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SEA-FOOD PRODUCTS IN ARMED FORCES RATIONS

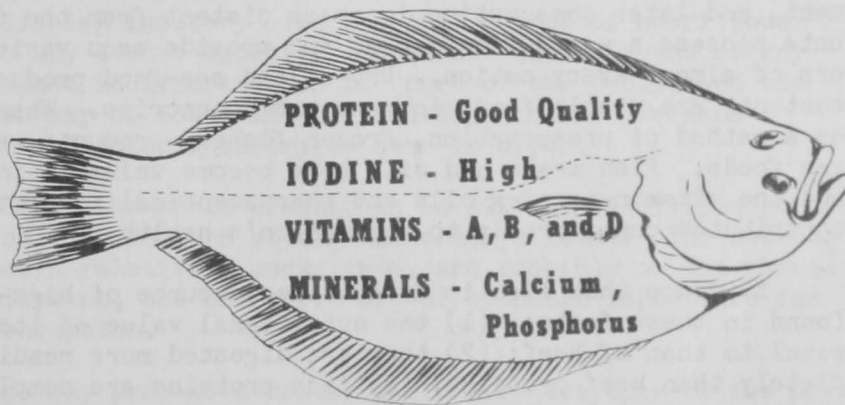
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ABSTRACT

FOODS HIGH IN PROTEIN ARE NOT SO PLENTIFUL AS TO WARRANT OVERLOOKING ANY SOURCE THAT CAN BE ECONOMICALLY EXPLOITED. MARINE PRODUCTS HAVE NOT, TO BE SURE, BEEN OVERLOOKED, BUT IN MILITARY FEEDING AT LEAST THEY HAVE NOT BEEN AMONG THE PROTEIN FOODS THAT COME TO MIND IMMEDIATELY WHEN DESIGNING OPERATIONAL RATIONS. BECAUSE THESE PRODUCTS OF THE SEA HAVE MANY VIRTUES IMPORTANT IN NUTRITION--A GOOD QUALITY OF PROTEIN IS ONLY ONE OF THEM--ATTENTION IS CALLED IN THIS ARTICLE TO THE MERITS OF SEA FOODS IN THEMSELVES AND TO THE RICH RESOURCES AVAILABLE WHEN IT COMES TO PROCURING FOODS IN VOLUME LOTS FOR MILITARY FEEDING. THIS ARTICLE REVIEWS THE CONTRIBUTION OF FISH TO THE DIET, THE RESOURCES OF THE NATION FOR PRODUCING FISHERY PRODUCTS, AND SOME OF THE OBJECTIVES OF ARMED FORCES DEVELOPMENT WORK. CURRENTLY, THE EMPHASIS IS ON INCREASING THE VARIETY OF FISHERY PRODUCTS AVAILABLE AND ACCEPTABLE TO THE ARMED FORCES.

CONSUMPTION IN ARMED FORCES

Consumption of sea foods in Armed Forces rations is small in comparison with the amount of meat and poultry products being consumed. At present, such products are in use by the Military primarily to provide variety in the "A" and "B" rations for general mess feeding, and to provide fish on Fridays in accordance with traditional Army menu practices. This apparent lack of Armed Forces interest is due to a number of factors. Perhaps the most important single reason is the general American consumer preference for meat and poultry over fish and the availability of these more preferred items.



In 1951, the average United States per-capita consumption of meat (excluding fish) was 137.7 pounds. This figure included beef, veal, lamb, mutton, and pork (no lard). The average per-capita consumption of chicken was 28.8 pounds and of turkey 5.2 pounds, making a total of 34.0 pounds for poultry products.¹ The average per-capita consumption of edible fishery products--11.5 pounds--is obviously well below the averages for other types of meats, and far below the averages for

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¹ FIGURES FOR MEAT AND POULTRY RELEASED BY THE U. S. DEPARTMENT OF AGRICULTURE.

certain sea food-consuming European and Asiatic nations. However, during any emergency, the abundant availability of meat and poultry must be discounted and sea-food products may have to be used in much larger amounts to help conserve the diminishing supplies of more generally accepted meat items. Furthermore, many sea-food products can also be served at a lower cost than most meat and poultry products.

Although sea-food products never have enjoyed the place in the American diet that they occupy in the diets of many European and Asiatic peoples, the popularity of fish as an entree is increasing in this country and this dietary tendency is naturally being reflected among the members of the Armed Forces. Most persons have many firmly developed food likes and dislikes before entering the Armed Services. Army consumption of sea foods during World War II showed a decided sectional influence. Depending upon where they had lived prior to the war, the men tended to eat a greater or lesser amount of sea-food products. Those from the West, certain parts of the Middle West, and from some sections of the South did not consume much fish whereas troops from coastal areas consumed both a wide variety and a large quantity. It must also be recognized that appetite and digestion are affected by a great variety of psychological factors associated with Armed Services operations, i.e., anxiety, boredom, homesickness, etc. Consequently, in order to promote a greater consumption of sea-food products by members of the Armed Forces, these items will have to be made highly acceptable and must also have the necessary military characteristics.^{2/} The future possibilities of more sea foods in the rations will, undoubtedly, depend to a large extent on the provision of products with a greater degree of acceptability.

SEA FOODS RICH IN FOOD VALUE

The food elements found in sea foods are protein, fat, mineral matter, and vitamins. The water content will vary from 70 to 80 percent, depending on the species and the individual fish.

Sea foods have always been a substantial source of the world's protein supply, largely because they are practical for preserving processes, storage, shipment, and later consumption in areas distant from the sea. Canned sea-food products possess a world-wide market and provide menu variety at low cost to consumers of almost every nation. Dry-salted sea-food products, because of their salt content, are staple foods in many warm countries. When freezing began to develop as a method of preservation, frozen fishery products were among the first new frozen foods. Fish meals and oils have become valuable in animal feeding programs, and the vitamin-bearing oils and pharmaceutical products derived from fish have contributed considerably to the nation's health.

Evidence that fish is an excellent source of high-quality protein is to be found in these facts: (1) the nutritional value of its protein has been found equal to that of beef; (2) they are digested more readily although not more completely than beef proteins; (3) fish proteins are complete because they contain the ten essential amino acids in proportions that can be economically utilized by the body; (4) the amino acids making up the proteins of fish muscle are the same as those found in chicken muscle and exist in approximately the same proportions (constituting about 18 percent of the meat). Fish, however, has more gelatin-forming protein and less extractives and consequently is perhaps less palatable for a steady diet. The fat content of fish varies from 1 to 20 percent, depending on the individual fish, the species, sex, degree of maturity, the season, and the abundance of food.

Mineral matter constitutes approximately one percent of the edible portion of fish, and these minerals are comparable to those found in other meats. Sea

^{2/} MILITARY CHARACTERISTICS MAY BE DEFINED AS THOSE REQUIREMENTS FOR SATISFACTORY PERFORMANCE UNDER CRITICAL AND UNUSUAL MILITARY OPERATING CONDITIONS.

foods, however, contain considerably more iodine than any other meat. (This does not hold true for fresh-water fish.) Analyses have shown that oysters, clams, and lobsters have 200 times more iodine; and shrimp, crabs, and ocean fish show 50 to 100 times more iodine than beef or milk. Because of the known relationship between iodine and goiter prevention, the so-called "goiter belts" are becoming increasingly aware of the need for more sea foods in the diet. In countries such as Japan where sea-food constitutes the main source of protein, goiter is unknown. Oysters, in addition, are rich in copper and iron--rating second only to liver in iron content. However, the common belief that fish is an especially good "brain food" has been discredited.

No standard value can be assigned fish as to their vitamin content as it is a variable factor. Fatty fish are a good source of the fat-soluble vitamins A and D, and with variations from species to species in vitamin B. However, the meat of fish generally is low in vitamin C. In this respect fish is comparable to other meats.

The average caloric value of one ounce of fish is 30 as compared with a value of 89 for an ounce of beef. The low fuel value of fish may be attributed to the high percentage of water, the low percentage of fat, and the high percentage of waste. Fish cannot be ripened like meat because of the unpalatable flavors resulting from the enzymic action. Furthermore, a great deal more waste is obtained from fish than beef due to the quantity of offal in the head, scales, fins, and entrails. Yet, in spite of the relatively low caloric value and its comparatively high percentage of offal, fish is an economical food. For example, production of other types of meat requires crop cultivation along with the expenditure of considerable labor. Today our land areas are progressing toward their peak of production of beef and other forms of animal protein. Fish, however, live on the vegetation found in all waters and consume no cultivated crops. They are found in almost inexhaustible numbers and require little or no planting; all that is necessary is some means of harvesting.

PRESENT SCOPE OF THE SEA-FOOD INDUSTRY

Granted then that the fishing industry offers a good source of nutritious and high-protein foods which may assume especial importance in the event of any national emergency, why the past indifference on the part of the public and the Military? Part of the answer may be found in the industry itself. Perhaps a brief look at the scope of the fishing industry is here in order.

It has been estimated that the world production in 1948 of 39 billion pounds would be worth about three billion dollars at the fishermen's level. The sea-food resources of the oceans, though relatively unexplored, are probably on the threshold of their greatest development, and therefore are of economic importance far beyond the casual current conception.

The following statistics may present a better picture of the size of the present fishing industry. The estimated catch of fishery products in all sections of the United States and Alaska in 1949 totaled 4.8 billion pounds, valued at \$339,000,000 to the fishermen. The catch was landed by 160,000 fishermen aided by 4,000 transporters; and 110,000 workers in 4,000 shore plants processed, packed, and distributed fishery products. The industry also was responsible for the indirect employment of an estimated 300,000 persons in allied industries, such as gear manufacture, shipbuilding, manufacture of processing equipment, and service industries supplying food, fuel, etc. About 85,000 craft were engaged in the fisheries, of which 8,000 were documented fishing vessels of five net tons or over. The products of the industry were worth an estimated \$996,613,000 when purchased by

the consumer in 1948, and the estimated replacement value of fishing craft, gear, processing plants, wholesale establishments, etc., was \$951,000,000.

The fresh- and salt-water fish and shellfish taken for food annually in the United States and Alaska are sold under 200 or more different names; however, consumer purchase is generally limited to only a few species, although all of the species are edible.

Approximately two-thirds of the world catch of fishery products is marketed as fresh, frozen, canned, or cured, and the remaining one-third is reduced to fish meal and oil. Of the amount that is caught for human consumption, about 40 percent is edible and the remainder (60 percent) is waste products. From an annual catch of 39 billion pounds it has been roughly estimated that the world's production of processed fishery products has been about 2 billion pounds of canned fish and about 3 billion pounds of cured fish (dried, salted, and smoked). A significant part of the catch along with the processed waste was used to produce fish meal and fish oil. It was estimated that about 13 billion pounds of the catch was used for reduction purposes. The remainder of the catch--approximately 16 billion pounds--was marketed as fresh or frozen products.

SPECIAL ARMED-FORCES REQUIREMENTS

In the procurement, storage, and shipping of foodstuffs, the Armed Forces have problems that are associated with factors arising from the providing of seasonal food the year-round to troops located both nearby and in distant parts of the world. This is certainly true of sea foods; they are generally caught during certain periods of the year and then sold fresh, canned, frozen, or preserved by other means. The canned and frozen products may be in storage for some time even after procurement by the Armed Forces before reaching the ultimate consumer. Generally speaking, this consumer is a new taster of any new sea-food item and the product will have to be good for him to eat it. If he likes it, then more of the same will be provided and eaten again, and he, the Armed Forces, and the fishing industry will have benefited. It is also safe to assume that if a liking is established for a food while in the Service, that liking will be maintained for the same food when out of the Service. It would seem important then that any sea-food ration provided to a soldier, sailor, airman, or marine should be what he desires and likes.

Perhaps one factor that needs brief mention here is the fact that despite the attractiveness and eye-appealing nature of most modern sea-food products, the picture is not entirely satisfactory. While great strides have been made generally by the industry, there are still some plants throughout the country that have not kept pace with the more modern handling of sea-food products. This tends to deter Armed Forces interest in such items. The Services are as always desirous of including more highly-acceptable, nutritious, and stable sea-food products in the rations in order to provide a greater variety in the menu of economical products readily available from a tremendous potential supply of protein food. Even at this date, however, the majority of sea-food products do not have the acceptability that they should have to meet Armed Forces requirements. This condition, then, should be remedied if the fishing industry is really interested in selling a larger amount of sea-food products to the Armed Forces.

The desired requirements and military characteristics of sea-food items in the three major product categories can now be presented in greater detail.

CANNED SEA FOODS

Canned sea-food products are needed that will have a storage life of at least one year at 100° F. These items, required for the operational rations, must be palatable when cold. Such products are further limited, at present, from the standpoint of variety. Development of at least a dozen acceptable fish combination items for operational rations is the present need.

A technological examination of an optimum canned fish product might disclose the following points:

1. Can size--dictated by the ration in which the product is to be used. For individual feeding, such as the C-ration, Assault Ration, In-Flight Ration, use is made of 6- to 12-ounce cans of standard size (300 x 200 or 300 x 308). For the B-ration, cans that are as large as possible and yet retain the quality of the contents should be used (30-ounce 401 x 411 or 404 x 404 to No. 10 cans, 603 x 700).

2. General appearance--pleasing and appetizing in the can without heating or any other kind of preparation. A lesser degree is acceptable for the large-size can where kitchen facilities (B-ration) are available.

3. Color--should be characteristic of the product, i.e., canned tuna--dark- to white-colored meat while salmon is pink to red colored; should denote high degree of preservation; should be uniform.

4. Odor--not to exceed a mild fish odor. Other ingredients, if used, should produce a pleasing aroma.

5. Flavor--within the limits of a mild fish flavor should be characteristic of the product. Highly spiced, salty, bitter, sour, or excessively sweet flavors are not desirable.

6. Texture--firm. Excessively dry or watery texture is undesirable. All ingredients should be clearly outlined in the can and a mushy appearance avoided. The minimum standard is-- "sufficiently firm to permit retention of characteristic outline of the product during additional preparation for those items used where kitchen facilities are available."

The above requirements may be considered the military characteristics necessary to assure satisfactory performance under critical and unusual military conditions of use, i.e., use without additional preparation in aircraft or a foxhole; with limited facilities in a submarine or in rear fighting areas.

Thus far, a number of canned sea-food items--both straight product-type and "combination" items have been examined, including: fish cakes, fish cakes and beans with tomato sauce, fishburger (both unfried and prefried), shrimp cakes, herring, mackerel, spiny lobster, turtle soup, lobster bisque, oyster soup, codfish patties, tuna loaf, turtle chili, salt codfish, fish vienna, salmon, tuna, sardines, salmon patties, chopped clams, and smoked fish patties in tomato sauce.

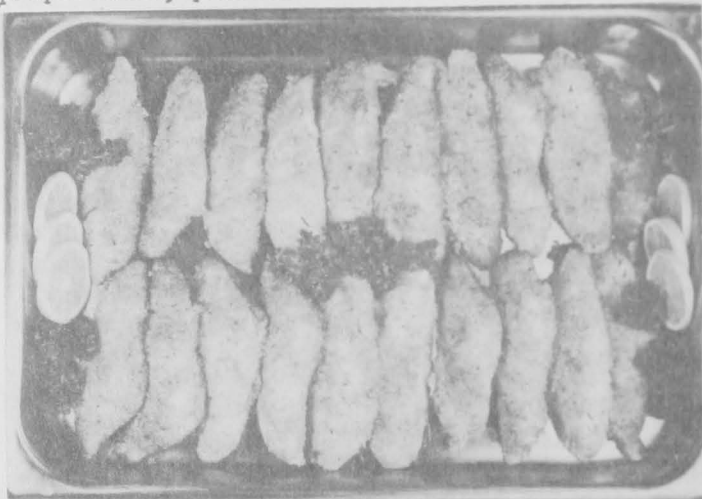
The experimental products that have enjoyed greatest acceptance in limited tests to date are: fish cakes, fish cakes and beans with tomato sauce, codfish patties, salmon, tuna, and sardines.

At the present time, canned salmon and tuna are the principal canned-fish products used by the Military. Other canned-fish items have not been used in the operational rations due to the lack of acceptability. Acceptability evaluations and freezing tests have been made on Puget Sound sockeye salmon packed in $\frac{1}{2}$ -pound cans. This product has received a very good rating. Various types and grades of canned tuna and California and Maine sardines have been examined for possible use in the operational rations, with some of these products also receiving good acceptance ratings.

Canned combination items utilizing sea foods appear to present the most feasible means of including sea-food products in the operational rations. Fish products marginally acceptable to the Armed Forces as straight fish items may be entirely acceptable if combined with other food items to provide a nutritious and satisfying product. Two such combination fish products have been prepared and tested for possible inclusion in the operational rations. One consists of tuna and noodles with vegetables and the other of tuna and noodles with cheese. A Military specification for these items is being coordinated with industry and other governmental agencies.

FROZEN SEA FOODS

Acceptance of perishable sea-food products by Armed Forces consumers depends largely on the variables connected with processing, preservation, transportation, preparation, plus of course, original condition. The principal difficulties at present are (1) to develop a means of measuring the degree of quality in sea foods prior to freezing and storing, (2) to obtain more complete knowledge of the storage life of various sea-food products tested under different conditions of storage, and (3) to determine the acceptability of the different species. Frozen sea-food products are now procured by the Quartermaster Market Center System for nationwide and overseas distribution to all branches of the Armed Forces. The items of greatest procurement are: fillets of cod, flounder, haddock, ocean perch, salmon, and sole; halibut and salmon steaks; oysters; and shrimp.



OVEN-BAKED BREADED FISH FILLETS. FROZEN FILLETS ARE ONE OF THE MOST POPULAR FISHERY PRODUCTS PURCHASED BY THE QUARTERMASTER CORPS FOR THE ARMED FORCES.

Some frozen fish do not have a sufficiently good over-all consumer acceptance in the Armed Forces and this generally results in considerable waste when served. Improvement of standards for frozen fish are required in order to increase Armed Forces acceptance. Such an effort is under way--an investigation dealing with improved standards for frozen fish has recently been initiated. Selected types of fresh-frozen fish fillets have been prepared and sampled to determine if the average consumer can significantly determine the relative eating quality of several species of fish generally considered to be of excellent, medium, and poor acceptance. It is anticipated that investigations will soon be conducted to better determine the characteristics of various species of fish under different conditions of storage. This is required because some species may be acceptable after relatively long periods of storage whereas others may have a very short storage life, and procurement should be governed accordingly.

Breaded shrimp is a recent item of procurement by some branches of the Armed Forces. Investigational work is being initiated toward development of an appropriate Military specification. In general, this investigational work will be concerned with the formulas for preparing breaded shrimp, processing methods, freezing, and storing the product.

DEHYDRATED SEA-FOOD ITEMS

It is desirable that new dehydrated sea-food items be developed since they provide a concentrated body-building food of high caloric density with a minimum of weight and bulk. Dehydrated shrimp and dehydrated fish fillets have been tested. The short shelf life and low-acceptance ratings of dehydrated sea foods discourages any attempt to include them in the rations at this time. Studies should continue on fish, shrimp, and other sea-food products in an effort to develop satisfactory items with considerable acceptability after prolonged storage at relatively high temperatures.

NEED FOR ARMED FORCES-INDUSTRY COOPERATION

There are four significant reasons why the Armed Forces are desirous of including sea-food products in the operational rations, namely: (1) the excellent nutritional qualities of this protein-rich food; (2) the vastness of the sources of supply; (3) the desirable element of variety that such products bring to the military menu; and (4) the advisability of expanding the basis of Armed Forces procurement by bringing into the picture a sizable industry that heretofore has been relatively untapped. This last is a particularly valuable consideration in the long-range planning for possible conditions of national emergency.

In its continuing research and development program, the Food and Container Institute prepares and tests various types of sea-food products for possible inclusion in the rations. The industry, on the other hand, has the essential know-how for producing sea foods, and it is because of their technological advances and the lessons learned from repeated processing of the items that the results of research can be realized in practical, high-quality products.

The function of the Quartermaster Food and Container Institute is to serve as both a co-developer and a liaison agency with the fishing industry, and it is hoped that this article will help to bring about a truly successful working relationship. The reward of this relationship, it might be emphasized in conclusion, is that millions of young Americans of military age will become habituated to sea-food products and thus a firm basis will have been laid for a greatly expanded future civilian market.

