

PRESENT AND FUTURE MARKET FOR FISH OIL^{1/}

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ABSTRACT

Primary technical needs for improving the future of the fish oil industry are (1) a commercial method of separating the fatty acids or other derivatives and (2) development of markets demanding the highly unsaturated fatty acid compounds to be derived from fish oil.

In developing potential markets, however, we must not neglect the existing ones.

INTRODUCTION

The market for fish oil will undergo great changes in the future. Although I can't predict the changes in detail, I can report my observations and conclusions based on a preliminary economic and technical survey. The purpose of this article is to make these results available to industry.

In this article, I sketch major past and present uses of fish oil, give the needs of a market that fish oil could enter, and cover the unique property of fish oil. Finally, I show what can happen when technical research adapts characteristics of an oil to the demands of a substantial market.

MAJOR PAST AND PRESENT USES

The largest of all domestic markets for fish oil from 1935 to 1945 was the soap industry when it used about 89 million pounds of fish oil per year (U. S. Bureau of the Census 1932-1962). This market dropped below 0.5 million pounds per year in 1951 and has remained below that level since. The drop occurred at a time when the price of fish oil was rising steeply and synthetic detergents were taking much of the soap market.

Over the years, drying-oil products--such as paints, varnishes, linoleum, and oilcloth--represent the most consistent large market for fish oil. During the past decade, drying-oil products have consumed an average of about 30 million pounds of fish oil per year. This market appears to be steady in the long-range view. Fish oil, being a natural drying oil, is used in the paint and varnish field as heat-bodied and blown oils and as modifiers in alkyd and other synthetic resins.

Fish oil was used extensively in this country in food products such as shortenings and margarines, reaching a maximum rate of 40 million pounds in the year of 1936. This domestic use has dropped below 0.5 million pounds per year since 1946, except in the years of 1950 and 1951 when higher usage was indicated, but available data do not state how much higher (U. S. Bureau of the Census 1932-1962). A large part of our recent production of fish oil has been exported to Europe for use in the manufacture of margarine.

NEEDS OF A MARKET THAT FISH OIL CAN ENTER

The most probable major market for fish oil in the future was aptly indicated in a recent chemical trade publication by the headline "Fats are seen likely to gain parity with coal and petroleum as organic chemical sources" (Oil, Paint and Drug Reporter 1962).

To enter the sophisticated chemical markets akin to those for the derivatives from coal and petroleum calls for considerably more development of fish-oil technology than we now

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In the past, the users' requirements were flexible and non-specific enough so that he could accept a crudely extracted product that deteriorated to some extent on storage. The market for fatty oils now is more competitive and demands fish oils with greater freedom from such problem materials as free fatty acids, proteinaceous matter, excessive stearine, waxes, and moisture. Although the fish oil industry is making progress toward a purer and hence more useful and stable product, the markets for fish oil are dynamically changing in the direction of demanding tighter specifications and even new basic qualities.

Demands in today's chemical markets are shifting toward purer, single chemical compounds or at least compounds within narrower ranges of chemical grouping. Fish oil can't escape from this trend if it is to break through into the high-priced markets its unique feature could command. To keep up with this trend, the industry must develop a commercially feasible process for separating fish oil into its component fatty acids or their simple derivatives. The fatty acids from fish oil are particularly difficult to separate because of their unusual chemical complexity. For instance, there are about 15 different fatty acids in hydrolyzed menhaden oil, considering only those present in relative concentrations of one percent or more (Ahrens et al 1959; and Gruger 1961^{2/}). This number is about double the highest number found in the same concentrations from any of the other major commercial fats and oils (Ditch 1956; and Archer-Daniels-Midland no date). Practical methods for separating fish oil fatty acids or their derivatives are being sought in commercial and governmental research laboratories. Such methods must be found before advantage can be taken of the potentially favorable property unique to fish oil.

UNIQUE PROPERTY OF FISH OIL

The most-promising unique property of fish oil is its great concentration of highly unsaturated fatty acid compounds. Twenty to 30 percent of the fatty acids derived from menhaden oil are unsaturated to the extent of 4, 5, and 6 double bonds (Ahrens et al 1959; and Gruger 1961^{2/}). None of the other major oils can supply more than mere traces of these highly unsaturated fatty acids. Thus, the future of fish oil will find its greatest security and highest value in the development of markets for which this high degree of unsaturation is essential. The most probable markets at present are in derivatives for manufacturing improved plastics.

WHAT HAPPENS WHEN RESEARCH ADAPTS CHARACTERISTICS TO DEMANDS

The effect of the kind of development that the fish oil industry needs is illustrated in figure 1.

Soybean oil, being a semidrying oil, was unsuitable--except in low concentration--for the paint and varnish manufacturing processes employed prior to 1930. By 1933, however, processes had been developed for the manufacture of alkyd resins incorporating drying or semidrying oils as modifiers (Golding 1959). Through this technical development, soybean oil advanced in a few years from a minor to a major competitor in the field of drying oils, climbing from 2 to 22 percent of the supply for the drying-oil products market over a period of about 20 years.

Tall oil, another semidrying oil, made a spectacular entry into the drying-oil market in 1933. Prior to that time, the high content of rosin acid in tall oil made it unacceptable in the drying-oil market. During the early forties, technical advances in the processing of tall oil resulted in commercially economic methods for reducing rosin acids to concentrations below 10 percent (Pattison 1959). Tall oils, thus qualified for use in alkyds, climbed abruptly from 10 to 13 percent of the drying-oil products market in 12 years. These are examples of what the right technical developments could do for fish oil in drying-oil products or other markets.

Linseed oil comprised 90 percent of the oil for the drying-oil products market in 1925, as shown in figure 2. This level was cut in half by 1958. The decline was due largely to the work of Gruger, E. H., November 1961, "Results of Single Analyses of Commercial Crude Menhaden Oils, by Gas-Liquid Chromatography"; unpublished.

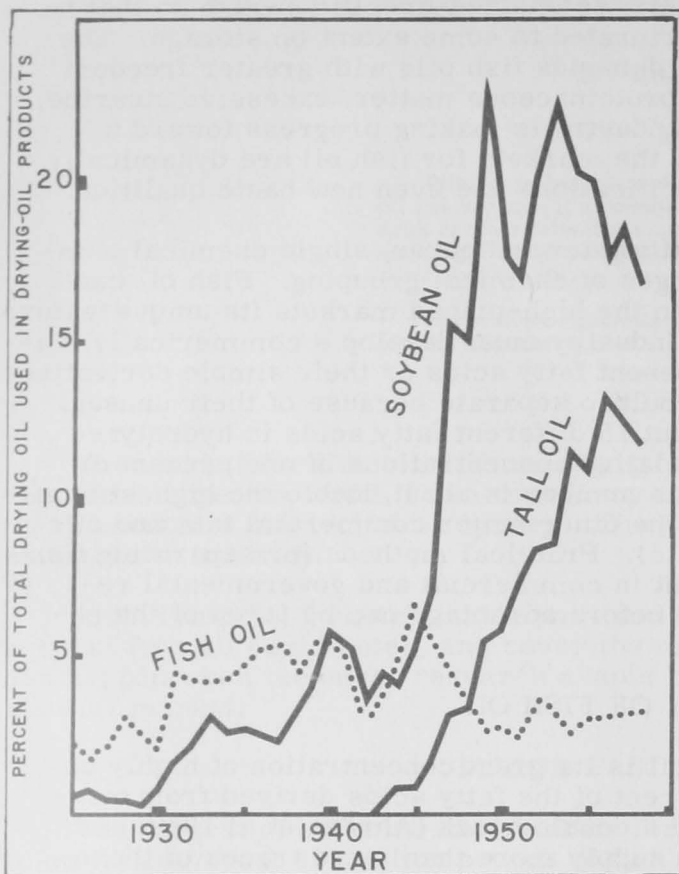


Fig. 1 - Relative use of fish oil, soybean oil, and tall oil in drying-oil products (U. S. Bureau of the Census, 1932 to 1961; and Banna 1954).

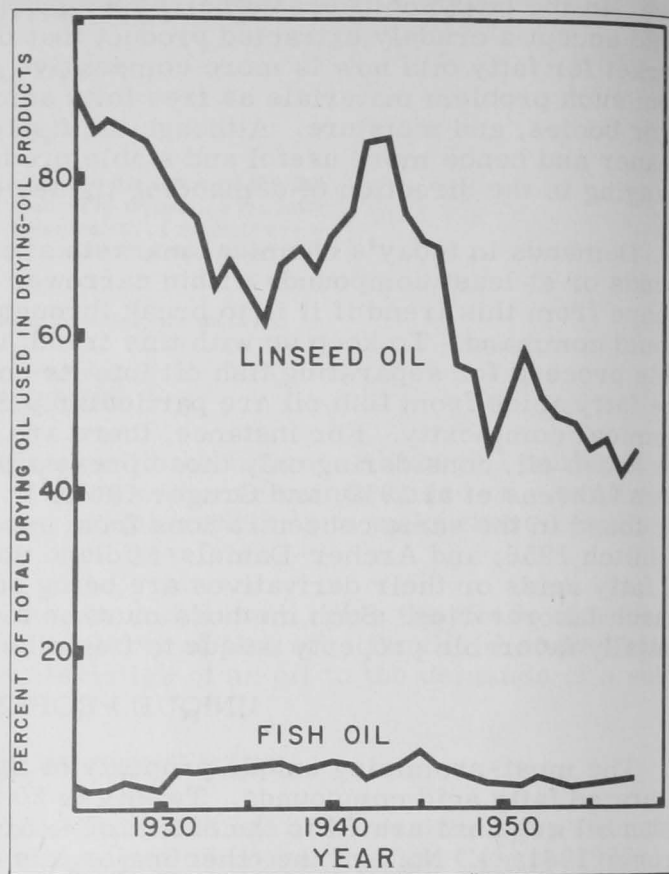


Fig. 2 - Relative use of fish oil and linseed oil in drying-oil products (U. S. Bureau of the Census, 1932 to 1961; and Banna 1954).

aggressive development of the competing oils shown in figure 1. Thus domination of a market can be countered with the aid of well-chosen technical developments.

SUMMARY

The great needs of the fish-oil industry are (1) practical methods for the separation of the complex set of fatty acid compounds in fish oil and (2) development of strong durable markets for the highly unsaturated fatty acids or their derivatives.

In the meantime, present day uses of fish oil can't be overlooked. Fish oil must be improved in quality, and current fish oil markets must be expanded to meet today's rising world production of fish oil and increasing competition from other oils.

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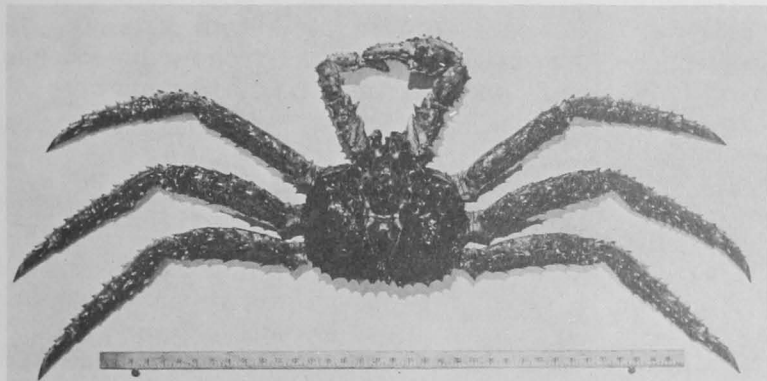
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ALASKAN KING CRABS DONATED TO PHILADELPHIA AQUARAMA

Unexpected visitors to the National Fisheries Institute 18th Annual Convention in Philadelphia, Pa., April 26-30, 1963, were four giant Alaskan king crabs--alive and kicking.



Actually, these Paralothides camachatica never got to Convention Headquarters--they were dropped off at the Philadelphia Aquarama, where they will make their permanent home.

The king crabs were donated to the new aquarama by an Alaskan firm.

They will be on display at the aquarama in a flood-lighted tank, with water kept to their favorite temperature. The crabs traveled in style by jet plane, packed in wet burlap and ice, and chaperoned by the manager of the firm's plant at Sel-dovia, Alaska. The trip took about 30 hours. The crabs were caught in Cook Inlet, an arm of the Gulf of Alaska.

These specimens bring to six the total of live Alaskan king crabs in the United States. The only other ones are at the New York Zoological Society's Aquarium in New York City.

These crabs--young ones chosen to withstand the hard trip--are typical of the Alaskan king crab canned and frozen for commercial consumption. In 1962, about six million of their brothers were caught and processed for the United States market. (Only the male king crabs are taken, and these must be at least 7 years old.) The Alaskan king crab as a frozen or canned seafood product is a postwar development and one which has been quickly accepted by the American homemaker.