

CANNED FISHERY PRODUCTS AS FOOD

While nutritional value is given more consideration than formerly, attractive appearance, palatability, and price are deciding factors in determining the diet of the average consumer. To urge consumption of an article simply and solely because "it is good for you" makes eating that food a duty and not a pleasure. The consumer buys no more than he considers absolutely necessary.

Factors used in the purchase of food are (1) nutritive value, (2) appetite appeal, (3) amount of waste, (4) cost, (5) variety of choice, (6) ease of purchase, and (7) ability to purchase in convenient amounts and packages. The food buyer wants to know how canned fishery products meet these requirements. If the information is not satisfactory, he does not buy. A discussion of these factors in relation to canned fishery products should therefore be of interest and value to the industry, especially as published data are scattered and not readily available. It is the purpose of this discussion to bring the information together in convenient form.

NUTRITIVE VALUE

The principal constituents of any food are: (1) Water, (the amount of water is usually larger than that of any other substance); (2) proteins, which are basically nitrogen compounds, represented by muscle fiber; (3) fats as represented by fish oils; (4) carbohydrates, such as starches and sugars, seldom found in fishery products; and (5) mineral elements.

DETERMINING FOOD VALUE

The "proximate composition" of a food includes the percentages of moisture, protein, fat, carbohydrate, if present, and total ash. Formerly it was thought that knowledge of the proximate composition was all that was necessary to measure the comparative food value. A second index measured the heat value of food in terms of calories per unit of weight. The caloric value is useful to determine the amount of food to be consumed for the performance of different activities. However, the modern knowledge of nutrition shows that the functions of food are to yield energy, to build up the body tissues and to regulate and maintain the body processes. Sherman (1933) has summarized the needs as follows:

1. Enough of the digestible organic food stuffs to supply the needs of the body for energy, usually measured in terms of calories.

2. Enough protein of suitable types to meet all needs for essential amino acids.
3. Adequate amount and proper proportions of the mineral elements or ash constituents of the food.
4. Enough of each of the necessary vitamins. Few foods make so varied and valuable a contribution as fishery products.

PROTEINS

All proteins are complex compounds built up of a number of simple nitrogenous substances called "amino acids," of which about 10 are essential to body maintenance and growth. Meat and fish proteins are designated "complete" proteins since they contain all of the essential amino acids in about the right proportion, while those from vegetable sources are less complete. Fish and other animal proteins should be included in the diet to balance the vegetable proteins, so better use can be made of them.

Lanham and Lemon (1938) found that the proteins of the fishery products which they tested compared very favorably with the protein of round steak and casein in growth-promoting value. Oyster protein was found markedly superior to the others, and apparently the fish which contain 10 percent or more of fat have somewhat more complete proteins than those which contain less fat, although the difference was not great (Fig. 65).

The value of a protein is also measured by its digestibility. The protein of fish is easily and quite completely digested. Experimental data show that the corrected digestibility coefficients for the several proteins of fish and crustacea tested were as high or higher than for beef (Lanham and Lemon, 1938; Lanham, *et al.* 1940). In summary, canned fishery products should be included in the diet to supply a source of efficient and highly digestible protein. The protein of fish can be substituted weight for weight for meat and dairy products protein to good advantage.

OILS AND FATS

The nutritive value of fish oils depends on composition, energy value, digestibility and vitamin content. The composition of fish fats is about the same as that of animal or vegetable fats except that fish fats are liquid at ordinary temperatures. Also, the fat of fresh fish oxidize and become rancid more readily than animal or vegetable fats. However, the fat of canned fishery products is even less liable to rancidity than fresh meat fats because air is excluded from the can.

Fat is important in the diet to supply energy and a certain minimum is needed for the proper functioning of the body. The

energy value of fish fats has been estimated as equal to most animal and vegetable fats and about one-fourth greater than that of butter or margarine. From such evidence as is available, the digestibility of fishery products fats as a class appears to be equal

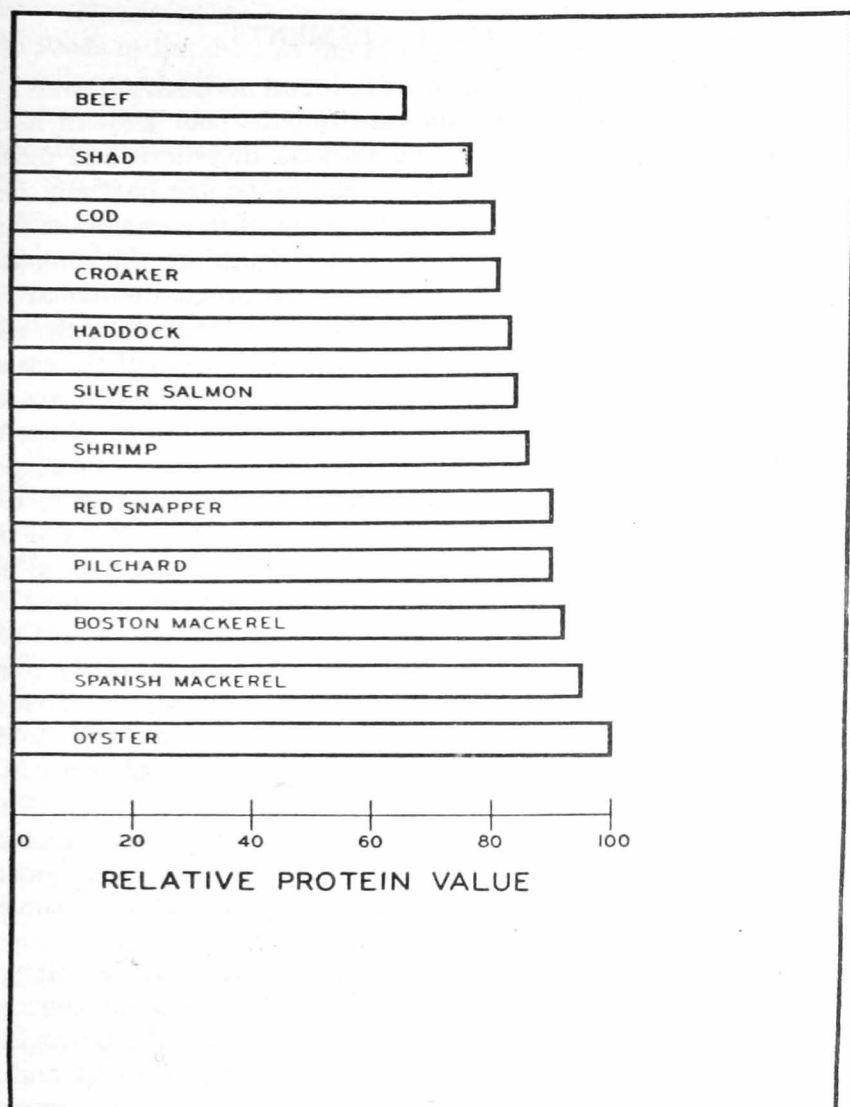


FIGURE 65.—The relative protein value of various species of fish and of beef. (After Lanham and Lemon, 1938)

to that of other fats. The apparent digestibility of oil from canned salmon has been found to be 97 percent, which is about equal to that of butter or olive oil and somewhat greater than that of beef fat.

The fish oils contain vitamins A and D as well as being a source of energy. The natural fish oils should be consumed wherever possible. For this reason such procedures as the addition of salmon oil to canned Columbia River chinook salmon are commendable and should be encouraged.

MINERAL ELEMENTS

A number of mineral elements are found necessary to well being, a deficiency of these elements resulting in poor growth and development, and susceptibility to various disorders and diseases. Some of the minerals are water soluble and are partially lost in cooking fresh foods. The bony structure of fish is rich in certain essential minerals such as calcium, but in fresh fish the bone cannot be utilized. In canned fish the water soluble minerals are preserved, while any bones are softened and made entirely edible. Canned fishery products are one of our best sources of the essential minerals, providing that the entire contents of the can are used.

Mineral elements needed for the proper functioning of the body are calcium, phosphorus, magnesium, iron, iodine, copper, potassium, and sodium. The average American diet is likely to be deficient in calcium, which is necessary for the development of bones and teeth (American Can Co., 1937). Therefore a special effort should be made to include foods rich in calcium in the diet. This need is one of the principal reasons for advocating a wider use of milk in the diet of children. Canned seafoods, especially salmon, sardines, and mackerel, are a reasonably good source of calcium and are rich in iron, copper, and iodine (Nilson and Coulson, 1939), which are scarce or lacking in milk. Phosphorous is also essential for the proper formation of bones and teeth (McCollum and Simmonds, 1929). Data on mineral content of foods show that fish are a good source of phosphorus, but as this element is found in many agricultural products, the average diet is not especially liable to be deficient in phosphorus.

A lack of iodine in the diet is the cause of endemic goiter, and this element is likely to be deficient in all areas not contiguous to the coast. These areas extend notably around the Great Lakes, extending eastward into New York, south into Kentucky and Missouri, and westward to the Pacific Coast. Children are especially liable, more than 50 percent being affected in some localities, and girls are more susceptible than boys. A survey of Seattle, Washington, school children showed that at the age of 13, 70 percent of the girls and 49 percent of the boys were affected (Jarvis, Clough and Clark, 1926). Endemic goiter is prevented or cured by furnishing the iodine required to make up the deficiency either by the addition of iodine to the food or water supply or by substitut-

ing foods rich in iodine for iodine deficient foods (Jarvis, 1928). A daily intake of 0.1 mg. of iodine has been recommended by the Technical Commission of the Health Committee for the League of Nations. Seafoods are the best source of iodine for such a diet as they have from 50 to 200 times the iodine content of land products. Nutritionists have for years urged the more liberal use of sea foods in the diet, as the best means of supplying the deficiency of iodine and other minerals (Coulson, 1935). Canned seafoods are especially recommended as a source of iodine as they contain valuable amounts of the element, are obtainable everywhere, and are sold at prices permitting their use even by low income groups.

The other minerals listed are important to the regulation of many vital body processes. They are usually provided by the ordinary mixed diet, but the regular use of canned sea foods is good insurance against any probable mineral deficiency in the diet.

VITAMINS

Little is yet known as to how the vitamins function in the body. Vitamin A is necessary for normal eyesight and the daily requirement is about 1500 to 4000 international units, with children requiring more than adults in proportion to weight. McCollum and Simmonds, (1929) state that fish and other marine animals are rich in Vitamin A. Research indicates that commercially canned products do not show a loss of Vitamin A in packing and are equal to freshly cooked or raw products as a source of Vitamin A. Canned fish roe is a good source of this vitamin.

Vitamin B₁, or thiamin hydrochloride, protects against certain nervous disorders. The extreme deficiency disease is beri-beri, which is rare in the United States but symptoms of marginal deficiency are common. The daily requirement is about 300 international units for an adult man. Oysters and fish eggs, such as canned fish roe, are especially rich in Vitamin B₁.

The principal role of Vitamin D is to ensure proper calcification of the bones. Lack of this vitamin and of optimum quantities of calcium and phosphorus is one cause of rickets in children. Most common foods are deficient in Vitamin D but a number of seafoods such as herring, salmon, and sardines are classed as very good sources. The Vitamin D content of the different species of salmon has been studied by the Fish and Wildlife Service. Eliot, *et al.* (1932) found that oil from two species of commercially canned salmon had Vitamin-D potency equal to that of cod liver oil, while oil of the third species was found to be about half as potent. Study of the Vitamin-D content of salmon oil, the amount of oil found in canned salmon, and the quantity of canned salmon

consumed in this country annually, led to the conclusion that this product supplies more Vitamin D than all the cod liver oil used for both human and animal feeding. Other studies indicate that herring (Maine sardines), pilchards (California sardines) and both wet and dry pack canned shrimp are definitely valuable sources of Vitamin D.

Until very recently, pellagra was thought to be mainly due to a deficiency of Vitamin G. Now it has been shown that pellagra is due to a multiple vitamin and protein deficiency, but nicotinic acid and riboflavin with which Vitamin G are identified, are of value in treatment. Very few assays of fishery products for nicotinic acid and riboflavin have been reported in recent literature, but canned salmon, flaked haddock, clams, crabs and oysters have been shown to have a pellagra preventive activity. Few assays have been conducted for the other known vitamins but preliminary experiments have shown that canned fishery products contain Vitamin K and pantothenic acid.

APPETITE APPEAL

If full use is to be made of the nutritional value of fishery products they must also be made appetizing. Other things being equal the consumer may be educated to use products with the superior nutritive value, but if canned fishery products are not prepared so that the maximum of favorable appearance and flavor are retained, some more attractively prepared article of lower food value will be substituted. Canned fishery products are very appetizing if the proper attention is paid to quality and if they are attractively served. Every care should be taken to produce high quality packs and advertising programs should be directed to helping homemakers and other cooks prepare attractive and appetizing dishes.

AMOUNT OF WASTE

Weight for weight, the more important canned fishery products are less expensive than the more popular cuts of meat. This favorable relationship is even more marked when retail price is considered together with the comparative yield of edible material, for again canned fishery products are entirely edible while in buying meat a higher price is paid for partially inedible material.

The data in figure 66 show a comparison of the retail price of canned fishery products with various cuts of meat and other foods. At the time this study was made, 3 pounds of Maine sardines (12 cans) or 3 pounds of pink salmon could be bought at retail for the price of 1 pound of beef round. The most striking comparison

indicates that the retail cost of 1 pound of beef round would purchase 4 pounds of canned herring roe, California mackerel, or sardines. Changing market conditions may alter these ratios at any time, but even at times of high retail prices canned fishery products are less expensive than meats.

VARIETY OF CHOICE

The great development in methods of preservation, transportation and storage has led the consumer to expect a much greater variety than our fathers were offered. This creates new prob-

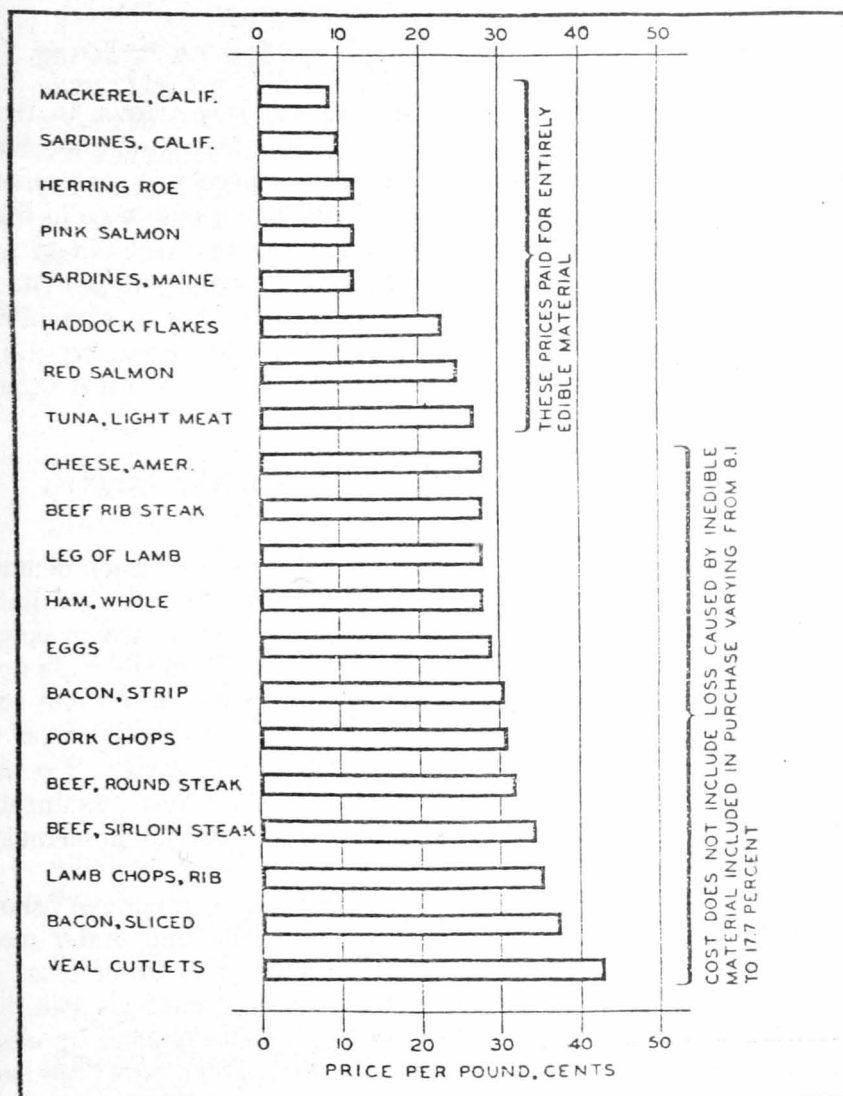


FIGURE 66.—A comparison of the prices of meat and canned fish.
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lems in retailing. When handling fresh fruit, vegetables, meat or fish, the retailer expects to lose a certain amount of the product unless he has adequate refrigeration equipment. No special equipment is needed to retail canned fish, and there are no spoilage losses in handling. Even when fresh, frozen or cured fish are available there is a wide market for canned fish, especially where it is properly merchandised, because the variety of choice is increased; for example, the consumer may buy canned salmon in preference to fresh, frozen, smoked or salted salmon when all are available. The inland consumption of fish would be negligible if it were not for the use of canned fish, of which 17 varieties are distributed generally.

EASE OF PURCHASE

The sale of fresh, frozen or cured foods is restricted to those stores equipped to handle such products. Many neighborhood or country food dealers cannot afford the necessary equipment. Regular deliveries are also required if the dealer is to handle fresh or frozen foods. Canned fishery products are available to any retailer anywhere in the United States. Special equipment, irregular or poor transportation, unfavorable weather, perishability, —all the difficulties hindering the wider distribution of fresh and frozen foods are readily surmounted in marketing canned fishery products.

ABILITY TO PURCHASE IN CONVENIENT QUANTITIES

Canned fishery products meet the last of the consumer demand factors better than any other type of food, for they are available in amounts from 2½ ounces to 5 pounds. There are packages for individual use and there are containers for large scale consumption. Tin and glass containers are the most convenient consumer packages since they do not leak nor is there danger of spoilage if the package is not delivered immediately. Tin and glass containers withstand handling much better than less durable types of food packages and it is not necessary for the homemaker to store them in the refrigerator.

From all the points of view of consumer interest, canned fishery products meet his requirements more generally and under more different and difficult conditions than almost any other class of foods. Intelligent marketing and advertising methods can undoubtedly increase the present demand. Development in other methods of preservation and handling should not affect the sale of canned fishery products so long as canners endeavor to pack products of high quality.

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UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF SPORT FISHERIES AND WILDLIFE
Branch of Fish Hatcheries

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TURTLES IN THE HOME AQUARIUM

The young of many varieties of American fresh water turtles are popular as pets in home aquariums. Thousands of baby turtles are sold annually by pet shops located in large cities. Space in the home is usually limited, but baby turtles are noiseless and odorless, and they need only a small space and quarters. Food need not be given on a time schedule, and they can plan vacations which do not include the pet turtle. Babies soon learn to associate the presence of their keeper with food. Turtle fanciers insist that their pets possess distinct personalities. Adults and children alike find pet turtles a source of pleasure.

VARIETIES: Most young turtles come from the wild, especially Louisiana, where collectors capture the baby turtles and either secure the eggs and re-bury them in pens until they hatch, or they raise them in pens. There are more than 60 varieties of turtles in the United States, but the most baby turtles reaching the market belong to only a few groups: map turtles (Graptemys), which generally have a brown shell with a dark ridge, and the sliders or red-ears (Pseudemys) which have a yellowish shell and an elongate red bar on both sides of the head. Other varieties available for fanciers are the northern and southern painted turtles, snapping turtles, soft-shelled turtles, and many varieties of Pseudemys. Occasionally young turtles are sold at fair prices with their shells decorated with painted designs. This is an unwise practice, as the shell of such a maltreated specimen is usually unable to grow normally, and the turtle may eventually die. It can be rescued by removing the paint, a chip at a time, with a knife blade, but the use of paint removers for this purpose is not encouraged as they are often injurious.

ENVIRONMENT IN HOME: Young turtles should be kept in fresh clean water at least several inches deep and a driftwood log upon which to crawl and become thoroughly dry from time to time. A 1-gallon aquarium will hold two small turtles, but the larger the aquarium, the greater the activity, rapidity of growth, and the longer the life of the turtles. A deep enamel or glass dish provided with sand will make a suitable and cheap turtle tank.