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FOR REFERENCE

NOT TO BE TAKEN FROM THIS ROOM

COLD STORAGE PROBLEM OF FISH MARKETING  
IN ISTANBUL AREA

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BEBEK, ISTANBUL

PAGE

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124013

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE

## TABLE OF CONTENTS

<u>Chapter</u>	<u>Page</u>
I. <u>Introduction</u>	1
A. Definition of the Topic	
1. Cold Storage Problem of Marketing Fish in Istanbul Area	
2. Its Nature	
3. Significance	
B. Methodology	
II. <u>Background Information on the Topic</u>	4
A. The Fisheries of Turkey	
1. Production in the Bosphorus-Marmara Area (Istanbul Area)	
2. Fishermen's Organizations	
3. Marketing Organization	
B. History and Development of Cold Storage of Fish	
1. History	
2. Fish Handling and Refrigeration	
(a) Basic Methods for Cold-Storing of Fish	
i) Freezing in Air	
ii) Freezing in Liquid	
iii) Freezing by Contact	
III. <u>Refrigeration and Marketing of Fish in the Bosphorus-Marmara Area</u>	26
A. Conditions Before Cold Storage	

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE

<u>Chapter</u>	<u>Page</u>
B. Development of Cold Storage of Fish and Its Marketing in the Bosphorus-Marmara Area.	
1. Cold Storage	
2. Distribution and Marketing	
C. Organized Institutions of Cold Storage of Fish	
1. State Meat and Fish Office	
2. Tutsat and Others	
a) Tutsat	
b) Tansever Corporation	
D. Price Analysis	
IV. <u>Conclusion</u>	51
V. <u>Summary of Conclusions and Recommendations</u>	54
A. Conclusions	
B. Recommendations	
<u>Appendices A-D</u>	57
A. Regulations for the Handling of Fresh Fish and Frozen Fish in Turkey	
B. Supply and Distribution of Fresh Fish in Turkey	
C. The Construction Program of the Meat and Fish Office - Capacities of its Cold Storage Warehouses	
D. Deflated Prices for Palamut (Bonito) and Uskumru (Mackerel) - Years 1953-1965	
<u>Bibliography</u>	

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 1

## CHAPTER I

### INTRODUCTION

#### A. Definition of the Topic

##### 1. "Cold Storage Problem of Marketing Fish in Istanbul Area".

##### 2. Its Nature:

At the very beginning what I had in mind as the topic of my thesis was "Cold Storage Problem of Marketing in Turkey". But in accordance with the criticisms made by Mr.Koç and Mr.Göker, I was obliged to reformulate my topic. This reformulation was made in a way to render one specific product dominant as was strongly recommended by the thesis committee.

After my interviews with Dr. Nezih Neyzi and Mr. Yıldırım Kılıkış, the Chairman of the Marketing Research Department of the Chamber of Commerce, and with their assurance about the fact that I could find sufficient data, I decided to deal with the "Cold Storage Problem of Marketing Fish in Istanbul Area."

##### 3. Significance

An important problem facing the businessmen today which calls for immediate solution is storage of raw materials and manufactured articles of every kind. Any businessman who can solve the storage problem correctly is well on his way to success.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 2

This is not a new problem but it has gained importance and required close attention due to its increasing influence on the achievement of time, price, and place utilities.

In addition to the general problem of storage, cold storage has attained considerable importance as the marketing of fresh vegetables, fruits, meat and fish gained importance. For Turkey, these four items present more of a problem because fish, for example, is a vital food product. It competes with meat to some degree and there is excess of supply in certain seasons and it is either wasted or poured back into the sea since the cold storage facilities are not adequate. In order to avoid wastage and to keep prices at a normal level, cold storage is required. In this respect cold storage tries to regulate, or to close the gap between, supply and demand.

What I have tried to analyze in this research was first the production and market structure for fish. Second, I tried to find out whether cold storage has any effects upon the time and place dimensions of the market for fish.

However, the main theme to which more emphasis was given, was the direction and magnitude of the fish prices between 1953 and 1965 and the relation of these to developments in the area of cold-storage. At the very beginning, the first question asked was "Has increased cold-storage capacity dampened, or not affected at all, price fluctuations?" The answer to this question will be explained in detail in the following chapters.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 3

## B. Methodology

The methods of gathering data were mainly interviews and use of books published by the Meat and Fish Office, FAO reports on Fish and Fishing, and certain published studies by the Chamber of Commerce. I had many interviews with the Meat and Fish Office people, certain fishermen and people from other private fishery organization whose names are given in the "Bibliography."

## CHAPTER II

### BACKGROUND INFORMATION ON THE TOPIC

#### Survey of Descriptive Information

In this part of my thesis I'll try to supply background information about the Fishes and Fisheries of Turkey. The chapter will start with a discussion of production in general and will continue with the production in Istanbul Area mainly. Next, I'll try to explain cold storage (Refrigeration) of fish and its main influences on the marketing of fish. The next step will deal with the existing Cold Storage conditions in Istanbul Area. The third part of this chapter will cover the "Analytical Information" on the topic which is mainly about "Prices". Finally, the chapter will include a discussion of the various "Organized Institutions of Cold Storage of Fish."

#### A. The Fisheries of Turkey

Fishing has been carried on for centuries in all coastal waters of Turkey, including the Black Sea on the north, the Bosphorous and Sea of Marmara on the west, and the Aegean and Mediterranean on the southwest and south coasts. The greatest concentration of production has been in the Bosphorous and the Sea of Marmara region, catering to the Istanbul Market. Important fisheries also exist in the waters of the eastern end

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 5

of the Black Sea centered on Trabzon. Inland fisheries are important in the major lakes, but the quantity caught in inland waters is a relatively small proportion of the total catch.

"Statistics of the catch, its value and other aspects of the industry, are scanty and to some extent confusing". <sup>1/</sup> It is clear, however, that the catch is subject to wide fluctuations from year to year. In prewar years, the catches in all waters were reported to have exceeded 130,000 metric tons but, in the early postwar years, landings to have dropped to as low as 50,000 tons. Part of this decline was due to low supplies of bonito in the Bosphorus where a cycle of production appears to exist. By 1958 reported landings had again risen to more than 130,000 tons and this trend continued to be an average amount in recent years.

Fisheries in Turkey can be divided into two categories: pelagic and demersal. The pelagic ones are migratory. Almost all of the Istanbul Area fishes are pelagic which are seasonal. The most important species landed are bonito (palamut), mackerel (uskumru), bluefin tuna (ton-orkinos), swordfish (kılıç). The less important ones are anchovy (hamsi), horse mackerel (istavrit), grey mullet (kefal), red surmullet (barbunya), blue fish (lüfer), horn fish (zargan), bass (levrek), shad (tirsi), turbot (kalkan), and spanish mackerel (kolyos).

After spawning in the Sea of Marmara in the early spring (April), the bonito and mackerel migrate through the Bosphorus into the Black Sea in May and June. The fish spends the summer in the Black Sea and migrates southward from September through early December. In the spring by the migration

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<sup>1/</sup> p.9 - "FAO Report to the Government of Turkey on Policy and Development of Turkish Fisheries".

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 6

northward the fish are lean, but in the autumn they are fat and very suitable for consumption in the fresh state.

With a high concentration of fishing in the Istanbul Area the migrations of the fish cause very great seasonal variations in the supplies available to the market, both domestic and foreign. During the peak periods the potential supply exceeds both the local and export demand, while during the off-season it is insufficient for the local demand. This creates many special problems from the point of view of both production and marketing. During the peak seasons there is an abnormal need for cold storage and canning facilities which may be in use only for a short period. Similarly, there is the problem of seasonal variation in employment both for fishermen and shore-workers.

The fishery, in the years following the Second World War up to 1949, appears to have been disorganized, with very little supervision or guidance from the government. Fishermen were poorly equipped, both as regards vessels and gear, and marketing facilities were inadequate. Little biological or statistical information had been accumulated, making estimates of potential supply difficult. Knowledge was lacking on the populations and movements of the fish. Technological knowledge was lacking on the ways and means of increasing catches or improving processing facilities. A need for capital investment in both the production and processing branches of the industry was apparent, but no facilities were available to provide such capital either from private or public sources.

Since 1950, greater interest by the Government of Turkey, together with the assistance from FAO and other foreign

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 7

assistance programs, has added considerably to the accumulation of basic knowledge and the equipment available to the industry. Technological and biological surveys have been made leading to the establishment of the Fisheries Research Center at Istanbul which is responsible for the more practical aspects of the problem and the Hydrobiological Institute, associated with the University of Istanbul, which engages in the more basic research. A start has been made at experimental fishing with new types of vessels and gear, and exploratory fishing has been carried out with echo-sounding equipment. A well-equipped research vessel has been made available. All these developments made it possible to plan for the development of the commercial fisheries and to estimate the potential resources of the fishery.

Although definite conclusions have not yet been reached on the most desirable types of vessels and gear, a substantial number of engines have been imported for the use of fishermen. The problems of financing the necessary improvements have not yet been fully resolved, but the Agricultural Bank has been empowered to make loans to the fishing industry. The importation of needed engines and other equipment is under the control of the Meat and Fish Office. Arrangements have been made for the local manufacture of twine, and a net-making plant has been established in Istanbul. Ship-building facilities within the country are adequate to take care of the need for wooden vessels. In this field qualified naval architects are required to provide drawings of new vessels as indicated by research and practical experience.

In 1952, the responsibilities of the fisheries, which had previously been that of the Office of Soil Products, was

transferred to a newly established Meat and Fish Office. This has made possible greater attention to the problems of fishing industry. A Fisheries Division has been established under the Meat and Fish Office, and this Division has assumed responsibility for the construction of cold storages, modernization of the canning industry, improvement of transport facilities, and the establishment of modern retail facilities on an experimental basis.

The presence of a number of technical experts in Turkey, together with the training of individuals through fellowships and on the spot, is beginning to provide a basis for carrying out the necessary Government development functions and to give leadership to all branches of the industry.

Fisheries of Turkey are drawn separately for the major areas of production, i.e. the Bosphorus-Marmara Area, the Black Sea and the Mediterranean Area.

Due to its significance for my topic, I'll deal only with the first and most important of these areas.

## 1. Production in the Bosphorus-Marmara Area (Istanbul Area)

No precise data are available on the total stocks of fish available in this area, but such figures as have been compiled show clearly the wide fluctuations which occur from year to year and seasonally within the year. There are a number of species caught in the area but bonito and mackerel account for some 65 to 75 percent of the total. The major product, in most years, is the bonito, which is separated into two classes - palamut and torik. There are three types of mackerel - uskumru,

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 9

kolyos, and istavrit. Torik and uskumru are caught in greatest quantity in most years. Other species such as sardines, tuna, surmullet and lobster are available only in limited quantities and do not create any special problems of production or marketing.

"The two types of bonito differ only in age and size, the palamut ranges in size from 1.17 to 1.3 kilograms per pair (1.25 to 1.5 pounds per fish) while torik ranges from 4 to 5 kilograms per pair (4.5 to 5.5 pounds per fish)." 1/ Both types are excellent in the fresh state but also suitable for freezing and canning. The bonito are migratory, moving to the Black Sea through the Bosphorus in May and June and returning to the sea of Marmara during the months of September to February. There is some variation in the date of actual peak movement. The annual catch reached a minimum in 1952 and 1953, but increased with a higher rate after 1955, averaging about 5,000 tons of palamut and 9,000 tons of torik in that year.

"There is reason to believe that the catches of bonito could be substantially increased, as fishermen have been practicing voluntary production control in order to maintain prices." 2/

The migration of the mackerel to the Black Sea in the spring comes a month or so earlier than the bonito, while the autumn peaks are usually later, varying from November through February. All types of mackerel are popular in the fresh state but they are also suitable for freezing, canning and salting. In recent years, the catch in the Bosphorus-Marmara Area has averaged 1500 tons of uskumru, 5-600 tons of kolyos, and 5-600

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1/ p.13 - "FAO Report to the Government of Turkey on Policy and Development of Turkish Fisheries" - Report No. 618.

2/ From the interview with a fisherman, Ahmet Kam (a Producer)

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 10

tons of istavrit. (In 1953 the catch of uskumru reached 10,000 tons).

Sardines are taken mainly in the Çanakkale or Southern end of the Sea of Marmara and are delivered direct to the canneries of that district. Tuna are available in limited quantities in the winter and early spring. These are fished in traps and by hook and line and are usually exported frozen to Italy. Other species, such as surmullet and lobster are scattered and are easily marketed in Istanbul and other domestic markets.

There are two main types of fishing enterprises in this area. The smaller enterprises are based on a small row boat using gill nets and trap nets. The larger enterprises are based on a girgir type of seine net normally operated by one powered vessel and two unpowered boats, although in some cases only one boat is used. "The larger motorized vessels are usually about 15 meters long and 4 meters in width. A few of the vessels are larger, up to 20 meters in length. The unpowered vessels are 9 to 11 meters in length and 2.5 to 3 meters in width." 1/

The fishermen are not concentrated in a few ports but rather are scattered in a fairly large number of small fishing settlements. There are many part-time fishermen as well as those who devote all their time to fishing. Generally the vessels and gear are owned by fishermen, but in many instances the control is by those who finance the operation. This is particularly true of the gir-gir outfits. The small enterprises usually involve three or four men. The men, other than the owner, are generally paid a small wage and receive a small share

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1/ p.14 - "FAO Report to the Government of Turkey on Policy and Development of Turkish Fisheries" - Report No. 618

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 11

of the catch. It is estimated that about "530 of these enterprises" operate in the area, employing some 1,500 men. Returns to these fishermen are generally low, but in good seasons they do quite well.

A high proportion of the total catch is landed by the more efficient gir-gir outfits. They are more mobile and can follow the fish as they move into different waters. Typical outfits employ from 15 to 20 men but some have as many as 30 to 35. In 1955, there were 105 gir-gir outfits in the area employing some 2,000 men. 1/

## 2. Fishermen's Organizations.

There are three fishermen's organizations in the area. Two of the groups represent the smaller fishermen and one the larger gir-gir operators. One group was organized in 1945 and the other two in 1949. The groups were organized in the first instance to assist the Government in the distribution of engines and imported gear. The present activities include supplying gear to members, and providing a limited amount of credit. In one case, an organization plays a large part in the sale and distribution of fish. Two of the groups are held together by merchants and other suppliers of capital who look after the business aspects for the members. The existence of these groups does make it possible for the Government to hold consultations with fishermen, but the groups do not necessarily represent in all cases the viewpoint of the 'man in the boat' fishermen.

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1/ p.11 - "A Survey on Turkish Fishery" - Istanbul 1962, Chamber of Commerce.

### 3. Marketing Organization

The central feature of the market structure is the Istanbul Fish Market. While a small portion of the total landings are sold directly to consumers, canners, salters and freezers, the majority of the fish is sold over the auction market. The fish may be placed on the market directly by the fishermen, but more often it is actually offered by a primary wholesaler. This wholesaler is often ~~is~~ financial backer of the fishermen. After passing the municipal inspector the fish is sold by the fish market auctioneer, who is an employee of the municipality. A charge of 5 percent is made for this service. The buyers on the market are for the most part secondary wholesalers although retailers, canners, (mostly small-scale enterprises), salters, and freezers also may appear directly in the market. The secondary wholesaler sells to local or other domestic retailers as well as to canners and freezers. There is considerable flexibility in the manner of flow of fish through the market but usually all phases are included. Exporters purchase their supplies on the market and have it delivered to their own premises where it is packed or frozen for shipment. Most of the exports, other than those handled by the Meat and Fish Office, are shipped by rail. Refrigerated cargo space is scarce because of the sinkings during the war. The Meat and Fish Office has two 100 ton vessels in operation.

The fishermen's organizations have operated a system of price maintenance for several years through voluntary control of production. This has avoided the accumulation of surpluses, but it has meant that less fish is caught and marketed than could be taken, especially during the peak periods of supply.

Since this is a fishery where costs per unit probably decrease sharply with increased production, it is not at all certain that the fishermen have always benefited by this system.

## B. History and Development of Cold Storage of Fish

### 1. History

Fish is among the most perishable of all foodstuffs. Since prehistoric times, large quantities of fish have been preserved by drying, salting, smoking, and pickling. Early in the 19th century, the preservation of fish by canning was begun and soon became an important industry. While these methods retain most of the food value of the fish, the flavor and appearance of the preserved product do not resemble closely those of fresh fish.

For centuries fishermen in very cold countries have been allowing their surpluses of fish to freeze during winter and thus preserving it for shipment or for storage for a few weeks. They recognized that freezing was an excellent method of preservation, since properly frozen fish when prepared for the table can scarcely be distinguished from fish which has not been frozen. "Stevenson's (1899) comments on the quality of frozen fish are interesting: 'The belief held by some persons that freezing destroys the flavor of fish is not well founded, the result depending more on its condition when the cold is applied and the manner of application than upon the effect of the low temperature. Fish decreases less in value from freezing than meat does but it is especially subject to two difficulties from which frozen meat is free: first the eye dries up and looses

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 14

its shining appearance after a long exposure to cold, and second, the skin being less elastic than the texture of the fish, gets hard and becomes somewhat loose on the flesh. Frozen fish is not less wholesome than fish not so preserved. The principal objection to this preservation method is the tenancy to freeze fish in which decomposition has already set in, and the prosperity of the frozen fish business requires that any attempt to freeze fish already slightly tainted, should be discountenanced." 1/

Much of the early experimental work on freezing was carried out on fish. Quick freezing of fish was common commercial practise for a decade prior to its adaption for the freezing of other foods. Freezing by direct immersion of fish in brine, or in a spray of brine, was originally proposed for the quick freezing of fish. Fish was the first food to be quick frozen in small packages.

Man's first refrigerators were the natural caves, particularly those of volcanic origin, as these were remarkably dry and cool. When ice first came into general use about 155 years ago, there were no refrigerators. Food was preserved by packing it in ice, or allowing the cake of ice to melt on the cellar floor. It was finally observed that during the melting of ice, the entire air volume of the cellar became decidedly colder, and that the food kept just as well in the cold air as it did when in actual contact with the ice. This was really the beginning of the cold storage era, the preservation of perishable products by means of low temperature, obtained by artificial means. As time progressed, the advantages of air circulation were brought out and the ice was then placed in racks above the floor.

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1/ p.1 - Tressler D. and Evers Clifford, 1947, "The Freezing Preservation of Foods"

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 15

With the formation of an urban population, the warehousing of food became a vital necessity. As transportation facilities improved, the distance between the urban and rural population became greater, and at the same time the productivity increased. This resulted in surplus production during certain seasons of the year and the warehousing for the preservation of this seasonal surplus production became a vital necessity. Today the warehousing of perishable foods is so important that no urban population could survive for many days without cold storage foods of one kind or another. Cold storage, as we now know it, began to develop about 1890 when mechanical refrigeration first started to assume practical importance. Previous to that time, such cold storages that existed were cooled with ice or a mixture of salt and ice.

"The artificial freezing of fish on a commercial scale began about 1865. Even prior to that time, fish caught through the ice were frozen by allowing them to remain on the ice for a few hours. This system was called "weather-freezing". "Weather-frozen" fish command good prices because of their high quality.

Enoch Piper of Camden, Maine, is credited with being the first to freeze fish artificially. He placed the fish on racks in an insulated chamber and set pans of mixture of crushed ice and salt on them. After freezing, he glazed them by a dip in cold water, then transferred them to an insulated chamber-refrigerated with the vertical metallic tubes filled with a salt and ice mixture.

Davis, in 1868, invented a process of freezing fish in rectangular metal pans with telescoping covers packed in an ice

and salt mixture. When frozen~~d~~, the cake of fish was loosened by momentary immersion in water. The cake of fish was glazed in cold water, and then stored. With the exception that the panned fish are frozen by means of artificial refrigeration, this method is still in use today.

The most important step in the history of the freezing of fish occurred about 1880 when refrigerated machines using ammonia were employed in the United States for the first time for freezing and storing of fish. By the beginning of the present century, the fish-freezing industry was well-established and soon rapidly expanded to a very important business." 1/

## 2. Fish Handling and Refrigeration

According to the official statistics of FAO are at present landed approximately 26 million tons of fish in the world every year. 45 percent or almost 12 million tons are marketed fresh for human consumption. When it is remembered that fish is one of the most perishable foods, the importance of efficient methods to delay the spoilage long enough to be able to bring the fish to the consumer is easily understood.

When a fish is pulled from the sea, it has a seaweedy smell, a rigid and firm body, and an elastic tissue. It has a shiny surface and a transparent slime will be evenly distributed over the skin. The eyes will be clear with a dark pupil, and the gills will have a clear, red color of different tints. If the fish is now put aside without any protections, certain changes will quickly be apparent. The fresh smell will be replaced by a rotten and putrid odour, the tissue will become soft, the surface of the fish will become dull and slime and will clot

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1/ p. 552 - Tressler D. and Evers, Clifford, 1947, "The Freezing Preservation of Foods".

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 17

into knots. The eyes will become grey and cloudy, and gills will become greyish or brownly. In short the fish is not attractive any more.

The deterioration and decomposition of fish is brought about partly by the activity of certain non-living substances known as enzymes that occur naturally in the flesh itself, and partly by the bacteria which attack the flesh from outside once the fish is dead. The activity of these enzymes and bacteria is considerably increased if the fish is subject to rough handling.

It is therefore understood that methods and procedures to store fish must aim at stopping or reducing the activities of the above-mentioned bacteria and enzymes. The best way to reduce their activities is by temperatures. The activity of enzymes can be stopped by simply destroying their chemical composition, which is done by heat. That is what we do when we cook the fish and when we used drying and smoking methods. The bacteria need plenty of liquid water of low content to live in and their activity can therefore be checked by eliminating such water. This can be done by drying the fish or salting it or by freezing, etc. But all these methods, are more or less irreversible, i.e. that the fish so teated cannot be brought into the same condition as before treatment. Therefore, the only efficient method available to retard the spoilage and keep the fish for some period without changing the character of the flesh, is to bring down the temperature as close as possible to the freezing point. This is known as "chilling", which is usually understood to cover the procedure of bringing the

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 18

temperature down, while keeping the goods at low temperature is called "cold storing".

How long can fish be kept in cold storage? This question cannot be answered with any one figure, because it depends on the circumstances, on so many things which have to be defined and specified before to answer the question.

Experience has shown that fish that is chilled immediately after it is caught will keep at  $0^{\circ}\text{C}$  at least twice or even thrice as long as fish which has been exposed to a temperature of  $20^{\circ}\text{C}$  for 12 hours before it is chilled. The period of duration also depends on cleanliness and sanitary handling. On the other hand, the ability to keep in cold storage is entirely different for different species of fish. Fat or oily fishes are much more perishable than lean or so called "white fishes", and fat fishes are very difficult to store because the enzymes from their own guts will very quickly attack their flesh. These are the reasons why it is pretty difficult to predict how long time fish will keep in cold storage, but on the other hand, it is possible to get a picture of the influence of temperature reduction by comparing the performance of the same kind of fish, handled in the same way but kept at different temperatures.

A Norwegian fishery has recently published observations on this matter after storing some fish at 5 different temperatures immediately after the catch. His results were as follows (in days):

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 19

T A B L E 1

	0°C	5°C	10°C	15°C	20°C
Still excellent	8 1/2	4 2/3	2 3/4	1 1/3	0 3/4
Still good	11	6 1/3	3 1/2	2	1 1/4
Still fair	12 1/2	7 1/2	4 1/4	2 1/2	1 1/3
Bad until inedible	14	8	4 2/3	2 2/3	1 1/2

Source: Tressler, Donald K. "The Freezing Preservation of of Foods", Second Edition, The Avi Publishing Co., New York 1957.

From this table, we see that fish which at 0°C keeps excellent for 8 1/2 days or 204 hours will, when kept at plus 20°C be inedible in 36 hours. It also shows the very rapid acceleration of the process. We can assume from this that the fish in question has been lean or white fish, because oily fish will not keep so long fresh under any conditions. On the other hand, some fishes can keep even longer. However, efforts should always be made to bring the fish to the consumer as quickly as possible. The chilling and cold storing has been done in many different ways. Chilling and cold storing in cold air has been tried without success. It does not chill the fish as fast as the other methods, and tends to dry the surface of the fish which causes a bad appearance.

(a) Basic Methods for Cold-storing of Fish

Quicker drilling can be obtained in cold water at  $0^{\circ}\text{C}$  or brine at approximately  $-1^{\circ}\text{C}$ , but the water or brine quickly gets contaminated by slime and dirt and the method is therefore objectionable from a sanitary point of view and this method is therefore not in common use.

The most common method for chilling and storing fresh fish is to ice it. Then the fish is usually packed in boxes with liberal amounts of ice on the bottom and on the top and along the sides of the box in that way that the fish is as far as possible enclosed in the ice. The procedure of icing has been known and practiced through centuries. From ancient times, natural ice has been taken from lakes and ponds in winter and stored in insulated ice houses or in stacks covered with heavy layers of sawdust or seagrass or other insulating materials.

The next step was to produce artificial ice by the method known as ice-block method. Although this method was commonly used abroad, it was not practical for the cooling of fish, because the blocks produced by this method often damages the sensitive fishes such as mackerels, sardines and similar. Another disadvantage is that it takes too much time to produce ice with this method. For the last 35 years, machines have been on the market to produce ice in small form directly from the refrigerated machine. Such ice is known as flake ice or scale-ice and it is more conveniently used to ice most kinds of fish.

The necessary amount of ice needed for chilling the fish can be estimated if the temperature of the fish is known since 16 calories will be needed to cool 1 kg. of fish down to  $0^{\circ}\text{C}$ . But the usual case is that some heat is coming also from

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 21

surroundings. Iced fish should therefore be stored and transported in insulated vehicles. Normally, 30-40% of the weight of the fish should be considered as a minimum amount of ice necessary. For chilling and transporting to distant areas as much as 50-70% is often used.

Inland distribution of fresh fish is usually done in the way that fish is packed in boxes of 30-70 kg. with normal amounts of ice needed. The boxes are closed with a lid and transported in insulated wagons or trucks. Before and after the transport, the fish is kept in insulated premises, and is transported to the market area and sold as quickly as possible. Fish that is distributed and sold fresh, on the other hand, is usually not prepared in any way except gutted, washed and iced in boxes. Only in rare cases it is filleted. The fillets are usually wrapped in cellophane and iced in insulated boxes.

It should always be remembered that the quality of the fish on the market to a high degree depends on the treatment and care it receives already in the boats by the fishermen, and it is therefore essential that the fishermen understand the basic principles of proper handling of fish.

As we have seen so far, most methods for preserving fish are based on the principles of eliminating the free liquid water that is necessary for the activity of bacteria, or to increase the salt content of the water so much that it is no longer suitable for the bacteria. We also learned that reduced temperature reduces the activity of both bacteria and enzymes. Freezing combines both of those principles.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 22

Although freezing in industrial scale has been known for more than half a century, only a little fraction of the fish landed in the world today is frozen; only about 900.000 tons or 3.5% of the 26 million tons landed. Freezing should, of course, only be applied to prevent from spoiling the fish that cannot be marketed fresh or to even out the peak supplies during seasons. Freezing can never improve the quality of the fish, but when applied skillfully and together with the much more expensive canning, it is probably the best method for preserving perishable foods at our disposal.

When salts are solved in water they lower the freezing point of it. Therefore fish does not start to freeze at  $0^{\circ}\text{C}$  but usually at  $-1$  to  $-2^{\circ}\text{C}$ . At  $-2.5^{\circ}\text{C}$ , nearly 70% of the water is frozen; at  $-10$ , 91%; at  $-20$ , 93%; and at  $-30$ , 98%. All the water is not frozen until about  $-50^{\circ}\text{C}$ . When the fish is frozen and kept at deep temperature, the activity of bacteria is almost completely eliminated. But the dangers of deterioration in frozen storage are mainly two: drying and oxidation. Drying often occurs in cold storage through evaporation of moisture from the fish.

With prolonged storage, the drying also extends to the interior of the fish so that the whole texture becomes loose and inelastic. Besides loss of quality, drying results in irreparable losses in weight and thus bring about heavy economic losses. While the quality of frozen fish can be seriously affected by faulty technique such as very slow freezing or storage at insufficiently low temperature without protection, there is no doubt that raw material of poor initial quality is the most frequent cause for bad frozen products. The procedure

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 23

sometimes occur here and there that the fish merchants try to sell their fish first fresh and when they do not succeed and their fish starts to spoil, then they freeze it. It must be the responsibility of fish merchants to estimate the marketing possibilities so that they can freeze their surpluses without delay.

Freezing methods are often classified in three groups by the medium used to transfer the cold to the goods. These groups are:

i) Freezing in air - This was applied in the first decades of the freezing industry almost exclusively. The goods to be frozen are brought into a room where the temperature was kept at, say  $-10^{\circ}\text{C}$ . By this method the freezing took a long time, so that fish were sometimes already spoiled before they were frozen and there was also a great danger of drying. The freezing time could be shortened by circulating the air by fans and that is what is being done in the so called "freezing tunnels."

ii) Freezing in liquid - In order to prevent drying of fish, brine, a solution of salt in water, has been widely applied since in brine the freezing is completed in shorter time than in air. But it is difficult to avoid the salt which from the brine penetrates into the fish which will have an undesirable influence on the flesh.

iii) Freezing by contact - The third possibility is to freeze the fish in direct contact with metallic surfaces inside which the refrigerant is evaporating. This method is widely used for freezing all-sized fish in square blocks and to freeze fish fillets in square packings.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 24

Of these methods, freezing in air is probably the most common of freezing fish in the world today, but usually high air-velocities and very low temperatures are applied. Brine freezing is now in decline for fish.

Experience has shown that deterioration in frozen fish quality does not occur during freezing but during storage. Storages for frozen fish are highly insulated rooms in which the temperature is kept low by evaporators. The temperature is usually about  $-20^{\circ}\text{C}$  but lower temperatures are used for fat fishes. The time during which the fish can be kept in frozen storage is, of course, depends on many conditions.

It is important to avoid the temperature differences in the rooms and the fish should, when put into the rooms, have the same temperature as the prevailing temperature in the room. For the same reason fish should never be chilled in the same room as fish that already has been chilled is being stored. Another protection is by good packing. Fish can be protected well in a close-fitting envelope of water-vapour-proof material. It also prevents the drying of fish. Distribution of frozen fish is done with heavily insulated wagons or trucks. Sometimes these trucks and cars are mechanically refrigerated by a built-in compressor unit. Sometimes they are cooled by a mixture of ice and salt kept in a container in the cars. Sometimes the cars are cooled with dry ice which is solid  $\text{CO}_2$ , which evaporates directly from solid form to gas at approximately  $-8^{\circ}\text{C}$  at atmospheric pressure.

Also in retail shops, it is necessary to keep the goods at the same low temperature as they have been stored at, and in

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 25

general it can be said that keeping of the same constant temperature from the time fish is first put in storage until it reaches the consumer is one of the main rules one has to follow if high quality frozen fish is wanted.

## CHAPTER III

### REFRIGERATION AND MARKETING OF FISH IN THE BOSPHORUS -

#### MARMARA AREA

##### A. Conditions Before Cold Storage

As we have already mentioned above, perishability of fish and fishery products creates a great demand for cold storage facilities. This subject becomes more important in the case of Turkey since fishing in Turkey has a "seasonal" characteristic. This is because of the fact that Turkish fishing industry depends on the pelagic (migratory) fishes. That is to say, there are peak seasons during which you should catch the maximum amount of fish you can, and then you should put them under refrigeration in order to make them available during the rest of the year. One of these peak seasons is, for example, between October and the end of December (especially for bonito). This means that during these three months, the maximum amount of bonito has to be caught in order to stabilize the market during the rest of the year.

Before cold storage, the production was at minimum since the total consumption was very low. Only 10% of the total production was distributed to various domestic markets. 20% was consumed in Istanbul and the rest, 70%, was exported. 1/

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1/ Interview with Mr. Sonyo at Tansever A.O.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 27

The reasons for the low production (about 20,000 - 30,000 tons/year) before cold storage was the low level of consumption. The reasons for this low level of consumption were manyfold:

1. People in villages in Anatolia don't like fish. They don't eat fish either because of their religious beliefs and traditions or because of fear of poisoning. 1/

2. Difficulties in transportation - Since there were not refrigerated trucks before cold storage, it was very difficult to distribute fish to Anatolia before it became spoiled.

Due to the above reasons, meat was always preferred to fish before cold storage. During those years, approximately 26 years ago, there were no cold storage warehouses, no refrigeration and freezing facilities, and no refrigerated trucks in Turkey. So the fish could be distributed before spoilage only to the markets which were less than 10 hours distance from Istanbul. This durability period was even less during hot days! Therefore there was low production in direct relation to the low consumption level, in order to prevent the pouring of the fish back into the sea. This was because of the fact that there was a lack of regulatory device between supply and demand.

In order to prove this fact it will be useful to state that fish consumption is estimated at 2.7 kg. per capita before cold storage. 2/ (This amount is found after subtracting the total exports). The consumption in coastal areas and in larger inland towns was higher than in the rest of the country.

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1/ Indere, Rifki - Director of Commerce, M.F.O.

2/ Indere, Rifki - MFO

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, İSTANBUL

PAGE 28

## B. Development of Cold Storage for Fish and its Marketing in the Bosphorus-Marmara Area

### 1. Cold Storage

The first Cold Storage warehouse for fish was established at Findıklı (Istanbul) in 1940 by a German man, Somazzi, involved in fishing business. The next one was also built during the same year at Fener by Ali Tansever who now has a large fish export firm. 1/ Similar small scale warehouses were built during the following years until finally the State realized in 1952 that a large scale solution should be found for regulating the fish and meat business.

It was understood that an intensified production of fish requires parallel developments in transport, handling and storage facilities. Machinery for cold storage and freezing plants had already been acquired by Turkey and work was being started on the Government's construction program by 1953. The construction program implemented by the Meat and Fish Office is shown in Appendix C.

Regarding the construction program, on visits to the coast it was noticed that, although the fishermen live in the small villages scattered along the coast, the bulk of the fish was landed in some few production centers (Istanbul, Trabzon, Samsun, etc.) where there is a relatively steady demand. 2/ This fact opened the way for centralization of the shore industries and this trend therefore has been promoted. The fishermen might be likely to demand that the Government provide

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1/ Sonyo, G.M., Tansever Fishing Co.

2/ Indere, Rifki, MFO

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 29

refrigeration facilities in many small communities where such industries were economically not justified. Acceding to such pressures would be a very short-sighted policy since centralization is important for successful operation in such cases.

It seems that all the most important centers of fish production are adequately covered for the present by the above construction program. The ice making sections and the daily freezing capacities are liberally determined, allowing for increased needs in the future. Should future requirements exceed the present capacity, careful consideration should be given as to whether decentralization is necessary or whether expansion of the present plants would meet the increased needs. The most pressing task of the Meat and Fish Office in this field is now to stabilize the operations of the plants which have been built before it engages in new construction plans for fish refrigeration.

The plants of the Meat and Fish Office are of two types: Ice-making and cooling only, and ice making, cooling and freezing plants. Their facilities are made available to the private and cooperative industry by letting the space and services.

The purpose of the cooling plants is to facilitate distribution of the catches by supplying the necessary ice and providing refrigerated storage for collection and, if necessary, a few days storage of the fish. This proposition does not offer any problem of an operational nature. The owner of the fish, whether it is the fisherman, the fishermen's cooperative or any marketing agency, will bring it to the plant, place it in the cooling room and remove it again. The staff of the plant will only have to see that the working order of the plant and its regulations are observed.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 30

The matter becomes different in the freezing sections. The purpose of these is to preserve the peak supplies of the seasons, the surpluses, which cannot be marketed fresh, until periods when marketing conditions are more favorable. There is much labor involved in preparing the fish for freezing. It is also known that only the freshest and best material is likely to make a good frozen product. The one who handles the fish prepares it, freezes and stores it, and will therefore have to accept responsibility for the quality of it.

With the great variety of fishes available in Turkey, it is obvious that the plants will be faced with a great variety of commitments requiring their services. A freezing plant that bases its operation on carrying out odd jobs, will hardly be run effectively and its operation is likely to be expensive. Freezing plants of such proportions as these here in question are in themselves industrial units, which must be operated - at certain seasons at least - in an industrial manner with great efficiency and high productivity. It would be useful therefore to define what could be called their main task, the priority of the different tasks that can be foreseen and the working plan of the plants and their equipment should be selected with a view to the tasks which are of greatest importance.

In the following paragraphs, each individual plant in the Bosphorus-Marmara Area is discussed.

- Beşiktaş - The plant in Beşiktaş is primarily designed as a freezing plant in contrast to that in Haydarpaşa which is a cooling plant only and is the center of the fresh fish distribution from the Istanbul Area. The former is the largest

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 31

of the freezing plants and tries to cope with great landings of bonito and mackerel in their short but rich seasons, namely autumn and early winter. At other times of the year, the plant deals with freezing swordfish, tuna, etc, but this is in relatively small quantities. Therefore, it seems reasonable to give the bonito and mackerel the highest priority in the plant during their seasons and to equip the plant especially to deal with this type of fish with the utmost efficiency.

Here the problem of operational organization stands out very clearly. It will obviously be very difficult to operate the plant, freezing daily 30 tons of cheap fish (which must be treated in an inexpensive and efficient manner) for a great number of customers, allowing them all admission to the plant and keeping their goods separately. 1/ Some kind of collective operational organization was, therefore, thought to be necessary.

Beşiktaş is also a distribution center of frozen fish. It has a storage capacity of 1900 tons (app.), while the other plants have only small storage rooms, and their stocks have to be transferred to Beşiktaş. 2/

- Marmara Island - This plant has been in operation since the end of 1953. It has been rendering valuable service to the canning industry on the island, but the fish supplies have by no means been sufficient to keep it working at capacity. It was originally anticipated that the fishermen from the villages on the south coast of the Sea of Marmara would bring their fish to the Island for storage and buy their ice there. So far this does not seem to have been the case. The reasons for this are twofold: There are no port facilities, on the one hand.

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1/ Indere, Rifki, MFO

2/ Indere, Rifki, MFO

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 32

On the other hand, the plant offers no assistance to the fishermen in their marketing problems. If they brought their fish to the island for freezing or storage, then they would have to take it back to the main land themselves for marketing.

The plant in Marmara has freezing facilities for 5 tons of fish a day. 1/ The fish that would be frozen there, are bonito and mackerel during the winter and swordfish and tuna in spring.

Further information on the capacities of plants are given in Appendix C.

## (a) Operational Procedures

In all the plants of the Meat and Fish Office ice is made in blocks; 135 kg. blocks in the bigger plants and 25 kg. ones in the smaller plants. 2/

The ice has a great tendency to crack during storage on account of the temperature fluctuations in the storage rooms. As most of the fish caught in Turkish waters are extremely delicate, good crushing of the ice becomes a necessity. When the ice is sold crushed care is always taken that it is properly crushed, leaving no large lumps liable to damage fish.

Regarding the treatment of the fish brought to the plants for cold storage, the following points are mentioned as guiding principles:

(a) When the fish are delivered to the plant, they should already be chilled by icing, especially if more than 6 hours have passed since they were caught and the ambient temperature is above 10°C.

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1/ İrdere, Rifki, MFO

2/ p.26, "Report to the Government of Turkey on Fish Handling and Refrigeration", Report No. 282, Rome, June 1954.

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 33

(b) Bleeding of the fish, removal of the guts and careful cleaning of the gut cavity, which all increase the safe storage period, are also done before the fish are delivered.

(c) Fresh, clean water should be running continuously into the washing tank, so that it contains only clean water at any time.

(d) After washing, the fish intended for fresh distribution are packed in ice in boxes and brought to the storage room where the boxes with unfastened lids are stored, 5 to 10 boxes being put on top of one another. Boxes are not placed directly on the floor, but are placed on frames allowing a distance of approximately 10 cm. between the box and the floor, to permit air circulation.

(e) The fish should be sent to the market as quickly as possible and in no case should they be kept longer than 8 days from the time they are caught until delivery to the retailer.

(f) When the stored fish are to be dispatched to the market, the boxes are removed, the ice content of each box checked and ice added where necessary, the lids are fastened and the boxes are loaded onto the transport.

If the fish are to be frozen, they are washed free of ice and dirt and one of the following freezing methods is applied:

(a) Suspension in air - The fish are hung tail up on bars which are laid across carriages. They hang straight so that they will freeze in shape as close to their natural form as possible. After freezing, it is necessary to glaze each fish individually by dipping repeatedly into fresh, chilled

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 34

(2°C - 4°C) water. This method is especially suitable for large fishes, such as tuna and swordfish, which need no other packing for storage. The method can also be applied to fishes such as bonito (Torik), Lüfer, Kefal, Levrek, etc.

(b) Wooden Boxes - Boxes of standard sizes and 8 or 16 cm. deep are made of wood and with openings in the bottom. The boxes are lined with parchment and the fish are placed in the boxes belly down, and close together, in as many layers as necessary to fill the boxes. The open boxes are placed on carriages and rolled into the freezer. After freezing, no further glazing is necessary and the lids are nailed on top of the boxes and these taken to the cold storage room. This method is suitable for mackerel, kolyos and horse mackerel. The method is especially suitable in case of short time storage. It can also be applied to palamut.

Other methods are not discussed here since they were included in the second chapter in detail and since they are not applied in Turkey. Further information on the handling of fish in Turkey is given in Appendix A.

In view of the large construction program of the Meat and Fish Office, the problem of proper staffing of the various plants and in turn the technical training of the personnel was of primary importance.

In cooperation with the Operation and Maintenance Branch of the Mechanical Department of the Office, the organization of a short training course in fish handling and refrigeration was discussed in 1954, to give the refrigeration plant personnel at least a rudimentary training and to establish a prototype of a training course which will be repeated in future years.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 35

The first one of these, a 2-weeks' course was arranged to take place in the refrigeration plant of the Office in Trabzon from 15 to 26 February 1954, with the approval of the Director-General of the Office and FAO Headquarters.

## 2. Distribution and Marketing

We have already seen the operations of the Istanbul Fish Market in Chapter II. Bearing these in mind, now let us discuss how the distribution and marketing of fish has changed since 1953.

One of the most important aspects of the Turkish Fisheries program is to improve and extend the distribution of fresh fish in the country. There is no doubt that local consumption can be very much increased.

"Per capita fish consumption in Turkey has remained at a very low level owing to the insufficiency of production and the inadequacy of distribution and storage facilities. The fall in prices resulting from higher production, accompanied by improvements in distribution and storage, will lead to the increase of per capita consumption from 2.2 kg. per annum in 1963 to 5.3 kg. in 1967." 1/ These are the comments made by the State Planning Organization in 1963. It is true that per capita consumption of fish is still very low in our country. But the situation has improved since 1954. During that year and the following years, before cold storage facilities of the Meat and Fish Office have reached their full capacity, fish was only rarely available in many inland cities

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1/ p.156, "First Five Year Development Plan",  
State Planning Organization", Ankara, 1963.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 36

because of the inadequate transport facilities and people had therefore not yet learned to appreciate fish as part of their daily diet. The first step towards increased fish consumption in such places was to make good, fresh fish available at reasonable prices.

Since the ice-making plants of the Meat and Fish Office were already under operation and making ice available in the most important fish collection centers, thus making big scale distribution of fresh fish possible, it was felt that it was the proper time to initiate the planning of such a distribution.

At that time, most of the iced fish were transported in bast baskets which were covered with a piece of sack cloth. These baskets were not returned but sold together with the fish. The baskets were usually of a poor quality, inadequate for the purpose and did not give the fish necessary protection.

The choice would be between aluminum and wooden boxes, and it is obvious that the former was chosen because they had many advantages. They last for years while the wooden boxes have a limited life and need much repair. Even though the aluminum boxes would cost more initially, they would be cheaper than the wooden boxes in the long run.

Another important consideration was that the aluminum boxes were much lighter and a truck would be able to carry 15 or 20 percent more fish in them than in wooden boxes. Last, but not least, the aluminum boxes are very sanitary and easy to clean, an advantage that is not in the same degree possessed by the wooden boxes.

The aluminum boxes are now replacing wooden boxes for distribution of fresh fish in Turkey, but it is not yet completely achieved.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 37

The transports in question are of two kinds: land and sea. Land transport is either by insulated truck or insulated railway van. Sea transport is usually carried out by the transport boats of the Office as required to collect the fish at the production centers.

Trucking has many practical advantages. Instead of having to bring the fish in trucks from the fish market to the railway station, transfer it to a railway car, transfer it again to a truck at the other end in order to bring it to the consumers market, the insulated truck can take it directly from the fisherman to the retailer, thus saving expensive and injurious handling and time. However, this was not so easy to decide upon if we take into consideration other facts. For example, the information about the route from Istanbul to Ankara makes the fact clear that the railways charge only 20L. per ton from Haydarpaşa to Ankara railway station while trucking from Istanbul to Ankara would cost 50-55 L.

Another possible railway route, is that from Samsun to Sivas and Kayseri. But here also the costs of bringing the fish from the sea and to the station count heavily. There are two good roads between Samsun and Kayseri. One goes through Amasya, Tokat, and Sivas and the other through Çorum, Yozgat and Kırşehir. All these towns, therefore, are supplied by the trucks, but the only one connected with a railway is Sivas. This is a good example of the fact that the road network covers the fishing centers as well as the consuming centers much better than the railway network.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 38

In the light of these and further analyses, Meat and Fish Office determined to make use of both railway and truck transportation which proved to be quite successful.

Further, they considered it necessary to divide the country into zones to establish a natural marketing area for each fish producing center. The reason for this may be explained by an example: If Ankara should get its main fish supply from Istanbul, surpluses of fish would occur in Zonguldak and Sinop, while fish would be scarce in the western part of the country, which is naturally supplied from Istanbul. The Ankara market, in other words, is needed as an outlet for the supplies of the Zonguldak-Sinop Area. Along such lines of thought, they prepared a plan described below.

The Plan covers distribution from 6 main fish collecting centers: Istanbul, Trabzon, Samsun, Sinop, Zonguldak, and Iskenderun. According to this plan, Istanbul distributes to Edirne, Kirklareli, Izmit, Adapazari, Bolu, Ankara, Bilecik, Eskişehir, Kütahya, Afyon, Konya, Elazığ, Diyarbakır, Maraş, Mardin, Malatya, Bursa, Adana, Tekirdağ, etc. Further information about the distribution zones of other centers are seen in Appendix B.

Fish distribution in each zone is directed from the main cooling plant of the zone. When fish may be scarce in one zone while abundant in another, there will be need for close cooperation between the zones. Such cooperation is established through direct contact between the zone managements but it is closely supervised by the Head Office for maximum efficiency. The Head Office is also responsible for directing all available

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 39

trucks to places where unusual abundance may occur, and to re-arrange the routes in such emergencies.

Besides the cities mentioned in the Plan, the trucks would pass through a number of towns and larger villages and they could deliver a part of their load at every place where supplies might be needed. In every major town and road center arrangements are planned to be made with local merchants to act as agents in the surrounding areas. Such transports outside the main route would be too small to justify special trucks, and the agents should make individual arrangements for such transports.

In every place where fish are going to be marketed, arrangements are to be made with local dealers to provide suitable shops for retailing. Such shops should have an insulated - not necessarily refrigerated - room to store fish from day to day, and the shops should meet the requirements of such sanitary regulations that may be in force at any time.

So far we have discussed the distribution of fresh fish. The situation differs when we consider the frozen fish.

Most of the fish which are frozen in Turkey are exported. Less attempts have yet been made to distribute frozen fish within the country. The consumers are not used to eat frozen fish and in many areas do not eat fish at all. There are no distribution facilities, and the retail shops are not equipped for dealing in frozen goods. The market is therefore not yet ready for the introduction of frozen fish and there are reasons to emphasize the necessity of careful preparations of the market before distribution of frozen fish can be successfully initiated.

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 40

The retail shops will have to be provided with suitable low temperature storage rooms, display counters, etc.

Frozen fish must be regarded as a substitute for fresh fish and will, therefore, hardly be in demand on a market where the consumer is unused to any fish at all. Thus, marketing of frozen fish in Turkey should not be started until the fresh fish distribution system has been successfully established. In the meantime, frozen fish should continue to be exported as at present.

- Transport Boats - The Office operates 8 fish transport boats: 3 of 100 tons, 2 of 60 tons, 1 of 40 tons, and 2 of 20 tons. (These are nominal tons and the boats will only hold about half of this tonnage of fresh fish iced in boxes.)

The holds are all insulated with 10 to 15 cm. expanded cork and covered on the inside with sheets of aluminum. They are of sanitary construction, well-suited for fish transport.

Only the biggest of the boats are designed for the low temperatures necessary to carry frozen fish, but the smaller ones, designed for keeping temperatures as low as  $-6^{\circ}\text{C}$  at evaporating temperatures of  $-18^{\circ}\text{C}$ , are likely to have such a margin that they can keep the cold in frozen fish for a short period (2 to 3 days).

These boats were originally intended for transporting fish supplies from the smaller fishing villages to the collection centers, but as mentioned before, the bulk of the fish is actually landed a few centers, from which there are good communication to the hinterland.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 41

## C. Organized Institutions of Cold Storage of Fish

So far, we have covered how the cold storage operations for fish are carried out. While discussing them, we have covered a lot of facts about Et Balik Kurumu - State Meat and Fish Office (EBK). Now let us deal with the remaining facts about the Meat and Fish Office (MFO), especially the facts explaining how it was established and why. Then I will discuss the operations of other institutions dealing with the cold storage of fish.

### 1. State Meat and Fish Office (MFO)

To deal with all the problems that are connected with the development of fisheries in Turkey, the organization Meat and Fish Office, already referred to, was set up in 1952.

The objective of the Office is expressed clearly in the Decree No. 871. This decree explains the functions of the industry, the duties of the management and the conditions of personnel. In conformity with the Ministry of Commerce, this Office has almost unlimited control over all the meat and fish industry. A close examination of the decree indicates that this control is more over some areas and less on others. According to the decree, the Headquarters is in Ankara. The aim of the Office is to regulate and coordinate the meat and fish business and to deal with the production, trade of meat and fish. In order to provide this the Office is entitled to:

- a) Buy, sell, and export livestock and fish.
- b) Buy, sell, and export all the industrial and natural produce of livestock and fish

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 42

- c) Spend every effort, and establish any industrial, commercial and agricultural organization in order to improve and develop the kinds of fish and cattle.
- d) Establish slaughter-houses or any organization to fulfill the aims in letters a, b, and c.
- e) If needed, organize sales by a decision of the Ministry of Commerce in order to eliminate price fluctuations in the meat and fish markets.
- f) To open credits within the limits of the regulations established by the Ministry of Commerce to the public institutions and to private enterprises which will be fixed by a decision of the Cabinet for any operation in the field of production, commerce and industry of fish and livestock.

In order to promote fisheries, this organization has done much to increase production by supplying fishing gears and equipment to the fishermen on long-term credits. Further, cold stores and freezing chambers have been constructed at the major landing centers, as discussed above, and an appropriate transport system has been arranged between the centers of production and those of consumption. Twine, engines, machinery for the fishing industry have been and are being supplied. In addition to the cold stores mentioned above, some 50 refrigerated and insulated trucks of about 5 tons each, some 70 railway vans and 8 refrigerated transport vessels are owned by the Meat and Fish Office and made available for the transport of fish to domestic and foreign markets. 1/

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1/ Indere, Rifki, MFO

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 43

Efforts are made to improve and encourage the activities of fisheries cooperatives.

In order to utilize the inedible species of fish and consumption surpluses, two fish-meal and oil factories have been set up by the Office, and a third with a processing capacity of 100 tons of fish per day was established in 1956. Fish canning factories are also projected by this organization. The purpose is to utilize the abundant species which are suitable for canning, and to make private enterprises more interested in this field.

The manufacturing of twine for fishermen has also been made possible in Turkey, and the MFO has set up a net-making plant to supply the fishermen with ready-made nets.

Great importance is attended to developing research work in fisheries. A Research Center was set up in Istanbul by the MFO in order to encourage the study of fishery biology, to improve gear and methods, and fish handling and processing. In order to ensure a long-term program of work at an academic level, the Hydrobiological Institute attached to the University of Istanbul has undertaken research work financed by the MFO. In addition, the Office has allocated for these purposes a 177 - ton research vessel equipped with modern facilities, 2 California-type fishing boats of 83 G.R.T. each, and 5 smaller boats. 1/

Although it seems from the above information that the MFO works adequately, in fact there are some organizational and financial difficulties facing the Office. These are mentioned

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1/ p. 274, "Fish Marketing in Western Europe since 1950", 1957  
OECC.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 44

in the book, "Kamu İktisadî Teşebbüslerine Ait Özel Raporlar", published by the Ministry of Finance in 1961. Although many of these difficulties are being overcome now, still some are continuing to create problems for the MFO.

The MFO was organized for 2 basic reasons: First, to be a revenue source; second, as a public institution to regulate the market and help the industry. It was not a revenue source. In regulating the market, it was halfway successful, moreover this was a factor why the Organization incurred losses. In order to regulate the market and not to let prices rise for the consumer, it was necessary to set the limits for maximum prices. The maximum prices set of meat and fish products were first set by the local municipalities, then approved by the Ministry. The setting of prices by local municipalities was considered good by the consumers, but it led the MFO to incur losses. Since the selling prices are set by the Government, the losses should also be covered by the Government.

Further information about the activities of the MFO is given in other parts of this thesis.

## 2. Tutsat and Others

Apart from the plants set up by the Government to develop the fisheries, there are a number of industrial concerns owned by private enterprise at the major fishing centers. There are 45 canning factories, 2 large and a number of cold stores and freezing stores, and salting, smoking, curing and caviar plants in the Bosphorus - Marmara Area. 1/

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1/ From the interview with Kalkış, Yıldırım, Head of Marketing Department in the Istanbul Union of Commerce.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 45

Due to the unwillingness of the owners and managers of these privately owned cold stores of fish in supplying the information about their firms, I will not be able to discuss their operations thoroughly here. However, I thought that it will be good to give some facts about them.

a) "Tutsat Fisheries Corporation"

"This is a privately owned company who has the biggest and the most modern cold storage facilities for fish in Turkey. They can preserve 2000 tons of fish per day in their cold stores. This is approximately 2 times more than the capacity of the MFO - Beşiktaş Cold Store. The annual capacity is 1000 tons. Our machines can freeze 100-150 tons of fish per day. The freezing period changes between 4 and 12 hours for various fish kinds. We have the machines available for 'quick freezing' at  $-45^{\circ}\text{C}$ ." 1/ (The MFO can freeze at not more than  $-25^{\circ}\text{C}$  because of the smaller capacity of their freezing machines).

"The aim of our firm", as stated by Mr. Doğın, "is to purchase fish, usually at the Istanbul Fish Market, and then to export them to the European countries after freezing in our cold stores." So they do not help the domestic market by distributing fish to the Anatolian markets. They usually freeze and export bonito, mackerel, and tuna when available in large quantities.

They also preserve other food products than fish in their cold stores on a commission basis during the seasons when production of fish is not large. As also stated by Mr. Doğın, they don't have any marketing and transportation problems since

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1/ From the interview with Doğın, Ruhi, Vice President -  
Accountant of the "Tutsat Balıkçılık A.Ş."

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 46

they always have ready-buyers and the frigofiric trucks and insulated ships of the MFO are at their disposal for transportation. They also use the German and Bulgarian frigofiric trucks for transportation to the European countries.

## b) "Tansever Corporation"

"Ali Tansever, owner of the 'Tansever A.O.' was the second one who established cold stores of fish in Turkey, in 1940 after a German, Somazzi", stated by Mr. Sonyo, an Italian, who is the marketing manager of 'Tansever Corporation'.

Their facilities can freeze 40-50 tons of fish per day and the capacity of their cold stores is 1200 tons per day.

This company is also in the export business mainly. Like "Tutsat", they freeze and export bonito, mackerel, and tuna. But they also distribute to the domestic market to some extent (Approximately 10% of the exports).

They don't have marketing and transportation problem either. "Before cold storage, our problem was the seasonality of the various fish kinds; but now, this problem has been eliminated by the introduction of cold storage facilities. We never pour the excess supply of fish back into the sea as we have done 30 years ago. Instead we put them in our cold stores and reserve for future demand." 1/

## D. Price Analysis

In dealing with fish prices, in general, it can be said that neither the wholesale nor the retail trade is subject to price control and prices fluctuate according to supply and demand.

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1/ Sonyo, G.M., Sales Manager of the "Tansever T.A.O."

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 47

However, cold storage helped a great deal in correcting these fluctuations by permitting the storing of excess supply of fish during peak seasons and then marketing them when there is a shortage in production. This conclusion has been reached in the following way: As it is seen on Appendix D, first monthly cost of living indices were converted into new indices by choosing months of October as the base month (=100). The reason to choose October as the base month was that it is the month of peak fish production in general. Then monthly average palamut (bonito) and uskumru (mackerel) prices were calculated from 1953 to 1965 by taking the average of daily prices for each month. The next step was to find price indices for each month again taking October as the base month. The last step was to find "deflated fish prices" by dividing price indices by cost of living indices. This was done in order to eliminate the influence of general rise in prices on fish prices. This helped a great deal in making actual comparisons among monthly prices.

As a result of these calculations, it became clear that price stability is observed to some extent in fish prices after 1961 in line with the increases in the capacities and numbers of cold storage facilities for fish. However, it should hereby be stated that it can never be argued this was a complete stability.

In order to explain the situation more clearly, let's see variations in average fish prices during each year from 1953 to 1965 from the following tables:

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 48

T A B L E 2

<u>Year</u>	<u>Bonito</u>		<u>Mackerel</u>	
	<u>I</u>	<u>II</u>	<u>I</u>	<u>II</u>
1953	+117	-32	+42	-61
1954	+ 71	-43	+47	-12
1955	+ 10	-69	+10	-51
1956	+ 32	-60	+24	-13
1957	+103	-21	+ 5	-20
1958	+110	-	+41	-
1959	+143	-	+52	-
1960	+ 38	- 5	+35	-
1961	+ 54	-	+44	-
1962	+ 7	- 8	+26	- 4
1963	+ 10	- 3	+16	-
1964	+ 9	-16	+ 6	- 5
1965	+ 10	- 2	+11	- 3

(I - Max. deflated price - Base month's price)

(II- Min. deflated price - Base month's price)

As can be seen from the above table, until the cold storage facilities of the Meat and Fish Office started to operate at full capacity, there was no stability in fish prices. For example, in 1953 the difference between the maximum deflated price and the deflated base month price (for bonito) was 117, in 1954 the same figure decreased to 71, and in 1955 it even dropped to 10. However, this decreasing trend should not deceive the reader, because it is in no way attributable to cold storage but only to ample fish production during 1953-55. Another example can be cited for mackerel prices: In 1954 the difference between the maximum deflated price and the deflated base month price was 47, but it dropped to 10 in 1955.

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 49

However, after 1961 there seems to be ample signs of stability in prices. For example, in 1962 the difference between maximum deflated price and the deflated base month price for bonito was 7, and it increased to 10 in 1963. The same figure was 9 in 1964 and again 10 in 1965. That is, the maximum change was 3 during these four years which strongly implies the stability achieved through the completion of cold storage facilities. Also, the differences between the minimum deflated prices and the deflated base month prices for the same period of time verify this point. In 1962, the figure was -8, in 1963 it was -3, in 1964 it was -16, in 1965 it was -2. That is, there were no great fluctuations in these figures either. From the same table, it can be observed that there is also a stability for mackerel prices for the same years.

In addition to the above verification of the result of stability achieved by the cold storage facilities operating at full capacity after 1961, another evidence is found in the following table:

T A B L E 3

Deviations from the Mean

<u>Year</u>	<u>BONITO</u>			<u>MACKEREL</u>		
	<u>Mean</u>	<u>I</u>	<u>II</u>	<u>Mean</u>	<u>I</u>	<u>II</u>
1953	90.5	123.7	- 25.3	93.3	48.7	-54.3
1954	113.9	57.1	- 56.9	115.5	31.5	-27.5
1955	69.2	40.8	- 38.2	77.4	30.6	-40.4
1956	79.6	52.4	- 51.6	105.7	18.3	-18.7
1957	145.4	57.6	- 66.4	91.3	13.7	-15.3
1958	164.6	45.4	- 46.6	119.9	9.1	-19.9
1959	175.0	68.0	- 75.0	122.8	29.2	-22.8
1960	112.9	25.1	- 17.9	114.7	20.3	-14.7
1961	133.9	20.1	- 33.9	125.9	18.1	-25.9
1962	97.6	9.4	- 15.0	107.6	18.4	-11.6
1963	103.8	6.2	- 6.8	106.2	9.8	- 7.2
1964	95.1	13.9	- 11.1	101.4	4.6	- 6.4
1965	104.7	4.3	- 6.7	105.2	7.8	- 8.2

(I - Max. deflated price - Mean of the year)

(II- Min. deflated price - Mean of the year)

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 50

In the above table the deviations from the mean prices of maximum and minimum prices are shown. If this table is carefully analyzed, it becomes clear that there is a stability in bonito and mackerel after 1961. For example, the difference between the mean price and the deflated maximum price for bonito in 1962 was 9.4, it was 6.2 in 1963, in 1964 it was 15.9 and in 1965 it was 4.5 which do not represent a great fluctuation. During the same period, the differences between the mean prices and the deflated minimum prices were as follows: in 1962 it was -15, in 1963 it was -6.8, in 1964 it was -11.1 and finally in 1965 it was -6.7. That is, the maximum change during 1962-65 was 8.2. For mackerel prices, there is even a greater stability. For example, between the means of four years (1961-1965), the maximum change was 3.8. In the same period, the maximum change between the mean price and the deflated maximum price was 8.6 and the maximum change between the mean price and the deflated minimum price was 4.4.

The conclusion to be derived from the above analysis is that a stability in fish prices, to a limited extent, has been achieved by the operation of cold storage facilities and by the improvement of administrative operations.

It is seen, however, that there is not a significant reduction in prices. Because "the main aim in building up cold storage facilities is not to decrease fish prices but on the first hand to achieve a stability in them and create time and place utilities which will impede the development of both domestic and export markets." 1/ Furthermore, the stability can be maintained by the improvements in the organization and by keeping the operation of cold storage facilities at full capacity as explained in the "Recommendations" chapter of this study.

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1/ Indere, Rifki, MFO

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 51

## CHAPTER IV

### CONCLUSION

Beyond the price utility achieved by cold storage which I have mentioned in "Price Analysis" heading, we should also touch to the degree of place and time utilities achieved by cold storage of fish.

Per capita fish consumption in Turkey has remained at a very low level owing to the insufficiency of production and the inadequacy of distribution and storage facilities. Fish was only rarely available in many inland cities because of the inadequate transport facilities and people had therefore not yet learned to appreciate fish as part of their daily diet. The first step towards increased fish consumption in such places was to make good, fresh fish available at reasonable prices.

Since most of the ice-making plants of the Meat and Fish Office were already under operation and making ice available in the most important fish collection centers, thus making big scale distribution of fresh fish possible, it was felt that it was the proper time to initiate the planning of such a distribution. From a technical point of view, with the reservations made by the government, they would be able to serve their purpose. But neither their supply of raw material nor the marketing of their products has yet been fully organized.

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, İSTANBUL

PAGE 52

In most parts of the country, the fishermen are still marketing their small catches individually in the old-fashioned way and the consumer's market is still doing without regular supplies of fish.

The organization of these aspects of the matter is a huge task on which the Office will have to concentrate its efforts. And it is not an easy one. Facilities and equipment for catching and for retailing are still insufficient. The consumers have not yet been educated to appreciate fish as the valuable food it is and the Office does not yet command an adequate staff with the necessary training and experience in the special field of fish handling.

Although utmost care has been paid in distributing in best manner, fish distribution has not yet reached most of the inland towns and even some cities. In other words, the spatial dimension of the fish market has not changed much.

In case of time utility, there is the related, above-mentioned problem facing us that the Turkish consumers even have not yet been educated to appreciate fish as the valuable food. So it is meaningless to try to achieve time utility for a product which is not even appreciated during its season. However, Meat and Fish Office achieved time utility through its cold storage facilities and this helped to some extent in the way to achieve price stability and price support.

Price support is in most cases nothing more than direct relief to the fishing industry and the major effort of the responsible Government agency should be to avoid the need for such relief. This can be done by giving the maximum encouragement

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 53

to the development of new outlets of fish and fish products at home and abroad. Considerable expenditure on the development of markets can be justified if it avoids the need for direct price supports. This may take the form of providing additional facilities for handling and transporting fish and the financing of representatives in foreign markets to develop trade and to advise on the forms and species of fish acceptable in such markets.

In some countries, the "deficiency payment" method of price support has proven satisfactory under certain circumstances. Under this method of support, the market is allowed to drop to a level where all supplies are moved and the market is cleared. In the meantime, the fishermen will have been assured that, if their returns are too low, a deficiency payment will be made to them based on their individual production. Under this method, maximum quantities would be caught and made available to consumers and the Government would avoid actual entry into the trade, but it is a complicated administrative operation and requires detailed statistics of production by individuals. Also there was the danger that the merchants will not try to get the best possible price nor pay the fishermen all they can as they will tell the fisherman that he will get his money from the Government.

But the idea of holding pool proved to be practical and successful so that the Government is still using this method to hold surplus fish during periods of peak production until such time as markets open up, or for sale during the periods of low seasonal production.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 54

## CHAPTER V

### SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

#### A. Conclusions

1. The fisheries of Turkey, particularly those of the Bosphorus-Marmara area and of the Black sea, are capable of substantial expansion and development.

2. The productive potential of the fishermen, with the vessels and gear now on hand, together with the knowledge non-available and the facilities which have been supplied, is, except for a shortage of refrigerated transport facilities, adequate to justify immediate steps to exploit market opportunities so that existing facilities may be more fully utilized.

3. The greatest immediate need is for leadership to see that those things which can be done are done.

4. This leadership must come largely, if not entirely, from Government sources, that is, the Meat and Fish Office.

#### B. Recommendations

1. Initial encouragement should be given to the improvement of existing boats and gear through modification in design and materials used to give added strength; adequate power units for the boats should be provided.

2. If and when more suitable boats and gear are proven, the introduction of such equipment should be encouraged with loans and, if necessary, subsidies.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 55

3. A concerted effort should be made to open up new markets for the fishery products of Turkey, both domestic and foreign, the first emphasis being placed on the export trade.

4. A new distribution plan should be tested as soon as possible in order to achieve fresh fish distribution throughout the Bosphorus-Marmara Area as a whole.

5. First priority should be given to markets for fresh and iced fish, followed by frozen, canned and salted fish. An effort should be made to produce a fish cake or fish ball which could be sold cheaply to the mass of the population. Fish meal production should not make use of fish which can economically be made available as food directly.

6. The number of demonstration plants which are sufficiently large to carry out actual commercial operations in the distribution of fresh fish and the canning, smoking, salting and freezing of fish and fish products, should be increased.

7. Distribution of frozen fish on a large scale, is still premature in Turkey. However, if a suitable, very limited market, such as a group of hospitals, military barracks or similar institutions, could be found, this will help the solution a great deal.

8. Quality should be protected by minimum standards, but such standards should not materially affect price. In other words, price stability should be achieved without any sacrifice in quality.

9. The municipal and national authorities and the fish trade of Istanbul should jointly consider rehabilitation of the Istanbul market and the possibility of diverting the larger catches to an alternative location. For the improvement of

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 56

Istanbul market, the Government should take the lead in arranging for joint discussions with the municipal authorities and the trade, and should have definite proposals to put forward. This will require some further investigations and the study of the market and its price-making functions.

10. Some form of price support is necessary in periods when production exceeds demand.

11. Further efforts are necessary to make the Turkish people accustomed to eat fish and accept it as a necessary food. These efforts should especially be directed towards inland villages. Cold storage warehouses should be constructed all around Turkey in order to keep fish unspoiled till the time of distribution. A "cold storage chain" is necessary to achieve a successful distribution of fish under stable prices.

## APPENDIX A

### REGULATIONS FOR THE HANDLING OF FRESH AND FROZEN FISH IN TURKEY

#### Interpretation

In these Regulations, unless the context otherwise requires,

- (a) "Fish Inspection Service" means the office or staff of fish inspectors appointed by the Turkish Government for the purpose of enforcing the Regulations;
- (b) "Premises" means any building, or parts thereof, in which fish are handled, processed, stored or packed for shipment;
- (c) "Production Plant" has the same meaning as given under (b) "Premises";
- (d) "Container" includes boxes or any other package used for packing, transporting or marketing of fish; baskets or tubs for unloading fishing vessels; insulated and/or refrigerated shipping containers; and

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 58

(e) "Filets" means the fleshy sides of the fish cut clean of head, vertabrae, fins and bones, with or without skin.

## Part 1. General

Art.1. All fish that are landed in Turkey and intended for human consumption shall be treated in accordance with these Regulations. If the Regulations provide for stricter requirements, they shall prevail.

The Fish Inspection Service will be in charge of enforcing these Regulations.

Premises, boats and vehicles used for storage, transport or treatment of fish must be approved and registered by the Inspection Service. The Inspection Service shall have unrestricted admittance to such premises, boats or vehicles, and is entitled to open containers and take samples. Approval of registered premises, boats or vehicles may be withdrawn by the Inspection Service when they no longer meet the requirements.

## Part 2. Fish Production Plants

Art.2. Fish to be marketed fresh or frozen for human consumption may only be stored, handled, processed and packed

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 59

in and dispatched to market from a Fish Production Plant which is registered and approved as such by the Fish Inspection Service.

To obtain such an approval the plant must be constructed and maintained in a sanitary condition and must meet the following requirements:

- (a) Floors must be of concrete or waterproof construction such as tiles, terrazzo, etc. They must have an even surface with slope of at least 1:100 toward ample drains.
- (b) Walls and ceilings must have an even inside surface which is easy to clean. The surface can be made of planed wood, concrete plaster, tiles, hard surface boards etc. Walls and ceilings shall be kept in white color. Outside walls shall be kept in light color.
- (c) There must be ample lighting in the working rooms. Windows shall be big and preferably placed at a high level. Electric lighting shall be not less than 50 Watt per each 10 square meter (when the bulbs are at a height of 2.5 to 3.0 meters from the floor).
- (d) There must be a suitable insulated (preferably refrigerated) room for storing ice in the plant or in the immediate vicinity of the plant.
- (e) There must be proper sanitary facilities for the workers of the plant.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 60

- Art.3. (a) In the plant there must be plenty of clean water available for cleaning purposes. 70 liters per minute will be regarded as ample for every ton to be handled per hour. In case of filleting an addition of 30% will be needed. Sea water may be used for cleaning floors only, if it is quite clean and free from any contamination by sewage or any kind of offal.
- (b) The equipment in the plant (boxes, washing containers, tables etc.) must be made of non-corrosive metal or planed wood. If made of wood, they must be painted with a hard surface coating in white color.
- (c) Strict cleanliness must be observed in the plants. Working space and equipment must be washed after every working day. Waste fish and offal must be removed immediately. Workers must wear clean clothing.

## Part 3. Fishing boats

Art.4. Fish holds in fishing boats shall be constructed in such a way that they are easy to clean and maintain in a sanitary condition.

Grating shall be provided on the bottom of the holds. When the height of the hold exceeds 1.1 meters, the

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 61

hold shall be divided by removable wooden partitions, horizontally and vertically, into compartments not exceeding 80 cm. each way. If the fish caught is bigger than 50 cm. in length, bigger compartments may be used to suit the size of the fish. The inside of the holds, partitions and other parts, which are in contact with the fish, must be made of properly planed and painted wood or equally good material (aluminum, etc.).

Instead of partitioning the hold, boxes as specified in Art. 10, may be used.

Fish holds and fish boxes must be kept clean and free of odor and washed thoroughly after each fishing trip, and chlorinated from time to time.

Painting of the holds must be done with hard surface paint (with lacquer) and the holds must be repainted as frequently as the Inspection Service finds necessary and not less than once a year.

Art. 5. All fish shall, as soon as they enter the boat, be bled by cutting the main blood vessel behind the gills, as close to the head as possible, and allowing the blood to drain off.

The fish shall be gutted as soon as possible after bleeding. All the guts shall be removed carefully.

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 62

Exempt from the requirements of bleeding and gutting are the following fishes only: anchovy, mackerel, spanish mackerel, pilchard and hornfish.

Immediately after gutting, the fish must be thoroughly washed, preferably in running water. Special attention shall be paid to washing the gut cavity and to removing completely every part of the guts blood etc. Fishes that are not gutted shall also be carefully washed.

When completely clean, the fish shall be stowed in the compartments of the holds or in the boxes. Gutted fish shall be placed belly-down; ungutted, belly-up.

If the fish are to remain in the boat for more than 6 hours and the temperature is above 10°C, the fish must be iced by placing a layer of ice under and on top of the fish in each compartment or box. When the temperature is under 0°C, care must be taken to protect the fish against freezing and frost damages of the surface.

Art.6. The fish must not be bruised, torn or crushed in any way. They must be introduced into and removed from the holds in suitable containers. The use of hooks or forks is not allowed.

## Part 4. Transport to the Production Plants

Art.7. During unloading and transport to the Production Plants, the fish must be properly protected against any kind of

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 63

contamination, as well as against sunshine, heat, frost, rain, etc.

The fish shall be transported to the Production Plant as quickly as possible. All fish shall be transported in boxes, as specified in Art. 10. Returnable boxes must be cleaned thoroughly before being used again, so that they are completely free of odor. In the boxes, the fish shall be placed evenly, belly-down (ungutted fish, belly-up). The boxes shall be full without exposing the fish to pressure when one box is put on top of another. During transports, all fish must be cooled with ice.

When the fish boxes are placed on deck or on quays, they must be covered for protection against the weather.

Boats used for fish transports shall meet the requirements for fish holds in fishing boats and, in addition, should preferably be insulated.

Loading and unloading must be done in a careful manner.

## Part 5. Handling in Production Plants

Art.8. The fish must be treated in a careful and sanitary manner, so as to avoid any kind of contamination or deterioration in quality. They may not be placed on

# THE S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 64

the floor without containers. Fish that have been chilled must be treated in such a manner that they do not loose any of their cold.

Hooks or forks are not allowed.

If the fish are so fresh when delivered that they have not yet been gutted, gutting shall be done in the plant. After gutting they are washed carefully to remove any remains of guts, blood, etc. The water is allowed to run off the fish before they are packed.

Art.9. If the fish are to be marketed fresh, they are packed in the transport boxes with plenty of ice. (Gutted fish belly-down, ungutted, belly-up).

The fish must be packed in the boxes in such a way that there are layers of ice on the bottom and on top and along the walls of the boxes.

If the fish appear to have been gutted too late or the gut cavities have not been properly cleaned, the fish shall not be accepted for marketing as fresh fish.

Only one kind of fish may be packed in any one box.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 65

Art.10. Boxes for storing and transporting fresh fish shall be made of carefully planed wood or better materials such as aluminum alloy, etc. The sizes of the boxes should preferably be 75 x 40 cm. with a height of 24 cm., but in cases where this size may not be suitable, other sizes may be used, if they meet the following standards:

One side: 20, 40, 60, 80 cm., and so on;  
Other side: 25, 50, 75, 100 cm., and so on;  
Depth: 8, 16, 24 or 32 cm.

Boxes must be clean, and they must be washed every time they have been emptied. Metal boxes should preferably be cleaned with steam.

Fish boxes shall have openings in the bottom of at least 1% of its total area.

During transport, each box must be covered with a lid.

Art.11. When fish are dispatched shortly after packing, the distribution of the ice in the boxes should be as follows:

On bottom	30%
Along the sides and among the fish	30%
On top	40%

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE66

If the fish are stored for a considerable period before dispatch, so that some ice can be expected to melt and make refilling with ice necessary before shipment, a larger part of the ice should be placed on the bottom.

Storing of fish before transport shall be done in insulated premises (preferably refrigerated at  $-1.5$  to  $0^{\circ}\text{C}$ ). If it is necessary to add ice before shipment, this should be added on top only. Boxes should be labeled with the registered number of the plant and the date of packing.

## Part 6. Freezing and Filleting

Art.12. Only such fish which have been caught within 24 hours and kept perfectly chilled can be accepted for freezing in order to be utilized for human consumption.

The fish shall be cleaned completely, removing all traces of blood and guts, and washed carefully before freezing.

Freezing and preparations for freezing may be done only in registered plants. The freezing may be carried out by means of bringing the fish into contact with cold surfaces (in contact freezers) or by cold air blast (air freezers, freezing tunnels). Brine freezing will only be allowed in special cases. Freezing in rooms designed for storage will not be allowed.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 67

The fish shall be packed and frozen in such a way that a temperature of  $-15^{\circ}\text{C}$ ., or lower, is obtained in the warmest part of the fish within not more than 16 hours. If the fish to be frozen is so big that the shortest diameter in its section exceeds 16 cm., the inspection Service can approve longer freezing time in special cases. The fish may not be taken out of the freezers until the temperature at every point of it is  $-15^{\circ}\text{C}$ ., or lower. Fish, exempt from the gutting, may be frozen ungutted. When fish are frozen whole, care shall be taken that their shape remains as close as possible to the natural one. Fish, which are frozen in a hanging position, must hang straight (i.e. not bent). Fish which are frozen without an approved water-tight wrapping, must be properly glazed by dipping them several times into - or spraying with - cooled ( $2 - 4^{\circ}\text{C}$ ) fresh water. The glazing must be renewed at suitable intervals during storage. The container or wrapping shall be marked with the registered number of the plant and the date of freezing.

Art.13. Fish which has been frozen in accordance with these Regulations shall be stored in a suitable insulated cold storage room at a temperature of  $-18^{\circ}\text{C}$ ., or lower.

The fish shall be stowed on a grating 10 cm. from the floor and not closer than 20 cm. to a wall, than 30 cm. to a cooling evaporator and than 30 cm. to the ceiling.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 68

The room temperature may not fluctuate more than one degree below to one degree above the average and must at no time rise above  $-18^{\circ}\text{C}$ . The temperature in every storage room must be noted and recorded at least twice every day and every plant that stores frozen fish is obliged to maintain in the plant at least one self-registering thermometer to be installed according to Inspection Service's request.

In cases where the fish are not packed in containers, only one kind of fish may be stored in one stack, and there should be a distance of at least 25 cm. between stacks.

No other goods (i.e. meat, fish, offal, etc.) may be stored at the same time in a storage room where fish frozen in accordance with the Regulations are being stored. Should such goods be stored in the room at a time when no fish is being stored there, a complete cleaning and chlorination of the room must be carried out before fish can be brought into the room.

Art.14. When fish are frozen for marketing fresh or for freezing, the following rules must be observed.

- (a) Only fish which are handled strictly in accordance with Art.2 to 8 may be accepted for filleting. The fish must be filleted within 12 hours after they are caught.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 69

- (b) Fillets can be with or without skin. If there are large scales on the skin and the skin is not to be removed, the scales must be removed from the skin before filleting is done.
- (c) After filleting, each fillet must be cleaned by dipping in chilled, fresh clean water. Each fillet must be carefully examined. Bloodspots may not occur.

Art.15. If the fillets are to be marketed fresh, they shall be packed with ice in boxes as specified in Art.10. A layer of wood wool (Excelsior) or wood-shavings is put on the bottom of the box, and on top of that a layer of ice (about 50% of the ice needed). The ice is pressed down firmly and covered with sheets of parchment and the sides and ends of the boxes are also lined with parchment. The fillets are now put in the boxes and covered with parchment, ice and wood wool or wood-shavings. The latter are also applied along the sides and the ends of the boxes, between the walls and the parchment sheets. The boxes are covered by lids. If the fillets are marketed within 36 hours after packing, the wood wool, or wood-shavings, may be omitted, but the fillets must be covered with parchment and ice on top of it. If the boxes are not dispatched immediately after packing, they must be stored in an insulated and preferably refrigerated (-1.5 to 0°C) room and, if necessary ice must be added before dispatch.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 70

Filleting may only be done in every clean working rooms. Workers touching the fillets after they are cut (weighers, packers) must wear white coats during their work. They are obliged to observe strict cleanliness and they must wash their hands before starting work and after every interruption of the work.

The rules in this article as well as those of articles 14 and 16 shall also apply to fish, the flesh of which is cut in other ways than by filleting (slices, steaks, etc.).

Art.16. Fillets to be frozen must be introduced into the freezer not later than 4 hours after they are cut. The fillets must not be taken out of the freezer until the temperature is  $-18^{\circ}\text{C}$  or lower in every part of them, but the fillets need to stay in the freezer may not exceed 5 hours for packs which are 5 cm. thick, or thinner.

## Part 7. Transport and Distribution

Art.17. Transport of fresh fish shall be accomplished as quickly as possible. The transport must be carried out in clean containers or vehicles, which are properly insulated and have drainage for melted ice. The fish must be iced even though the transport container or vehicle is mechanically refrigerated and the ice must be applied

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 71

so liberally that there is still plenty of ice left when the transport reaches its destination. The temperature in the transport shall be kept as near  $-1$  to  $+1^{\circ}\text{C}$ . as possible and must not be allowed to drop below  $-1.5^{\circ}\text{C}$ .

If fresh fish are transported together with other goods, care must be taken that fish containers and stowing give the fish proper protection.

Art.18. Frozen fish must be transported in mechanically refrigerated containers and vehicles where the temperature is kept at the same level as during the previous storage. Refrigeration by dry ice (solid carbon dioxide) or eutectic mixtures, may only be permitted in special cases and when the arrangement is such that the fish are completely protected against damage or contamination from the dry ice or the eutectic solutions.

Gratings shall be provided in the refrigerated transport on the floor, the walls and the ceiling, to allow air to circulate around the goods.

During loading and unloading, the transfer from one refrigerated room to the other must be carried out without delay and the goods must be protected against unfavorable weather (sunshine, rain, etc.)

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 72

Art.19. Fresh fish can only be offered for retail sale in shops which are approved and registered by the Fish Inspection Service. To obtain such an approval the shops must meet the following requirements:

- (a) the floors must have a hard and even surface, preferably of tiles or terrazzo with proper slope towards ample drains;
- (b) the walls and ceilings must have an even surface which is easy to clean, and which is light in color;
- (c) there must be an ample water supply for cleaning purposes;
- (d) there must be a suitable, insulated room for storing iced fish from day to day.

Art.20. Frozen fish can only be offered for retail sale in shops which are approved and registered by the Fish Inspection Service. To obtain such an approval the shops must meet the requirements of points (a), (b) and (c) in Article 19 and, in addition, there must be an insulated and mechanically refrigerated storage room where a temperature of  $-18^{\circ}\text{C}$ ., or lower, can be maintained.

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 77

## Not:

1. Mahalli Belediyeler ile iştirakli tesisler
2. Çift rejimli odalar, hem Soğuk Muhafaza hem de donmuş Muhafaza olarak çalışabilir.

Oda satırlarından; Kolonlar, Soğutucu Ünitelere geçiş koridorları düşünölmüş olup, emtea istif koridorları dikkat nazara alınmamıştır.

## M<sup>2</sup>. ye Stok Edilebilecek Mal Ağırlıkları

Soğuk Muhafaza	Taze Balık	: 250 Kg/M <sup>2</sup>
	Taze Et	: 100 " "
	Teneke ile Umumi Gıda	: 1400 " "
	Sebze ve Meyve	: 750 " "
	Donmuş et	: 750 " "
	Donmuş Balık	: 1000 " "

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 78

## APPENDIX D

### BONITO (PALAMUT)

<u>1953</u>	<u>Actual Prices</u>	<u>Price Index (Base month= October)</u>	<u>Cost of Living Index (Base month= October)</u>	<u>Deflated Price Index</u>
January	200	100	85	118
February	N.A.	-	95	-
March	N.A.	-	105	-
April	280	140	92	152
May	230	115	87	132
June	400	200	92	217
July	190	95	85	112
August	160	80	85	94
September	120	60	88	68
October	200	100	100	100
November	150	75	86	87
December	-	-	-	-

Source: Computed on data provided by Meat and Fish Office and Istanbul Fish Market.

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 79

1954	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Deflated Price Index
January	120	62	87	71
February	200	98	91	107
March	300	153	89	171
April	240	123	92	134
May	300	153	94	163
June	350	162	96	169
July	280	143	99	144
August	150	77	97	79
September	110	56	98	57
October	195	100	100	100
November	185	95	101	94
December	150	77	99	78

1955

January	60	50	95	53
February	65	46	96	48
March	80	66	97	68
April	50	42	99	42
May	35	30	98	31
June	50	42	100	42
July	90	75	103	73
August	120	100	95	105
September	130	108	98	110
October	120	100	100	100
November	85	70	97	72
December	100	84	96	87

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 80

1956	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Deflated Price Index
January	100	91	97	94
February	140	127	113	112
March	100	91	111	82
April	75	68	115	59
May	35	32	113	28
June	50	45	115	40
July	100	91	112	81
August	140	127	96	132
September	85	77	88	87
October	110	100	100	100
November	80	72	110	65
December	140	127	118	76

1957

January	250	166	88	189
February	270	180	91	197
March	275	183	90	203
April	200	133	90	148
May	250	166	93	178
June	225	150	95	158
July	200	133	97	137
August	160	106	98	108
September	125	116	100	116
October	150	100	100	100
November	120	80	101	79
December	200	133	101	132

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 81

1958	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Deflated Price Index
January	270	141	87	162
February	300	166	90	184
March	320	172	90	191
April	300	166	90	184
May	325	174	90	193
June	350	194	93	208
July	360	200	95	210
August	280	155	96	161
September	270	141	97	145
October	180	100	100	100
November	220	122	103	118
December	230	127	105	120

1959

January	280	200	88	227
February	300	214	88	243
March	270	193	90	214
April	280	200	89	225
May	270	193	89	217
June	250	178	93	191
July	240	171	97	176
August	190	128	97	132
September	185	124	99	125
October	140	100	100	100
November	150	107	100	107
December	200	144	101	143

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 82

1960	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Deflated Price Index
January	260	104	104	100
February	320	128	103	124
March	300	120	105	114
April	330	132	105	126
May	370	148	107	138
June	310	124	106	117
July	240	96	101	95
August	300	120	101	119
September	260	104	100	104
October	250	100	100	100
November	240	98	99	97
December	280	112	101	111

1961

January	265	115	98	117
February	320	138	100	138
March	340	147	101	145
April	350	152	102	149
May	360	156	101	154
June	350	152	100	152
July	320	138	98	141
August	330	143	96	149
September	265	115	98	117
October	230	100	100	100
November	260	113	101	112
December	310	134	101	133

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 83

1962	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Derlated Price Index
January	270	75	97	77
February	350	97	98	99
March	360	100	100	100
April	370	103	100	103
May	350	97	101	96
June	380	106	102	104
July	390	108	101	107
August	325	90	98	92
September	355	98	97	101
October	360	100	100	100
November	350	97	101	96
December	360	100	103	97

1963

January	365	104	97	107
February	360	103	99	104
March	360	103	102	101
April	350	100	103	97
May	380	108	105	103
June	400	114	103	110
July	390	111	101	110
August	350	100	101	99
September	380	108	100	108
October	350	100	100	100
November	360	103	102	101
December	380	108	102	106

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 84

1964	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Deflated Price Index
January	265	88	99	88
February	270	90	100	90
March	255	85	99	86
April	270	90	100	90
May	285	95	99	96
June	245	81	97	84
July	280	93	97	96
August	300	100	96	104
September	320	110	101	109
October	300	100	100	100
November	280	93	102	91
December	310	110	103	107

1965

January	255	102	98	104
February	255	102	95	107
March	265	106	101	105
April	275	110	101	109
May	270	108	101	107
June	260	104	99	105
July	265	106	101	105
August	260	104	99	105
September	245	98	100	98
October	250	100	100	100
November	275	110	101	109
December	265	106	103	103

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 85

## MACKEREL (USKUMRU)

<u>1953</u>	<u>Actual Prices</u>	<u>Price Index (Base month= October)</u>	<u>Cost of Living Index (Base month= October)</u>	<u>Deflated Price Index</u>
January	75	78	85	92
February	90	84	95	88
March	110	121	105	115
April	45	47	92	52
May	40	42	87	48
June	35	36	92	39
July	110	121	85	142
August	90	84	85	99
September	100	106	88	120
October	95	100	100	100
November	105	110	86	128
December	90	84	87	97

Source: Computed on data provided by Meat and Fish Office and Istanbul Fish Market.

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 86

1954	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Deflated Price Index
January	190	128	87	147
February	125	83	91	91
March	190	128	89	144
April	155	103	92	112
May	125	83	94	88
June	155	103	96	107
July	185	123	99	124
August	150	100	97	103
September	195	130	98	132
October	150	100	100	100
November	165	110	101	109
December	190	128	99	129

1955

January	145	103	95	108
February	130	93	96	97
March	75	53	97	55
April	70	50	99	51
May	60	44	98	45
June	55	37	100	37
July	70	50	103	49
August	100	71	95	75
September	145	103	98	105
October	140	100	100	100
November	150	107	97	110
December	130	93	96	97

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 87

1956	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Deflated Price Index
January	300	120	97	124
February	260	104	113	92
March	325	130	111	117
April	330	132	115	115
May	285	114	113	101
June	250	100	115	87
July	290	116	112	104
August	260	104	96	108
September	250	100	88	114
October	250	100	100	100
November	300	120	110	109
December	290	116	118	98

1957

January	245	76	88	86
February	300	93	91	102
March	300	93	90	103
April	245	76	90	84
May	250	78	93	84
June	320	100	95	105
July	250	78	97	80
August	235	76	98	76
September	285	89	100	89
October	320	100	100	100
November	310	96	101	95
December	300	93	101	92

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 88

1958	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Deflated Price Index
January	270	108	87	124
February	245	98	90	109
March	265	106	90	118
April	300	120	90	133
May	315	126	90	140
June	300	120	93	129
July	335	134	95	141
August	275	110	96	115
September	265	106	97	109
October	250	100	100	100
November	275	110	103	107
December	300	120	105	114

1959

January	240	100	88	113
February	270	113	88	128
March	330	137	90	152
April	250	104	89	117
May	320	133	89	149
June	280	116	93	125
July	270	113	97	116
August	280	116	97	120
September	300	125	99	126
October	240	100	100	100
November	300	125	100	125
December	250	104	101	103

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 89

1960	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Deflated Price Index
January	245	122	104	117
February	210	105	103	102
March	270	135	105	129
April	285	142	105	135
May	270	135	107	126
June	245	122	106	115
July	220	110	101	109
August	210	105	101	104
September	250	125	100	125
October	200	100	100	100
November	210	105	99	106
December	220	110	101	109

1961

January	250	119	98	121
February	270	128	100	128
March	300	142	101	140
April	310	147	102	144
May	280	133	101	131
June	270	128	100	128
July	250	119	98	121
August	260	123	96	128
September	250	119	98	121
October	210	100	100	100
November	270	128	101	127
December	260	123	101	122

# T H E S I S

ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL

PAGE 90

1962	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Deflated Price Index
January	300	100	97	126
February	285	95	98	97
March	290	96	100	96
April	320	106	100	106
May	330	110	101	109
June	340	113	102	111
July	320	106	101	105
August	350	116	98	118
September	345	115	97	119
October	300	100	100	100
November	310	103	101	102
December	310	106	103	103

1963

January	250	100	97	103
February	265	106	99	107
March	275	110	102	108
April	300	120	103	116
May	260	104	105	99
June	275	110	103	107
July	280	112	101	111
August	265	106	101	105
September	250	100	100	100
October	250	100	100	100
November	280	112	102	110
December	275	110	102	108

# T H E S I S

**ROBERT COLLEGE GRADUATE SCHOOL  
BEBEK, ISTANBUL**

PAGE 91

1964	Actual Prices	Price Index (Base month= October)	Cost of Living Index (Base month= October)	Deflated Price Index
January	270	100	99	101
February	280	103	100	103
March	280	103	99	104
April	275	102	100	102
May	285	105	99	106
June	265	98	97	101
July	260	96	97	99
August	275	102	96	106
September	260	96	101	95
October	270	100	100	100
November	280	103	102	101
December	275	102	103	99

1965

January	285	109	98	111
February	240	93	95	97
March	260	100	101	99
April	300	115	101	113
May	275	106	101	105
June	270	103	99	104
July	280	107	101	106
August	285	109	99	110
September	275	106	100	106
October	260	100	100	100
November	280	107	101	106
December	285	109	103	106

# THESIS

ROBERT COLLEGE GRADUATE SCHOOL  
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PAGE

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PAGE

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