I would like to repeat a few general observations made at the Paris meeting as to principles which should guide any fishing industry group in developing its thinking with respect to financial assistance programs:

(1) A prime objective should be proper use of our fishery resources.
(2) Strive for greater efficiency in vessel operation and productivity of fishermen.
(3) Recognize the credit principles involved in a particular problem and plan properly to solve the problem without violating any sound credit principles.
(4) Don't give a crutch to industry but keep the fishermen independent.

In all of this the government should look to the particular fisherman using these aids as the central figure in the scheme of things. This is best stated in the following exerpt from an official report:[1]

"The key to successful fishery development is the capable fisherman. Given the opportunity and sufficient information and advice he will acquire the boat and gear best suited to the fishery he pursues and will operate it successfully. The best designed equipment can be of little value in the hands of a man who lacks ability and skill or in particular circumstances for which it is not suitable. The government agency administering the scheme can collect valuable information on the performance of various types of equipment and other relevant factors and can provide expert advice, but the final judge of what equipment to use and of where and how to use it, must be the able, enterprising and skillful fisherman himself. The less he is hemmed in by limitations, minimum requirements, and standardization, the more likely is he to be successful. The central task of the administering authority is then, in our opinion, to ensure that grants and loans are extended to those most likely to use them to the best advantage. To this end an intimate knowledge of the fishermen and the fisheries. . . is essential."

Fish in Nutrition

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Abstract

The Food and Agriculture Organization International Conference on Fish in Nutrition was attended by 304 participants from 35 countries and international organizations.

The Conference was convened in response to a recommendation of the 10th Session of the FAO Conference held in Rome in 1959. The main objectives of the Conference were to group together scientists in human and animal nutrition, and food and fishery technology to evaluate the knowledge available in these fields, and to point to future research direction as well as the practical application of existing information.

The Conference was convened in plenary session only and organized into the following five main topics:

I. The Role of Fish in World Nutrition

[1]Source: *Report of the Prince Edward Island Fisheries Development Committee*, Charlottetown, P.E.I., 1956, pp. 35-36.

II. General Composition of Fish and Fishery Products
III. Contribution of Fish and Fish Products to National Diets
IV. Fish and Fishery Products in Animal Nutrition
V. Demand for Fish as Human Food and Possibilities for Increased Consumption

The survey of the present knowledge in these very different fields was accomplished by the presentation of 33 review papers, supported by 35 original scientific and technical contributions. Presentations are summarized.

INTRODUCTION

SOME FEW YEARS AGO, I recall reading in a popular magazine that of all the people who had lived since time began—four-fifths are alive now. Well, as incredible as it seemed, a few reference books and some rather simple calculations proved the statement to be reasonable.

Following my arithmetical calculations, I had a startling thought and one just as true. In some future generation, only an alarmingly few years from now, some article will tell how four-fifths of the people are living then. If the majority of the population today is underfed, imagine the total numbers who are doomed in this near-future generation—if the present ratio of the adequately fed to those who are inadequately fed holds constant.

Encouragingly, the delegates of the Tenth Session of the Food and Agriculture Organization (FAO) of the United Nations held in Rome in 1959 recommended that FAO schedule an international scientific conference on the nutritive value of fish. Aware that marine products represent the last major underexploited source of animal protein, the delegates recognized the need to gather, discuss, and disseminate research results to help ensure that fish optimally serve to end world malnutrition.

The FAO International Conference on Fish in Nutrition was a truly scientifically rewarding one. For nine days, from the 19th to the 27th of September 1961, 304 participants from 35 countries gathered in Washington, D. C., to discuss problems of mutual interest and to share their findings, aspirations, and scientific opinions.

The Conference was an experiment—a first. The Conference planners, of which I was fortunate to be included, decided not to survey one narrow field of research exhaustively but to review the complete aspects of fish in world nutrition. We hoped that the sessions themselves would dramatically focus attention on specific areas most in need of concentrated effort.

The Conference was organized for the discussion of five main topics, each under a distinguished chairman with an equally distinguished rapporteur and secretary. For each topic, a number of review papers, 33 in all, were invited from well-known authorities, supplemented by 35 selected original short research papers. The Chairman of the Conference was Donald L. McKernan, Director of the Bureau of Commercial Fisheries.

The edited proceedings of the Conference will be published by Arthur J. Heighway Publications, Ltd., of London. The publication will contain over 700,000 words. Obviously, in the short time available here it will be possible for me to report only the more important issues discussed under each of the main topics, which topics were as follows:

1. The present and potential resource.
2. The chemical composition of fish and fishery products. Influence of handling, treatment, and processing.

3. The role of fish in human feeding. Contribution of fish and fish products to national diets.
4. Fish and fishery products in animal nutrition.
5. Demand for fish as human food and possibilities for increased consumption.

The Present and Potential Resource

If we are to assign an increasingly important role to fish in man's diet, an evaluation has to be made of the present and potential resource.

The Conference opened with a clash of opinion among the marine biologists on the maximum yield that could be expected from the seas, using today's methods of harvesting. Some biologists took the conservative view that knowing the quantity of solar energy that can be fixed by marine plants and with certain assumptions as to the number and efficiency of the conversion steps in the food chain, we cannot hope for much more than double, or at most triple, the present catch of slightly less than 30 million tons of marine fin fishes per annum. Others pointed out that landings from the oceans have already nearly doubled in the past 10 years, and that there is reason to believe that even using present methods of fishing, five or even ten times the present yield can be achieved and sustained. This discussion was not settled and perhaps may form the nucleus of a future fisheries conference.

Nevertheless, greatly improved methods of harvesting fish were envisaged. The suggestion was revived, for instance, of the planned ploughing of the sea through convectional heat from atomic piles. In this manner, nutrients from the ocean depths would be brought into the upper layers.

Still looking into the Wellsian future, the researchers envisioned fish farming on a vast scale. These distant potentialities, however, do not dispose of present-day problems. Dr. Kesteven reminded the attendees that man acts not only as a predator and disturber but also as an intervener in natural systems, so the fish stock of the future is likely to be different from now, depending on what man makes it.

Chemical Composition of Fish and Fishery Products. Influence of Handling, Treatment, and Processing

Entering the second session, the Conference attendees heard reviews on the proximate, amino acid, vitamin, and mineral composition of fish as well as on the protein and lipids of fish. Oxidation of fish lipids and new methods of analysis of fish oils were intensively discussed. Five reviews covered the influence of refrigeration, canning, drying, salting, smoking, fermentation, solvent extraction, and irradiation preservation on the nutritive value of fish and fishery products.

The consensus of this session was that fish is a first-class food, being rich in high-quality protein, valuable lipids, and essential minerals and fat- and water-soluble vitamins.

Yet much more extensive data are required, particularly for use by less developed countries, concerning physical losses of raw material as well as changes in nutritive value and acceptability occurring during existing practices in handling, preserving, processing, storing, and transporting fish and fishery products.

Finally, it was agreed that there has been considerable exaggeration, on very slender evidence, of the toxicity of oxidized fish-oils for which the peroxides are currently held to be mainly the cause. There seems to be no convincing evidence that oxidized lipids are toxic when consumed at, or even

somewhat exceeding, customary levels of ingestion. Much more research, however, is needed before the hazard of toxicity can be properly assessed.

The Role of Fish in Human Feeding. Contribution of Fish and Fish Products to National Diets

General agreement was reached concerning the lack of realization of the nutritive implications of the tremendous gap between have and have-not nations. Yet it is an exaggeration to say that millions and millions of people of the have-not nations are starving, since a clear distinction should be but has not been made between malnutrition and starvation.

Although fish accounts for only about 12 per cent of the total animal protein, it constitutes the chief source of this nutrient for more than a billion people. Milk, meat, and egg products, representing the remaining world animal protein, feed the more opulent nations. Fish, in general, is the protein of the poor, nationally and globally.

Fish and fishery products, to the extent that they are presently used, make valuable contributions to national diets. In some areas they make major and unique contributions. If the use of such products could be increased, substantial dividends in terms of better health, less disease, and greater productivity would unquestionably result. The scientific evidence presented at the Conference confirmed what man has known and practiced intuitively since earliest time. Fish are excellent food when obtainable, but there is great variation in the consumption of foods in different geographic regions within a country and at different seasons and times. Socio-economic variations are important. Habits, folkways, and superstitions remain barriers to good nutrition. Indeed, there is even inequitable distribution of food within the family group. We were forcibly reminded of the more prevalent protein malnutrition of children in the age group of one to four years and of pregnant and lactating women that greater consumption of fish could do much to remedy. The need for education is great.

It was well documented at the Conference that the body fats of fish and shellfish contain relatively large quantities of polyunsaturated fatty-acids, which produce significant decreases in serum cholesterol and in other serum-lipid constituents. The level of these substances in human blood has, in turn, been associated with the incidence of atherosclerosis and the diseases that accompany it, particularly coronary artery disease and cerebral vascular disease. Thus the exciting possibility exists that increased consumption of fish and fishery products would have a significant effect in decreasing disability and death from diseases that have world-wide importance and indeed are the major killers in many well-developed countries—a case perhaps of malnutrition of well-fed peoples.

Fish and Fishery Products in Animal Nutrition

Fish and fishery products in ruminant, swine, poultry, and fur-animal feeds was thoroughly discussed. The technical problems and values of fishery products were detailed—which I will not do here—but, suffice to say, both the problems and values are considerable.

For maximum nutrient utilization by man, it was suggested that the harvest of the sea should be utilized directly for human consumption, which introduces the fact that great quantities of fish are consumed by animals—the nutrient go-between for man. One-third of the U.S. broiler production, for example, can be attributed to the sea.

It is not a simple matter, however, to decide if it is best to use fish directly as human food or to obtain it indirectly by feeding it first to animals. The question has complex socio-political and economic implications. It should be remembered, however, that although the loss of energy at each step in the food cycle is great, protein may be converted with 50 per cent efficiency under ideal circumstances. Amino acids such as lysine and methionine may be recovered at efficiency levels up to 70 per cent in animal products such as hen's eggs. It should be remembered also that much vegetable protein is available to us because cattle diets are supplemented by fish meal. The total loss of energy and nutritive value thus is not as great as is commonly believed.

It was brought out at the Conference, however, that animals need not necessarily be competitors with man for fish supplies. It nevertheless was admitted that animal feeding is an opportunist operation, which makes use of whatever products and byproducts are available at suitable prices.

My subjective opinion on this matter and I believe that many at the Conference felt similarly is that the role of fish for animal feeding is at best a compromise. Yet, we will continue to derive much benefit by converting fish to beef and poultry flesh until we can devise techniques to put all fish into the human market.

Demand for Fish as Human Food and Possibilities for Increased Consumption

At the final session, fundamental economic and socio-political problems involved in the efficient use of fish in nutrition were discussed.

In developed countries, fish and fishery products compete not only among themselves, but also with meat and other protein foods. In developing countries, on the other hand, the first requisite often would be to increase fish consumption, because in many areas fish is potentially the cheapest and most easily available source of animal protein.

Various general recommendations for increasing demand for fishery products were indicated. These were to:

1. Develop methods to balance supply and prices.
2. Develop effective criteria and methods of quality control.
3. Develop and maintain adequate standards of public health compliance.
4. Improve traditional processing methods, including the improvement of quality and the diversification of products.
5. Develop new products suited to regional tastes, social customs, and income levels and to educate the people to accept them.
6. Improve storage and distribution facilities for fish and fishery products to fit needs of particular areas where fish products not only are wanted but also are needed for adequate nutrition of the population.
7. Establish adequate training programs in fishery technology at various areas, such as Latin America and Africa.

Much discussion centered around a relatively new type of fishery product—fish flour. This product is a powder of dried fish—sometimes tasteless and odor free. Many saw in fish flour, with Secretary Udall, "the basic fishery product of the future." Yet it was the consensus concerning fish flour that there is a definite need to find:

1. *Processes* that comply with the following general specifications:
   a. Economical capital outlay.
   b. Flexibility for large- and small-scale production ranges.
   c. Adaptability for use in areas where public utilities, skilled labor, and transport and product-storage facilities are limited.
2. *Products* that comply with these general specifications:
   a. Flexibility as to food preferences, social customs, and income levels.

b. Dependability for consistent and uniformly high quality protein in the concentrate, plus a maximum of other needed nutritive factors.
c. Products that adapt themselves to being produced, packaged, stored, and transported at a low price but without sacrifice of high biological value or of suitability for incorporation into the consumers' diet.

CONCLUSION

In conclusion, I believe the Conference has firmly challenged us to increase the yield from the sea, to solve the technical and educational problems of getting fish consumed where it is needed in a form that is wanted, and to ensure that the form wanted is nutritious.

Admitting that much already known is not fully utilized and could be better utilized through education and training, we can only truly meet the Conference challenge of the optimum utilization of fish as food through increased support of fundamental fisheries research.

How "Rules of the Road" Make Your Vessel Safer at Sea

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Abstract

Rules of the Road, or more formally, Regulations for Preventing Collisions at Sea, are the traffic laws of the sea and have many similarities with ordinances regulating traffic on city streets. The need for the Rules of the Road by fishing vessels is shown by statistical samples of collision accidents. Justly or injustly, fishing boat operators have acquired a reputation for navigational irresponsibility. Fishing vessels are protected to some degree by the Rules whether or not the fishing vessels are operated in strict compliance. Better understanding of the Rules and better compliance by fishermen would save lives, reduce property loss, and reduce the probability for more stringent and restrictive safety regulations.

Discussions held in the United States in preparation for the 1960 International Conference on Safety of Life at Sea and the actions and recommendations of that Conference suggest specific steps the fishing industry might take to improve its safety record.

THE "RULES OF THE ROAD" to be discussed here are the Collision Regulations applying to all vessels at sea. Similar, but slightly different, rules are in effect for inland waters; and these inland rules vary somewhat in different parts of the world. The International Rules of the Road have universal application to vessels at sea, however, and perhaps have the widest acceptance of any world rules. The non-controversial nature of the Rules is one of their important features, and in international conferences on safety, the Rules are considered separately from other items because of the importance of unanimous agreement on them. As originally developed, the Rules were made for sailing ships. Changes have been made from time to time chiefly because technological developments have produced larger and faster ships with new capabilities and new problems. Although the Rules antedate modern safety conferences, they have regularly been given an important, if separate, place in such deliberations.

In 1960, an international meeting was called to study the entire safety prob-