

THE EUROPEAN COMMON MARKET AND THE UNITED STATES FISHING INDUSTRY

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SUMMARY

Six western European nations--Belgium Netherlands, Luxembourg, Federal Republic of Germany (West Germany), France, and Italy--have agreed to unite their economies by eliminating tariffs among themselves and by establishing a uniform external tariff structure toward the rest of the world. To permit gradual adjustments to new conditions, the six countries will develop this new economic union, known as the European Common Market (also known as the European Economic Community), ^{1/} over a period of 12 to 15 years and arrive at a complete customs union at the end of that period. The United States and other parties to the General Agreement on Tariffs and Trade (GATT) will seek to insure that the six countries form their new tariff structure in conformance with the principals of that Agreement.



Since the United States exports up to 90 percent of its production of menhaden oil to the Netherlands and West Germany, the United States has a direct interest in the Common Market tariffs to be established on this and other competitive oils.

The six Common Market countries tentatively plan to base the new tariff rates on the averages of present import fees. At present, menhaden oil enters the Netherlands and West Germany duty free. Belgium and Luxembourg have an import tax on fish oils; France and Italy have import duties on these

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^{1/} Includes the overseas territories of Belgium, France, Netherlands, and Italy with some special provisions.

Note: The European Common Market is not to be confused with the European Free Trade Area, which is a proposal now being negotiated. The Free Trade Area would associate the United Kingdom and 10 other member countries of the Organization for European Economic Cooperation (OEEC) with the six-nation Common Market. A free-trade area differs from a customs union (such as the European Common Market) in that, while both eliminate internal restrictions, only the customs union has a common external tariff. Each member of a free-trade area maintains its own tariffs against imports from nonmembers.

oils. A new uniform tariff rate on menhaden oil based on the average import fees of the six countries might be as high as 13 percent ad valorem.

Margarine producers in the Netherlands and West Germany use United States menhaden oil as an ingredient of margarine because they can obtain it in large volume at a low price. Several organic oils are used somewhat interchangeably, the proportion of each depending on the price of individual oils and on the grade of margarine being produced. Since menhaden oil enters this trade on the basis of its low price, an import duty established by the Common Market countries would lower its competitive position.

In addition to tariff changes, the Common Market includes an agriculture-expansion program and a program to fully use and develop the resources of member nations. These programs may also retard the imports of menhaden oil. Under these programs, should the six nations decide to expand their own production of organic oils, imports may be limited or excluded.

Even without trade restrictions, the European margarine processors who now use menhaden oil may turn to the use of other ingredients. In anticipation of a need for new markets, United States chemists are attempting to find new uses for menhaden oil.

On other United States fishery products the European Common Market probably will establish import tariffs that will be higher than the tariffs now enforced by the principal importing countries of the new economic union. The six countries also could exclude imports of fishery products altogether in an attempt to build up their own fisheries under the proposed programs mentioned. However, the United States now exports only small quantities of canned salmon, canned sardines, and other food fish to Common Market countries and even the complete exclusion of those fishery products would have little immediate effect on the food-fish fisheries of the United States. But in the future, if the Common Market countries improve their economy and develop increased purchasing power for dollar goods, and if liberal trade policies prevail, the six nations may increase their buying capacity for United States fishery products.

SIX COUNTRIES MAY REVISE IMPORT REGULATIONS

On January 1, 1958, Belgium, Netherlands, Luxembourg, West Germany, France, and Italy signed a treaty to create a Common Market to improve their economies. If the treaty is enacted as planned, the pattern of European economic life will change markedly over the next few decades, and the effects of the change will be felt throughout the world. The countries formed the Common Market on January 1, 1959. Once the Common Market becomes fully effective, goods will move among the six countries free of duty and the countries will have a uniform tariff on imports from the outside world.

The basic idea of the Common Market appears simple, but the six nations face the complex problems of setting up a new tariff schedule that will put a minimum import burden on their own industries. At the same time, the six countries must meet their trade and tariff obligations to the rest of the world.

The first real step toward integrating the six economies was the lowering of internal tariffs and the liberalizing of import quotas on January 1, 1959.

The Common Market countries had planned to begin to eliminate internal tariffs on January 1, 1959, and to begin to harmonize external tariffs on January 1, 1962. They expect to complete the new tariff structure in 12 to 15 years. Gradual modification over the long period will ease the strain on affected producers (both inside and outside the Common Market area), who must adjust to the new tariff structure.

Temporarily, pending final negotiations for the 17-nation Free Trade Area, the Common Market countries have deviated from their original plan and have applied their January 1, 1959, tariff cuts toward all GATT nations. They did this as a gesture of good will--mainly toward other OEEC nations who fear a loss of trade. The OEEC nations had been invited to join the Common Market, but they chose to retain their economic sovereignties and form the less stringent Free Trade Area through which they not only hope to avoid loss of trade but hope to receive some of the benefits of the Common Market.

Although the Common Market countries will cut their purchases of goods from the outside at first, under the originally proposed plan several factors indicate that the economic union can ultimately benefit outside countries. The Common Market system should stimulate more efficient production within the area and subsequently greater purchasing power with which to pay for imports. The Common Market treaty contains antitrust provisions against certain practices of cartels. In addition, the six countries may ease import-license and foreign-exchange restrictions, which now form stringent trade barriers in France and Italy. Statesmen of the six countries assure that the commercial policies will be designed to increase the Common Market trade with the rest of the world.

The six countries propose to base most common external tariff rates on an arithmetical average of the tariff rates in effect on January 1, 1957. As these countries begin to trade freely among themselves, producers on the outside--who wish to export goods into the Common Market area--may face new competition. Reduced internal tariffs and increased external tariffs may necessitate marketing adjustments for products with established markets in any of the six countries.

In designing the new economic union, the Common Market countries must consider their individual foreign trade commitments. Since the six countries propose to reduce the tariff rates to each other and to form a common external tariff based on an arithmetical average of present tariffs, they must either obtain waivers from present tariff commitments and obligations contained in the General Agreement on Tariffs and Trade (GATT), or renegotiate new duty rates.

The GATT was organized to improve world economy by increased international trade; its members include the United States, the Common Market nations, and most of the other free nations of the world. Under the Gatt, if one member country reduces or binds a duty to another, that duty shall apply equally to all GATT countries. Inasmuch as the GATT favors the establishment of free-trade areas and the advancement of world trade--and the Common Market proposes both--the GATT countries generally approve of the basic plan proposed by the six Common Market countries, although they do not approve in all cases of the proposed increased tariff rates.

The United States will have a voice in shaping the structure of the Common Market when its representatives discuss with representatives of other Gatt countries the formation of the Common Market in relation to the GATT. The United States will encourage the Common Market to establish a tariff structure that will permit liberal entry of United States goods.

TRADE RESTRICTIONS MAY AFFECT UNITED STATES MENHADEN INDUSTRY

Unification of the tariffs of the six Common Market countries may create restrictions that will affect the United States menhaden fishery. During recent years, up to 90 percent of the United States production of menhaden oil has been marketed in West Germany and the Netherlands where it has entered duty free. If the Common Market should place a duty on menhaden oil under its proposed uniform tariff structure, United States producers could lose their price advantage, and thereby their principal market to closely competitive products.^{2/}

^{2/} See p. 20 for latest information on effect of Common Market on Netherlands importation of menhaden oil.

The tariff rates on menhaden oil in the Common Market countries are as follows: For the Benelux countries (Belgium, Netherlands, and Luxembourg) and Italy there is no duty; West Germany also has no duty, except that oil containing more than 50-percent fatty acids is dutiable at 4 percent ad valorem; and France has a duty of 18 percent ad valorem which has been suspended temporarily. Other import trade restrictions exist: Belgium-Luxembourg has a sales tax of 5 percent on duty-paid value; France has an import tax of 24 percent and a stamp tax of 3 percent of total customs charges; and Italy has a sales tax of 3 percent on duty-paid value. France and Italy now restrict the quantities of fish oil imported from dollar countries through import-license requirements.

Table 1 - United States Production of Menhaden Oil, 1950-57

Year	Quantity ^{1/}	Value
	1,000 Lbs.	US\$,1,000
1957	118,484	9,466
1956	168,211	14,092
1955	159,241	12,195
1954	139,811	9,755
1953	133,684	8,806
1952	96,665	5,785
1951	94,028	9,771
1950	76,575	5,867

^{1/} Converted from gallons at 7½ pounds per gallon.
Source: Bureau of Commercial Fisheries. Fishery Statistics of the United States, 1950-56, and Fish Meal and Oil, 1957.

A new external tariff rate on menhaden oil based on the arithmetical average of official import duties for the four Common Market customs areas would be 4½ percent ad valorem. If a new rate is based

on the arithmetical average of import duties and import taxes combined, the duty would be about 13 percent ad valorem.

In 1956, a concession on menhaden oil was granted by the Benelux countries at the GATT Conference in Geneva. The concession granted in negotiations with the United States consisted of binding the duty-free status of menhaden oil. This product is also exempt from Netherlands monopoly fees or corresponding Belgium-Luxembourg charges if imported for further processing. Under the rules of the GATT, now that the duty-free status is bound, Benelux cannot place a duty on menhaden oil unless they would compensate by granting the United States another concession to offset any loss in trade caused by an increased duty.

THE UNITED STATES MENHADEN INDUSTRY

The United States now accounts for practically all the world's catch of menhaden. Additional stocks of menhaden exist beyond the range of present operations of the United States fishing fleet, but commercial fishing possibilities are uncertain. The United States menhaden industry could increase its landings by establishing menhaden reduction plants in remote areas or by building floating reduction plants. Rather than expand fishing operations, the immediate concern of the menhaden industry is to maintain existing markets for its products or develop new markets.

Table 2 - United States Exports of Crude Fish-Body and Fish-Liver Oils, 1952-57

Country	Quantity						Value					
	1952	1953	1954	1955	1956	1957	1952	1953	1954	1955	1956	1957
	(1,000 Lbs.)						(US\$,1,000)					
Common Market Countries:												
Netherlands	23,933	17,827	87,385	80,519	49,648	27,815	1,884	1,238	6,655	6,827	4,409	2,543
Belgium-Luxembourg	17	1,527	0	2,197	1,499	1,323	7	108	0	188	121	115
France	298	14	0	5	0	9	27	3	0	1	0	1
West Germany	10,268	72,311	20,962	21,006	63,484	52,593	756	5,018	1,637	1,683	5,908	4,893
Italy	440	56	39	65	120	350	49	10	4	8	19	42
Total	34,956	91,735	108,386	103,792	114,751	82,090	2,723	6,377	8,296	8,707	10,457	7,594
Other Countries	7,746	14,844	32,397	38,386	25,830	32,688	647	1,127	2,607	3,073	2,384	3,126
Grand Total	42,702	106,579	140,783	142,178	140,581	114,778	3,370	7,504	10,903	11,780	12,841	10,720

Source: Bureau of the Census. United States Exports of Domestic and Foreign Merchandise, 1952-57.

Between 1950 and 1956 landings of menhaden doubled, whereas landings of other fish in the United States declined. The sharp increase in menhaden landings followed an apparent increase in abundance of menhaden along the Atlantic coast and increased menhaden fishing in the Gulf of Mexico. A decline in the availability of California sardines contributed to a greater demand for meal and oil produced from menhaden. In 1956 landings of menhaden reached a peak at 2.1 billion pounds. Then

in 1957 the catch declined to 1.7 billion pounds because bad weather restricted fishing operations and fewer menhaden were available. In 1958, bad weather and lack of fish have again limited the catch, and the year's landings were somewhat lower than those in 1957.

Menhaden meal is used in the United States mainly as feed for poultry. Menhaden oil is used mainly as an ingredient of margarine in the Netherlands and West Germany. The margarine producers prefer oil from Gulf-of-Mexico menhaden over oil from Atlantic menhaden. As the menhaden fishery in the Gulf of Mexico expanded, the relative importance of the sales of menhaden oil increased. In 1949, oil accounted for about 15 percent of the value of menhaden products, meal accounted for about 85 percent, and a negligible amount of salted menhaden accounted for less than 1 percent. By 1956 the oil accounted for about 30 percent of the value of menhaden products.

Production of menhaden oil doubled between 1950 and 1956--increasing from 76.6 million pounds to 168.2 million pounds (table 1). Menhaden oil is not classified separately in Bureau of the Census export statistics, but is included in a single category with other inedible fish oils. United States exports of fish oils (mostly menhaden oil to the Netherlands and West Germany) reached a peak in 1956 at 142.2 million pounds; of this total, 114.8 million pounds went to Common Market countries (table 2).

Since 1956 the market for menhaden meal has remained rather stable, but the market for menhaden oil has weakened because of increased competition in the Netherlands and West Germany from other organic oils. The average wholesale price of menhaden oil, f.o.b. Baltimore, declined from approximately $9\frac{1}{2}$ cents a pound to $8\frac{1}{2}$ cents in early 1957, and from $8\frac{1}{2}$ cents to $7\frac{1}{8}$ cents in mid-1958.

MENHADEN OIL COMPETES IN THE EUROPEAN ORGANIC-OIL MARKET

New trade restrictions by Common Market countries could change the channels of trade in United States menhaden oil. In Europe, fish oil is used mainly by margarine and shortening manufacturers. Since menhaden oil produced in the United States is available in large volume at a low price, it has become an established ingredient in the margarine produced in West Germany mainly by one large refining company and in the Netherlands by a similar company. Menhaden oil competes with other organic oils, including herring oil, pilchard (sardine) oil, numerous vegetable oils, whale oil, and the byproduct oils from the meat-packing industry. Generally, menhaden oil sells for at least 10 percent less than whale oil and competitive vegetable oils. Organic oils may be used interchangeably to a large extent, but each oil has chemical properties which tend to channel it toward certain industries. Within the individual industries price plays a major role in determining the proportion of each oil used in a given product. In Europe, the proportion of fish oil in margarine has varied from none to 60 percent, depending on the grade of margarine and on the relative price of fish oil. Common Market countries produce little raw materials for organic oils. They do have a small production of fish oil from the wastes of herring canning plants, but the major supply of fish oil consists of the menhaden oil obtained from the United States.

The demand for United States menhaden oil slackened somewhat in 1957 and again in 1958 possibly owing to the increased amounts of soybean oil available in Western Europe. When the average wholesale price of menhaden oil dropped to $8\frac{1}{2}$ cents a pound in early 1957, margarine processors in West Germany and Netherlands continued to absorb United States production. The stability of the menhaden oil market in Europe varies according to the following factors: (1) availability of dollar currency, (2) demand for the various grades of margarine, (3) butter production,

(4) world demand for fish meal since fish oil is a byproduct of fish meal, (5) the production of South African pilchard oil, (6) whale-oil production, (7) vegetable-oil and oil-seed production, (8) the relative facilities for and merits of crushing oil seeds in the Common Market area, and (9) new technological advances in oil uses.

COMMON MARKET COUNTRIES MAY INCREASE ORGANIC-OIL PRODUCTION

The Common Market countries may try to develop a large supply of organic oils of their own. The Common Market treaty includes an agriculture-expansion program for increasing production and earnings, stabilizing markets, and guaranteeing supplies of agriculture and fishery products. To accomplish this, the Common Market countries plan to apply import controls and subsidize industries where necessary. Should the Common Market countries increase their production of fish oils, animal oils, or vegetable oils, their requirements for imported menhaden oil will decline. At present most of their organic oils are derived from imported oil seeds. Domestic sources of organic oil are whales, herring wastes, and domestically-grown oil seeds. With the overseas territories of France and Belgium included in the Common Market area, the capacity for raw, organic-oil production in the Common Market will be several times larger. At present, Western Europe imports sizable quantities of palm oil, palm-kernal oil, and other tropical vegetable oils from these overseas territories.

Table 3 - United States Exports of Edible Fishery Products, 1957

Country	Fresh or Frozen			Cured		Canned					Total
	Salmon	Other Fish	Shellfish	Salmon, Salted and Pickled	Other	Salmon	Sardines	Other Fish	Shrimp	Other Shellfish	
(US\$1,000)											
Common Market Countries^{1/}:											
Netherlands	0	19	15	28	0	171	4	0	1	0	238
Belgium-Luxembourg	43	2	12	17	1	59	52	2	49	0	237
France	90	35	15	10	2	3	0	1	3	2	161
West Germany	4	0	3	67	6	0	0	2	5	4	91
Italy	0	0	13	0	1	1	0	9	3	13	40
Belgian Congo	0	0	0	0	0	23	2	40	5	0	70
French Pacific Islands	0	0	0	0	0	2	40	6	0	0	48
French Somaliland	0	0	0	0	0	0	0	1	0	0	1
Total	137	56	58	122	10	259	98	61	66	19	886
Other Countries	310	963	2,379	104	366	4,481	2,681	4,424	2,344	1,613	19,665
Grand Total	447	1,019	2,437	226	376	4,740	2,776	4,485	2,410	1,632	20,551

^{1/} Includes selected territories.

Source: Bureau of the Census. United States Exports of Domestic and Foreign Merchandise, 1957.

Another factor to be contended with is the duties that will be assessed under the Common Market for competitive vegetable oils. Any new duties placed on fish oils and any duty changes on vegetable oils and oil seeds will be important considerations in the fish-oil market.

RESEARCHERS SEEK NEW USES FOR FISH OILS

In preparation for the possibility that the Netherlands and West Germany may reduce purchases of menhaden oil, United States chemists are studying fish oils to find new uses. Menhaden oil, as well as other fish oils, can be used as an ingredient in over 100 food and industrial products, including soaps, paints, varnishes, leather conditioners, cooking oils, and poultry feeds. But, in many cases, fish oils are less desirable than other organic oils, primarily because they are chemically less stable and more likely to turn rancid. For the past three years, the U. S. Bureau of Commercial Fisheries and other groups have worked to develop new uses for fish oils. One approach would utilize these unstable properties as valuable assets in the manufacture of chemically-modified products. Other work is aimed at improving the stability of the oil.

The most promising development so far appears to be the use of fish-oil constituents for ore collection, by the flotation process. This is a project conducted by the University of Minnesota School of Mines and Metallurgy under a Bureau contract

with funds made available through the Saltonstall-Kennedy Act of 1954. Once the product is perfected, the iron-ore processing industry can use large quantities of menhaden or other fish oil to recover iron from low-grade ores. Years ago the industry used low-cost fish oils to float iron ore away from impurities. Now that the high-grade ore fields in the United States have been depleted, the industry may use fish oils again. But under the proposed process, the fish-oil constituents would be used to float the impurities away from the iron ore.

Meanwhile, other laboratories continue to work on other applications for fish oils and on improved processing techniques. Possible new applications include the use of fish oils in fungicides, insecticides, pharmaceuticals for coronary disease, and heat-resistant paints.

OTHER UNITED STATES FISHERIES LITTLE AFFECTED BY COMMON MARKET

Among the edible fishery products imported by the Common Market countries from the United States are frozen salmon, canned salmon, cured salmon, canned California sardines, and canned shellfish. As far as these products are concerned, the value of United States shipments to Common Market countries in recent years has been small (table 3).

Canned salmon, the second most important fishery product exported by the United States to the Common Market countries, typifies the present insignificant role of United States edible fishery products in the trade of Common Market countries. Before World War II, United States exports of canned salmon to those countries increased from about 1 million pounds in 1935 to about 4 million pounds in 1938. Trade was cut off during World War II. In 1946, when foreign aid programs were strong, the United States shipped about 1 million pounds to the six countries. Following the establishment of the Marshall Plan in 1948, which encouraged greater self-sufficiency in Western Europe, canned salmon exports declined to less than 250,000 pounds. But, as the economy of Europe improved, imports increased to the present rate of about 500,000 pounds a year. Nearly all canned salmon shipped to the Common Market countries from the United States is imported by the Benelux countries free of duty. For many years shipments of canned salmon to Common Market countries have accounted for less than 1 percent of United States production. Currently, the United States accounts for less than 10 percent of total imports of canned salmon by Common Market countries.

The present tariff rates on canned salmon in the Common Market countries are as follows: In the Benelux countries, the official duty of 15 percent ad valorem has been temporarily suspended; Italy has a 10 percent ad valorem duty; Germany, 20 percent; and France, 20 percent. The principal territory that imports canned salmon, the Belgian Congo, has a duty of 15 percent and an import sales tax of 5 percent of the duty-paid value. Belgium and Luxembourg have a sales tax of 5 percent. Italy has a sales tax of 3 percent, and France has an import tax of 30 percent and a stamp tax of 3 percent of the import duty and import tax. The Governments of France and Italy restrict canned-salmon imports by permitting only small quantities to be received by holders of government-issued import licenses. Until early 1957, West Germany also had import-license restrictions on canned salmon.

The Common Market tariff on canned salmon will be $12\frac{1}{2}$ percent ad valorem if based on the arithmetical average of actual duties of January 1, 1957. If based on an arithmetical average of official tariff rates, it will be $17\frac{1}{2}$ percent ad valorem, or about 27 percent if based on aggregate import fees. At the GATT conference at Geneva in 1956 the official tariff in Benelux countries was reduced from 20 percent to 15 percent in a concession granted to the United States. At the same conference Italy granted a concession to Canada on canned salmon, reducing the duty to 14 percent.

SPECIFIC: From Anacortes, Wash., 100 medium-to-large day-old herring were procured. At the laboratory they were cleaned and randomly divided into two groups. One group consisted of lots of five fish that were lightly ice-glazed and sealed in evacuated polyethylene bags; the second group consisted of lots of five fish frozen in blocks of tap water. The two groups then were stored side by side at 0° F.

On the day of examination, one bag of each of the two groups was removed from storage, thawed, and filleted. The right fillet of each fish was prepared for organoleptic examination by being baked in foil. The left fillet of each fish was carefully skinned and boned in preparation for the TBA measurement. Five fillets were blended with their weight of water (1:1 dilution) in a pint jar, and 1.9 to 2.1 grams of the homogenate was removed by means of a large-tip pipette and weighed into a tared 250-milliliter round-bottom flask. The remainder of the procedure followed exactly that described by Yu and Sinnhuber except that it was found desirable to store the TBA solution in a refrigerator and to mix it in the solution of citrate buffer used, just prior to adding it to the sample.

The red color that develops when the TBA reagent is refluxed with the sample of fish was measured at 535 millimicron on a Beckman DU spectrophotometer, the value being reported in terms of $E_{1\%}^{1\text{cm}}$.

RESULTS

The data showing the effect of the two methods of packaging on TBA value of herring held at 0° F. are given in figure 1. The fillets from the two groups were compared and scored for odor and taste immediately after removal from the oven. Results are given in table 1.

Storage Days	Organoleptic Rating	
	Herring Stored in Ice Blocks	Herring Stored in Polyethylene Bags
0	Good odor and flavor	Good odor and flavor
12	Good odor and flavor	Trace rancidity
16	Good odor and flavor	Trace rancidity
24	Trace rancidity	Trace rancidity
33	Trace rancidity	Trace to slight rancidity
60	Trace rancidity	Slight rancidity
90	Trace rancidity	Strong rancidity

In this experiment, trace rancidity, as determined organoleptically, was first evident at a TBA value of 0.05 ($E_{1\%}^{1\text{cm}}$). A later stage of rancidity, which can be described as "slightly rancid," occurred at a value of 0.10. Extreme rancidity occurred at 0.17.

In both packaging methods, an initial rise in TBA value (corresponding to development of trace rancidity) was followed by a period in which the TBA value remained relatively constant. Unfortunately, in this intermediate stage of slight rancidity, the TBA test gave somewhat inconsistent and overlapping values (compare results in table 1 and figure 1). In the case of the polyethylene-wrapped samples, a second rise in TBA value occurred corresponding to development of extreme rancidity at the end of the induction period. The ice-glazed samples had not developed sufficient rancidity by the time this experiment was ended to show this second increase in TBA value.

This experiment indicates the high efficiency of an ice glaze to protect frozen fish against rancidity and, also in confirmation of previous findings, suggests that polyethylene offers relatively inferior protection against entrance of oxygen into packages of frozen food wrapped in this material. The findings in this experiment therefore are in line with previous observations. Nevertheless, owing to the restriction of the test to one species of fish under one set of conditions, we are not necessarily implying that similar correlation would be obtained if conditions were varied.

Since the start of the tests reported here, Sinnhuber and Yu (1958) have suggested an alternate method of reporting TBA values in terms of equivalent malonaldehyde content of the sample. If our data are expressed in terms of this new TBA number (milligrams of malonaldehyde per 1,000 grams of sample), 2.3 is obtained for trace rancidity, 4.6 for slight rancidity, and 7.8 for extreme rancidity.

CONCLUSIONS

1. In the present single series of storage tests at 0° F. with herring lightly glazed and sealed in evacuated polyethylene bags or frozen in blocks of tap water, the 2-thiobarbituric acid (TBA) test for rancidity correlated with the organoleptic test.

2. When the data obtained were expressed at TBA values ($E \frac{1\%}{1cm.}$), 0.05 was obtained for trace rancidity, 0.10 for slight rancidity, and 0.17 for extreme rancidity.

3. When the data were expressed in terms of milligrams of malonaldehyde per 1,000 grams of sample, 2.3 milligrams was obtained for trace rancidity, 4.6 milligrams for slight rancidity, and 7.8 milligrams for extreme rancidity.

4. Owing to the restriction of the test to one species of fish under one set of conditions, a similar correlation of TBA value with organoleptic test would not necessarily be obtained if the conditions were varied.

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TREATING SALMON WITH NITRITE DIP FOR BETTER PRESERVATION

Treatment of salmon with nitrite by dipping for 2 to 3 minutes in a 0.2-percent solution of the preservative showed slight improvement in the keeping quality of the iced fish. The 5-minute dipped samples developed brownish black discoloration during 2 weeks of iced storage. The pink color of the gills disappeared more quickly than normal and there were spots of strong rancidity. After frozen storage of untreated and nitrite-dipped salmon for 7 or 8 months at -20° C. (-4° F.), no bad effect of a 2-minute dip could be shown but the 5 minute dipped samples resulted in serious quality deterioration including discoloration and rancidity (Arsberetning fra Fiskeriminsteriets Forsogslaboratorium for 1957, Copenhagen, Denmark).