

A STUDY OF THE FLORIDA NATURAL
SPONGE INDUSTRY WITH SPECIAL
EMPHASIS ON ITS MARKETING PROBLEMS

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PREFACE

The sponge industry in the United States is located primarily on the west coast of Florida in Tarpon Springs. Around the turn of the century the industry was established by immigrants of predominantly Greek origin from southeastern Europe, and their old-world methods of operation are still being used. From the time of its establishment until World War II the industry experienced an increasing amount of sales and prosperity. For example, during the 1940's sales of natural sponges climbed to approximately \$3 million annually.

After reaching their peak in the early 1940's sponge sales have declined up to the present time. Annual sales of domestic natural sponges have dropped from their approximately \$3 million peak to an average annual figure of less than \$400,000 between the years 1960 and 1963.

Persons engaged in the business of harvesting and selling sponges realize the existence of a problem, but they disagree concerning its causes and solutions. Some industry members attribute the decline in sponge sales primarily to the invention of artificial sponges, whereas others see an inadequate supply of divers as the main cause of their predicament. Suggested solutions include tariff protection, importation of middle-aged divers from the eastern Mediterranean, and government support of sponge prices.

Confusion and diversity of opinion prevent spongers from taking steps toward a constructive solution of their problems. The bulk of

the research that has been conducted on the sponge fisheries has emphasized the biological aspects of the industry. The economic aspects of the industry have either been totally ignored or have been touched upon only incidentally. The purpose of this study is to analyze the neglected economic and marketing aspects of the natural sponge industry and to attempt to determine the real causes of its problems. With the exception of landing statistics there is virtually a complete lack of information on the sponge fisheries between the years 1908 and 1937. Inasmuch as no such work has been undertaken before, an attempt has been made to bring together, analyze, and evaluate all factors of economic significance pertaining to the Florida sponge industry at its various stages of production and distribution. Because of the scarcity and fragmented nature of the available statistics on the sponge fisheries, past and present data have been supplemented by information obtained through interviews conducted with fishermen, packers, and sponge distributors and by the personal observation of the author. For example, most of the material presented in Chapter III is based upon information obtained from a sample of better than 80 per cent of the diving craft operating in the sponge fisheries in the summer of 1964. Also, to obtain material in Chapter IV it was necessary to interview the entire packer population in Tarpon Springs, Florida. The section on distributors is based upon personal interviews conducted by the author in New York and New Jersey. These interviews covered 30 per cent of the total distributors in the United States; however, according to trade association officials this 30 per cent sample is responsible for more than 80 per cent of the sponge sales at

the distributor level. Similarly, the information on the operations of the Tarpon Springs Sponge Exchange and the Sponge and Chamois Institute were obtained through interviews with the officials of these organizations and through personal observations by the author.

Foreign competition and competition by artificial substitutes have also been examined in order to evaluate their impact on the natural sponge industry of Florida. Information on foreign competition was obtained through correspondence with U. S. Department of State officials in sponge-producing countries and foreign government officials of such countries. Such information was further supplemented by correspondence and personal interviews with U. S. Customs officials and International Trade specialists in Atlanta, Georgia. Data on synthetics were obtained through correspondence with home offices and interviews with the regional representatives of the major synthetic producers in Atlanta, Georgia.

Because of such factors as the very small size of the populations involved, the great length of time spent in contacting individual respondents, the language problem, and the lengthy and wide-ranging nature of the responses, it was not practical to attempt to crystallize the data-gathering process into formal questionnaire form; therefore, most of the prepared questionnaires were used loosely as interview guides (see Appendix A).

The results of the present study have led to the identification of the problems of the sponge industry and to recommendations which, it is hoped, will benefit the Florida sponge interests in the long run. At this stage it may be useful to point out that the recommended

course of action may not completely solve the problems of the sponge interests in Florida; however, correct problem recognition is of paramount importance in determining any future course of action for the Florida sponge industry.

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CHAPTER I

INTRODUCTION

Historical Utilization of Natural Sponges

The natural sponge has been known and traded in the Mediterranean for thousands of years. Many ancient Greek excavations have uncovered pictures of sponges. According to Homer, Hepaestus used a sponge to wash off the grime of the smithy,¹ and the housemaids of Penelope and Odysseus used sponges in cleaning dining tables.² Aristotle mentions Greek soldiers padding their greaves and helmets with sponges they called "Achileion."³ According to Pliny, Romans used sponges as paint brushes and maps, and Roman soldiers carried a piece of sponge rather than a cup for drinking purposes.⁴ This early usage is further verified by the Bible;⁵ it describes the way in which Roman soldiers gave Christ vinegar to drink from a sponge while He was on the cross.

¹A. T. Murray, The Illiad (Cambridge: Harvard University Press, 1935), p. 319.

²A. T. Murray, The Odyssey (Cambridge: Harvard University Press, 1931), p. 369.

³A. H. Stuart, World Trade in Sponges, U. S. Dept. of Commerce Industrial Series No. 82 (Washington: U. S. Government Printing Office, 1948), p. 4.

⁴"Sponges," Encyclopaedia Britannica, 1963 ed., Vol. XXI.

⁵Mark 15:36.

In the thirteenth century Arnold of Villa Nova introduced the "burnt sponge" as a medicine to be taken internally for scrofula, tuberculosis of the lymphatic glands. Any therapeutic effect can probably be attributed to a high content of iodine which is present in the "burnt sponge" in the form of NaI.¹

The first sponges used by man were probably those washed ashore by storms; however, as was pointed out previously, sponge fishing has been known since the early days of man's civilization. The first deliberate efforts to obtain sponges were those of naked divers who dived by using heavy stones as weights in order to reach the depths of the sponge beds.² According to legend, numerous divers' lives were sacrificed in supplying the sponges for the baths of empresses, such as Messalina and Cleopatra.³

In modern times, besides obvious toilet and household uses, sponges are used for many purposes, such as the washing of cars, the manufacture of special surgical and hygienic preparations, the application of glaze to fine pottery, leather dressing, and the manufacture of electric chairs. They are extensively employed by garages, tile and bricklayers, painters, lithographers, decorators and window washers, although all of these markets have been constantly shrinking for reasons to be explained later in this study.⁴

¹"Sponges," Encyclopaedia Britannica.

²Stuart, p. 4.

³Ibid.

⁴John F. Storr, Ecology of the Gulf of Mexico Commercial Sponges and Its Relation to the Fishery, U. S. Fish and Wildlife Service Special Scientific Report, Fisheries No. 466 (Washington: U. S. Government Printing Office, 1964), pp. 63-65.

Description of the Natural Sponge

Although ancient Greeks called the sponge "zoo-phyton,"¹ a name which implies part animal and part vegetable, in the past many people regarded sponges as vegetable because of their stationary nature. In 1765, John Ellis was the first to discover the animal nature of sponges by observing the water currents produced by a sponge and noticing the contractions on the surface of its body.² Today sponges are considered to be one of the simplest forms of animal life and are classified as Porifera.³

Persons who have seen sponges displayed in stores would not recognize the animal as it comes from the sea. The live sponge is an animal with a solid and fleshy body. Its color varies in a considerable range from grayish yellow to brownish black. Its form varies from cup-shaped to spheroidal and cake-shaped, depending on the species, age, and subsurface environment.⁴ The marketed sponge is merely the skeleton of the living animal. This skeleton is composed of a substance similar in chemical properties to silk, horn, and chitin which is the basic material that forms the shells of insects and crabs. This material is distributed in a fibrous network in sponges, usually in accordance with a definite general pattern in each species; the diameters of the fibers, the sizes of the meshes, and the relations

¹George Frantzis, Strangers at Ithaca (St. Petersburg, Fla.: Great Outdoors Publishing Co., 1962), p. 127.

²"Sponge," National Encyclopedia, 1945 ed., Vol. IX.

³Ibid.

⁴Stuart, p. 25.

existing among the various fibers in each species lie within more or less well-fixed limits. In addition, the main fibers always contain some foreign matter, such as sand grains and insects.¹

An examination of the living sponge shows it to be covered by a skin raised periodically into blunt little cones over the ends of the supporting skeletal fibers. Distributed over the surface are sieve-like membranes, whose small pores lead into cavities lying just below the skin. From these cavities canals lead into the substance of the sponge, opening by several minute pores into many small chambers, which from their opposite ends discharge through larger openings. The canals gradually increase in diameter until they reach the surface of the sponge as large conspicuous pores known as "oscula," or, as the spongers call them, "eyes." The position and distribution of such oscula depend on the species. Each osculum is surrounded by a smooth membrane which by expansion or contraction varies the size of the opening.²

Through this canal system feeding and respiration are accomplished by the sponges in the following fashion. The small chambers described previously are lined with cells, each of which is provided with a little lash projecting into the chamber and beating in a rhythmical manner so that a one-directional current is created. Through the action of these cells, water is sucked through the pores in the surface of the sponge and into the small chambers and then is forced into the

¹Stuart, p. 26.

²Paul S. Galtsoff, Sponges, U. S. Fish and Wildlife Service Fishery Leaflet 490 (Washington: U. S. Government Printing Office, 1960), p. 2.

larger canals until it is sent out through the oscula. Food is carried into the sponge by the water stream and waste material is discharged in the same manner.¹

Commercial Kinds of Natural Sponges

Biologists mention the existence of more than 3,000 species of sponges distributed throughout the world from tropical seas to polar waters.² The presence of a hard object to which the sponge can attach itself and of flowing water for filtering through its canals the microorganisms on which it feeds are sufficient for the survival and growth of sponges. From this extravagant variety of sponge species only thirteen are commercially important. Eight of the thirteen commercially important sponges which will be identified later are available in Florida and contiguous waters. Without exception all commercial sponges grow in warm tropical or semitropical waters. At present almost all sponge fishing operations are confined to the Mediterranean Sea, the Caribbean Sea, and the Gulf of Mexico.³

Table 1 lists the thirteen commercially known sponges in their common English, scientific, and foreign names together with their sources.

¹William M. Stephens, "A Remarkable Animal-The Sponge," Sea Frontiers, X (February, 1964), 17.

²Stuart, p. 4.

³Stephens, Sea Frontiers, X, 20-21.

TABLE 1

NAMES OF COMMERCIAL SPONGES
AND SOURCES OF SUPPLY

Sponges		Sources of Supply
Italian	Greek	Other
	Psathouria, Lagoffita	Pil Yullagi (Turkey)
		Mediterranean
		Bahamas, Cuba, Florida
		Bahamas, Cuba, Florida, Honduras
		Bahamas, Cuba, Honduras
		Mediterranean
Spagne de Equine	Hondru, Kabadika	Cabar (Syria)
		Mediterranean
		Bahamas, Cuba, Florida, Honduras

Bahamas, Cuba,
Florida, Honduras,
Jamaica

Mediterranean

Melati, Fina Abiurd
Bklekta (Syria)

Mediterranean

Bahamas, Cuba,
Florida, Honduras,
Jamaica

Cuba, Florida

Bahamas, Cuba,
Florida, Honduras,
Jamaica,
Mediterranean

Mediterranean

de Melati
a,
itine

Teimoulka Acimar
(Syria)
Tsimouri
(Turkey)
Madjemi (Tunis)

from H. F. Moore, "The Commercial Sponges and the Sponge
Business, Papers and Discussions, U. S. Dept. of
on: U. S. Government Printing Office, 1910).

Turkey Cup sponge

Turkey Cups are cup-shaped sponges and bring the highest prices; perfect cups are relatively rare. The oscula are comparatively large and numerous and are grouped together in the concavity of the cups, the skeletal partitions separating them being often very thin. The outer surfaces are perforated by several pores; the narrow skeletal partitions between the pores are surrounded by slender, soft, fibrous pencils. The foreign bodies in the fibers are negligible, and the main fibers themselves are small in number. Such characteristics make the Turkey Cup the softest, finest, and most elastic sponge on the market. These sponges are used primarily for applying cosmetics and for bathing.

This sponge grows solely in the waters of the Mediterranean Sea, especially around the Syrian coast and the islands of Crete and Cyprus. The best kinds of Turkey Cups are obtained in the underwater caves and crevices, where they attain a finer growth than elsewhere.¹

Turkey Toilet sponge

Turkey Toilets are flatter than the cup sponges and their oscula are confined to the upper surface. Not as soft, fine and elastic as the Turkey Cups, toilet sponges can be found throughout the Mediterranean. They are used for leather dressing, surgery, toilet purposes, and various other uses.²

¹Stuart, p. 20.

²Ibid.

Zimocca sponge

The Zimocca sponge is distributed throughout the Mediterranean Sea, the Adriatic Sea, the Dardanelles, and the west coast of Asia Minor. These are massive sponges, broader than high, with their oscula scattered over the upper surface and arranged in irregular radial rows. The Zimocca sponges are the hardest of the Mediterranean grades. It is possible to soften them through bleaching, although bleaching reduces their durability. Both bleached and unbleached Zimoccas have a relatively dark color. They are used by potters, leather dressers, and other artisans.¹

Honeycomb sponge

Zoologists classify the Honeycomb with the Yellow sponge of the Florida Keys; but unlike the pineapple-shaped Yellow sponge the Honeycomb is always broader than high with the oscula unevenly scattered over the upper surface. This sponge is generally distributed throughout the Mediterranean. It is a popular bath sponge and is also used by jewelers, leather manufacturers, bank tellers, et cetera.²

Elephant Ear sponge

These sponges have the shape of a rolled ear. The oscula are confined to the inside and are arranged in groups of four to six in radial or concentric rows. The Elephant Ear is found on the coasts of North Africa and the Aegean Sea. This sponge equals the Turkey Toilet in fineness, softness, and durability. It is used for toilet

¹Ibid., p. 22.

²Ibid.

purposes, in the medical application of electricity, by potters, fine-leather workers, jewelers, and other craftsmen requiring a smooth, fine, soft, and durable sponge.¹

Yellow sponge

There are various kinds of Yellow sponges known in commerce. These sponges are more elastic than other western hemisphere sponges with the exception of Sheepswool sponges. They are regular in shape, attractive in appearance, and grow to a diameter of about 18 inches. When alive they have a smooth surface and are very dark brown on top, becoming yellowish on the sides. The oscula are situated on the top of rounded cones or in the upper surface of the sponge. Yellow sponges are less durable than the Sheepswool or Velvet sponges, but they are attractive and inexpensive bath sponges and are used for many other purposes. The commercial varieties of Yellow sponges are as follows: Florida Key Yellow, Anclote Yellow, Bahama Yellow, Cuba Yellow, Honduras Yellow, and Mediterranean Yellow.

The Florida Key Yellow is the best kind of Yellow sponge and comes from the vicinity of Matecumbe Keys. Oscula are confined to the upper surface. The Anclote Yellow is harsher and less elastic than the Florida Key Yellow and, consequently, less valuable for commerce. Unlike the Florida Key Yellow the oscula are not confined to the upper surface but occur all through the sponge. The Bahama Yellows are light brown sponges with oscula scattered over the top surface and sometimes on the sides. This variety of Yellow sponge is common near Andros Island. The Cuba Yellow sponge is similar to the Anclote Yellow;

¹Ibid., p. 24.

however, it differs in its brighter color, more cavernous structure, and greater number of oscula. The Honduras Yellow comes from the British Honduras and is harsher than the Florida Key Yellow but less harsh than either the Bahama or Cuba Yellow.¹

Sheepswool sponge

Sheepswool sponges are a product of the western Atlantic. They exhibit wide local variation, are very sensitive to environment, and when transplanted undergo significant changes in character. The oscula are large, few in number, and confined to the upper surface. The living sponge has a black color, becoming brownish at the base. Sheepswool sponges grow to over 18 inches in diameter and are unexcelled in softness, absorbency, and durability. They are employed for general bath purposes and for cleaning cars and other highly polished surfaces where size, softness, absorbency, and durability are required. Sheepswool sponges are known under the following market varieties: Florida Rock Island, Florida Key Wool, Bahama Wool, Cuba Wool, Mexican Wool, and Honduras Wool.²

The Florida Rock Island is the most valuable sponge of North America. It is found on the west coast of Florida between Johns Pass and St. Marks. It has a grayish brown color and the specimens found in deep water are superior to shallow water specimens in texture, density, and durability. The Florida Key Wool comes from the Key Grounds of Florida and is next in value to the Rock Island, which it surpasses in softness but does not equal in strength, durability, and

¹Ibid., p. 10.

²Ibid., pp. 6-7.

capacity for holding water. The Key Wool sponges have a pale color and consist of rather weak fibers. The Bahama Wool is inferior to the two varieties mentioned previously. The best kinds are obtained from the vicinity of Abaco and Andros Island. The Cuba Wool has the same characteristics as the Bahama specimens although it is less desirable than the Bahama. The Mexican Wool grows in shallow water and is the poorest of the Sheepswool sponges. It lacks softness, resiliency, and durability. It grows from a narrow base with a rather high shape and has large oscula on the upper surface. The Honduras Wool resembles the Mexican Wool variety, but it is of better quality and is found on the coast of British Honduras.¹

Velvet sponge

These sponges are found in the straits of Florida, the Caribbean Sea, the Bahamas, and the waters off the coast of Jamaica. They were greatly decimated by the 1937 sponge disease and are quite scarce today. Velvet sponges are generally cake-shaped or spheroidal, broader than high, and attached by a broad base from which the sides swell out. The number of oscula varies from one to three on the upper surface. The color of the skeleton is light brown or dull yellow. Velvet sponges are very soft to the touch but are less resilient and absorbent than the Sheepswool. In commerce Velvet sponges are graded as follows: Florida Velvet, Bahama Velvet, Cuba Velvet, and Jamaica Velvet.²

The Florida Velvet is found in small quantities on the reefs between Key West and Cape Florida. They are generally rather harsh

¹Ibid., p. 7.

²Ibid., p. 11.

and more or less torn and irregular. Of the Bahama Velvets the best come from near Abaco. These are soft, moderately strong, and well-shaped sponges. The Cuba Velvet resembles the Florida Velvet but is softer. Of the Honduras Velvet sponges the coast of British Honduras has produced the best. The Jamaica Velvet is inferior to all other Velvet sponges. Unlike other Velvet sponges the Jamaica Velvet has an upright rather than a spheroidal shape, most specimens being decidedly columnar.¹

Grass sponge

Grass sponges are found commercially in Florida, the Bahamas, Cuba, Mexico, and British Honduras. They exhibit great diversity of shape and texture but are inferior in quality, lacking in durability, usually harsh to the touch, or, if soft, exceedingly tender. Grass sponges are known under the following grades in the market: Anclote Grass, Key Grass, Bahama Grass, and Cuba Grass.²

The Anclote Grass is the choicest of the Grass sponges. It is shaped like a vase with inverted truncated cones deeply hollowed on the upper surface. The attached base is one-third to one-half narrower than the upper rim; the sides are almost straight or slightly convex, and the interior is hollowed out almost to the base. There are no oscula on the outer surface. The walls are thin at the rim of the vase and thicker toward the base. The skeletons are of a dirty brown color, harsh to the touch, and highly elastic. These sponges are used by manufacturers for cleaning purposes in machine shops

¹Ibid.

²Ibid., pp. 11-14.

since they are especially useful where there is a great deal of oil, as greasy matter is more easily washed out of them than any other sponge. For this reason and because of their stiff surfaces they are also useful for washing pots and pans in the kitchen. Almost all current production, however, is sold to curio shops along the sponge docks in Tarpon Springs. The Anclote Grass is found distributed over the entire Bay Grounds. The Key Grass is more diverse in appearance, softer, more elastic, and less durable than the Anclote Grass. The Bahama Grass is round or cake-shaped with numerous circular oscula located on the upper surface. The Cuba Grass is the least desirable variety of Grass sponge because of its extremely weak fiber texture.¹

Glove sponge

This species has a very interesting appearance, the sides being fluted with irregular, vertical paralleled ridges between which lie one or two rows of round holes from one-sixteenth to three-sixteenths of an inch in diameter. The base is almost as broad as the body of the sponge. Glove sponges are found in the Key and Bay Grounds of Florida and in the Bahamas. The best ones come from Biscayne Bay which is part of the Key Grounds, while those from the Bay Grounds are very poor and are rarely brought in by the spongers, who call them "bread sponges" because of their excessive tenderness. Glove sponges are very soft and elastic, but due to the weakness of their fibers they are almost worthless for commerce.²

¹Ibid., p. 14.

²Ibid.

Reef sponge

These sponges are found in the Bahamas, Cuba, and British Honduras. Those found in British Honduras are inferior to the rest. The few Reef sponges taken from the Key Grounds in Florida are not marketed as a separate species but are included with the Yellow sponges. Because of their limited durability these sponges bring a low price.¹

Hardhead sponge

The Hardheads come from the Bahamas, British Honduras, and Cuba. Although more durable than Reef sponges, they are very similar to the Reef sponges from which they are differentiated mainly by their hardness. This species is used for activities in which great softness is not necessary, such as applying shoe dressings and moistening stamps in offices. In general, these sponges are more durable than Reef sponges.²

Wire sponge

This sponge comes from the west coast of Florida and is known as "bastard sheepswool" because of its superficial likeness to the Sheepswool sponge. In shape it is regular, broader than high, and attached by a broad base. The oscula are confined to the upper surface but are smaller and more numerous than in the Sheepswool sponge. Wire sponges are seldom brought to market, because they lack resilience, absorbency, and strength.³

¹Ibid., p. 15.

²Ibid., p. 17.

³Ibid.

Qualities Affecting the Value of Natural Sponges

The main qualities affecting the marketability of sponges are color, size and shape, softness, fineness, durability, resiliency, and absorbency.¹

Color

The color of a sponge is of little importance from a functional viewpoint, although it exerts a considerable influence on the price merely for esthetic reasons. In general, the trade prefers the lighter tones of a yellow color. A pale yellow is the most desirable color, and in order to obtain this color sponges are frequently bleached before they are offered to the ultimate user.²

Size and shape

The most desirable size, and to some extent shape, depends upon the purpose to which the sponges are to be put. For example, users will prefer a smaller sponge for toilet purposes than for washing a car. Sponges up to approximately eight inches in diameter are marketed whole and are called "forms."³ Sponges above an eight-inch diameter are usually cut into pieces and are known commercially as "cuts."⁴

In order to be of commercial value a sponge must be regular, massive, and free from long processes and digitations. The most

¹Ibid., p. 25.

²Ibid.

³Ibid.

⁴Ibid.

desirable sponge forms are the spheroidal and cake-shaped.¹ In applying a glaze to pottery, however, and in other similar work a smooth flat surface is desired, and this is generally obtained either by cutting up the more massive forms or by taking pieces from a smooth-surfaced, cup-shaped sponge.

Softness

Other things being equal, the better sponges are always softer.² The extent of this characteristic depends upon the thickness and arrangement of the fibers and the amount of foreign matter included in them. Sponges in which the fibers are heavily loaded with sand are invariably harsh and consequently less desirable.

Fineness

The fineness of the sponge texture differs among the species, the Mediterranean varieties being superior in fineness over the rest.³ Fineness also varies within the same species, depending on the environment under which the individual sponge is produced.

Durability and toughness

These factors vary with the different species and are influenced by environmental conditions. In any given species, the looser the general structure and the larger and more numerous its canals the more easily it is torn and the sooner it wears out.⁴ For example, the loose

¹Ibid.

²Ibid., p. 26.

³Ibid.

⁴Ibid.

open-textured Sheepswool sponge of Biscayne Bay is much less durable than the denser Rock Island variety.

Resilience

In general, sponges are more elastic when dry, and they gain in compressibility when wet. Good resiliency is indicated when a wet sponge promptly returns to its original shape when compression is removed. Resiliency depends partly upon the size and composition of the fibers but mainly upon the thoroughness and manner of cleaning.¹ Poorly cleaned sponges contain "gurry" and therefore are sluggish in returning to shape after compression. Gurry is liquified organic matter which results from decomposition and is also known as "meat" or "milk."

Absorbency

Absorbency is a result of a combination of softness, fineness, and resilience. The quick absorbent sponges have slender fibers and close textures. The existence of large canals and cavities adversely affects the amount of water that can be absorbed by a sponge.² From a functional point of view this is the most important property upon which the usefulness of a sponge depends.³

¹Ibid., p. 27.

²Ibid.

³Ibid.

Geographical Location of Natural Sponges
in the United States

The sponge grounds of the United States extend over the Continental Shelf from a depth of a few feet to approximately 150 feet, and they are broadly divided into two separate areas, the Bay Grounds and the Key Grounds. The exact extent and density of the sponge population is not known, but it is believed that these two areas cover approximately 9,300 square miles of sponge-yielding bottom.¹ An ocean floor with firm and clean objects is necessary for sponge growth, since sponges cannot attach themselves to sand, mud, or grass. Thus, bottom topography is an important factor in the determination of the sponge beds.²

Sponge-bearing grounds, or "bars," as the spongers call them, are found through the use of a "glass bucket" in shallow waters. In deeper waters they are located by means of a "sounding lead." This is a soap-covered device which, when it reaches the bottom, picks up samples of the sea floor, thus informing the crew of the presence or absence of sponges. This and other techniques of sponge fishing were observed by the author during several trips aboard the diving craft "Eleni" in the summer of 1964.

The Bay Grounds

The Bay Grounds are located in the open waters of the Gulf of Mexico. They begin near Johns Pass, a few miles north of Tampa Bay, and extend a distance of 160 miles, as far as St. Marks.³ Spongers

¹Florida, State Board of Conservation, Second Biennial Report, Biennium Ending June 30, 1936, p. 64.

²Stuart, p. 2.

³Stuart, p. 43.

divide this area into regions, such as Rock Island, Pepperfish Key, New Ground, Withlacoochee Light, St. Martin's Reef, Anclote Key, and Highlands. The better qualities of United States sponges come from the Bay Grounds, the area responsible for over 90 per cent of United States natural sponge fishing.¹

The Key Grounds

The Key Grounds consist of the reefs and keys in the inshore waters around Key West, Florida Bay, and the lower part of Biscayne Bay.² Some sponge bars are also interspersed in the area between Cape Sable and the mouth of Tampa Bay. Until the discovery of the Bay Grounds in 1873, the Key Grounds were the only source of supply for sponges in Florida.³ These grounds now are comparatively exhausted, and they make a smaller than 10 per cent contribution to the total sponge catch.⁴ Since sponges taken from the Key Grounds are found in relatively shallow waters they are inferior in durability and texture to Bay Ground sponges.

¹U. S., Congress, House, House Miscellaneous Reports IV, 81st Cong., 2d Sess., 1950, H. Rept. 2120, p. 2.

²Stuart, p. 43.

³Ibid.

⁴U. S., Congress, House, House Miscellaneous Reports IV, p. 2.

CHAPTER II

ECONOMIC HISTORY OF THE SPONGE INDUSTRY

The purpose of this chapter is to trace the economic developments in the Florida sponge fisheries from their inception to the present time. In any fishery natural elements, such as weather, marine diseases, and sheer luck, are important factors in determining levels of production. The importance and effect of these unmeasurable factors on sponge fishing is studied through the examination of landing statistics of past years.¹

The accuracy of early fishery statistics in the United States is questionable, and even the most recent fishery statistics are contradictory and lack the accuracy necessary for a precise description of the situation. In discussing this point, C. P. Idyll deplors the fact that in reporting landing figures for the State of Florida, the U. S. Fish and Wildlife Service and the State of Florida reported widely differing figures.² Despite their shortcomings, however, such data are helpful in indicating trends and broad relationships which can be used to advantage in solving fishery problems and in recommending alternative policies and ways of action.

¹Landing figures indicate the aggregate pounds of fishery products caught by commercial fishermen on an annual basis.

²Clarence P. Idyll, How Can Statistics Increase The Catch? Florida Board of Conservation Educational Series No. 3 (Coral Gables, Fla.: Marine Laboratory, University of Miami, 1949), p. 5.

A historical survey of the sponge fisheries would indicate that the fisheries have experienced some unusual developments since 1937, as contrasted to their normal behavior since their inception in the middle 1800's. The year 1937 can be considered as a turning point in the sponge fisheries; it is pertinent to analyze the industry under two time intervals: (1) the early period covering the years 1895 to 1937, and (2) the later period covering events from 1937 to the present time.¹ Although there is a complete absence of data for the years 1909-1912, it is convenient for purposes of analysis to label the entire period from 1895 to 1937 as the early period. The year 1895 was selected as a starting point, because prior to that time no statistical information on the United States sponge fisheries is available. The historical development of the sponge fisheries will be discussed in the following section.

Historical Development

The sponge fisheries of the western Atlantic have been commercially known since the 1840's. It was around that period that New World sponges were introduced to world markets by a French merchant who had been shipwrecked in the Bahamas.²

In the United States, Key West was the first and for many years the only sponge center. In all probability the natives of the keys knew about sponges and their utilization long before they became an article of commerce, but the first shipment of sponges was sent from Key West to New York in 1849, where they were sold for ten cents

¹Storr, p. 51.

²Stuart, p. 4.

per pound.¹ Prior to this time American demand for sponges had been satisfied through imports from the Mediterranean.²

Beginning in the year 1895, Tarpon Springs exceeded Key West in the sale of sponges and as time passed became the center of the United States and later of the world sponge industry. At present it is estimated that more than 95 per cent of the United States sponge fishing takes place in Tarpon Springs, Florida.³ It is interesting to note that despite this shift in emphasis from Key West to Tarpon Springs, the sponge fisheries of the United States are still restricted to a single state, namely Florida.

The successful sale of Key West sponges in 1849 was followed by a continuous increase in capital investment and employment in the sponge fisheries of this locality. These facts were reported in the Proceedings of the Fourth International Fishery Congress; however, no specific figures were given on the amount of increase in investment and employment.⁴ At first sponges were gathered by merely pulling them out of shallow water by hand. Later, as it became impossible to find sponges in sufficiently shallow waters, the practice of wading had to be abandoned. In order to obtain sponges from deeper waters spongers invented the sponge hook, a sharp hook attached to a pole of moderate length. The fisherman would scan the bottom of the ocean from

¹Moore, Proceedings of the Fourth International Fishery Congress, p. 425.

²Ibid.

³Interview with Louis Smitzes, President of Tarpon Springs Sponge Exchange, Tarpon Springs, Fla., April 6, 1964.

⁴Moore, Proceedings of the Fourth International Fishery Congress, p. 426.

the bow of his boat and tear sponges loose with the hook as they came to his attention. Thus, it became possible to reach sponges at slightly greater depths.

A continuously increasing demand for sponges, coupled with the exhaustion of the shallow water beds, pushed the sponge operations into progressively deeper waters.¹ It became almost impossible to scan the bottom of the ocean for sponges as spongers moved into increasingly greater depths. In order to overcome this difficulty the "glass bucket" was introduced, first about 1870.² This was a regular bucket with a glass bottom and is still being used today by many fishermen. By means of this instrument it became possible to see the bottom of the ocean up to a depth of 50 feet in clear waters. In the early days wading and hooking were the only methods used by Key West spongers. This is easily understood since the methods of the sponging industry of the United States were virtually copied from those of the Bahamas, and most of the Key West spongers were brought in from those islands.³ There is no record of any other changes between the years 1870 and 1905.

In the spring of 1905, a Greek named John Cocoris with the assistance of John Cheyney, a sponge dealer, decided to try sponging methods employed in the Mediterranean.⁴ With this method sponge fishing can be extended to depths up to 150 feet, whereas spongers using

¹Ibid., p. 509.

²Ibid., p. 437.

³Interview with Louis Smitzes, April, 1964.

⁴George D. Protos, "The Sponge Industry of Tarpon Springs" (unpublished paper in the files of the P. K. Yonge Library of Florida History, University of Florida, n. d.), p. 28.

the hooking method cannot go beyond a depth of 50 feet under the most favorable conditions.

John Cocoris brought men and sponging materials from the old country to Tarpon Springs in order to carry out his experiment, and made his first trip in April, 1905. This first trip was so successful that by May, 1906, little more than a year later, there were 50 diving boats at work and 35 more were waiting for crews to be supplied, largely from the Greek islands.¹

The first diving boats used in Florida were locally built sloops which had been remodeled to fit the new requirements. It was reported that these boats were not suitable for the job; however, the author was unable to ascertain why the earlier sloops were unfit for diving operations. The immigrants introduced boats styled after vessels in Greece. The same type boats are used by spongers today, although several improvements, such as diesel engines and wireless communications, have been incorporated into the contemporary vessels.²

The successful use of the scaphander resulted in considerable agitation within the sponge industry, especially among Key West spongers using the hooking method. This is easy to understand since at that time sponge fishing was the number one industry in Key West, as is indicated by the following quotation:

¹Moore, Proceedings of the Fourth International Fishery Congress, p. 442.

²Interview with Louis Smitzes, April, 1964.

The sponge fishery is of more importance to the citizens of Key West than any other branch of business. The outlay for supplies and utensils required by the numerous sponge fleet, amounting to \$100 or \$200 per vessel each trip, is no inconsiderable factor in the industrial condition of the place, while the large cash sums put in circulation by the sponge buyers constitute the principal source of ready money for a large proportion of the population.¹

Despite the fact that Key West spongers were objecting primarily for economic reasons, they pretended to be concerned only about the conservation of the sponge beds. For example, Mr. E. J. Arapian, a well-known Key West sponge dealer, objected to machine diving on the ground that sponges cease to grow where submarine divers have walked with their heavy shoes.²

In an attempt to lessen the animosity of the users of the hooking method, Greek divers carried their operations well offshore into depths of 60 feet and over, but this only made matters worse because the sponges found in deeper waters were of larger size and better quality and, consequently, commanded higher prices in the market.³

The animosity of the Key West spongers was carried to the extent of burning Greek diving boats and influencing the Florida legislature in the passage of a law prohibiting the taking of sponges through diving, either with or without the scaphander, within a three-mile limit.⁴ All such efforts proved to be inadequate in halting the progress of machine diving. Greek divers showed themselves to be superior to Key West hookers in gathering sponges, and eventually they

¹U. S., Congress, The Fish and Fisheries of the Coastal Waters of Florida, 54th Cong., 2d Sess., 1897, Doc. 100, p. 37.

²Ibid., p. 6.

³Moore, Proceedings of the Fourth International Fishery Congress, p. 441.

⁴Florida, Statutes (1914), c. 253.692.

practically obtained a monopoly on all methods of sponging used on the Florida coast.¹

H. F. Moore uses the following example to illustrate this fact. In 1909, the schooner "Fillmore," manned by ten Greeks, was out for 60 days and had fished in depths of 35 to 40 feet, bringing in sponges that were sold for a total of \$2,180.² A non-Greek schooner with thirteen of the most skilled hookers and under one of the best captains sponged for 42 days in depths of less than 30 feet, bringing in a revenue of \$1,180.³ The second vessel yielded \$2.16 per man-day, almost 59 per cent less than the Greek vessel which averaged \$3.63 per man-day.

In 1908, several sponge dealers took the initiative in establishing the Tarpon Springs Sponge Exchange.⁴ Prior to the establishment of the Exchange, sponges were sold at the various "crawls" around the city. A crawl was a shore enclosure about ten feet square, constructed of stakes driven close together, in which live sponges were exposed to air and sun in order to accelerate maceration. As there were a number of crawls at considerable distances from each other, dealers had to waste much time in traveling from crawl to crawl. In order to obviate this inconvenience they organized the Tarpon Springs Sponge Exchange. This is a non-profit cooperative organization whose shares are owned by the sponge dealers, and it is financed through a 2 per cent billing

¹Moore, Proceedings of the Fourth International Fishery Congress, p. 441.

²Ibid.

³Ibid., p. 442.

⁴Stuart, p. 35.

on the sales of each boat's merchandise. A more detailed description of this organization is offered in Chapter IV.

The establishment of the Exchange gave Tarpon Springs a permanent lead over Key West. At present, all industry statistics are based on transactions which have taken place in the Tarpon Springs Sponge Exchange, and it is estimated that such transactions amount to better than 95 per cent of total industry dealings in the United States.¹

Early Period, 1895-1937

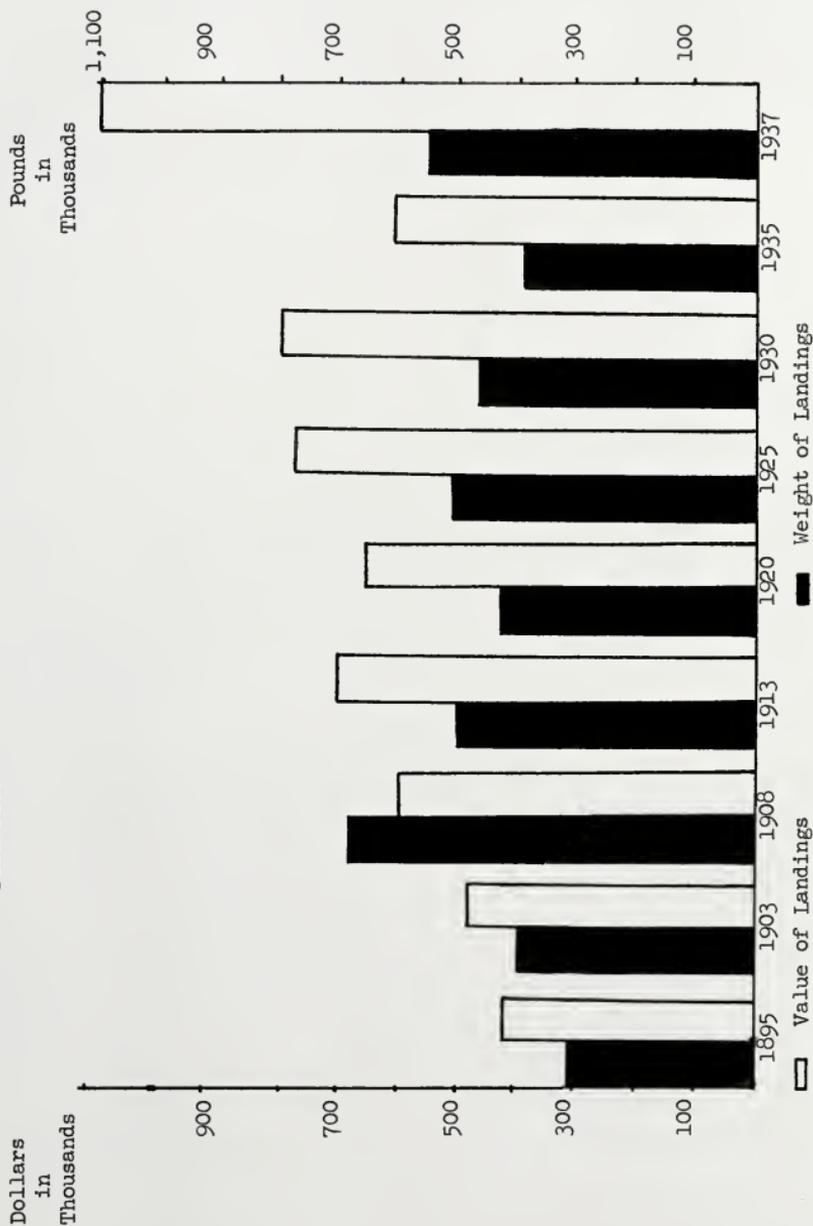
Production

In 1895, the sponge fisheries were Florida's most valuable fisheries with 306,120 pounds of landings valued at \$368,871. During that year Florida landings were 37,036,768 pounds at a value of \$1,209,725. The value of sponge landings was approximately one-third of total landings. The landings of the next four most valuable Florida fisheries were valued at \$555,086. The mullet fisheries were second to sponges in importance with landings valued at \$310,847, followed by red snapper landings valued at \$155,346, oyster landings valued at \$61,723, and sea trout landings with a value of \$27,170.² Table 2 contains the earliest available production statistics by species for the sponge fisheries of Florida. Figure 1 indicates landings and value of landings for the period of 1895 to 1936.

¹Ibid., p. 45.

²Carter C. Osterbind, Florida's Commercial Fisheries: Markets, Operations, Outlook (State Economic Studies, No. 7; Gainesville, Fla.: Bureau of Economic & Business Research, University of Florida, 1955), p. 153.

Figure 1. Value and Weight of Landings in the Florida Sponge Fisheries



Source: Based on Tables 2 and 10.

TABLE

WEIGHT, VALUE, AND AVERAGE PRICE PER POUND OF WOOL, YELLOW

Year	Wool			Yellow			Pounds
	Pounds	Dollars	Prices Per Pound	Pounds	Dollars	Prices Per Pound	
1895	231,272	363,107	1.57	29,509	11,789	.40	21,387
1896	149,724	248,196	1.66	23,655	9,318	.39	44,617
1897	157,476	240,599	1.53	32,362	13,082	.40	128,622
1898	..	..	..	..	..	..	..
1899	153,700	332,390	2.16	55,800	16,205	.29	76,900
1900	181,311	483,263	2.67	74,466	44,045	.59	143,112
1901	..	..	..	..	..	..	..
1902	..	..	..	..	..	..	..
1903	219,334	411,562	1.88	62,001	18,390	.46	83,381
1904	184,645	346,784	1.88	47,213	17,183	.36	51,977
1905	235,561	483,444	2.05	45,070	19,234	.43	67,431
1906	431,214	801,437	1.86	103,938	39,154	.38	46,765
1907	278,334	470,076	1.69	265,662	76,955	.29	158,214
1908	309,681	484,553	1.56	190,714	43,129	.23	109,617

Source: 1895-1899 from Hugh M. Smith, Notes on the Florida Commission, Vol. XIX for 1899 (Washington: U. S. Government Print-Florida in 1900, U. S. Commission of Fish and Fisheries extract Printing Office, 1903). 1903-1908 from Moore, Proceedings of the

GRASS, AND OTHER SPONGES LANDED IN FLORIDA, 1895-1908

Grass		Other			Total		
Dollars	Prices Per Pound	Pounds	Dollars	Prices Per Pound	Pounds	Dollars	Prices Per Pound
5,464	.26	23,952	6,502	.27	306,120	386,387	1.26
11,508	.26	18,315	3,990	.22	236,311	273,012	1.16
29,188	.23	13,086	3,171	.24	331,546	286,040	.86
..
14,319	.19	18,000	5,000	.28	304,400	367,914	1.21
33,263	.23	17,236	7,114	.41	316,546	567,685	1.80
..
..
14,794	.18	13,199	2,600	.20	377,915	447,346	1.18
9,541	.18	7,712	2,687	.35	291,546	376,195	1.29
16,166	.24	17,030	3,812	.22	365,092	522,926	1.43
12,409	.27	7,977	1,583	.32	589,894	854,583	1.45
30,711	.19	1,706	408	.24	703,916	571,751	.82
17,230	.16	12,477	3,964	.32	622,489	548,876	.88

Sponge Fishery in 1899, House Documents, Bulletin of the U. S. Fish ing Office, 1901). 1900 from John N. Cobb, The Sponge Fishery of from U. S. Fish Commission Report for 1902 (Washington: U. S. Government Fourth International Fishery Congress.

The supply of sponges and of any type of fishery product depends on many factors, such as period of operational activity during a given year, condition or normalcy of the beds during the same period, and productivity of the fishing fleet during that year. Sponge fishermen have no power over most of these factors. Bad weather conditions can greatly influence the amount of time that fishermen can spend productively in retrieving sponges in any given year. Marine diseases also have an adverse effect on sponge production, because such epidemics invariably reduce the amount of sponges available for fishing.

From the inception of the industry until 1905, sponge fishermen utilized one type of gear, that used in hooking operations. Beginning in 1905, a new method of operation was introduced to the industry, the method of retrieving sponges from the bottom of the sea through the use of submarine divers equipped with a diving suit and helmet. Machine diving used more capital and proved to be more productive than the hooking method. After 1905, the level of production in the sponge industry depended on the productivity of two types of gear, namely those of hooking and machine diving.

Machine diving has an advantage over hooking in the sense that fairly rough surface waters cannot prohibit the machine divers' fishing, while hooking requires a relatively smooth surface; however, machine divers at times have been unable to locate sponge beds even under the most serene surface conditions because of poor visibility at the bottom.¹

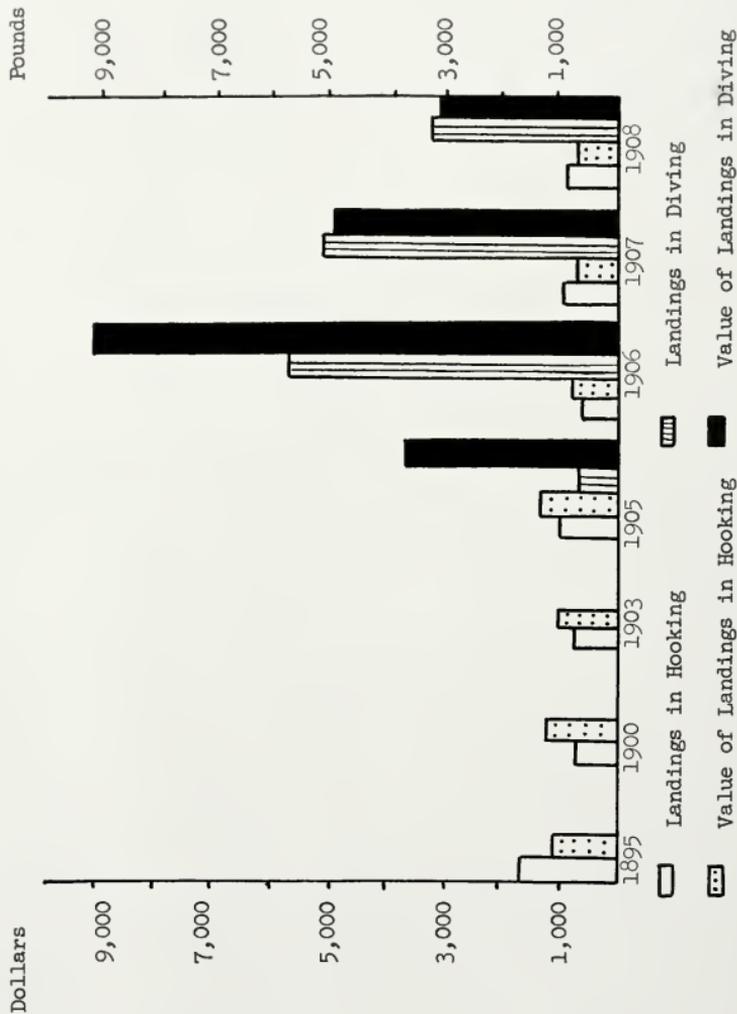
¹Machine divers have mentioned "milky bottoms" as a kind of submarine fog which limits visibility at the bottom of the ocean.

Figure 2 shows that landings per craft between 1905 and 1908 were considerably higher for diving ships than for hooking ships, indicating the superiority of the newer method of operation. When the comparison is made on a value of landings basis rather than a weight of landings basis, diving outfits indicate an even better situation. There are three reasons for this: (1) sponges retrieved by diving bring a higher price per pound than those obtained by hooking, because deep water sponges are superior in quality to shallow water sponges; (2) in addition to harvesting more sponges, historically speaking, diving outfits have concentrated on the more valuable species, such as the Sheepswool sponges; (3) sponges obtained by diving are in better physical condition than those obtained by hooking, since the hook used in hooking operations often damages the sponges.¹ Table 3 shows that with the exception of the year 1905, which marks the beginning of machine diving, the catch of diving outfits percentage-wise has consistently exceeded that of hooking outfits. Figure 3 indicates that average prices received by diving outfits, although volatile, were always higher than those received by hooking outfits.

The production of sponges for the years 1895 and 1908 is shown in Figure 2. It can be seen that the introduction of machine diving gave considerable impetus to the quantity of sponges gathered. Between the years 1904 and 1907 sponge landings increased by 141 per cent, and the value of such landings went up by 52 per cent. Although sponge prices are determined by all of the conditions of supply and demand, one cannot overlook the importance of specific factors, such as seasonality,

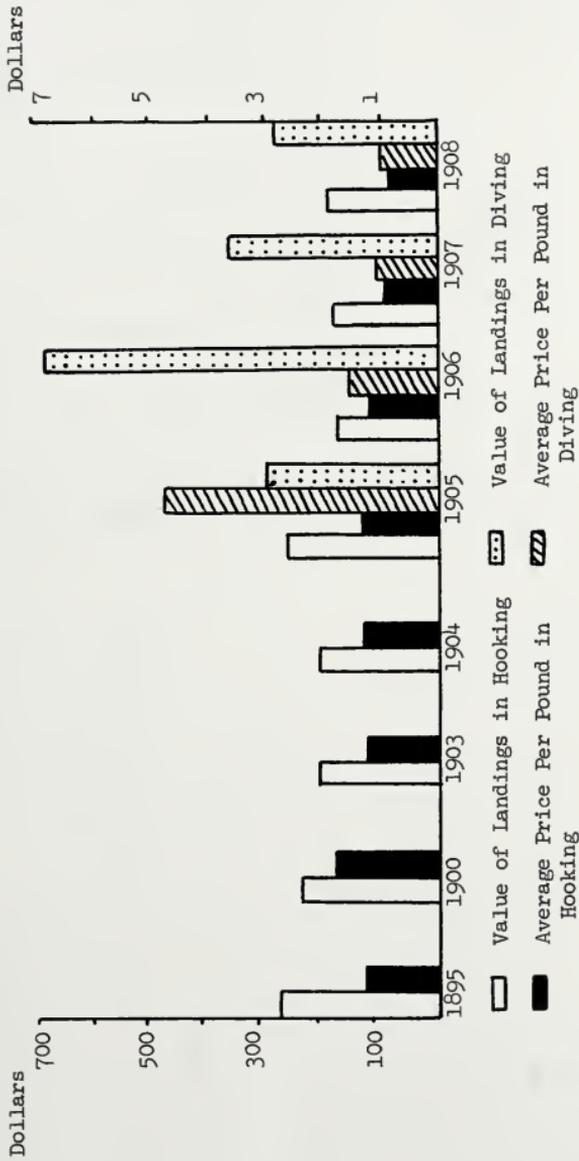
¹Stuart, p. 29.

Figure 2. Per Craft Landings and Value of Landings by Method of Operation in the Florida Sponge Fisheries



Source: Based on Tables 8 and 9.

Figure 3. Average Sponge Prices and Value of Landings Per Fisherman by Method of Operation



Source: Based on Tables 8 and 9.

TABLE 3

PERCENTAGE DISTRIBUTION OF CATCH AND VALUE OF
LANDINGS BY METHOD OF OPERATION, 1905-1908

Year	Catch			Value of Catch		
	Hooking	Diving	Total	Hooking	Diving	Total
1905	97.29	2.73	100.00	90.87	9.13	100.00
1906	39.25	60.75	100.00	25.25	74.75	100.00
1907	39.20	60.80	100.00	31.37	68.63	100.00
1908	35.47	63.53	100.00	33.06	66.94	100.00

Source: Moore, Proceedings of the Fourth International Fishery Congress.

substitute products, existence of large buyers, and quality, in the determination of market prices. Other factors, such as profit and cost considerations, competitor practices, product replacement rate, stability of industry price structure, credit terms, trade discount policies, promotional activities, and government regulations, may also influence prices; however, there is a complete absence of information on such factors for the early years of the sponge industry. Average sponge prices declined by 36 per cent between 1904 and 1907. This could have been the result of an excess in the quantity produced by the prolific machine diving method of operation, the result of gathering sponges of inferior quality, or some other factor not known at present. As was pointed out previously, the supply of sponges depends on many natural factors over which the producers have little or no control. The same is true, although to a lesser extent, for

the quality of sponges. Spongers rely on luck in locating sponge beds of a given quality, although experience does play a small role. In addition, the quality of any sponge bed hinges on natural factors, such as the direction of underwater currents and the existence or absence of micro-organisms, which cannot be controlled by man. Since it is a non-perishable commodity, it is possible to hold sponge supplies until market conditions become favorable. Because of their limited resources, most fishermen are unable to exercise such market power, although some sponge packers have been known to engage in such practices.¹ The exercise of market power by a minority of packers is against the interests of the majority of these firms; however, at present their cooperative, the Tarpon Springs Sponge Exchange, has no provision to take care of this problem.

Investment

With the exception of a survey conducted in 1932 by Pinellas County,² there are no statistics available on investment in the sponge fisheries after 1908.

Table 4 indicates investment in the sponge fisheries of Florida for available years from 1880 to 1963. The decline of total dollars invested has not been as spectacular as the decline in the size of the fleet used in sponge fishing, due to the constant decline in the value of the dollar.

¹Interview with Nick Gialourakis, owner of Nick Gialourakis Packing Firm, Tarpon Springs, Fla., May 12, 1964.

²Fred K. Sage, "Sponge Industry Summary Report," Pinellas County, Fla., C. W. A. Project 52-89. (Mimeographed.)

TABLE 4

INDEXES OF THE NUMBER OF CRAFT BY METHOD OF OPERATION OF TOTAL EMPLOYMENT AND INVESTMENT IN THE FLORIDA SPONGE INDUSTRY FOR AVAILABLE YEARS, 1880-1963^a
1905=100

Year	Investment in Current Dollars	Hooking Craft Index	Diving Craft Index	Total Employment Index
1880	\$162,050	..	..	..
1900	494,866	..	..	..
1903	502,669	..	..	..
1904	417,591	..	..	..
1905	459,871	100	100	100.00
1906	447,033	..	..	..
1907	479,064	..	..	..
1908	555,267	68	1025	164.00
1932	270,000	..	..	..
1937	..	76	600	67.00
1940	..	52	558	51.00
1950	..	8	50	.60
1955	..	12	117	1.10
1960	..	7	100	.90
1961	..	25	100	1.60
1962	411,300	24	150	1.08
1963	325,000	22	108	..

Source : 1880, 1900, 1903-1908 from Moore, Proceedings of the Fourth International Fishery Congress. 1932 from "A Survey of the Sponge Industry," F. E. R. A. Project No. 52-7-31. (Typewritten.) 1962-1963 based on estimates by the President of the Tarpon Springs Sponge Exchange and boat captains. Index numbers based on Table 8 and Table 15.

^aIn 1932 there were 51 diving craft and 15 hooking craft in the sponge fisheries of Florida. Each diving craft had a market value of \$5,000 and each hooking craft a market value of \$500. In 1962 the fisheries had 18 diving craft and 81 hooking craft. Each of the former had a market value of \$17,000, and each of the latter was valued at \$1,300. By 1963 the number of diving craft had declined to 13 and that of hooking craft to 80 with no change in estimated market values from 1962.

Between the years 1880 and 1903 investment in the sponge fisheries increased steadily and became relatively stable between 1903 and 1908. In 1908, the level of investment in the sponge fisheries reached its peak, probably because of a tremendous increase in the size of the diving fleet during that year. Although statistics concerning investment in the industry are scant, from available information one can deduce that the level of investment in the sponge fisheries declined rapidly during the depression of the 1930's and has been rather unstable since 1962. Table 4 dramatizes this situation by the use of index numbers. Taking the year 1905 as a base year, total physical investment in the hooking fleet in 1963, measured in numbers of craft, had declined by 78 per cent. By using the same base year one gets an index of 108 for the diving fleet, meaning that between the years 1905 and 1963 the diving fleet increased by 8 per cent. However, one should not overlook the fact that 1905 was the year in which machine diving was first introduced to the shores of the western Atlantic and that, taking 1905 as a base, the boat-number index stood at 1025 in 1908, only three years later (again see Table 4).

Costs

With the exception of the Pinellas County survey made in 1934, there are no statistics available on operating costs in the sponge fisheries. This survey gives the operating costs of 49 diving craft for the first six months of 1934. The total operating costs for the fleet are shown to be \$104,136 with an average figure of \$2,123 per boat.

TABLE 5

SEMI-ANNUAL OPERATING EXPENSES OF 49 DIVING CRAFT
IN PINELLAS COUNTY, JANUARY 1 - JUNE 30, 1934

Item	Amount	Average Per Craft
Gas and Oil	\$35,731.00	\$729
Food and Supplies	41,512.89	847
Diving Suits	6,050.00	123
Interest for Trip	6,145.00	125
Boat and Engine Repairs	11,052.26	225
Exchange Fees	3,644.85	74
Total	\$104,136.00	\$2,123

Source: Pinellas County, Fla., F. E. R. A. Project No. 52-F2-31.

If it is assumed that the next six months were similar to the preceding six months, the annual operating expenses were \$208,272 for the fleet, and each of the 49 boats had an average of \$4,246 as operating costs. This figure is only \$88 lower than the present average operating expenses of each diving craft. The market value of a boat more than tripled between 1934 and 1963, and in view of this fact and the substantial increase in the average price level between 1934 and the present, the validity of the \$4,246 figure looks very questionable, although one must always bear in mind that averages, unless adequately explained, are full of pitfalls. The per-craft operating expenses figure for 1934 was reached by dividing total operating expenses by the number of boats in operation at that particular time. In 1934,

the fleet contained large boats, each with six or more divers who harvested sponges in depths up to 150 feet.¹ By contrast, all craft in the present fleet are considerably smaller and have a maximum of two divers who never go below 60 feet.² It is obvious that such large boats would have had substantially higher operating expenses. The existence of such extreme values might have influenced averages, giving the above-mentioned unrealistic picture of costs. To be sure, the above treatment of costs is based on fragmentary information and may be only of historical value; however, historical data are frequently important in comprehending current events. By relating past and present information, it is often possible to give meaning to present occurrences and to understand the forces that brought such phenomena into existence.

Employment

According to a survey of Florida fisheries made by Professor Carter C. Osterbind in 1953, the number of fishermen in Florida has not tended to increase over the past half century but has fluctuated around the number employed in the industry at the beginning of the century (see Table 6). Table 7 indicates total employment and employment by method of operation in the sponge fisheries for the years 1895 to 1908. While fishery employment has remained relatively stable in Florida, employment in the sponge fisheries has declined precipitously. Between 1895 and 1905 employment in the sponge fisheries increased by

¹Interview with John Samarkos, Captain of the diving craft "Eleni," Tarpon Springs, Fla., May 11, 1964.

²Ibid.

TABLE 6

FISHERMEN EMPLOYED IN COMMERCIAL FISHERIES IN
FLORIDA, SELECTED YEARS, 1890-1962

Year	Number of Fishermen
1890	5,472
1895	6,154
1897	6,143
1902	9,114
1908	9,212
1918	8,491
1923	7,661
1927	8,275
1928	8,870
1930	7,878
1940	8,937
1945	6,104 ^a
1950	10,281
1955	14,332
1960	10,520
1961	10,156
1962	10,589

Source: 1890-1950 from Osterbind. 1955-1962 from U. S., Fish and Wildlife Service, U. S. Fishery Statistics.

^aWest Coast only.

TABLE 7

NUMBER OF CRAFT AND EMPLOYMENT BY METHOD OF
OPERATION, 1895, 1900, 1903-1908

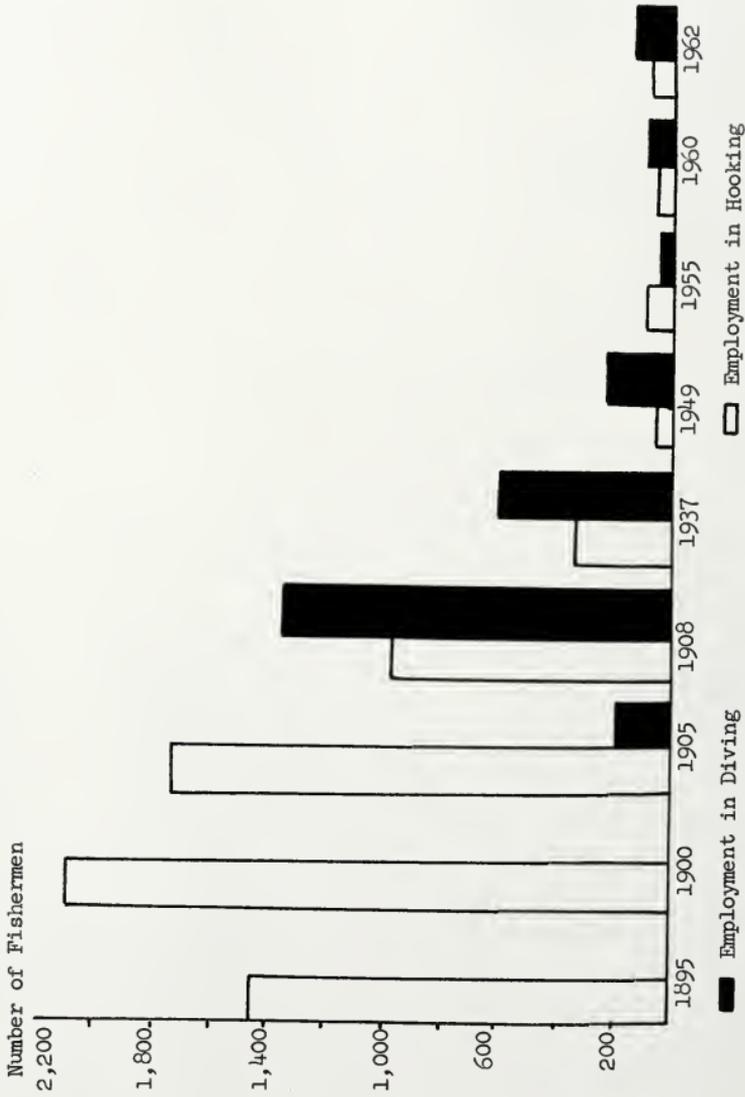
Year	Hooking		Diving		Total Employment
	Craft	Fishermen	Craft	Fishermen	
1895	282	1,419	..	..	1,419
1900	384	2,113	..	..	2,113
1903	383	2,085	..	..	2,085
1904	338	1,777	..	..	1,777
1905	337	1,743	12	166	1,909
1906	244	1,272	69	942	2,214
1907	255	999	78	1,089	2,088
1908	228	978	123	1,342	2,320

Source: 1895 from U. S., Congress, The Fish and Fisheries of the Coastal Waters of Florida. 1900 from Cobb. 1903-1908 from Moore, Proceedings of the Fourth International Fishery Congress.

34 per cent. Sponge fishery employment reached a peak of 2,320 only three years later in 1908. Although no employment statistics are available after 1908, by 1937 employment in the sponge fisheries had declined by one-third as compared to its 1905 level. Twenty-five years later, in 1962, sponge fishery employment had declined by almost 99 per cent as compared to employment figures in 1905.

From Figure 4 one can see that employment in hooking started its decline in 1905 with the introduction of machine diving. By 1907, employment in the diving fleet exceeded employment in hooking, and this situation was not reversed until 1950.

Figure 4. Employment by Method of Operation in the Sponge Fisheries of Florida



Source: Based on Tables 7 and 14.

Other things, such as working conditions, ease of entrance and training, opportunities for advancement, and degree of occupational hazard, being equal, the level of employment in an industry depends upon the level of wages. Wages, on the other hand, depend on the level of productivity, since a higher productivity indicates ability to pay higher wages.¹ This condition, however, may not materialize. Labor productivity in the sponge fisheries can be measured in terms of the value of average catch per fisherman. The value of average catch per fisherman is derived by dividing total landings by the total number of fishermen employed, and it depends on two factors: (1) the weight and quality of the landed species and (2) the market price that such species will command.

A comparison of Table 8 with Table 9 shows that the value of average catch per fisherman from the very beginning was considerably higher in machine diving. This was so because diving craft not only landed more sponges per enterprise unit but also were able to market their product at higher prices per pound. The columns showing the average price per pound of sponges in Table 8 and Table 9 show this relationship to be true for every year. This higher productivity, coupled with better earnings in machine diving, appears to have caused employment to decline in hooking operations. Also, the introduction of machine diving had a secondary adverse effect on employment in the sponge fisheries. One might say that machine diving, in addition to being more productive, was also a labor-saving method of operation. Like any other capital intensive method of production, machine diving

¹Abraham L. Gitlow, Labor Economics and Industrial Relations (Homewood, Ill.: Richard D. Irwin, 1957), p. 424.

TABLE 8

AVERAGE CATCH PER HOOKING CRAFT,
1895, 1900, 1903-1908

Year	Catch Per Craft in Pounds	Value of Average Catch Per Craft in Dollars	Value of Average Catch Per Fisherman in Dollars	Average Price Per Pound in Dollars
1895	1,806	1,379	272	1.26
1900	823	1,478	269	1.80
1903	987	1,168	215	1.18
1904	863	1,113	212	1.29
1905	1,054	1,412	273	1.34
1906	781	885	170	1.13
1907	1,008	735	180	.70
1908	1,023	796	186	.78

Source: 1895 from U. S., Congress, The Fish and Fisheries of the Coastal Waters of Florida. 1900 from Cobb. 1903-1908 from Moore, Proceedings of the Fourth International Fishery Congress.

tends to use less labor and more capital. This fact, later coupled with shrinking markets because of substitute competition from synthetics and diseases in the sponge beds, resulted in a precipitous decline in total employment in the sponge fisheries as indicated in Table 4.

As was mentioned previously the value of average catch per fisherman concept is by no means an indication of the actual wages received by fishermen. It is only a measure of labor productivity. The actual wages received by fishermen depend on many additional factors, such as employer bargaining power, degree of intra-industry

TABLE 9
 AVERAGE CATCH PER DIVING CRAFT, 1905-1908

Year	Catch Per Craft in Pounds	Value of Average Catch Per Craft in Dollars	Value of Average Catch Per Fisherman in Dollars	Average Price Per Pound in Dollars
1905	833	3,980	288	4.78
1906	5,803	9,257	678	1.60
1907	5,113	5,031	360	.98
1908	3,164	2,987	274	.94

Source: Moore, Proceedings of the Fourth International Fishery Congress.

competition, and fishermen's ability to find employment in other fisheries or fields of employment.

There are no actual earnings figures available for fishermen in the sponge industry, with the exception of the Pinellas County survey. According to this report, earnings in the sponge fisheries for the first six months of 1934 were as follows:

Average earnings for divers	\$612.50
Average earnings for engineers	382.00
Average earnings for life line tenders	300.00
Average earnings for crew members	215.00

A more detailed description of earnings will be given in the next chapter, although at this stage it might be pertinent to mention that labor remuneration in the sponge fisheries is not a set amount of wages but consists of a sharing system after the subtraction of certain costs from total receipts.

The Period from 1937 to 1964

The years following 1937 were full of unprecedented disturbances for the Florida sponge industry. Factors, such as the 1937 disease of the sponge beds, World War II, competition from synthetics, the disease of 1947 (the red tide), and an acute shortage of labor, caused the sponge industry to undergo drastic changes. The effects of these events by themselves and through interaction with each other appear to have shaped the future of the sponge industry in an unalterable manner.

Production

The year 1937 marks the beginning of a secular decline in the sponge fisheries, for it was in 1937 that a destructive marine microorganism invaded all the known sponge beds in the western Atlantic, resulting in a drastic decline in sponge landings. The velvet sponges were hardest hit by this disease and were almost completely wiped out. Despite this decline in the weight of landings, however, the number of hooking craft between 1937 and 1939 increased from 256 to 301 and the number of diving craft from 72 to 89 (see Table 14).

The decline in the productivity of the sponge beds, coupled with an increased number of craft, resulted in lower landings per craft. For example, between 1937 and 1940 landings per diving craft declined from 6,551 pounds to 3,027 pounds. In the meantime, the value of average landings per diving craft declined only slightly between 1937 and 1940, from \$13,259 to \$11,445 because of higher prices received (see Tables 15 and 16).

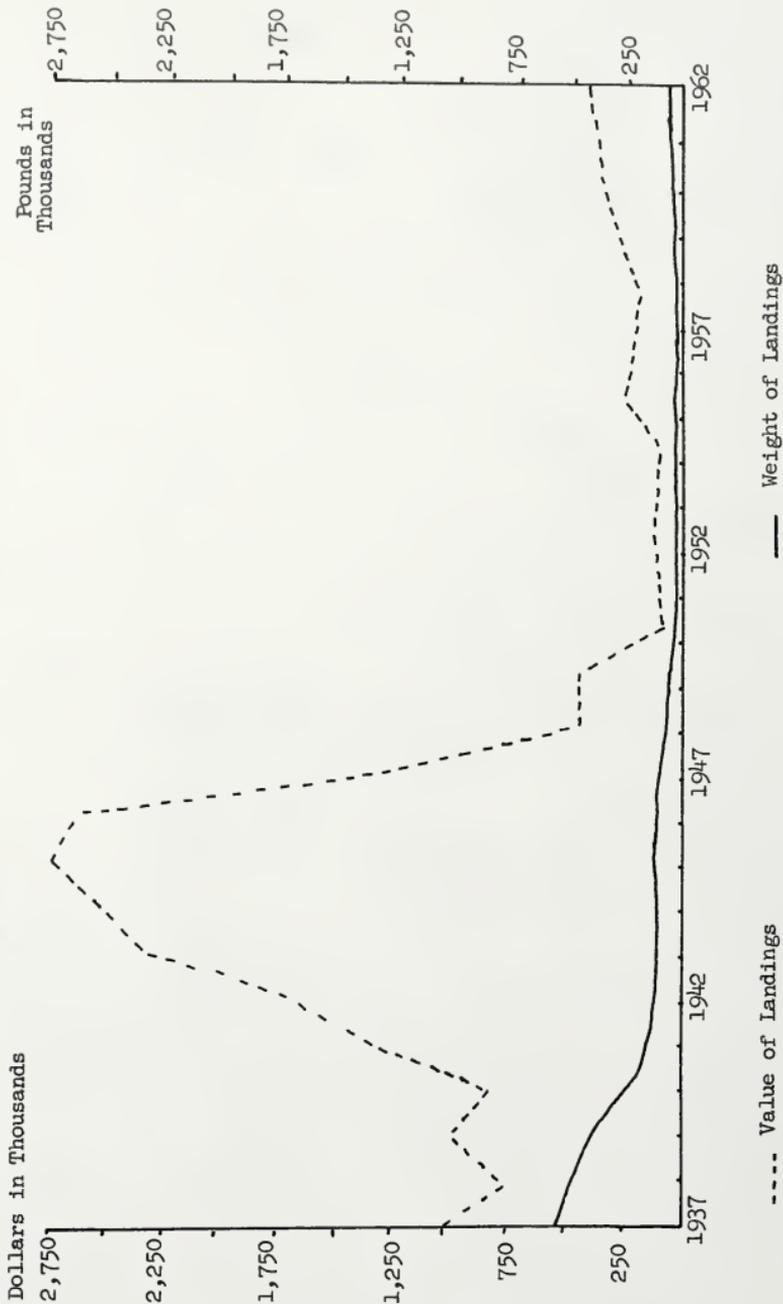
As can be seen in Figure 5 the decline in landings was accompanied by a tremendous increase in the value of landings. This increase was caused primarily by the entrance of the Federal Government in the market as an active sponge buyer. During the war years the United States Government bought practically all the sponges landed.¹ The existence of such a large-scale buyer caused sponge prices to skyrocket within a very short period of time. For example, average sponge prices at the producers' level rose from \$2.49 per pound in 1939 to \$15.99 a pound in 1946 (see Table 10). It was such price increases that lured additional investment into the sponge fisheries at a time when the productivity of the sponge beds was declining because of a marine disease. Although no official statistics are available on the number of craft in the sponge fisheries during the war years, in conversations with fishermen in Tarpon Springs the author was told that more than 90 diving craft were in operation during World War II.

The interaction of the 1937 disease and World War II set the stage for the final collapse which took place in 1949. There were two reasons for the collapse. First, heavy government purchasing during the war years dislocated many established trade relationships. Unable to compete with the government many natural sponge users had to use substitute products during the war years when sponges were scarce. It was impossible to recapture such users after the war, and the majority of them, including the American housewife, were lost permanently to synthetics.² Second, an increase in the number of

¹"Sponges for War," Business Week, April 10, 1943, p. 30.

²Interview with Edward Riley, President of American Sponge and Chamois Co., Long Island City, N. Y., November 19, 1964.

Figure 5. Value and Weight of Landings in the Florida Sponge Fisheries



----- Value of Landings

———— Weight of Landings

Source: Based on Table 10.

TABLE 10

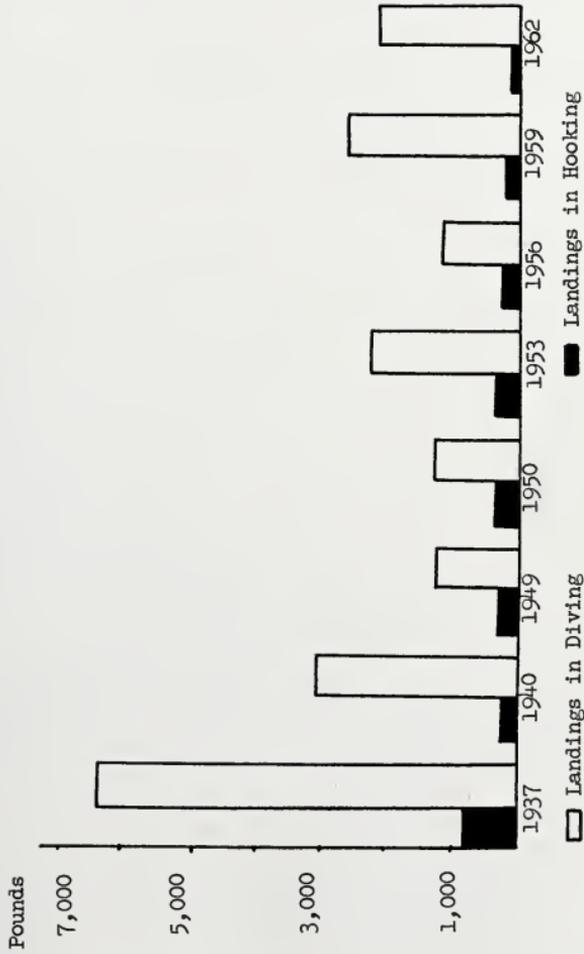
WEIGHT, VALUE AND AVERAGE PRICE PER POUND OF WOOL, YELLOW, AND GRASS SPONGES LANDED IN FLORIDA
1913-1963

Year	Wool			Yellow			Grass			Total		
	Pounds	Dollars	Average Price	Pounds	Dollars	Average Price	Pounds	Dollars	Average Price	Pounds	Dollars	Average Price
1913	362,000	586,000	1.62	65,000	47,000	.72	56,000	40,000	.71	483,000	673,000	1.39
1914	332,000	515,000	1.55	65,000	26,000	.40	42,000	17,000	.40	439,000	558,000	1.27
1915	..	..	..	..	..	..	..	..	..	..	..	..
1916	..	..	..	..	..	..	..	..	..	..	..	..
1917	332,000	785,000	2.36	76,000	46,000	.61	50,000	27,000	.54	458,000	858,000	1.87
1918	273,000	554,000	2.03	57,000	28,000	.49	17,000	9,000	.53	347,000	591,000	1.70
1919	364,000	640,000	1.75	61,000	39,000	.64	20,005	25,000	1.25	445,005	704,000	1.58
1920	308,000	602,000	1.95	61,000	43,000	.70	37,000	30,000	.81	406,000	675,000	1.66
1921	307,000	492,000	1.60	59,000	30,000	.51	26,000	13,000	.50	392,000	564,000	1.44
1922	418,000	638,000	1.53	56,000	38,000	.40	34,000	20,000	.59	548,000	696,000	1.27
1923	395,000	664,000	1.68	73,000	47,000	.64	36,000	16,000	.44	504,000	727,000	1.44
1924	430,000	672,000	1.56	68,000	38,000	.16	6,000	3,000	.50	504,000	731,000	1.45
1925	396,000	654,000	1.65	101,000	48,000	.48	11,000	8,000	.73	508,000	710,000	1.40
1926	355,000	629,000	1.77	46,000	23,000	.50	20,000	13,000	.65	421,000	665,000	1.58
1927	389,000	814,000	2.09	55,000	33,000	.60	20,000	14,000	.70	464,000	861,000	1.86
1928	359,000	674,000	1.88	51,000	29,000	.57	30,000	21,000	.70	440,000	724,000	1.65
1929	321,000	656,000	2.04	57,000	32,000	.56	24,000	14,000	.58	402,000	702,000	1.75
1930	403,000	750,000	1.86	47,000	33,000	.70	22,000	17,000	.77	472,000	800,000	1.69
1931	267,000	547,000	2.05	81,000	39,000	.48	25,000	19,000	.76	373,000	611,000	1.64
1932	274,000	431,000	1.57	75,000	44,000	.59	52,000	29,000	.56	401,000	504,000	1.26
1933	259,000	352,000	1.36	80,000	51,000	.64	20,000	9,000	.45	359,000	442,000	1.15
1934	351,000	572,000	1.63	105,000	71,000	.68	29,000	19,000	.66	485,000	662,000	1.36
1935	270,000	528,000	1.96	80,000	67,000	.84	22,000	16,000	.73	372,000	611,000	1.64

1936	1468,000	938,000	2.00	122,000	74,000	.61	26,000	17,000	.65	616,000	1029,000	1.67
1937	399,000	977,000	2.45	130,000	96,000	.74	17,000	12,000	.71	546,000	1085,000	3.82
1938	421,000	893,000	2.12	92,000	46,000	.50	8,000	6,000	.75	521,000	745,000	1.43
1939	325,000	916,000	2.82	60,000	79,000	1.32	24,000	24,000	1.00	409,000	1019,000	2.49
1940	212,000	826,000	3.90	6,000	8,000	1.33	13,000	12,000	.92	231,000	846,000	3.66
1941	167,000	1244,000	7.45	6,000	23,000	3.83	28,000	97,000	3.46	201,000	1364,000	6.79
1942	157,000	4333,000	9.76	5,000	44,000	8.80	22,000	123,000	5.59	184,000	4700,000	9.24
1943	156,000	2033,000	13.03	10,000	97,000	9.70	20,000	175,000	8.75	186,000	2305,000	12.39
1944	161,000	2257,000	14.02	9,000	99,000	11.00	22,000	191,000	8.68	192,000	2347,000	13.27
1945	158,000	2377,000	15.04	8,000	91,000	11.38	28,000	248,000	8.86	194,000	2717,000	14.00
1946	162,000	2590,000	15.99	..	..	..	..	..	..	162,000	2590,000	15.99
1947	107,000	1142,000	10.67	4,000	45,000	11.25	9,000	58,000	6.44	118,000	1245,000	10.55
1948	60,130	433,989	7.22	5,023	12,865	2.56	9,311	19,083	2.05	74,464	465,937	6.26
1949	57,700	455,176	7.89	4,500	9,097	2.02	6,500	6,530	1.00	68,700	470,580	6.85
1950	19,800	128,300	6.48	1,100	1,100	1.00	1,100	1,100	1.00	22,000	130,500	5.93
1951	14,800	107,300	7.25	500	1,845	3.69	500	1,610	3.22	15,800	110,755	7.00
1952	12,200	103,700	8.50	5,400	16,200	3.00	7,400	22,200	3.00	25,000	142,100	5.68
1953	14,800	120,472	8.14	1,300	3,744	2.88	1,200	3,700	3.08	17,300	127,916	7.39
1954	13,500	114,750	8.50	900	2,979	3.31	700	1,450	2.07	15,100	119,179	7.89
1955	26,200	222,700	8.50	4,100	14,350	3.50	4,000	14,050	3.51	34,300	251,100	7.32
1956	25,900	227,890	8.83	2,400	8,160	3.40	1,400	5,516	3.94	29,600	241,566	8.16
1957	36,700	224,641	6.12	5,100	10,583	2.08	2,600	9,734	3.74	44,400	244,958	5.52
1958	19,300	197,627	10.24	8,200	5,126	1.11	1,900	7,270	3.83	29,400	214,025	7.28
1959	24,000	273,765	11.41	1,800	8,004	4.45	1,500	7,751	5.17	27,300	289,520	10.61
1960	35,000	301,700	8.62	1,800	6,235	3.46	500	1,562	3.12	37,300	309,497	8.30
1961	35,500	361,587	10.19	1,300	4,258	3.28	100	801	8.01	36,900	366,646	9.94
1962	43,939	398,093	9.06	2,490	8,006	3.22	1,552	9,621	6.20	47,981	415,720	8.66
1963	41,813	367,733	8.65	11,406	20,368	1.79	2,019	5,160	2.56	55,238	387,261	7.01

Source: 1913-1947 from J. Q. Tierney, The Sponge Industry of Florida, Florida Board of Conservation Educational Series No. 2 (Coral Gables, Fla.: Marine Laboratory, University of Miami, 1949). 1948-1962 from U. S., Fish and Wildlife Service, U. S. Fishery Statistics. 1963 from U. S., Bureau of Commercial Fisheries, Florida Landings.

Figure 6. Average Landings Per Enterprise Unit in the Sponge Fisheries of Florida



Source: Based on Tables 15 and 16.

craft at a time when sponge beds were hit by an epidemic meant that the beds were being fished to the point of depletion. Figure 6 indicates how rapidly catch per craft declined after 1937. This should have aroused some concern about conservation of the sponge beds, but instead higher prices caused practices which led to an almost complete exhaustion of the beds.¹

After the exit of the United States Government from the market as an active buyer of sponges, average per pound prices fell from the \$15.99 peak in 1946 to \$6.26 in 1948. Average catch per diving craft stood at 1,458 pounds in 1949. This decline in catch per craft along with greatly weakened prices caused the number of diving craft to be reduced to 40 in 1949, a decline of almost 50 per cent in three years. The final blow to the industry came when the already exhausted sponge beds were struck by another disease in 1949.²

After having reached a peak of \$2,716,000 in 1945 (again see Table 10), sponge landings dropped to \$110,755 by 1951, a period of six years. The diving fleet, which had consisted of over 90 craft during the war, contained only two outfits in 1952 (again see Table 14). This fluctuation in the number of craft can be explained in terms of opportunity costs. In economics the concept of opportunity cost denotes the most favorable price that can be commanded by a factor of production, which thus tends to become the minimum cost at which that factor can be had by any user.³ Although sponge outfits are a

¹Storr, p. 51.

²Ibid., p. 48.

³Harold S. Sloan and Arnold J. Zurcher, A Dictionary of Economics (New York: Barnes & Noble, 1958), p. 234.

TABLE 11

CATCH OF WOOL, YELLOW, GRASS, AND OTHER SPONGES BY HOOKING OUTFITS, 1937-1962

Year	Wool		Yellow		Grass		Other		Total	
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
1937	91,300	222,881	46,700	28,147	21,700	14,003	..	..	159,700	265,031
1938	95,300	195,842	18,500	8,745	10,200	8,331	..	..	124,000	212,918
1939	71,900	192,558	12,000	15,669	10,700	9,523	10,300	3,993	104,900	221,743
1940	29,500	112,024	1,000	1,308	9,600	9,128	..	..	40,100	122,460
1941	..	..	..	..	..	..	..	..	..	..
1942	..	..	..	..	..	..	..	..	..	..
1943	..	..	..	..	..	..	..	..	..	..
1944	..	..	..	..	..	..	..	..	..	..
1945	44,200	256,360	..	..	5,900	12,390	13,100	18,733	63,200	287,483
1946	..	..	..	..	..	..	..	..	..	..
1947	..	..	..	..	..	..	..	..	..	..
1948	..	..	..	..	..	..	..	..	..	..
1949	5,400	52,466	1,000	2,027	4,000	4,030	..	..	10,400	58,523
1950	11,300	73,220	800	800	800	800	..	..	12,900	74,820
1951	8,800	63,800	300	1,107	300	966	..	..	9,800	66,073
1952	5,400	45,900	2,400	7,200	3,400	10,200	..	..	11,200	63,300
1953	5,700	46,398	1,100	3,168	1,000	3,050	..	..	7,800	52,616
1954	4,900	41,650	600	1,985	500	1,750	..	..	6,000	45,386
1955	14,200	120,700	2,100	7,350	2,300	8,050	300	450	18,900	136,550
1956	7,300	64,065	1,100	3,740	900	3,546	..	..	9,300	71,891
1957	25,700	157,310	4,800	9,960	2,500	9,360	100	696	33,400	177,437
1958	6,200	63,487	7,600	8,460	1,800	6,888	300	1,922	15,900	80,757
1959	3,900	43,133	800	3,157	1,300	6,419	..	..	6,000	52,709
1960	5,700	42,625	800	3,248	300	743	..	..	10,800	45,571
1961	4,800	42,851	1,100	3,248	..	..	..	..	5,900	46,099
1962	6,900	55,704	1,600	4,127	1,400	8,694	..	..	9,900	68,525

Source: U. S., Fish and Wildlife Service, U. S. Fishery Statistics.

CATCH OF WOOL, YELLOW, GRASS, AND OTHER SPONGES BY DIVING OUTFITS, 1937-1962

Year	Wool		Yellow		Grass		Other		Total	
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
1937	352,700	866,486	102,800	75,806	..	..	16,200	12,382	471,700	954,674
1938	376,900	801,496	90,500	45,648	6,700	4,272	7,900	6,514	482,000	857,930
1939	298,900	842,260	49,000	64,266	17,400	17,824	14,200	15,852	379,500	940,202
1940	193,500	754,829	5,400	7,322	3,900	3,632	..	..	202,800	765,783
1941	..	..	..	..	..	..	..	..	..	..
1942	..	..	..	..	..	..	..	..	..	..
1943	..	..	..	..	..	..	..	..	..	..
1944	..	..	..	..	..	..	..	..	..	..
1945	134,700	2377,314	12,100	91,200	56,600	247,500	..	..	203,400	2916,414
1946	..	..	..	..	..	..	..	..	..	..
1947	..	..	..	..	..	..	..	..	..	..
1948	..	..	..	..	..	..	..	..	..	..
1949	52,300	402,710	3,500	7,070	2,500	2,500	..	..	58,300	412,280
1950	8,500	55,080	300	300	300	300	..	..	9,100	55,680
1951	6,000	43,500	200	738	200	644	..	..	6,400	44,882
1952	6,800	57,800	3,000	9,000	4,000	12,000	..	..	13,800	73,800
1953	9,100	74,074	200	576	200	650	..	..	9,500	75,300
1954	8,600	73,100	300	993	200	700	..	..	9,100	74,793
1955	12,000	102,000	2,000	7,000	1,700	5,950	100	150	15,800	115,100
1956	18,500	163,825	1,300	4,420	500	1,970	..	..	20,300	170,215
1957	11,000	67,331	300	623	100	374	..	..	11,400	68,328
1958	13,100	134,140	600	668	100	382	..	..	13,800	135,190
1959	20,100	230,632	1,000	4,872	200	1,332	..	..	21,300	236,836
1960	29,300	259,075	1,000	3,500	200	819	..	..	31,000	263,586
1961	30,700	318,736	200	1,010	100	801	..	..	31,000	320,547
1962	37,000	342,388	900	4,122	200	927	..	..	38,100	347,437

Source: U. S., Fish and Wildlife Service, U. S. Fishery Statistics.

TABLE 13

 PERCENTAGE DISTRIBUTION OF WOOL, YELLOW, GRASS, AND OTHER SPONGES
 BY METHOD OF OPERATION, 1937-1961

Year	Hooking				Total	Diving				Total
	Per Cent of Total					Per Cent of Total				
	Wool	Yellow	Grass	Other		Wool	Yellow	Grass	Other	
1937	57.16	29.24	13.58	..	100.00	74.78	21.79	..	3.43	100.00
1938	76.85	14.92	8.23	..	100.00	78.20	18.78	..	1.64	100.00
1939	68.54	11.44	10.20	9.82	100.00	78.76	12.91	4.59	3.74	100.00
1940	73.57	2.49	23.94	..	100.00	99.41	2.66	1.92	..	100.00
1941	..	..	..	..	..	..	..	..	..	..
1942	..	..	..	..	..	..	..	..	..	..
1943	..	..	..	..	..	..	..	..	..	..
1944	..	..	..	..	..	..	..	..	..	..
1945	69.94	..	9.34	20.72	100.00	66.22	5.95	27.83	..	100.00
1946	..	..	..	..	..	..	..	..	..	..
1947	..	..	..	..	..	..	..	..	..	..
1948	..	..	..	..	..	..	..	..	..	..
1949	59.92	9.62	38.46	..	100.00	89.71	6.00	..	..	100.00
1950	87.60	6.20	62.01	..	100.00	93.41	3.30	4.29	..	100.00
1951	89.89	3.06	3.06	..	100.00	93.75	3.13	3.13	..	100.00
1952	48.21	21.43	30.36	..	100.00	49.28	21.74	28.99	..	100.00
1953	73.08	14.10	12.82	..	100.00	95.79	2.11	2.11	..	100.00
1954	81.67	10.00	8.33	..	100.00	94.51	3.29	2.19	..	100.00
1955	75.13	11.11	12.17	1.59	100.00	75.95	12.66	10.76	6.33	100.00
1956	78.49	11.83	9.68	..	100.00	91.13	6.40	2.46	..	100.00
1957	76.95	14.37	7.49	2.99	100.00	96.49	2.63	0.88	..	100.00
1958	38.99	47.53	11.32	1.89	100.00	94.93	4.35	0.72	..	100.00
1959	65.00	13.33	21.67	..	100.00	94.37	4.69	0.94	..	100.00
1960	52.78	7.41	2.78	..	100.00	94.51	3.23	0.64	..	100.00
1961	81.36	18.64	..	..	100.00	99.03	0.60	0.32	..	100.00

Source: U. S., Fish and Wildlife Service, U. S. Fishery Statistics.

specialized type of fishing craft, when yields in sponging fall too low it becomes necessary for some outfits to convert to other types of fishing. For example, after 1952 many diving craft converted to shrimp boats.¹ This exodus of outfits came to an end when the remaining craft could earn a satisfactory return, that is, when the earnings in the sponge fisheries were equal to earnings in the next easiest accessible type of fishery.

The reduction of the fleet also had a beneficial effect on the productivity of sponge beds; with fewer fishing outfits in existence sponge beds could be fished less extensively. This reduction in fishing effort gave the almost depleted sponge beds an opportunity to recuperate. As the sponge beds recuperated catch per craft improved.

Assuming that there is no change in the price level, increasing catch per craft means higher earnings. Higher earnings in turn attract more investment into the fisheries, and this condition continues until the last craft attracted to the sponge fisheries earns an amount equal to what it would have earned in some other type of fishing activity. A practical application of the afore-mentioned relationship can be observed in the anticipated earnings behavior of the shrimp fisheries during 1953 and 1957. In the shrimp fisheries these years were characterized by very high landings per craft, and each of these years was followed by a large increase in the size of the fishing fleet in the shrimp fisheries.² Of course, such conditions will be met only under the postulate of labor and capital mobility. To the extent that

¹Interview with Louis Smitzes, May, 1964.

²Carter C. Osterbind and Robert A. Pantier, Economic Study of the Shrimp Industry in the Gulf and South Atlantic States (Gainesville, Fla.: Bureau of Economic & Business Research, University of Florida, 1965), p. 23.

factors of production are immobile, the production of a particular economic good will not respond readily to changes in the level of earnings.¹

The degree of mobility is not the same for hooking and machine diving. As can be seen in Figure 7 hooking craft enter into and exit from sponge fishing more readily than diving craft. This is due to the fact that diving, as compared to hooking, is a more specialized operation. It takes more effort to convert diving outfits into other types of fishing boats, whereas hooking outfits can be easily adapted to other types of fishing. Also, unlike hooking, machine diving is a highly skilled operation, and such skills cannot be easily transferred to other types of fishing at the same level of earnings. In other words, diving craft personnel may be as mobile as other fishermen in obtaining less skilled jobs, but they have less horizontal mobility since no other type of fishing operation has use for submarine divers.

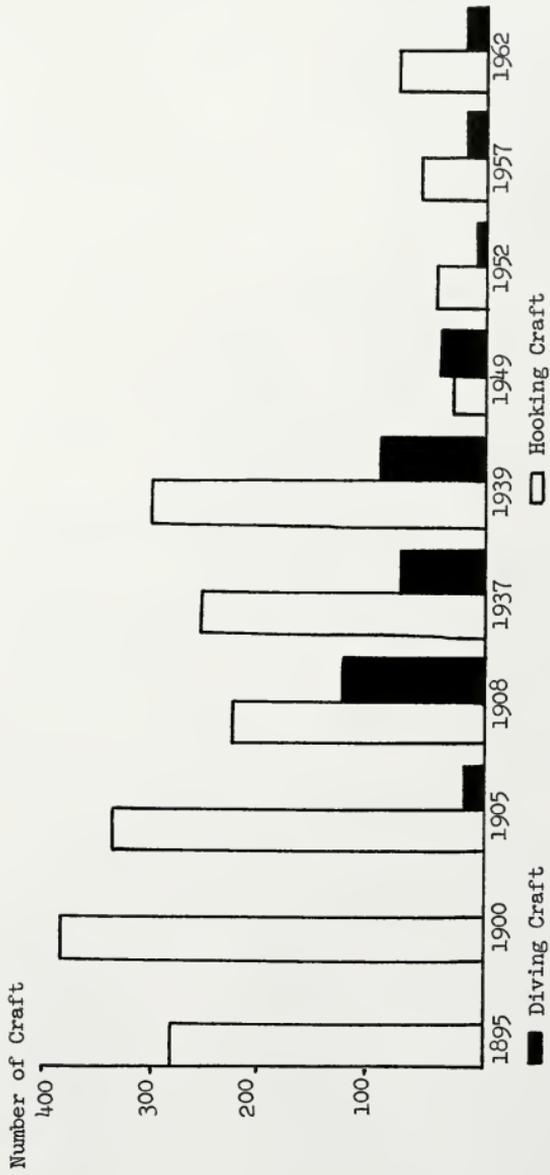
Investment

Based on current market values expert opinion has estimated 1963 investment in the sponge fisheries to be approximately \$325,000 (again see Table 4). This figure is restricted to investment in the fleet alone and does not include money invested in shore facilities, such as the Tarpon Springs Sponge Exchange, or other auxiliary activities, such as investment in the packing establishments.

Figure 7 shows fluctuations of physical investment measured in number of craft in the sponge fishery. It can be observed from the chart that the number of hooking outfits has fluctuated more widely

¹Kenneth E. Boulding, Economic Analysis (3rd ed.; New York: Harper & Bros., 1955), p. 219.

Figure 7. Number of Hooking and Diving Craft in the Sponge Fisheries of Florida



Source: Based on Tables 7 and 14.

TABLE 14
 NUMBER OF CRAFT AND EMPLOYMENT BY METHOD OF OPERATION, 1937-1963

Year	Hooking				Diving				Total Employ- ment
	Craft	Fishermen			Craft	Fishermen			
		Regular	Casual	Total		Regular	Casual	Total	
1937	256	380	..	380	72	569	..	569	949
1938	290	410	..	410	72	509	..	509	919
1939	301	489	..	489	89	634	..	634	1,123
1940	175	233	46	279	67	451	..	451	730
1941	..	..	..	..	..	..	..	..	..
1942	..	..	..	..	..	..	..	..	..
1943	..	..	..	..	..	..	..	..	..
1944	..	..	..	..	..	..	..	..	..
1945	..	..	..	..	..	..	..	..	..
1946	..	..	..	..	..	..	..	..	..
1947	..	..	..	..	..	..	..	..	..
1948	..	..	..	..	..	..	..	..	..
1949	28	57	..	57	40	223	..	223	280
1950	28	59	..	59	6	36	..	36	85
1951	29	60	..	60	3	12	..	12	72
1952	46	96	..	96	2	12	..	12	108
1953	27	75	15	90	4	28	..	28	118
1954	48	67	25	92	9	54	..	54	146
1955	39	44	46	90	14	66	6	72	162
1956	45	57	38	95	17	66	12	78	173
1957	59	63	65	128	13	42	12	54	182
1958	41	67	20	87	10	53	5	58	145
1959	37	73	..	73	8	56	6	62	135
1960	23	58	..	58	12	60	12	72	130
1961	84	67	84	151	12	60	12	72	223
1962	81	69	30	99	18	108	..	108	207
1963	..	..	..	..	13	78	..	78	78

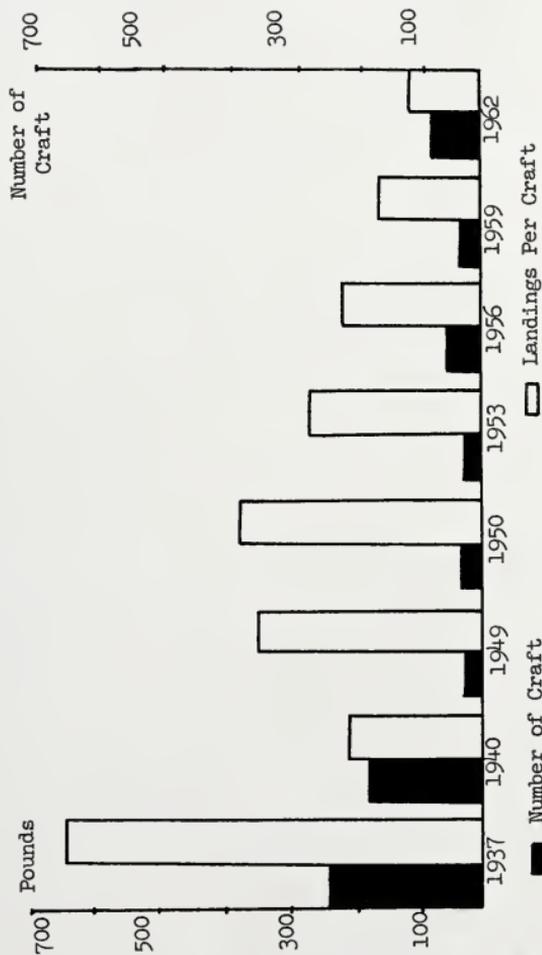
Source: U. S., Fish and Wildlife Service, U. S. Fishery Statistics.

than the number of diving outfits. The reasons for this pattern will be explained in the following section. Although diving outfits have always been fewer in number than hooking outfits, with the exception of a few years, they have always landed a larger percentage of the total catch (see Table 17). The same table also indicates that for each year the percentage value of landings credited to diving craft has always exceeded their percentage contribution to physical landings, thus showing that throughout history the diving fleet has maintained its ability to command better prices for its products.

As can be seen from Figure 6 productivity per enterprise unit has always been highest for diving craft. This has been true without exception, even for years when the entire diving fleet has landed fewer sponges than the entire hooking fleet. The recent upsurge in the number of hooking craft is not of great significance, since a majority of such outfits do their fishing as a sideline or on a part-time basis. The number of diving craft seems to have stabilized during the last few years, mainly due to a shortage of qualified divers.

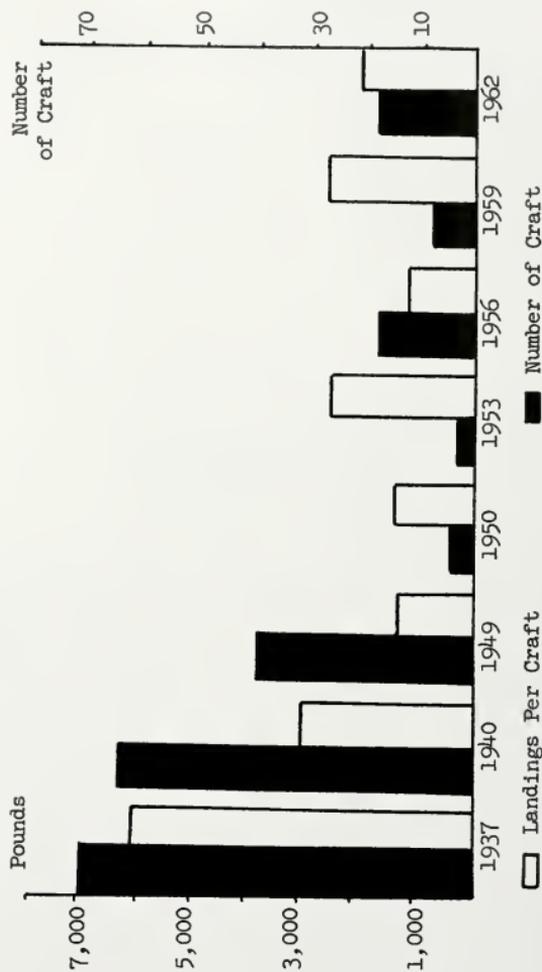
Figure 8 and Figure 9 show the relationship between the number of craft (physical investment) and catch per craft for hooking and diving outfits respectively. One can readily deduce that as the number of craft decreases the productivity per enterprise unit tends to go up, but this increase in productivity per craft - assuming no drastic decline in sponge prices - will attract outfits that had previously left sponging for more lucrative fishing activities. Figure 10 illustrates the concept of stable equilibrium in the sponge fisheries; however, the relationships pictured in Figure 10 will occur

Figure 8. Number of Hooking Craft and Landings Per Hooking Craft in the Sponge Fisheries of Florida



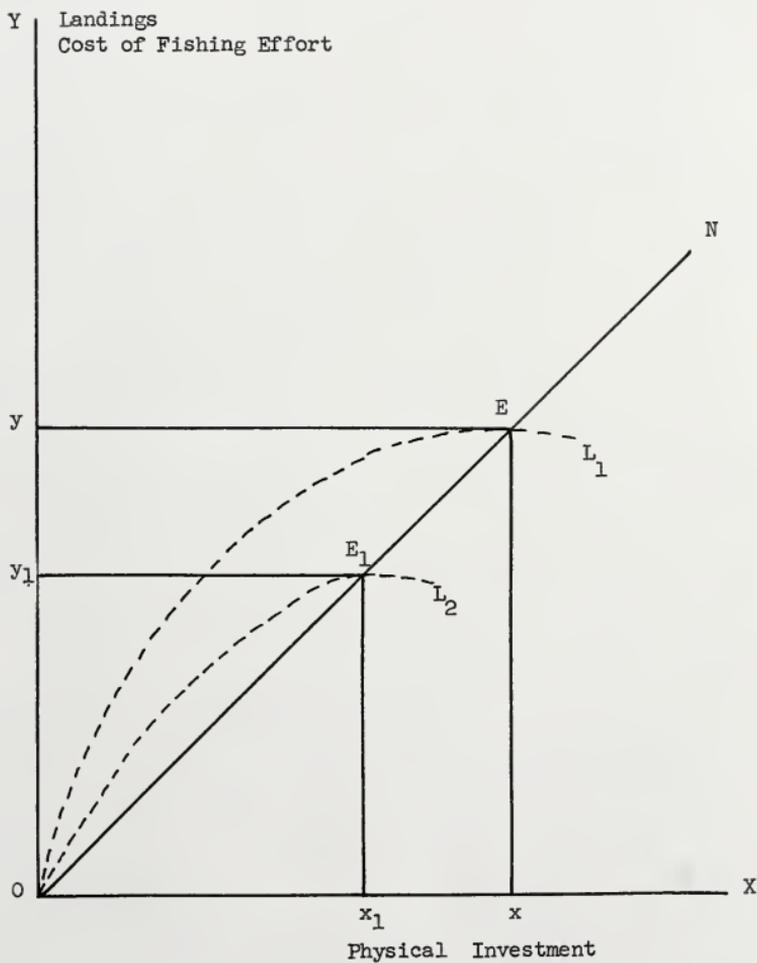
Source: Based on Tables 11 and 14.

Figure 9. Number of Diving Craft and Landings Per Diving Craft in the Sponge Fisheries of Florida



Source: Based on Tables 12 and 14.

Figure 10. An Equilibrium Model for the Sponge Fisheries of Florida



only if certain assumptions implied in the description hold true. A change in user tastes or preferences may change the market demand to such an extent that any fleet size based on a biological equilibrium may have no economic meaning. For example, if most current users of natural sponges decide to shift to synthetics, intensity of fishing effort as determined by fleet size and level of sponge population would be of limited economic significance. Also, a change in the relative importance of imports could sharply alter the market share and subsequently create unforeseen disturbances among the operators of sponge craft. It is obvious that the existence of such conditions could preclude the orderly adjustment described in the following paragraphs.

Sponge landings and cost of fishing effort are measured along the OY axis; the OX axis measures physical investment or the number of craft in the sponge fisheries. The curve labeled L_1 is a landings function, and it has a steadily diminishing slope because of the law of diminishing returns; that is, as successive units of fishing craft are applied to a fixed amount of sponges, the amount of average landings per fishing craft, after a certain point has been reached, will decline.¹ Any short run shifts in this curve would depend on uncontrollable natural elements, such as the diseases which hit the sponge beds in 1937 and 1949, and on the intensity of fishing effort as determined by the number of craft in the sponge fleet. Curve N is a cost function, and its slope represents the assumption that additional fishing effort will have no inflationary effect on the prices of factors of production.

¹Boulding, p. 589.

This is a reasonable assumption in view of the fact that currently there are about seven former diving craft that could readily be made operational were it not for the current labor shortage. Also, any new craft constructed for the sponge fisheries would constitute such a small percentage of total ship construction that any inflationary effect on the prices of factors of production would be negligible. Curve N also includes a normal return on investment which the owner of the fishing outfit could have earned in some other type of fishing activity.

Point E in the diagram represents an equilibrium position. At E productive factors used in sponge fisheries have been placed in their highest paying employments, and there is no incentive for the owners of these productive factors to move their resources from sponge fishing to another type of fishing activity.¹ Since E represents an equilibrium position, at E, the number of craft are landing the amount of sponges with all enterprise units making a normal return on their investment.² Suppose that a marine disease were to hit the sponge beds, greatly reducing the amount of sponges available for fishing. This would mean a downward shift of the landings function from L_1 to L_2 . A drastic decline in the amount of sponges available for fishing will have an adverse effect on the productivity of each craft; that is, when the same number of craft have to share a smaller quantity of sponges, catch per craft will decline. Assuming that there is no change in market demand, this will make sponge fishing less attractive, and there will be a tendency for some craft to leave the fleet. The

¹Ibid., p. 566.

²Ibid.

rate of exit will depend on the intensity of the disease plus fishing conditions in other types of fisheries.

A reduction in the size of the domestic sponge fleet may also occur as a result of a change in the relative importance of imports. In 1957, 238,550 pounds of natural sponges valued at \$1,415,571 were imported. Imports have declined steadily since then and in 1963 were 83,888 pounds valued at \$805,103 (see Table 39). This drop in the relative share of imports was caused primarily by the narrowing of the price differential between domestic and imported sponges. The substantial price advantage enjoyed by foreign producers has tended to diminish since 1961 (see Table 34), primarily because of supply shortages encountered by the principal foreign producers. The increase in domestic sponge production and in the size of the sponge fleet since 1961 may be attributable to developments in foreign lands over which the fisherman has no control, rather than to any fluctuations in the domestic sponge population and/or changes in the cost of fishing. By the same token, should foreign countries be able to solve their supply problems, in the future the relative importance of imports may improve. Such a situation is likely to create excess capacity in the domestic sponge fisheries regardless of the condition of the domestic sponge beds; however, in either case an adjustment in the size of the fleet will take place eventually.

E_1 in the diagram represents the new equilibrium position, and it was reached after x_1x number of craft left the sponge fisheries. At E_1 , ox_1 number of craft are landing oy_1 amount of sponges. In the absence of additional domestic or foreign natural disasters this reduction of fishing effort due to the reduction in the number of

craft, coupled with proper conservation practices, will tend to increase the sponge population, thus pushing the landings function upward.¹ In addition to the sponge population and intensity of fishing, the level of equilibrium landings will also depend on conservation laws. By placing legal limits on the size of sponges that can be harvested, conservation authorities can move the level of equilibrium either to the right or left of the above diagram. Currently, both Florida and U. S. laws prohibit the harvesting of sponges with a diameter of less than five inches when wet. This is done in order to give young sponges a chance to propagate themselves, since three to four years need to elapse before a sponge larva can reach the legal fishing size.²

To be sure, the equilibrium positions described in the above paragraphs may never materialize in actuality. The concept of equilibrium indicates a position which provides no incentive or opportunity to move. An enterprise unit which is in equilibrium is obtaining the highest possible return on its factors of production and is maximizing its profits. Any changes from this equilibrium position will cause a decline in profits. Changes in market demand, in costs of production, and in the state of technology may constantly shift the equilibrium position, because the enterprise unit facing such changes will have to readjust the employment of its factors of production if they are to be utilized at their highest paying capacity. Since firms in disequilibrium will tend to move toward a

¹Storr, p. 67.

²Ibid., p. 17.

TABLE 15

AVERAGE LANDINGS PER DIVING CRAFT, 1937-1962

Year	Catch Per Craft in Pounds	Value of Average Catch in Dollars	Value of Average Catch Per Fisherman in Dollars	Average Price Per Pound in Dollars
1937	6,551	13,259	1,678	2.02
1938	6,694	11,916	1,686	1.78
1939	4,264	10,564	1,485	2.48
1940	3,027	11,445	1,698	3.78
1941	..	..	..	..
1942	..	..	..	..
1943	..	..	..	..
1944	..	..	..	..
1945	..	..	..	14.33
1946	..	..	..	..
1947	..	..	..	..
1948	..	..	..	..
1949	1,458	10,307	1,849	7.07
1950	1,517	9,280	1,547	6.12
1951	2,133	14,961	3,740	7.01
1952	6,900	39,400	6,567	5.71
1953	2,375	18,825	2,689	7.93
1954	1,011	8,310	1,385	8.22
1955	1,129	8,221	1,599	7.28
1956	1,194	10,018	2,182	8.38
1957	877	5,256	1,265	5.99
1958	1,380	13,519	2,661	9.80
1959	2,663	29,605	3,820	11.12
1960	2,583	21,966	3,661	8.50
1961	2,583	26,712	4,452	10.34
1962	2,111	19,278	3,213	9.13

Source: U. S., Fish and Wildlife Service, U. S. Fishery Statistics.

TABLE 16

AVERAGE LANDINGS PER HOOKING CRAFT, 1937-1962

Year	Catch Per Craft in Pounds	Value of Average Catch in Dollars	Value of Average Catch Per Fisherman in Dollars	Average Price Per Pound in Dollars
1937	624	1,035	700	1.66
1938	428	1,018	519	1.72
1939	349	737	453	2.11
1940	229	700	439	3.05
1941	..	..	..	..
1942	..	..	..	..
1943	..	..	..	..
1944	..	..	..	..
1945	..	..	..	4.55
1946	..	..	..	..
1947	..	..	..	..
1948	..	..	..	..
1949	371	2,090	1,027	5.63
1950	461	2,653	1,263	5.80
1951	338	2,278	1,101	6.74
1952	243	1,376	659	5.65
1953	289	1,949	585	6.75
1954	125	946	493	7.56
1955	485	3,501	1,517	7.22
1956	207	1,598	757	7.72
1957	566	3,007	1,386	5.31
1958	388	1,970	928	5.08
1959	162	1,425	722	8.78
1960	470	1,981	786	4.22
1961	70	549	305	7.81
1962	123	852	692	6.90

Source: U. S., Fish and Wildlife Service, U. S. Fishery Statistics.

TABLE 17

PERCENTAGE DISTRIBUTION OF LANDINGS AND VALUE OF
LANDINGS BY METHOD OF OPERATION, 1937-1963

Year	Catch			Value of Catch		
	Hooking	Diving	Total	Hooking	Diving	Total
1937	25.29	74.71	100.00	21.73	27.27	100.00
1938	20.46	79.53	100.00	19.88	80.12	100.00
1939	21.66	78.34	100.00	19.08	80.92	100.00
1940	16.51	83.49	100.00	13.79	86.21	100.00
1941	..	..	..	..	..	..
1942	..	..	..	..	..	..
1943	..	..	..	..	..	..
1944	..	..	..	..	..	..
1945	23.71	76.29	100.00	8.97	91.03	100.00
1946	..	..	..	..	..	..
1947	..	..	..	..	..	..
1948	..	..	..	..	..	..
1949	15.14	84.86	100.00	12.43	87.57	100.00
1950	58.64	41.36	100.00	57.33	42.67	100.00
1951	60.49	39.51	100.00	59.55	40.45	100.00
1952	44.80	55.20	100.00	44.55	55.45	100.00
1953	45.09	54.91	100.00	41.13	58.87	100.00
1954	39.74	60.26	100.00	37.77	62.23	100.00
1955	54.47	45.53	100.00	54.26	45.74	100.00
1956	31.42	68.58	100.00	29.69	70.31	100.00
1957	74.55	25.45	100.00	72.20	27.80	100.00
1958	53.54	46.46	100.00	37.40	62.60	100.00
1959	21.98	78.02	100.00	18.20	81.80	100.00
1960	25.84	74.16	100.00	14.74	85.26	100.00
1961	15.99	84.01	100.00	12.57	87.43	100.00
1962	20.89	79.11	100.00	16.47	83.53	100.00

Source: U. S., Fish and Wildlife Service, U. S. Fishery Statistics.

new equilibrium, the significance of this concept lies in the fact that it indicates the direction in which economic changes can be expected to move.

Costs

In an attempt to obtain current operating statistics for the diving fleet in the summer of 1964, the author interviewed nine diving craft captains in Tarpon Springs, Florida, by using the interview guide appended to this study (see Appendix A). At the time the survey was conducted only eleven diving craft were in operation in the sponge fisheries, and the findings of this survey as shown in Table 18 can be considered as representative of the total population. Taking the operating expenses in Table 18 and multiplying them by the number of craft in diving gives \$56,342 as the total operating costs of the diving fleet. This is considerably lower than the available total operating costs figure of \$208,272 in 1934, mainly due to the fact that the number of craft has declined by 74 per cent between 1934 and 1963. The reasons for cost differences between 1934 and 1963 were explained in the preceding discussion of the early period (see pages 39-41).

Either because of their ignorance of the subject or their unwillingness to cooperate it was not possible to obtain cost data from sponge hookers. Personal observation by the author, coupled with opinions of fishermen in Tarpon Springs, revealed that operating expenses do not constitute an important factor in sponge hooking.

TABLE 18

AVERAGE OPERATING EXPENSES
OF NINE DIVING CRAFT, 1963

Item	Dollars
Fuel and Oil	\$ 984
Painting and Overhaul	497
Food and Supplies	1,367
Engine Repair	426
Diving Suits	300
Interest on \$4,000 Working Capital	320
Exchange Dues	440
Total	\$4,334
Average Deviation	136

Source: Survey of boat captains in Tarpon Springs, Fla., by the author, May, 1964.

Employment

As can be seen in Figure 4 employment in the sponge fisheries has been declining steadily since 1939. Up to 1950, employment in machine diving exceeded that in hooking, but beginning in 1950, employment in hooking has exceeded employment in diving. The hooking fleet can be credited with having a better employment record since 1950, because there are more casual fishermen¹ in this type of sponge fishing. For example, during 1961, 56 per cent of the fishermen employed in hooking were casual workers. Very little capital investment is needed for hooking, since all that is required is a glass

¹Casual fishermen are defined by the U. S. Bureau of the Census as fishermen who receive less than half their annual income from fishing.

bucket, a pole approximately 20 feet long with a hook attached to the end, and any boat that can be manned by two people. It is estimated that not more than \$1,300 is needed to equip such an operation. Although detaching a sponge with a 20-foot pole requires some skill, such skill can be acquired with relatively little training and is not comparable to the elaborate skills needed in machine diving. Consequently, many aged fishermen and persons who have other occupations in Tarpon Springs and Key West have found the hooking type of sponge fishing to be a profitable side line.¹ Table 16 indicates the value of average catch per fisherman in hooking operations. The productivity of such fishermen is very low when the figures are compared with the value of average catch per fisherman for diving operations in Table 15. In calculating the value of average catch per fisherman the value of total landings was divided by the total number of fishermen, including casual fishermen. This has deflated the productivity figures for regular fishermen in hooking and machine diving, but in no way has it disguised the productivity relationship between fishermen in hooking and machine diving.

Employment in diving has been relatively stable between 1960 and 1963. This is due mainly to the fact that it has been impossible to attract younger men into this occupation.² With the exception of one, all 26 divers employed by the diving fleet today are divers of Greek descent who migrated to this country before World War II. The median age of these divers as of August, 1964, was 59 years. Any expansion in employment that has taken place during the last decade has almost

¹Interview with Louis Smitzes, May, 1964.

²Ibid.

exclusively come from the ranks of ex-divers who took shore jobs after the 1949 sponge disease. Professor John F. Storr of the State University of New York conducted a study of the Gulf of Mexico commercial sponges in which he found that the diving craft with the youngest diver (all over 40 years of age) had a catch over 50 per cent greater than any other craft in the fleet in 1957.¹ This does not strike one as something unexpected, since in a type of activity, such as diving, in which physical fitness is important, one would expect to find a positive relationship between physical fitness and productivity. Younger divers, in addition to being able to spend more time under water, are capable of operating at greater depths. These two factors make it possible for them to explore new areas and harvest sponges which command higher market prices.

As can be observed from Table 15 average productivity figures per fisherman have been steadily increasing during the last six years. This improvement in productivity is primarily due to two factors: (1) a general recovery of sponge beds from the disease of 1949, and (2) a scarcity of diving craft despite this recovery, due to a shortage of qualified machine divers. The sponge industry has tried to solve this manpower shortage by importing divers from the Mediterranean, but such efforts have proved fruitless thus far.² After entering the United States imported divers often leave diving for more remunerative employment in Detroit or other industrial centers of the North.³

¹Storr, p. 55.

²Interview with Louis Smitzes, April, 1964.

³Ibid.

Attempts are being made by the Tarpon Springs Sponge Exchange to bring divers over 45 years of age from the Mediterranean. The Tarpon Springs Sponge Exchange Board of Directors reached this decision on the hypothesis that it would be difficult for divers of this age to find alternative employment opportunities.¹ This may be an expedient solution to the acute shortage of divers in the short run, but in the long run any industry's survival depends on its ability to attract labor and capital. Employing older divers will affect the average productivity of fishermen, but this may not prove to be very important since it has been pointed out previously that such productivity depends largely on the condition of the sponge beds rather than any effort exerted by man. The important thing is to find divers who can function even if their performance is somewhat hampered by age.

Importance of the Sponge Industry
to Florida and the United States

The past and present economic significance of the sponge fisheries can be measured in terms of past and present performance in areas such as production and employment. In 1963, Florida fisheries landed 172,319,000 pounds of sea products at a value of \$27,718,000 (see Table 19). The contribution of the sponge fisheries was only \$387,261, a very small percentage of the total value.

In 1895, the sponge fisheries were Florida's most valuable fisheries, credited with one-third of the total landings for that particular year. A comparison of Table 20 with Table 21 shows that while other types of fisheries have been enjoying economic gains

¹Ibid.

TABLE 19

QUANTITY AND VALUE OF LANDINGS^a BY
COMMERCIAL FISHERIES IN FLORIDA,
SELECTED YEARS, 1880-1962

Year	Pounds ^b	Dollars ^b
1880	10,663	643
1895	37,037	1,210
1908	74,087	3,389
1918	135,965	5,167
1928	131,839	6,250
1934	118,801	3,645
1940	187,492	5,005
1945	243,846	18,836
1950	118,418	15,985
1953	206,887	31,523
1962	170,850	30,889
1963	172,319	27,718

Source : 1880-1953 from Osterbind, Florida's Commercial Fisheries. 1962 from U. S., Bureau of Commercial Fisheries, United States Fisheries, 1962, C. F. S. No. 3471, Annual Summary. 1963 from U. S., Bureau of Commercial Fisheries, Florida Landings.

^aValue in current dollars.

^bPounds and dollars in thousands.

sponge fisheries until very recently have been experiencing nothing but deterioration. Taking the year 1895 as a base year, between 1895 and 1963 the index indicating the quantity of Florida landings increased to 503 while the index showing their value went from 100 to 2291. In the sponge fisheries landings between 1896 and 1962 declined by 80 per cent while their value went up by only 52 per cent. It is obvious that the sponge industry has not kept pace with the growth of other fishing industries. The contribution of the sponge fisheries in the provision of employment has been unimpressive. While employment in

TABLE 20
 INDEXES OF QUANTITY AND VALUE OF LANDINGS BY
 COMMERCIAL FISHERIES IN FLORIDA,
 SELECTED YEARS, 1895-1963
 1895=100

Year	Quantity Index in Pounds	Value Index in Dollars
1895	100	100
1908	200	280
1918	367	427
1928	356	517
1934	321	300
1940	506	414
1945	658	1557
1950	320	1321
1953	559	2605
1962	505	2553
1963	503	2291

Source: Based on Table 19.

fisheries has slightly increased since the early 1900's, employment in the sponge fisheries has declined by almost 100 per cent (again see Table 4).

Although the sponge fisheries served the nation well during World War II, measured in monetary terms the contribution of the Florida sponge fisheries to the total Gross National Product in 1963 was \$387,261, which can be considered as even less than a drop in a bucket.

Viewed in this light one may conclude that the sponge fisheries of Florida are of little economic value to Florida and the United States. This, of course, is a very limited interpretation. It has been mentioned previously that the sponge fisheries of Florida are a unique

TABLE 21

INDEXES OF PRODUCTION AND AVERAGE PRICE PER POUND
OF FLORIDA SPONGES, SELECTED YEARS, 1896-1963
1896=100

Year	Catch Index	Value of Catch Index	Average Price Per Pound Index
1896	100	100	100
1906	250	313	125
1926	178	244	160
1931	158	224	141
1936	261	377	144
1941	85	500	585
1946	69	949	1378
1951	7	41	603
1956	13	88	703
1961	16	134	857
1962	20	152	747
1963	23	142	600

Source: Based on Table 2 and Table 10.

product of the state of Florida, and in terms of tourist attraction they rank favorably with other Florida landmarks.¹ Judging by the number of tourists seen daily on the sponge docks in Tarpon Springs, one may speculate that indirectly through tourist expenditures the sponge fisheries add equal or perhaps more value to the economy of Florida than they do through their landings of sponges. A great number of retail outlets selling curios and providing sea food in Tarpon Springs capitalize on the sponge fisheries in their efforts to attract tourists.

¹Interview with Louis Smitzes, May, 1964.

CHAPTER III

THE PRODUCTION OF NATURAL SPONGES

Sponge Fishing Methods and Auxiliary Procedures

In Chapter II attention was given to economic developments in the United States sponge fisheries. Some of the production factors were dealt with in terms of the economic significance that such activities had on the development of the fisheries. This chapter discusses production from a microeconomic viewpoint. The various productive activities which were viewed from an aggregate viewpoint in the previous chapter are now analyzed from an operational perspective. The following paragraphs examine the organization of firms in the sponge fisheries, their operating procedures, and distribution of earnings. An attempt is also made to discover the extent to which such factors affect supply and employment dependability in the industry.

Commercial sponges are harvested by wading, nude diving, fernezen diving, dredging, hooking and machine diving. The market value of a sponge often depends on the method by which it has been obtained, since sponges taken from deep waters have qualities superior to those harvested in shallow waters.

Curing the sponge

When the living sponges are brought to the boat they are at first squeezed by the crew to initiate the maceration of the living material.

The next step is to place the sponges on the deck with the root down to facilitate the draining out of the gurry. In order to expedite the death of the living matter in the sponges the crew often trods on them with their bare feet. In order to avoid the drying of the sponges during this decomposition of the soft tissue they are covered by a wet burlap sack. To assure uniform decaying sponges are turned several times since uneven or excessive decomposition reduces the market value of the product.

Under sunny skies this process of decaying will usually last no longer than one day, and the following day the sponges are ready for their final cleaning. Final cleaning starts by washing the sponges several times with sea water, since washing them with fresh water tends to make sponges look darker. After the final rinsing the sponges are thrown forcibly against the deck to knock out the dead shrimp and other foreign material that may have lived in the larger canals of the sponges. Then the outer surfaces of the sponges are scraped with short-bladed knives to remove the last traces of the skin. Finally, the clean sponges are strung on rope yarns, technically known as "stefani," and tied to the rails of the boat for drying. After drying the stefani, each consisting of 150 sponges, are stored in the forward hold of the boat.¹

The selling of sponges by fishermen

The information presented in this section is based primarily on the author's personal observation and information collected from residents of Tarpon Springs in the summer of 1964.

¹Interview with John Samarkos, June, 1964.

After the fishermen return to shore the sponges are stored in the Tarpon Springs Sponge Exchange. At the Sponge Exchange there are about one hundred jail-like cells. Each captain occupies one or more cells depending on the amount of his catch, and he deposits and keeps his sponges in the cells until the day of selling. Prior to the sale the boat crew strings the sponges on yarn 5 feet long, known in the trade as bunches. The number of sponges on each bunch depends on the size of the strung sponges.

Whenever sponges are available for sale the buying and selling takes place twice a week on Tuesday and Friday at 9:30 A. M., but not on Good Friday. If on the market day there is more than one captain desiring to sell his catch, then the selling order is determined by drawing a ballot.

The Tarpon Springs Sponge Exchange bills the captain for 2 per cent of his sales for the services of protection, storage, and auctioning that it provides. If the captain is a member of the local Greek Orthodox Church another 0.5 per cent is withheld and donated to the church of St. Nicholas in Tarpon Springs.

The sponges are sold to the packers at auction. A sponge auction is carried on in a silent manner with the packers carefully examining the sponges, while at the same time marking their bids on pieces of paper. The packers are experienced buyers, and their offers are based on the size and quality of sponges, this being established through a visual examination.

The auctioneer awards the sponges to the highest bidder, provided the seller considers the amount adequate. The seller is permitted to refuse an offer if he believes that the price is too low. Bids often

differ by a few dollars, and the prices paid for any variety of sponge depend to a large extent on their size and other qualities as described in Chapter I.

Units of Operation

Of all the possible operational methods only hooking and machine diving are being practiced today by sponge fishermen in the United States. Although the analysis of the fisheries in the previous chapter was undertaken in terms of a sponge fleet, one must not forget that this term in no way implies any common ownership or centralized direction of activities. As a matter of fact, of the thirteen diving outfits in operation in 1963, none had more than one owner.¹ The same is true for hooking operators.

It will be convenient to think of each craft in the sponge fisheries in terms of a separate enterprise. The objective of each enterprise unit is to maximize its landings. The combination of the three factors of production, that is, capital, management, and labor, in an effort to achieve the enterprise objective will depend primarily on the size and complexity of the operation. For example, in hooking operations it is not uncommon for the owner — capitalist to be also the manager and captain and to provide at least half of the labor requirements of the enterprise. On the other hand, one often finds separation of ownership and management in diving operations. Of the thirteen diving outfits operating in 1963, four or approximately 31 per cent were characterized by absentee ownership.² Generally

¹Survey of nine diving craft captains by the author in Tarpon Springs, Fla., May, 1964.

²Ibid.

speaking, in sponge fishing as in many other forms of production, as the size and complexity of the enterprise increases so does the division of labor. Such increased specialization increases the number of people engaged in the supply of the productive factors necessary to discharge the enterprise objectives.

In 1963, there were thirteen diving outfits in the sponge fisheries of Florida. Between 1962 and 1963, the number of craft in the sponge fleet was reduced by five, largely due to an absence of qualified divers. The median length of a diving craft was 47 feet. The median age for each diving outfit was 31 years. The newest craft was 22 years of age, while the oldest craft was constructed 47 years ago. These diving outfits had an average market value of \$17,000, which by fishery standards is considered to be a substantial investment.¹

Due to their small size, intermittent nature of operations, and widely scattered locations, it was not possible to determine the precise number of hooking craft for the year 1963. According to the statistics released by the Bureau of Commercial Fisheries, there were 81 hooking outfits in 1962. Although the Bureau publishes statistics on casual workers, no such distinction is made for casual employment of capital. Informed sources in the sponge fisheries are of the opinion that most hooking craft harvest sponges on a part-time basis.² The same sources estimate the number of hooking craft to have been around 80 in 1963. Such craft usually have a length of about 15 feet. Most of them are propelled by a motor; however, there are some that

¹Ibid.

²Ibid.

employ oars and sails. The capital required to undertake such an operation may vary widely depending on the size of the boat, type of motor, et cetera, with \$1,300 quoted as an average figure by most hookers in the trade.

Distribution of earnings

The following discussion will center around practices in machine diving operations. The process of distributing earnings has been institutionalized in this type of sponge fishing.

At the beginning of each trip it is the owner's responsibility to furnish the ship with all the necessary equipment. The owner is expected to pay for all major repairs and to have the craft in perfect operational condition. In addition, it is the duty of the owner to supply his crew with advance payments, known as "platika," from the time they have agreed to work for him until the final settlement of accounts approximately six months later. Owners are expected to take care of any emergencies that may arise in the families of their crew, and if the final proceeds are not adequate to cover the advances made to the crew, owners are expected to write off such losses.¹

Currently, each diving craft consists of six members--the captain, two divers, an engineer, a lifeline tender, a cook, and a deck hand. With the exception of one case, the captain was always one of the divers. The rest of the crew is hired by the captain for a duration of six months. Crew members have no stake in the operation except the investment of their time. Their remuneration depends on the value of the catch plus the shares which each one is entitled to receive from

¹Interview with Louis Smitzes, July, 1964.

this catch. It was reported that the former depends on the size of the catch and its market price; the latter depends at any given time on the complexity of skills supplied by each crew member.

The shares of the participants are also influenced by the amount of the operating expenses, such as groceries, fuel and oil, diving suits, and minor repairs. One may say that, in a sense, at the beginning of each six months the craft is turned over to the crew, which is then responsible for all operating expenses plus any damages to the craft during the trip. After the deduction of all the specified expenses the remainder is divided by the participants in the operation as follows:¹

First diver	2 shares
Second diver	2 shares
Engineer	1.5 shares
Lifeline Tender	1.5 shares
Cook	1 share
Deck hand	1 share
Boat	3 shares
Total	12 shares

When the captain is not the owner the latter gets 2.5 shares, with 0.5 share going to the captain. Thus, the remuneration of each fisherman is contingent upon the success of the individual fishing trip. This sharing system offers a strong incentive to the fishermen to obtain the largest possible catch and at the same time to keep operating expenses at a minimum. If the trip proves not to be

¹Storr, p. 60.

successful the owner theoretically loses nothing except depreciation on his investment and interest, either implied or actual, incurred in equipping the craft. However, when a trip proves to be unprofitable owners are expected to write off the advance payments made to the crew.¹

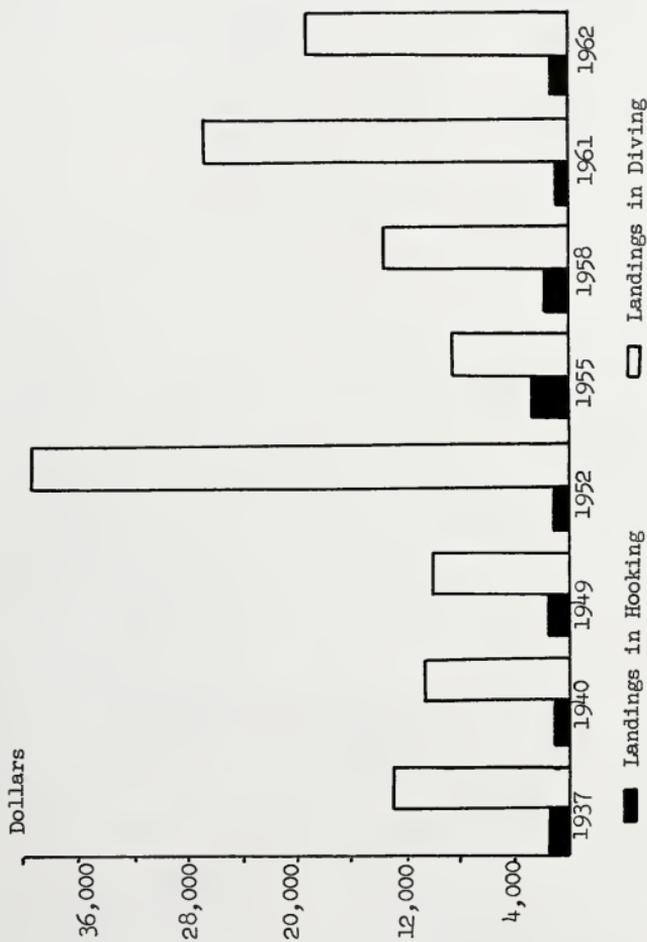
In hooking operations the pattern of distribution of the proceeds from the catch is less rigidly defined. Due to the large number of part-time workers and to the ease of operation, attempts to institutionalize the distribution of earnings have not been successful. Most hooking operations consist of two people working from one boat. A rather common practice among those engaged in hooking on a full-time basis is to deduct all operating expenses from the proceeds and then to divide the remainder by 2.5, each individual receiving one share and a half share going to the owner of the boat.

Figure 6 and Figure 11 indicate that enterprise units engaged in diving operations have been more productive than those engaged in hooking operations. For diving outfits the catch per enterprise unit has always been higher both in terms of weight and value.

Figure 12 indicates that labor has also been more productive in diving operations. This is to be expected, since the productivity of any combination of labor and capital tends to increase as the ratio of capital to labor goes up. The value of average catch per fisherman is higher in diving than it is in hooking. This is an indication of the higher productivity of fishermen in diving, but the actual remuneration received by each fisherman in diving will depend on the

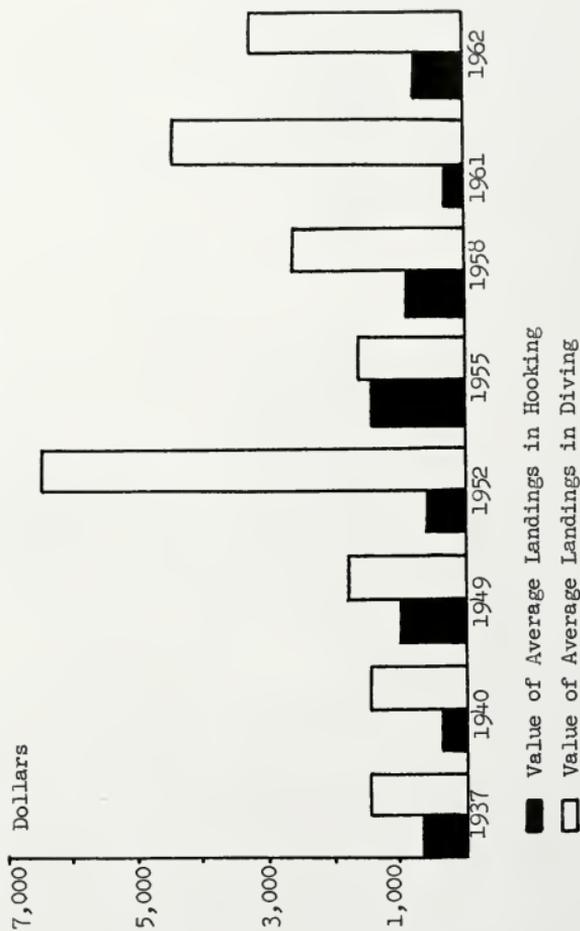
¹Interview with John Samarkos, May, 1964.

Figure 11. Value of Average Landings Per Enterprise Unit in the Sponge Fisheries of Florida



Source: Based on Tables 15 and 16.

Figure 12. Value of Average Landings Per Fisherman in the Sponge Fisheries of Florida



Source: Based on Tables 15 and 16.

shares he receives, as determined by the skills he supplies in the fishing process.

Cost structure

The following analysis of costs is based on the information received from the captains of nine of the eleven diving craft operating in 1964. It was not possible to receive much meaningful information from hooking outfits. Table 18 indicates the average annual operating expenses of diving outfits. All the operating expenses are deducted before the distribution of earnings.

The value of landings per diving outfit was \$26,992 in 1963. After deducting all operating expenses as shown in Table 18, the remainder, \$22,658, was distributed among the participants in the following fashion:

Diver	2 shares	\$3,776
Engineer	1.5 shares	2,832
Lifeline Tender	1.5 shares	2,832
Cook	1 share	1,888
Deck hand	1 share	1,888
Boat	3 shares	5,664

In most cases the senior diver, who was also the captain, received \$4,720, and if he was the owner of the craft his total receipts amounted to \$9,440. In addition to such earnings, all crew members received free food and lodging throughout the duration of the trip.

Return on investment

The value of the average diving craft is estimated around \$17,000. This is the figure that nine of the eleven craft owners mentioned as

the price for which they would be willing to sell their boats. Being an asking price, it is possible that this figure is above the amount that potential buyers would be willing to pay. Since only two ships have changed ownership during the past fifteen years, in the absence of any recent selling transaction it was impossible to obtain a more accurate market value than the price asked by the present owners.¹

In 1963, the average diving craft claimed 2.5 shares out of the total proceeds. This was equivalent to \$4,720, or a gross return of approximately 27.76 per cent on invested capital. As explained before, the element of risk and operating expenses inherent in sponge fishing are spread among all participants in the process of production. This is in contrast to other types of economic activity where all risks rest wholly with the entrepreneur or investor. To be sure, craft owners are still subject to the risk of losing their total investment, that is, the ship may sink or they may be unable to recover the money paid in advance to the crew.

It is possible to purchase insurance to cover sinking, but without exception no owner carries such insurance because of its very high cost, between \$900 and \$980 a year.² Although such steep insurance rates imply rather high loss experiences among marine vessels in general, this experience appears not to be applicable to the sponge fleet. Since the oldest craft in the sponge fleet is 47 years old and the newest has an age of 22 years³ one can surmise that fishing craft in the sponge fleet have had a rather favorable accident record.

¹Interview with John Samarkos, May, 1964.

²Ibid.

³See page 85.

Owners are responsible for any major repairs needed to make the craft operational prior to the beginning of each semi-annual fishing trip. However, in informal conversations with the author, crew members cited cases in which dishonest craft owners deliberately neglected proper care and maintenance, since any repairs that occur during the trip are deducted from total receipts before arriving at the value of a share. Since owners take a reduced risk, a return of 27.76 per cent may be an excessive remuneration for the functions they perform. Under present conditions and barring any unforeseen developments it is possible to recoup the entire investment in a diving craft in a period of a little over three years.

It is obvious that such excess earnings by craft owners cannot last over a long period of time. It has been explained in the previous chapter that excess earnings may attract additional entrepreneurs into sponging and that as the number of craft exploiting given sponge grounds goes up landings per craft and, consequently, returns on each owner's investment will go down. The high level of present earnings can be explained in terms of a quasi-rent. The return on any factor in temporarily fixed supply is called a quasi-rent in economic terminology.¹ It has been mentioned previously that, due to an acute shortage of divers, the size of the diving fleet was reduced by 34 per cent from 1962 to 1963. The improvement of sponge bed productivity coupled with a smaller fleet has increased the amount of catch per craft. Present craft owners will keep receiving

¹Alfred Marshall, Principles of Economics (8th ed.; London: Macmillan Co., 1922), pp. 614-615.

this quasi-rent until the supply of labor can be increased, either by importing divers from the Mediterranean or by training local people.

It is possible that part of these excess earnings by one factor of production, namely capital, can be appropriated by labor, but even under conditions of the present labor shortage this is not likely to happen for several reasons. First, all of the present divers are elderly people with little alternative job opportunities elsewhere; second, such people are culturally tied to a minority community in Tarpon Springs and are unwilling to take chances in a foreign environment. It was reported that the majority of these fishermen migrated to the United States in the early twenties, but most of them still speak only a few words of English. Third, most of these people have a certain pride in their occupation; their involvement in their jobs is romantic as well as economic, and one may assume that they would not think of moving or quitting even under the most adverse conditions. In short, this represents an unusual situation where the workers have not taken advantage of their increased bargaining power.

Dependability of Supply

It has been pointed out in the preceding chapter that, given the size of the fleet, the supply of sponges at any time depends on natural elements, such as weather conditions and marine diseases. It can be observed in Figures 13 through 16 that sponge landings from 1961 to 1964 have generally followed the same trend as total Florida landings, indicating that sponge landings like any other fishing activity depend largely on the clemency of the weather. Of course,

Figure 13. Monthly Comparison of Total Florida Landings and Sponge Landings, 1961

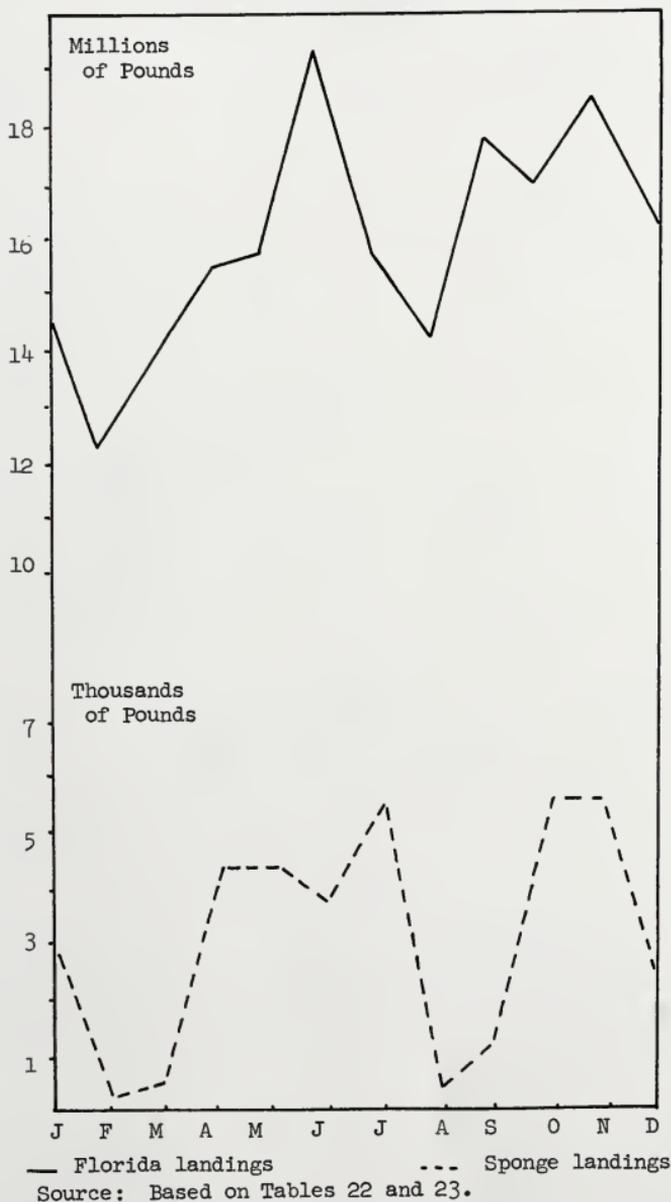
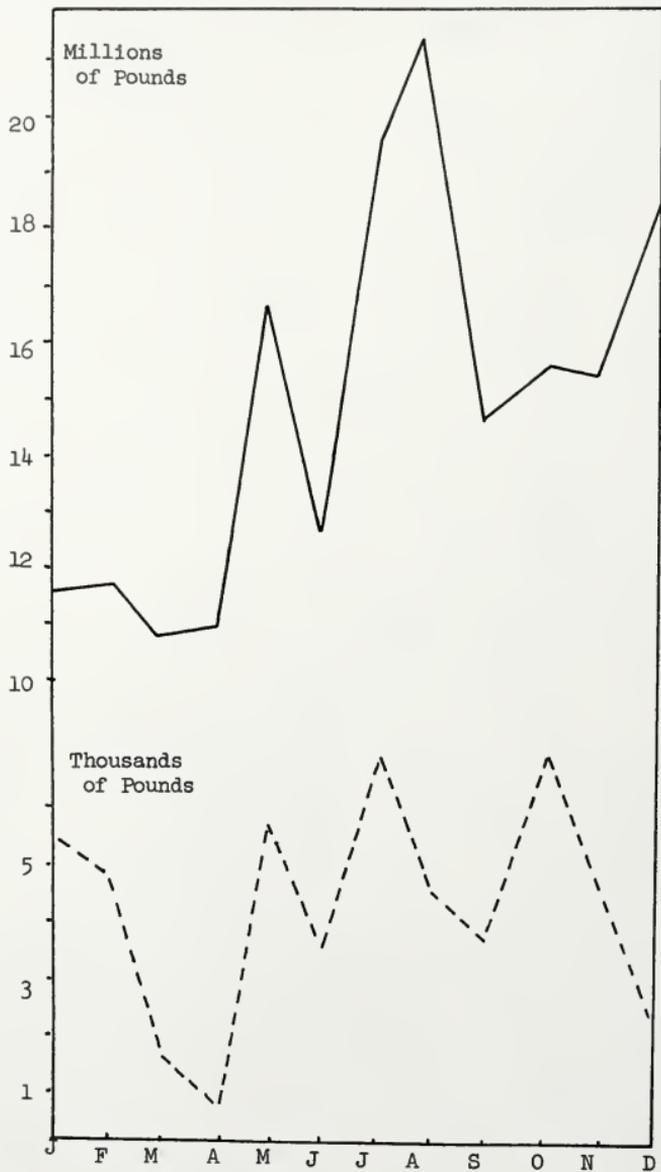


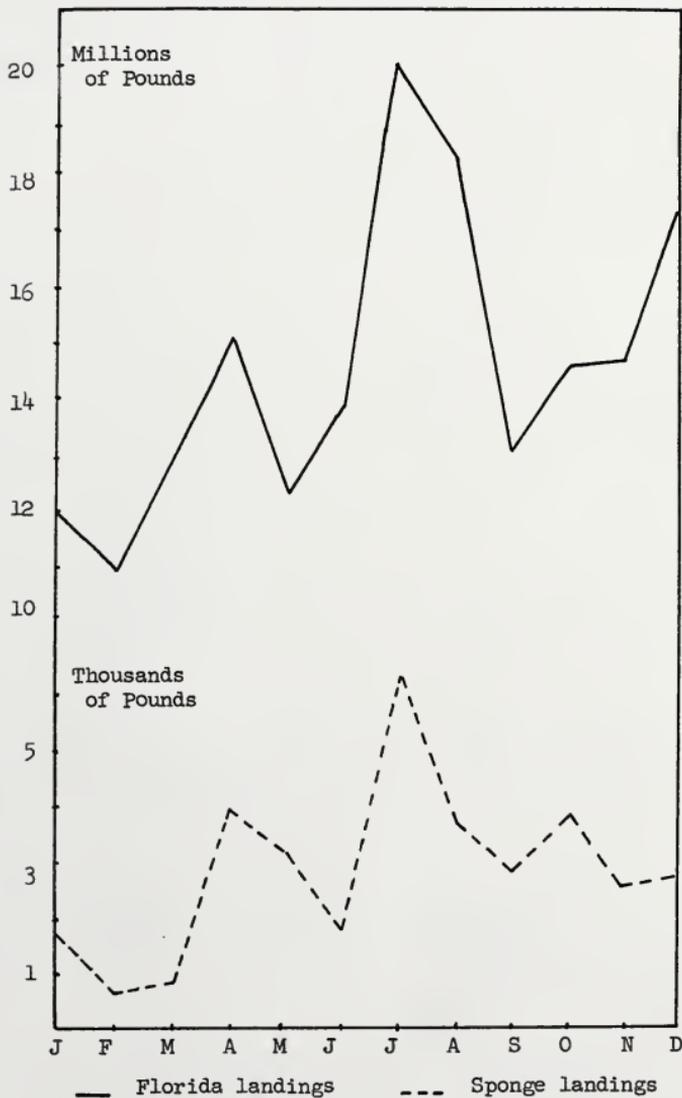
Figure 14. Monthly Comparison of Total Florida Landings and Sponge Landings, 1962



— Florida landings --- Sponge landings

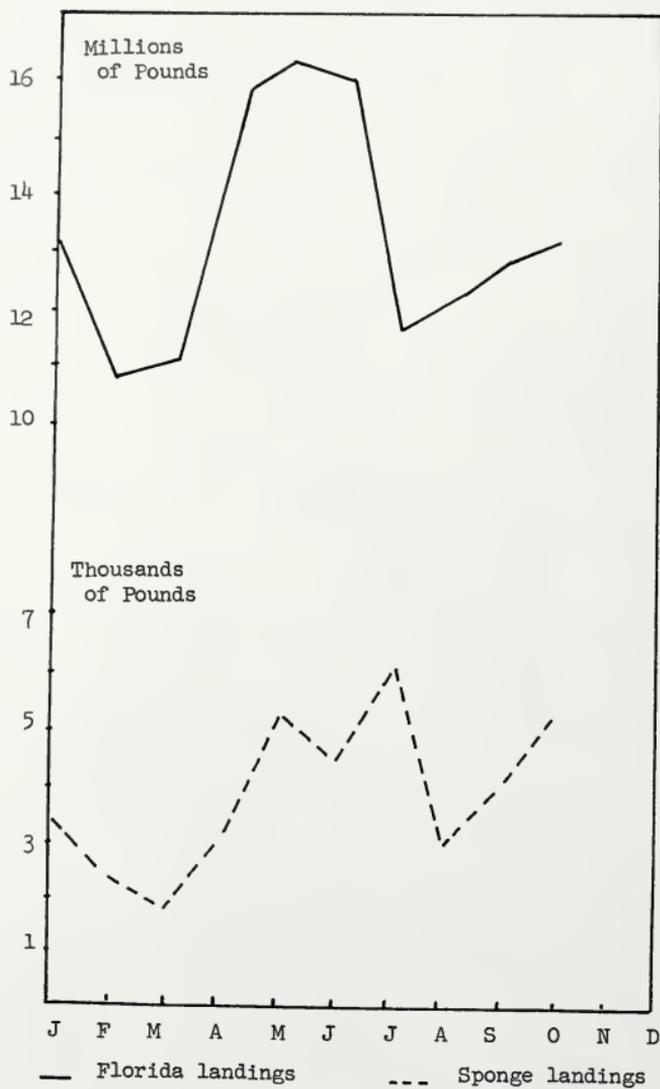
Source: Based on Tables 22 and 23.

Figure 15. Monthly Comparison of Total Florida Landings and Sponge Landings, 1963



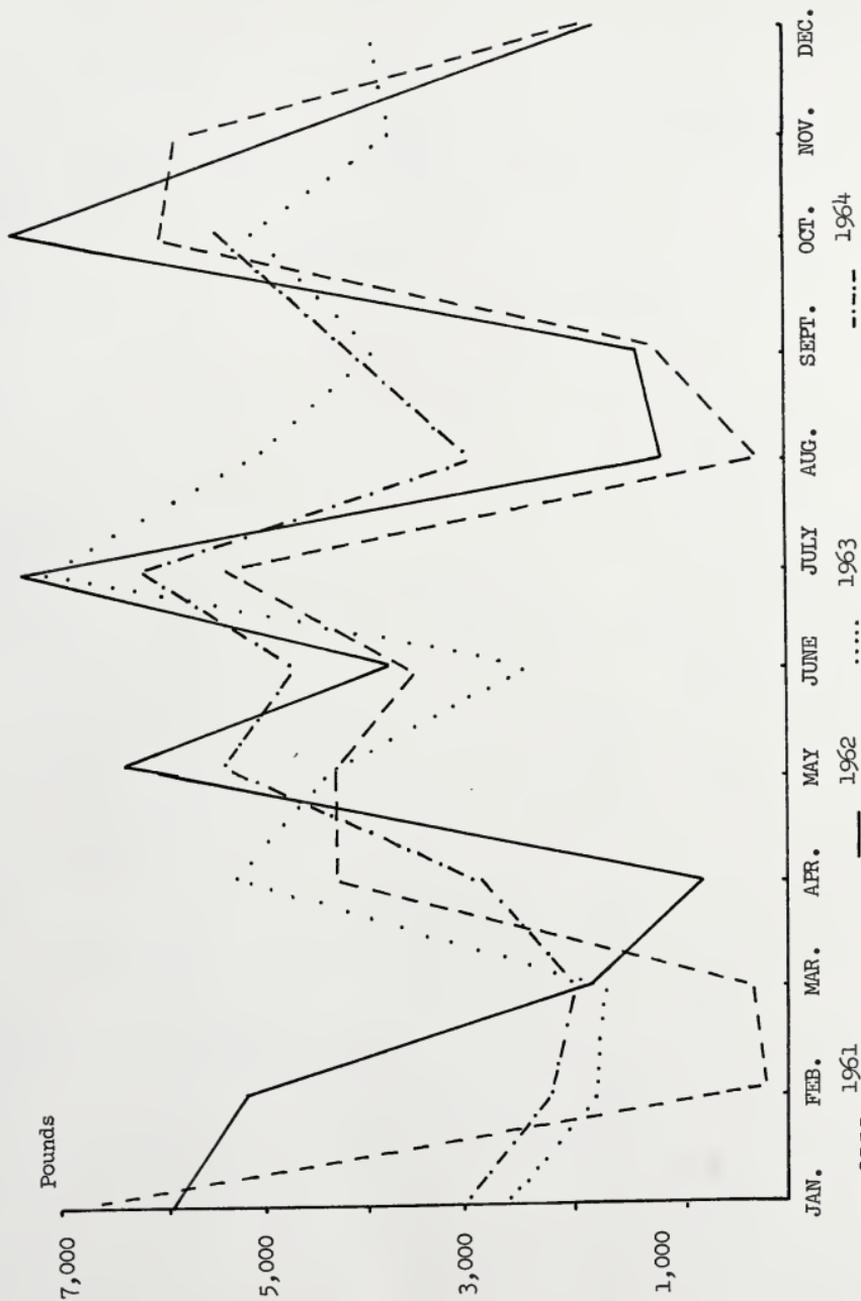
Source: Based on Tables 22 and 23.

Figure 16. Monthly Comparison of Total Florida Landings and Sponge Landings, 1964



Source: Based on Tables 22 and 23.

Figure 17. Sponge Landings by Months, 1961-1964



Source: Based on Table 23.

in instances where the sponge beds suffer from an epidemic disease, sponge landings may move in an opposite direction from total landings if such a disease affects only the sponges and no other inhabitant of the ocean. For the years 1961 to 1964 the conditions of the sponge beds can be described as normal.¹ It can be seen that sponge landings attributed to the months of August and December have consistently been lower and not in accord with total Florida landings. This is so because very little sponge fishing is performed during these two months. Traditionally, the sponge fleet returns to port early in August and December for the celebration of religious festivities and a sort of semi-annual settlement of earnings.² This is also the time when the craft undergo any major repairs or overhauling that may be necessary.

Figure 17 shows sponge landings by months for the past four years; with the exception of 1963 and part of 1964, landings as measured in pounds have gone up. Constant improvement of catch can be taken as an indication of the recovery of the sponge beds. Sponge landings have decreased in 1963 and part of 1964, but this decrease was the result of a reduction in fishing effort caused by a shortage of qualified machine divers rather than an unhealthy condition in the sponge beds.

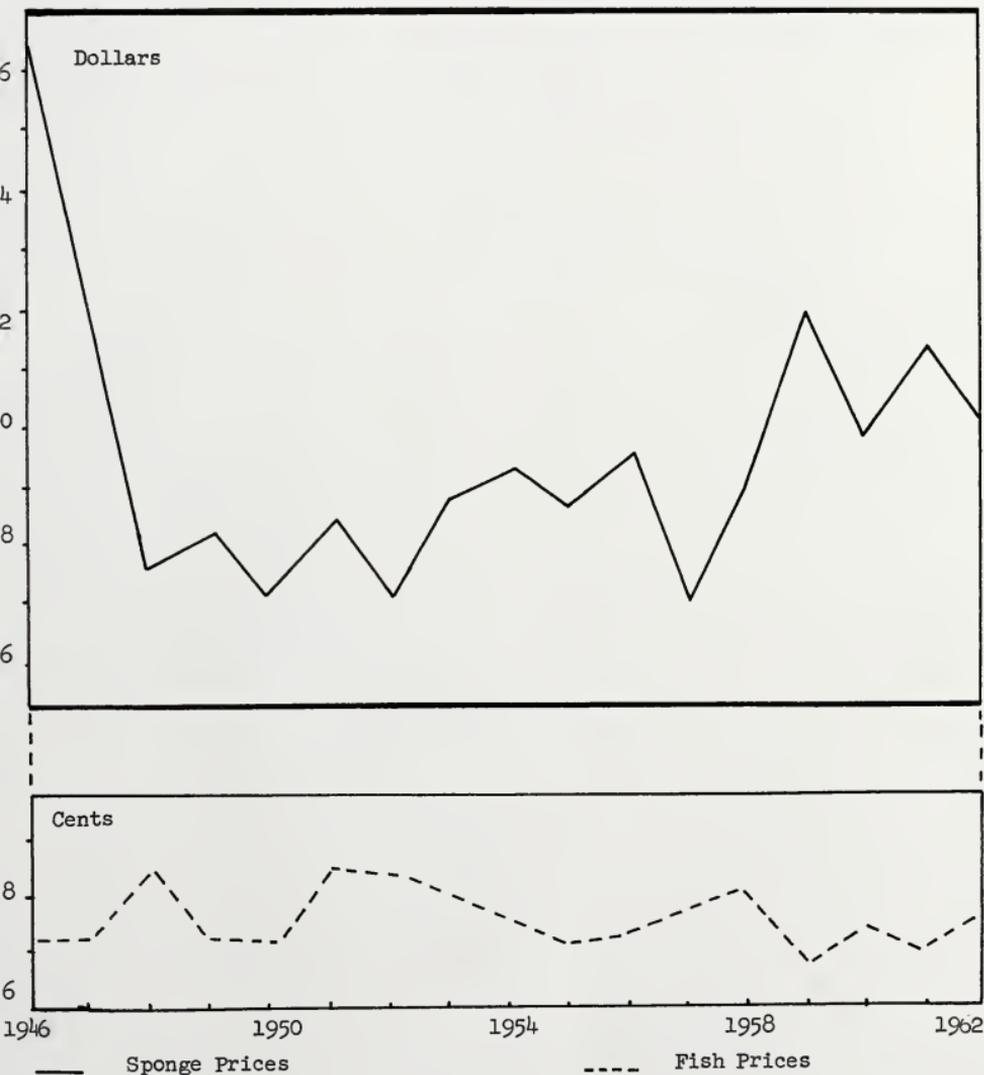
Supply and price relationship

Figure 18 compares average per pound prices received by sponge fishermen with average per pound prices for all fishery products since 1946. As the chart indicates, average sponge prices have fluctuated

¹Interview with Louis Smitzes, June, 1964.

²Ibid.

Figure 18. A Comparison of Average Per Pound Prices Received by Fishermen and Sponge Fishermen in the United States



Source: Based on Table 24.

TABLE 22

FLORIDA LANDINGS BY MONTHS, 1961-1964

Month	Pounds			
	1961	1962	1963	1964
January	14,625,418	11,687,664	11,815,097	13,101,828
February	11,970,142	11,845,146	10,783,364	10,614,230
March	13,626,493	10,739,310	13,002,772	10,838,582
April	15,266,660	10,917,340	14,891,300	15,724,086
May	15,541,449	16,585,191	12,061,689	16,174,562
June	19,686,964	12,354,288	13,612,453	16,186,842
July	15,450,754	19,018,984	20,137,744	11,552,690
August	13,957,106	21,780,056	18,138,030	11,990,636
September	17,880,870	14,477,191	12,896,432	12,816,281
October	16,668,825	15,431,087	14,764,688	13,185,492
November	18,519,042	15,370,418	14,761,100	..
December	16,393,804	18,643,341	17,604,619	..
Total	189,587,527	178,849,916	172,319,178	82,640,076

Source: U. S., Bureau of Commercial Fisheries, Florida Landings.

more than average prices for other fishery products. It has been pointed out previously that quality and supply are the two main factors determining the prices received by sponge fishermen. In Table 10 a comparison of average prices and total quantity landed reveals that with a few exceptions every increase in quantity landed was accompanied by a decrease in the average price received by sponge fishermen.

Comparison with Earnings in Fisheries

According to the 1960 United States Census of Population the median income of fishermen in Florida was \$2,113. In 1960, the value of average catch per hooking craft was \$1,981. Assuming no costs and

TABLE 23

SPONGE LANDINGS BY MONTHS, 1961-1964

Type of Sponges	January						February						March											
	1961		1962		1963		1964		1961		1962		1963		1964		1961		1962		1963		1964	
Glove	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Grass	..	..	14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wool	3,081	5,644	2,468	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716	2,716
Yellow	..	19	108	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317
Total	3,081	5,663	2,590	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069	3,069

Type of Sponges	April						May						June											
	1961		1962		1963		1964		1961		1962		1963		1964		1961		1962		1963		1964	
Glove	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Grass	..	..	36	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wool	4,519	550	4,565	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562	2,562
Yellow	..	153	442	295	295	295	295	295	295	295	295	295	295	295	295	295	295	295	295	295	295	295	295	295
Total	4,519	703	5,043	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896	2,896

Type of Sponge	July					August					September					
	1961		1962		1963		1964		1961		1962		1963		1964	
	1961	1962	1962	1963	1963	1964	1964	1961	1962	1962	1963	1963	1964	1964	1964	
Glove	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Grass	41	85	130	347	32	32	347	32	32	32	32	32	32	32	32	
Wool	5,381	7,877	5,915	5,141	197	197	5,141	197	945	945	3,575	1,302	1,302	1,985	3,249	
Yellow	258	402	1,166	648	94	94	648	94	92	92	1,111	959	959	1,299	668	
Total	5,680	8,364	7,211	6,136	223	223	6,136	223	1,037	1,037	4,751	2,809	2,809	3,811	3,981	

Type of Sponge	October					November					December					
	1961		1962		1963		1964		1961		1962		1963		1964	
	1961	1962	1962	1963	1963	1964	1964	1961	1962	1962	1963	1963	1964	1964		
Glove	..	9	..	..	..	..	..	..	..	..	..	..	..	..
Grass	47	236	312	65	..	..	65	..	..	..	..	..	..	..
Wool	5,609	6,488	3,846	4,686	5,635	5,635	4,686	..	4,901	4,901	3,085	..	..	..
Yellow	91	456	736	551	78	78	551	..	42	42	461	..	..	..
Total	5,747	7,189	4,894	5,302	5,713	5,713	5,302	..	4,943	4,943	3,609	..	..	..

Source: U. S., Bureau of Commercial Fisheries, Florida Landings.

TABLE 24

AVERAGE PRICE PER POUND RECEIVED BY SPONGE FISHERMEN
AND BY FISHERMEN IN THE UNITED STATES, 1946-1962

Year	Prices Received By Sponge Fishermen	Prices Received By Fishermen
	Dollars	Cents
1946	15.99	7.01
1947	10.55	7.16
1948	6.26	8.22
1949	6.85	7.13
1950	5.93	7.09
1951	7.00	8.23
1952	5.68	8.20
1953	7.39	7.94
1954	7.89	7.55
1955	7.32	7.05
1956	8.16	7.08
1957	5.52	7.39
1958	7.28	7.86
1959	10.61	6.76
1960	8.30	7.15
1961	9.94	6.98
1962	8.66	7.40

Source: U. S., Bureau of Commercial Fisheries, United States Fisheries, 1962.

dividing the value of total landings per hooking craft among 2.5 shares, with each fisherman receiving one share and one-half share going to the boat, the average annual wage in sponge hooking was \$268.80. This figure is considerably lower than the median income of fishermen in the state and explains why many people in hooking outfits have additional jobs.

In 1960, the value of the average landings per diving craft was \$21,966 (see Table 15). Although it is not possible to obtain operating expenses for 1960, assuming that they were similar to those of 1963, earnings available for distribution after the deduction of operating expenses amounted to \$17,632. The earnings per share amounted to \$1,469.33 with divers receiving an annual wage of \$2,938.66, engineers and lifeline tenders an annual wage of \$2,204, and deck hands and cooks a wage of \$1,469.33.

The above calculations indicate that with the exception of hooking earnings in the sponge fisheries compare favorably with earnings in other types of fisheries. Divers, engineers, and lifeline tenders had incomes above the median earnings of fishermen. Even the least skilled person, such as a deck hand, earned more in machine diving than a relatively skilled worker did in hooking, primarily due to the higher capital labor ratio in machine diving.

It is interesting to note that higher than average earnings in diving have not induced additional fishermen to enter this activity. Evidently the higher earnings received by divers are not high enough to compensate for the risks involved in this occupation. Also, fishermen with low earnings often can find superior opportunities in other industries which may employ labor more productively than machine diving.

CHAPTER IV

THE MARKETING OF NATURAL SPONGES

From the very inception of the sponge fisheries in the United States sponges have been sold at auction.¹ The implications of the auction procedure are discussed later in this chapter. At Key West, which retained its monopoly of the sponge trade until 1895, a wharf was set apart as a sponge market with the buyers paying a fee proportional to their purchases.²

By 1895, Tarpon Springs had developed into a large-scale sponge market, and by the turn of the century it had passed Key West in importance. Before 1908 sponges were sold at irregular times at the various crawls in Tarpon Springs. This arrangement was inconvenient for sponge buyers, as the crawls were several miles away from the city and from each other. To obviate this difficulty sponge buyers, known in the trade as packers, organized the Tarpon Springs Sponge Exchange in 1908.³ The establishment of the Sponge Exchange, coupled with the development of machine diving and the discovery of the Bay Ground sponge beds, made the city of Tarpon Springs the capital of the sponge business in the United States.

¹Stuart, p. 35.

²U. S., Congress, The Fish and Fisheries of the Coastal Waters of Florida, p. 43.

³Stuart, pp. 35-75.

The Tarpon Springs Sponge Exchange

The Tarpon Springs Sponge Exchange is a shareholding company with all its shares owned by its members. Over 90 per cent of the sponges produced in the United States are sold through the Sponge Exchange. Membership in the Sponge Exchange is a prerequisite for all purchasers who buy sponges through the Sponge Exchange. Theoretically, non-members can obtain sponges by purchasing them through members, but no such practice has taken place for the past two decades. All local packers in Tarpon Springs hold membership in the Sponge Exchange.¹

Organization

The Tarpon Springs Sponge Exchange has a seven-member directing council which consists of a president, vice-president, secretary-treasurer, and four directors. These officers are elected by members annually on the third Tuesday in January. The Sponge Exchange has a constitution and by-laws which regulate all transactions taking place at the Exchange. In addition to the seven-member directing council the Sponge Exchange employs an auctioneer and a secretary, the latter on a part-time basis.²

Operations

The Tarpon Springs Sponge Exchange provides boat owners with storage facilities and insures their product against theft and fire while in storage. There are over 100 cell-like cages on the premises of the Sponge Exchange where boat owners store the harvested sponges

¹Interview with Louis Smitzes, June, 1964.

²Ibid.

from the time they are brought ashore until they are sold to members of the Sponge Exchange.

Whenever sponges are available for sale the buying and selling take place twice a week on Tuesday and Friday, except Good Friday. All auctions start promptly at 9:30 A. M. If on the auction day more than one boat owner wishes to sell the order of offers is determined by drawing a ballot.

A sponge auction is conducted in a rather silent fashion with the buyers critically examining the bunches of sponges for quality. Upon finishing their examination buyers write on a piece of folded paper the highest price they will pay for a bunch of sponges. A definition of this term was given in Chapter III. The highest bidder is awarded the sponges, provided the seller considers the amount satisfactory. Owners can refuse to sell at a price they consider too low. In such cases their sponges are auctioned later the same day or on the following day.

For the services provided, the Tarpon Springs Sponge Exchange charges the seller 2 per cent of the amount of his total sales.¹ From such billings the Sponge Exchange defrays the expenses that might be required in promoting the interests of the industry. Owners, members of Greek church, are charged with an additional 0.5 per cent, and this amount is donated to the treasury of the St. Nicholas Greek Orthodox Church in Tarpon Springs.²

¹Ibid.

²Ibid.

Evaluation of operations

Since the Tarpon Springs Sponge Exchange was organized by the packers, most of its activities are geared toward furthering their interests. The Exchange is in a position to assist fishermen in their operations through a more meaningful classification of landing figures. For example, by classifying landings by region it might be possible to predict depletion of sponge beds for the various fishing regions. Such information, coupled with some industry regulations, might be used to direct fishermen to fish in other regions until the depleted beds have a chance to replenish themselves. Conservation of sponge beds can also be accomplished by classifying landings as to the size of the caught species. Consistent catches of smaller species may indicate potential supply problems, since a systematic harvesting of young sponges will adversely affect the future of the sponge grounds. Tarpon Springs Sponge Exchange officials recognize the value of such information, but they feel that it would be unrealistic to install such a system with the present personnel, which consists of an auctioneer and a part-time secretary, and they are financially unable to employ more people.¹

The Exchange has concentrated most of its activities in the area of politics, and in 1963, it was instrumental in influencing the General Services Administration to purchase all its natural sponges from Tarpon Springs packers.² Prior to fiscal year 1963, the Federal Government bought most of its natural sponges from distributors located

¹Ibid.

²Interview with George Arfaras, owner of George Arfaras Packing Firm, Tarpon Springs, Fla., May 13, 1964.

outside Florida.¹ In the same year the Exchange, primarily through political influence, played an important role in the enactment of a state law which directed all state agencies to purchase Florida-produced sponges. This law, as explained in the next chapter, has failed to accomplish its objective.

At present the Tarpon Springs Sponge Exchange is attempting to obtain the permission of the United States Immigration Service to import more divers from the Mediterranean.² This attitude is easily understandable, because the analysis of packer operations in the following paragraphs indicates that most packing firms are unable to obtain enough sponge volume to break even. Although importation of divers may alleviate packer problems in the short run, the Exchange has not considered the long-run effect that such a policy might have on the earnings of sponge fishermen, sponge prices, and the availability of sponge supplies. These matters will be dealt with in greater detail in the conclusions of this paper.

Packers

At the Tarpon Springs Sponge Exchange sponges are auctioned to business firms known in the trade as packers. All such firms are located in Tarpon Springs, and they are responsible for the creation and operation of the Exchange.

The process of sponge buying has been explained, but it should be noted here that the methods used by packers to determine the quality of a given bunch of sponges are completely sensory and

¹Ibid.

²Interview with Louis Smitzes, June, 1964.

qualitative. The test methods used in quality determination are derived from long years of experience and depend on the use of sight, touch, and smell.¹

Most of the information on packers was obtained through a survey conducted in the summer of 1964 among the eleven packing firms which were in operation during that period in Tarpon Springs, Florida. Although the survey covered the entire population of packers, due to suspicious attitudes and a lack of records it was not possible to collect much meaningful information from these businessmen. An English translation of the original Greek interview guide used in the survey is presented as Appendix B.

Operations

Natural sponges sold at the Exchange to the packers are for the most part devoid of foreign material, but they may contain some fragments of rock or dead shrimp. Also, the shape of some of these sponges is irregular or the size too large to suit the requirements of buyers. At the packing house all foreign particles are removed and any irregularities on the surface of the sponge are sheared off by clippers known as "psalidistades" in the trade.² Packers estimate the waste from such clippings to average between 4 to 8 per cent of sponge purchases depending on the composition and quality of the purchased species.³ For example, the Rock Island Wool sponges normally require less

¹Interview with John Kouremetis, owner of John Kouremetis Packing Firm, Tarpon Springs, Fla., May 19, 1964.

²Ibid.

³Survey of packers in Tarpon Springs, Fla., by the author, July, 1964.

clipping as compared to Grass sponges which, because of their size and shape, demand extensive shearing before being offered to the market. In the past such waste was sold to manufacturers of roofing paper and steam pipe insulation.¹ During the war when there was a shortage of sponges such trimmings were sold for 50 cents a pound.² At present, packers are unable to dispose of such clippings and extreme care is exercised to reduce such waste to a minimum.³

After being carefully clipped sponges are separated by size and quality. The first step is to separate the sponges into two groups, "forms" and "cuts."⁴ Forms are sponges in their whole natural shape. Cuts are sponges cut either from larger form sponges or from sponges that have been distorted by the clipping out of a diseased part or a crabhole. Cut sponges are further classified into firsts, seconds, and thirds, depending on quality. These classifications are then assorted by size, the grading depending on the number of sponges required to make a pound. The sizes are ones, twos, twos to threes, threes to fours, fours to sixes, sixes to eights, eights to tens, tens to twelves, twelves to sixteens, and sixteens to twenties. The sizing is done by passing the specimens through standardized holes in a piece of veneer.

After having performed the above-mentioned functions packers sell the sponges to wholesale distributors located primarily in

¹Stuart, p. 38.

²Ibid.

³Interview with Mike Samarkos, owner of Samarkos Brothers, Inc., Tarpon Springs, Fla., May 20, 1964.

⁴Interview with Louis Smitzes, June, 1964.

New York City, Chicago, St. Louis, and Cincinnati, with New York City being the most important market.¹ It is known by the trade that some packers sell their products directly to users. All surveyed packers were aware of the existence of such selling, but none admitted doing so himself because this is considered by the trade to be an unethical practice. The amount of sales outside the established distribution channels is not known, but in view of its clandestine nature one may assume that it could not be a large percentage of total packer sales. Also, because of their rather limited financial resources packers could not afford an aggressive selling policy.

Until 1951, packers sold sponges by weight.² Because of the limited supply of sponges and their high price packers gradually developed a practice known as "loading" by which the weight of sponge shipments was increased through the addition of all kinds of foreign materials to the species.³ In later years this practice became so extravagant that at times up to 100 per cent weight was added by foreign materials, which not only were difficult to insert into the sponge but had to be removed from it before it could be sold to the ultimate user.⁴ In 1951, to obviate this unethical practice and under pressure from the Federal Trade Commission packers in Tarpon Springs resolved to sell sponges by piece instead of weight. One may assume that loading had an adverse effect on sponge users, although it is

¹Ibid.

²Ibid.

³Robert B. Bennett, Background Information for Voluntary Grade Standards on Natural Sponges, U. S. Fish and Wildlife Service Special Scientific Report, Fisheries No. 273 (Washington: U. S. Government Printing Office, 1958), p. 53.

⁴Ibid.

impossible to measure the number of users who may have switched to substitute products. Distributors in New York City mentioned that their customers still examine sponges for rocks and other weight-adding foreign matter.¹

Packers sell sponges in burlap bales corded with jute rope and marked with a card giving the date, the kind and grade, the weight, and the number of pieces in each bale. The size of the bale depends on the number of pieces ordered by the distributors. It is customary for packers to sell F.O.B point of purchase with the distributor paying the freight charges and making his remittance in 60 days. Although bales shipped by packers are of no standard weight, packers indicated that orders of 250-300 pieces are the most frequently received. They estimated that the material cost in packing such a shipment is approximately 50 cents.²

Personnel

Table 25 shows that most of the firms engaged in packing are small family operations. The typical firm is managed by a rather elderly husband and wife team with the children and other relatives assisting in the operations. As can be seen in Table 25 the ratio of relatives to non-relatives is high, indicating that such enterprises might not survive if they had to pay going wages for the performance of functions necessary to run the business. Because of their low profitability such firms have been unable to attract the type of personnel that could lead an enterprise to grow through exploring

¹Interview with Robert Sinenberg, partner in Florida Sponge and Chamois Co., New York, November 18, 1964.

²Interview with George Arfaras, May, 1964.

TABLE 25

TOTAL NUMBER OF FULL-TIME AND PART-TIME EMPLOYEES OF ELEVEN
PACKING FIRMS IN TARPON SPRINGS, FLORIDA,
AND THEIR RELATIONSHIP TO THE OWNER

Number of Firms	Total Full-Time Employees		Total Part-Time Employees		Relatives as a Percentage of Full-Time Workers
	Relatives	Non- Relatives	Relatives	Non- Relatives	
1	1	3	2	0	25
2	1	3	0	0	25
3	2	0	2	0	100
4	1	0	0	5	100
5	1	1	1	0	50
6	1	2	0	0	33.3
7	1	1	2	0	50
8	2	0	0	0	100
9	2	0	0	0	100
10	1	0	2	0	100
11	2	0	1	0	100

Source: Survey of packers in Tarpon Springs, Fla., by the author, July, 1964.

unexploited opportunities and reaching out for new markets. As a rule the owners of these establishments have shown little effort since the inception of their firms to change their operating procedures or try new methods in order to better serve their customers. The column "Relatives" in Table 25 includes the owner or owners of the enterprise, inasmuch as, in addition to managing the enterprise, all owners perform non-managerial duties such as bookkeeping, cleaning the premises, and clipping sponges. Two of the surveyed firms employed clerical workers, one each, and only the two largest firms employed clippers on a full-time basis. The other firms perform this clipping

function by hiring help on a part-time basis or, as in the majority of cases, the clipping is done by the owners themselves. For example, a husband and wife team can trim a \$10,000 purchase consisting of approximately 1,00-1,200 sponges in about a week.¹ Part-time clippers can always be found among the ranks of idle or retired fishermen, and they are paid on an hourly basis at a current hourly rate of \$1.50.²

Evaluation of operations

In 1932, there were fifteen firms engaged in sponge packing in the city of Tarpon Springs, and in 1933, the number of such firms increased to sixteen.³ It is possible, although not likely, that a businessman would invest capital in a field beset with supply and demand difficulties. Although this may be a highly speculative assumption the fact that an additional firm was added in one year can be interpreted in terms of a favorable market outlook, which also implies that no supply problems were anticipated at that time.

Between 1933 and 1963 sponge production declined by 83 per cent; however, for the same period the number of packing firms showed only a decline of 31 per cent. Of the currently operational packing firms none has been in this kind of business for less than 30 years.⁴ Despite shrinking markets and a chronic shortage of sponges to sell, such firms try to maintain their image as sponge packers. At present, only three firms are engaged in packing on the basis of selling sponges as a full-time activity. Most of the remaining firms derive

¹Interview with Mike Samarkos, May, 1964.

²Interview with George Arfaras, May, 1964.

³Sage, p. 3.

⁴Survey of packers in Tarpon Springs, Fla., by the author, July, 1964.

TABLE 26

PACKER SALES BY LINE OF PRODUCT, 1963

Number of Firms	Sponge Sales as a Percentage of Total Sales	Souvenir Sales as a Percentage of Total Sales	Brush Manufac-turing	Real Estate	Leather Processing
3	100	..	..	..	..
1	20	10	..	..	70
1	..	20	80	..	..
2	50	50	..	..	..
1	20	50	..	30	..
2	30	70	..	..	..
1	20	80	..	..	..

Source: Survey of packers in Tarpon Springs, Fla., by the author, July, 1964.

better than three-fourths of their receipts from activities shown on Table 26, but due to their emotional involvement such persons still prefer to be called packers and do their best to reflect such an image.

The customary markup of packers is 25 per cent on the cost of purchases.¹ As was pointed out previously, lack of record keeping among packers was such that no meaningful data could be developed. Of the three bona fide packers the largest two are credited with buying between 75 to 80 per cent of the annual sponge production for the past several years. This figure was consistently mentioned by all packers, including the owners of the two enterprises doing such buying. Table 27 indicates the financial strength of the two largest packing firms as estimated by Dun and Bradstreet.

As will be demonstrated in the following pages, with the present production of natural sponges most firms could not break even if they

¹Interview with Mike Samarkos, May, 1964.

TABLE 27

FINANCIAL STRENGTH OF ELEVEN SPONGE PACKERS
IN TARPON SPRINGS, FLORIDA, 1963

Total Assets	Number of Firms
\$ 5,000 - 10,000	3
10,000 - 20,000	1
20,000 - 35,000	1
35,000 - 50,000	2
75,000 -125,000	2
n.a.	2
Total Firms	11

Source: Dun and Bradstreet, Reference Book, 1964 (New York: Dun & Bradstreet, 1964).

had to rely on the sales of sponges alone. While surveying the sponge industry in June and July of 1964, the author lived in a house owned by the owner of the firm which has been mentioned previously as the third firm engaged in full-scale packing. Due to such close association it was possible to obtain accurate data on expenses and profitability of an average size bona fide packer (see Table 28). The other two packing firms were very uncooperative in disclosing information concerning even rough approximations of expenses and other phases of their operations. The financial strength of this establishment as estimated by Dun and Bradstreet is between \$35,000 - \$50,000. The site of the business is owned by the owner; his annual purchases for 1963 were \$39,963, and his sales during the same year amounted to \$50,983. The owner performs all the needed functions except the clipping of sponges which is done by part-time labor as the need arises. During 1963, \$684

was paid to clippers for trimming approximately 5,700 lbs. of sponges.¹ Based on these relationships the approximate cost of clipping one pound of sponges is about 12 cents. Packers mentioned that it takes \$2.25 worth of burlap and cord to make a bale weighing roughly 50 pounds which means that the average cost of packing one pound of sponges is approximately 4.5 cents. Of course, this average cost per pound may vary with the size of the bale, larger bales resulting in a lower cost per pound and smaller bales in a higher cost per pound. In view of the fact that this is the only information available on the cost of packing sponges and that most of the orders received by packers are for sizes weighing approximately 50 pounds, the 4.5 cents figure can be accepted as a crude approximation of the overall average cost. The cost for clipping and packing one pound of sponges was 16.5 cents in 1963, and the total cost of performing these two functions for 5,700 pounds amounted to \$940.50. This figure, when added to total annual purchases of \$39,963 and then subtracted from annual sales of \$50,983, gives a gross profit of \$10,079.50 for the year 1963, which represents a 25.22 per cent markup on cost. By dividing this markup of 25.22 per cent into the total annual fixed expenses shown in Table 28 it is possible to approximate the breakeven point of this enterprise, which is \$18,712.

This case study shows that the current level of sponge landings is not sufficient to sustain the number of establishments presently

¹The average price per pound received by sponge fishermen in 1963 was \$7.01 (see Table 10). Since prices paid by packers are those received by the fishermen, dividing annual purchases of \$39,963 by the average price of \$7.01 gives a figure approximately equal to the weight of the purchased sponges.

TABLE 28

SUMMARY OF OPERATING EXPENSES OF ONE PACKING FIRM FOR 1963^a

Item	Amount
Licenses	\$ 83.25
State Board of Conservation	\$50.00
City License	18.00
State and County License	15.25
Telephone	673.39
Light and Power	1,177.61
Insurance ^b	850.00
Taxes ^c	500.00
Depreciation ^d	795.00
Interest ^e	600.00
Total . . . . .	.\$4,719.25

^aSince the owner's residence and place of business are the same it was not possible to determine which part of the above expenses should be charged to the firm. All the expenses in the table are deducted from his taxes by the owner.

^bCovers premises, equipment, and merchandise in storage.

^cProperty taxes.

^dBuilding and equipment.

^eImplicit interest calculated at 6 per cent per annum on an average annual inventory of \$10,000. The owner does not make such calculations.

engaged in sponge packing. In 1963, the three firms mentioned previously bought \$330,408.75 worth of sponges or 85 per cent of the total sponge landings for that year. Adding a 25 per cent markup on \$56,852.25, which represents the 15 per cent of 1963 sponge landings not absorbed by the three firms, leaves a \$71,065.31 sales volume to be shared by the remaining eight packers. In view of the above case study of a single packer it is obvious that eight firms could not possibly operate and make a profit by sharing a sales volume of

\$71,065. This situation supports the findings of the author in his complete canvass of packers in Tarpon Springs that eight of eleven packers had to carry other lines in order to spread their overhead cost over a larger volume of sales.

The existence of two large firms buying more than three-fourths of the total annual production has undoubtedly profited the fishermen at the expense of the packers. Few of the smaller packers have the financial strength to compete with the two large buyers on a price basis. It is the consensus of industry members that in the absence of such concentrated buying sponge prices at the producers' level would be lower than they are today.¹

Packers see increased production as the solution to their problem. At present, with the sponge beds having returned to a condition of normalcy the main obstacle to higher production is a shortage of diving personnel. During the past five years packers have imported through their trade association, the Tarpon Springs Sponge Exchange, fourteen divers from the Mediterranean, but all such divers have sought and found other jobs in the industrial cities of the North after entering the United States.² The Tarpon Springs Sponge Exchange has petitioned the Immigration and Naturalization Service for permission to import twenty divers from the Mediterranean. It has decided that no diver younger than 45 years of age should be brought in because an older person with little or no knowledge of the English language will have a limited opportunity to find employment in other industries.

¹Survey of packers in Tarpon Springs, Fla., by the author, July, 1964.

²Interview with Louis Smitzes, July, 1964.

All eleven packers agreed that unless sponge production is increased they will either be forced out of business or be pushed into other types of activities.¹

It has been pointed out previously that between 1933 and 1963 sponge landings decreased by 83 per cent (see Table 10). Between 1932 and 1963 the number of diving craft decreased from 51 to 13, a decline of approximately 75 per cent, but for the same period the number of packing establishments showed a decrease of only 31 per cent. Such figures support the implications of the analysis in the preceding paragraphs, that the packing level of the sponge industry is overcrowded. The current level of sponge landings is not sufficient to sustain the eleven firms in Tarpon Springs currently listed as packers.²

The Sponge and Chamois Institute

The Sponge and Chamois Institute was founded in 1933 by the distributors and suppliers of natural sponges and real chamois.³ As of November 1964, the Institute had 24 members; six of the members are located in foreign countries, with the remaining eighteen scattered among nine states. More than 50 per cent of the domestic distributors are located in or near New York City, and the Sponge and Chamois Institute is located in Long Island, New York. Its staff consists of a president, an executive secretary, and a clerical worker.⁴

¹Survey of packers in Tarpon Springs, Fla., by the author, July, 1964.

²Interview with Louis Smitzes, July, 1964.

³Interview with Mrs. Elizabeth Wallace, Executive Secretary, Sponge and Chamois Institute, New York, November 16-20, 1964.

⁴Ibid.

Operations

The Institute cooperates closely with the Tarpon Springs Sponge Exchange and various governmental sources in protecting and promoting the interests of its members and the sponge industry at large. For example, the Institute participated in the sponsoring of the Harrisburg market experiment which will be discussed later in this chapter. In addition, the Institute informs member distributors about sales trends, opportunities, and regulations through a regular semi-monthly publication, the Bulletin.¹ Such data are based on information collected from members and various governmental agencies. Also, the Institute issues various Trade Reports at irregular intervals to inform its members of urgent matters and unusual developments concerning the sponge and chamois business.² Information developed by the Institute will be presented in subsequent analysis.

After obtaining a list of their customers from sponge packers in Tarpon Springs the author found that in addition to the eighteen distributors listed as members of the Sponge and Chamois Institute, Tarpon Springs packers sold to seven other distributors who were not members of the Institute.³ Since--barring clandestine sales and imports--packers are the only source for purchasing domestically produced sponges, it can be seen that approximately 82 per cent of the sponge distributors in the United States are members of the Sponge and Chamois Institute. This indicates that statistics provided by

¹Ibid.

²Ibid.

³Survey of packers in Tarpon Springs, Fla., by the author, July, 1964.

the Institute are of considerable value for the following reasons.

(1) Data provided by the Institute constitute the only available information on sponge sales at the distributor level. (2) A large number of distributors hold membership in the Institute and cooperate with it in the collection of statistical data. (3) Non-member distributors constitute a small percentage of the total distributor population and are responsible for an even smaller percentage of total sponge transactions at the distributor level. Officials of the Sponge and Chamois Institute estimate that non-member sales constitute less than 2 per cent of total distributor sponge sales.¹ (4) All known chamois distributors are members of the Institute. As will be pointed out in discussing distributors, sponge and chamois are products of a complementary nature. In order to be successful as a sponge distributor a firm has to include both items in its product mix.

Evaluation of operations

The only natural sponge statistics available at the distributor level are those gathered by the Sponge and Chamois Institute. The Institute compiles annual figures of natural sponge sales and chamois sales as reported by its members.² It also compiles statistics on total natural sponge imports from data published by the Bureau of Census.³

¹Interview with Mrs. Elizabeth Wallace, November, 1964.

²Ibid.

³Ibid.

In spite of its limited staff and facilities the Institute does a remarkable job, but there is much room for improvement. For example, it would be very helpful to know sales by type of customer of the distributor in order to get a better picture of sales trends. At present, no such figures are kept by the Institute, primarily because members object to excessive paperwork. Mrs. Elizabeth Wallace, Executive Secretary of the Institute, is currently attempting to persuade members of the value of reporting such information which might be useful for conducting their affairs more efficiently.¹

Distributors

Distributors constitute the next link in the marketing of natural sponges. In 1964, there were eighteen natural sponge distributors in the United States. Most sponge distributors are located in and around ports on the eastern Atlantic coast.² This is a natural development since, as can be seen in Table 29, imports have always constituted a rather large percentage of the total natural sponge supplies in the United States. Most of the information on distributors was obtained from records supplied by the Sponge and Chamois Institute and by interviewing the owners of six firms located in the states of New York and New Jersey. According to Mrs. Elizabeth Wallace, these six firms are responsible for better than 80 per cent of the sponge sales at the distributor level. Two attempts to obtain information from all known distributors produced no response.

¹Ibid.

²Ibid.

TABLE 29

DOMESTIC AND IMPORTED SPONGES AS A PERCENTAGE OF TOTAL SUPPLY
1934-1963

Year	Domestic		Imports		Total	
	Per Cent of Total		Per Cent of Total			
	Quantity	Value	Quantity	Value	Quantity	Value
1934	50.30	63.06	49.70	36.94	100.00	100.00
1935	37.76	56.83	62.24	43.17	100.00	100.00
1936	50.42	64.69	49.58	35.31	100.00	100.00
1937	48.41	64.87	51.59	35.13	100.00	100.00
1938	54.86	61.05	45.14	38.95	100.00	100.00
1939	48.66	68.16	51.34	31.74	100.00	100.00
1940	30.80	58.96	69.20	41.04	100.00	100.00
1941	47.50	72.47	52.50	27.53	100.00	100.00
1942	61.02	73.48	38.98	26.52	100.00	100.00
1943	48.85	71.71	51.15	28.29	100.00	100.00
1944	60.84	72.95	39.16	27.05	100.00	100.00
1945	66.99	77.43	33.01	22.57	100.00	100.00
1946	33.04	45.62	66.96	54.38	100.00	100.00
1947	36.12	42.64	63.88	57.36	100.00	100.00
1948	17.34	15.26	82.66	84.74	100.00	100.00
1949	22.11	19.55	77.89	80.45	100.00	100.00
1950	6.18	5.19	93.82	94.71	100.00	100.00
1951	5.90	4.92	94.10	95.08	100.00	100.00
1952	12.31	10.22	87.69	89.78	100.00	100.00
1953	6.28	7.28	93.72	92.72	100.00	100.00
1954	7.27	9.59	92.73	90.41	100.00	100.00
1955	13.69	15.15	86.31	84.85	100.00	100.00
1956	11.98	15.76	88.08	84.24	100.00	100.00
1957	15.69	14.75	84.31	85.25	100.00	100.00
1958	13.37	13.77	86.63	86.23	100.00	100.00
1959	14.42	19.18	85.58	80.82	100.00	100.00
1960	16.67	19.81	83.33	80.19	100.00	100.00
1961	27.47	31.10	72.53	68.90	100.00	100.00
1962	34.22	33.17	65.78	66.83	100.00	100.00
1963	39.99	32.48	60.01	67.52	100.00	100.00

Source: Based on Table 40.

In addition to marine sponges, distributors deal in chamois, a product which is used in cleaning, drying, and polishing surfaces.¹ This product is used in conjunction with sponges under most circumstances and is of a complementary nature. During the last decade natural sponge distributors have begun to sell synthetic sponges, a substitute product. Table 30 shows distributor sales since 1951 by line of product. Intermittent supplies of natural sponges coupled with high prices forced all distributors toward substitute products, that is, synthetic sponges under private brand names. By selling a large number of units of synthetic sponges at lower prices, distributors have been able to increase the sales volume of the complementary product mentioned previously. This strategy has enabled these firms to increase their total sales volume and make a handsome profit through an accelerated turnover of the complementary good bearing a high markup. This can be better understood through an examination of the data presented in Table 31.

In 1953, natural sponge sales contributed 39.69 per cent to the distributors' total sales volume. The contribution of the complementary product, chamois, was 60.31 per cent (again see Table 31). Ten years later in 1963, the contribution of natural sponges to total sales volume had fallen to 12.97 per cent while that of the complementary product increased to 71.92 per cent. Between 1953 and 1963 natural sponge prices were relatively stable, both at the producers' and distributors' levels (again see Table 10). The same held true for chamois prices for the same span of time. Since prices were stable

¹Ibid.

between 1953 and 1963, a drop in percentage contribution to total sales volume indicates that fewer units of natural sponges were sold in 1963. The reverse is true in the case of chamois. Chamois sales as a percentage of total sales increased by 11.61 per cent in ten years. Since there were no price increases during that period this indicates that more physical units of chamois were sold in 1963 than were sold ten years ago. The expansion in chamois sales is due primarily to an increase in synthetic sponge sales. In 1963, synthetic sponge sales were only 15.11 per cent of the distributors' total sales volume. This is 11.61 per cent less than the natural sponge sales of all distributors in 1953, but because of the low per-unit price of synthetic sponges, it represents an increase in the physical units sold of the absorbing material. Since chamois is a complementary good to any absorbing material, an increase in the sales volume of synthetic sponges has resulted in a higher sales volume for chamois.

Operations

Distributors obtain their supplies of natural sponges from packers in Tarpon Springs and various foreign countries, primarily Greece. The customary method for domestic purchases is F.O.B. point of origin. Imports are handled on a C.I.F. point of destination basis. Distributors contact potential buyers through the use of the telephone and travelling salesmen, depending on the size of the firm. Since most buyers are located in and around New York City most selling is done via the telephone.¹ Only four of the largest distributors indicated the use of salesmen.

¹Interview with Robert Sinenberg, November, 1964.

TABLE 30

SALES IN DOLLARS OF NATURAL SPONGES, SYNTHETIC SPONGES,
AND CHAMOIS AT THE DISTRIBUTOR LEVEL, 1951-1964

Year	Natural Sponges	Synthetic Sponges	Chamois	Total
1951	2,951,970	..	4,602,427	7,559,397
1952	2,516,379	..	3,749,342	6,265,721
1953	2,402,223	..	3,649,742	6,051,965
1954	2,140,721	..	3,281,171	5,421,892
1955	2,294,874	..	3,627,368	5,922,242
1956	2,413,700	..	3,445,089	5,858,789
1957	2,241,033	..	3,207,861	5,448,894
1958	2,055,089	..	2,804,320	4,859,409
1959	1,919,958	..	3,059,791	4,979,749
1960	1,666,127	1,142,874	3,245,136	6,054,137
1961	1,336,254	1,275,789	2,998,395	5,610,438
1962	1,639,144	1,409,652	6,153,822	9,202,618
1963	1,207,051	1,406,332	6,692,352	9,306,235
1964 ^a	773,622	1,245,722	3,965,661	5,985,005

Source: Sponge and Chamois Institute records (in the files of the Institute).

^aNatural and synthetic sponge figures for 1964 cover nine months only, and chamois figures for 1964 cover six months.

Table 32 shows distributor sales of natural and synthetic sponges as reported by distributors to the Sponge and Chamois Institute. No such data are available for the years prior to 1962, but a comparison of the available figures for two years shows that synthetic sponges have gained ground in all these designated categories. The category "Trade" appears to be the most profitable outlet for natural sponges, since more than 90 per cent of the natural sponge sales were absorbed by this market. This broad category of "Trade" consists of wholesalers and jobbers catering to the needs of the janitorial, paint, ceramic, automotive, and lithographic trades. Not a single firm among natural

TABLE 31

DISTRIBUTOR SALES OF NATURAL SPONGES, SYNTHETIC SPONGES, AND CHAMOIS AS A PERCENTAGE OF TOTAL SALES, 1951-1964

Year	Natural Sponges	Synthetic Sponges	Chamois	Total
1951	39.05	..	60.95	100.00
1952	40.16	..	59.84	100.00
1953	39.69	..	60.31	100.00
1954	39.48	..	60.52	100.00
1955	38.75	..	61.25	100.00
1956	41.20	..	58.80	100.00
1957	41.19	..	58.81	100.00
1958	42.29	..	57.71	100.00
1959	38.56	..	61.44	100.00
1960	27.52	18.88	53.60	100.00
1961	23.82	22.74	53.44	100.00
1962	17.81	15.32	66.87	100.00
1963	12.97	15.11	71.92	100.00

Source: Based on Table 30.

TABLE 32

DISTRIBUTOR SALES OF NATURAL SPONGES BY TYPE OF CUSTOMER, 1962-1964

Year	To Trade		Institutional		Federal Government	
	Natural	Synthetic	Natural	Synthetic	Natural	Synthetic
1962	\$1,346,808	\$1,192,970	\$270,758	\$18,937	\$21,578	\$190,773
1963	1,081,256	1,159,423	105,158	43,551	1,519 ^a	203,858
1964 ^b	686,431	1,116,711	65,868	28,731	..	100,217

Source: Sponge and Chamois Institute records.

^aAfter June, 1963, the Federal Government started purchasing its natural sponges directly from the lowest bidder among packers in Tarpon Springs.

^b1964 figures are for nine months.

TABLE 33

DISTRIBUTOR SALES OF NATURAL SPONGES TO TRADE CUSTOMERS

Type of Customer	Per Cent of Total Sales
Janitorial Trade	30
Paint	30
Ceramic and Pottery	30
Tile Setters	5
Miscellaneous	5
Total	100

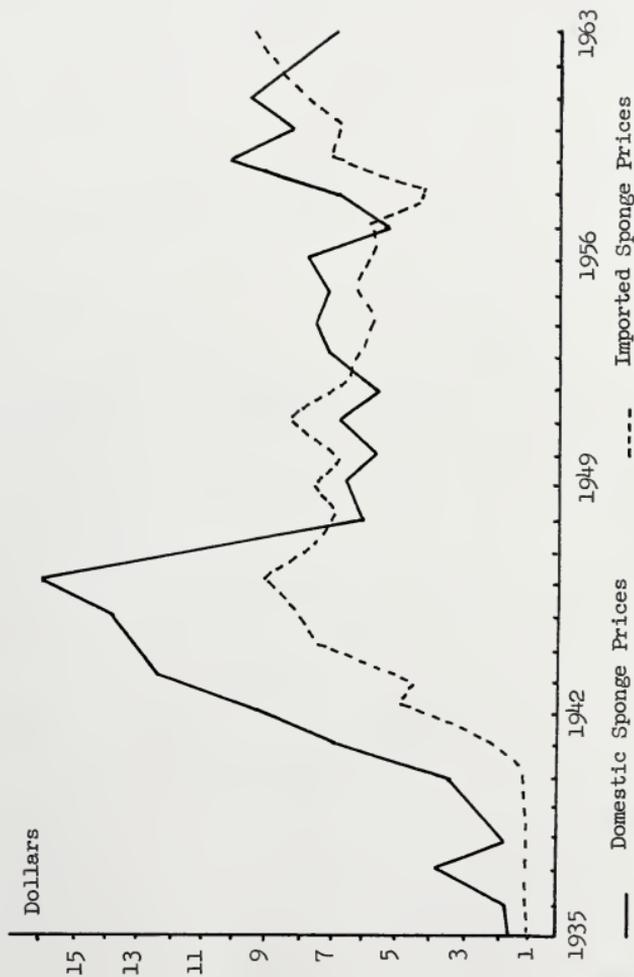
Source: Based on a survey conducted by the Sponge and Chamois Institute, 1964.

sponge distributors keeps records showing natural sponge sales by type of customer within the three broadly designated categories of "Trade," "Institutional," and "Government" (again see Table 32). With the encouragement and cooperation of the author an attempt was made by the Sponge and Chamois Institute to obtain a classification of sales by a finer breakdown of customer type. The results of this survey are shown in Table 33 and are based on the opinions and educated guesses of six members of the Institute. The remaining members either could not furnish any information or refused to do so.

All distributors interviewed by the author have indicated a preference for imports over domestically produced natural sponges. The reasons for this preference follow. (1) In general, foreign producers have proved to be a more reliable source of supply than the domestic sources. Had it not been for imports, especially those from the Mediterranean, all users of natural sponges would have shifted to synthetics during the acute shortages of sponges which followed the blights of 1937 and 1941.¹ (2) Usually distributors have to clean

¹Interview with Edward Riley, November, 1964.

Figure 19. A Comparison of Average Per Pound Prices of Domestic and Imported Sponges



Source: Based on Table 34.

TABLE 34

A COMPARISON OF AVERAGE PER POUND PRICES
OF DOMESTIC AND IMPORTED SPONGES
1934-1963

Year	Price Per Pound in Dollars	
	Domestic Sponges	Imported Sponges
1934	1.36	.81
1935	1.64	.76
1936	1.67	.93
1937	3.82	1.00
1938	1.43	1.11
1939	2.49	1.11
1940	3.66	1.13
1941	6.79	2.33
1942	9.24	5.22
1943	12.39	4.67
1944	13.27	7.64
1945	14.00	8.29
1946	15.99	9.40
1947	10.55	8.03
1948	6.26	7.29
1949	6.85	7.75
1950	5.93	6.91
1951	7.00	8.41
1952	5.68	6.85
1953	7.39	6.38
1954	7.89	5.87
1955	7.32	6.20
1956	8.16	5.94
1957	5.52	5.94
1958	7.28	7.01
1959	10.61	7.53
1960	8.30	6.72
1961	9.94	8.34
1962	8.66	9.08
1963	7.01	9.71

Source: Based on Table 10 and Table 40.

and wash Florida sponges, because this process is often neglected or done very superficially in Tarpon Springs.¹ This washing and drying process obviously adds to the cost of the sponges and has an adverse effect on distributors' profits. No cleaning and washing is needed with imported sponges, a factor which makes them more desirable from a distributor's point of view.² (3) As can be seen in Figure 19, with few exceptions average prices of imported sponges have always been lower than average prices of domestic sponges. As a matter of fact, the price differences are larger than those indicated, because Figure 19 compares average domestic prices obtained by fishermen with average import prices paid by distributors. Adding packer markups and transportation costs from Tarpon Springs to distributor locations will obviously raise domestic sponge prices considerably at the distributor's level. (4) Although most users ask for Florida Rock Island sponges, distributors state that the majority of them could not tell the difference between Florida and imported sponges.³ Distributors substantiate this contention by the fact that in order to avoid losing customers because of price increases they simply hold the price line by offering imported sponges as Florida sponges.⁴ (5) Since most users cannot tell the difference between domestic and imported sponges, distributors can and do sell low-cost imported products at the same price as the domestic product. A higher markup on imports gives distributors an incentive to carry them and push them more aggressively.

¹Interview with Robert Sinenberg, November, 1964.

²Ibid.

³Ibid.

⁴Ibid.

TABLE 35

FINANCIAL STRENGTH OF NATURAL SPONGE DISTRIBUTORS
WHO ARE MEMBERS OF THE SPONGE AND
CHAMOIS INSTITUTE, 1964

Total Assets	Number of Firms ^a
\$ 25,000	1
50,000	1
100,000	5
300,000	2
500,000	1
Total	10

Source: Thomas' Register of Manufacturers, 1964 (New York: Thomas Publishing Co., 1964).

^aEight member firms and the other seven customers buying from the packers but who were not members of the Sponge and Chamois Institute were not listed in Thomas' Register.

Facilities

Table 35 shows the financial strength of ten sponge distributors as reported in the 1964 edition of the Thomas Register of Manufacturers. The median firm in 1964 had total assets of \$100,000, which is considerably higher than the assets of the median packer (again see Table 27) or producer of natural sponges. This financial strength coupled with more sophisticated management has placed the distributors in a position of channel leaders in the distribution of natural sponges. Unlike packers in Tarpon Springs, who are mostly order takers from distributors, distributors attempt to reach and enlarge their markets through more sophisticated marketing techniques. For example, the Sponge and Chamois Institute was instrumental in developing a fourteen-minute film entitled "Sponge - Treasure of the Sea," which has been filmed in cooperation with the Bureau of Commercial Fisheries. This film has

been shown to television and theater audiences in the United States in order to acquaint them with natural sponges and arouse their interest.¹ The Harrisburg test market which was conducted in 1963 was also promoted by the Sponge and Chamois Institute in order to sell more natural sponges to ultimate consumers.² The results of this experiment will be described in Chapter VI.

Distributor premises include warehouses, bleaching facilities, and various machines for the cutting and packaging of synthetic sponge blocks. Chapter V gives a more detailed account of synthetic sponges handled by natural sponge distributors. The number of personnel employed by distributors differs widely depending on financial size and diversity of operations. For example, American Sponge and Chamois Company, the largest natural sponge distributor, had 90 employees in 1964.³ The majority of these workers, however, were used in the handling of synthetic sponges and chamois. By contrast, a smaller firm had only five employees, two of whom were employed in the office.⁴

Evaluation of operations

Previous discussions have indicated that distributors, by virtue of their financial size, proximity to markets, and intimate contacts with most users, can be considered as the most influential group in the distribution of natural sponges. Since natural sponges constitute only one of the three main product lines carried by these firms, one can

¹Interview with Mrs. Elizabeth Wallace, November, 1964.

²Ibid.

³Interview with Edward Riley, November, 1964.

⁴Interview with Robert Sinenberg, November, 1964.

work on the a priori assumption that the effort that distributors exert in selling any of these product lines will be directly related to the contribution that the particular product line makes to total firm profits. The clarification of this point is of paramount importance for the sponge industry of Florida, inasmuch as its well-being depends on the aggressiveness which distributors exhibit in selling Florida-produced natural sponges. On the other hand, distributor effort behind any product line will depend on the contribution that the product can make to distributor profits. This evaluation hinges on the assumption that distributors as a group are interested in maximizing their profits. Although much has been said about the validity of the profit maximization motive,¹ its application here conforms very accurately to the description of distributor behavior, and it can be used as a means of predicting their behavior in the future. Such prediction in turn may prove very useful for Florida spongers, since under the current distribution system their well-being depends on the activities of distributors.

Among the three main lines carried by the distributors the absorbing commodities, synthetic and natural sponges, are substitutes for each other, while both are complementary to chamois. It follows that a rational profit-oriented businessman will attempt to combine his product mix in a fashion that will most favorably affect his profits. Since both absorbing commodities are complementary to chamois, chamois sales will be most favorably affected by the complement that sells at the lowest price.

¹Milton H. Spencer and Louis Siegelman, Managerial Economics (Homewood, Ill.: Richard D. Irwin, 1959), pp. 125-127.

It was pointed out previously that in most instances incentives to carry a product will be determined by the contribution that the product makes to total profits, either by itself or in conjunction with other products. An attempt was made by the author to obtain information on profitability by product lines carried by distributors, but since most businessmen consider markups on products to be confidential it was impossible to obtain such information directly. The conclusions which follow are based on fragmentary information, several assumptions, and deductive reasoning. It is possible that they might not conform to some specific instances, but they are useful for purposes of analysis and prediction of future developments.

During an interview with Mr. Milton Cohn, President of the Gulf and West Indies Company, the author was told that a cellulose sponge of $6 \times 4 \times 2\frac{1}{4}$ inch size, which is the most popular size in the market, cost the distributor 20.5 cents and was sold for 36 cents, giving the distributor a 75.6 per cent markup on cost.¹ The suggested retail price for this sponge was 69 cents, although Mr. Cohn pointed out that the product usually sold for 59 cents or less and that discounts up to 25 per cent were customarily given to the trade in order to make private cellulose brands more attractive than national brands. In 1963, distributors sold \$1,406,382 worth of synthetic sponges (again see Table 30). Assuming that all synthetic sponges were of a $6 \times 4 \times 2\frac{1}{4}$ inch size and sold for 36 cents apiece distributors sold 39,078,672 pieces of synthetic sponges in 1963.

¹ Interview with Milton Cohn, President of Gulf and West Indies Co., Inc., New York, November 20, 1964.

During the Harrisburg experiment participating retailers bought natural sponges of a 3-3½ inch diameter for 65 cents with shipment prepaid.¹ These were small Florida Wool sponges and were bought by distributors for 35 cents apiece. This gives distributors an 85.71 per cent markup on natural sponges. This is a reliable estimate since it is based on actual figures, but the markup on sponges may differ according to the type of customer and by the size of the sponge. When interviewed by the author, distributors mentioned several figures between 70 and 100 per cent as the average markup on natural sponges. In the absence of more reliable information an 85 per cent markup can be taken as a fairly accurate approximation of the actual markup on natural sponges. Since imported sponges are obtainable at a lower price and can be sold at the same price as the domestics, one would expect distributors to make a larger profit on the sales of imported sponges.

The most popular size of natural sponge is the 6½-7 inch size which retails for \$2.70 and costs the distributor 90 cents.² Adding the above-derived 85 per cent markup gives \$1.67 as the price at which the distributor would sell such a sponge to the trade. This \$1.67 divided into total distributor sponge sales of \$1,207,051 in 1963 shows that 722,785 pieces of sponges were sold in that year under the assumed conditions. A comparison of the same calculation for synthetic sponges indicates that for each piece of natural sponge sold

¹Sponge and Chamois Institute, "Test Market Report," A report to the members prepared by the Sponge and Chamois Institute, New York, 1963, p. 5. (Mimeographed.)

²Interview with Milton Cohn, November, 1964.

distributors sold 53 pieces of synthetic sponge. Since sponges, either natural or artificial, go with chamois like ham and eggs the artificial product had the ability to sell chamois by a ratio of better than 53 to 1.

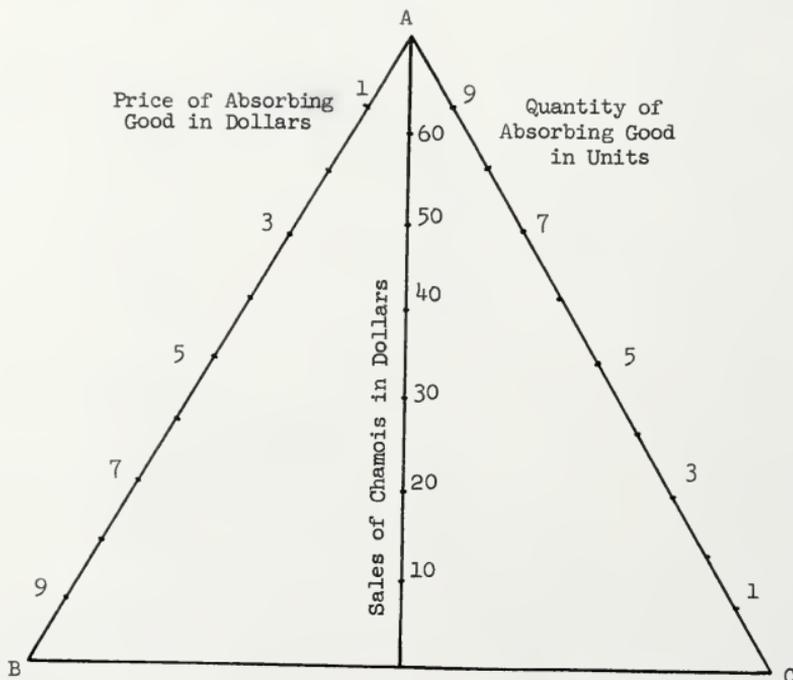
All distributors who are members of the Sponge and Chamois Institute sell only real chamois, which is an imported commodity. In 1962 and 1963, the United States imported \$2,358,576 and \$2,667,209 worth of chamois, respectively.¹ Table 30 indicates that members of the Sponge and Chamois Institute sold \$6,153,822 worth of chamois in 1962. The same table indicates that chamois sold by distributors in 1963 amounted to \$6,692,352. Assuming that there were no other costs and no sales out of previously held inventory, distributors had a markup of 163 per cent in 1962 and 158 per cent in 1963 on their sales of chamois. This indicates why distributors have been willing to sell synthetic sponges below the customary prices. This entire concept may be demonstrated by the diagram in Figure 20.

The actual relationships involved may not be linear as pictured in the diagram. The objective of the diagram is to show a conceptual relationship, not an actual measurement. This simplification is applied to many diagrammatic explanations of demand and supply relationships. Even if the actual relationships are of a curvilinear nature, a linear depiction shows the relationship more simply and as clearly.

Lines AB and AC show the familiar relationship between price and quantity, that is, as the price decreases more units are sold. The

¹Sponge and Chamois Institute, Bulletin, XXXI (August 12, 1964), 4.

Figure 20. Relationship of Synthetic Sponge Sales to the Sales of Chammois



Source: Richard H. Leftwich, The Price System and Resource Allocation (New York: Holt, Rinehart & Winston, 1961).

vertex AD measures sales volume of the complementary good; given that the price of the absorbing commodity is \$9, only one unit of it will be sold and this will generate an additional \$10 in sales of the complementary good. When price is lowered to \$3, seven units of the absorbing commodity will be sold and this will generate additional sales of \$50 of the complementary good. Since synthetics were able to expand their share of the market primarily by selling at low prices, this would indicate that the product is price elastic. Users of complementary products are interested mainly in the total price for the family of products rather than the price of each individual product. Faced by high prices of Florida sponges distributors resorted to a strategy of substitution in order not to lose their chamois business because of the rising sponge prices. Their willingness to give generous discounts on synthetic sponges is explained by the fact that such a strategy increases their sales of chamois, which provides them with a rather generous markup. Under these circumstances it is obvious that were it not for some die-hard customers, distributors would have little incentive to push domestically produced natural sponges.¹

To summarize, the distribution channel of natural sponges originates with the fishermen who sell their product to the packers through the Tarpon Springs Sponge Exchange. The product is sold by the packers to the distributors, who in turn sell it to various types of users and retailers. The firms constituting the distribution channel are of rather small size. Most of them, especially those operating in Florida, are family-type operations. Because of successive management

¹Interview with Robert Sinenberg, November, 1964.

inbreeding such firms have done very little in terms of exploring new market opportunities or exerting effort to better serve their existing markets. The majority of them have historically been merely order takers and done practically nothing to stimulate demand for their product.

This chapter has traced the process of marketing sponges from the time they are caught by fishermen until their final sale. Although poor record-keeping and suspicion toward an investigator has made a great deal of information unavailable for further analysis, this is the most comprehensive treatment in existence on the subject of sponge distribution.

CHAPTER V

COMPETITION

Imports

Imports of marine sponges for consumption were 238,550 pounds valued at \$1,415,571 in 1957 (see Table 36). They dropped sharply after 1960, and in 1963 were 82,888 pounds valued at \$805,103. This drop in imports is attributable primarily to the narrowing of the price differential between domestic and imported sponges (see Table 34). It has been mentioned in the previous chapter that historically prices of imported sponges have usually been lower than domestic sponge prices. This differential has tended to disappear in recent years, primarily because of supply shortages encountered in the principal supplying country, Greece. Such price increases have had an adverse effect on sponge consumption, and experts are of the opinion that synthetic sponge manufacturers will take over more of the market as time passes.¹

Table 36 shows United States natural sponge imports by country of origin since 1957. A cursory examination of the table shows that most American imports have come either from the Mediterranean or the western Atlantic. In accordance with this pattern the following paragraphs will deal with sponge production in the principal producing countries in the Mediterranean and the western Atlantic.

¹Letter from Leslie Robinson, Commodity-Industry Analyst for U. S. Tariff Commission, Washington, D. C., February 25, 1965.

UNITED STATES IMPORTS OF SPONGES BY COUNTRY OF ORIGIN, 1957-1963

1961		1962		1963	
Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
313	2,946	10,416	42,772	5,107	9,200
80	280	2,659	2,481	..	..
..	..	85	622	..	..
18,917	63,390	..	..	1,301	12,466
..	..	135	3,676	110	2,605
55	625	557	7,268	474	8,142
329	4,143	65,017	668,327	66,054	679,380
58,749	610,428	187	1,506	31	446
115	1,030	..	..	..	..
..	..	..	..	393	6,249
5,902	56,900	12,865	108,608	7,644	70,493
..
..
..
..
914	1,891	..	..	..	..
2,510	27,409	..	..	1,259	14,480
22	328	..	..	..	..
263	1,355	174	1,793	..	..
8,586	40,100	40	396	..	..
..
650	1,550	83	173	40	374
97,405	812,384	92,218	837,702	475	1,268
				82,888	805,103

Mediterranean countries

Greece.--The principal sponge beds of Greece are located in the Cyclades and Sporades and around the Islands of Rhodes, Kalymnos, Samos, Hydra, Kos, and Crete. This area produces all species of Mediterranean sponges and is known for the fine sponges harvested from crevices and caves in the Aegean Sea.¹

Greek sponge fishing has two seasons, summer and winter. During the summer season most fishing is done in foreign waters. The Greek government conducts negotiations with nearly all North African and Southern European nations in order to obtain fishing privileges for Greek sponge fishermen.² It is estimated that more than 60 per cent of the Greek sponge catch comes from foreign waters.³

Sponge fishing is done by nude divers, hookers, fernezen divers, and machine divers.⁴ In the summer of 1964, Greek spongers began to use scuba diving apparatus in sponge fishing.⁵ This apparatus consists of an oxygen tube strapped on the diver's back, a mask which protects the diver's head and eyes, and a pair of rubber fins worn on his feet to facilitate mobility under water. Although such equipment has been introduced only recently, it is anticipated that its widespread use will have the same impact on the sponge fishing industry that the introduction of machine diving had early in the nineteenth century.

¹Stuart, p. 65.

²Letter from Edward M. Cohen, Second Secretary of the American Embassy in Athens, Greece, November 17, 1964.

³Ibid.

⁴N. Vokos, "Greek Sponge Fishing," Trade with Greece, V (July, 1964), 31.

⁵Ibid.

The old type of diving suit requires preparation before being put on and the help of others to dress the diver. The scaphander is always used in rotation, which means that one diver must always remain on board idle. Apart from this, machine diving requires expensive equipment, such as air-pumps and diving suits, and supporting labor which adds to the cost of production. The skin diver's apparatus with its special rubber suit does not require the help of others to be worn, nor does it cost as much as machine diving equipment. The widespread adoption of this method may cut production costs considerably, assuming that nothing happens to affect the normalcy of the sponge beds.

Almost the entire Greek sponge production is destined for export markets, and the sponge industry is considered as a valuable source of foreign exchange by the Greek government.¹ To assure continuity of sponge exports the Greek government, in addition to negotiating for fishing privileges with other nations, sponsored the establishment of a diver training school on the Island of Kalymnos in 1955.² The existence of this school assures a steady supply of divers, and it acquaints trainees with safety methods and practices. Unlike the United States sponge industry most foreign operations are characterized by a rather high incidence of diving deaths and accidents. For example, in Greece in 1963, according to Trade with Greece, the quarterly journal of the Athens Chamber of Commerce and Industry, there were seventeen sponge fishing accidents, five of which resulted in death.³

¹Ibid.

²Ibid.

³Ibid.

TABLE 37

GREEK SPONGE PRODUCTION, TOTAL EXPORTS, AND EXPORTS
TO THE UNITED STATES, SELECTED YEARS, 1936-1963

Year	Production in Pounds	All Exports in Pounds ^a	Exports to the U. S. in Pounds ^a	Exports to the U. S. as a Percentage of Total Exports
1936	141,700	167,100	2,400	1.44
1937	93,900	129,300	2,300	1.78
1938	86,900	104,700	3,000	2.87
1939	77,900	51,300	3,300	2.43
1947	331,000	189,400	51,600	27.22
1960	..	\$1,228,000	\$808,425	65.83
1961	..	1,335,000	610,428	45.71
1962	194,550	1,267,923	668,327	52.55
1963	202,424	..	679,380	..

Source: 1936-1939, 1947 from Stuart. 1960-1963 from Trade with Greece and U. S., Tariff Commission, Annotated Tariff Schedules.

^aWeight converted to value after 1947.

At present Greece is the major sponge producer in the world. Table 37 shows Greek sponge production, total exports, and percentage of such exports shipped to the United States for selected years. Although most of the Greek sponge landings are destined for foreign markets, the amount exported is considerably higher than domestic production because Greek exports include domestic production plus the production bought by Greek sponge merchants from other countries. In 1964, for example, Greek sponge merchants purchased 10,400 pounds of sponges from Syria, the entire Syrian production for that year, to be exported to other countries.¹

¹Letter from George M. Lane, American Vice-Consul in Aleppo, Syrian Arab Republic, December 29, 1964.

Greece has become the most important sponge supplier of the United States. As can be seen in Table 38 in 1963, 48 per cent of the total United States sponge supply came from Greece. This constituted almost 80 per cent of total sponge imports for that year.

In 1963, the sponge fishing fleet of Greece consisted of 103 craft. The composition of this fleet by method of operation was as follows: 78 craft engaged in machine diving, 8 trawls, 10 fernezen boats, and 7 unspecified, presumably hookers. This fleet was manned by 1,125 seamen of which 583 men were classified as divers.¹

Firsthand local information from all sponge producing countries and a survey of secondary sources show that Greece is the only country where sponge fishing is not considered as a declining industry. Between 1936 and 1963, Greek sponge landings increased from 141,000 pounds to 202,424 pounds, approximately 30 per cent (again see Table 37). This is in contrast to what happened in other major sponge producing countries. The superior position that the Greek sponge fisheries hold among other sponge producing nations is attributable to the following factors. (1) Unlike the sponge beds of the western Atlantic, the Mediterranean sponge beds have been relatively immune to marine diseases. During the World War II years when western Atlantic sponge beds were being fished intensively, sponge fishing in the Mediterranean was interrupted. This interruption of fishing led to an increase in the sponge population, which was reflected in the higher amounts of landings which followed the war years. (2) Historically speaking, Greek fishermen have been very receptive to the adoption of new methods and techniques of operation. All known

¹Vokos, Trade with Greece, V, 31.

TABLE 38
 SPONGE TRADE WITH GREECE, 1956-1963

Year	Greek Imports as a Percentage of Total Sponges Available in the U. S.		Greek Imports as a Percentage of Total Sponge Imports in the U. S.	
	Quantity	Value	Quantity	Value
1956	39.31	48.59	44.66	57.68
1957	36.48	52.60	43.27	61.60
1958	33.66	46.42	38.84	58.84
1959	45.16	53.53	52.78	66.23
1960	39.16	51.75	46.99	64.53
1961	43.74	51.77	60.31	75.14
1962	46.37	53.36	70.50	79.78
1963	47.82	56.98	79.69	84.38

Source: Based on Table 36 and Table 39.

improvements and changes in sponge fishing, such as the glass bucket, trawling, machine diving, and most recently skin diving, were either introduced or readily adopted by Greek sponge fishermen. By contrast, with the exception of the United States, the remainder of the world's sponge fishing has never passed the stage of hooking. Even in the United States machine diving is a method practiced by Greek-Americans.

(3) Because of its value as a source of foreign exchange the government of Greece has played an active role in supporting the Greek sponge industry. Such support has taken the form of bilateral treaties in the negotiation of fishing privileges for Greek spongers in foreign waters, increased hospitalization, pension and retirement benefits for sponge divers, and the establishment of a divers' training school in Kalymnos to assure a continuity of supply of divers.¹ (4) Aggressiveness

¹Ibid., pp. 32-34.

is another factor which characterizes the Greek sponge industry. When unable to harvest sponges in their national waters Greek fishermen have not hesitated to fish in foreign waters, even in the absence of permission to do so.¹ (5) In 1963, the average Greek diver was 25 years old.² In other words, the average Greek diver was approximately half as old as his American counterpart. It is obvious that younger divers can descend to greater depths and stay underwater for longer periods. Unlike American divers who never go below 60 feet, the average diving depth for Greek fishermen is 140 feet.³ These factors have enabled the Greek sponge industry to gain a practical monopoly on the fairly inaccessible sponge beds which, as was pointed out previously, are populated with sponges of the best quality.

Italy.--There is very little sponge production in Italy.⁴

Italian sponge fishing is being performed on a handicraft scale and, currently, a comparatively limited number of fishermen is devoted to this activity in the areas of Leghorn, Tripani, and Torre del Greco.⁵ These fishermen utilize self-propelled boats and two-or three-pronged hooks for harvesting sponges. Italian sponge production was 5,000 pounds valued at \$11,200 in 1958. By 1963, annual sponge landings had fallen to 400 pounds at a value of \$1,280. According to information obtained from the American Embassy in Rome, Italy imported 87,780 pounds

¹Letter from Cohen, November, 1964.

²Vokos, Trade with Greece, V, 31.

³Ibid.

⁴Letter from Theodore J. Hadraba, Counselor of Embassy for Commercial Affairs of the American Embassy in Rome, Italy, November 20, 1964.

⁵Ibid.

of sponges valued at \$160,000 in 1963. Imports do not show country of origin, but presumably Greece and Turkey are the main suppliers. Sponge exports in the same year totaled 32,560 pounds valued at \$160,000 and went mostly to Switzerland and Japan. These latter sponges primarily represent imported natural sponges that were processed in Italy for export.¹

Lebanon.--At present, Lebanon is the second-largest producer of sponges in the Mediterranean.² Local consumption is negligible and export figures give a fairly accurate reflection of total production. Most fishing is done by hooking and fernezen diving. The latter is the method used solely by Greek fishermen who were imported from Greece by the firm of Massad Antakly and Company. Total Lebanese exports in 1964 were estimated to be worth \$174,000.³

Syria.--Sponge landings in 1964 consisted of 11,000 pounds of poor quality sponges valued at \$600. All of the 1964 Syrian sponge production was sold to a Greek merchant. Because of the poor condition of the sponge beds and the uncontrolled fishing in the area the Syrian government has decreed that sponge fishing will be permitted every alternate year.⁴

Turkey.--This country's sponge producing areas are scattered along the coasts of the Mediterranean and Aegean Seas off Turkey and the southern coast of the Sea of Marmara. There is practically no local demand for sponges, and the entire production is exported to

¹Ibid.

²Letter from John C. Weisert, Commercial Attache of the American Embassy in Beirut, Lebanon, January 4, 1964.

³Ibid.

⁴Letter from Lane, December, 1964.

TABLE 39

**TOTAL AVAILABLE SUPPLIES OF SPONGES IN THE UNITED STATES
FROM PRODUCTION AND IMPORTS, 1934-1963**

Year	Domestic Production		Imports		Total Supply	
	Pounds	Value	Pounds	Value	Pounds	Value
1934	485,000	662,000	479,307	387,730	964,307	1,049,730
1935	372,000	611,000	613,143	464,211	985,143	1,075,211
1936	616,000	1,029,000	605,683	561,738	1,221,683	1,590,738
1937	546,000	1,085,000	581,906	587,620	1,127,906	1,672,620
1938	521,000	745,000	428,664	475,238	949,664	1,220,238
1939	409,000	1,019,000	431,536	476,035	840,536	1,495,035
1940	231,000	846,000	519,041	588,763	750,041	1,434,763
1941	201,000	1,364,000	222,117	518,107	423,117	1,882,107
1942	184,000	1,700,000	117,528	613,010	301,528	2,313,010
1943	186,000	2,305,000	194,781	909,205	380,781	3,214,205
1944	192,000	2,547,000	123,581	944,459	315,581	3,491,459
1945	194,000	2,717,000	95,596	791,979	289,596	3,508,979
1946	162,000	2,590,000	328,281	3,087,321	490,281	5,677,321
1947	118,000	1,245,000	208,653	1,674,818	326,653	2,919,818
1948	74,464	465,937	355,015	2,587,305	429,479	3,053,242
1949	68,700	470,580	242,000	1,937,000	310,700	2,407,580
1950	22,000	130,500	334,000	2,329,000	356,000	2,459,500
1951	15,800	110,755	252,000	2,142,000	267,800	2,252,755
1952	25,000	142,100	178,000	1,248,000	203,000	1,390,100
1953	17,300	127,916	258,000	1,628,000	275,300	1,755,916
1954	15,100	119,179	191,107	1,124,113	206,207	1,243,292
1955	34,300	251,100	216,348	1,341,692	250,648	1,592,792
1956	29,600	241,566	217,507	1,291,567	247,107	1,533,133
1957	44,400	244,958	238,550	1,415,571	282,950	1,660,529
1958	29,400	214,025	191,044	1,338,443	220,444	1,552,468
1959	27,300	289,520	161,975	1,220,275	189,275	1,509,795
1960	37,300	309,497	186,511	1,252,764	223,811	1,562,261
1961	36,900	366,646	97,405	812,384	134,305	1,179,030
1962	47,981	415,720	92,218	837,702	140,199	1,253,422
1963	55,238	387,261	82,888	805,103	138,126	1,192,364

Source: 1934-1944 from U. S., Department of Commerce, Foreign Commerce and Navigation of the United States; 1945-1963 from U. S., Tariff Commission, Annotated Tariff Schedules.

western Europe with very little of such exports reaching the United States market. In 1963, Turkish sponge exports were 112,607 pounds valued at \$419,028.¹

Western Atlantic countries

From 1934 to 1939 approximately one million pounds of natural sponges per year were consumed in the United States. Imports supplied about 50 per cent of the total domestic consumption (see Table 29 and Table 39). As can be seen from Table 40, before World War II Cuba and the Bahama Islands supplied almost 100 per cent of the imported natural sponges. Taking the mean figure of the total sponge imports from 1934 to 1939, the period immediately preceding World War II, we find that the United States imported an average of 523,373 pounds of natural sponges per annum during that time. By applying the same procedure to imports from Cuba and the Bahamas, we find that their sponge exports to the United States averaged 322,810 and 178,849 pounds per annum respectively for the same period. In other words, on the average Cuba contributed 66 per cent of total sponge imports between 1934 and 1939, while approximately one-third of total United States sponge imports during that period came from the Bahamas.

In 1937, a blight hit the sponge beds in the Bahamas. The same epidemic later infected the fishing grounds of Cuba and Florida, as has been mentioned in previous chapters. Although this disease had a disastrous effect on all known sponge beds in the western Atlantic, the Bahama beds were the hardest hit.² The Velvet sponges in the

¹Letter from Arthur C. Lillig, Commercial Attache of the American Embassy in Ankara, Turkey, November 20, 1964.

²Stuart, p. 58.

Bahamas were completely destroyed, and after 1937 the Bahama Islands ceased to rank among the principal sponge producers of the world.¹

Although no production figures are available, one can reach a conclusion about Cuban sponge production after the 1937 disease by examining Cuban sponge export statistics. Since there is practically no local demand for sponges in Cuba, exported quantities give a fairly good indication of levels of production. United States imports from Cuba between 1940 and 1942 declined from 464,589 pounds to 101,317 pounds, a decline of approximately 77 per cent, but by 1944 Cuba was supplying more than 90 per cent of the total United States sponge imports (see Table 40). This situation was a logical development caused by the war. When the war cut off the European markets virtually all sponge production in the western Atlantic was shipped to the United States.²

After the war the import situation underwent a drastic change. Mediterranean sponge fishing, which was interrupted during the war, was resumed and expanded, primarily by the Greek sponge fleet.³ Because of the short supply of sponges from domestic sources and other western Atlantic nations, caused primarily by the diseases in 1937 and 1949, imports from the Mediterranean increased tremendously. By 1949 Cuba was exporting only about 13 per cent of the total United States sponge imports, the Bahamas about 0.2 per cent, while the remaining 87 per cent

¹Ibid.

²Richard A. Kahn and Lois B. Sandven, Sponge Production and International Sponge Trade of the United States, U. S. Fish and Wildlife Service Fishery Leaflet 170 (Washington: U. S. Government Printing Office, 1946), p. 4.

³Stuart, p. 48.

TABLE 40

TOTAL UNITED STATES IMPORTS FROM CUBA AND
THE BAHAMAS, SELECTED YEARS, 1934-1963

Year	Cuba		Bahamas	
	Pounds	Dollars	Pounds	Dollars
1934	309,502	262,813	134,779	55,864
1935	389,167	313,357	192,306	65,583
1936	363,680	387,073	189,973	97,039
1937	315,922	363,698	227,056	133,632
1938	271,466	343,783	141,195	68,639
1939	277,124	288,242	187,783	119,105
1940	464,589	503,681	38,998	40,351
1941	185,636	443,096	21,662	19,244
1942	101,317	569,620	9,481	17,562
1943	191,636	803,615	572	3,038
1944	118,076	899,629	2,649	14,652
1945	62,898	513,733	87	450
1946	70,234	608,154	121	400
1947	32,098	261,348	17,686	75,843
1948	46,505	235,941	880	8,970
1954	36,850	153,458	..	..
1955	44,861	162,481	..	..
1956	71,234	267,006	22,224	58,426
1957	84,917	308,662	31,406	59,899
1958	85,262	329,596	3,179	7,615
1959	62,914	247,320	1,586	5,266
1960	76,264	294,746	2,144	8,032
1961	18,917	69,390	80	280
1962	85	622	10,416	42,772
1963	..	..	5,107	9,200

Source: 1934-1944 from U. S., Department of Commerce, Foreign Commerce and Navigation. 1945-1948, 1954-1963 from U. S., Tariff Commission, Annotated Tariff Schedules.

was supplied by the countries of the Mediterranean.¹ All United States imports from Cuba were suspended on May 24, 1962, thus eliminating Cuba as a source of natural sponges. At present, sponge imports from the Bahamas and other western Atlantic countries constitute a very small percentage of total imports (again see Table 40), and over 90 per cent of the United States sponge imports come from the countries of the Mediterranean. Later in this chapter recognition will be given to the fact that synthetic sponge imports from Europe affect both the natural and artificial domestic sponge market.

Excluding the United States, all sponge fishing in the western Atlantic is done by hookers. No diving equipment is used, and no deep-sea fishing has ever been attempted.² Almost all landings are tendered to the highest bidder at public auctions and then processed and baled for export. Batabano, on the southern coast of Habana Province, is the center of the Cuban sponge industry, while the Sponge Exchange of Nassau is considered to be the center of the sponge industry in the West Indies.³

Sponge cultivation

Because of their high regenerative power sponges can be grown from small cuttings. The discovery of sponge culture by means of cuttings is attributed to an observation made by F. Cavolini in 1785

¹Richard A. Kahn, The Legislative Situation on Sponges (N.p.: U. S. Fish and Wildlife Service, Branch of Commercial Fisheries, n.d.), p. [3].

²Stuart, p. 52.

³Ibid., p. 58.

TABLE 41
 UNITED STATES IMPORTS OF NATURAL SPONGES FROM THE BAHAMAS, 1956-1963

Year	Wool		Hardhead, Reef		Yellow, Grass Velvet		Not Elsewhere Specified		Total	
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
1956	11,106	30,208	312	1,398	7,067	10,196	3,738	16,624	22,224	58,426
1957	22,647	45,130	1,060	2,797	6,706	9,903	993	2,069	31,406	59,899
1958	1,339	4,680	816	1,060	872	1,082	152	793	3,179	7,615
1959	1,376	4,504	..	..	210	762	..	..	1,586	5,266
1960	1,806	7,825	338	207	..	..	..	..	2,144	8,032
1961	80	280	..	..	..	..	..	..	80	280
1962	8,507	38,944	1,909	3,828	..	..	..	..	10,416	42,772
1963	1,154	2,827	850	1,920	3,103	4,453	..	..	5,107	9,200

Source: U. S., Tariff Commission, Annotated Tariff Schedules.

TABLE 42

UNITED STATES IMPORTS OF NATURAL SPONGES FROM CUBA, 1956-1962

Year	Wool		Hardhead, Reef		Yellow, Grass Velvet		Not Elsewhere Specified		Total	
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
1956	58,108	231,637	491	2,812	19,654	23,733	1,981	8,824	71,234	267,006
1957	65,645	269,395	351	1,923	18,866	37,114	55	230	84,917	308,662
1958	70,181	299,230	447	1,096	14,293	27,772	341	1,498	85,262	329,596
1959	51,360	224,375	256	1,325	10,515	17,405	783	4,215	62,914	247,320
1960	55,403	258,878	664	2,667	15,025	22,282	5,172	10,919	76,264	294,746
1961	11,416	59,633	664	1,066	6,837	8,691	..	..	18,917	69,390
1962	85	622	..	..	..	..	..	..	85	622

Source: U. S., Tariff Commission, Annotated Tariff Schedules.

that sponges cut into pieces would attach to foreign bodies and grow.¹ A document published in 1897 mentions a Mr. J. Fogarty of Key West conducting a series of successful experiments in propagating sponges from clippings, but the publication also hastens to add that artificial propagation of sponges did not receive much attention in Florida.²

This method was put into operation by the British colonial government in the West Indies during the early 1930's. The colonial government granted concessions to interested individuals, permitting them to plant sponge cuttings in designated areas at Andros Island.³

The technique of sponge cultivation consists of cutting a mature sponge into segments two or three inches in diameter and attaching the pieces to cement discs, flat rocks, stakes, or non-corrosive wires which will support the sponge cuttings just above the bottom of the sea.⁴ The sponge must be cut with a sharp knife to avoid crushing. Both the mature sponge and the cuttings must be protected from prolonged exposure to direct sunlight and must be kept in clean seawater, as rainfall or freshwater will quickly kill the sponge.⁵ The ideal bed for sponge cultivation is relatively flat, free from excessive currents, and has a normal salt concentration. The water must be deep enough to avoid disturbance of the bottom by wave action,

¹Moore, Proceedings of the Fourth International Fishery Congress, p. 550.

²U. S. Congress, The Fish and Fisheries of the Coastal Waters of Florida, p. 9.

³John F. Storr, The Sponge Industry of Florida, Florida Board of Conservation Educational Series No. 9 (Coral Gables, Fla.: Marine Laboratory, University of Miami, 1957), p. 26.

⁴Tierney, p. 17.

⁵Ibid.

yet not deeper than three or four feet so that workers may plant and harvest the sponges without much difficulty.¹

Artificial culture was shown to be practicable until the 1937 sponge blight. From 1935 to 1937 more than 140,000 sponges were raised in the Bahamas, and more than 700,000 cuttings were planted at Turneffe, British Honduras.² Unfortunately, the mortality rate of 1939 was particularly high among the cultivated sponges, and the beds were almost completely destroyed.³ Also, attempts to cultivate sponges in locations appearing desirable but in which no natural sponges have been found growing have led to the discovery that starfish and certain types of crab prey on the young sponges and kill them.⁴

In spite of its theoretical feasibility and recommendation by many marine biologists this approach has never received much attention from United States sponge fishermen, primarily because cultivated sponges have not proved to be any more immune to marine diseases than naturally grown sponges.⁵

Synthetics

Approximately 30 years ago Americans had never heard of synthetic sponges.⁶ Today better than 90 per cent of all sponges sold in the

¹Ibid.

²"Sponges," Encyclopaedia Britannica.

³Ibid.

⁴Stuart, p. 60.

⁵Florida, State Board of Conservation, Ninth Biennial Report, 1949-1950, p. 46.

⁶Cellulose Sponge Institute, An Absorbing Story (N.p.: Cellulose Sponge Institute, n.d.), p. [2].

United States are made of synthetic materials.¹ They are universally used in an infinite variety of ways around the home, in business establishments, and in various other types of activities.²

The natural sponge was the only type available in this country until 1936 when the cellulose sponge, perfected in France in 1932, was introduced here.³ Response to the product was slow until 1937, when a blight hit the natural sponge beds in the entire western Atlantic area. Shortly after that, World War II ended the importation of sponge supplies from the Mediterranean, and the shortage became acute.⁴

The United States was faced with the problem of obtaining sponges for both military and civilian use, and it was then that the synthetic sponge came into the public eye. As a result of constant improvement, ample supplies, and lower prices, synthetic sponges were able to displace natural sponges from many uses in a period of approximately 30 years.

Three different kinds of synthetic sponges are currently sold in the United States: vinyl, urethane, and cellulose sponges.⁵

Vinyl sponge

The Simoniz Corporation was the only domestic producer of vinyl sponges. The company discontinued the production of vinyl sponges in

¹Ibid.

²Ibid.

³Ibid., p. [3].

⁴Ibid.

⁵"Sponge Profits in a Squeeze," Chemical Week, IXC (October 27, 1962), 46.

1961, and since then it has concentrated on the urethane variety.¹ Today vinyl sponges constitute an insignificant proportion of total synthetic sponge sales. Those found on the market are either sold from accumulated domestically produced inventories or are of foreign origin.²

Urethane sponge

Urethane sponges are easy to produce, a fact which explains why there are so many companies producing them.³ According to Chemical Week it is conceivable that a handy do-it-your-selfer could purchase the needed materials from a single supplier and froth up the stock in a basement tub.⁴ Urethane sponges are priced below the cellulose product, but unlike cellulose sponges they do not absorb water unless totally immersed in it, and they dribble water when removed from immersion.⁵ For this reason natural sponge distributors and cellulose sponge producers prefer to call urethane products cleaning aids rather than sponges. As a matter of fact, some people in the sponge trade are of the opinion that urethane products have hampered rather than promoted synthetic sponge sales, because users who buy a urethane sponge and become dissatisfied with its performance may not purchase another synthetic sponge in the future. Market penetration of urethane sponges

¹Ibid.

²Ibid.

³Ibid.

⁴Ibid.

⁵Ibid.

is estimated to be between 10 and 15 per cent of the total synthetic sponge market, with 10 per cent considered as the figure closer to reality.¹

Cellulose sponge

Cellulose sponges are considered to be responsible for between 80 and 90 per cent of total synthetic sponge sales. Cellulose sponge sales in the United States climbed from \$16 million in 1953 to \$31 million in 1963 (see Table 47).

Unlike the synthetic products made of vinyl and urethane, the cellulose sponge is a very close substitute for the ocean-grown sponge. Cellulose sponges soak up from 20 to 25 times their weight in water; they develop no odor; they float and can be made in any size and shape. They do not scratch smooth surfaces, are relatively long-lasting, can be dyed almost any color, are available in a virtually endless supply, and compared to natural sponges are very inexpensive. These qualities of cellulose sponges, when compared to the qualities of natural sponges on pages 16-18, indicate that with the exception of durability the cellulose sponge is as functional as the natural product. As a matter of fact, several distributors are of the opinion that certain brands of synthetic sponges are as durable as the natural product.² The trade also anticipates that in the future the artificial product will excel natural sponges even in durability. In addition to comparing favorably on a functional basis, cellulose sponges show a superiority over natural sponges in the process of marketing. Due to

¹Ibid.

²Interview with Edward Riley, November, 1964.

their wide variety of colors, attractive packaging, and ease of display, the synthetic sponge has always been given preference over the natural sponge by the majority of retailers and other middlemen.¹ These characteristics, along with pricing and promotion which will be discussed later, have given the artificial product a competitive advantage over the natural sponge.

Production.--At present, there are four domestic producers of cellulose sponges: they are Du Pont; General Mills' O-Cello Division in Kankakee, Illinois; Nylonge Corporation in New York City; and Burgess Cellulose Company in Freeport, Illinois.² At the time that this study was being conducted the Burgess Cellulose Company was negotiating the sale of its cellulose sponge business to the 3M Corporation of St. Paul, Minnesota. The fact that this multimillion dollar market is covered only by four manufacturers is primarily attributable to technological requirements. The technological process of cellulose sponge manufacturing is highly specialized and requires a rather expensive capital investment.³

The prime ingredient used in the production of cellulose sponges is the cellulose, basically wood pulp which has been treated and refined into white sheets which resemble blotting paper.⁴ A second ingredient is sodium sulfate salt in crystals, made in a variety of sizes from slightly larger than a pea down to almost a powder.⁵

¹Interview with Robert Sinenberg, November, 1964.

²"Sponge Profits in a Squeeze," Chemical Week, IX, 43.

³Ibid.

⁴Letter and unpublished material from Peter G. Kerby, Production Vice-President of Nylonge Corp., New York, December 28, 1964.

⁵Ibid.

These salts make the holes in the finished product. The third ingredient is either vegetable, cotton, or hemp fiber cut to precise lengths. It acts as a binder for the cellulose and other fibers in much the same manner as the reinforcing rods used to strengthen concrete and gives the sponge greater tensile strength and resistance to abrasion.¹

In making cellulose sponges the sheets of cellulose are soaked and mixed in a solution of water and then treated with carbon bisulfide and caustic soda until there is a resulting jelly-like substance called viscose. To the viscose are added the proper quantities and sizes of salt crystals and reinforcing fibers. To all this is added the dye or pigment which gives the resulting sponge blocks the desired pastel color.² These substances are then mixed carefully in accordance with a time-tested formula which produces the proper even distribution of all the elements in complete uniformity throughout the mass.³

The mix is then poured into rectangular block-shaped molds, much like giant loaves of bread, and the molds are cooked until the material coagulates and the cellulose is properly regenerated from the viscose complex.⁴ Each step in this process is carefully controlled with rigid timing, temperatures, et cetera, as dictated by years of experience and experimentation in order to produce a uniformly high-grade end product.⁵

¹Ibid.

²Ibid.

³Ibid.

⁴Ibid.

⁵Ibid.

During the cooking process most of the salt crystals melt and run off, leaving the holes which have been preplanned through the specification of the sizes, quantity, and dispersion of the salt crystals in the mixing procedure.¹ Fine pore sponges are made by using only the powdered salt and smaller crystals, coarse pore sponges by using a range of crystal sizes varying from small to large.²

After the sponge block has been removed from the cooking mold the last vestiges of salt are removed by thoroughly washing the block, which is then run through successive bleaching, washing, and softening baths and sprays. The end result is a large oblong block over a foot square and several feet long of the desired soft pastel color, ready for slicing and packaging. The slicing is done by an automatic cutter, insuring uniformity of length, width, and thickness in every piece of each size marketed. The packaging in plastic or cellophane bags and shipping cases completes the process.³

Market structure.--Despite the fact that there are only four producers of cellulose sponges in the United States cellulose sponges can be found under a plethora of brand names.⁴ With the exception of Du Pont all producers provide various types of buyers with private brands. In addition, many sponge distributors and other types of middlemen sell only imported synthetic sponges under their own brand names.⁵ For example, the American Sponge and Chamois Company in Long

¹Ibid.

²Ibid.

³Ibid.

⁴"Sponge Profits in a Squeeze," Chemical Week, IXC, 43.

⁵Ibid.

Island City, New York, the largest natural sponge distributor, imports its synthetic sponges from Novacell in France and Aktiebolaget Celloplast, a Swedish company located in Stockholm.¹ At this point it may be appropriate to point out that due to their confidential nature the four domestic synthetic sponge producers were extremely reluctant to provide detailed information on their operations. Most data obtained were fragmented and of a general nature. In order to arrive at some meaningful conclusions it was necessary to supplement such information with deductions and opinions of distributors and other knowledgeable people in the trade.

Invariably private brands are priced a little lower than the customary retail prices for identical synthetic sponges that have national brand labels. For example, the Nylonge Corporation produces and markets sponges under the Nylonge brand and under several other brand names, including such well-known companies as Sears, Roebuck and Montgomery Ward.

Distribution.--Correspondence and personal interviews with officials of the four domestic cellulose sponge producers have indicated that these producers sell their product through wholesalers, automotive brokers, and major chains. Inasmuch as sponges are used primarily for cleaning purposes, distribution very much parallels that of other cleaning items, such as soaps, detergents, scouring pads, and bleaches. For this reason the two smaller manufacturers admitted that their products could not be distributed as extensively as those of Du Pont and General Mills, because the latter two had a very well-established distribution network of cleaning products. To cope with

¹Interview with Edward Riley, November, 1964.

this situation the two smaller producers have tried to obtain as great a volume as possible through the use of private brands. In addition, all four producers sell sponges directly to manufacturers for conversion to various cleaning devices, such as block sponge mops, sponge cloths, soap dishes, and dish mops. Except for Du Pont all the producers market their products under both national and private brands,¹ and with the exception of General Mills all producers sell sponges only in cut up sizes. General Mills sells synthetic sponges both in blocks and cut up sizes.²

Cellulose sponges marketed under private labels are carried by many types of firms, such as department stores, mail-order houses, hardware wholesalers, and sponge distributors. Such firms can obtain their supplies from any domestic producer except Du Pont or from several cellulose manufacturers abroad. Most of them, especially those importing sponges from other countries, purchase cellulose sponges in loaf-like shapes several feet long, slice the oblong shaped cellulose into consumer size sponges, package them in cellophane bags, and sell them under their own brand names.

With the exception of a few, most of these concerns are relatively small firms with limited local markets.³ The majority of the smaller firms use foreign sources of supply;⁴ however, even when they buy from

¹Letter from T. G. Lynam, Household Specialties of E. I. du Pont de Nemours & Co., Wilmington, Del., January 4, 1965.

²Letter from T. A. Schneider, Sales Manager of Chemical Division of General Mills, Inc., Kankakee, Ill., January 8, 1965.

³"Sponge Profits in a Squeeze," Chemical Week, IXC, 43.

⁴Ibid.

domestic producers, the producers do not consider them as part of their regular channel of distribution. For example, both Burgess and Nylonge view private brand sales as a means of using excess capacity and consider such customers as competitors rather than part of their regular distribution channel.¹

Prices

This feeling of antagonism between national brands and private brands is due primarily to the latter's pricing strategy.² Despite increases in production costs and rises in the general price level synthetic sponge prices have not risen appreciably since World War II.³ As a matter of fact, the tendency has been for prices to go down rather than up. This deflationary price trend has been caused primarily by the small independent firms who market synthetic sponges under private brand names. For example, a 6x4x2 $\frac{1}{4}$ inch MAR-VEL synthetic sponge, a brand represented by the Gulf and West Indies Company of New York City, retails for 59 cents or less in many stores where it is carried. A comparable size bearing a national brand would retail for not less than 69 cents according to Mr. Milton Cohn, President of the Company.

Competitive position

In 1950, Richard A. Kahn, Chief of the Economic and Cooperative Marketing Section of the United States Fish and Wildlife Service,

¹Letter from Kerby, December, 1964.

²"Sponge Profits in a Squeeze," Chemical Week, IXC, 43.

³Ibid.

⁴Interview with Milton Cohn, November, 1964.

estimated that natural sponge sales at the user's level had a value of \$7,080,000, while synthetic sponge sales to users amounted to \$13,317,800.¹ Presumably these figures include imports and domestic production. Since the two products are very close substitutes for each other one may assume that a summation of the natural and synthetic sponge sales represents total market demand for the absorbing commodity. Based on this assumption, in 1950 natural sponges had a 34.70 per cent share of the total sponge market. In 1963 the composite market including imports was estimated to be in the vicinity of \$40 million, with natural sponges sharing approximately 10 per cent of this total.²

It was pointed out previously that for many users the cellulose sponge is a very good substitute for the natural product. This is the opinion of the majority of distributors selling both kinds of sponges, although the two products have never been compared under scientific laboratory conditions. Sellers of natural and synthetic sponges are of the opinion that natural sponges are more durable than synthetics; however, they quickly emphasized that this superior durability is confined only to the Rock Island variety.³ Even if this contention is true many users either are not aware of such a superiority or else this quality of superior durability is not considered to be important enough by them to significantly differentiate the natural product from the synthetic.⁴ As a matter of fact, many tradespeople

¹Richard A. Kahn, "Is the Natural Sponge Fishery Doomed by Synthetic Sponges?" Proceedings of the Gulf and Caribbean Fisheries Institute, Third Annual Session (N.p., November, 1950), p. [2].

²"Sponge Profits in a Squeeze," Chemical Week, IXC, 43.

³Interview with Edward Riley, November, 1964.

⁴Ibid.

contend that certain features of artificial sponges, such as color, shape, and availability, make a more favorable impression on the user than the durability claim of natural sponges. Since from a functional point of view the two products are considered to be substitutes for each other it follows that under these conditions user preference would be influenced primarily by price. To be sure, prices do not have to be identical, because such factors as individual tastes and preferences may induce some users to pay a higher price for either product, but any such difference would have to be within a reasonable range. In 1950, a survey conducted by the United States Fish and Wildlife Service among natural sponge distributors and retailers selling natural sponges stated that 46.64 per cent of the respondents indicated high prices as the most important reason for the decline in natural sponge sales.¹ According to the same survey, at that time the average unit value of natural sponges sold was \$1.13, and the unit value of synthetic sponges was 49.3 cents.² The survey concluded that some customers indicated a willingness to pay up to 75 cents per piece for natural sponges but that beyond this price they would shift to synthetics.³

In 1964, a 6x4x2 $\frac{1}{4}$ inch good quality synthetic sponge retailed for 59 or 69 cents, the former representing a private brand and the latter a national one.⁴ Both brands could be bought for about 10 cents less

¹Kahn, Proceedings of the Gulf and Caribbean Fisheries Institute, p. [2].

²Ibid.

³Ibid.

⁴Interview with Milton Cohn, November, 1964.

in certain types of cut-price establishments, such as drugstores and discount houses. During the same period a Rock Island sponge of a comparable $6\frac{1}{2}$ - 7 inch size retailed for \$2.70, a price difference of \$2.11.¹

In 1950, the price difference between natural and synthetic sponges was 63.7 cents per average unit value. Although the Fish and Wildlife Service does not describe average unit value, assuming that this represents a $6 \times 4 \times 2\frac{1}{4}$ inch size for synthetics and $6\frac{1}{2}$ - 7 inch size for natural sponges, which are the most popular sizes, the price difference between natural and synthetic sponges has increased by almost 30 per cent in fourteen years.

Synthetics are such close substitutes for the natural sponge that they clearly affect the elasticity of the latter. It is a well known fact that synthetics are being used across the country for purposes in which natural sponges were formerly utilized, and one need not engage in a marketing survey to prove this point. Under such conditions it is obvious that an increase in the price difference between natural and synthetic sponges would adversely affect the market share of the former. This fact has been demonstrably verified by the events that have taken place during the past few decades.

Imports

Although some of the smaller firms selling synthetic sponges purchase them from foreign manufacturers, imports have never been an important factor in this area. For example, Table 43 shows that in 1963 imports constituted an infinitesimal proportion of total

¹Ibid.

synthetic sponge sales, less than 1 per cent. This contrasts sharply with the natural sponge situation as shown in Table 29 where more than two-thirds of the available sponges were supplied through imports. There are several reasons for the inability of imports to displace the domestic product. First, unlike most firms that produce or sell natural sponges the synthetic sponge industry is characterized by rather large amounts of capital investment.¹ As a matter of fact, two of these firms have assets totaling millions of dollars and are considered to be among the largest corporations in the United States. Second, the tariff policy of the United States has afforded synthetic sponge producers a degree of protection which is stronger than the protection given to natural sponge producers. A comparison of Table 44 and Table 45 shows that for each category synthetic sponges have been given better protection than natural sponges. Third, either because of competitive pressures or deliberate policy synthetic sponge prices have been kept remarkably low since the end of World War II.² Such low prices enabled the domestic producers to penetrate the market and gave very little inducement to potential competition. Again, this is in sharp contrast with the natural sponge situation where in addition to availability the lower prices of the imported sponges have been responsible for the large influx of imports.

Marketing strategies

Unlike the natural sponge business whose products have been produced, handled, and marketed in the same way since the beginning of

¹"Sponge Profits in a Squeeze," Chemical Week, IXC, 46.

²Ibid., p. 43.

TABLE 43

IMPORTS OF SYNTHETIC SPONGES IN DOLLARS, 1956-1963

Country of Origin	1956	1957	1958	1959	1960	1961	1962	1963 ^a
Australia	..	..	..	..	..	..	..	413
Austria	..	..	..	..	..	..	..	351
Belgium	..	1,213	5,400	..	541	..	..	708
Canada	1,883	..	2,492	..	..	..	..	..
Czechoslovakia	..	..	105	..	..	..	..	..
Denmark	..	..	..	1,212	..	..	..	..
Finland	..	..	..	..	..	1,491	..	..
France	61,289	42,154	33,296	32,898	49,843	358,761	361,222	125,848
Hong Kong	..	..	..	..	..	..	..	366
Italy	..	25	18	20	9	464	15	7,855
Japan	668	1,908	353	..	..	1,939	648	6,603
Netherlands	5,732	3,248	..	..	..	14,407	37,784	805
Norway	..	..	..	..	1,378	80,093	46,752	40,627
Sweden	..	..	..	..	97,891	..	23,448	3,056
Switzerland	..	..	..	..	292	..	..	424
United Kingdom	..	..	..	..	2,828	8,911	9,539	2,801
West Germany	33,964	38,036	1,646	2,483	2,828	466,066	479,400	192,857
Total	103,536	76,584	43,310	36,613	152,782	466,066	479,400	192,857

Source: U. S., Tariff Commission, Annotated Tariff Schedules.

^aIn 1963 the classification of cellulose sponges was broadened, and the figures include cellulose and rubber products used for purposes other than sponges.

TABLE 44

MARINE SPONGES: UNITED STATES RATES OF DUTY EXISTING
ON JANUARY 31, 1965, AS DEFINED IN SEC. 256 (4)
OF THE TRADE EXPANSION ACT OF 1962

Description of Item	Rate of Duty Existing January 31, 1965 ^a	
	Most Favored Nation	Communist Block Countries
Grass, Velvet, or Yellow	7.5% ad valorem	25.0% ad valorem
Sheepswool	12.0% ad valorem	22.5% ad valorem
Hardhead, Reef	4.0% ad valorem	15.0% ad valorem
Not Elsewhere Specified	7.5% ad valorem	15.0% ad valorem

Source: U. S., Congress, Trade Expansion Act of 1962. U. S. Code Congressional and Administrative News, 87th Cong., 2d Sess., 1962.

^aEffective May 24, 1962, imports of Cuban origin were denied the benefits of concessions contained in any trade agreement.

TABLE 45

SYNTHETIC SPONGES: UNITED STATES RATES OF DUTY EXISTING
ON JANUARY 31, 1965, AS DEFINED IN SEC. 256 (4)
OF THE TRADE EXPANSION ACT OF 1962

Description of Item	Rate of Duty Existing January 31, 1965	
	Most Favored Nation	Communist Block Countries
Polyurethane	12.5% ad valorem	25.0% ad valorem
Cellulose	38.0% ad valorem	60.0% ad valorem
Natural Rubber	12.5% ad valorem	25.0% ad valorem
Not Elsewhere Specified	25.0% ad valorem	50.0% ad valorem

Source: U. S., Congress, Trade Expansion Act of 1962.

the sponge industry in the United States, the synthetic sponge industry is characterized by a high degree of innovation. This innovation consciousness permeates all phases of the business and is reflected in improved products, better packaging, and a constant search for new uses for the product. It has been mentioned before that many distributors and users consider synthetic sponges to be as good as the natural product. By using polyethylene wrappers it has become possible to package synthetic sponges while wet in glycerin, a factor which gives the product a softer "squeezier" feel while on display.¹ This encourages higher sales, especially under self-service conditions. The various pastel colors of synthetic sponges and their shape, which is conducive to uniform stocking, provide attractive displays in stores. In contrast, until a few years ago all natural sponges were sold without wrapping.² At present, natural sponges are sold wrapped in cellophane, but they still display a drab appearance in comparison with the multi-color display of synthetic sponges. As a matter of fact, the majority of natural sponge distributors complained that their product is never given a decent display in most establishments.

An ability to constantly discover new uses for their product has been another factor characterizing the synthetic sponge business. For example, American Sponge and Chamois introduced the sponge-cloth, a cloth-like sponge, which has replaced dishcloths and washcloths in many households. By extruding a cellulose sponge around a cotton core Du Pont makes mops with spaghetti-like strands, and by attaching

¹Ibid., p. 50.

²Interview with Mrs. Elizabeth Wallace, November, 1964.

wooden handles to sponge blocks it forms them into attractive, modern-looking dish mops. A larger size of the dish mop serves as a floor mop. Also popular is a removable sponge block attached to a mop handle with a device for squeezing water from the sponge without wetting the hands with dirty soapy water. Tiny cellulose sponges containing a silver polish are also on the market. Hospitals are using cellulose and urethane sponges as wound packing material in surgery, a function which formerly was performed by the natural product.¹

Because of its confidential nature it was not possible to obtain detailed information on the subject of strategy from synthetic sponge producers; however, the examples cited in the above paragraphs indicate that such firms have always capitalized on market trends in formulating their marketing strategies. For example, product improvements, such as sponge-cloths, sponges with silver polish, and sponge-mops, capitalize on trends of convenience, leisure, health, and beauty-consciousness. Innovations in packaging have been geared to take advantage of the self-service trend. Also, the distribution of synthetic sponges has kept up with changes in consumer-buying habits. As opposed to the limited number of places where one can purchase natural sponges, synthetics can be found in supermarkets, service stations, department stores, discount houses, and variety stores. Obviously, this flexibility in distribution has greatly increased the consumer's exposure to the product. This is in sharp contrast to the historically rigid distribution pattern of the natural sponge.

¹"Sponge Profits in a Squeeze," Chemical Week, IX, 50.

Recognition and profitable exploitation of market trends by a firm implies that it has the ability to study and understand the consumer. In a consumer-oriented society the success of a business depends on how well it serves the consumer, and the quality of such service is a function of understanding the consumer. In addition to capitalizing on market trends producers of synthetics have achieved growth by constantly finding new users, such as hospitals and beauty salons, for synthetic sponges. Unlike the natural sponge industry which is characterized by a philosophy of sticking to tradition the synthetic sponge industry reflects a strategy of planned innovation.

Protection and Subsidies

Protection

At present, commercial sponge resources of the United States are protected both by an act of Congress and by the laws of the State of Florida. The act of Congress - Public Law No. 172, approved August 15, 1914; 38 Stat. 6921 - prohibits in waters of the Gulf of Mexico and the Straits of Florida which are outside the limits of territorial jurisdiction of Florida the capture of sponges measuring less than 5 inches in diameter when wet. This act also forbids the landing, curing, possession, or sale of sponges smaller than the established 5 inch size and provides penalties for violators. The laws of Florida contain essentially the same prohibitions with respect to catching and marketing sponges within the territorial limits of the state. State law also prohibits the use of diving equipment for taking sponges within the territorial limits of Florida and specifies that hooks used

in removing sponges from the bottom of the sea be 5 inches wide (see page 26).

It can be easily inferred that the objective of these laws is to protect the species rather than the interests of the members of the sponge industry. For example, fishermen can catch all the sponges possible as long as they do not land sponges less than 5 inches in diameter when wet. Such a law may be useful for the preservation of the sponge beds, but it is of little or no benefit to certain elements of the sponge industry. As will be explained later, the interests of the sponge population, the fishermen, and the packers and distributors are not necessarily compatible.

Table 44 shows the current duty rates for the various species of imported sponge. A comparison of Table 44 and Table 45 shows that synthetic sponges, which have a much superior stronghold on the United States market, have been given more protection than natural sponges. On January 24, 1955, the Sponge Industry Improvement Committee of Tarpon Springs sent a resolution accompanied by 2,000 signatures to President Dwight Eisenhower, Senators George Smathers and Spessard Holland, and all United States Congressmen from Florida urging increased tariffs on imported sponges and the prohibition of sponges less than 5 inches in diameter.¹ This venture was unsuccessful in increasing tariff rates on imported sponges, but it did accomplish its latter objective.²

¹Interview with George Frantzis, President of Sponge Industry Improvement Committee, Tarpon Springs, Fla., July, 1964.

²Ibid.

Subsidies

Like many other troubled industries and segments of the American society spongers have long been trying to obtain the assistance of governmental bodies both at the federal and state level. Heavy government purchases of natural sponges during World War II created a prosperity among spongers which they are not likely to forget. After the cessation of hostilities, however, high prices and unreliable supplies forced the Federal Government to shift to the use of artificial sponges.¹ It was not until 1955 that through the efforts of Representative William C. Cramer the name of Florida natural sponges was restored to the General Services Administration catalog.² Table 46 shows Federal Government purchases of natural sponges since 1962. It was not possible to obtain any figures prior to 1962, since such data were destroyed according to governmental policy. Table 46 indicates that primarily due to the pressures from vested interest groups the Federal Government has increased its purchases of natural Florida sponges, but it is also apparent that government purchases of artificial sponges have been going up at a faster rate. For example, in fiscal year 1964 the Federal Government purchased \$2,029,741 worth of synthetic sponges as compared to \$74,195 spent on Florida natural sponges. It is this large expenditure for synthetics that whets the appetites of spongers and motivates them to capture part of this business, mainly through political pressure.

Tarpon Springs lobbyists were also successful having a law passed by the Florida Legislature in 1963. According to this law, "all

¹Ibid.

²Ibid.

TABLE 46

FEDERAL GOVERNMENT PURCHASES OF NATURAL
AND SYNTHETIC SPONGES, SELECTED YEARS, 1948-1964

Year	Natural (Dollars)	Synthetic (Dollars)	Ratio of Synthetic to Natural Sponges
1948	23,445	74,703	3.18:1
1962	44,540	1,903,873	42.74:1
1963	61,070	1,584,830	25.95:1
1964	74,195	2,029,741	27.35:1

Sources: 1948 from Kahn, The Legislative Situation on Sponges. 1962-1964 from letter from H. A. Abersfeller, General Services Administration Commissioner, January 19, 1964.

county officials, boards of county commissioners, school boards, city councils, city commissioners, and all other public officers of state boards and commissions charged with the letting of contracts or the making of purchases shall, in the purchase of sponges, always specify sponges grown, cultivated or otherwise produced in Florida, whenever such sponges are available and price, fitness, and quality are equal."¹

Unfortunately, the passage of this law did not measure up to the expectations of its proponents because of the manner in which the text was phrased. Most state officials have interpreted the term "produced in Florida" to be inclusive of synthetic sponges, and since such sponges can be obtained at much lower prices the synthetics have been given preference by state purchasing agencies. As of August, 1964, no state agencies had purchased natural sponges under this law, much to the disappointment of the Florida natural sponge industry.²

¹Florida, Statutes (1963, c. 370.162.

²Interview with George Arfaras, July, 1964.

CHAPTER VI

CONCLUSIONS

The present chapter will attempt to reach some conclusions, chiefly on the basis of the analysis contained in the previous chapters. Such conclusions in turn will form the cornerstone of the recommendations which will follow. Since in a free enterprise system the fate of any economic good is determined by the interaction of factors, such as supply and demand, advertising, sales promotion, selection of channels of distribution, product image, and pricing policies, the following discussion will deal with these factors both through an examination of historical data and from information obtained through a market experiment.

Supply and Demand

Availability of substitutes is the most important factor determining demand elasticity.¹ Inasmuch as synthetic sponges are a very good substitute for natural sponges, one could make an a priori statement that the demand for natural sponges is highly elastic. Both the Kahn survey conducted in 1950 and current opinion expressed by sponge distributors indicate that price is considered as the main factor causing sales of natural sponges to shrink. Table 3⁴ shows that between 1952 and 1953 the average price of domestic natural sponges

¹Ralph H. Blodgett, Our Expanding Economy (New York: Rinehart & Co., 1955), p. 260.

rose from \$5.68 to \$7.39, an increase of 30 per cent. During the same years the quantity of marketed domestic sponges declined by 31 per cent. As can be seen from Table 34, between 1952 and 1953 average prices of imported sponges were relatively stable, but the price increase in domestic sponges may have been responsible for the 45 per cent increase in imports during that period.

This situation reversed itself exactly ten years later. Between 1962 and 1963 average import prices went up by 6.9 per cent, and this price increase was accompanied by an 11 per cent decline in the quantity imported (again see Table 34). During the same period average domestic prices declined from \$8.66 to \$7.01, by 19 per cent. This price decline coupled with higher import prices resulted in a 30 per cent increase in the marketed quantity of domestic sponges. All these facts further corroborate the allegation made earlier concerning the price elasticity of the product.

The degree of price elasticity can further be demonstrated by applying the concept of cross elasticity. Cross elasticity of demand measures the extent to which various products are substitutes for each other.¹ If products are substitutes for each other the cross elasticity between them will be positive. A high cross elasticity coefficient would indicate that the products are close substitutes for each other. Between 1950 and 1963 sponge prices at the packers' level rose by 18 per cent (again see Table 34). Since the industry engages widely in cost plus pricing we may assume that this was reflected at the retail level. In 1950, synthetic sponge sales

¹Leftwich, p. 45.

amounted to \$13,317,800 with an average unit price of 49.3 cents.¹ This means that approximately 27,013,793 units of synthetic sponges were sold in 1950. In 1964, synthetic sponge sales were estimated to be in the vicinity of \$38,000,000 with the most popular size selling for 59 cents.² Assuming that the 1950 price of 49.3 cents and the 1964 price of 59 cents reflect units of comparable size and value, unit sales of synthetics between 1950 and 1964 increased by 37,392,986 pieces or by 136 per cent. Although in reality other things are seldom constant, if for the sake of demonstration one could disregard other variables the result would be a cross elasticity coefficient of 5.1. It is obvious that the existence of such a good substitute is certain to make the demand for natural sponges highly elastic.

An elastic demand coupled with high prices appears to have slowed down the turnover of natural sponges in many selling outlets, which in turn has limited the distribution of the product. Slow turnover is the main complaint of all middlemen in justifying their refusal to give the product a wider market exposure.³ In advising the natural sponge industry Mr. Hugh Parker, a vice-president of the J. Walter Thompson Company, recommended wide distribution for the product, since most people buy sponges on impulse. He also suggested the brand name "Triton" in order to differentiate natural sponges from substitutes.⁴ Although this recommendation was instrumental in triggering

¹Kahn, Proceedings of the Gulf and Caribbean Fisheries Institute, p. [2].

²Letter from William E. Smith, Cellulose Sponge Institute, Chicago, December 10, 1964.

³Sponge and Chamois Institute, "Test Market Report," p. 12.

⁴Letter from Hugh Parker, Vice-President of J. Walter Thompson Company, to Theodore Cantouris, a sponge distributor, August 27, 1963.

TABLE 47
CELLULOSE SPONGE SALES, 1953-1962

Year	Dollars
1953	15,500,000
1954	20,300,000
1955	23,000,000
1956	24,600,000
1957	24,800,000
1958	26,600,000
1959	27,200,000
1960	27,900,000
1961	30,100,000
1962	31,000,000

Source: Letter from William E. Smith, Cellulose Sponge Institute, Chicago, Ill., December 10, 1964.

the Harrisburg test which will be explained later, the Kahn survey conducted in 1950 and an examination of historical data clearly indicate that a strategy of product differentiation would be of limited value in advancing the interests of the natural sponge industry.

In view of the elastic demand for the product a logical policy for attaining extensive distribution must rest upon the assumption that the supply of natural sponges is relatively elastic, but this assumption is nullified by the historical interaction of supply and demand in the industry. For example, prices of sponges have tended to rise faster than the quantity of sponges supplied whenever the demand for the commodity increased. This is most vividly illustrated in Table 48 which shows the behavior of the industry during World War II. As an increase in demand caused sponge prices to go up rapidly during the war years, the quantity of the product supplied was very unresponsive to such price changes.

TABLE 48

ANNUAL PERCENTAGE CHANGE IN SPONGE
LANDINGS AND IN AVERAGE SPONGE PRICES,
1941-1946

Year	Sponge Landings in Pounds	Average Price per Pound in Dollars	Percentage Change in Landings from Previous Year	Percentage Change in Price from Previous Year
1941	231,000	3.66		
1942	201,000	6.79	-13	85
1943	184,000	9.24	- 8	36
1944	186,000	12.39	1	34
1945	192,000	13.27	3	7
1946	194,000	14.00	1	5

Source: Based on Table 10

The explanation of this situation lies in the fact that even if it is possible to increase the number of fishing outfits it is impossible to increase the size of the sponge population. As a matter of fact, as the number of fishing craft increases the entire level of the sponge population may go down, because competitive practices force fishermen to violate laws of conservation. An increase in the intensity of fishing effort, when applied to a fixed sponge population, will increase the cost of fishing, which implies a rather steep supply function for the industry as a whole. Fishermen will try to pass on such cost increases to the next buyer in the distribution channel. If each member in the channel succeeds in passing along his increased costs the final user will be faced with a higher price, which will further damage the product's market position and hurt the industry.

It is possible that fishermen will have to absorb any cost increases resulting from their attempts to increase sponge landings. If this happens fishermen's earnings and the returns on boat investment will have to go down. As fishermen's earnings and returns on boat investment decline labor and capital will be forced out of sponge fishing. This situation in turn will precipitate a shortage of fishing craft and personnel in the industry. It is obvious that with a reduction of operating units it will be almost impossible to attain wide distribution as suggested by Mr. Hugh Parker. In September, 1963, the Sponge and Chamois Institute in cooperation with the Bureau of Commercial Fisheries launched the Harrisburg experiment in order to test the possibility of increasing natural sponge sales through a more aggressive promotional effort. The city of Harrisburg, Pennsylvania, was selected as a sample, because the participating government personnel had good contacts in the city, and the city is located relatively close to the offices of the Bureau of Commercial Fisheries and the Sponge and Chamois Institute. The city also had a good mixture of ethnic and racial groups and was considered to be fairly good from the standpoint of available advertising media.¹

The test market operation lasted two weeks and consisted of the following specific steps. The two local newspapers, the Patriot News and the Evening News, with an estimated local newspaper coverage of 98 per cent spearheaded the promotion through editorial support. Spot announcements were developed and distributed to all eight radio stations in Harrisburg. Two local television stations, WHP and WTPA, gave the

¹Sponge and Chamois Institute, "Test Market Report," p. 7.

campaign extensive coverage and showed slides and the fourteen minute Bureau-produced film "Sponge - Treasure from the Sea." The same film was shown to all junior and senior high school students in Dauphin County. Also, 5,500 pamphlets featuring natural sponges were distributed to the students and attendants at the Meat Institute cooking school. The latter promotion was sponsored by the Meat Institute and the Patriot News and was attended by approximately 4,000 homemakers.¹

In addition, a young lady from Tarpon Springs acted as an "Ambassadress of Good Will" during the last three days of the campaign. Her activities included a television appearance, a speech at the Lions Club, a tennis match, an appearance at the Exchange Club where she presented the Lieutenant Governor with a wreath of sponges, and visits to several retail outlets. Newspaper representatives were with the "Ambassadress of Good Will" during all her appearances and gave appropriate newspaper coverage.

Table 49 shows the participating stores together with the amount of sponges that they purchased. Sponges were packed in poly bags and retailed for 99 cents. The cost to the retailer was 65 cents with shipment prepaid. In order to give the product wide exposure it was agreed that all sponges not sold by the end of November could be returned for a full refund.

Although the Harrisburg experiment was called a marketing test by its sponsors, it was merely a poorly organized promotional effort. The sole purpose of the Harrisburg experiment was to sell sponges rather than to attempt to determine cause and effect relationships

¹Ibid., p. 6.

which could lead to the development of a marketing plan. There was no hypothesis to be tested, nor were provisions made to control conditions pertinent to the testing of such a hypothesis. To the extent that the above conditions were not met the Harrisburg event cannot be called a marketing test.¹ Although Harrisburg is considered to be a fairly popular city,² authorities in marketing believe that there is no single market area which can be representative of the entire national market. According to Professor M. S. Heidingsfield there is no such place as a "Middle Town, U. S. A."³ To the extent that a local market area fails to be representative of the entire United States market any test findings cannot be projected as applicable to the national market.

As can be seen from Table 49 the campaign to sell sponges was less than successful. Although no information on the cost of the campaign is available, the amount of sponges sold would be a prima facie indication that the campaign failed to accomplish its objective. In its Test Market Report to the members of the industry the Sponge and Chamois Institute reached the following conclusion:

Lower priced synthetics sold much better than aggressively promoted natural sponges Regardless of the final results, this test market research and promotional campaign did not lack for advertising, promotion or merchandising.⁴

¹Harper W. Boyd and Ralph Westfall, Marketing Research (Homewood, Ill.: Richard D. Irwin, 1956), p. 80.

²"Test Marketing Goes Truly National," Sales Management, November 10, 1958, p. 28.

³Myron S. Heidingsfield and Frank H. Eby, Jr., Marketing and Business Research (New York: Holt, Rinehart & Winston, 1963), p. 138.

⁴Sponge and Chamois Institute, "Test Market Report," p. 26.

TABLE 49

SUMMATION OF SPONGE SALES IN HARRISBURG

Name of Store	Quantity Delivered (Pieces)	Number of Sponges Sold
Acme Food Stores	288	0
A. & P.	504	0
Food Fair	1,080	0
Town and Country Distributors	2,800	0
Rea and Derick Drugs	864	0
Peoples Drug Store	720	96
Joe the Motorist	720	25
Stanley Distributing Company	432	0
S. S. Kresge Company	432	27
F. W. Woolworth	288	24
G. C. Murphy Company	216	8
Joseph Caplan Drug Company	144	0
B. F. Goodrich Company	144	0
Restaurant Equipment Company	144	0
H. L. Green Company	144	52
Pomeroy's Department Store	144	0
Bowman's Department Store	144	0
Total	9,208	232

Source: Sponge and Chamois Institute, Bulletin, XXX (January 14, 1964), 3.

Even though the above paragraph does not show any cause and effect relationships it indicates that in addition to being price elastic, the product is also highly advertising inelastic. That is, a percentage increase in advertising expenditures leads to a smaller percentage increase in sales. This would suggest that attempts to differentiate the product within a general market may be a total waste of time, money, and effort.

One may hazard a guess that the Harrisburg experiment might have produced dissimilar results under a different promotional approach and

different timing. For example, had the promotion taken place in the spring rather than the fall season the results might have been more encouraging. It may be reasonably assumed that in northern climates more people would be willing to purchase sponges for cleaning and washing purposes in the spring rather than in the fall.

Distribution Structure

At present, the established pattern for distributing Florida-produced natural sponges consists of the following levels: fisherman to packer, packer to distributor, distributor to wholesaler or user, and wholesaler to user or retailer. This channel is rather long when compared to the distribution of synthetics and imports. It was pointed out that synthetics are sold directly from manufacturer to retailer, manufacturer to wholesaler, and manufacturer to distributor. Imports of natural sponges also move through a shorter channel, since their first contact in the domestic market is at the distributor level.

It was estimated during previous discussions that packers charge an average 25 per cent markup on cost. The markup added by distributors is estimated to be in the vicinity of 85 per cent. Judging by the Harrisburg experiment where sponges bought for 65 cents were sold for 99 cents, one may venture to say that an average retail markup would be around 52 per cent. This is close to the "normal" 50 per cent markup recommended for synthetic sponges by the National Retail Hardware Association in its Turnover Handbook.¹ Assuming these estimates to be fairly close to the actual practices of the businesses,

¹Letter from Dwayne Laws, Executive Vice-President of National Retail Hardware Assn., Indianapolis, Ind., March 17, 1965.

it is apparent that a sponge sold for \$1.00 by fishermen in Tarpon Springs would cost the user \$3.53. This is a rather high markup, but it is very hard to condemn. Because of the slow turnover rate of the product most middlemen would not carry it at all if the markup were low. As a matter of fact, the National Retail Hardware Association does not recommend the carrying of natural sponges because of their low turnover rate, and natural sponges are not even included in its Turnover Handbook.¹ The fact that distributors enjoy the highest markup in the channel is an indication that they are expected to do some aggressive selling and promoting of the product. The analysis of distributor operations in Chapter IV, however, indicates that a "push" strategy by the distributors could not be expected to succeed in view of the nature of the product lines carried by them.

One may consider the possibility of packers selling sponges directly to users as a device to reduce certain markups and trim prices at the user level; however, this suggestion would not be practical for two reasons. First, the discussion on packers in Chapter IV indicates that these businessmen have neither the financial resources nor the talent to undertake such an operation. Direct selling by packers would require that they finance larger inventories, tie up some additional funds in accounts receivable, and be prepared to cope with collection problems. Most users are located in the North and are accustomed to placing small orders by telephone and obtaining immediate delivery. It would be difficult to satisfy these needs from Florida, and the adoption of such a policy might be the last straw in

¹Ibid.

TABLE 50

SPONGE PURCHASES FOR 1963 BY ELEVEN PACKING FIRMS
IN TARPON SPRINGS, FLORIDA

Total Assets of Firm in Thousands of Dollars	Purchases in Dollars
75-125	150,031.79
75-125	139,413.96
35- 50	39,963.00
35- 50	19,680.00
20- 35 . . . . .	..
10- 20	7,800.46
5- 10	2,672.15
5- 10 . . . . .	..
5- 10 . . . . .	..
..	980.00
..

Source: Firm assets from Dun and Bradstreet. Firm purchases from survey of packers in Tarpon Springs, Fla., by the author, July, 1964.

making all users shift to synthetics. Second, an attempt to sell directly to users would most probably cause the packers to lose the entire market, since distributors are in a better position to retaliate by promoting both imported and artificial sponges.

Finally, the preceding paragraphs have indicated that in view of the limited supply function in the short run and the fact that the level of supply is very unreliable in the long run it would be economic folly to invest money in the declining sponge industry. The experiences of 1937 and 1949 are too fresh to forget.

Product Trend

One may deduce from the Harrisburg experiment that the natural sponge has no distinct image in the minds of the users. It may be possible to create an image for the product, but this is not very likely to succeed for two reasons. First, if the Harrisburg test is

any indication, the amount of funds required to accomplish such an undertaking would be prohibitively large. The second reason is the fact that the product does not possess any distinct advantages to differentiate it in the minds of the users to overcome the substantial price difference vis-a-vis the synthetics.

In addition to facing direct competition from synthetics, natural sponges have been adversely affected by improvements in other industries. For example, lithographers were once one of the best markets for selling natural sponges, but in recent years they have shifted to the use of zinc rather than stone plates.¹ This innovation has obviated the need to scrub stone plates with sponges. Spray paints have greatly reduced the consumption of sponges by painters. Before the introduction of sprays the average paint wholesaler bought 1,500 pieces of natural sponges a year. Spray paints have reduced this amount to 50 pieces annually.² At present, window and car washers are among the best customers of natural sponge distributors, but one would not be too far afield to venture that innovations, such as automatic car washing, will make inroads in these areas in the not so distant future.

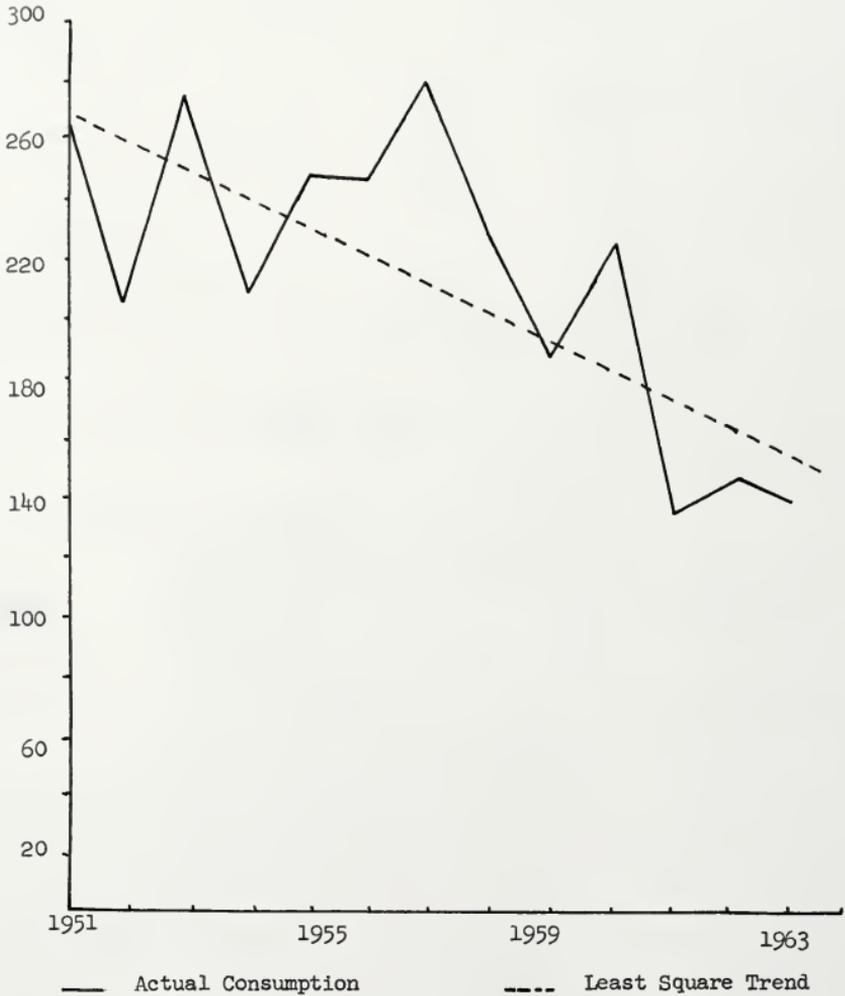
Figure 21 indicates the overall picture of the natural sponge in regard to its consumption. It depicts the trend of the product since 1951, a time which may be considered as a period of relative normalcy after the blights of 1937 and 1949. This estimate assumes that all imported and domestically produced natural sponges within any year

¹Interview with Robert Sinenberg, November, 1964.

²Interview with Edward Riley, November, 1964.

constitute the annual consumption of the product for that year. The projected trend will deviate from specific annual figures in the future; however, it does indicate the general direction of natural sponge consumption. Of course, a projection based on historical experience will not be valid if unpredictable factors, such as innovations or changes in user tastes and preferences, upset the assumptions inherent in the historical data. Historical precedent supplemented by logic would indicate that such trend disturbing forces are not likely to upset the trend of the natural sponge in its present market. As a matter of fact, if the present trend continues sponge consumption will cross the horizontal axis in a little over twenty years (again see Figure 21). It is obvious that the future of the Florida sponge industry is rather gloomy unless certain basic changes are effected in order to pull the industry out of its secular decline.

Figure 21. Least Square Straight-Line Trend of Natural Sponge Consumption in the United States



Source: Based on Table 51.

TABLE 51
 COMPUTATION OF LEAST SQUARES STRAIGHT-LINE
 TREND OF NATURAL SPONGES

Year	Apparent Consumption				
N	Y	X	X ²	XY	Ye
1951	267,800	-6	36	-1,606,800	271,562
1952	203,000	-5	25	-1,015,000	261,932
1953	275,300	-4	16	-1,101,200	252,302
1954	206,207	-3	9	-618,621	242,672
1955	250,648	-2	4	-501,296	233,042
1956	247,107	-1	1	-247,107	223,412
1957	282,950	0	0	0	213,782
1958	220,444	1	1	220,444	204,152
1959	189,275	2	4	378,550	194,522
1960	223,811	3	9	671,433	184,892
1961	134,305	4	16	537,220	175,262
1962	140,199	5	25	700,995	165,632
1963	138,126	6	36	828,756	156,002
Total	2,779,172	0	182	-1,752,626	

$$a = \frac{\sum Y}{N} = 213,782$$

$$b = \frac{\sum XY}{X^2} = -9630$$

Source: Based on Table 39

CHAPTER VIII

RECOMMENDATIONS

The objective of the combined descriptive and analytical work in the preceding chapters was to establish the basis and lay the groundwork for the following advisory paragraphs. This final chapter purports to indicate possible future alternative courses of action for the sponge industry. Since the existence of clearly defined objectives is of paramount importance in recommending courses of action, it is appropriate to reiterate that from the outset the concern of this study has been limited to the sponge industry within the State of Florida. Therefore, the main objective of the suggested courses of action is to maximize those interests of the sponge industry that lie within the political jurisdiction of Florida.

Marketing

At present, the sponge interests in Florida see increased production as the sole remedy for their problem.¹ No one within the industry is concerned about the marketing element. The only consciously applied marketing effort in the industry's history was the afore-mentioned abortive Harrisburg experiment. Even then one can easily deduce that the Harrisburg test tried to sell rather than market natural sponges.

¹Interview with Louis Smitzes, July, 1964.

Selling involves promoting the product through the use of salesmen and advertising; however, selling is only one of the many functions of marketing.¹ Unlike selling, which is primarily volume oriented and seeks to promote the interests of the seller, marketing is concerned primarily with the attainment of the firm's objectives through the satisfaction of customer needs.² It is almost impossible to gratify customer needs without making a conscious effort to find out why customers purchase a certain product and what contribution that particular product can make toward the solution of the customers' personal problems. It was pointed out in the previous chapter that the objective of the Harrisburg test was to increase sponge sales. This, of course, is a rather limited viewpoint, since sales cannot be increased in a vacuum. The objective of a marketing experiment should be the discovery and measurement of factors and variables that, if properly manipulated, could lead to better profits and increased user satisfaction simultaneously.

The preoccupation with production at the expense of marketing is typical of many unprofitable and declining industries and product categories.³ The previous analysis of the sponge industry indicates that increased production is not the answer to the problems of the Florida natural sponge industry.

¹E. Jerome McCarthy, Basic Marketing (Homewood, Ill.: Richard D. Irwin, 1964), p. 17.

²Ibid., p. 16.

³Theodore Levitt, "Marketing Myopia," Harvard Business Review, XXXVIII (July-August, 1960), 45-56.

The distribution pattern of natural sponges in the United States has not changed almost since the inception of the industry. Members of the distribution channel at all levels have not changed their selling methods and customary markups in spite of the dramatic changes that have taken place during the last two decades. It was pointed out previously that supply shortages prompted many users to shift to synthetics. Having the benefit of hindsight, it is easy to observe that constant product improvements and lower prices were bound to increase the market penetration of synthetic sponges at the expense of the natural product.

It is obvious that such errors committed in the past coupled with the physical and environmental limitations of the present have resulted in little promise for natural sponges in their current market. According to distributor opinions, which seem to have been substantiated by actual events, an absorbing commodity is considered a shopping good by many users.¹ However, since there can be no automatic classification for a product, some users, especially household users, might look at the product as an impulse item.² Since shopping goods have many good substitutes, most users are motivated by price alone, and this is an area where natural sponges cannot compete with synthetics. To be sure, there are still some users, such as window washers, who through experience in use consider the product to be a specialty good, but distributors almost unanimously agree that this attitude is changing rapidly because of the constant product improvements in the synthetic sponge industry.³

¹Interview with Edward Riley, November, 1964.

²McCarthy, p. 393.

³Interview with Robert Sinenberg, November, 1964.

Since natural sponges are unable to compete with synthetics in their present market, it follows that the marketing efforts of the sponge industry should be aimed toward the creation of a new market. A new market with an inelastic demand would take the product out of price competition and transfer it from a category of shopping goods to that of a specialty good. More specifically, a market segmentation strategy appears to be the best insurance for the future of the industry. This implies that the present production preoccupation of the sponge industry should change to an emphasis on marketing. Successful implementation of a market segmentation strategy presupposes the selection of a target market and the selection of appeals which can be most successfully employed in catering the product to the target customers.

A strategy of market segmentation is based on the assumption that by gearing marketing effort to the satisfaction of hitherto unmet or neglected consumer requirements it is possible to achieve substantial penetration in market segments that are effectively defined. Definitions of market segments could be based either on physical or psychological factors. In defining market segments, care should be exercised in capitalizing on a supplier's special advantages, such as location, tradition, and product, that might give him leverage in catering effectively to the desires of certain market segments.¹ By recognizing and exploiting successfully defined market segments, it is

¹William Lazer and Eugene J. Kelley (ed.), Managerial Marketing: Perspectives and Viewpoints (Homewood, Ill.: Richard D. Irwin, 1962), p. 39.

possible for a product to attain a more secure market position and greater overall stability.¹

Since the days of Adam Smith it has been an accepted economic principle that division of labor depends on the magnitude of a given market.² For example, the present elongated distribution channel for natural sponges evolved during the market growth period of the industry. If an expanding distribution channel is the usual development during the growth stages of an industry, it may be logical to assume that the distribution channel should contract in a declining industry. Any contraction in the sponge industry should be at the distributor level, since previous analysis has indicated that the interests of distributors are not necessarily compatible with the interests of spongers operating in Florida. The elimination of distributors will take sponges out of competition in the national market. Furthermore, it was pointed out that high production costs and intermittent supplies preclude any possibilities of successful mass selling. All these factors point to the conclusion that future marketing efforts should be aimed at a market within a rather narrow geographical location, which is not price conscious, which may have growth possibilities in the future, and which can be reached with a minimum of promotional effort in view of the industry's limited financial resources.

¹Wendell R. Smith, "Product Differentiation and Market Segmentation as Alternative Marketing Strategies," Journal of Marketing, July, 1956, p. 8.

²Paul A. Samuelson, Economics (3rd ed.; New York: McGraw-Hill Book Co., 1955), p. 44.

The tourists visiting Florida seem to meet all the requirements mentioned above.¹ The geographical dimensions of the tourist market are narrow compared to the national market, since by definition they are tourists visiting Florida. Most tourists visiting the state are in a mood to purchase many souvenirs and other curios, such as coconuts and various articles made of shells, without much regard for price. For example, in 1963 tourists spent \$182,369,214 in buying souvenirs in Florida. This category has been rising constantly as can be seen in Table 52. Since tourist expenditures are closely related to the levels of general prosperity, constantly rising income levels should further increase the expenditures of this group in the future. It can be seen from Table 52 that tourism has been a growing industry in Florida. This is in sharp contrast with the declining trend of the sponge industry. The examination and analysis of all pertinent factors in this study indicate that the domestic sponge industry has been constantly losing ground to substitute products in its present market. One can assume that the product may not have sufficient economic value to justify the continuation of industry efforts to serve its historical market. Abandoning the presently served market and concentrating on attracting the tourist market may be a more fruitful way to utilize the capital and manpower of the Florida sponge industry. Furthermore, this tourist market can be easily reached, since most visiting tourists have already been presold on Florida. It is obvious that the tourist market presents distinct opportunities for those who recognize its existence and are prepared to serve it.

¹The idea of exploiting the Florida tourist market originated during a discussion with Dr. Carter C. Osterbind, Director of the Bureau of Economic and Business Research, University of Florida.

TABLE 52

NUMBER OF TOURISTS, TOURIST EXPENDITURES, AND TOURIST EXPENDITURES
FOR GIFTS AND SOUVENIRS, SELECTED YEARS, 1929-1963

Year	Number of Tourists	Tourist Expenditures (Dollars)	Expenditures for Gifts and Souvenirs (Dollars)
1929	1,925,000	215,000,000	..
1939	2,600,000	291,000,000	..
1949	4,700,000	825,000,000	..
1959	11,300,000	1,767,562,843	..
1960	10,794,842	1,855,417,443	..
1961	12,840,230	2,043,266,000	147,728,117
1962	13,010,389	2,244,776,500	160,851,342
1963	14,208,279	2,522,396,000	182,369,214

Source: Florida, Development Commission, Tourist Service Division, Florida Tourist Study, 1963 and Florida Handbook, 1963-1964, comp. Allen Morris (Tallahassee, Fla.: Peninsular Publishing Co., 1963).

Implementation

Once the objective of catering to the Florida tourist market has been adopted two different approaches are suggested to accomplish this purpose. First, the product can be sold to tourists throughout Florida as a souvenir unique to the State of Florida. Second, the uniqueness of the sponge fisheries can be used to advantage in developing more tourist trade for the entire community of Tarpon Springs.

In order to sell sponges as Florida souvenirs it is suggested that a sponge fishermen's cooperative be formed. It is an old maxim in marketing that one can eliminate a middleman but not his functions. The geographical dimensions of the market and the limited number of retail outlets selling curios and souvenirs may make it possible to eliminate some of the middlemen. By availing itself of professional

advice such a cooperative could sell directly to the various curio shops in Florida through the use of traveling salesmen. In view of the number of such stores located in the state (see Table 53), this activity could be performed at a reasonable cost by a single salesman. In addition, the cooperative should engage in some sort of product development through finding imaginative applications and forms for sponges. For example, sponges might be used in a similar fashion to coconuts and shells in constructing souvenir Indian beads, marine sceneries, et cetera. The use of marketing research or simple brain storming may prove to be of great value in discovering new ideas.

Since fishermen have limited financial means, the most logical promotion should be based on a pushing policy. This would imply allowing selling outlets generous markups in order to provide them with an incentive to promote the product through proper displays, billboards, and other forms of advertising.

In addition, attempts may be made to have Florida sponges listed in the catalogs of trading stamp companies. Properly merchandised in trading stamp catalogs, natural sponges may be made appealing to campers, automobile owners, and homemakers. Arranging to have Florida sponges given away by automobile dealers to their favored customers may be another potential with great promise. A sponge worth a few dollars is not a large cost item to a dealer who has just sold a car worth several thousand dollars. All these approaches fall within the recommended market segmentation strategy and are means for isolating the product from direct price competition.

It may be more realistic, although not ideal, to have the above suggestions implemented by the Tarpon Springs Sponge Exchange instead

TABLE 53

NUMBER OF SOUVENIR AND GIFT SHOPS IN FLORIDA

County	Number of Stores
Broward	54
Dade	86
Duval	21
Manatee	11
Orange	14
Palm Beach	25
Pinellas	49
Polk	17
Sarasota	14
Volusia	17
Total	308 ^a

Source: U. S., Department of Commerce, County Business Patterns, First Quarter, 1962.

^aThere was a total of 399 souvenir and gift shops reported for the State of Florida; however, adding the number of such shops given for each county results in a discrepancy of 91 shops.

of forming a fishermen's cooperative, because any approach to eliminate packers is bound to receive their resistance. In view of their influence in the local community, packers acting as a group may negate the entire idea of creating a new market if they think their role in the selling of sponges is to be eliminated.

In using the sponge industry to develop the area as a tourist attraction it may be possible to elicit the cooperation of the local community. The citizens of Tarpon Springs already recognize the importance of the sponge industry in attracting tourists to the area;¹ however, little organized effort is made by local interests to increase tourist trade for the area by capitalizing on this unique

¹Tarpon Springs (Fla.) Chamber of Commerce, The Tarpon Springs Sponge Industry, Largest in the World, p. [4].

industry of the state. At present, the tourist traveling in a north-south direction on highway U. S. 19 is the most likely prospect to stop and spend a few dollars in Tarpon Springs. The billboards advertising the Tarpon Springs sponge docks do not start until one has almost reached the city limits, and their size is much smaller than the size of other billboards competing for the motorists' attention. Beginning at a distance from Tarpon Springs, by placing large posters on main traffic arteries at frequent intervals it may be possible to get more tourists interested in visiting the city. Tourist interest can further be stimulated by emphasizing the uniqueness of the sponge industry and the foreign-country atmosphere of the community. A sharply differentiated community image will most likely attract more tourists to the area. Advertising and publicity efforts that use the sponge industry as a theme in order to attract tourists will also indirectly increase the sale of sponge souvenirs in Florida because of an increase in tourist awareness of the product. Although awareness is not synonymous with sale, one may assume that the higher the impact made by an advertisement the greater is the possibility of that advertisement producing sales.¹

Production

Chapter II described the concept of stable equilibrium in the sponge fisheries and pointed out that the present relatively high earnings of fishermen and craft owners are the result of restricted fishing effort. Under normal circumstances, fisheries do not offer much

¹Heidingsfield, p. 130.

opportunity for profit.¹ Professor Harden F. Taylor attributes the inability of fisheries to make profits to their common property nature.

This backwardness of the fisheries industry may well be explainable by its odd nature, in which it stands alone, as an incongruous mixture of communism and capitalism. It is communistic in the non-private or public ownership and political control and regulation of the source, but capitalistic in the ownership of the tools of production and freedom of enterprise, and individualistic in the detached and isolated lives that rival fishermen live, much of the time at sea.²

Firms or individuals in the sponge fisheries have no legal title to the natural resource. Although from a social viewpoint such natural resources are scarce, they are free goods for individual fishermen. The communistic nature of the sponge fisheries leads to wasteful competition through an overexpansion of the fishing fleet, which in turn tends to put a squeeze on profits and results in needless wastage of the sponge beds as was explained in Chapter II.

The fact that industries exploiting natural resources cannot remain profitable unless properly regulated can best be demonstrated by drawing an analogy between the sponge fisheries and the petroleum industry. Although a person may own the piece of land on which an oil well is built, he usually shares the subsurface natural resource, petroleum, with his neighbors.³ Since each surface owner has unlimited access to the subsurface natural resource, in the absence of

¹Harden F. Taylor, Survey of Marine Fisheries of North Carolina (Chapel Hill: University of North Carolina Press, 1951), p. 304.

²Ibid., p. 311.

³Vernon A. Mund, Government and Business (2d ed.; New York: Harper & Bros., 1955), p. 638.

regulation he is impelled to drill as many wells as possible to retrieve the oil and gas before someone else can get it.¹ In the past this common-property nature of petroleum has resulted in an over-expansion of productive facilities and unnecessary wastage of petroleum. The situation was not rectified until all the principal oil-producing states and the Federal Government decided to regulate and limit the production of petroleum.²

This would suggest that a deliberate restriction of supply would be in the interest of fishermen, and it would tie in perfectly with the recommended strategy of market segmentation.

It is not likely that packers will be receptive to this suggestion, since an inadequate level of landings appears to be their main problem. Dollar volume is a function of quantity and price. Under the recommended marketing strategy packers may be able to attain or go beyond their break-even volume at lower levels of sponge landings if higher prices can be commanded from the newly aimed market.

Sustained adequate earnings will also solve the industry's perennial problem of a labor shortage. By assessing operating units in return for granting a fishing permit, a controlling body, such as the Tarpon Springs Sponge Exchange or a fisherman's cooperative, can build up a fund which may be used to train the needed number of divers and other operating personnel.

Adjustments

The suggested courses of action will require some adjustments at the various levels of the sponge industry, but under the above

¹Ibid.

²Ibid., p. 639.

recommendations such changes will be relatively painless. The discussion of distributors has demonstrated that those firms are adjusting to the idea that natural sponges are in a decline. This situation is reflected by their present policies. Since natural sponges have become a relatively unimportant element in their product mix, a restriction of sponge landings is not likely to hurt them a great deal.

The same is true for sponge producers at the present level of craft and personnel. The limited number of operating units makes the present a very opportune time to apply the above recommendations. The demands for importing more divers are based feeling rather than analysis. The importation of additional divers is not likely to solve any problems, and it will undoubtedly make any future adjustments more painful.

Under the proposed remedial policies certain packers may have to accept some changes. It is possible that their business may improve in spite of reduced landings, but this will depend largely on the price level that the product will command from its newly created markets. In all likelihood some packers may cease to be packers in the literal sense of the word; however, this should not be a very painful adjustment since at present only three firms qualify as bona fide packers. The rest, whether they admit it or not, have been in the process of adjusting their businesses to the pressures of unalterable economic forces for a long time.

To be sure, the above suggestions are merely hypotheses which generated from the analysis of the secondary and primary data collected during the course of this study. Their implementation may not remedy the ills of the Florida sponge industry. The validity of

these hypotheses should be tested before making a total commitment to sell natural sponges exclusively to Florida tourists and to develop the Tarpon Springs area as a tourist attraction by capitalizing on the sponge fleet. No reliable marketing plan can be developed without empirically testing the importance that should be placed on the various elements in the marketing mix. These factors can only be explored through further experimental research involving the expenditure of substantial amounts of money which were not available to the author of this study.

A P P E N D I C E S

APPENDIX A

TRANSLATION FROM GREEK OF INTERVIEW GUIDE USED IN INTERVIEWING
CRAFT CAPTAINS IN TARPON SPRINGS, FLORIDA

CRAFT

1. Name _____
2. Length _____
3. Tonnage _____
4. Age _____
5. Price at which owner
would consider selling
craft _____
6. Market value of equipment _____

PERSONNEL

7. Number of crew _____
8. Number of owners or
partners in crew _____
9. Age and nationality of
divers _____

OPERATIONS

10. Method of fishing Hooking _____ diving _____
11. Approximate number of
days spent in fishing _____
12. Approximate number of
hours worked per day
while fishing _____
13. Distance of grounds
fished from shore _____
14. Value of landings in 1963 _____

OPERATING COSTS IN 1963

15. Fuel and oil _____
16. Food and supplies _____
17. Diving suits _____
18. Boat painting and repair _____
19. Engine repair _____
20. Annual depreciation _____

APPENDIX B

TRANSLATION FROM GREEK OF INTERVIEW GUIDE USED IN INTERVIEWING
SPONGE PACKERS IN TARPON SPRINGS, FLORIDA

1. Name of firm _____
 2. Legal form of business _____
 3. Number of years in business _____
 4. Member of Tarpon Springs
Sponge Exchange Yes _____ No _____
 5. Engaged in business
other than sponge packing Yes _____ No _____
 6. If yes, type of such business _____
 7. Sponge sales as a percentage
of total sales _____
 8. Total number of employees Full-time _____ Part-time _____
 9. Number of employed relatives Full-time _____ Part-time _____
 10. Type of employment Clerical _____ Other _____
 11. Average employee wages Hour _____ Week _____ Month _____
 12. List five most important sponge buyers (distributors)
- | <u>Name of firm</u> | <u>Location</u> | <u>Average volume purchased</u> |
|---------------------|-----------------|---------------------------------|
| a. | | |
| b. | | |
| c. | | |
| d. | | |
| e. | | |
13. Estimated material cost of
packing a bale. _____

14. Is there any seasonality in selling sponges? Yes _____ No _____
15. What are your annual sponge sales on the average Dollars _____ Pounds _____
16. Are sponge clippings a total waste? Please explain.

17. Importance of government in the sponge market.
- Federal _____

- State _____

- Other _____
18. What do you think of the sponge legislation recently enacted by the Florida Legislature?
19. Estimated investment in: Land _____
 Building _____
 Equipment _____
20. In your opinion how can the sponge industry be improved?

B I B L I O G R A P H Y

BIBLIOGRAPHY

Public Documents

- Florida. Development Commission, Tourist Service Division. Florida Tourist Study, 1963. 1964.
- Florida. State Board of Conservation. The Conservation Law. Revised and indexed by Greene S. Johnston, Jr., 1935.
- Florida. State Board of Conservation. Ninth Biennial Report, 1949-1950. 1950.
- Florida. State Board of Conservation. Second Biennial Report, Biennium Ending June 30, 1936. 1936.
- Florida. Statutes (1914). c. 253.692.
- Florida. Statutes (1963). c. 370.162.
- U. S. Bureau of Commercial Fisheries. Florida Landings. January, 1961-October, 1964.
- U. S. Bureau of Commercial Fisheries. United States Fisheries, 1962. C. F. S. No. 3471, Annual Summary.
- U. S. Congress. The Fish and Fisheries of the Coastal Waters of Florida. Document No. 100. 54th Cong., 2d Sess., 1897.
- U. S. Congress. Trade Expansion Act of 1962. U. S. Code Congressional and Administrative News. 87th Cong., 2d Sess., 1962.
- U. S. Congress. House of Representatives. House Miscellaneous Reports IV. House Report 2120. 81st Cong., 2d Sess., 1950.
- U. S. Department of Commerce. County Business Patterns. First Quarter, 1962.
- U. S. Department of Commerce. Foreign Commerce and Navigation of the United States. 1934-1944.
- U. S. Fish and Wildlife Service. U. S. Fishery Statistics. 1937-1962.
- U. S. Tariff Commission. Annotated Tariff Schedules of the United States. 1945-1948, 1954-1963.

Books

- Bennett, Robert B. Background Information for Voluntary Grade Standards on Natural Sponges. (U. S. Fish and Wildlife Service Special Scientific Report, Fisheries No. 273.) Washington: U. S. Government Printing Office, 1958.
- Blodgett, Ralph H. Our Expanding Economy. New York: Rinehart & Co., 1955.
- Boulding, Kenneth E. Economic Analysis. 3rd ed. New York: Harper & Bros., 1955.
- Boyd, Harper W., and Westfall, Ralph. Marketing Research. Homewood, Ill.: Richard D. Irwin, 1956.
- Cobb, John N. The Sponge Fishery of Florida in 1900. (U. S. Commission of Fish and Fisheries extract from U. S. Fish Commission Report for 1902.) Washington: U. S. Government Printing Office, 1903.
- Dawson, Charles E., Jr. A Survey of the Tampa Bay Area. (Florida Board of Conservation Technical Series No. 3.) Tallahassee, Fla.: Florida Board of Conservation, 1953.
- Dun and Bradstreet. Reference Book, 1964. New York: Dun & Bradstreet, 1964.
- Florida Handbook, 1963-1964. Compiled by Allen Morris. Tallahassee, Fla.: Peninsular Publishing Co., 1963.
- Frantzis, George. Strangers at Ithaca. St. Petersburg, Fla.: Great Outdoors Publishing Co., 1962.
- Galtsoff, Paul S. Sponges. (U. S. Fish and Wildlife Service Fishery Leaflet 490.) Washington: U. S. Government Printing Office, 1960.
- Gitlow, Abraham L. Labor Economics and Industrial Relations. Homewood, Ill.: Richard D. Irwin, 1957.
- Heidingsfield, Myron S., and Eby, Frank H., Jr. Marketing and Business Research. New York: Holt, Rinehart & Winston, 1963.
- Idyll, Clarence P. How Can Statistics Increase the Catch? (Florida Board of Conservation Educational Series No. 3.) Coral Gables, Fla.: Marine Laboratory, University of Miami, 1949.
- Kahn, Richard A., and Sandven, Lois B. Sponge Production and International Sponge Trade of the United States. (U. S. Fish and Wildlife Service Fishery Leaflet 170.) Washington: U. S. Government Printing Office, 1946.

- Lazer, William, and Kelley, Eugene J. (ed.) Managerial Marketing: Perspectives and Viewpoints. Homewood, Ill.: Richard D. Irwin, 1962.
- Leftwich, Richard H. The Price System and Resource Allocation. New York: Holt, Rinehart & Winston, 1961.
- Marine Laboratory, University of Miami. Survey of the Sponge Grounds North of Anclote Light. Tallahassee, Fla.: Florida Board of Conservation, 1948.
- Mark 15:36
- Marshall, Alfred. Principles of Economics. 8th ed. London: Macmillan Co., 1922.
- McCarthy, E. Jerome. Basic Marketing. Homewood, Ill.: Richard D. Irwin, 1964.
- Mund, Vernon A. Government and Business. 2d ed. New York: Harper & Bros., 1955.
- Murray, A. T. The Iliad. Cambridge: Harvard University Press, 1935.
- Murray, A. T. The Odyssey. Cambridge: Harvard University Press, 1931.
- Osterbind, Carter C., and Pantier, Robert A. Economic Study of the Shrimp Industry in the Gulf and South Atlantic States. Gainesville, Fla.: Bureau of Economic & Business Research, University of Florida, 1965.
- Osterbind, Carter C. Florida's Commercial Fisheries: Markets, Operations, Outlook. (State Economic Studies No. 7.) Gainesville, Fla.: Bureau of Economic & Business Research, University of Florida, 1955.
- Ovenden, A. E. Costs of Earnings Investigations of Primary Fishing Enterprises. (FAO Fisheries Study No. 10.) Rome: Food and Agriculture Organization, 1961.
- Samuelson, Paul A. Economics. 3rd ed. New York: McGraw-Hill Book Co., 1955.
- Sloan, Harold S., and Zurcher, Arnold J. A Dictionary of Economics. New York: Barnes & Noble, 1958.
- Smith, Hugh M. Notes on the Florida Sponge Fishery in 1899. (House Documents, Bulletin of the U. S. Fish Commission, Vol. XIX for 1899.) Washington: U. S. Government Printing Office, 1901.
- Spencer, Milton H., and Siegelman, Louis. Managerial Economics. Homewood, Ill.: Richard D. Irwin, 1959.

- Storr, John F. Ecology of the Gulf of Mexico Commercial Sponges and Its Relation to the Fishery. (U. S. Fish and Wildlife Service Special Scientific Report, Fisheries No. 466.) Washington: U. S. Government Printing Office, 1964.
- Storr, John F. The Sponge Industry of Florida. (Florida Board of Conservation Educational Series No. 9.) Coral Gables, Fla.: Marine Laboratory, University of Miami, 1957.
- Stuart, A. H. World Trade in Sponges. (U. S. Department of Commerce Industrial Series No. 82.) Washington: U. S. Government Printing Office, 1948.
- Taylor, Harden F. Survey of Marine Fisheries of North Carolina. Chapel Hill: University of North Carolina Press, 1951.
- Thomas' Register of Manufacturers, 1964. New York: Thomas Publishing Co., 1964.
- Tierney, J. Q. The Sponge Industry of Florida. (Florida Board of Conservation Educational Series No. 2.) Coral Gables, Fla.: Marine Laboratory, University of Miami, 1949.

Articles and Periodicals

- "Caisson Disease," National Encyclopedia, 1945 ed., II, 346.
- "Florida Citrus Sets Three-Year Holding Campaign," Advertising Age, XXXIV (May 20, 1963), 101.
- Harris, J. E. "Sponge Fishermen of Tarpon Springs," National Geographic Magazine, XCL (January, 1947), 119-136.
- Huttner, Matthew. "Deep Water Farmers," Argosy, CCCXIII (December, 1946), 28-30.
- Key, Alexander. "Treasure on the Ocean Floor," Saturday Evening Post, CCXIV (June 20, 1942), 12-13.
- Levitt, Theodore. "Marketing Myopia," Harvard Business Review, XXXVIII (July-August, 1960), 45-56.
- Moore, H. F. "The Commercial Sponges and the Sponge Fisheries," Proceedings of the Fourth International Fishery Congress: Organization and Sessional Business, Papers, and Discussions (U. S. Department of Commerce and Labor, Bulletin of the Bureau of Fisheries, Vol. XXVIII, Part I of 1908 / Washington: U. S. Government Printing Office, 1910/), 399-585.
- Munroe, Kirk. "Sponges and Spongers," Scribner's Magazine, XXII (November, 1892), 628-639.

- Peattie, D. C. "From Tarpon Springs to Tub," Nature Magazine, IV (January, 1929), 43-45.
- Smith, Wendell R. "Product Differentiation and Market Segmentation as Alternative Marketing Strategies," Journal of Marketing, July, 1956, pp. 3-8.
- Sponge and Chamois Institute. Bulletin. Vols. XXX-XXXI. New York: Sponge & Chamois Institute, 1963-64.
- "Sponge Profits in a Squeeze," Chemical Week, IXC (October 27, 1962), 43-51.
- "Sponge," National Encyclopedia, 1945 ed. IX, 352-353.
- "Sponges," Encyclopaedia Britannica, 1963 ed., XXI, 248-255.
- "Sponges for War," Business Week, April 10, 1943, pp. 30-31.
- Stephens, William M. "A Remarkable Animal - The Sponge," Sea Frontiers, X (February, 1964), 15-23.
- Stuart, A. H. "Synthetic Sponges, Sweden, United Kingdom, and the Netherlands," World Trade in Commodities, VII, Part XVIII, Special Products, No. 15 (August, 1949), 1-4. (U. S. Department of Commerce, Office of International Trade Publication.)
- "Test Marketing Goes Truly National," Sales Management, November 10, 1958, pp. 28-36.
- Vokos, N. "Greek Sponge Fishing," Trade with Greece, V (July, 1964), 29-34. (Quarterly Journal of Athens Chamber of Commerce and Industry.)

Pamphlets and Reprints

- Cellulose Sponge Institute. An Absorbing Story. N.p.: Cellulose Sponge Institute, n.d. (Unpagged.)
- Kahn, Richard A. "Is the Natural Sponge Fishery Doomed by Synthetic Sponges?" Proceedings of the Gulf and Caribbean Fisheries Institute, Third Annual Session. N.p., November, 1950. (Unpagged reprint.)
- Kahn, Richard A. The Legislative Situation on Sponges. N.p.: U. S. Fish and Wildlife Service, Branch of Commercial Fisheries, n.d. (Unpagged.)
- Tarpon Springs (Fla.) Chamber of Commerce. The Tarpon Springs Sponge Industry, Largest in the World. Tarpon Springs, Fla.: Tarpon Springs Chamber of Commerce, n.d. (Unpagged.)

Unpublished Material

- Lewis, Cladin. "A History of the Sponge Industry of Florida." Unpublished Master's thesis, Stetson University, 1934.
- Lovejoy, Gordon Williams. "The Greeks of Tarpon Springs." Unpublished Master's thesis, University of Florida, 1938.
- Pinellas County, Florida. F. E. R. A. Project No. 52-F2-31. (Type-written.)
- Protcs, George D. "The Sponge Industry of Tarpon Springs." Unpublished paper in the files of P. K. Yonge Library of Florida History, University of Florida, n.d. (Typewritten.)
- Sage, Fred K. "Sponge Industry Summary Report." Pinellas County, Fla., C. W. A. Project 52-89. (Mimeographed.)
- Sponge and Chamois Institute. "Test Market Report." A report to the members prepared by the Sponge and Chamois Institute, New York, 1963. (Mimeographed.)
- "A Survey of the Sponge Industry." F. E. R. A. Project No. 52-7-31. (Typewritten.)
- Writers' Program. "Sponge Industry in Florida." Unpublished paper in the files of the P. K. Yonge Library of Florida History, University of Florida, n.d. (Typewritten.)

Letters

- Abersfeller, H. S., General Services Administration Commissioner, Washington, D. C. January 19, 1965.
- Cohen, Edward M., Second Secretary of the American Embassy in Athens, Greece. November 17, 1964.
- Hadraba, Theodore J., Counselor of Embassy for Commercial Affairs of the American Embassy in Rome, Italy. November 20, 1964.
- Iltter, Canip, Director of the Fourth Department of the Turkish Ministry of Commerce in Ankara, Turkey. January 5, 1965.
- Kerby, Peter G., Production Vice-President of Nylonge Corp., New York. December 28, 1964.
- Lane, George M., American-Vice Consul in Aleppo, Syrian Arab Republic. December 29, 1964.
- Laws, Dwayne, Executive Vice-President of National Retail Hardware Assn., Indianapolis, Ind. March 17, 1965.

- Lillig, Arthur C., Commercial Attache of the American Embassy in Ankara, Turkey. November 20, 1964.
- Lynam, T. G., Household Specialties of E. I. du Pont de Nemours & Co., Wilmington, Del. January 4, 1965.
- Parker, Hugh, Vice-President of J. Walter Thompson Co., to Theodore Cantouris, a sponge distributor. August 27, 1963.
- Robinson, Leslie, Commodity-Industry Analyst for U. S. Tariff Commission, Washington, D. C. February 25, 1965.
- Schneider, T. A., Sales Manager of Chemical Division of General Mills, Inc., Kankakee, Ill. January 8, 1965.
- Smith, William E., Cellulose Sponge Institute, Chicago. December 10, 1964.
- Weisert, John C., Commercial Attache of the American Embassy in Beirut, Lebanon. January 4, 1965.

Interviews

- Albee, E. R., District Sales Representative, General Mills, Inc., Atlanta, Ga. January 28, 1965.
- Arfaras, George, owner of George Arfaras Packing Firm, Tarpon Springs, Fla. May-July, 1964.
- Cohn, Milton, President of Gulf and West Indies Co., Inc., New York. November 18-20, 1964.
- Frantzis, George, President of Sponge Industry Improvement Committee, Tarpon Springs, Fla. July, 1964.
- Gialourakis, Nick, owner of Nick Gialourakis Packing Firm, Tarpon Springs, Fla. May, 1964.
- Kouremetis, John, owner of John Kouremetis Packing Firm, Tarpon Springs, Fla. May, 1964.
- Leonard, Arthur P., International Trade Specialist, U. S. Department of Commerce, Atlanta, Ga. February 8, 1965.
- Riley, Edward, President of American Sponge and Chamois Co., Long Island City, N. Y. November 19, 1964.
- Samarkos, John, Captain of the diving craft "Eleni," Tarpon Springs, Fla. May-June, 1964.
- Samarkos, Mike, owner of Samarkos Brothers, Inc., Tarpon Springs, Fla. May, 1964.

Sinenberg, Robert, partner in Florida Sponge and Chamois Co., New York.
November 18, 1964.

Smitzes, Louis, President of Tarpon Springs Sponge Exchange, Tarpon
Springs, Fla. April-July, 1964.

Wallace, Mrs. Elizabeth, Executive Secretary, Sponge and Chamois
Institute, New York. November 16-20, 1964.

Other Sources

Sponge and Chamois Institute records (in the files of the Institute).

Survey of distributors conducted by the Sponge and Chamois Institute,
1964.

Survey of nine diving craft captains in Tarpon Springs, Fla., conducted
by the author, May, 1964.

Survey of packers in Tarpon Springs, Fla., conducted by the author,
July, 1964.

BIOGRAPHICAL SKETCH

John Vasil Petrof was born January 6, 1933, in Istanbul, Turkey. In September, 1953, he joined the Turkish army from which he was discharged in 1955 as a First Lieutenant. He came to the United States in 1956 to attend Emory University from which he received the degree of Bachelor of Arts in June, 1958. In June, 1959, he was awarded the degree of Master of Business Administration by the same institution. From 1959 to 1962 he was employed as an instructor by the Atlanta University School of Business Administration. In 1962, he enrolled in the Graduate School of the University of Florida in order to pursue his work toward the degree of Doctor of Philosophy in Economics and Business Administration. He worked as an interim-instructor in the Department of Economics until May, 1963, and was awarded a Department of Interior fellowship the following academic year. In September, 1964, he returned to Atlanta University to work as a Resource Development Specialist for the newly established Regional Economic Development and Business Service Center.

John Vasil Petrof is married to the former Barbara Jean Gainey and is the father of two children. He is a member of the American Association of University Professors, American Economic Association, American Marketing Association, and the Society for the Advancement of Management.

This dissertation was prepared under the direction of the chairman of the candidate's supervisory committee and has been approved by all members of that committee. It was submitted to the Dean of the College of Business Administration and to the Graduate Council, and was approved as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

June 20, 1967



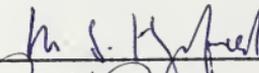
Dean, College of Business Administration

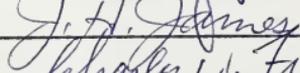
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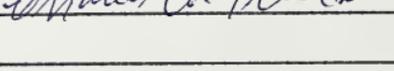
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