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# EAT Iowa FISH

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FISH AND WILDLIFE SERVICE — UNITED STATES DEPARTMENT OF THE INTERIOR

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IOWA STATE CONSERVATION COMMISSION

Cooperating

IOWA STATE COLLEGE

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## Eat Iowa Fish

BY ANNA MARGRETHE OLSEN

Few residents of Iowa know that Iowa waters contain some 131 species of native fishes, both game and non-game, and about 31 other species (1)\*. The non-game fish occur in quantities, and many of them have good eating qualities, but the demand has not been sufficiently great to make it feasible to place these fish commercially on the local markets (2). The three most important and abundant non-game food fish not only of Iowa but also of the upper Mississippi valley—buffalofish, carp and sheepshead—are discussed in this bulletin with emphasis on their use as a food.

### AVAILABILITY OF IOWA'S NON-GAME FOOD FISH

From figures on the supply of fish in various areas, the U. S. Fish and Wildlife Service has estimated that about 20 million pounds of non-game, freshwater fish (also called rough or coarse fish) can be caught annually from the north central area which includes 10 midwestern states (2). The bulk of these fish (four-fifths carp and the balance buffalofish, white carp, sheepshead, burbot and suckers) would come from Wisconsin, Minnesota and Iowa, with each of the other seven states in the area contributing to the total. At present the greater part of these fish, especially carp, are shipped to eastern markets.

During the year 1942 the state commercial fishing of Iowa amounted to approximately 2 million pounds (2). Most of the Iowa fish are marketed whole or round. They are thoroughly iced but not frozen, or they are held alive in cribs or ponds until they are sold. The retail dealer eviscerates, gills, fleeces (scarfs or flenses)\*\* or scales, and prepares the fish in the forms demanded by his trade (see figs. 1 to 5, p. 202).

Fish are classified commercially in Iowa according to size: small, 2-4 pounds; medium, 4-6 pounds; large, 6-10 pounds; jumbo, 10 pounds and up (9).

\*See literature cited p. 257.

\*\*All three terms used to designate process of removing scales and deep scale pockets of large-scaled fish with one stroke. See fig. 6, p. 204. The term "fleecing" is used by the Fish and Wildlife Service, but is not given this meaning in the dictionaries.



## USUAL RETAIL FORMS OF FISH

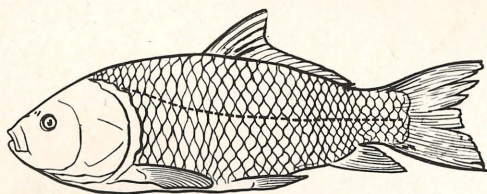


Fig. 1. Whole or round fish. Just as they come from the water with no preparation made for cooking. Fish that keep well without dressing, or small fish, or small sizes of certain varieties are often sold in this form.

Fig. 2. Drawn fish. Only entrails and gills are removed (see dotted lines). Fish intended for baking whole, or small fish which are cooked whole are sold in this form. They have to be prepared for cooking.

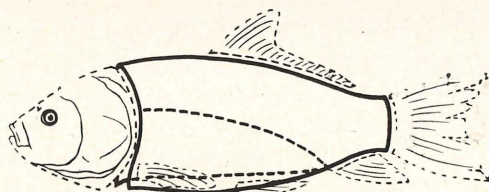
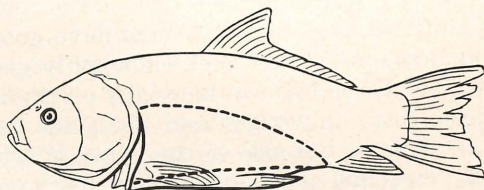


Fig. 3. Dressed or pan-dressed fish. Scale fish with deep scale pockets are fleeced: those with small scale pockets are scaled. Entrails and usually head and all fins are removed; split open along the belly or back. Washed, ready for pan.

Fig. 4. Steaks or slices (left). Cross-sections of larger dressed fish, usually cut from  $\frac{5}{8}$  to 1 inch thick for frying and broiling; from 1 to 2 inches thick for boiling and baking. Sticks (right). Uniform pieces cut crosswise or lengthwise from fillets.

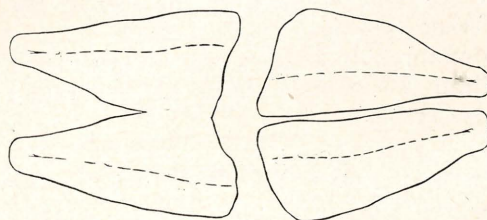
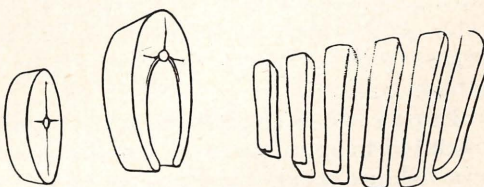


Fig. 5. Butterfly or double fillets (left). Single fillets held together by uncut belly. Single fillets (right). Meaty sides of fish, with or without skin; cut lengthwise away from the backbone and ribs. About 40 percent by weight of whole fish.

**Freshness of, scale or fin fish**, round or whole, can be judged by the following points:

- Eyes:** bright, clear (not milky), moist, full and bulging (not sunken).
- Gills:** reddish-pink (not brown), free from ropy slime and odor.
- Scales:** tight, cling to skin, bright with characteristic sheen.
- Flesh:** firm and elastic, springs back when pressed, adheres to bone; light-colored around caudal vein and kidney.
- Odor:** fresh, fishy, not tainted, sour or putrid.

## HANDLING THE FRESH CATCH

There are times when it is convenient for a homemaker to know how to handle a freshly caught fish—her own catch or a gift. The best way to acquire this knowledge is to watch an experienced fisherman or fish dealer at work. Several different methods are used. Some prefer to fleece or scale a fish, others to skin the fish without first removing the scales.

Large-scaled non-game freshwater fish with deep scale pockets are usually fleeced (fig. 6). Buffalofish and carp belong to this group. Other non-game small-scaled fish with small scale pockets, such as the sheepshead, are scaled. The fish are then eviscerated by carefully slitting the belly and cutting around the pelvic fins to remove these with the entrails. The gills decompose rapidly and should be cut out at once. The remaining procedure is as follows: Cut off head behind pectoral (front) fins, removing these with the head. Cut flesh at base of dorsal or large back fin, turning fish over to cut along both sides; if first rays of fin are heavy serrated spines, grasp rear part of fin with pliers rather than with fingers, and pull forward toward head to remove fin with nuisance bones attached. The anal or ventral fin with its many bones attached, and sometimes with serrated spines, is removed in the same manner, first cutting the flesh around the fin.

If fleeced, eviscerated and gilled fish is to be used on the same day, scrub and wash thoroughly, removing blood, kidney, fat and any remaining viscera and membrane. Then remove skin, fillet or bone as desired. See figs. 7 to 10 for directions. Larger fish may be cut crosswise into slices  $\frac{5}{8}$  to 2 inches thick, using steaks or thinner slices for frying and broiling, and thicker slices for baking and boiling.



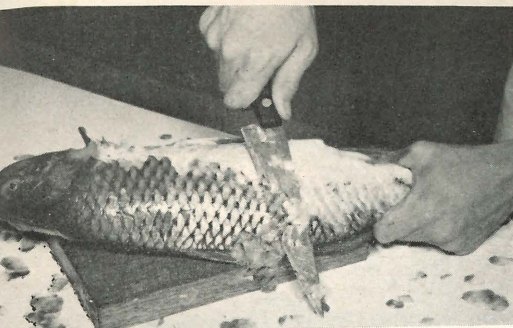


Fig. 6. To fleece fish: Grasp fish firmly by tail; insert sharp, pointed knife under scales tilting edge upward slightly. With smooth, saw-like strokes cut off scales in strips, working forward from tail of fish. Scales and scale pockets are removed with each stroke without cutting into skin and flesh.

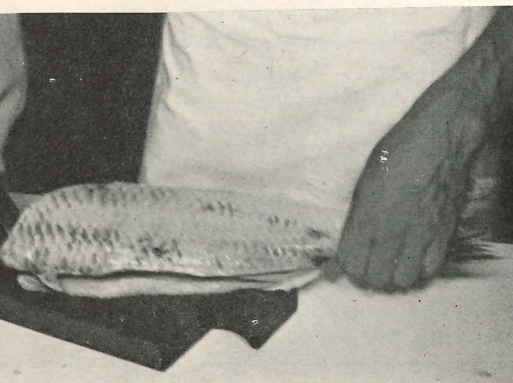


Fig. 7. To remove skin: (a) A proper start is important in removing skin. Insert thin, pointed knife, with edge away from you, in lower corner as pictured. Then loosen skin part way down, using knife as needed if flesh clings to skin.

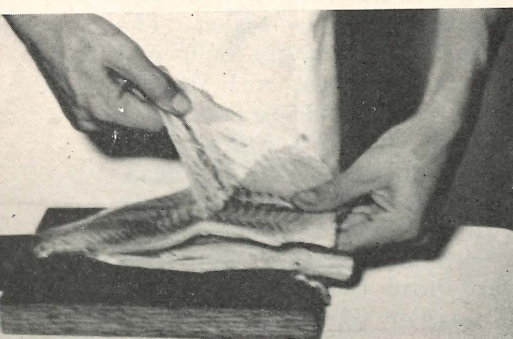


Fig. 8. To remove skin: (b) Grasp skin with your right hand and hold side with left as pictured. With two or three pulls the skin should come off entire side. The dark strip of flesh along lateral line (from gills to tail) is common to buffalofish and carp. It is soft, turns dark on cooking and detracts from appearance and sometimes from flavor of fish.

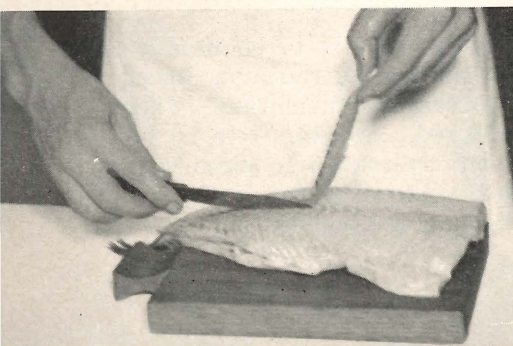


Fig. 9. To remove red streak: Red strip of flesh is deep and narrow in upper half of fish and spreads and thins out in lower half; for upper part, cut along each side of streak and remove V-shaped piece; for lower part, shave off streak. This is likely to divide each fillet into several pieces.

Fig. 10. To fillet a fish: To lift off entire side of flesh in one piece do not remove red strip along sides. With sharp knife cut down through flesh just behind the head. When knife reaches the backbone, turn it flat and cut along the backbone to the tail. Loosen flesh by scraping forward along ribs and lift off. (3). Repeat on other side. Skin need not be removed.



Note: To bone whole fish for baking: Head may or may not be removed. Proceed as for filleting without cutting through skin. Leave tail end of bone to hold fish together.

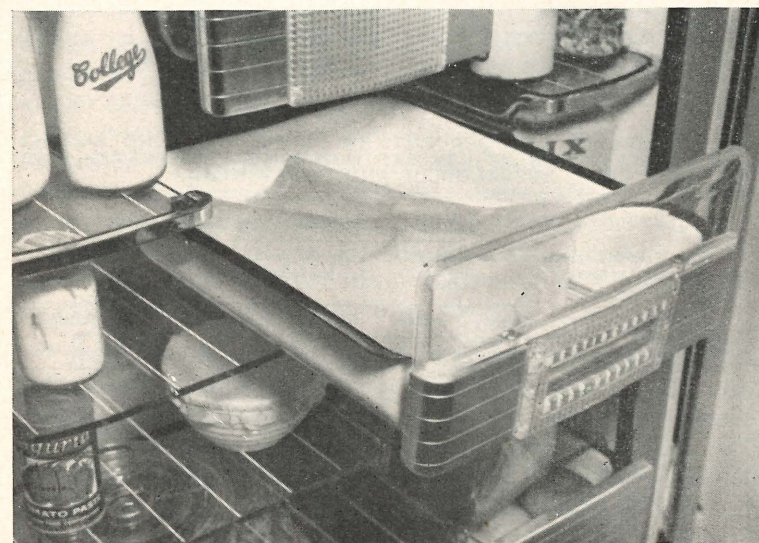


Fig. 11. To store the fresh catch:

a. In refrigerator: To keep fish fresh for several days they should be fleeced or scaled, eviscerated and gilled, but not washed. Wipe with cloth. Chill, wrap in waxed paper and store in refrigerator (not in freezing unit).

b. With ice: Fish (fleeced, eviscerated, gilled and wiped with cloth but not washed) may be thoroughly iced and held iced in well-covered container for several days if water is drained off as soon as ice melts.

c. With salt (corning): From U. S. Fish and Wildlife Service (3) "This is an easy method of preserving fish for a day or two. The fish should be filleted or dressed for baking. Wash, drain, and cover all surfaces (inside and out of dressed fish) with as much fine salt as will cling with careful handling. About  $\frac{1}{2}$  pound of salt to 5 pounds of fish should be used. Pack the fish in a deep vessel and store from 4 to 6 hours. The brine formed and any excess salt, should be rinsed from the fish. Wipe dry, keep cool."



## ALLOW FOR WASTE IN BUYING AND USING WHOLE FISH

As table 1 indicates, the percentage of waste in fish is high. It is therefore necessary to allow a generous amount, from  $\frac{2}{3}$  to  $\frac{3}{4}$  pound round weight, for each portion. Only about 42 percent of buffalofish, carp or sheepshead is edible, and the remaining 58 percent is waste. A whole or round carp weighing  $2\frac{1}{2}$  pounds will weigh about: 1.9 pounds (76 percent of original weight) when eviscerated, gilled and fleeced; 1.3 pounds (52 percent of original weight) when cleaned with head and all fins but tail removed; and 1 pound (41 percent of original weight) when filleted with skin on. That is, a carp weighing  $2\frac{1}{2}$  pounds would make 3 average portions.

TABLE 1. WEIGHTS AND PERCENTS IN TERMS OF ROUND WEIGHT OF DIFFERENT FORMS OF DRESSED NON-GAME FRESHWATER FISH CARP, BUFFALOFISH AND SHEEPSHEAD.\*

Fish	Fish weighed	Round weight ounces I.	Weight of and percent in terms of round weight											
			Eviscerated, gilled, fleeced II.				Cleaned; head, all fins but tail removed III.			Fillets (not skinned) IV.				
			Weight		Percent		Weight		Percent	Weight		Percent		
			No.	Sex	Range	Av.	Av.	Range	Av.	Av.	Range	Av.	Av.	Range
				Oz.	Oz.	Oz.	Per-cent	Per-cent	Oz.	Per-cent	Per-cent	Oz.	Per-cent	Per-cent
Carp	6	F.	24.0	59.5	46	35	73-77	76	24	49-55	52	18	38-42	41
	5	M.	21.5	58.5	36	27	75-78		19	48-56		15	38-44	
Buffalo-fish	9	F.	29.5	108.0	76	58	72-77	74	41	50-56	53	32	38-44	42
	3	M.	60.5	98.5	70	54	73-75		40	53-54		31	41-43	
Sheeps-head**	5	F.	15.8	20.5	19	16	83-85	85	10	49-54	51	8	39-43	41
	6	M.	14.0	23.5	18	15	82-87		9	48-53		7	39-45	

\*Fish were caught in East Okoboji and recorded August 5, 1943. All fish were well conditioned. All weights are in ounces. Data were obtained by Dr. Reeve M. Bailey, leader, Iowa Fisheries Research Unit. Weights are likely to be modified somewhat in the spring, especially in the female prior to spawning.

\*\*Scaled, not fleeced (Col. II.)

## FRESHWATER, NON-GAME FISH IN THE DIET

Americans like meat and spend more money for this food than for any other type of food. Probably only a small portion of the money is spent for fish, for the people of the United States have been rated among the lowest fish consumers of all nations. In the United States and Alaska about 3 billion pounds of fish are taken annually for food by commercial fishermen (4). This figure, however, does not represent the

total consumption of fish for it does not include the large quantities of fish caught by local fishermen, much of which is consumed without passing through the regular channels of marketing. The freshwater non-game food fish are among the cheapest of animal foods.

Nutritionally (4-6), fish and shellfish deserve a more prominent place in the American diet. They are an excellent source of high quality animal proteins with the characteristics of meats, poultry and game. Fish, with meat, poultry and eggs, compose one of the seven basic groups of foods, recommended by the National Nutrition Committee, to be eaten daily for better health. About 20 percent, by weight, of the edible portion (fillet) of fish is protein. Fish proteins are complete proteins: they contain not only all of the essential amino acids but also in the quantities needed for growth and maintenance of weight. By contrast, for example, some of the proteins found in foods from vegetable sources are incomplete; they will maintain life but are lacking in some of the amino acids needed for growth. An average serving of fish will not only contribute a substantial amount of the protein for the day, but will also be of real value in supplying those essential amino acids likely to be low in low cost diets.

Most freshwater fish are not important fuel foods. They lack carbohydrates and contain only a relatively small amount of fat. The fat content will vary with the species and the season. As found in the market, fish classified as low in fat contain as little as  $\frac{1}{2}$  percent; as fairly low in fat, about  $2\frac{1}{2}$  percent (buffalofish and carp); and the fatter varieties contain up to 20 percent or more (7). Freshwater sheepshead with about 4 percent fat falls into the lower bracket of the fatter fish (5).

Less is known about the mineral composition of freshwater than the salt-water fish; the available data on the mineral elements of the two types are inadequate for specific comparisons. Undoubtedly, freshwater fish can be depended upon to furnish phosphorus, sulfur and magnesium (calcium in canned fish if bones are softened and eaten).

Comparatively few vitamin assays have been conducted on fish and especially on freshwater fish. Lean fish supply little, if any, fat-soluble vitamins (A and D); freshwater fish, in general, contain a negligible amount of thiamin ( $B_1$ ), and small and variable amounts of riboflavin ( $B_2$ ) and niacin.



## FISH COOKERY

### FRESH FISH

Fish are tender protein foods that require just enough cooking to separate the flesh easily from the bone, to bring out their delicate flavor and to leave them moist and tender. Overcooking by any method toughens and dries the fibers.

Buffalofish, carp and sheepshead were fried, broiled, baked, planked, boiled (poached), steamed and stewed according to basic cookery methods. Many old and new cook books were consulted for favorite fish recipes among different nationalities, in various sections of the country and in foreign countries as well. Some of the popular recipes were used as the basis for preparing more elaborate dishes, and adapted to suit the fish. The prepared dishes were scored on aroma, flavor and texture by a panel composed of five staff members\*, the author and assistant. The recipes that follow are those that were approved by this panel. In general, dishes using buffalofish and carp scored equally high, with sheepshead a close second.

The fish were shipped from Lake Okoboji twice a week and reached the laboratory in excellent condition. They had been drawn, fleeced or scaled, with head, gills and usually all fins but tail removed. The fish had been wiped with a cloth but not washed. Before cooking, the fish were scrubbed to remove all slime, any remaining viscera and membrane lining of the abdominal cavity (dark in the buffalofish), washed in running water and drained. "Dressed fish" as used in these recipes have to be scrubbed and washed before they are ready for the pan. To remove skin and fillet or bone a fish see directions on p. 204 and 205.

In many of the recipes the vegetables are cooked in the fat to give a blend of flavors rather than a pronounced flavor of any one of the vegetables used. For maximum flavor of parsley, in particular, add it raw and use it in smaller amounts.

\*Miss Belle Lowe, professor of foods and nutrition and research professor.  
Dr. Soledad Ramos Payawal, research assistant.  
Dr. George O. Hendrickson, assistant professor of zoology and entomology.  
Dr. Reeve M. Bailey, assistant professor of zoology and entomology.  
Mr. Buford R. McClurg, assistant professor of animal husbandry and research assistant professor.

Generous amounts of both parsley and green peppers have been used in many recipes to increase the food value.

### Special Treatment for Fish

The fish that reach the commercial markets are very likely to be of high grade the year around. "Home caught" fish, however, may become somewhat soft and develop a musty or off-flavor during the hot summer months, especially when taken from warm, muddy and sluggish streams. While the food value is not changed, the palatability is decreased, a condition more apparent to some people than to others. To improve both the texture and flavor, the Fish and Wildlife Service (3-7) and the Fisheries Department, Iowa State Conservation Commission (8), have recommended two general preliminary treatments for such fish: marinating with a highly seasoned mixture, or brining. After either treatment the fish are washed thoroughly in running water or several changes of water, then drained and used in any fish recipe, omitting salt or adding it as needed.

#### a. Marinade or Spiced Mixture

1 cup ground onion	1 teaspoon black pepper
1 cup salt	$\frac{1}{8}$ teaspoon mace
	2 tablespoons vinegar

Mix the ingredients thoroughly increasing, if necessary, the amounts in the proportions given. Place the dressed fish or fillets in a deep plate or tray, cover with the marinade and allow it to stand one hour, turning fish to cover all sides. Discard marinade after using. This mixture imparts a special flavor to the fish.

**Note:** At the suggestion of one of the judges, the onion and salt were reduced to  $\frac{1}{2}$  cup each and the time doubled for marinating. Fish marinated in the two spiced mixtures and then fried were comparable in flavor and texture.

#### b. Brine

$\frac{3}{4}$ cup salt	1 gallon cold water
------------------------	---------------------

Soak the dressed fish or fillets for 1 to 2 hours in brine. The salt solution will draw out diffused blood and carry away musty flavors, but at the same time it will dissolve a small amount of the soluble proteins, minerals and vitamins which are lost in the brine.



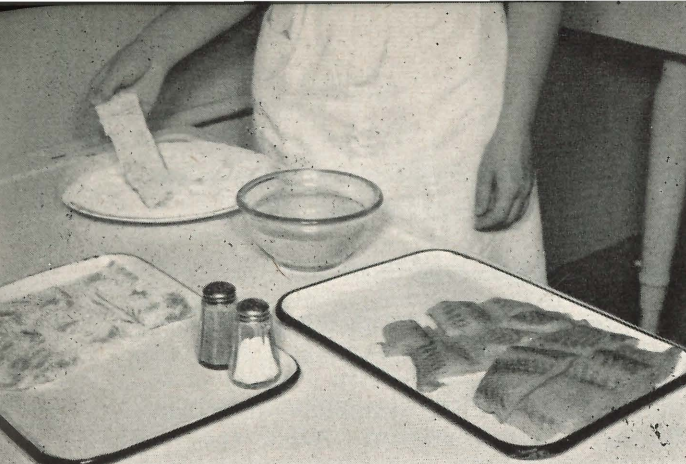


Fig. 12. Preparing fish for frying-pan, shallow-fat or deep-fat: For heavy coating dip fish first in liquid. The covering protects tender protein and keeps fish moist during cooking at high temperature in the hot fat.

### Fried Fish

2½ to 3 lb. dressed fish

Salt, pepper

Liquid:

Cold water or

1 egg, beaten slightly, and

1 tablespoon water or milk

1 cup dry cereal or crumbs

(use one or a mixture)

Flour, cornmeal or sifted

crumbs

Cooking fat (with high smoking point)

1. Clean, wash, skin and fillet fish; cut in pieces for serving; or cut skinned fish crosswise in slices (about ¾ inch thick). Sprinkle both sides with salt and pepper, and let stand about 10 minutes to season.

2. Dip fish in water, or in egg and water or milk mixture; then roll in one of the following: flour, cornmeal, bread or cracker crumbs, or in mixture of two or more used in variable amounts.

3. Pan-fry or sauté, shallow- or deep-fat fry fish (methods a, b, c) in hot but not smoking fat: smoking or burning fat gives an unpleasant and disagreeable flavor and odor to the fish. Drain fried fish on absorbent paper.

4. Place on hot platter and garnish as desired. Serve hot, plain or with a fish sauce (p. 233 to 235). Makes 6 to 8 portions.

5. Method:

a. **Pan-Fried or Sautéed:** Place fish in heavy frying pan with thin layer (1/8 inch) of hot fat covering bottom of pan. Fry at moderate heat until fish is done, turning



Fig. 13. If and when you deep-fat fry fish: Fat and equipment are paramount. Fat (lard, hydrogenated fat, corn oil, cottonseed oil) with high smoking point—for perfect frying. Deep kettle, small diameter

—for safety and economy. Wire basket, fitting into kettle—for ease and convenience. Thermometer (450° F.)—for correct frying temperature. Absorbent paper—for removing any excess fat on cooked fish. Covered pail with cloth-lined strainer—for collecting used fat.

once to brown both sides: allow 8 to 12 minutes according to thickness of fish. Add more fat if all is absorbed during frying. Fish should be moist, covered with a well-browned, crisp crust.

b. **Shallow-Fat Fried:** Place enough fat in heavy frying pan to cover bottom with ½- to 1-inch layer. Heat fat, testing temperature with cube of stale bread—if it browns in 40 seconds it is right for frying fish. Care is necessary to keep fat from smoking. (It is difficult to measure temperature of small amount of fat with thermometer.) Fry just enough fish at one time to cover bottom, turning once to brown both sides; allow 6 to 8 minutes. This is a modified form of deep-fat frying using minimum fat.

c. **Deep-Fat Fried:** Use deep, heavy kettle provided with frying basket; half-fill kettle with fat. A fat thermometer or one that registers high temperatures is desirable for best results. Heat fat to 370°-380° F., or test with cube of stale bread—if bread browns in 40 seconds fat is hot enough. Place layer of fish in frying basket and cook to an even golden brown, or for 4 to 6 minutes. Fish remains immersed in fat. Raise basket to check browning; no turning is necessary. Do not attempt to fry more than one layer at a time as this lowers temperature of fat below the proper cooking point.



### Broiled Fish

2½ to 3 lb. dressed fish  
Salt and pepper

Butter, oil, or French dressing  
¼ cup fat

2 tablespoons lemon juice

1. Clean, wash and dry fish. Fillet or cut in steaks about 1 inch thick; fish is less likely to fall apart if skin is left on. For ease in turning cut each fillet in pieces for serving. Small or medium-sized fish may be split and broiled without removing tail and bones. Sprinkle both sides with salt and pepper and brush generously with melted butter, oil or French dressing.

2. a. Arrange fish on greased hot rack of broiler pan—fillets and split fish skin-side up, if skin has not been removed. Place pan in hot preheated broiler about 2 inches from source of heat; cook 5 to 7 minutes, or until skin is covered with dark brown bubbles, basting once with seasoned mixture of fat and lemon juice; turn carefully with spatula or pancake turner and cook 4 to 6 minutes, or until nicely browned, basting with remaining liquid. Turn just once.

b. Arrange fish on well-greased baking sheet—fillets and split fish skin-side down, if skin has not been removed. Place on broiler pan in hot preheated broiler and broil 5 to 7 minutes, or until browned, basting several times with seasoned mixture of fat and lemon. Place in hot oven for 5 to 10 minutes to finish cooking without turning fish.

3. Remove carefully to hot platter, garnish as desired, and serve hot, plain or with lemon butter. Makes about 6 portions.

Fig. 14. Broiled fillets, steaks or split fish are popular (above). Place on well-greased hot rack in broiler pan in preheated broiler about 2 inches from source of heat. Fillets are easily turned with pancake turner when cut in pieces and broiled until skin is covered with brown

bubbles. Ready to eat when flesh sides are nicely browned. Delicious—tender and juicy, if basted several times with drippings or other fat.

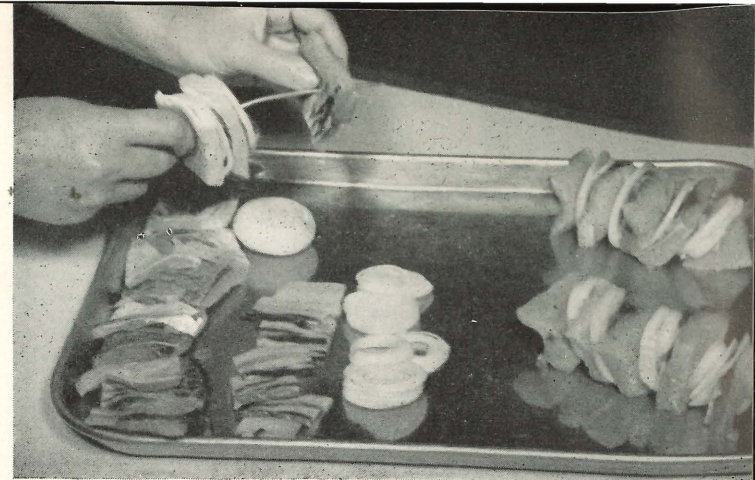


Fig. 15. Barbecued Fish Kabobs (below). Super good when broiled in the out-of-doors over an open fire. Skin left on fillets helps to hold tender fish together.

Alternate the pieces of fish, onion or tomato, and bacon on skewers, pointed sticks, or long forks. String loosely, turn often, spreading pieces to crisp the bacon. Barbecue Sauce basting adds zest.

### Barbecued Fish Kabobs

Dressed fish

Barbecue Sauce:

⅓ cup cooking oil or other fat

2 tablespoons lemon juice or vinegar

1 teaspoon salt

Pepper, paprika

¼ cup ketchup

1 teaspoon scraped onion

Bacon slices, cut in squares

Onion, thin slices, or tomatoes, sliced crosswise

Salt, pepper

1. Clean and wash fish; fillet without removing skin; cut in 2-inch squares.

2. Marinate in Barbecue Sauce made by combining all ingredients listed under sauce, or in French dressing, for 1 to 2 hours; do not discard sauce or dressing.

3. Thread pieces, skin-side down, on skewers or sharpened green twigs, with slice of onion or tomato and square of bacon between each two pieces. Use four or five squares of fish and three to four onion or tomato slices and bacon squares; add salt and pepper.

4. Arrange skewers on well-greased hot rack of broiler pan, spreading pieces slightly to cook and crisp bacon. Place in hot preheated broiler, about 2 inches from source of heat, basting several times with sauce left from marinating fish, and turning frequently to brown all sides. Allow about 20 minutes for broiling. Or broil over moderately hot coals out-of-doors.

5. Place kabobs on heated platter and serve hot. Or serve, picnic style, with toasted buns and coleslaw. Barbecue Sauce will marinate about 2 pounds fish fillets or 6 to 8 kabobs.



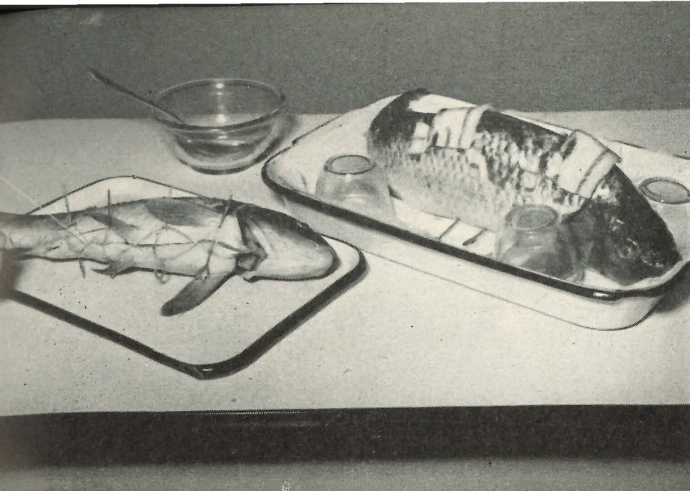


Fig. 16. Baked Fish — festive dinner in the making (below). Buffalo-fish or carp—with head, tail and small fins for looks. Stuffed with a savory bread dressing, held together with small skewers or sturdy tooth-

picks and laced string. Resting on cheesecloth in well-greased baking pan, brushed with fat and larded generously on top and in gashes cut along sides, propped with custard cups, the fish is ready for that moderately hot oven. When baked until browned and flesh leaves bone, tender and juicy, the fish with simple garnish will be set for that final test.

### Baked Stuffed Fish

Whole fish—drawn (3 to 5 lb.)	4 cups stale bread cubes
Salt	1 teaspoon salt
3 tablespoons chopped onion	$\frac{1}{8}$ teaspoon pepper
$\frac{3}{4}$ cup chopped celery tops and stalks	$\frac{1}{2}$ to 1 teaspoon finely crushed herb (sage leaves, marjoram, thyme or savory seasoning)
1 tablespoon minced parsley	
5 tablespoons fat (about)	4 slices salt pork or bacon

1. Select a fish weighing from 3 to 5 pounds; clean, fleece or scale (p. 204) and wash but do not split (head and dorsal or back fin may or may not be removed). Wipe fish dry; rub inside and outside with salt and let stand 10 minutes to absorb salt.

2. For dressing cook vegetables slowly in fat in heavy frying pan about 10 minutes, stirring occasionally; remove from heat, add bread cubes, salt, pepper and one herb or mixture of several, and mix thoroughly.

3. Stuff fish loosely leaving space for dressing to expand. Run small metal skewers or round, sturdy toothpicks through edges and lace together with string; or sew edges together. Prop mouth open with an olive or piece of vegetable.

4. Place fish, seam-side down, on greased rack or on

cheesecloth placed in bottom of well-greased shallow baking pan; arrange fish in letter "S" or circle if large, using props as needed to make fish stand up. Slash several times through skin on each side to allow for shrinkage. Brush with fat and lay slices of salt pork over top, or insert strips in gashes with remaining slices on top. If bacon is used, place on fish the last 15 minutes of baking.

5. Bake uncovered in moderate oven (350°-375° F.) for 40 to 60 minutes, or until skin is browned and flesh shrinks slight from frame. Baste occasionally with drippings or other fat.

6. Remove to hot platter; if baked on cloth fish may be easily transferred. Pull out fasteners and string. Garnish with parsley, lemon or tomato wedges and insert green or stuffed olives or pickled onions in eye sockets; arrange buttered boiled potatoes and one other seasoned vegetable around fish, as desired. Serve hot, plain or with Creole, Russian, Caper or Tartar Sauce (p. 233 to 235). Allow about  $\frac{3}{4}$  pound round fish per portion.

### Baked Stuffed Fillets

$2\frac{1}{2}$ to 3 lb. dressed fish	$\frac{1}{4}$ cup drippings
Salt, pepper, paprika	3 tablespoons lemon juice
2 cups bread dressing	3 to 4 slices bacon (opt.)*

1. Clean, wash, skin and fillet fish, leaving each side in one piece; season both sides lightly with salt, pepper and paprika.

2. Prepare about 2 cups bread dressing, using  $\frac{1}{2}$  of amounts used for Baked Fish (p. 214), or use your own dressing recipe. Place on one fillet, cover with other fillet, and fasten together with toothpicks or small skewers.

3. Place on well-greased rack or on cheesecloth placed in bottom of well-greased shallow baking pan. Brush with mixture of drippings and lemon juice.

4. Bake uncovered in moderate oven (350°-375° F.) for 40 to 50 minutes. If desired place bacon strips over top the last 15 minutes of baking; place under broiler, if necessary, to brown bacon.

5. Remove carefully to hot platter; remove fastenings, garnish as desired and serve hot, plain or with any tart sauce. Makes about 6 portions.

\*Optional.



### Baked Fish Fillets—Spencer Method

(A time-honored method, developed in the U. S. Bureau of Fisheries by the late Mrs. Evalene Spencer.)

2½ to 3 lb. dressed fish	1 cup sifted dry crumbs
1 tablespoon salt	4 tablespoons butter, bacon fat
1 cup milk	or oil

1. Clean, wash, skin and fillet fish; cut in portions for serving.

2. Pour salted milk into shallow pan; spread crumbs thinly over two flat plates or large baking sheet. Dip fillets into salted milk, then into crumbs, coating both sides; place in well-greased baking sheet or shallow pan. Crumbs should be dry for perfect covering. Pour melted fat over fish.

3. Place pan on shelf (near top) of very hot oven (500°-550° F.) and bake 10 to 12 minutes. The fillets should be dry, covered with brown, crisp crust, and moist inside. They should taste like fried fish.

4. With pancake turner or spatula transfer each piece to hot platter, garnish as desired, and serve hot, plain or with Lemon Butter or Tartar Sauce. Makes about 6 portions.

### Planked Fish

3 to 3½ lb. fish (whole and drawn) or 2 to 2½ lb. dressed fish (with or without tail)	Seasoned mashed potatoes
Salt, pepper	Seasoned cooked vegetables: (use 2 or more)
¼ cup chopped onion	Peas, carrots, mushrooms
Cooking oil or other fat	String beans, onions, beets
Lemon juice	Cauliflowerets, baked tomatoes
	Parsley or other greens
	Lemons or tomatoes

1. If special hardwood fish plank is used, soak in cold water 6 to 8 hours or longer, rub with oil, put in cold oven and heat thoroughly as oven is preheated.

2. Clean and wash fish: if small and whole or round (drawn), fleece or scale and bone (p. 204), but do not remove head and tail; if dressed (with or without tail), bone, leaving enough of lower backbone to hold fish together; or split and

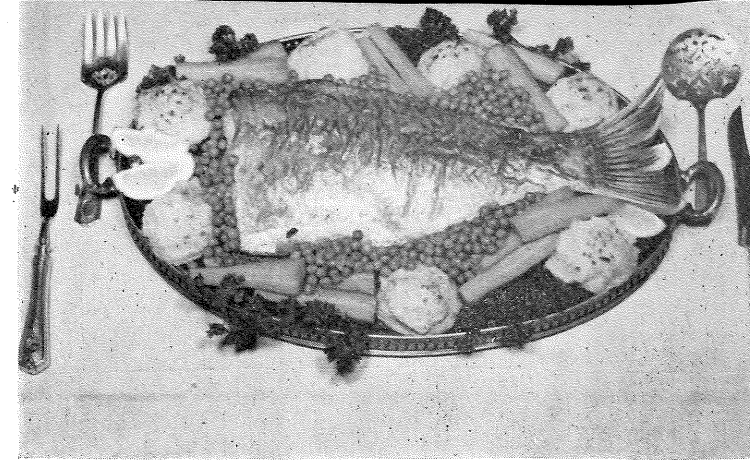


Fig. 17. Planked fish for a most attractive dinner. Buffalo-fish or carp, boned for ease in serving. Baked until nicely browned on well-seasoned hardwood plank soaked in water and oiled and preheated. An oven-glass platter (with no direct contact with flame), a metal platter, or shallow baking pan can be used. Potato rosettes browned right on plank or on pan and transferred to plank. Hot, well-seasoned colorful vegetables arranged simply around fish, in regular repeats or as space permits—not too crowded. Garnished with sprigs of parsley and lemon slices. Many attractive vegetable combinations are possible.

bone dressed fish. Dry and sprinkle all sides with salt and pepper.

3. Fry onion in 2 tablespoons fat until light yellow, stirring to brown evenly; scatter on inside of whole fish or over split fish. Brush with ½ of mixture of 3 tablespoons fat or oil and 1 tablespoon lemon juice, or with French dressing. Place fish in center of hot oiled plank, or on greased oven-glass or metal platter: whole fish on side; split fish flat with skin-side down.

4. Bake in moderately hot oven (375°-400° F.) allowing 40 to 50 minutes for whole fish, 20 to 30 minutes for split fish. Place under broiler if necessary to brown fish, but do not permit flame to touch glass platter.

5. Remove from oven and arrange border or rosettes of potatoes around fish. Place under broiler to brown potatoes. Remove, and quickly arrange two or more hot well-seasoned vegetables around fish. Place in plank holder or on small tray; garnish with parsley or other greens, and with lemon or tomato wedges or slices.

6. Serve hot, plain or with Lemon Butter (p. 234). Allow ⅓ to ½ pound dressed fish per portion.



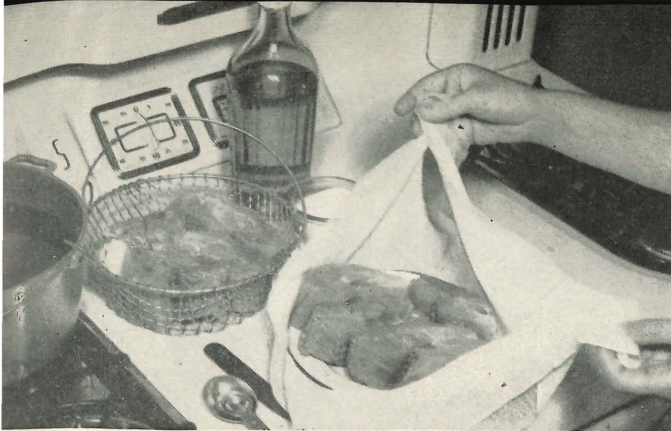


Fig. 18. Boiled Fish—delicately flavored, good to look at (below). Fresh-water fish (lean or fairly low in fat) are ideal for boiling or steaming. Thick slices hold together better than thin ones. Use deep

kettle with cover, half full of boiling salted water, plain or acidulated, or a seasoned vegetable stock (Court Bouillon). Fish can easily be lowered into and removed from the kettle if placed in wire basket or on plate tied in cheesecloth. Cook only until flesh leaves bone easily. Serve boiled fish with a rich colorful sauce (p. 233), with parsley-buttered potatoes, peas and tomatoes or any other attractive vegetable combination.

### Boiled Fish

<b>2½ to 3 lb. dressed fish</b>	<b>Salted water with acid (¼ to ½</b>
<b>2 quarts boiling liquid</b>	<b>cup vinegar or lemon juice, or</b>
<b>(about):</b>	<b>1 lemon, sliced) or</b>
<b>Salted water (2 to 3</b>	<b>Fish stock (bones and trimmings)</b>
<b>tablespoons salt) or</b>	<b>(2 to 3 tablespoons salt)</b>
<b>Court bouillon (p. 219) or</b>	

1. Clean and wash fish; cut crosswise in steaks or thick slices (1½ to 2 inches); or leave small fish whole with head, tail and fins removed.

2. Place layer of fish slices in wire basket, or on plate and tie in cheesecloth; or wrap whole fish in cheesecloth. Lower fish into deep kettle of boiling hot liquid, using one of the above liquids or any other as desired. Bring to a boil, then simmer, covered: 8 to 12 minutes for fillets and steaks; about 20 minutes for thick slices; longer, if necessary, for whole fish. When cooked, fish should separate from bone or break easily into flakes. Always simmer or cook fish below the boiling temperature.

3. Remove fish (without breaking) to hot platter, garnish

with parsley sprigs, and sprinkle with paprika. Serve hot with melted butter or lightly browned butter poured over fish, or serve with Egg, Tomato, Creole, or Tartar Sauce (p. 233) or any other rich, bright-colored sauce. Serve with buttered boiled potatoes, and one or two well-seasoned vegetables such as: green snap beans, peas, limas, carrots (cubes, slices or sticks), beets (baby, diced or sliced), kale, spinach, chard, cabbage (white or red), tomatoes (baked or broiled). Makes about 6 portions.

### Court Bouillon

<b>½ cup each chopped onions,</b>	<b>2 tablespoons salt</b>
<b>carrots and celery</b>	<b>4 whole cloves</b>
<b>6 sprigs parsley</b>	<b>6 peppercorns or whole black</b>
<b>2 tablespoons fat</b>	<b>peppers</b>
<b>2 quarts water</b>	<b>1 to 2 sprigs thyme or</b>
<b>¼ to ½ cup vinegar or lemon</b>	<b>basil leaves</b>
<b>juice or sliced lemon</b>	<b>1 bay leaf</b>

1. Cook vegetables in fat about 5 minutes to brown lightly; add 2 cups water, bring to a boil and add to remaining 1½ quarts water.

2. Add vinegar or lemon juice, salt, spices and herbs (tied in a bag) and cook 30 minutes; strain. Vary the combination of vegetables, spices and herbs, as desired.

3. Strain bouillon through cheesecloth after using, bottle and keep cold for future use.

### Steamed Fish

<b>2½ to 3 lb. dressed fish</b>	<b>Salt</b>
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1. Clean, wash and prepare fish as directed for Boiled Fish; salt both sides and let stand 5 to 10 minutes to season.

2. Place layer of fish in well-greased steamer or perforated pan, and cook over boiling water for 10 to 20 minutes, or until meat is tender and separates from bone.

3. Transfer to hot platter. See recipe for Boiled Fish for suggestions for garnishes and sauces. Makes about 6 portions.



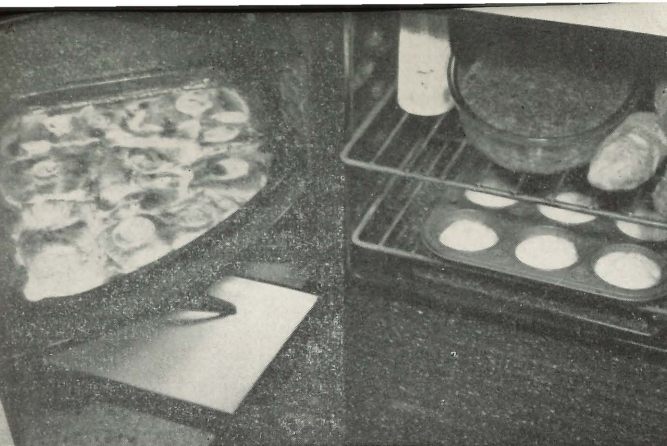


Fig. 19. Oven-Braised Fish in Cream (below). Fillets or slices are delicious even when crowded out of a full oven and into the broiler —

under the oven unit or with special broiler unit, as pictured. Use broiler pan (without rack) and place far down on very bottom of broiler. Check your oven thermostat occasionally with a dependable oven thermometer.

### Oven-Braised Fish With Tomato

2½ to 3 lb. dressed fish      2 cups drained, stewed tomatoes  
Salt, pepper, paprika      1 cup onion slices  
3 to 4 bacon slices, halved or minced

1. Clean, wash and dry fish; cut crosswise in thick slices (1 to 2 inches); or skin and fillet fish and cut in pieces for serving.

2. Sprinkle both sides lightly with salt, pepper and paprika, and place close together in greased shallow baking pan. Cover with tomatoes, seasoned with salt and pepper, and top with onion slices. Place bacon on top of each serving.

3. Bake, uncovered, in moderate oven (350°-375° F.) about 40 minutes, or until fish is tender; place under broiler for 5 minutes to brown and crisp bacon, if necessary.

4. Place on hot platter; garnish as desired. Serve plain. Makes about 6 portions.

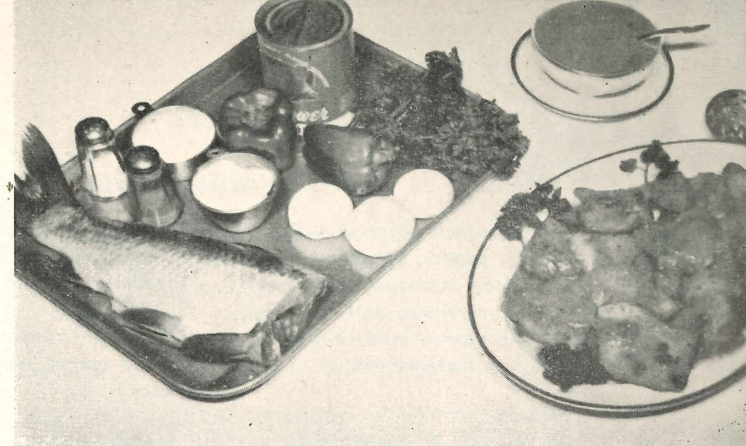
### Oven-Braised Fish in Cream

2½ to 3 lb. dressed fish      Onion slices (opt.)  
Salt, pepper, paprika      1 cup light cream or top milk  
Parsley or water cress

1. Clean, wash, skin and fillet fish; season both sides.

2. Sprinkle both sides lightly with salt, pepper and paprika, and place close together in greased shallow baking

Fig. 20. Fish Creole (p. 224). The ingredients on the tray make this a palatable and nutritious dish, high in proteins, vitamins (C,A) and iron.



pan or bottom of broiler pan. Place thick slice of onion on top of each slice or piece, if desired; pour cream over all.

3. Bake, uncovered, in moderate oven (350°-375° F.) until fish is cooked, basting occasionally with cream in pan. Allow 30 to 40 minutes for slices; 25 to 30 minutes for fillets. Place under broiler, if necessary, to brown slightly. Fish can be baked in bottom of broiler oven if pan is about 6 inches from heat. Fish absorbs most of the cream and is moist and delicately browned when baked with moderate heat.

4. Place on hot platter; garnish with parsley or water cress, minced and sprinkled over top. Serve hot, plain with sauce in pan. Makes about 6 portions.

### Fish Stew

2 to 2½ lb. dressed fish      3 cups potato sticks  
Salt, pepper, mace      2 cups carrot sticks  
1 bunch parsley, chopped      5 cups boiling water  
2 medium onions, sliced      2 tablespoons flour (opt.)  
½ cup cut celery tops      ¼ cup cold water (opt.)

1. Clean and wash fish; cut in 1½- to 2-inch thick slices. Rub thoroughly with salt, pepper and mace, and let stand to season.

2. Add vegetables and 1 teaspoon salt to boiling water and cook 10 to 15 minutes; add fish, bring to a boil and simmer, covered, 20 minutes, or until flesh leaves the bones easily and vegetables are just tender. If mixture is thin, thicken with paste made of flour and water; it should have consistency of thick stew.

3. Season to taste, pour into heated large bowl and serve hot. Makes about 6 portions.



### Oven-Braised Spiced Carp Fillets

2½ to 3 lb. dressed fish	¼ teaspoon caraway
Salt, pepper, paprika	⅛ teaspoon mixed spices
2 large onions, chopped	4 tablespoons butter or bacon drippings
¼ cup minced parsley	1 cup fine crumbs, seasoned
⅛ teaspoon minced thyme	⅓ cup lemon juice
1 bay leaf, minced	
1 cup water	

1. Clean, wash, skin and fillet fish; season both sides.
2. Scatter onions over bottom of well-greased oven-glass platter or shallow baking pan; lay fillets on top. Sprinkle mixture of herbs and spices over fish; spread crumbs, seasoned with butter or drippings, salt and pepper, over surface. Pour ⅓ of mixture of lemon juice and water over all.
3. Bake, uncovered, in moderately hot oven (350°-375° F.) about 30 minutes, basting twice with remaining liquid. Crumbs should be fairly dry and browned when fish is done.
4. Serve fish on oven-glass platter, or transfer from baking pan to hot platter. Makes about 6 portions.

### Curried Fish

2½ to 3 lb. dressed fish	1 to 2 teaspoons curry powder
Salt, pepper	2 cups fish stock
¼ cup fat	Dash of cayenne
1 medium onion, sliced	1 tablespoon lemon juice or vinegar
2 tablespoons flour	

1. Clean, wash, skin and fillet fish; cut in 2-inch squares. Season both sides with salt and pepper. Cook bones for stock.
2. Fry fish in fat, turning to brown both sides lightly; place fish in stewpan over hot water to keep hot.
3. Add onion, flour and curry powder to remaining fat in frying pan and cook 10 minutes, stirring to brown uniformly. Add stock, stirring and cooking until smooth and slightly thickened. Add cayenne and lemon juice, and season to taste with salt and pepper. Pour over fish in stewpan, cover tightly and let simmer over boiling water about 30 minutes to flavor fish thoroughly. Stir occasionally. Cold, left-over boiled fish may be heated in curry sauce without browning in fat.
4. Serve hot, piled up on hot platter or in large bowl. Makes about 6 portions.

### Fish With Dill

2½ to 3 lb. dressed fish	2 tablespoons chopped chives
Salt, pepper	2 tablespoons flour
1 bunch parsley, chopped	4 tablespoons butter or other fat
3 to 4 sprigs dill, fresh or dried, or	1¼ cups water
1 teaspoon dill seed	1 egg yolk, beaten slightly

1. Clean and wash fish; cut crosswise in slices for serving. Sprinkle both sides with salt and pepper, and place close together on bed of parsley covering bottom of well-greased baking pan. Sprinkle parsley, minced dill and chives over top.
2. Stir flour into melted fat; add water gradually, stirring and cooking until mixture thickens. Add 1 teaspoon salt and pour over fish. Cover tightly and simmer for 15 to 20 minutes, or until fish separates readily from bone; or bake, covered, in moderate oven (350° F.) for 20 to 30 minutes. Remove fish to hot platter and keep hot. Thicken pan gravy with egg yolk.
3. Pour gravy over fish. Arrange parsley-buttered boiled potatoes around fish, if desired. Makes about 6 portions.

### Fish Piquant

2½ to 3 lb. dressed fish	1 teaspoon chili powder or
Salt	⅛ teaspoon cayenne
⅓ cup butter or other fat	2 cups fish stock
2 large onions, sliced	Pepper, paprika
1 clove garlic, sliced	⅛ teaspoon celery seed
¼ green pepper, chopped	½ teaspoon grated lemon rind
3 tablespoons flour	3 tablespoons lemon juice

1. Clean, wash and skin fish; fillet and cut in pieces, or cut fish crosswise in 1-inch thick slices, or leave fish whole.
2. Season; sauté in butter. Remove fish to stewpan; keep hot.
3. Add onions, garlic and green pepper to fat in frying pan and cook about 10 minutes, stirring occasionally; add flour and chili powder, stirring and cooking until lightly browned. Add stock gradually, stirring until smooth and thickened. Season to taste with salt, pepper, paprika and celery seed; stir in lemon rind and juice or vinegar. Pour sauce over fish and cook 5 minutes.
4. Arrange fish on hot platter or in shallow serving bowl; pour sauce over fish; sprinkle minced parsley over top, if desired. Serve hot. Makes about 6 portions.



### Fish Creole

2½ to 3 lb. dressed fish	3 tablespoons flour
Salt, pepper	¼ cup water
1 clove garlic, sliced (opt.)	2 cups tomato pulp
⅓ cup cooking oil or other fat	1 tablespoon sugar
3 medium onions, sliced	½ teaspoon Worcestershire sauce
2 green peppers, chopped	Parsley or chives, minced

#### Paprika

1. Clean, wash, skin and fillet fish; cut in 2-inch squares. Sprinkle both sides with salt and pepper.

2. Fry fish and garlic in oil or other fat about 8 minutes, or until fish is lightly browned on both sides, turning once; remove fish to hot stewpan, and keep hot over boiling water.

3. Cook onions and peppers in fat in frying pan 10 minutes, or until nearly done; stir in flour, then water and tomato pulp, cooking and stirring until smooth and thickened. Add fish, sugar, Worcestershire sauce and additional salt and pepper, if needed; cover and simmer 10 minutes to flavor fish.

4. Place on hot platter or in shallow bowl; sprinkle minced parsley and paprika over all; or place in center of ring of cooked rice or well-seasoned mashed potatoes, arranged on hot large platter or chop plate. Makes about 6 portions.

### COOKED OR CANNED FISH

Leftover portions of cooked or canned fish may be made into a variety of attractive, palatable and nutritious luncheon, dinner or supper dishes, simple or more elaborate as you wish. Different types of recipes are included in this section. Possible combinations and flavorings are many and can be varied as taste and material at hand dictate. Use smaller amounts of lemon juice, vinegar or ketchup with fish canned with acid, and salt to taste, sparingly to begin with.

Flake or pull apart cooked fish carefully removing all bones, large and small; flake, cube or break into larger pieces canned fish, crushing or breaking into bits the softened and edible bones for additional calcium and phosphorus. The softness of bone will vary with size of bones and method used in processing. Cook all home-processed fish 10 minutes before

Fig. 21. Fish Timbales — so simple to serve (below). A custard type of leftover or canned fish dish high in calcium if softened bones in canned fish are eaten. Tender and firm if baked in shallow pan of hot water in thermostat-regulated oven. A reliable oven thermometer used occasionally for double check. Attractively served in cups or turned out on hot platter.



tasting or using in any food preparation (p. 237); the pieces are broken up into flakes when boiled. One pint canned fish makes about 1¼ cups flaked fish.

### Fish Timbales

2 cups flaked cooked or canned fish	2 tablespoons flour
1 tablespoon lemon juice	1 cup milk
1 tablespoon chopped onion	2 eggs, beaten slightly
2 tablespoons chopped green pepper or parsley	½ to 1 teaspoon salt
2 tablespoons butter	Dash of pepper
	Dash of paprika
	½ cup grated American cheese
	½ cup fine crumbs, buttered

1. Pull fish apart into coarse flakes removing all inedible bones; add lemon juice and toss together lightly with fork.

2. Cook vegetables in butter or other fat about 5 minutes; stir in flour and add milk gradually, stirring and cooking until smooth and thickened. Remove from heat, stir in eggs and seasonings; add to fish and mix well. If fish is moist and mixture thin, add crumbs to thicken slightly.

3. Fill greased custard cups or ramekins with mixture. Sprinkle cheese over top and cover with bread crumbs, browned lightly in 2 tablespoons butter and seasoned with salt and pepper.

4. Place cups in shallow pan of hot water in moderate oven (350° F.) and bake 30 minutes, or until well browned and firm.

5. Serve in cups or ramekins, or turn out on hot platter and garnish with lemon slices and parsley or water cress. Makes 6 cups or ramekins.



**Fish Soufflé**

2 cups flaked cooked or canned fish	2 tablespoons bacon drippings or other fat
2 to 4 tablespoons ketchup	½ to 1 teaspoon salt
¼ cup cut celery	⅛ teaspoon pepper
2 tablespoons chopped onion	Dash of cayenne
¼ to ½ cup chopped green pepper or raw carrot	2 cups well-seasoned mashed potatoes
4 eggs, separated	

1. Pull fish apart into coarse flakes removing all inedible bones; add ketchup and toss together lightly with fork.

2. Cook celery, onion, green pepper or carrot in fat 10 minutes; remove from heat, add seasonings, potatoes and fish, and mix well.

3. Beat egg whites until stiff but not dry. Then beat egg yolks until thick and light colored; add yolks to fish and vegetable mixture and mix well. Fold in egg white and turn into greased large casserole.

4. Set in shallow pan of hot water and bake in moderate oven (350° F.) for 50 to 60 minutes, or until delicately browned and firm when touched.

5. Serve at once with Russian or Caper Sauce, or with any other tart fish sauce (p. 234). Makes about 6 large portions.

**Fish Loaf**

2 cups flaked cooked or canned fish	½ cup finely chopped celery
1 to 2 tablespoons lemon juice, vinegar or ketchup	4 tablespoons flour
5 slices bacon	1 cup tomato juice or milk
2 to 4 tablespoons chopped parsley or green pepper	¾ teaspoon salt
	⅛ teaspoon pepper
	½ cup fine bread crumbs (about)
	Fat

1. Pull fish apart into coarse flakes removing all inedible bones; add lemon juice and toss together lightly with fork.

2. Dice 3 slices bacon, fry until lightly browned; add vegetables and cook 5 minutes. Stir in flour, add tomato juice or milk gradually, stirring and cooking until smooth and

thickened. Remove from heat, season and add fish and enough crumbs to thicken, mixing well.

3. Shape into loaf and place on oiled paper or greased cheesecloth on rack in open roasting pan. Or form into loaf in greased baking pan. Brush surface with fat.

4. Bake in moderate oven (350° F.) about 45 minutes, or until browned and firm, placing remaining slices of bacon over top the last 15 minutes of baking. Place under broiler, if necessary, to crisp bacon.

5. Remove to hot platter, garnish with parsley, lemon or tomato wedges. Serve with Creole, Russian or Tartar Sauce (p. 234); or pour sauce over loaf. Makes about 6 portions.

**Shepherd's Fish Pie**

2 cups flaked cooked or canned fish	2 cups milk
2 tablespoons chopped onions	1 teaspoon salt
2 tablespoons chopped parsley or green pepper	Paprika
3 tablespoons butter or other fat	½ cup cooked peas or green snap beans
4 tablespoons flour	½ cup diced cooked carrots
	3 cups well-seasoned mashed potatoes (about)

1. Pull fish apart into coarse flakes removing all inedible bones.

2. Cook onion and parsley or green pepper in fat about 5 minutes, or until onion is lightly browned; stir in flour and add milk gradually, stirring and cooking until smooth and thickened. Add seasonings, peas or beans, carrots and fish, and mix well.

3. Line sides of greased baking dish with thin layer of potatoes, fill center with creamed mixture and cover with layer of potatoes. Brush top with additional milk or melted butter to brown more evenly.

4. Bake in hot oven (400°-425° F.) about 15 minutes, or until lightly browned on top.

5. Serve hot in baking dish, covering dish with folded napkins, if desired. Makes 6 to 8 portions.



### Fried Fish Cakes

2 cups flaked cooked or canned fish	Dash of pepper
2 cups well-seasoned mashed potatoes	1 teaspoon thyme or sage, or 1 tablespoon Worcestershire sauce
1 tablespoon minced onion or chives	1 egg, beaten slightly
1/2 teaspoon salt	Milk
	4 tablespoons cooking fat

1. Pull fish apart into coarse flakes removing all inedible bones. Add potatoes, onion or chives, seasonings and egg, and mix well; add milk as needed to moisten. Shape into flat cakes about 1 inch thick.

2. Fry in fat in heavy frying pan until browned and crusty on both sides, turning once.

3. Place on heated platter, garnish with tomato or lemon wedges. Serve hot, plain or with Creole, Tomato or Tartar Sauce (p. 234). Makes about 12 cakes.

### Manhattan Fish Chowder

4 cups flaked or cubed cooked or canned fish	1 medium onion, chopped
1 1/2 cups cubed potatoes	1/2 cup chopped green pepper
1 cup water	2 tablespoons flour
1 cup fish or meat stock	2 cups stewed tomatoes
1/3 cup diced salt pork (2 oz.)	1/4 teaspoon salt
1/2 cup cut celery	1/8 teaspoon pepper
	Pilot or other crackers

1. Cube cooked fish removing all bones; flake canned fish, crushing soft bones.

2. Cook potatoes, covered, in boiling water and fish or meat stock 10 minutes.

3. Fry salt pork to a golden yellow. Add celery, onion and green pepper, and cook about 5 minutes; stir in flour, then tomatoes, cooking and stirring until thickened. Add to potatoes and continue cooking 10 minutes, or until vegetables are tender but not mushy. Add fish and seasonings; simmer, covered, 5 minutes, or until thoroughly heated, adding more salt if desired, and boiling water if too thick; chowder is a thick soup.

4. Serve hot in heated tureen or soup bowls over toasted crackers. Makes about 6 portions.

### New England Fish Chowder

4 cups (2 lb.) flaked or cubed cooked or canned fish	2 cups sliced potatoes
3/4 cup (4 oz.) salt pork, cubed	4 cups milk, scalded
1/2 cup sliced onion	1/8 teaspoon pepper
4 cups water	1 lemon, sliced (opt.)
1 teaspoon salt	Paprika
	Minced parsley or chives
	Crisp crackers or toast points

1. Flake or cube cooked or canned fish.

2. Fry pork to a golden yellow; add onion and cook until pork is crisp and onion a light yellow, stirring occasionally. Add water and salt, bring to boil and pour into saucepan. Add potatoes, cover, and cook 20 minutes, or until nearly done. Add fish and simmer 5 minutes to heat thoroughly. Just before serving, add hot milk, lemon slices and additional seasoning, if needed.

3. Pour, piping hot, into heated soup bowls, sprinkling paprika and minced parsley or chives over each; or pour into heated large tureen and serve at table. Serve with crackers or toast points. Makes about 8 portions.

### Cream Fish Soup

2 cups flaked cooked or canned fish	1 teaspoon salt
1/4 cup sliced onion	1/8 teaspoon pepper
1 cup chopped celery	1 teaspoon caraway (opt.)
4 tablespoons butter or other fat	1 to 2 tablespoons vinegar or lemon juice (opt.)
4 tablespoons flour	Paprika or minced chives or parsley
4 cups milk, scalded	Toast sticks or crisp crackers

1. Pull fish apart into coarse flakes removing all inedible bones.

2. Cook vegetables slowly in fat in saucepan about 15 minutes, or until tender but not browned, stirring occasionally. Add flour and mix well. Add milk gradually, stirring and cooking until mixture thickens. Place over boiling water; add seasonings and fish, and cook about 5 minutes to heat thoroughly. Add more salt, if needed. Just before serving stir in vinegar or lemon juice, if desired.

3. Pour into heated soup bowls, sprinkle paprika, minced chives or parsley over tops, and serve with toast sticks or crisp crackers. Makes about 6 portions.



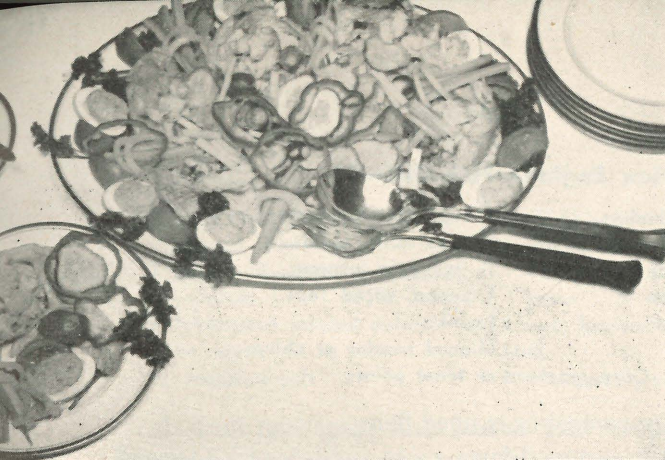


Fig. 22. A sumptuous salad platter for easy and attractive service. Vitamin- and mineral-rich vegetables arranged casually around individual, savory fish salads in lettuce cups. All vegetables washed and crisped in refrigerator in vegetable container or in waxed paper, and prepared just before serving for maximum vitamin richness. Bunches of carrot sticks run through onion rings, cucumber slices with green scalloped edges, green pepper rings, tomato wedges, parsley sprigs, radish roses and deviled eggs, all combine to make this a tempting salad. For equally attractive salads see p. 230 to 232.

frigerator in vegetable container or in waxed paper, and prepared just before serving for maximum vitamin richness. Bunches of carrot sticks run through onion rings, cucumber slices with green scalloped edges, green pepper rings, tomato wedges, parsley sprigs, radish roses and deviled eggs, all combine to make this a tempting salad. For equally attractive salads see p. 230 to 232.

### Fish Salad

- |  |   |
|--|---|
| 2 cups cubed or flaked cooked or canned fish     | 1 tablespoon Worcestershire sauce, or 1 tablespoon ketchup or chili sauce |
| 2 to 3 cups prepared vegetables, fresh or canned | <b>Salad dressing:</b>  |
| 2 to 4 tablespoons salad oil                     | French dressing, mayonnaise or cooked dressing                            |
| 2 to 4 teaspoons lemon juice                     | Crisp lettuce or any other salad setting                                  |
| 1 teaspoon minced onion (opt.)                   | Parsley or other garnishes  |
| 1 to 1½ teaspoons salt                           |   |
| ⅛ to ¼ teaspoon paprika                          |   |

1. Place cubed or flaked fish in large bowl, rubbing bowl first with a freshly cut surface of onion or garlic, if desired; chill.

2. Use one of the vegetable combinations suggested (p. 231), or choose your own combination from vegetables at hand. Crisp and firm vegetables add body to salad. Use sound, fresh vegetables. Crisp, if necessary, and cut up for salad just before serving; or use firm, not soft or mushy, cooked vegetables, chilled.

3. Add cold vegetables to fish; sprinkle combined oil, lemon juice or vinegar and seasonings over all, and toss together lightly with spoon and fork. Mix with salad dressing; season.

4. Serve on crisp lettuce or on any other salad setting listed (p. 231), as individual salads, or in salad bowl with additional dressing. Garnish as desired (p. 235). Makes 6 to 8 portions.

### Vegetable Combinations With Suggested Preparations

- |   |   |
|---|---|
| I.  | II.   |
| Cucumber—cubed, sliced                              | White, red or Chinese cabbage—shredded, chopped     |
| Celery—cubed, strips                                | Carrots—grated, strips, cubed                       |
| Lettuce, romaine—shredded                           | Olives, green or ripe—chopped, sliced               |
| Spinach (raw)—shredded                              | Chives—minced, chopped, or scallions—sliced         |
| White onion—minced, sliced                          | Pimiento—chopped, sliced                            |
| Red radishes—sliced, cubed                          |   |
| Green pepper—sliced, chopped, shredded              |   |
| III.  | IV.   |
| Red radishes—sliced                                 | Tomato—wedges, sliced                               |
| Cauliflowerets—sliced, or cabbage—shredded, chopped | Cucumber—sliced, cubed, strips                      |
| Parsley—coarsely cut                                | Green or red sweet pepper—sliced, chopped, shredded |
| Celery—cubed, strips                                | Celery—cubed, strips                                |
| Pickles—cubed, sliced                               | Chives—minced, chopped                              |
| Pimiento—shredded, sliced                           | Turnips (raw)—diced, strips                         |
| V.  | VI.   |
| Cooked peas, green snap or kidney beans             | Cooked beets—cubed, or cooked asparagus—tips        |
| Cooked cauliflowerets                               | Green pepper—rings, chopped                         |
| Celery—strips, cubed                                | Scallions—sliced                                    |
| Bermuda onion—sliced, minced                        | Water cress—coarsely cut                            |
| Carrots—strips, cubed                               | Pimiento—shredded, sliced                           |
|   | Cooked potatoes—cubed                               |

### Salad Settings

- |   |  |
|---|--|
| Crisp lettuce, romaine—leaves, shredded           | Apple or orange cups                     |
| Water cress—sprigs                                | Chicory or French endive—leaves shredded |
| Spinach, dandelion greens—tender leaves, shredded | Chinese or celery cabbage—shredded       |
| Curly endive, escarole—leaves, shredded           | White and red cabbage—shredded           |
| Tomatoes—wedges, cups                             | Grape leaves                             |
| Avocado—wedges, rings                             | Nasturtium leaves                        |



### Picnic Fish Salad Bowl

2 to 3 cups cubed or flaked cooked or canned fish	12 red radishes, sliced 2 tablespoons minced onion or chives
6 to 8 slices bacon, fried crisp and chopped (opt.)	1 to 1½ teaspoons salt
2 to 3 cups cubed hot potatoes	¼ teaspoon pepper
½ cup diced celery	Paprika
½ to 1 cup cubed cucumber or chopped cabbage	¼ cup ketchup ⅓ to ½ cup mayonnaise, or cooked salad dressing
1 bunch parsley, chopped, or 1 green pepper, sliced	Crisp lettuce or shredded cabbage
2 to 3 hard-cooked eggs	

1. Combine fish cubes or flakes, bacon, potatoes and crisp vegetables, seasonings and salad dressings, by tossing together lightly with fork. Add sufficient dressing to moisten; season to taste. Cubed eggs may be mixed with salad, if desired.

2. Chill large bowl, rub inside with freshly cut surface of onion or garlic, and line with crisp lettuce leaves or finely shredded red or white cabbage. Fill with salad mixture; arrange slices of egg over top if not combined with salad. Sprinkle additional paprika or minced parsley or chives, lightly over top. Makes 6 to 8 portions.

### Sandwich Fillings

½ cup flaked cooked or canned fish	1 to 3 teaspoons minced onions, chives, olives, parsley, water
2 to 4 tablespoons salad dressing	cress, green or red pepper, mushrooms
Seasoning to taste (Choose one or several)	Condiments, spices, herbs to taste (Use sparingly, add one at a time)
1 to 2 tablespoons prepared horse-radish	Salt, pepper, paprika, cayenne, celery, dill and caraway seed,
1 to 2 teaspoons prepared mustard	bay leaf, thyme, tarragon, marjoram, cherril
1 to 4 tablespoons ketchup, chili sauce, sandwich spread, chopped olives, pickles, pimiento, mushrooms	1 to 3 tablespoons cooked vege- table, chopped

### SAUCES FOR FISH DISHES

Choose a sauce to accentuate the fine qualities inherent in fish. The right sauce blends with rather than disguises or covers up the natural flavor of fish—sometimes subtly, sometimes by contrast. The right sauce enhances the delicate neutral color of fish and makes it more attractive and appetizing.

#### White Sauce

2 tablespoons butter or other fat	1 cup milk ½ teaspoon salt
2 tablespoons flour	⅛ teaspoon pepper

1. Melt butter or other fat and stir in flour; add milk gradually, stirring until mixture boils and thickens; then cook slowly 5 minutes longer, stirring occasionally; add seasonings.

2. Place over hot water until ready to use; cover tightly to prevent skin from forming over top.

3. Use as foundation for creamed sauces, creamed or scalloped fish dishes. Makes about 1 cup sauce.

#### Caper Sauce

1 cup White Sauce	2 to 4 tablespoons capers
½ teaspoon lemon juice	Dash of paprika

1. To hot white sauce, add lemon juice, capers and paprika.

2. Serve hot with boiled, fried or baked fish. Makes 1 cup sauce.

#### Tomato Sauce

2 cups canned or stewed tomatoes	⅛ teaspoon pepper
1 small onion, chopped	2 tablespoons butter or other fat
½ teaspoon celery salt	2 tablespoons flour
⅛ teaspoon powdered thyme	Fish stock or water
	½ teaspoon Worcestershire sauce

1. Cook tomatoes, onion and seasonings 10 minutes; force through sieve.

2. Melt butter or fat and stir in flour; add tomato pulp, stirring and cooking until thickened, and cook slowly 5 minutes longer. Thin to desired consistency with fish stock or water, and add Worcestershire sauce and more seasoning, if desired.

3. Serve hot with fish dishes. Makes about 1½ cups sauce.



**Egg Sauce**

- |                             |                        |
|-----------------------------|------------------------|
| 1 cup White Sauce           | 1 teaspoon dry mustard |
| 2 hard-cooked eggs, chopped | Salt                   |
| 1 tablespoon chopped chives | Pepper                 |

1. To hot white sauce add eggs; season with chives, mustard, salt and pepper.

2. Serve hot with boiled, fried or baked fish, or with dishes made with cooked or canned fish. Makes about  $1\frac{1}{3}$  cups sauce.

**Russian Sauce**

- |  |                            |
|--|----------------------------|
| 1 cup White Sauce                        | 2 teaspoons Worcestershire |
| $\frac{1}{2}$ cup grated American cheese | sauce, or 6 drops Tabasco  |
| $\frac{1}{2}$ cup green olives, chopped  | sauce                      |
| 1 tablespoon chopped pimiento            | 2 tablespoons chili sauce  |

1. To hot white sauce, add cheese and heat over hot water until cheese is melted; then add remaining ingredients.

2. Serve hot with boiled, fried or baked fish, or with dishes made with cooked or canned fish. Makes about  $1\frac{1}{2}$  cups sauce.

**Creole Sauce**

- |   |                         |
|---|-------------------------|
| $\frac{3}{4}$ cup finely chopped onions | 4 tablespoons butter or |
| 1 cup finely chopped sweet or           | salad oil               |
| green peppers                           | 2 cups stewed tomatoes  |
| 1 clove garlic, minced                  | Salt, pepper, paprika   |

1. Cook fresh vegetables in fat 10 minutes, or until tender, stirring frequently; add tomatoes and cook 5 minutes; season.

2. Serve hot with baked or boiled fish, or with fish cakes or other fish dishes. Makes about  $2\frac{1}{2}$  cups sauce.

**Maitre D'Hôtel Butter (Lemon Butter)**

- |                                       |                              |
|---------------------------------------|------------------------------|
| $\frac{1}{3}$ cup butter              | 2 tablespoons minced parsley |
| $\frac{1}{2}$ tablespoons lemon juice | $\frac{1}{2}$ teaspoon salt  |
| Dash of pepper                        |                              |

1. Cream butter until soft, gradually working in the lemon juice, parsley, salt and pepper; beat until fluffy.

2. With chilled butter paddles roll into small balls,  $\frac{3}{4}$  to 1 inch in diameter; roll in additional minced parsley if desired; chill.

3. Place one ball at the side of each serving of broiled or fried fish. Or spread mixture on fish just before serving. Makes about  $\frac{1}{3}$  cup sauce or 6 balls; or serve hot as Lemon Butter.

**Tartar Sauce**

- |   |                             |
|---|-----------------------------|
| 1 cup mayonnaise                            | 1 tablespoon finely chopped |
| 1 tablespoon finely chopped                 | parsley                     |
| sweet or dill pickle                        | 1 tablespoon finely chopped |
| 1 tablespoon chopped olives,                | onion or chives             |
| plain or stuffed                            | 1 tablespoon capers (opt.)  |
| 2 teaspoons lemon juice or tarragon vinegar |                             |

1. Combine ingredients; chill.

2. Serve cold with fried, broiled or boiled fish, or with any fish dish. Or use as dressing for fish salads. Makes about  $1\frac{1}{4}$  cups sauce.

**GARNISHES FOR FISH DISHES**

To add piquancy to a fish dish, fresh vegetable garnishes must be crisp, tender and cold, and bring contrast in color, texture and shape. For thorough chilling and crispness, wash vegetables (do not soak), drain and place in refrigerator: in closed compartment under freezing unit, or in any covered container, or on tray when wrapped in waxed paper or a moist cloth.

For maximum food value prepare chilled vegetables just before using; if sliced or cut into shapes and left exposed to heat and air, they lose most of their vitamins A and C. Pare very sparingly; many vitamins and minerals are deposited close to the skin. Always use a sharp knife when paring or cutting into slices, sticks, shreds, cubes or dices. Bruising with a dull knife destroys more vitamin C.

**Garnishes With Suggested Preparations**

- |                                 |                                     |
|---------------------------------|-------------------------------------|
| Water cress and parsley—sprigs, | Scallions—whole, sliced             |
| minced                          | Lemon—slices, wedges                |
| Tomatoes—slices, wedges         | Olives, green, ripe, stuffed—whole, |
| Celery—hearts, curls, sticks    | sliced, minced                      |
| Radishes—whole, slices, roses   | Pickles, sweet, dill—whole, sliced, |
| Green and sweet red pepper—     | minced                              |
| strips, rings                   | Pimiento—strips, rings, shapes      |
| Cucumber—slices, sticks         | Beets, cooked—whole, fancy          |
| Carrots—sticks, curls, shredded | shapes                              |
| Bermuda or Spanish onion—       | Eggs, hard-cooked—slices,           |
| slices, rings                   | wedges, grated (yolk), deviled      |



## HOME PRESERVATION OF FISH

Fish may be preserved in many different ways in the home: they may be canned, pickled, smoked, corned, brine cured, dried and dry salted. This pamphlet deals with only three methods: canning, pickling (modified canning or cooking in an acid sauce) and smoking. Buffalofish, carp and sheepshead were preserved by all three methods by following tried recipes and recommended directions. Experimental work was limited largely to points in technique, i. e., ease of method, time involved in each process, equipment available in the average home, desirability and keeping qualities of the final products. The results have been incorporated in the recipes and directions that follow.

### CANNING (10-19)

When properly done, canning is one of the most satisfactory methods developed for preserving perishable foods. The fundamental principle involved in canning is to destroy or render inactive by heat all the organisms which are likely to cause spoilage in hermetically sealed containers with minimum sacrifice of flavor and texture to the food. Processing at high temperature (240°-250° F. or 10-15 lb. pressure in a pressure canner or cooker) for a short time, or at the temperature of boiling water (boiling water bath) for a long time, will destroy or inactivate the active or vegetative organisms that cause spoilage. Some of the heat-resistant spore forms of the thermophilic or "heat loving" bacteria are not destroyed in either the pressure canner or the boiling water bath, but ordinarily they will not grow at room temperature. However, these same organisms will grow if temperature conditions are favorable. It is highly important, therefore, to cool processed foods quickly and thoroughly, and to store them in a cool place, well below the optimum temperature (100°-130° F.) for the growth of many organisms. Spoilage may occur during a short or long storage period. As a rule, home-processed foods should not be held longer than 9 months or a year.

### Types of Spoilage

Bacteria may cause different types of spoilage in canned foods. The fermentation types produce acid with gas, and

give a sour or cheesy flavor to the food. The gas present may break the seal of glass jars or cause tin cans to bulge. Other types of bacteria may produce acid without gas formation. This type of spoilage, referred to as flat-sour spoilage, occurs especially in corn, peas and snap beans. A third type, the heat-resistant clostridium botulinum of the putrefaction type, is widespread in nature both in the soil and in food. While these bacteria are present in most foods they will not grow or produce toxins when taken into the body. But these same bacteria (clostridium botulinum) may produce in canned foods a toxin which is deadly poisonous in its effect. The presence of this toxin is not always detected by a putrid or off-odor, or by the presence of gas or darkening or softening of the contents. The botulinus toxin is most likely to occur in nonacid foods.

### Botulinus Toxin in Foods Made Harmless by Boiling

Fortunately, poisoning from botulinus bacteria is rather infrequent in occurrence, and the toxin, if present, is rendered harmless by boiling. Hence as a precaution against the possible presence of botulinus toxin, **boil all home-processed (pressure canner and boiling water bath) non-acid foods such as fish and vegetable products, 10 minutes before tasting or serving.** Remove fish to stewpan, add just enough water to prevent fish from burning, cover, bring to a boil and **boil 10 minutes**, stirring frequently with fork to heat thoroughly. If an off-odor is apparent in the first steam or in any steam which forms, do not use product. Discard all jars of home-processed foods with leaky lids, any off-odor or any other signs of spoilage. Always destroy by burning or burying any spoiled processed fish whenever possible; if placed in waste can, boil 10 to 20 minutes before discarding to protect against any possible poisoning of animals.

### Processing Acid and Nonacid Foods

In general, all types of organisms are more readily destroyed or rendered inactive by processing, as the acidity of the food increases, as the number of micro-organisms in the food decreases (they increase as food is held or stored), as the temperature in processing is raised, and as the size of the container is reduced (pint jars preferable to quart size). For



acid foods the boiling water bath is the method most generally used; for nonacid foods, the pressure canner is most satisfactory. The pressure canner method is the only one recommended for all nonacid foods by many State Experiment Stations and Extension Services, and by the Bureau of Human Nutrition and Home Economics, U. S. Dept. of Agriculture, and the Fish and Wildlife Service, U. S. Dept. of Interior. However, incomplete processing may occur in the pressure canned products, due largely to temperature variations resulting from a faulty pressure gauge, or from faulty operation of the pressure canner (fig. 26, p. 240). The boiling water bath method has successfully been used for nonacid foods (including fish) by many Iowans. Nevertheless, it is advisable to use this method for processing fish **only** when a pressure canner is not available (fig. 28, p. 241). The addition of vinegar or lemon juice in the amounts indicated in the recipes probably changes the acidity of the fish enough to aid in both methods of processing (16, 17, 18, 19).

### Steps in Canning

Fish are highly perishable and deteriorate rapidly under improper storage conditions, with micro-organisms increasing greatly in number. For quality product, process fish only when fresh—promptly and quickly. To avoid delays and reduce spoilage, begin with all canning equipment checked and scrupulously clean. Thorough familiarity with all important steps in canning, including operation of canners, is essential.

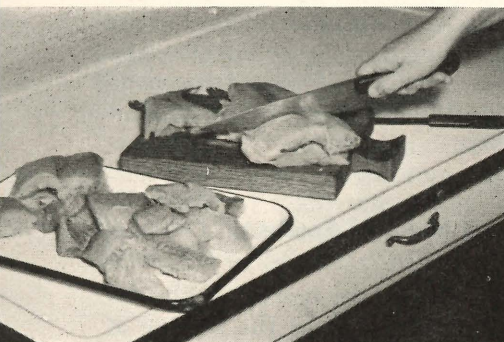


Fig. 23. Preparation of fish.

1. Prepare just enough fish to be processed at one time. For most attractive appearance, remove skin and red streak of flesh along sides of buffalofish and carp. About 1 pound will fill pint jar.

2. Split along back bone removing larger bones only; smaller bones usually soften during processing and supply valuable calcium when eaten.

3. Cut into circular pieces—container length or shorter, or in 1-inch strips. Brining is not essential with quality fish—it tends to make flesh firmer but it dissolves a small amount of soluble nutrients.

Fig. 24. Filling the jars.

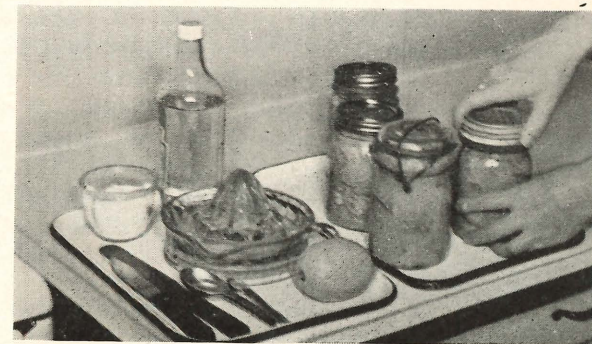


1. Wide-mouthed, short-necked pint jars, if free from chips and cracks, are ideal when available. Processing temperature reaches center in smaller jars, more quickly than in larger jar. Processed 15 minutes or more, jars need not be sterilized before filling but they must be thoroughly scrubbed and rinsed. Tighten loose wire clamps on jars.

2. Pack fish (without crushing) into jars, flush with rim, to make attractive looking jars: large pieces circular fashion, strips up and down.

3. No "head space" necessary. Shrinkage of fish during processing leaves adequate head space.

Fig. 25. Filled jars ready for processing.



1. Add 1 teaspoon salt, and 3 teaspoons vinegar or  $1\frac{1}{2}$  teaspoons lemon juice to pint jar when half full (no water); acid improves quality of fish and aids in softening bones. Wipe off necks of jars to remove any material on sealing edge.

2. Use new live rubber rings, screw tops and self-sealing lids; dip in boiling water before using; do not boil lids that have a sealing composition.



3. Adjust lids to permit air to escape from jars: partially seal glass tops (side clamp up) or screw tops (turned until rubber grips); completely seal self-sealing lids (bands screwed tight or clamps adjusted to hold tops to jars)—tops are raised enough to let air escape from jars during processing.



**Fig. 26. The pressure canner or cooker for processing.**

1. The pressure canner is ideal for processing all nonacid foods when the pressure gauge is accurate and the canner is operated correctly. The pressure gauge should be checked for accuracy at the beginning of the canning season, or oftener if

the canner is used a great deal. At 10 pounds pressure the temperature of steam within the canner is 240° F., at 15 pounds pressure, 250° F.

2. Add water enough to canner to come up to the bottom of the rack placed in canner. Use tongs to lower jars onto rack, leaving space between each for circulation of steam. Adjust and tighten cover. To drive all air out of the canner or cooker, let steady jet of steam escape from petcock before closing it. To make sure that all air is out, allow from 5 to 7 minutes to elapse after the steam first begins to escape before closing the petcock. If all air is not driven out the temperature of the two gases (air and steam) within the canner may vary from 4° to 39° F. from that indicated by the pressure gauge for all steam (17). As a result, the temperature of the product in the center of the jars will not reach the desired degree, and the food will not be processed properly.

3. Begin counting processing time when the pressure gauge reaches the desired point. Keep pressure constant—no ups or downs if you wish to keep liquid within jars. If for any reason steam should escape from canner with the pressure remaining constant, the temperature within the canner will agree with that indicated by the gauge and processing will be complete. Pressure gauges are delicate instruments which can

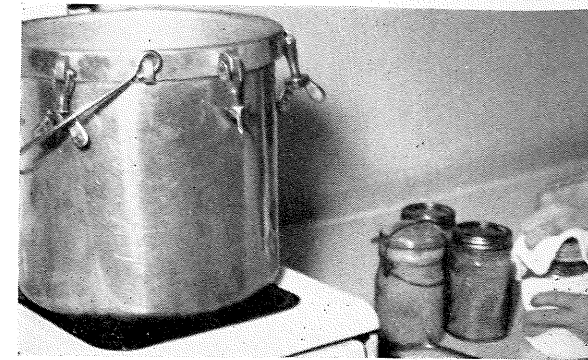
easily get out of order with careless handling. The equipping of every canner with a thermometer to indicate the temperature of the retort would be a marked improvement over the present canners, equipped only with pressure gauges. In addition to detecting any irregularities between the actual temperature of the canner and the theoretical temperature indicated by the gauge, it would be of definite help in maintaining the pressure-temperature relationship at higher altitudes: for every 2,000 feet elevation above sea level, the pressure must be increased 1 pound (12). Iowa does not have to correct for any elevation.

**Fig. 27. Removing jars from pressure canner.**

1. Let pressure gauge return to zero (approximately 20 to 30 minutes), then wait 5 minutes before opening petcock. Always open petcock before unlocking canner.

2. Lift up cover by raising side farthest away. When water stops bubbling lift out jars with tongs, and complete seal at once on the partially sealed.

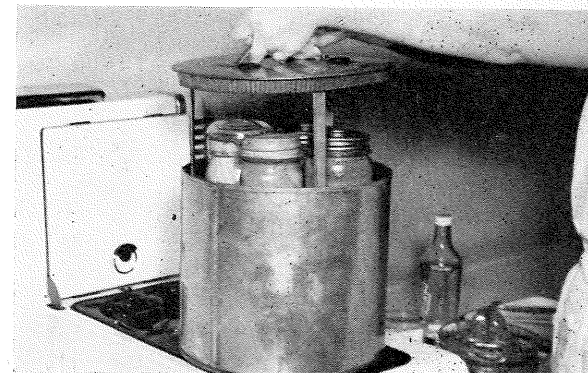
3. Seal rubber ring jars; test for leaks by inverting or rolling jar after sealing. Do not disturb screw bands or clamps on self-sealing lids; do not test for leaks—seals are completed as jars cool.



**Fig. 28. The boiling water bath for processing.**

1. The boiling water bath should be used for nonacid foods only when pressure canner is not available.

2. The temperature of the food in the jars reaches the boiling point of





water (210° F. in Iowa) and goes no higher. Destruction or inactivating of organisms likely to cause spoilage is obtained only by holding jars at boiling temperature for a prolonged time. Some spores withstand boiling temperature of water for 5½ to 10 hours.

3. Lower jars (preheated first in hot water) onto rack in deep container half full of boiling water, with space between jars for circulation of water. Add boiling water, as needed, to cover jars with 1 to 2 inches of water. Container must be deep enough to allow for rapid boiling.

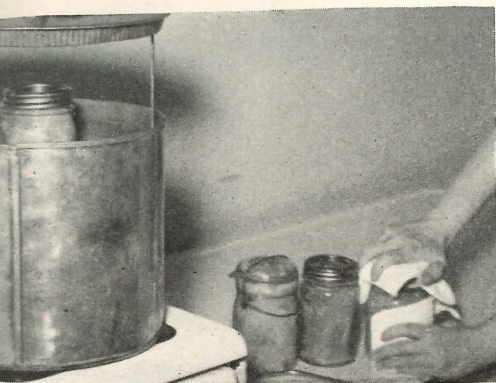


Fig. 29. Removing jars from boiling water bath.

1. Cover container tightly. Begin counting processing time when water is at a full rolling boil. **Keep water boiling hard during the entire processing time, adding boiling water as needed.**

2. Remove lid by raising edge of cover farthest

away when processing time is over, and while water still boils.

3. Lift out jars, completing seal of each as soon as removed, if partially sealed; test for leaks. Do not disturb screw bands or clamps on self-sealing lids; do not test for leaks.

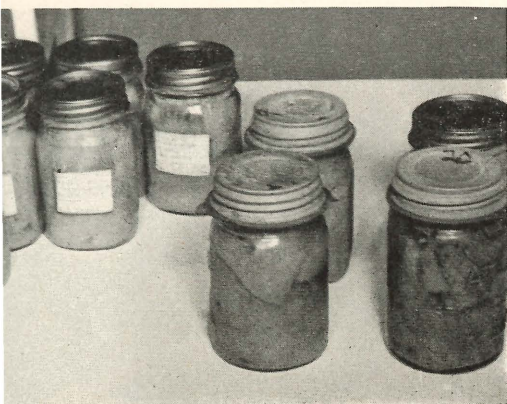


Fig. 30. Jars made ready for storing.

1. Set jars apart to cool, away from all draft for 15 to 30 minutes to avoid possible breakage; then cool quickly below optimum temperature (100°-130° F.) for development of any spores that may have resisted

processing. Ordinarily cooling takes place rapidly enough by just separating the jars, if the room is comfortable—not hot.

2. Test all jars for leaks: invert or roll on side jars with rubber rings and look for leakage; tap those with self-sealing lids (do not invert)—clear ringing sound indicates perfect seal. Remove screw band by holding fingers firmly on lid. Discard leaks.

3. Wipe off and label jars with name of product and date of processing. Store in cool, dark, dry place with space between jars. Check occasionally for spoilage. Any heat-resistant spores present may become active during storage and cause spoilage even after 6 to 12 months.

**Always boil all home-canned fish for 10 minutes before tasting or serving.**

### Canned Fish

#### Fresh fish

#### Brine (opt.):

3 tablespoons salt  
4 cups water

#### ½ to 1 teaspoon salt

3 teaspoons vinegar (preferably distilled) or 1½ teaspoons lemon juice

1. Clean, fleece or scale, and wash fish, removing membrane lining from cavity if present; skin and remove red streak of flesh along each side of buffalofish and carp. Split and cut crosswise into container length or 1-inch strips. Brining is optional: soak in brine about 1 hour; rinse in cold water.

2. Pack fish into clean pint jars, flush with rim: large pieces circular fashion and strips up and down to make attractive looking jars. Use smaller pieces to fill spaces and neck of jar. Do not crush fish in packing.

3. Add salt and vinegar or lemon juice when half full: 1 teaspoon salt, if fish has not been brined, or ½ teaspoon, if brined. Do not add water. If desired, add ¼ bay leaf and 1 slice onion to each jar.

4. Partially seal glass top and screw top jars; completely seal jars with self-sealing lids.

5. Process: in pressure canner 90 minutes at 15 pounds pressure, or 100 minutes at 10 pounds; in boiling water bath 210 minutes.

6. Complete seal immediately on partially sealed jars. Do not disturb jars with self-sealing lids.

7. Cool quickly, protected from drafts; label; check for



leakage on second day. Store in cool, dry place, protected from light; check occasionally for spoilage.

8. Boil 10 minutes before using in dishes made with cooked fish. One pint jar canned fish makes about  $1\frac{1}{4}$  cups flaked fish.

#### PICKLING (9, 12, 13)

Pickling is a favorite method of preparing freshwater fish. Pickled fish is a palatable product ready for the table without additional preparation, and it can be eaten by old and young with little or no fear of bones (acid softens bones if not too large). Pickled fish can be used on hot or cold plates as a main protein food or as an appetizer; it adds zest and variety and supplies protein food to the lunchbox. Pickled fish can also be used in salads. It should not be marinated with acid, and seasonings should be added according to taste.

Pickling of fish as a method of preservation is limited in this pamphlet to either processing or cooking fish in an acid sauce. The cooked fish, well covered with sauce, can be stored in sterilized covered containers and held in refrigerator or other cold place for several weeks. Distilled vinegar is free from tannin and for that reason is preferable to cider or other fruit acid vinegars which contain tannins; there are likely to combine with certain salts in the fish and darken the flesh. Pickled fish need not be boiled before serving.

#### Canned Spiced Fish

<b>Fresh fish</b>	<b><math>1\frac{1}{4}</math> teaspoons whole pepper</b>
<b>Brine (opt.):</b>	<b>1 tablespoon celery seed</b>
<b>3 tablespoons salt</b>	<b><math>\frac{1}{2}</math> tablespoon mustard seed</b>
<b>4 cups water</b>	<b>6 to 8 bay leaves</b>
<b><math>\frac{1}{2}</math> quarts vinegar</b>	<b>1 tablespoon whole cloves</b>
<b>(preferably distilled)</b>	<b>2 small pieces (<math>\frac{1}{4}</math> in. each)</b>
<b><math>1\frac{1}{2}</math> quarts water</b>	<b>whole ginger root</b>
<b><math>\frac{1}{3}</math> cup sugar</b>	<b><math>\frac{1}{2}</math> to <math>\frac{3}{4}</math> teaspoon salt</b>

1. Prepare fish as directed for canned fish, or fillet fish and cut in squares to keep pieces whole. Brining is optional.

2. For spiced vinegar sauce combine vinegar, water and sugar; add condiments, herbs and spices (all tied in a cloth); bring to a boil and simmer 1 hour. Strain. For a more sour sauce, use 2 quarts vinegar and 1 quart water.

3. Pack fish loosely into clean jars. Add salt when half

filled:  $\frac{1}{2}$  teaspoon to each jar if brined,  $\frac{3}{4}$  teaspoon if not brined. Pour  $\frac{1}{3}$  to  $\frac{1}{2}$  cup sauce over fish, or enough to fill jar (sauce should trickle down over fish).

4. Partially seal glass or screw top jars, or seal vacuum-sealed jars. Place on rack in canner.

5. Process pint jars in pressure canner for 90 minutes at 10 pounds pressure, or 60 minutes at 15 pounds; or process in boiling water bath for 210 minutes.

6. Remove, seal only the partially sealed jars and cool quickly; label jars, check for leakage. Store in cool, dry, dark place.

7. Use as relish, appetizer or in salads.

#### Pickled Fish

<b>3 pounds fish strips (<math>2\frac{1}{2}</math> in. x <math>\frac{3}{4}</math> in. x <math>\frac{1}{3}</math> in.) or squares (2 in. x 2 in. x <math>\frac{1}{3}</math> in.)</b>	<b><math>1\frac{1}{4}</math> quarts water</b>
<b>Brine (opt.):</b>	<b><math>\frac{1}{4}</math> cup sugar</b>
<b>3 tablespoons salt</b>	<b><math>\frac{1}{3}</math> cup salt</b>
<b>4 cups water</b>	<b>1 teaspoon ground white pepper</b>
<b><math>1\frac{1}{4}</math> quarts vinegar</b>	<b>1 teaspoon whole mixed spices</b>
<b>(preferably distilled)</b>	<b>1 large onion, sliced</b>
	<b><math>\frac{1}{2}</math> cup cubed celery (opt.)</b>

1. Clean, wash, skin and fillet fish; cut in strips or squares, splitting pieces if thick ( $1\frac{1}{2}$  lb. dressed fish with tail gives about 1 lb. fillet). Brine, if desired.

2. For sauce bring vinegar, water, sugar, salt, pepper, mixed spices (tied in cloth) and vegetables to a boil, and simmer 20 minutes. For a more sour sauce, use  $1\frac{1}{2}$  quarts vinegar and 1 quart water.

3. Put layer of fish strips or squares in wire basket; lower into boiling hot sauce, bring to a boil and simmer about 10 minutes, or until tender (do not overcook). Use about  $\frac{2}{3}$  of sauce for cooking fish.

4. Remove fish and pack in sterilized fruit jars or stone crock. Add bay leaf and freshly sliced onion, as desired, and pour sauce used in cooking over fish, filling with remaining sauce.

5. Store, covered, in refrigerator or cool place for future use. Fish can be eaten soon after pickling but improves on standing 2 weeks or longer.

6. Serve cold: as appetizer or main dish on cold or hot plate.



### Fish in Spiced Tomato Sauce

(Canned)

Fresh fish	1 teaspoon celery seed
Brine (opt.):	1/2 bay leaf
3 tablespoons salt	6 drops Tabasco sauce
4 cups water	1 1/2 tablespoons Worcestershire
1 1/2 quarts canned tomatoes	sauce or ground horse-radish
2 small onions, chopped	3 tablespoons lemon juice or
1/4 cup chopped parsley	vinegar
6 whole cloves	1/2 to 3/4 teaspoon salt

1. Prepare fish as directed for Canned Fish.
2. For spiced tomato sauce cook tomatoes, vegetables and herbs 20 minutes; put through fine strainer. Add Tabasco sauce, Worcestershire sauce or horse-radish, and lemon juice or vinegar; add salt to taste; cool.
3. Proceed as for Canned Spiced Fish, substituting Spiced Tomato Sauce for Spiced Vinegar Sauce.

### Pickled Fish Tidbits

3 pounds fish strips	Pickles (sweet or dill)
(3 in. x 1 1/2 in. x 1/3 in.)	Pickled onions (small)
Stuffed olives (small)	Spiced Vinegar Sauce (p. 245)

1. Prepare fish as directed for Pickled Fish, cutting fish in wider strips (1 in. to 1 1/2 in.).
2. Roll strips around olives, pieces of pickle, or pickled onions; fasten with round toothpicks.
3. To cook, store and serve tidbits, follow directions given for Pickled Fish.

### Pickled Fish in Tomato Sauce

2 to 3 pounds fish strips	Brine (opt.)
(2 1/2 in. x 3/4 in. x 1/3 in.), or	3 tablespoons salt
squares (2 in. x 2 in. x 1/3 in.)	4 cups water
Spiced Tomato Sauce (above).	

1. Follow directions given for Pickled Fish, substituting Spiced Tomato Sauce for Spiced Vinegar Sauce. For tidbits follow directions given in recipe above.

### SMOKING (20-22)

Smoking as a means of preserving fish is not done extensively in the home. Experience shows that it can be done both properly and economically with simple homemade equipment, producing a palatable and attractive product.

Wood smoke in itself has little if any preservative action; the wood creosote constituents in the smoke are deposited in the fish and may have slight action (21). Smoke does flavor and color the fish. However, the heat from the smoldering fire is an effective drying agent, and usually the longer the fish is smoked the better its keeping qualities.

There are two general methods used in smoking fish. Hot smoking or barbecuing cooks the fish, and it can be used at once without any further cooking. The fish has only limited keeping qualities (1 to 2 weeks) unless stored uncovered at or about 40° F., when it will keep for several months in perfect condition. Cold smoking is usually done with a low continuous smoldering fire (90° F. and lower) for 24 hours if fish are to be kept a couple of weeks, or for 4 to 5 days, if fish are to be kept for some time. Cold smoked fish has to be cooked before using.

Directions for making two types of smokehouses from scrap items follow.

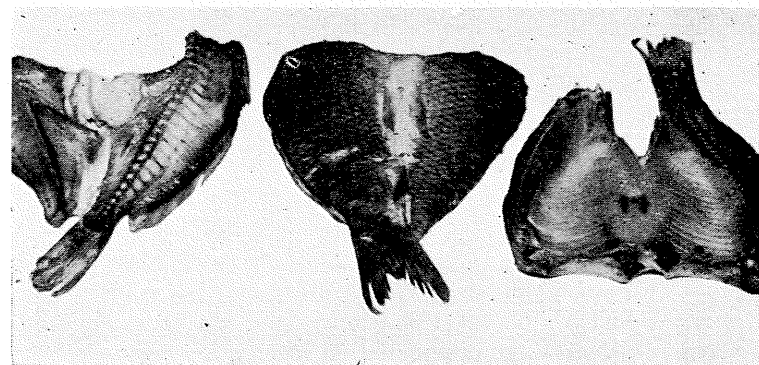


Fig. 31. Sheepshead, carp, buffalofish, (left to right)—all with glossy brown surfaces. Cooked and delicious to eat right from the smokehouse, or served hot. Cured with dry salt, spiced or plain strong (90°) brine or pickle.\* Hot smoked, with 12 hours of cold smoke and 3 hours of hot smoke (130° to 150° F.). Stored, uncovered, at 38° to 40° F. for 1 month. As fresh and good as when just smoked.

\*A 90° brine or pickle contains 23.85 percent salt. It is prepared by adding enough water to 2.35 pounds of salt to make a gallon of brine.





Fig. 32. An improvised smokehouse.

For smoking fish a house may be made from various scrap items.\* Figure 32 shows a length of discarded culvert used as a smokehouse. Notice the tray containing the fish, made of scrap mesh wire and supported on iron rods driven through the smoker, and the hinged door, closed during the smoking period. Boards with a crack between and weighted with stones cover the smoker. The smokehouse sits over a pit about 2 feet deep, which at the side opposite the door extends beyond the smoker to form a firepit. The firepit has a cover to con-

\*Prepared by Dr. George O. Hendrickson, assistant professor of zoology and entomology, Iowa State College.

trol the fire and force the draft with the smoke into that part of the pit under the smoker.

A small house constructed of rough lumber, a large wooden box, or a discarded wood or metal barrel with ends out will serve very well as a smokehouse. Of course, if the entire small smoker is wooden it is necessary to have the firepit several feet away and lead the smoke through a clay tile or metal pipe to the pit under the house lest the structure catch on fire. A box, fitted with a door and with battens inside to support trays or hooks on which fish may be hung, may be set over the barrels.

Almost any non-resinous wood such as oak, hickory and maple may be used as fuel in smoking. Sawdust and chips are better than larger pieces of wood because they make more smoke and smolder more slowly. Clean corn cobs may be used as smoking fuel, but a cob fire must be watched more closely than a wood fire, because it tends to flare up and burn out quickly.

### Hot Smoking or Barbecuing Fish

The three different methods of curing and the two of hot smoking fish, used in the laboratories, are outlined. About 90 pounds of fish divided between buffalofish, carp and sheepshead were smoked by two different methods in the Animal Husbandry meat laboratory smokehouse.\* The panel of staff members scored the three types of smoked fish prepared under the same conditions and indicated a slight preference for carp over buffalofish. Only one member scored sheepshead equally high and frequently higher than the carp and buffalofish. The smoked fish was served on a cold plate in the Institution Management Tea Room and enjoyed by most of the 90 or more patrons.

**1. Preparation of fish.** Do not scale fish. Cut off head especially of larger fish, just below gills, leaving hard bony collar plate. Split fish down along backbone so it will lie flat in one piece. Scrape out all viscera, kidney, membrane and blood. Scrub with stiff bristle brush and wash thoroughly under running water.

**2. Brining (optional):** If fish have not been properly bled

\*Under the direction of Buford R. McClurg, assistant professor of animal husbandry, Iowa State College.



and blood is diffused throughout flesh, if flesh is soft, or if fish have been taken from sluggish and muddy streams, brining is desirable. Soak in brine (2 cups salt to 1 gallon tap water) for 30 minutes. Rinse thoroughly, removing all traces of blood and membrane.

**3. Curing:** Curing can be done in several ways. The length of time for curing depends on size, thickness and fatness of fish, on length of time smoked fish is to be held, and on preference of individual for light or heavily cured fish. Curing should be done in a cool place, preferably a basement room. When removing from cure, wash thoroughly under running water, scrubbing, if necessary, to remove traces of salt.

a. **Dry salt cure:** Drop fish, one at a time, into shallow box or large pan partially filled with "all-around" or coarse salt. Dredge and rub with salt to cover thoroughly. To stack fish, cover bottom of box or pan used as container with thin layer of salt, then place fish in even layers, flesh-side up, scattering a small amount of salt between each layer. Place top fish skin-side up. Leave in salt for 4 to 18 hours.

b. **Spiced brine cure:** Prepare brine, increasing amounts as needed to make enough to cover fish:

2 lb. salt	1 oz. crushed cardamon seed
1 lb. sugar	or celery seed
1 oz. crushed whole black pepper	1 oz. bay leaves, crushed
	½ to 1 oz. saltpeter
Tap water to make 1 gallon	

Spices and herbs may be increased in variety and amounts according to their availability and the preference of individuals. Keep fish immersed in brine from 4 to 18 hours.

c. **Brine cure:** Prepare 90° brine (2½ lb. salt with tap water to make 1 gallon—this will float an egg). Keep fish immersed in brine 4 to 18 hours.

**4. Drying cured fish—placing in smokehouse:** If fish are dried, skin-side down, on wire mesh racks or trays in open and well-ventilated smokehouse, they need not be moved for smoking. It is better, when possible, to dry fish on racks outside in a shady and breezy place. Dry for 3 hours, or until a thin pellicle or skin forms over surface. Fish smoked while

still moist require longer time for smoking, and lack the color and finish of well-smoked fish.

Fish placed on racks or trays in smokehouse are easily handled. Fish are often hung on "S" shaped hooks and hooked over rods, or on sets of two rods: use one rod for each side of flattened fish, and run it under the hard bony collar. If fish are overcooked or smoked too long, they are likely to drop off rods into the fire. However, more can be handled at one time when fish are hung, and they are likely to have more uniform smoke and color than when placed on racks. Fish should not touch or overlap in smokehouse.

**5. Hot smoking processes:** Hot smoked fish are uniform in color with a glossy brown surface, and cooked or partially cooked when well smoked. They may be eaten either cold with no special preparation, or heated with butter or other fat in slow oven or over boiling water and served with lemon. If fish are too salty, soak in cold water before heating, or cook in several waters.

a. **Combination cold and hot smoke:** Smoke for 12 hours with a cool, low smoldering fire of hardwood logs with temperature at 90° F. or under. Heat should not feel hot to the bared arm. Then increase fire until temperature is between 130° and 150° F., and smoke for 3 hours. (Pine or pitchy wood imparts a bitter flavor to fish and should not be used.)

b. **Hot smoke:** Smoke for 5 hours with continuous hot smoke with temperature between 130° and 150° F. during at least half of the smoking period.

**6. Cooling and storing smoked fish:** Allow fish to cool several hours before storing. If fat or moisture has collected, remove by draining, or wipe with cloth. Sheephead are likely to require draining. Fish may be cooled in open and well-ventilated smokehouse for 2 to 3 hours, or in a protected and breezy place. Stored without stacking or wrapping at or about 40° F., the fish smoked in the college smokehouse were in perfect condition at the end of 2 months.

For the average home storage, sprinkle fine table salt lightly over cold fish and wrap each piece separately in waxed paper. Keep in a cool, dry place for a week or two.



## APPENDIX

### IDENTIFY YOUR FISH

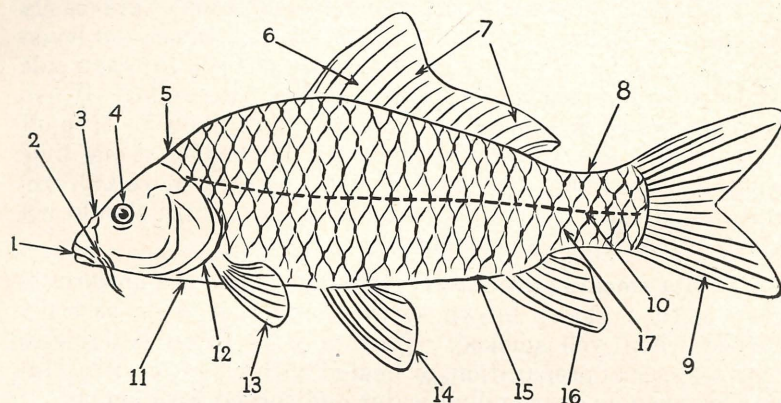


Fig. 33. The external parts: 1. mouth 2. barbels 3. nostrils 4. eyes 5. nape 6. dorsal fin (in some fishes in two parts—anterior and posterior) 7. rays (spinous and soft) 8. peduncle 9. caudal or tail fin. 10. lateral line 11. isthmus 12. opercle or gill covers 13. pectoral fins (front) 14. pelvic fins 15. vent 16. anal or ventral fin 17. scales.

### Functions of Parts

1. **Mouth:**
  - a. Meat-eating fish: usually wide, terminally located with sharp, conical teeth for grasping prey rather than for chewing; food swallowed whole.
  - b. Plant-eating fish: usually tube-like sucking mouth with grinding molars or plates in back of throat to partially masticate food.
2. **Barbels or fleshy feelers:** around the mouth, but not found on all fish; one or two pairs on upper lip of some bottom feeders, such as the carp; may serve as taste organs in selecting food particles; some barbels, as in the case of the catfish, have taste buds.
3. **Nostrils:** pair of double nostrils with sensory sac-like structure at bottom; do not connect with mouth; currents of water pass into anterior openings down over sensory sacs, then out through the posterior nostrils; used to detect some odors.
4. **Eyes:** usually large and lidless with big round pupils; see about 15 feet in clear water; some discrimination for color.
5. **Nape:** back of the neck.
6. **Dorsal fin:** (in some fishes in two parts—anterior and posterior): back fin; adds verticalness to fish; serves as keel; small or nuisance bones attached to base.
7. **Rays** (spinous and soft): bony and soft rods which extend and support membrane of fins; prominent in dorsal and anal fins.
8. **Peduncle:** narrow basal part of fish between larger part of body and tail.
9. **Caudal or tail fin:** main locomotor organ; gives power in swimming.
10. **Lateral line:** distinct line on either side of fish from gill to tail,

common to most fish; lateral line sensory organ (lateral canal with short tube connections leading from holes under scales and with nerve endings leading to brain) runs parallel with lateral line and acts as an antenna detecting sound vibrations in water; lateral line probably aids fish in following currents of water.

11. **Isthmus:** passage between head and body.

12. **Opercle or gill covers:** flap-like structure of head which covers gills; protects delicate gill filaments from rough objects. Gills used for respiration under water.

13. **Pectoral fins** (front): located on sides near head; used for balancing, turning to sides, ascending, descending and stopping.

14. **Pelvic fins:** located on lower abdomen of fish; correspond to hind legs of quadruped; for use, see pectoral fins (No. 13).

15. **Vent:** anus; opening of intestine.

16. **Anal or ventral fin:** often with heavy serrated spines; small or nuisance bones attached to base; for use, see dorsal fin (No. 6).

17. **Scales:** two types common—**ctenoid** (comb-like) with toothed outer edge (found in yellow pike-perch, sheepshead) and **cycloid** with smooth outer edge (found in carp, buffalofish); efficient covering.

### Buffalofish

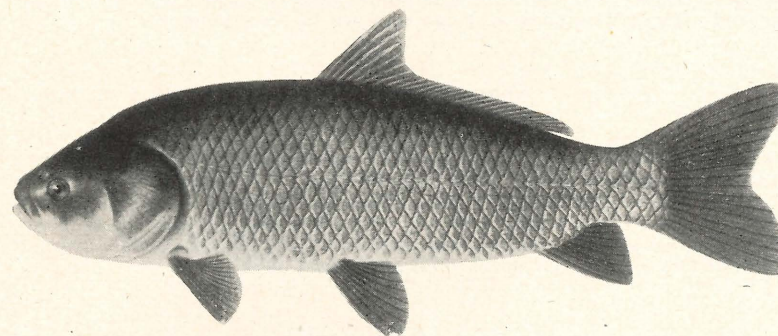


Fig. 34. Buffalofish: Bigmouth Buffalofish, Smallmouth or Channel Buffalofish, Black Buffalofish.

### Life History and Habits\*

Three species of buffalofishes occur commonly in Iowa waters. The bigmouth buffalofish, *Megastomatobus cyprinella* (Valenciennes), was the only species used in testing the recipes given in this bulletin, but the species probably differ little in palatability. The bigmouth is the most abundant of the three in the lakes and quiet backwaters and sloughs of Iowa's boundary waters. The smallmouth or channel buffalofish and the black buffalofish predominate in the flowing waters of the large rivers. Each of the three is widely distributed in the larger rivers and lakes of the state. In the aggregate, they yield more revenue to commercial operators than does any other species of Iowa fish. The name

\*Prepared by Dr. Reeve M. Bailey, leader, Iowa Fisheries, Research Unit, and assistant professor of zoology and entomology, Iowa State College.



buffalofish is derived from the conspicuous fleshy hump in front of the dorsal fin of older fish, especially evident in the smallmouth buffalofish.

These fish are gregarious and most active at night. Like the carp they feed by rooting into the mud, commonly with the body in an oblique position so that the tail may break water. The food consists of small animals, including crustaceans, insect larvae and mollusks, and aquatic vegetation, including algae, duckweed and seeds. They spawn during the middle to late spring, at which time several males accompany a female into shallow water. Oviposition is accompanied by tremendous splashing which on quiet evenings is said to be audible for a distance of a mile. No nest is constructed. They are extremely prolific, and since the young grow so rapidly that many soon attain size immunity to predation by other fishes, they are able to maintain large populations even when the fishery for them is intense. Unlike the carp, they are infrequently caught by hook and line fishing.

#### Characteristics (External)

Usual weight, 2-6 lb., maximum weight, 80 lb.; length, 1½-2 ft.; body, robust; back, curved; color, dull greenish-olive, much lighter than carp—under parts whitish; head, blunt; mouth, small to large and oblique with thin lips and no barbels; dorsal (back) fin, long and low—without spine; anal fin, without spine; tail or caudal fin, not deeply forked—bluish hue; scales, large and set in deep pockets.

#### Characteristics (Internal)

Fat content, fairly low (about 2½ percent); dry-meated, large flakes similar to carp; flavor, mild, good—considered a superior non-game fish; flesh, solid; color, whiter than carp; dark streak along lateral line on each side as in carp (usually removed)—likely to be soft—also darkens on cooking and may impart flavor to flesh; small bones (spindle shaped), numerous throughout—all nuisance bones are not removed by pulling out dorsal and anal fins.

#### Carp

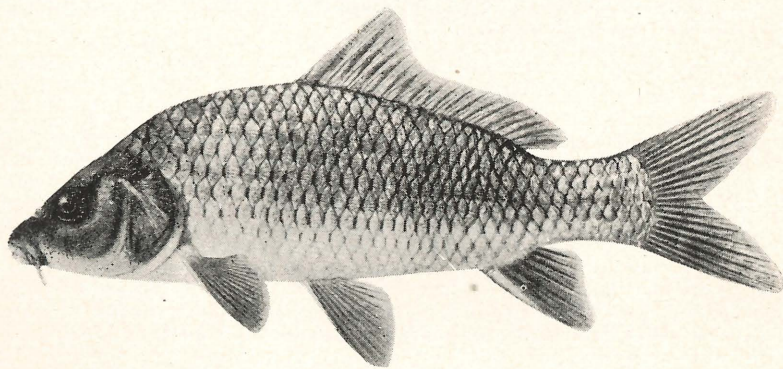


Fig. 35. Carp: *Cyprinus carpio* Linnaeus.

#### Life History and Habits\*

Carp were originally inhabitants of Asian waters but have been introduced into the streams and lakes of Europe and North America with great success. Many years ago they were planted in most important Iowa waters and have proved highly adaptable. Although not infrequently found in small creeks they are most abundant in lakes and larger streams throughout the state. Possessed of remarkable hardiness, they are equally at home in the clear, heavily vegetated waters of Lake Okoboji or the roily, swirling Missouri River, and even in the intolerant environments which man is prone to create by pouring domestic wastes into natural watercourses. Their rugged constitution is further evidenced by their capacity to live for long periods out of water, a great boon to fishermen and handlers in getting them to the market in fresh condition. Powerful in body, the carp is also respected for its intelligence by fishermen who find it adept at eluding nets and seines.

Carp have diversified food habits, regulated in large measure by the organisms present in their environment. Vegetation is commonly consumed, but where insects and small crustaceans are present these seem to be used more commonly, and in most of our streams insect larvae are the predominant food, since vegetation is usually scarce. In feeding they commonly root in the soft bottom with their snouts, dislodging small animals and aquatic plants. Large numbers feeding together in clear water lakes may be readily detected by the resultant roiliness of water. Because of the destruction of plants, either directly or as a result of increased turbidity of the water, and their competition with game fishes for animal food, their numbers are commonly held under control in game fishing water. Carp are taken in large numbers by hook and line fishermen, usually using "doughballs," liver, worms, or chicken entrails for bait.

Few freshwater fish are as prolific as the carp. The spawning occurs in shallow water near shore during late spring. Males may mature when 2 years old. At the first spawning, when 3 years of age, females deposit about one-half million eggs, but older fish lay from one to two million. The eggs are strewn about and adhere to sticks, roots and vegetation, no nest being prepared. The rate of growth is very rapid under favorable conditions, a weight of over 5 pounds being attained in 3 years.

#### Characteristics (External)

Usual weight, 2-10 lb.; maximum weight, 40 lb.; length 1½-2 ft.; back, arched; ventral side, nearly straight; color, dark olive green or golden above with a dark spot at base of each scale—yellowish below; nose, blunt; mouth, small with 2 pairs of barbels on upper lip; dorsal (back) and anal fins, each with the first ray a heavy serrated spine; tail or caudal fin, deeply forked and reddish; 3 types: scales, large and set in deep pockets (usual form), partly scaled with patches of light-colored scales (mirror carp), no scales (leather carp). The last two types are not common.

#### Characteristics (Internal)

Fat content, fairly low (about 2½ percent); dry-meated, large flakes similar to cod; flavor, mild and good; flesh, firm, less solid than buffalofish; color, darker than buffalofish; dark streak along lateral line on sides as in mackerel (deep and narrow in upper half, shallow and spread in lower part)—somewhat soft—usually removed—darkens on cooking; small bones, distributed throughout body—all are not removed by pulling out back and anal fins—small bones more easily removed in larger fish.

\*Prepared by Dr. Reeve M. Bailey, leader, Iowa Fisheries, Research Unit, and assistant professor of zoology and entomology, Iowa State College.



## Freshwater Sheepshead

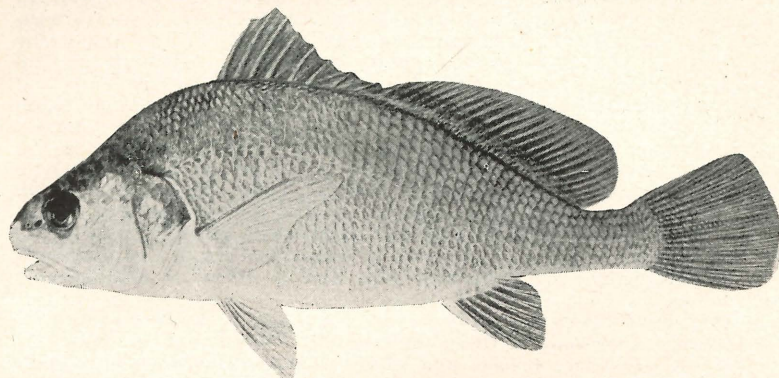


Fig. 36. Freshwater Sheepshead: *Aplodinotus grunniens* Rafinesque.

### Life History and Habits\*

The freshwater sheepshead or drum (the gaspergou of the lower Mississippi) is our only representative of a predominantly marine family including the weakfishes, croakers and drums. Characteristically it is an inhabitant of large waters, either rivers or lakes, and is taken infrequently if at all in the smaller streams. Thus, most Iowa specimens come from the boundary streams or the large lakes of Dickinson County.

Children are familiar with the enlarged earstones of the sheepshead, each bearing an L-shaped marking, and value them as "lucky stones." It is said that these were once used by Indians as a medium of exchange. The tremendously enlarged second anal spine, in a large fish measuring several inches in length and over half an inch in diameter, is supposed to have been put to more practical use by the Indians as a spear tip.

Perhaps the most publicized habit of the sheepshead relates to its sound production, a grunting or drumming noise made while in the water or when caught. Specialized muscles and a complicated air bladder are involved in the production of these sounds.

Massive pharyngeal bones provided with a pavement of rounded cobblestone-like teeth (located in the throat) permit thorough crushing of food organisms. As suggested by the small horizontal mouth the sheepshead is a bottom feeder. Of sluggish habit, it readily captures its slow-moving prey, which while it is young consists of insect larvae and crustaceans, whereas older fish eat snails, thin-shelled clams and some insects, crayfish and small fish. Sportsmen have learned that they may be hooked readily by stillfishing near the bottom with crayfish for bait.

### Characteristics (External)

Usual weight, 1½-8 lb.; maximum weight, 40 lb.; length, 1-2½ ft.; back, strongly arched; body, elongated and compressed; tail base, slender; color, silvery gray on sides and back—iridescent white underneath; head, heavy; snout, blunt; lower jaw, shorter than upper; mouth, horizontal; dorsal fins (anterior and posterior), continuous, with 8 or 9

\*Prepared by Dr. Reeve M. Bailey, leader, Iowa Fisheries, Research Unit, and assistant professor of zoology and entomology, Iowa State College.

spines in forward part; tail or caudal fin, not forked; scales, smaller than in carp—not set in deep pockets—with roughened edges.

### Characteristics (Internal)

Fat content higher than in buffalofish and carp (about 4 percent); flesh, firm and fine-textured in small fish—coarse and fibrous in large fish; color, white; flavor in smaller fish (¾ to 3 lb.), pleasing—in adult and large fish, flesh has a shark-like flavor; small or nuisance bones are attached largely to dorsal and anal fin, and removed when these are pulled out.

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### SUMMARY

This bulletin has been prepared to promote the use of freshwater non-game food fish, especially buffalofish, carp and freshwater sheepshead, among Iowans.

Iowa has a wealth of fish, probably twice as many non-game as game fish. The annual harvest of non-game fish is approximately two million pounds and consists largely of carp, buffalofish, freshwater sheepshead, quillback and suckers. At present the greater part of these fish (chiefly carp, buffalofish and sheepshead) is shipped to eastern markets. There they are prized by many, foreigners in particular, among both the lower and higher income groups. Only a small amount of the fish is sold in local markets in the larger cities and near the centers of production. However, just as soon as the home demand for these fish is increased so that marketing of them becomes profitable for commercial fishermen, they will be available.

These fish, when taken from fresh cold waters, well-conditioned and properly prepared, are palatable the year round. Sometimes when taken from warm sluggish streams during the hot summer months, these fish develop an off flavor which does not affect their food value. They may be made more palatable by soaking before cooking in brine or a highly seasoned mixture, or by adding flavorful ingredients in cooking.

The section on the cooking of fish includes the conventional methods which develop the natural flavor of the fish; these will appeal to the real fish lovers. The number of modifications following each method will bring variety, subdue or give added flavor to the fish dish; these will appeal to those who are less fond of fish, also to those who like fish served in a variety of ways. The use of leftover and canned fish has been stressed to increase the consumption of fish, to give variety to the diet and to reduce the waste of an animal protein food.

Home preservation of fish by canning, pickling and smoking is simple to do and yields palatable and satisfactory products. When catches are unusually good, especially among non-commercial fishermen, or when the local markets are flooded and fish can be obtained at prices below wholesale, home preservation of fish is an economical measure and contributes to the food conservation program.

Fish is chiefly a protein food. Protein foods of animal origin are likely to be not only more expensive but also more limited in quantity than other types of food in the diet. Very often when food shortages occur, whether in peacetime or during war, it becomes increasingly important to conserve in every possible way the available supply of protein food, especially of animal origin, and to increase the production. It is hoped that this bulletin will help in meeting protein shortages.





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