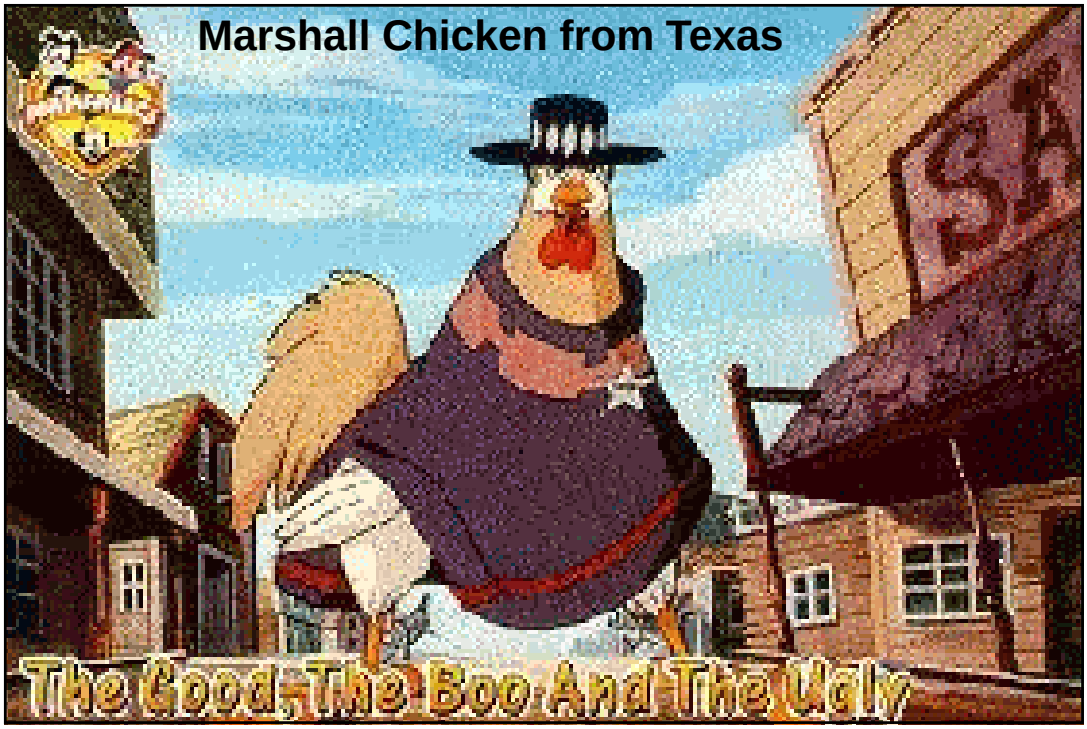


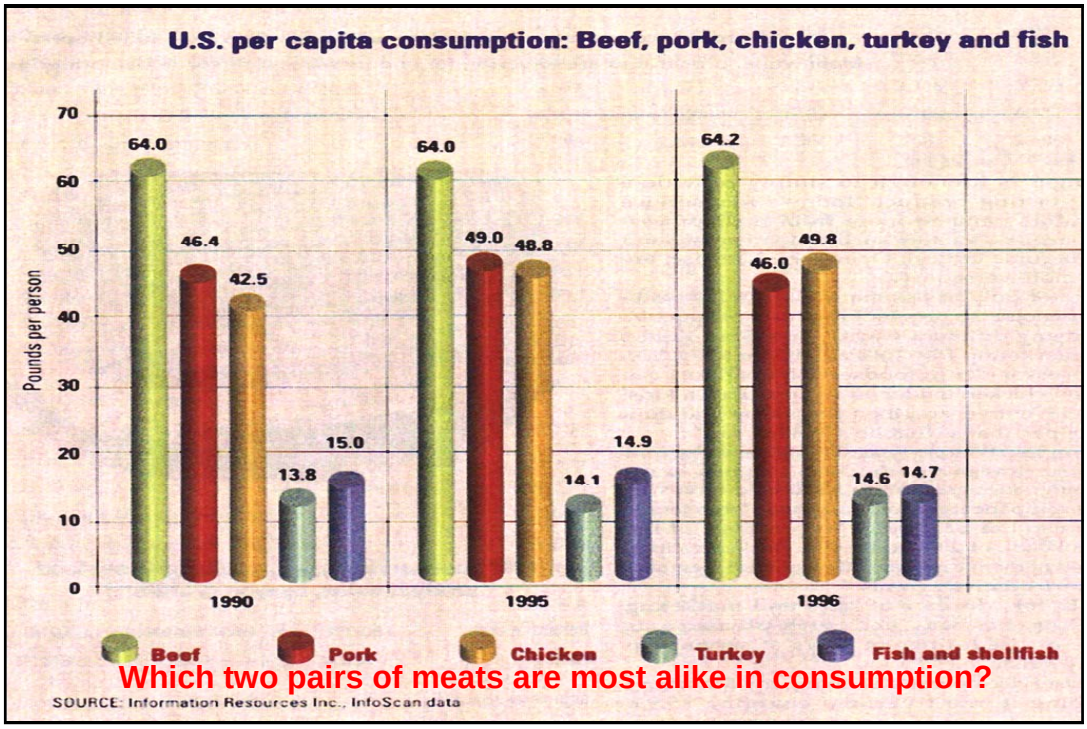
POULTRY, FISH AND SHELLFISH



PREPARED BY:
C. BOYD RAMSEY
PROF. EMERITUS

TEXAS TECH ASFT DEPARTMENT





Top Broiler Producing Companies, Mid-1998

Company	Average Weekly Production million pounds, ready-to-cook weight basis	Marketshare percent
Tyson Foods	155	26.0
Gold Kist	55	9.2
Perdue Farms	47	7.9
Pilgrim's Pride	35	5.9
ConAgra Poultry	30	5.0
Wayne Poultry	25	4.2
Cagle's	16	2.7
Seaboard Farms	15	2.5
Foster Farms	15	2.5
Sanderson Farms	15	2.5
Townsends	14	2.3
Fieldale Farms Corp.	13	2.2
Wampler Foods	12	2.0
Choctaw Maid Farms	12	2.0
O.K. Foods	12	2.0
Allen Family Foods	11	1.8
Simmons Foods	10	1.7
Mountaire Farms	9	1.5
Marshall Durbin Companies	9	1.5
Peco Foods	8	1.3
George's	7	1.2
B.C. Rogers Poultry	7	1.2
Peterson Farms	5	0.8

POULTRY INSPECTION

Poultry inspection was started in 1957, 51 y later than red meat inspection, with general inspection procedures similar to those for red meat. Review these procedures in Ch. 3 of *The MWE* if you need to refresh your memory.

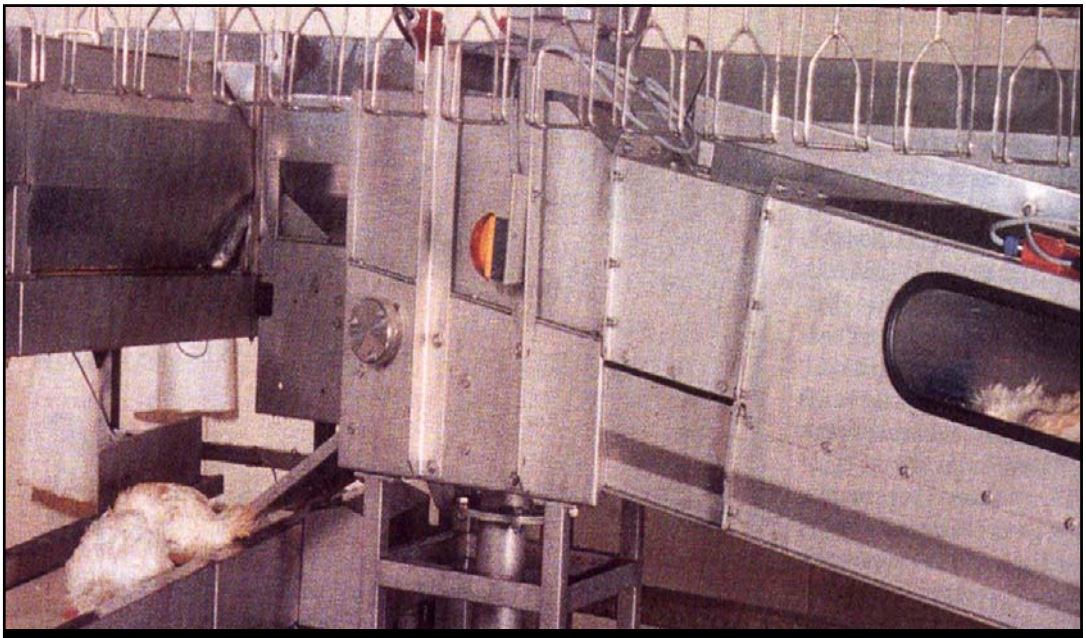
Antemortem inspection – checking for any evidence of illness or injury. Pass, Suspect or Condemn

Post-mortem inspection – after stunning, bleeding, scalding (125°F for 2 min.), picking (plucking), and evisceration, the carcass and internal organs are examined for evidence of diseases or other conditions that would render the meat unfit to eat. Pass, Retain or Condemn

Mirrors are used to view the back side of carcasses because the fast line speeds do not allow time to turn the birds for viewing.

Do you remember from the Meat Inspection unit which federal meat inspection stamps are used with each species and/or on packages of meat?

If not, review p. 103 in MWE



A GAS CHAMBER FOR RENDERING POULTRY UNCONSCIOUS BEFORE BLEEDING (Most birds are Kosher-style bled)

SLAUGHTER AND DRESSING LINE FOR POULTRY

Live bird receiving → Stunning & Bleeding → Scalding & Picking →

Evisceration → FSIS Postmortem Inspection → Final Washer →

Pre-chill Reinspection → Chiller → Post-chill Reinspection

Maximum line speeds for inspection:

1 inspector = 31/min.

2 inspectors = 55/min.

New line speed inspection system (using mirrors to see the back side of the carcass)
2 inspectors = 73/min.

PERCENTAGE OF BIRDS CONDEMNED DURING POSTMORTEM INSPECTION AND THE THREE PRINCIPAL CAUSES OF CONDEMNATION

Kind	Percent	Principal causes
Young chickens	1.0	Septicemia (blood poisoning), Arisacculitis, contamination
Young turkeys	1.0	Septicemia, Arisacculitis, Synovitis
All ducks	1.3	Septicemia, Arisacculitis, Synovitis
Mature chickens	4.0	Septicemia, tumors, contamination
Mature turkeys	2.9	Septicemia, Arisacculitis, contamination
All poultry	1.1	Septicemia, Arisacculitis, contamination

LIQUID ASSETS

FSIS allows poultry carcasses and parts to pick up water during chilling. Most are chilled in ice water and must reach 40°F internally within 4 h if <4 lb., 6 h if 4 to 8 lb. and 8 h if >8 lb.

The allowable weight gains for chickens are:

8.0 to 8.7% for carcasses <4.25 lb.
6.0 to 6.7% for carcasses >4.25 lb.

For turkeys, the allowable gains range from 8.0% for lightest carcasses to 4.3% for the heaviest carcasses

For chickens to be cut up and packaged, the limits are 10 to 11% for cut-up birds and 11 to 12% for ice-packed and whole birds

These values result in about a billion dollars worth of water being sold each year in poultry

How much weight gain does FSIS allow in red meat carcasses?

Grading of Poultry

Grading involves both quality and quantity determinations

Birds must have been inspected before being eligible for grading

Factors considered during grading:

1. **Condition (wholesomeness) – dressing must be correctly done; no feces, pin feathers, bruises, GI tract parts or other internal organs present**
2. **Class (by age and sex) – young birds are thin, smooth and soft-skinned, and tender. Old birds are thick, coarse and tough-skinned, tough, and much less valuable.**
3. **Quality – desirability of the carcass; how many dressing defects, amount of meat, thickness of muscling, color of skin**

TWO CATEGORIES OF POULTRY GRADES ARE USED

Consumer:
Grades consumers see at the retail level are graded on an individual carcass basis the grades are *U.S. Grade A, B, and C*

Procurement:
Primarily for institutional use representative sample of a lot is graded the grades are *U.S. Procurement I and II* (U.S. I has the same specs as U.S. Grade B)

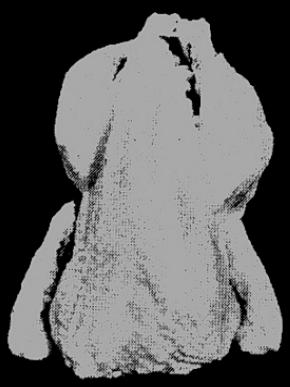
In effect, the grade A carcasses are pulled out and the remainder graded into the two procurement grades

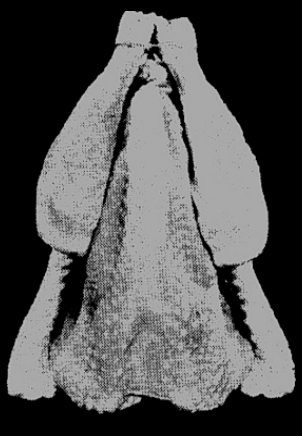
FIVE U.S. GRADES FOR POULTRY

CONSUMER: A, B, C; PROCUREMENT: I & II

U.S.Grade A **U.S.Grade B**

WHAT IS THE MOST VISIBLE DIFFERENCE BETWEEN A & B?





STANDARDS FOR U.S. GRADE A POULTRY

Conformation - carcass is free of deformities that detract from its appearance, is well-fleshed and has a well-developed layer of fat under the skin

Carcass is free of feathers, hair & feces (must have been inspected before being graded)

The maximum aggregate diameter of exposed flesh (cuts/tears in the skin) is no more than 1.5 inches. No exposed flesh is allowed on the breast or legs.

No broken or missing joints except wing tips and tail

Little skin discoloration

See chapter 12 in the MWE for more details on grading specifications

Because U.S. poultry grades B and C have a less attractive appearance (missing parts, thin muscling, discoloration, etc.), these grades usually are processed into products in which the appearance of the meat does not reduce its sales value.

See chapter 12 in the MWE for information about grading of poultry food products and boneless breasts and thighs.

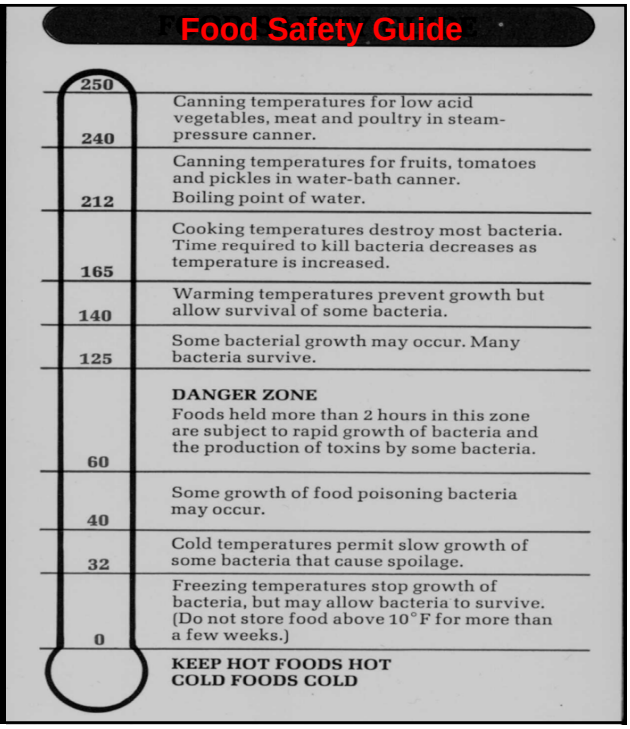
Grading stamp and combined inspection and grading stamps

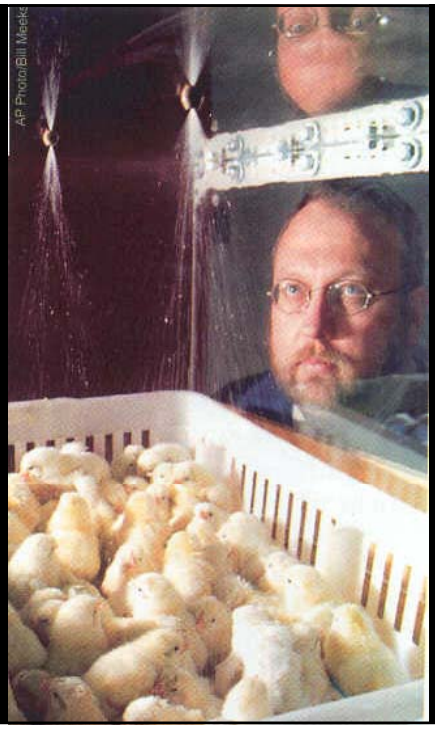
Poultry carcasses have been noted for having higher levels of pathogenic microbes than red meat animal carcasses.

However, because of considerable effort on the industry's part, the levels of pathogens are being greatly reduced.

As a consumer, be familiar with the "Food Safety Guide" and keep foods out of the danger zone temperatures.

Cook all poultry well done!





Preempt, an anti-salmonella agent designed for chickens, but with potential for hogs and cattle, was one of several anti-microbial agents introduced in 1998.

Preempt contains bacteria that compete with Salmonella and help prevent them from developing sufficient numbers to cause harm.

Preempt is sprayed on baby chicks to give these friendly microbes a chance to become established before Salmonella reach harmful levels.

KINDS AND CLASSES OF POULTRY

Kind of poultry, such as chickens, turkeys, geese and ducks, refers to species of bird

Classes (within kinds) are determined by age and sex

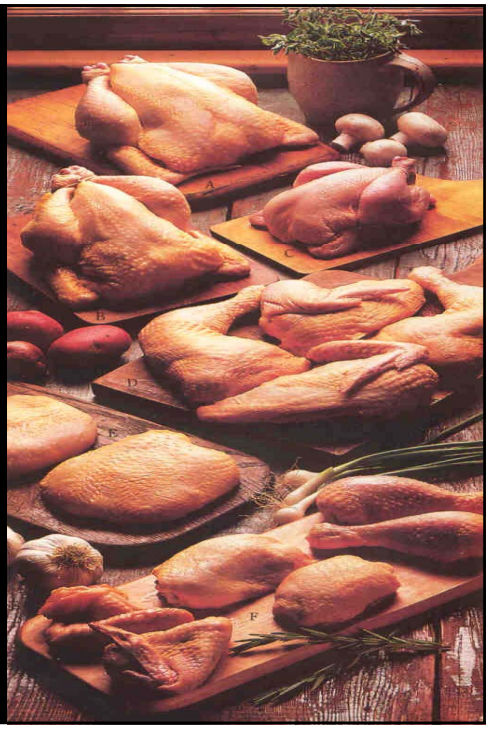
Classes for chickens:

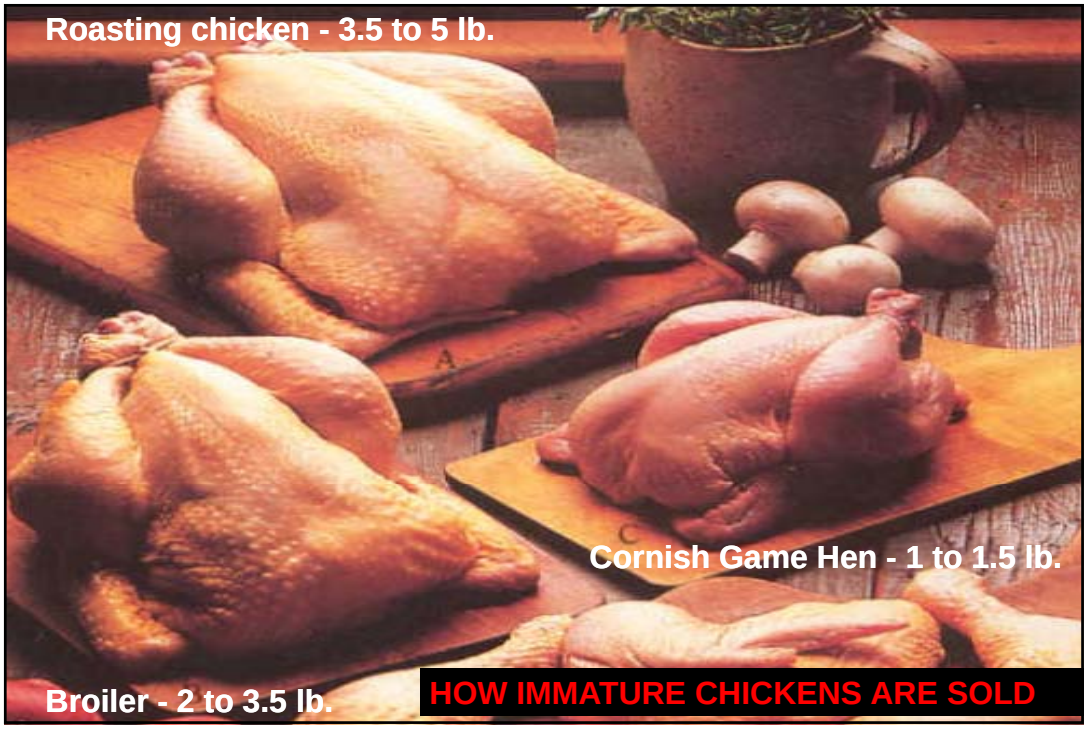
- **Rock Cornish Hen** (or Cornish Game Hen) - young, immature chicken, usually 5 to 6 wk. of age, weighing no more than 2 lb. (ready to cook weight), must have Cornish breeding. Is ready to cook whole.
- **Broiler** (or fryer) - young chicken of either sex usually under 8 wk. of age
- **Roaster** - young chicken usually under 3 to 5 mo. of age that is tender-meated.

Fresh chicken is sold in many forms

The poultry industry has done a better job of developing new, value-added products than has the red meat industry.

What two big changes have occurred since 1990 in how chicken is merchandized in supermarkets?





HOW IMMATURE CHICKENS ARE SOLD

Broiler Quarters

Excellent for grilling out of doors

You must use a sauce when cooking chicken on a grill to prevent scorching the surface

Wings are attached to breasts and legs to thighs

An Excellent BBQ Sauce to use during Cooking of Chickens

Ingredient	For 4 halves	For 100 halves
Cider vinegar	1 cup	1 gallon
Cooking oil	1/3 cup	3 pints
Salt	4 tsp.	2 cups
Tabasco sauce	2 tsp.	4 bottles
Worcestershire sauce	2 tsp.	2 bottles
Garlic powder (optional)	1/8 tsp.	3 tsp.

This sauce imparts a golden color to the chicken and can be sprayed on if a large amount is being cooked out of doors

Do not use a tomato-based BBQ sauce on meat. Tomato chars.

AT WHAT TIME OF THE YEAR IS THE DEMAND FOR BROILER PARTS HIGHEST FOR CONSUMPTION AT HOME?

YIELD OF CUTS FOR BROILERS

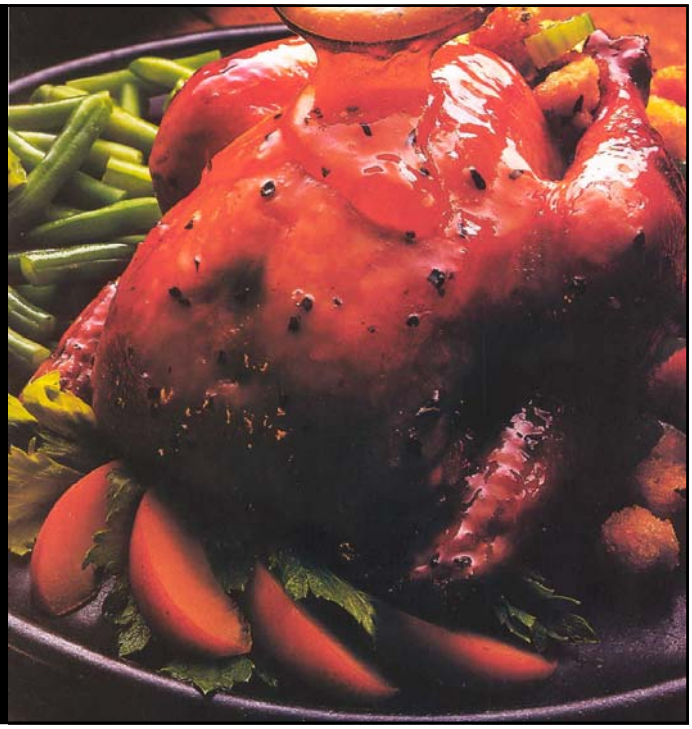
BREAST	22.4%
LEGS	15.0%
THIGHS	15.9%
WINGS	12.6%
BACK	17.3%
OTHER CUTS	16.8%

Necks and backs have so little meat on them that it is not profitable to bone them by hand. The soft tissue is removed with a mechanical deboner. MD poultry meat is widely accepted in processed products, but MD red meats are not.

On The Average, 1 Lb. Of Raw, Bone-in Broiler Yields About 0.5 Lb. Of Cooked, Boneless Meat

This 50% Yield Doubles The Raw Cost

Apricot-Glazed Cornish Hen ready to carve to provide two generous servings



Cornish hens usually are sold frozen

KINDS AND CLASSES OF POULTRY (cont'd)

- **Capon** - unsexed male usually under 8 mo. of age. Rare because the testes are located inside the body cavity.
- **Stag** - male usually under 10 mo. of age. Few are marketed.
- **Hen** - mature female. Source is laying hen flocks and they often are called "spent hens."
- **Cock** - old rooster; mature male

Similar to red meat animals, mature birds have tough muscle that must be either ground or cooked with moist heat to make it sufficiently tender to consume.

Name some products using meat from old birds.

Pot pie is a product that can contain meat from mature birds

CLASSES OF TURKEYS

- **Roaster** (or fryer) - usually under 16 wk. of age
- **Young Hen** - female usually under 8 mo. of age
- **Young Tom** - male usually under 8 mo. of age
- **Hen** - mature, usually over 15 mo. of age
- **Tom** - mature male usually over 15 mo. of age

Some consumers will buy only young hens or young toms.

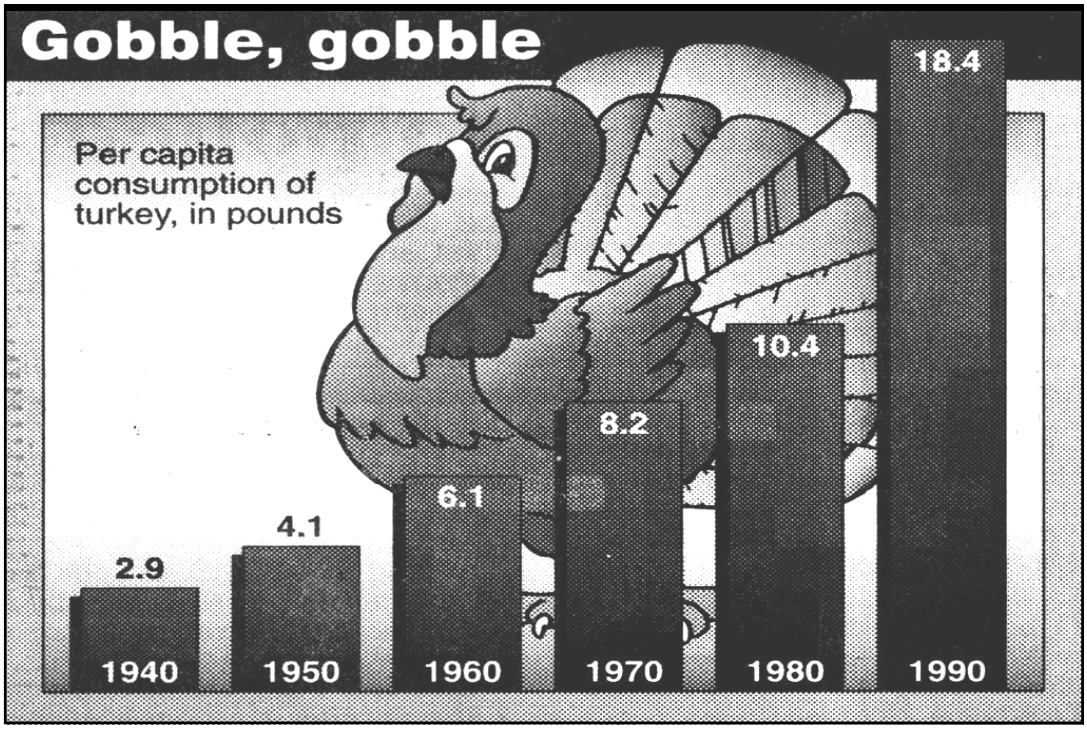
Toms are more muscular, but are not as tender. Modern toms have such large breast muscles that they usually cannot naturally mate with a hen.

Hens are more tender and may be more juicy because of their increased fat content.

A modern broad-breasted tom turkey

White feathers are preferred because white pin feathers that may be missed during dressing are less visible than dark ones.

AT WHAT TWO HOLIDAY SEASONS ARE TURKEYS IN MOST DEMAND?



CLASSES OF DUCKS

- **Broiler (or fryer) duckling - usually under 8 wk. of age**
- **Roaster duckling - usually under 16 wk. of age**
- **Mature (or old) duck - usually over 6 mo. of age**

Some high-class restaurants have built a reputation for having very good roast duck on their menu. It usually is served with a distinctive sauce such as orange sauce.

Geese (not covered in this unit) are noted for having higher fat content carcasses than ducks, chickens or turkeys.

Pekin Ducks

China is by far the largest producer and consumer of ducks.

Pekin ducks predominate in the U.S., having been imported from China in the 1870's.

Breast of young duck is one of the lowest calorie poultry cuts

DRESSING PERCENTAGES

- **Broilers - Male 73, Female 71%.**

Which Red Meat Animal Species Dresses Closest To These Figures? Why The Sex Difference?

- **Hen Turkey - 77%**

Why Is This The Highest DP So Far?

More Thickness Of Muscling And Are Older

- **Tom Turkey - 79%**

Why Is DP Higher For Toms Than For Hens?

Male Hormones Result In More Muscling Than In Hens

- **Ducks 66%**
- **Geese 75%**

THOUGHT QUESTIONS

1. **What is the one principal reason that so much chicken is consumed?**

   Because it's cheaper than red meats or seafood.
   Also, the average consumer believes that chicken is a healthier meat for them to eat than is beef.

2. **Do the facts about meat composition support this health belief? Why or why not?**

3. **Suppose that you are out of school, married, have a good job, and are celebrating your anniversary.**

   What species of animal will most likely supply the entrée for this special meal?

Specification Buying Is Used In The Poultry Industry Just As In The Red Meat Industry

An Example Of Specs For A Turkey Purchase:

Kind	**Turkey**
Type	**Fresh Chilled (40^0 Or Lower)**
Class	**Tom**
Size	**22 To 24 Lb.**
Style	**Ready-to-cook**
Grade	**A**

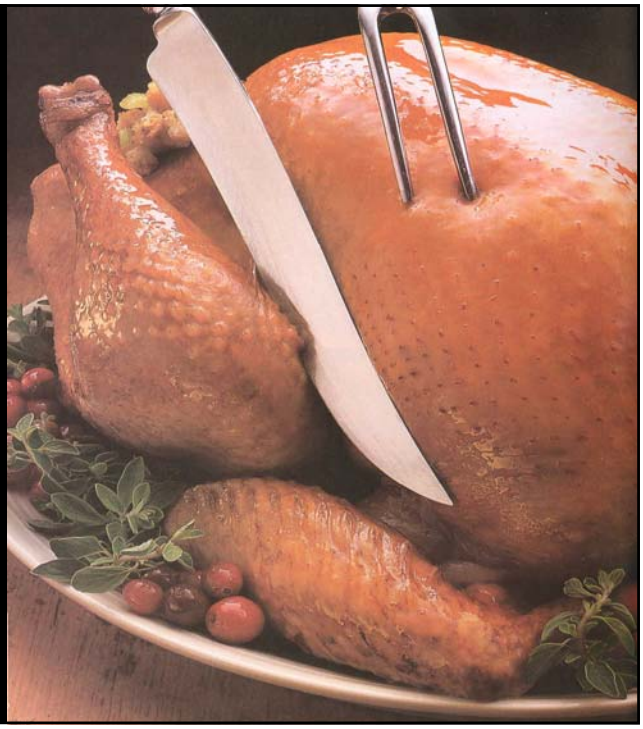
These Specifications Allow The Buyer To Order Electronically Or Take Bids And Know What The Product Will Be Like Before He/She Sees It

HOW TO CARVE POULTRY

- Everyone should know how to carve poultry.
- It's not difficult, and you never know when you might be asked to perform.

"Jim/Jill, you took that Meats course at Tech. Why don't you carve."

You need a sharp knife and a fork for holding the bird for carving. It's easier to carve on a carving board than on a plate.

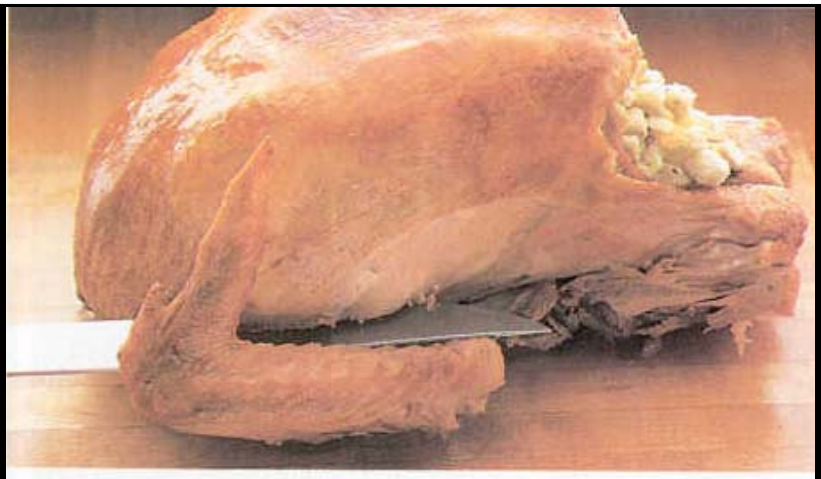


1. Separate Leg: To remove entire leg — drumstick and thigh — hold drumstick firmly with fingers and pull away from body. At the same time, cut through skin between leg and body. With skin cut, entire leg will pull freely from body.

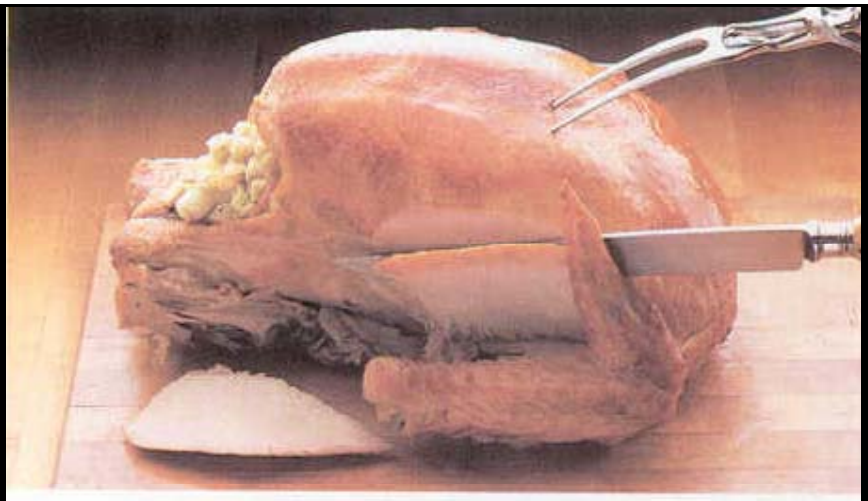
2. Remove Leg: Press leg away from body. The joint connecting leg to backbone will often snap free or may be severed easily with knife point. Cut dark meat completely from body by following body contour carefully with knife.

3. Slicing Dark Meat: Place leg on separate plate and cut through connecting joint. Both pieces may be individually sliced. Hold drumstick with napkin and tilt to convenient angle, slice toward plate.

4. Slicing Thigh: To slice thigh meat, hold firmly on plate with fork. Cut even slices parallel to the bone. Dark meat slices may be arranged neatly on a plate. Repeating this process with the other leg will provide ample meat.



5. Preparing Breast: In preparing the breast for easy slicing, place knife parallel and as close to wing as possible. Make a deep cut into the breast, cutting right to the bone. This is your base cut. All breast slices will stop at this vertical cut.



6. Carving Breast: After base cut, begin to slice breast. Start halfway up the side, carving down, ending at base cut. Start each new slice slightly higher up on breast. Keep slices thin and even.

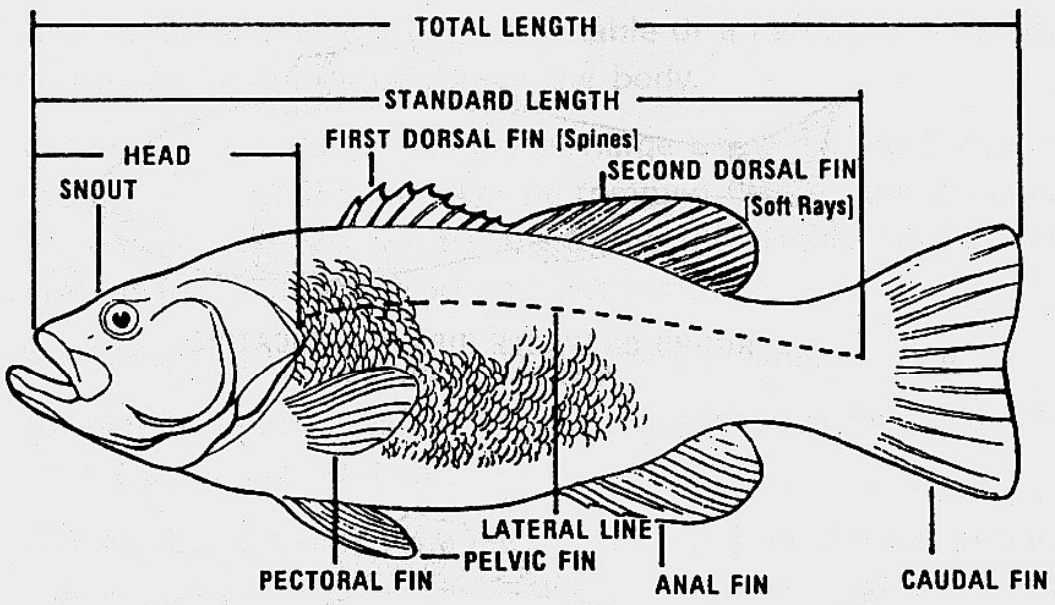
If you need to limit your caloric intake, let someone else eat the fried chicken. Much chicken fat is attached to the skin and the breading and frying add many more calories.

Calories from Poultry – Total Calories and Percent from Fat in a 3-oz. Serving of Cooked Meat (no bone or visible fat)

Kind of poultry	Calories/ 3-oz. serving	Calories from fat, %
Duck breast	132	14
Turkey white meat	133	18
Chicken breast	142	19
Chicken drumsticks	151	30
Turkey dark meat	159	35
Duck leg	163	27
Chicken wings	171	36
Chicken leg	181	40
Goose	202	48

From womensedge.com

PARTS OF A FISH

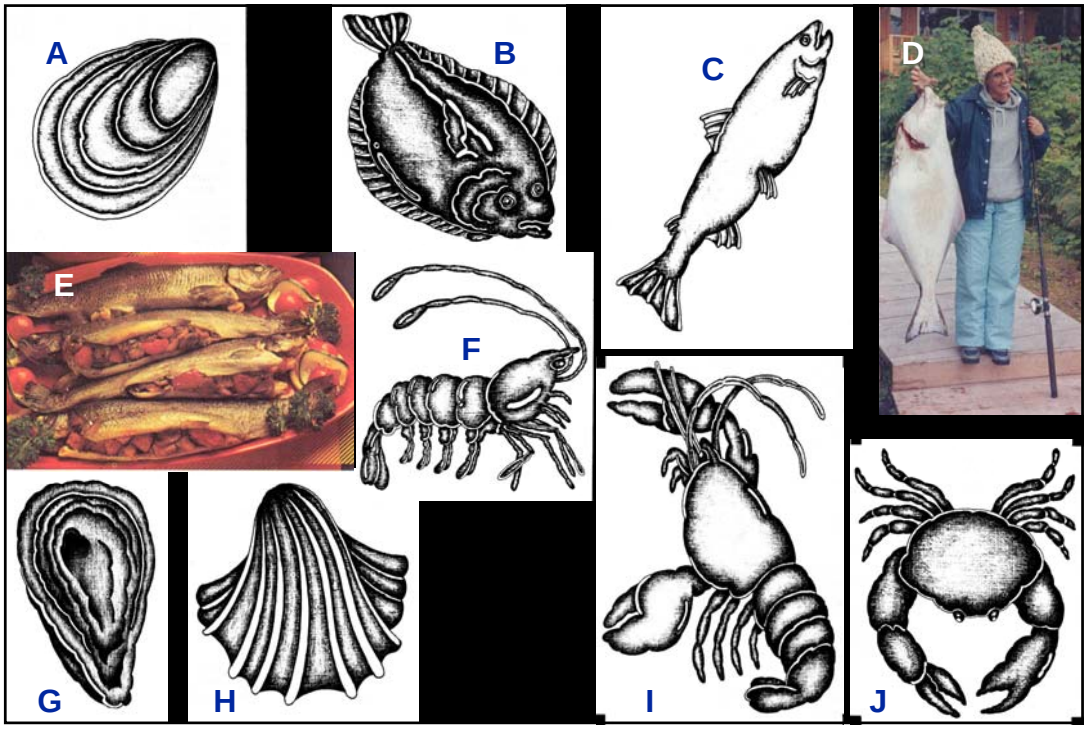


IT'S KNOW YOUR SEAFOOD TIME!

On the following slide are diagrams or pictures of the following:

Clam	**Oyster**
Crab	**Salmon**
Flounder	**Scallop**
Halibut	**Shrimp**
Lobster	**Trout**

How many can you identify?



Categories of Fish

Fresh water – from lakes and rivers; Rainbow trout, lake trout, channel catfish, yellow perch and other lesser-used species. Channel catfish are extensively farmed and their feed:gain may be 1:1 or better because they get food from the water in addition to the feed they are fed.

Ocean (marine) – over 50 species are used

- **Pelagic –** near the surface of oceans and seas; herring, mackerel, salmon, tuna, sardines, anchovies, etc. This category includes many of the fatty fishes, some of which have as much as 20% fat in their muscles.
- **Demersal –** at depths; cod, haddock, whiting, flat fish such as flounder and halibut, ocean perch (and the shellfish). Usually contain 5% or less fat with 1% or less in their muscles.

Federal Inspection Of Seafood is Voluntary

Q: What is the voluntary seafood inspection program?

A: The National Oceanic and Atmospheric Administration (NOAA) conducts a voluntary seafood inspection program on a fee-for-service basis. The program provides vessel and plant sanitation, product inspection, grading, and certification, label review, laboratory analysis, training, consultative and information services. Participants may use official marks on complying products that indicate that they are federally inspected.

Q: How much does the program cost?

A: All costs will be discussed with each applicant prior to contractual agreements. NOAA maintains a schedule of fees and charges for inspection services.

GRADING OF FISH

Grading of fish is voluntary just like grading of a red meat carcass.

Grading is done by the NOAA on a fee basis. Little grading is done.

The grades are:
A – best quality, uniform size, excellent condition, few or no dressing defects

B – good quality, less uniform size more defects

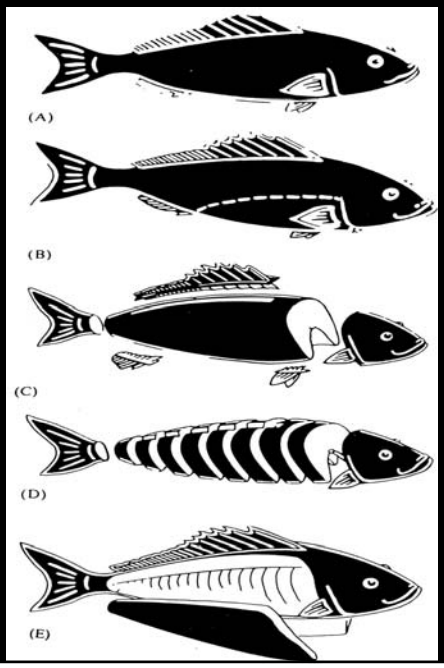
C – all others

These products can be graded: fillets, portions, steaks, breaded, precooked portions and sticks, shrimp, scallops and whiting

---

Fish has a good consumer image – nutritious, omega-3 fatty acids, low cholesterol, low fat, low calories, but difficult to prepare and less desirable taste than most other meats. Not all fish are low fat.

Market Forms of Fish



Whole: as they come from the ocean or lake; edible portion = 43 to 47%

Drawn: eviscerated; edible portion = 46 to 50%

Dressed: scaled and eviscerated (head, fins and tail usually are removed); edible portion = 65 to 69%

Steaks: cross-section slices of fish cut about .75 to 1 inch thick; edible portion = 84 to 88%

Fillets: boneless meaty side portions; edible portion = 100%

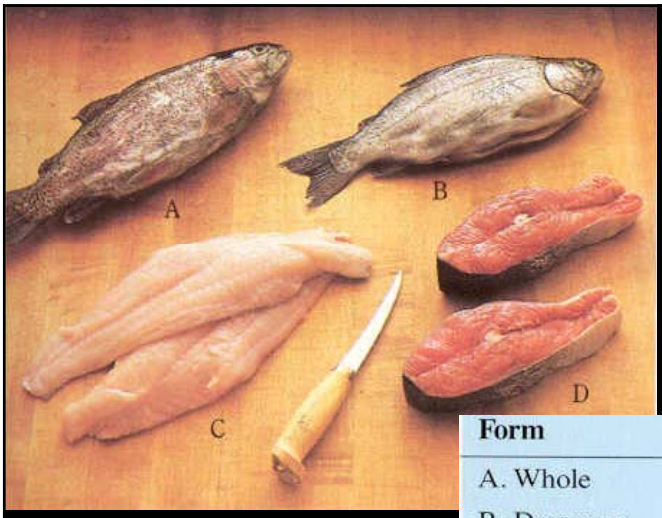
Other Market Forms of Fish

Butterfly: fillet cut in half except for a small hinge holding the two sides together. Doubles the area.

Portion: cut from frozen blocks and breaded.
Raw breaded: usually 3/8-in. thick and more than 1.5 oz. Must contain at least 75% fish flesh.
Fried breaded: similar to raw breaded but must contain no less than 65% fish flesh.

Sticks: cut from frozen fish blocks, breaded and usually 1 X 3 inches in size

Chunks: cut from cross sections of dressed fish with only a piece of the backbone remaining



Judging from the percentage of meat to eat and the labor involved, which form should cost the most and the least/lb.?

Form	Definition
A. Whole	The entire fish.
B. Drawn or Pan-Dressed	The whole fish that has been eviscerated and scaled.
C. Fillets	Boneless pieces cut from the side of the fish.
D. Steaks	Pieces cut crosswise through the backbone.

Fresh vs. Frozen Fish Products

If you live in an inland location such as Lubbock, it's nearly always best to buy frozen seafood products

Some factory fishing boats process and freeze fish as soon as they are caught. This procedure is by far the best for producing a product with the least microbial contamination.

Other fishing boats keep so-called "fresh" fish on board on ice for 1 to 8 days and then the fish may be held by a wholesaler for some time. Therefore, "fresh" fish may not be fresh at all.

Some supermarkets in Lubbock buy frozen fish and then thaw them overnight for sale as "fresh" fish. This practice should be outlawed because of the increased chances for very high microbial counts on the thawed product.

Seafood is much more perishable and has a much shorter refrigerator life than red meats. **Why?**

1. All fish struggle when caught, using up their glycogen supply and having a higher pH because of a shortage of lactic acid production. Most microbes that cause problems on seafood grow better at higher pH's.
2. A high proportion of seafood is taken from contaminated waters; they have a high count of microbes present on them and in their gut. When they die, the gut barrier breaks down and microbes rapidly attack the tissues.
3. Many of the species of microbes on the seafood thrive at refrigerator temperatures because the fish were taken from cold waters to which the microbes are accustomed. Contrast this situation to that of a steer.

Russian Factory Boat with Tenders (also fishing vessels); this boat can immediately process and freeze seafood

Fish Fats

Fish fats are more unsaturated than the fats of either red or fowl meats.

Therefore, fish fats oxidize more readily, causing rancid odors and flavors.

Fish and shellfish have a shorter refrigerator and freezer life because of this increased fat oxidation.

The greatest problem during freezer storage usually is the development of fat rancidity.

Fish and shellfish are among the least standardized and shortest shelf life products on the market, particularly for quality and time since being harvested.

EFFECT OF STORAGE TEMPERATURE ON STORAGE LIFE OF COD & HADDOCK

TEMPERATURE, °F	DAYS
32	12
33	8
37	5
45	2
77	<1

Stability of Some Fish Products

From *Food Science* by Potter (adapted)

Product	Maximum storage time, days At 32°F	At 60°F
Fresh cod, salmon and halibut	12 - 14	1
Salted herring	365	90 - 120
Dried salted cod	365	120 - 180

Compare the refrigerator life of the fresh fish listed above with that of a ribeye steak, a pork loin chop, ground beef, and pork sausage
And the winner i-s-s-s-s-s _____!

It's always best to cook fresh seafood within two days of purchase. If not possible, here are some tips to help you store it.

- Never let seafood sit unrefrigerated for long, especially in a hot car. If necessary, transport seafood to your home in an ice chest or ask your fish market to pack it in ice for you.
- Handle all seafood with care. Seafood with bruises or punctures will spoil more rapidly.
- As soon as possible refrigerate finfish as close to 32 degrees as possible. Fish can be held twice as long at 32^{o} as at 37^{0}.

Storage cont'd

- Always thaw fish and seafood in the refrigerator. Thawing at temperatures higher than 40 degrees causes excessive drip loss and adversely affects taste, texture, aroma and appearance.
- Store live oysters, clams and mussels in the refrigerator at a temperature of about 35 degrees. Keep damp, but do not place on ice or allow fresh water to come in contact with them or place in air-tight containers because it will kill them.
- Keep freshly shucked oysters, scallops and clams in their own containers and store in a refrigerator about 32 degrees. For best results, surround the containers with ice.
- Store live lobster and crab in the refrigerator in moist packaging (seaweed or damp paper strips), but not in airtight containers, water or salted water. Lobsters generally should remain alive for about 24 hours.

Storage cont'd

- Just before opening or cooking, scallops, mussels, clams, or oysters in the shell should be scrubbed under cold water to clean them. Soaking them in water with flour or cornmeal to encourage the creatures to eat to clean out the grit only shortens their life.
- Store frozen fish and seafood at 0 degrees or below. For fish purchased frozen, use within 2 months. If your home freezer door is opened frequently, use fish within 2 weeks for optimum taste and nutrition.

When buying frozen fish keep in mind the following guidelines

- **Whole fish should be free of ice crystals, with no discoloration.**
- **Fillets or steaks should be solidly frozen in the package.**
- **No evidence of drying out, such as white spots, dark spots, discoloration or fading of red or pink flesh should be visible.**
- **No signs of frost or ice particles should be seen inside the package. If ice crystals are present, the fish has either been stored for a long period or thawed and refrozen. No liquid, frozen or thawed, should be evident in the package.**
- **Make sure packages have no open, torn or crushed edges.**
- **Avoid packages that are above the frost line in a store's display freezer.**

It's easy to tell when seafood is fresh. Just follow these general guidelines.

- **When purchasing whole fish, look for eyes that bulge a little and are clear, usually a good indication that the fish is fresh. A few fish have naturally cloudy eyes, however, such as walleye pike.**
- **When purchasing whole fish or fish fillets, look for firm flesh. If you press the fish with your finger and it leaves an indentation, it is not high quality, even though it still may be good to eat. Also look for shiny flesh. Dull flesh means that the fish is old. On fish fillets previously frozen, of course, flesh may not be as shiny because to the freezing process, but are good to eat.**

It's easy to tell when seafood is fresh. Just follow these general guidelines (cont'd).

- Live clams, oysters, and mussels may have slightly gaping shells and should close tightly when tapped. Live crabs and lobster legs should show leg movement. Leg activity will lessen if refrigerated, but legs should show some movement. If not, the shellfish may be dead and should be discarded.
- Check to make certain that there is no darkening around the edges of the fish or brown or yellowish discoloration, especially if these areas appear dry or mushy. If you are still uncertain about how fresh the fish is, ask to have it rinsed under cold water and then smell it. Fresh fish should have no fishy or ammonia smell.

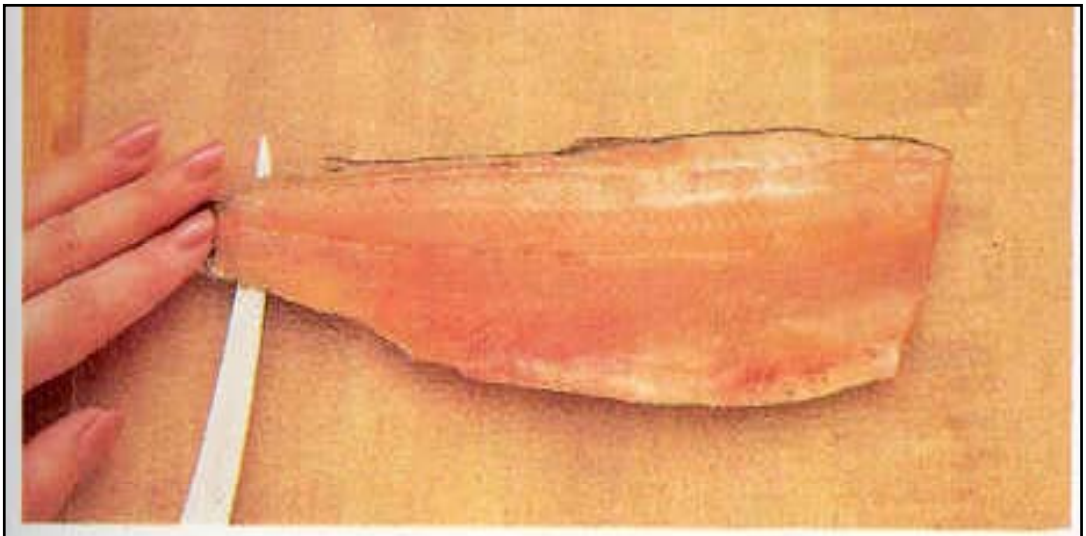
HOW TO FILLET A FISH

1. Lift pectoral fin. Using a thin, flexible sharp knife, angle the knife toward the back of the head and cut to the backbone.

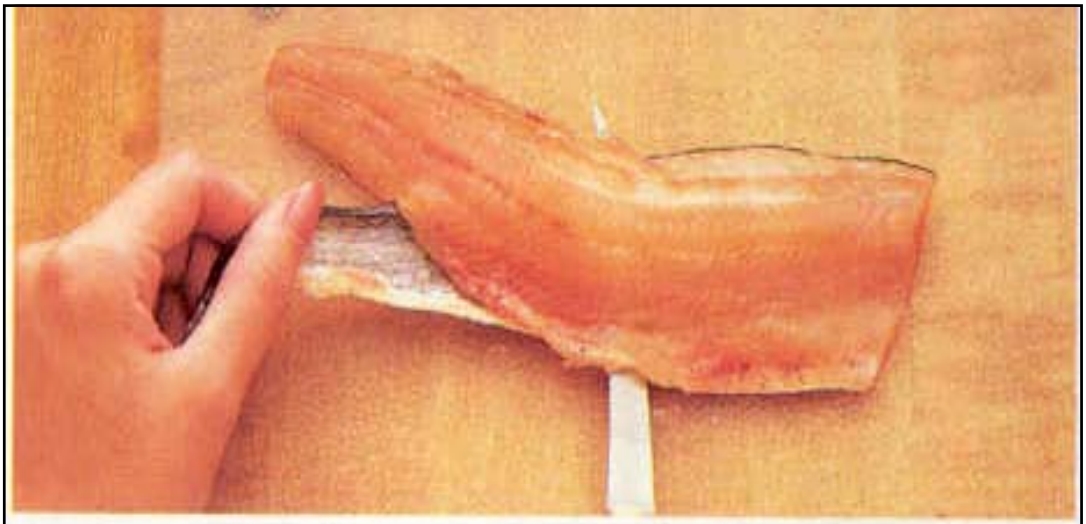
2. Turn the blade parallel to the backbone. Cut toward tail with a sawing motion. Cut fillet off.

3. Remove rib bones by sliding the blade along the ribs. Turn fish over and remove second fillet.

4. Cut off the strip of fatty belly flesh. Discard guts, belly, bones and head.



5. If desired, skin the fillet by cutting into the tail flesh to the skin. Turn the blade parallel to the skin.



6. Pull the skin firmly while moving the knife in a sawing action between the skin and the flesh.

SOME SPECIES OF SEAWATER FISH (*Seafood Retailing Manual* by Price)

Albacore

Fatty

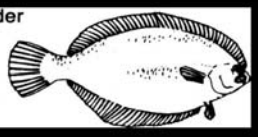
Albacore are members of the tuna family. Albacore caught off the Pacific coast average 10 to 20 pounds in weight. The flesh is firm, and mildly flavored. Albacore are available fresh in season from June through October, and frozen, smoked, or canned year-round. Only albacore can be sold as canned "white meat" tuna.

Cod

Lean

Atlantic cod are abundant in North Atlantic waters. They range in size from three to 20 pounds, and have white, firm, and lean meat. Atlantic cod are available fresh, frozen, canned, and smoked year-round. Pacific cod are close relatives of Atlantic cod, and average from five to ten pounds in weight. They have a mild flavor, and tender soft white meat that flakes easily when cooked. Pacific cod are available fresh and frozen year-round.

Flounder



Lean

Both eyes are on the same side of the head

Two families of flatfish, right eye flounders and left eye flounders, include most species of soles, flounders, and halibuts, and are found worldwide. Local names may vary, but nearly all flatfish are flounders. Many species of sole and flounder are practically identical in appearance, texture, and flavor, and are often substituted for one another. Sole and flounder average from one to 12 pounds in weight, are usually marketed as fillets, and are available year-round.

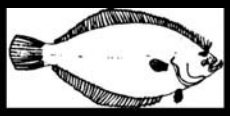
Pacific species include arrowtooth flounder, dover sole, English sole, petrale sole, rex sole, sanddab, sand sole, and starry flounder. Atlantic species include American plaice, blueback or winter flounder, fluke or summer flounder, grey sole or witch flounder, lemon sole or blackback flounder, and yellowtail flounder.

Haddock

Haddock are relatives of cod, and in the same family as Pacific whiting and pollock. They are found in North Atlantic waters, and have very lean white meat, with a mild flavor. Haddock are available fresh in season from April to December, and frozen year-round.

Halibut

Lean



Halibut species include the largest member of the flatfish family. Halibut range from five pounds to over 800 pounds in weight, and have tender white flesh. North Pacific halibut are available fresh from May to September, and frozen year-round. California halibut are available fresh from May to September, and are usually sold as fresh fillets. Atlantic halibut are not common in the U.S., and imports from Canada are usually available fresh from April to December, and frozen year-round.

Mackerel

Mackerel belong to the large family of fish that includes tuna. They average from one-half to 25 pounds in weight, and have a high fat content with firm flesh. Pacific coast mackerel include the Pacific mackerel, also known as blue or American mackerel. Atlantic coast mackerel include King mackerel, Atlantic mackerel, and Spanish mackerel. Mackerel are available fresh, frozen, canned, and smoked year-round.

Shark

Fatty

Shark are found worldwide, and have flaky, firm meat with a light flavor. Shark are available as fresh and frozen steaks and fillets year-round. Commercial species include soupfin shark, thresher shark, mako shark, leopard shark, angel shark, sand shark, and tiger shark.

Swordfish

Swordfish are found worldwide, and average 200-300 pounds in weight. The meat is firm, with a medium fat content. Swordfish are available usually as steaks, fresh and frozen year-round.

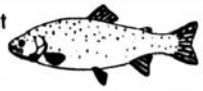
SOME SPECIES OF FRESHWATER FISH (*Seafood Retailing Manual* by Price)

Catfish

Channel catfish are raised commercially in the southeastern states and in California. They average one to four pounds in weight, and have firm meat with a high fat content. Catfish are available fresh year-round.

Rainbow Trout

Fatty



Rainbow trout are raised commercially in ponds or raceways. They are commonly sold weighing five to ten ounces, and have excellent flavor and delicate flesh. Rainbow trout are available fresh and frozen year-round. Continued

Carp

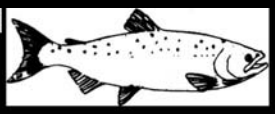
Carp are found throughout the U.S., and average two to eight pounds in weight. The meat is firm and lean. Carp are available fresh in season from December to June, and frozen and smoked year-round.

Lake Perch

Lake perch or yellow perch are found throughout the U.S., and average one-quarter to three-quarters of a pound in weight. The meat is firm, white, and lean. Yellow perch are available fresh from April to November, and frozen year-round.

Most salmon spend part of their life in the ocean, returning to the freshwater stream where they hatched to spawn and die

Salmon



Note that Pink and Chum salmon are low in fat content, but the other species are not.

Five species of Pacific salmon and one species of Atlantic salmon are marketed on the West Coast. Chinook or king salmon average from five to 30 pounds in weight, and have a high fat content, an excellent flavor, and a softer texture than the other salmon species. Flesh color ranges from deep salmon pink to white. Chinook salmon are available fresh in season from May to October, and frozen, canned, and smoked year-round.

Chum salmon average from seven to eight pounds in weight, and have a lower fat content than other salmon. Flesh color is light pink. Chum salmon are available fresh from June to December, and canned, smoked, and frozen year-round.

Coho or silver salmon average from four to nine pounds in weight, and have a high fat content. Flesh color ranges from light to dark pink. Coho salmon are available fresh in season from June to September, and frozen year-round.

Pink, humpy, or humpback salmon average about four pounds in weight, and contain very little fat in comparison to other salmon species. The flesh is softer than that of other salmon species. Pink salmon are available fresh from June to December, and canned and frozen year-round.

Sockeye or red salmon average from four to 12 pounds in weight, and have ruby-red flesh with a high oil content. Sockeye salmon are available fresh in season from June to November, and canned, frozen, and smoked year-round.

Atlantic salmon are more closely related to trout than the other salmon species. They average five to ten pounds in weight, and have pink flesh and a delicate flavor. Most Atlantic salmon are reared in pens in Scandinavia. They are available fresh year-round.

USE YOUR FINGERS TO REMEMBER THE KINDS OF PACIFIC SALMON

King (longest finger) or Chinook

Silver (ring) or Coho

Sockeye (point to your eye) or Red

Pink (pinkie) or Humpy or Humpback

Chum (thumb) or Dog (because they are used to feed sled dogs)

KOKANEE SALMON THAT HAVE RETURNED TO SPAWN IN A STREAM IN ALALSKA WHERE THEY HATCHED

These salmon, who never leave fresh water, have spawned and are dying. The white spots are fungal growth. The middle one already has lost its left eye.

Like red meats and poultry, seafoods have a wide range of fat content and calories and a much wider range in cholesterol content than poultry or red muscle meats

Seafood: Fit or Fat?

Seafood Type 3 oz serving	Fat (g)	Cholesterol (mg)	Calories
Salmon (Chinook)	11.4	72	196
Salmon (Atlantic)	6.9	60	155
Tuna (Bluefin)	5.3	42	157
Swordfish	4.4	43	132
Oysters (Eastern) (12 medium)	4.2	93	117
Salmon (Pink)	3.8	57	127
Halibut	2.5	35	119
Clams (19 small)	1.7	57	126
Snapper	1.5	40	109
Crab (Alaska king)	1.3	45	82
Shrimp (6 large)	0.9	166	84
Orange Roughy	0.8	22	75
Lobster	0.5	61	83

Market Forms of Shellfish

Live in shell, cooked in shell, shucked, headless, and cooked meat

Also, fresh, frozen, breaded, canned, and minced

Percent edible portion:

- 6 to 32 for different kinds of clams
- 4 to 14 for oysters in the shell
- 20 to 35 for lobsters in the shell
- 47 to 55 for shrimp in the shell

Into which of these ranges in edible portion would an average live slaughter steer's edible portion fit?

Some Shellfish

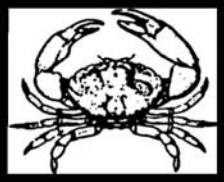
Clams

Lean

Clams are bivalve molluscs, and are found worldwide. Popular Pacific coast clams include: butter clam, little neck clam (native, and Japanese or Manila little neck), gaper or horse neck clam, razor clam, softshell clam, and geoducks. Atlantic coast clams include: hardshell clam (from smallest to largest: little neck, cherrystone, and quahog or chowder clam), softshell clam, and surf clam. Clams are available live, shucked, and canned year-round.

Crabs

Lean



True crabs are crustaceans with rounded bodies, five legs, and an abdomen or tail folded up under its body. Crabs are found in all coastal waters. Popular Pacific crabs include: Alaskan king crab, rock crab, Dungeness crab, and snow or tanner crab. Atlantic crabs include blue crab, jonah crab, red crab, and stone crab. Market forms include live, whole cooked, softshell (blue crab), cooked legs, claws, and body meat, frozen cooked, and canned. Crabs are available fresh in season, and canned and frozen year-round.

Crayfish

Lean

Crayfish are small freshwater lobster-like crustaceans. They are harvested wild and raised commercially throughout the world. The meat is similar to lobster and shrimp. Crayfish are available live from March to September, and cooked and frozen year-round.

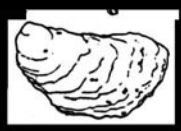
Lobster

Lean

There are two types of lobster: American or Maine lobster which have large claws, and spiny or rock lobster which do not. American lobster are found off the North Atlantic coast, and usually weigh one to five pounds. American lobsters are available live, whole cooked, as cooked meat, and in specialty items such as soups, bisques, and dips year-round. Spiny lobster are found primarily in tropical and subtropical waters throughout the world, and are usually marketed as frozen lobster tails. The tails range in size from about two ounces to two pounds. Lobster meat is snow white and lean.

Oysters

Medium in fat

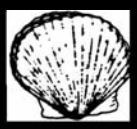


Oysters are bivalve molluscs. They are harvested in the wild on the Atlantic and Gulf coasts, and farm raised on the Atlantic and Pacific coasts. Three oyster species are most common: Eastern oysters from the Atlantic and Gulf coasts; Pacific or Japanese oysters from the Pacific coast; and Olympia oysters from Puget Sound. Oysters are available live, shucked, and canned year-round.

Shucked oysters are sold on the basis of size. For Eastern oysters, Extra Large is not more than 160 per gallon, Large is 160-210 per gallon, Medium is 210-300 per gallon, Small is 300-500 per gallon, and Very Small is more than 500 per gallon. For Pacific oysters, Large is not more than 64 per gallon, Medium is 64-96 per gallon, Small is 96-144 per gallon, and Extra Small is 144 or more per gallon.

Scallops

Lean



Scallops are bivalve molluscs, and found throughout the world. Three species are most common in the U.S.: Bay scallops from off the south Atlantic coast; Calico scallops from off the Florida and Gulf coasts; and Sea scallops from off the north Atlantic coast. Sea scallop meat ranges in size from 10 to 70 count per pound, and bay scallop meat from 70 to 120 count per pound. Calico scallops are related to bay scallops, but are slightly larger. Scallop meat is firm, low in fat, and has a sweet nutty odor. Scallops are available fresh and frozen year-round.

Shrimp

Lean

Shrimp are crustaceans, and found worldwide. Several varieties of shrimp are harvested in the U.S., and other varieties are imported from around the world. Shrimp have a distinctive flavor, with creamy-white, firm meat. Shrimp are available fresh, frozen headless, peeled and deveined, cooked, battered/breaded, and canned year-round.

Shrimp are sold by size (number of shrimp per pound). For raw headless shrimp: Extra Colossal, less than 10 per pound; Colossal, 10-15 per pound; Extra Jumbo, 16-20 per pound; Jumbo, 21-25 per pound; Extra Large,, 26-30 per pound; Large, 31-35 per pound; Medium Large, 36-40 per pound; Medium, 40-50 per pound; Small, 50-60 per pound; Extra Small, 61-70 per pound; and Tiny, more than 70 per pound.

Oyster Counts (Number per bushel)

In the shell:		Shucked:	
Bluepoint (small)	320 – 400	Very small	500+
Medium	200 – 240	Small (standard)	301 – 500
Large	120 – 160	Selects	211 – 300
		Large	161 – 210
		Extra large	160 -

Just as is true in many foods, the “jumbo” sizes of shellfish usually do not have as desirable flavor or texture as smaller ones.

Annual Seafood Consumption

Species	Pounds
Tuna (canned)	3.40
Shrimp	2.50
Salmon	1.41
Cod	98
Catfish	.86
Clams	.57
Crabs	.32
Flatfish (flounder)	.30
Scallops	.24

It is common practice to mix seafoods in preparing dinner dishes such as this seafood stew

Is this practice as common with poultry or red meats?

This San Francisco classic, Cioppino, contains halibut, clams, shrimp and scallops

Example of consumer information from seafood.nmfs.gov/

Mild Flavor	Moderate Flavor	Full Flavor
Delicate Texture	Delicate Texture	Delicate Texture
•Cod •Crabmeat •Flounder •Haddock •Pollock •Scallops •Skate •Sole	•Black Cod •Buffalo •Butterfish •Lake Perch •Lingcod •Whitefish •Whiting	•Bluefish •Mussel •Oysters

How much Fish and Shellfish to Buy?

- Whole or round fish - 3/4 to 1 lb. per person
- Dressed or cleaned - 1/2 to 3/4 lb. per person
- Fillets and steaks - 1/3 lb. to 1/2 lb. per person
- About 1/4 lb. to 1/3 lb. per person for cooked crab meat, cooked lobster meat, surimi products, cooked and peeled shrimp, raw scallops, raw cleaned squid
- Live:
  - 1 to 2 lb. lobster per person
  - 1 to 2 lb. crabs per person
  - 12 to 15 mussels per person
  - 6 10 12 oysters depending on size
  - 6 to 12 clams depending on size

Health plan emphasizes dangers of raw shellfish

Eating raw seafood of any kind is like playing Russian roulette. Don't do it!

TARPON SPRINGS, Fla. (AP) – Educating the public about the risks of eating raw shellfish and reducing those dangers are top priorities in a public health action plan released Saturday for the Gulf of Mexico.

The document issued at the Environmental Protection Agency's biennial symposium on "America's Sea" is part of its Gulf of Mexico program.

The plan made its debut just days after Florida health officials warned against eating raw oysters following seven deaths this year from a bacteria found in the shellfish.

in sediments where oysters live. Pollution or failure to properly refrigerate oysters may be causing the bacteria to multiply, he said.

Doctors also would be targeted for educational programs so they can recognize illnesses caused by raw shellfish.

Judges and law enforcement officials would be encouraged to treat violations of harvesting bans due to pollution more seriously.

Another public health priority: to find ways to reduce pollution, partic-

Discover how computer vision and image processing enhance speed, accuracy, and detection performance in **five major areas** of fish production ...

1. quality inspection for defects
2. measurement and sorting by length, weight, species, shape, orientation, and other attributes for packaging, handling, selection, registration, and pricing
3. analysis for cutting, filetting, and other operations
4. examination of dynamic and age-dependent growth behavior in aquaculture
5. spotting by satellite imagery for catches

Computer imaging has entered the seafood world

For more consumer information about seafood, visit www.websites.noaa.gov/

THE END