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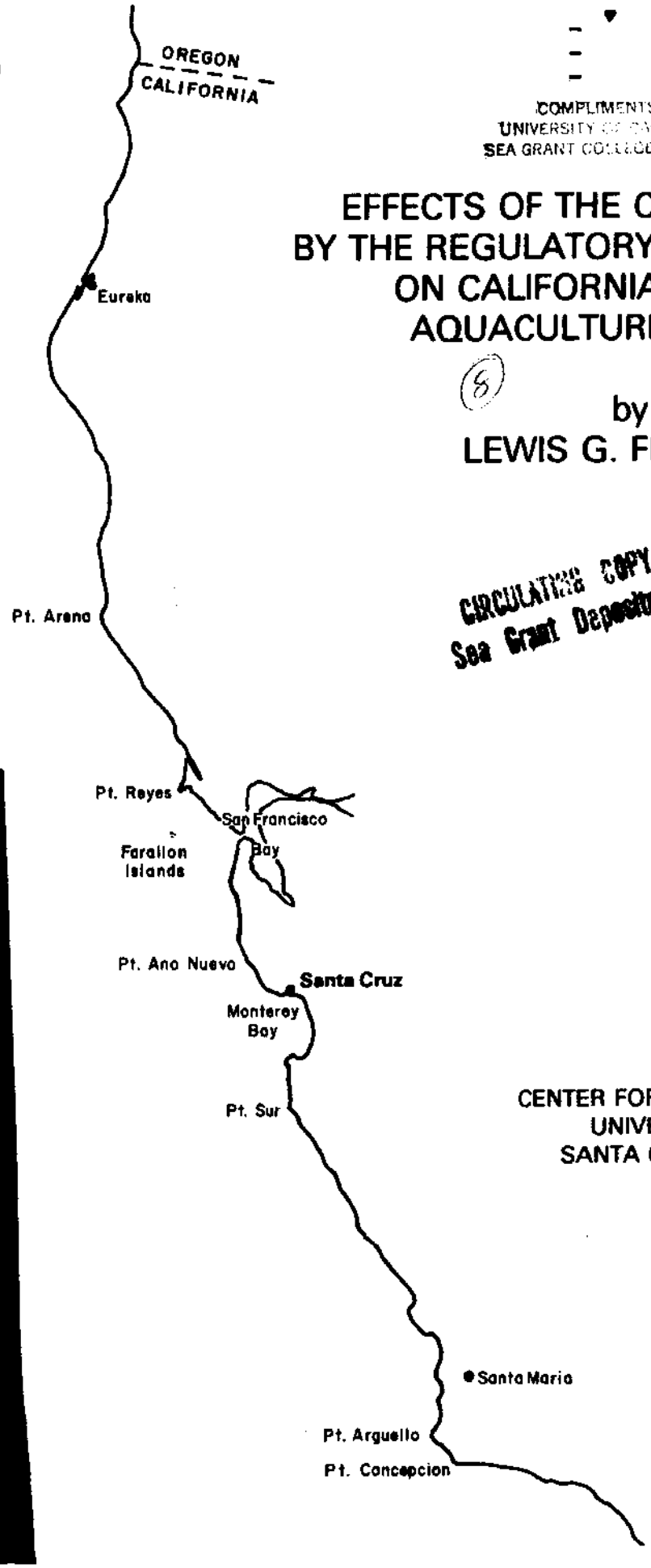

by

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ABSTRACT

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The objective of this study was to determine costs imposed by regulatory permit procedures on California's coastal aquaculture industry and to assess the effects of these costs on aquaculturalists and the development of the industry.

Permit experiences were reconstructed through interviews with aquaculturalists. Information obtained was confirmed with permit agencies. Results were analyzed to determine the effects of costs of government regulations on the industry.

Permit acquisition can be time-consuming, expensive, and uncertain. The actual cost of the process for a given firm is a function of: a) the organism cultured; b) the technique employed; c) facility siting; and d) the year the process was initiated. A large number of agencies independently regulate aquaculture, and there is no guarantee that firms can obtain approval from all agencies. This uncertainty discourages individuals and banks from providing aquaculturalists with capital. In sum, costs related to the permit process discourage small-scale aquaculture ventures.

The paper can be used by: (1) policy-makers in the process of shaping public policy; (2) potential aquaculturalists requiring an understanding of institutional constraints; (3) banks and investors considering aquacultural investments; (4) industry members needing assistance during expansion; and (5) educational institutions studying economics and public policy.

Key issues raised by the study include: (1) can the volume of regulations be lessened to reduce burdens on firms; (2) can inter-governmental agency cooperation be enhanced to reduce cost and delay; (3) what steps can government take to encourage the flow of capital to aquaculture; and (4) does government wish to promote large corporate investment or small business venture? How would this intention be implemented?

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CHAPTER ONE: MARINE AQUACULTURE AND THE REGULATORY ENVIRONMENT

1.1 Introduction

The idea that humans would one day farm the sea has been an exciting prospect for generations. Yet aquaculture--the science and art of growing aquatic species in controlled or selected environments--has only recently been pursued on a commercial scale. In the past the United States had an abundance of fisheries resources but now must import over half of the seafood it consumes.[1] The U. S. balance of payments situation is being aggravated as a result.[2] A reversal of this trend does not look promising.

> "U. S. fisheries resources are already being harvested at or near maximum sustainable yield levels. Imports have increased, but world demand is also expanding. This situation is expected to limit the amount of seafood available for export to the United States or to make it excessively expensive. Thus, the U. S. demand for traditional seafoods will become critical within the next decade, resulting in physical shortages and increased prices of many products."[3]

It is clear that there is a potent economic incentive for this country to promote the establishment and growth of a domestic aquaculture industry.

There is a serious question, however, whether California's vast marine resources will play an appropriate part in a national effort to augment domestic seafood supplies. Over the past fifty years, California has woven a regulatory net so broad and so fine that it may completely screen out a

marine aquaculture industry. Potential California aquaculture entrepreneurs must spend considerable amounts of time and money complying with local, state, and federal governmental requirements before they can begin operations. It is the objective of this paper to determine whether the overhead monetary cost attributable to governmental regulation is acting as a major barrier to the development of a coastal aquaculture industry in California.

The following chapters will provide an analysis of the effects of this cost. The purpose of this introductory chapter, however, is to provide the reader with some background in the subject at hand. First, the potential that aquaculture holds in the United States will be discussed. Second, a brief profile of the California coastal aquaculture industry will be presented. Third, a discussion of the agencies involved in regulating coastal aquaculture will be offered. Finally, a presentation of the types of costs that are incurred as a result of complying with regulatory controls will be given.

1.2 The Potential for Aquaculture

In 1975, total world aquaculture production amounted to six million metric tons (mt) (13.2 billion pounds).[4] This represents approximately ten percent of world fish production.[5] Japanese aquaculture production increased from 110,000 mt (242 million pounds) in 1971 to 500,000 mt (1.1 billion pounds) in 1975.[6]

Japan presently produces roughly ten percent of its fisheries products through aquaculture.[7] In 1974, Israel produced almost half its finfish through aquaculture which amounted to 10,330 mt (2.7 million pounds).[8] In the United States, however, only three percent of domestic landings (65 million metric tons, or 143 million pounds) was produced through aquaculture during 1975.[9] Indeed, while world aquaculture production has doubled within the last

five years, U. S. production has remained static.[10] Yet, with proper support, aquaculture in this country could reach 250,000 mt (550 million pounds) by 1985 and one million mt (2.2 billion pounds) by the year 2000.[11]

1.3 The California Coastal Aquaculture Industry

The potential for aquaculture in California remains unknown. However, the long range prospects for a successful aquaculture industry seem promising. Increasing prices for Pacific fisheries products have enticed a handful of individuals to attempt to establish commercial operations in the state. Four areas of aquaculture are actively being pioneered: 1) molluscan (oyster, oysterseed, and abalone); 2) anadromous fish (silver and king salmon, and steelhead trout); 3) crustacean (lobster); and 4) aquatic plants (Iridaea and carrageenan). Molluscan and anadromous fish aquaculture are discussed in chapters two through four of this paper. Discussions of crustacean and aquatic plan aquaculture will be conspicuously absent. To date, both of these areas of aquaculture remain in the experimental stages.

Two projects are presently under way in the area of crustacean aquaculture. At the Bodega Bay Marine Laboratory of the University of California, researchers are working on the cultivation of the American lobster, Homarus Americanus.[12] Aquaculture Enterprises, a small privately funded venture located in Monterey, California, is also attempting to develop a commercially viable lobster aquaculture system for H. Americanus. The Bodega Marine Laboratory's activities are excluded from this report for two reasons. First, the University of California's aquaculture research endeavors are not governed by the same regulatory controls which apply to the commercial industry. Second,

this paper focusses only on the effects of regulatory costs paid by private sector firms. While Aquaculture Enterprises is indeed a private sector operation, its activities remain experimental. Determining the effects that regulatory costs have had on this firm would be of little value.

Plant aquaculture is also in its infancy. Thus far only one California venture has entered the field. Catalina Offshore Products, Inc. (COP) of Catalina Island, California, is involved in developing cultivation techniques for Iridaea, a sea weed which is made into a gel that is used in bio-medical research.[13] This firm is enclosing areas of open ocean waters with submerged nets and planting crops on the sea floor. Because COP has yet to engage in commercial activities, an assessment of its experience with the regulatory environment would not yield substantial results. However, one must bear in mind that plant aquaculture may be an important component of California's coastal aquaculture industry in the future. A $3 million per year industry presently exists on the northeastern coast of the United States.[14] Declining levels of water quality there have prompted a number of East Coast plant aquaculturalists to seek suitable sites on the West Coast for use in commercial operations.[15]

Levels of technology in the areas of molluscan and anadromous fish aquaculture have advanced to where commercial cultivation of abalone, salmon, oysters and oysterseed is taking place in California. Although many of the cultivating techniques employed are somewhat primitive, California aquaculturalists are convinced that technology is not the barrier to the development of the industry. They place a major part of the blame on the volume of regulations which control many of their activities.

1.5 The Regulatory Environment

It has been stated that forty-two government agencies and sub-agencies of local, state, and federal jurisdiction can be involved in the affairs of a given aquaculture enterprise.[16] In addition to the handful of agencies that are involved in the activities of any business (the Internal Revenue Service, the Social Security Administration, the Unemployment Administration, the State Franchise Tax Board, etc.), aquaculture ventures must contend with agencies that administer laws and regulations in the following areas:

a. Coastal Protection and Land-Use Planning

b. Public Health

c. Wildlife Protection

d. Environmental Protection

e. Navigational Safety

f. Occupational Safety

g. Investment Protection

Private compliance with the public responsibilities inherent within each of these areas consititutes dealing with the following agencies.

a. Coastal Protection and Land-Use Planning

California's 1100 miles of coastal resources are protected by a variety of controls. Coastal aquaculturalists must adhere to regulations administered by the State and Regional California Coastal Commissions. In addition, because many of the activities of aquaculture take place on public tidelands and ocean bottoms, the State Lands Commission has regulations that may apply. City and County Planning Departments also set land-use policies which may restrict the way coastal land can be developed and the way in which private property can be used.

b. Public Health

Aquaculture is in the business of producing aquatic organisms in high densities. Sometimes antibiotics must be used along with other disease controlling chemicals. The California State Health Department, Federal Food and Drug Administration, and Bureau of Alcohol, Tobacco and Firearms have certain standards which regulate the use of such chemicals.

c. Wildlife Protection

Many laws and regulations which govern hunting and fishing in state and federal waters also apply to aquaculture. Inspections, monitoring programs, and prohibitions which were designed for hunters and fishers must also be adhered to by aquaculturalists. These regulations are administered by the U. S. Fish and Wildlife Service, and the California Department of Fish and Game.

d. Environmental Protection

Aquaculturalists who conduct operations on land cultivate marine animals in salt water that is taken from and returned to the sea. Chemicals are often added to this water. In addition, the waste products of the organisms are concentrated in the outflow. Aquaculturalists must therefore comply with the water quality standards and environmental requirements set by the Environmental Protection Agency, the California State Regional Water Quality Control Boards, and the State Resources Agency.

e. Navigational Safety

The U. S. Army Corps of Engineers administers federal regulations which protect the safety of navigable waterways. When an aquaculturalist conducts operations or builds any structure in navigable waterways approval from the Corps must be gained.

f. Occupational Safety

The State and Federal Occupational Safety and Health Administration enforces regulations which are designed to protect the health and safety of employees. OSHA administers and enforces safety standards which apply to almost every aspect of an enterprise, from construction to operations to accidents.

g. Investment Safety

The California Corporations Commission and the Federal Security Exchange Commission regulate the way in which new businesses, including aquaculture ventures, raise capital. Complying with these regulations includes keeping detailed financial records and filing annual financial statements.

Thus, the business activities of coastal aquaculturalists are governed by a wide array of agencies which administer a myriad of laws and regulations.

1.6 The Cost of Regulations

Complying with these agencies and the regulations they administer can be expensive. There are four ways in which costs can be incurred.[17] First, the process of acquiring permits can be expensive. Before an aquaculturalist can operate, permits must be obtained and fees must be paid. Some agencies may require that bonds be posted or special studies be undertaken before they will consider issuing permits. Lawyers, engineers, and other professional consultants may have to be hired. These direct expenditures, including managerial and administrative salaries devoted to permit acquisition, can involve substantial amounts of money. Second, administering the regulations that apply after permits have been obtained can be costly. To conduct monitoring and inspection activities in accordance with regulations necessitates that an aquaculturalist

spend time and money on clerical and administrative activities. In addition, legal assistance may be required to interpret the proper way in which these functions should be carried out. Third, conforming to regulations may require additional capital investment for plant and equipment. Here, too, managerial time and energy must be expended. Indeed there are occasions when such conformance is impossible[18] and large amounts of time and money must be devoted to modifying regulations. Finally, there are opportunity costs to compliance. When regulations are grappled with, vital entrepreneurial energy is diverted from solving important technological, financial, and engineering problems which impede a firm's progress.

The purpose of this analysis is to test the hypothesis that the monetary cost of the process of obtaining regulatory permits constitutes a major barrier to persons wishing to enter the marine aquaculture industry.[19] In order to test this hypothesis it is necessary to measure the various costs associated with regulatory compliance. It is, of course, impossible to measure each of these costs accurately since such things as delay can be a minor cost to one venture but a major threat to another. Indeed some costs, such as lost opportunity to do something else with the same capital, cannot be measured at all without being dubiously speculative. These limitations are especially important to bear in mind here because coastal aquaculture in California is both recent in its development and small in its scale. The choice of operations from which to choose is thus small and the history of each operation is hardly long enough to measure according to any yardstick. In short, the reader is cautioned to recognize that the samples selected for measurement are not representative of an industry. Many operations have started and failed and even more have failed before they reached operational status.

These failures are not represented in this study and the impact of regulation on their failure has not been examined.

1.7 Methodology

In order to properly assess the effects of the costs of permit acquisition on the development of California's coastal aquaculture industry, the following five-step process was employed. First, successful molluscan and anadromous fish aquaculturalists were interviewed. Information was gathered during interviews which pertained to the number of permits each aquaculturalist had to acquire, the agencies which granted these permits, the price of each permit, the time spent acquiring each permit, and the additional expenditures accruing

to the process (legal fees, consultant fees, administrative salaries, etc.). Second, the information obtained was then checked for accuracy. Personal searches of public agency files were conducted when possible. When distance prohibited personal searches, agencies were contacted by telephone and staff members conducted file searches. Third, literature was surveyed to gain information about: a) each area of aquaculture; b) the cultivating technique presently employed; and c) the financial environment within which aquaculturalists operate. Fourth, agency personnel, financial professionals, and research scientists were contacted for supplementary information. Finally, the resultant information was analyzed to determine the effects of the costs of the permit acquisition process on the California coastal aquaculture industry.

The purpose of this report is to assist local, state, and federal policy makers who are in the process of shaping public policy toward aquaculture. Individuals who are considering entering the aquaculture industry can also use this study to gain an understanding of the economic and institutional constraints they may face when attempting to establish operations. Financial institutions and investors can use this study to better understand the financial needs of aquaculturalists and the risks associated with investing in aquaculture operations. In addition, certain aspects of this report may be helpful to industry members as they seek to expand their operations or attempt to diversify into other areas of aquaculture. Finally, this report can serve as an important tool to educational institutions engaged in the study of coastal development, business economics, and public policy.

The following chapter presents an assessment of the costs imposed by the regulatory permit process on abalone aquaculturalists. Chapter three discloses the regulatory costs borne by California's only anadromous fish

aquaculture firm. Chapter four examines the cost of the regulatory permit process for oyster and oysterseed aquaculture firms. The last chapter presents the results of this effort and considers the economic effects of the regulatory permit process on the economic structure and development of the coastal aquaculture industry. In the last part of this chapter, alternatives to the present system are offered.

CHAPTER TWO: THE REGULATORY COSTS ASSOCIATED WITH ABALONE AQUACULTURE

2.1 Introduction

The cost imposed by government regulations on an abalone aquaculture firm is directly related to the number of regulatory agencies which have jurisdiction over the firm. The regulations applying to a particular operation are, in part, a function of the aquaculture technique employed. One of three methods can be used. Abalone can be cultured using: (1) enclosed on-shore artificial habitats; (2) off-shore natural or artificial habitats; or (3) a combination method which breeds young abalones on shore and later transfers them off shore to develop to maturity. The cost of regulation is also a function of facility siting. Different locations fall under the jurisdiction of different levels of government. Thus a firm's site can be subjected to varying degrees of regulation and cost. Finally, operations started in different years are subject to different controls.

The principle objective of this discussion is to assess the overhead cost attributable to public regulations. More precisely, however, it is our purpose to explore the various costs of public regulation imposed on abalone growers within the context of a) time, b) place, and c) method employed in their operation. The best way to gain this understanding is to look at examples of various forms of industrial abalone aquaculture techniques now in use. But before costs can be examined it is first important to understand something about abalone and the industry geared to produce it.

2.2 The California Red Abalone

The California Red Abalone, Haliotis rufescens, is the largest type of abalone in the world[1] and the most important from a recreational and commercial

standpoint.[2] The red abalone reaches maturity in approximately ten years, weighing over four pounds, and measuring approximately eleven inches.[3] It is a single-shelled mollusk that grows in tidal and subtidal areas along the California coast.

The edible portion of the red abalone is its "foot," the muscle which it uses to attach itself to submerged rocks. In its natural state, abalone flesh is tough and gristly, and thus barely edible. Elaborate preparation is required. In the United States, the foot, which weighs approximately one pound, is separated from the shell and sliced into one-quarter inch "steaks." These thin sections are then pounded in order to tenderize them, and are usually quick-fried in a seasoned egg batter.[4] In the Far East canned abalone is prepared in a variety of ways and considered a delicacy, chopped for soup, diced or ground for chowder, fried or smoke-dried and chewed like a seafood jerky. In Japan, abalone is thin-sliced raw and served as sashimi or sushi.[5]

2.3 Economic Incentives

Over the years, the ocean harvest of abalone has been declining steadily. As early as 1864, California's Chinese population harvested the red abalone. Great numbers were shucked, sliced, and dried in open racks. The processed meats were then shipped to the Orient.[6] During its peak, the annual abalone harvest averaged between five and six million pounds.[7] This has dwindled to a current level of slightly less than one million pounds.[8]

The declining supply of abalone has been met with significant increases in both consumer demand and wholesale and retail prices. Over the last ten years, wholesale abalone prices in the United States have increased from $1.40 per pound to a current price of $8.00 per pound.[9] In the last two years alone, wholesale prices have increased more than seventy percent.[10] Over the last

ten years, canned abalone has increased from $26 to $215 per case.[11] Retail prices have also increased sharply to a current level of $11.50 per pound.[12] A single restaurant portion consisting of two or three steaks weighs a total of one-third to one-half pound and costs from $9.00 to $15.00.[13]

Because of sharp declines in stocks, many restrictions have been placed on harvests. Size limitations, closed seasons, and regulations which prohibit the drying, shipping, and canning of abalone have been in force for over forty years. These restrictions, however, do not apply to cultured abalone.[14] Thus, anyone who can successfully grow a large number of abalones to marketable size will be able to augment supplies and make potentially large profits. These economic incentives have prompted a number of individuals to investigate the feasibility of culturing abalone in on-shore and off-shore natural and artificial habitats.

2.4 California Abalone Aquaculture Enterprises

There are, at present, five individual firms attempting to establish abalone aquaculture operations. Three firms are currently in the production phase: The Ab Lab, located in Ventura County; California Marine Associates of San Luis Obispo County; and Monterey Abalone Farms of Monterey County. (See Figure 1.)

a) The Ab Lab

The Ab Lab[15] was established in 1974. It is located in Port Hueneme, California, on federal land leased from the Department of the Navy. Two individuals, a marine biologist and a business manager, run the entire operation. The facility consists of a hatchery room approximately 25' X 25' in size, a small laboratory for preparing feeding solutions, a small room with tanks for setting abalone larvae, and a set of outside development tanks. The Ab Lab has contractual agreements with Union Oil Company to use the water column below an off-shore oil platform to grow abalones to marketable size.

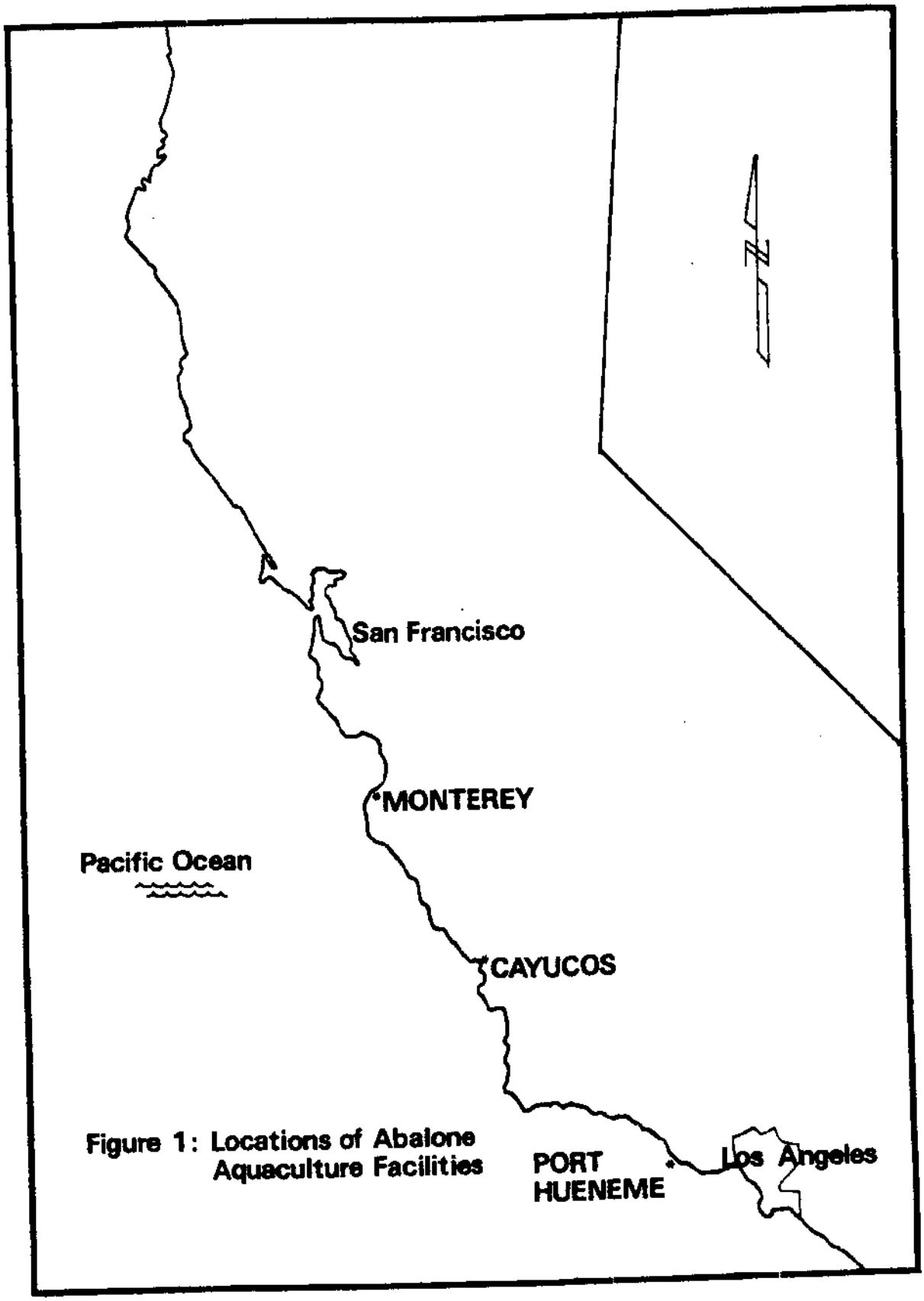

Figure 1: Locations of Abalone Aquaculture Facilities

Abalones are spawned through chemical inducement at the facility and are allowed to develop for six months to one year. At this age they are approximately one-half to one inch in size. The young abalone are then brought by boat to the oil platform and are placed in "growing containments." The containments are plastic drums which are anchored to the oil platform. They are approximately four feet deep and are filled with plastic baffles. Divers place the young abalones by hand into the containments. The animals are then allowed to grow for three to five years or until they reach marketable size.

Thus far, capitalization of the Ab Lab venture has approached $90,000. The business originally operated as a limited partnership. In 1975, the operation was reorganized as a close corporation[16] under California Corporation Commission regulations.

b) California Marine Associates

California Marine Associates (CMA) is located on Estero Bay, five miles north of Cayucos, California. The operation was established in 1968 to culture red abalone for commercial purposes. Five individuals are employed in the operation. The CMA facility includes three large rooms in which abalones are spawned artificially. The free-swimming abalone larvae settle to the bottom of one of many plastic tanks and feed upon the algae grown on the sides and bottom of the tank. In about ten to twelve months, or when they have reached one inch in size, the fry (young abalone) are switched to a diet consisting exclusively of kelp.[17]

By three years of age, the young abalone have grown to approximately two and one-half to three inches and are transferred to one of three outdoor concrete basins with free-standing panels. The young abs attach themselves to the panels and feed upon kelp. Each tank is 30' X 16' X 10' deep and is divided into three sections with separate fill and drain lines.[18] Each section holds about 10,000 abalone.[19] Eventually, forty tanks are to be built which will produce some 400,000 six-year-old abalone a year.[20]

CMA is also experimenting with the use of the water column beneath Atlantic-Richfield Company's (ARCO) oil platform, "Holly," located in the Santa Barbara Channel. A number of two and one-half to three year old abalone have been planted in specially designed plastic habitats which are connected to the oil platform. The firm estimates that they will eventually harvest 250,000 marketable abalone each year from the waters below the platform.

Annual sales are anticipated to reach one million dollars. CMA is not limiting sales to restaurant markets in the United States, but is hoping to sell seed and smaller abalone in the U.S. and Japanese markets. Three-to-four-year-old animals will be canned; four-to-six-old animals will be exported to the Orient; and six-to-eight-year-old animals will be sold to restaurants.[21]

Total capitalization of the enterprise has approached $700,000 for the ten-year period of operation.[22] CMA operates as a general partnership under California Corporation Commission regulations.[23] In 1975, a commitment for $415,000 in additional capital was obtained from ARCO after a contract was made which solicited CMA's research expertise to examine the feasibility of using oil platforms in abalone rearing.[24] In the long run, it is the desire of California Marine Associates to grow abalone in containers suspended from the ocean floor.[25]

c) Monterey Abalone Farms

Monterey Abalone Farms (MAF) was established as a limited partnership in 1972 for the purpose of culturing abalone from spawn to adult in on-shore tanks. MAF is located on private land within the city of Monterey. Total capitalization of the venture to date is estimated at $2 million.[26]

Operations are conducted within a three-story 20,000-square-foot building.[27] The first and second floors contain laboratories and holding tanks. Offices are on the third floor. MAF employs about ten individuals: a business manager,

several marine biologists and biochemists, and various laboratory and administrative assistants.[28]

MAF scientists have done an excellent job of synthesizing the environmental conditions of the ocean. Refrigeration systems keep the building's air temperature between 58 and 62 degrees.[29] Water is pumped from 700 feet off-shore at 150 gallons per minute, and is continually filtered.[30] MAF scientists have also developed a supplemental artificial diet that does not depend on the ocean.[31] As a result, MAF claims it can grow abalone to maturity (approximately seven and one-quarter inches) in five years,[32] which is twice as fast as nature.

Little has been disclosed about the exact culturing techniques used by MAF and it appears that this mystery is the preference of the management. What is known, however, is that MAF scientists chemically induce spawning in mature female abalones that have been collected from the ocean under permission from the California Department of Fish and Game.[33] After fertilization by the male, the eggs float to the surface of the holding tank. In 48 hours, the floating eggs become free swimming larvae.[34] Chemically induced metamorphosis occurs over time in the tanks while the growing abalone nourish upon cultured algae and scientifically determined nutrients.[35] When the abalones reach marketable size, they are simply removed from the tanks, packaged, and sold to buyers.

d) Other Firms

Two other organizations are attempting to engage in red abalone aquaculture. Presently, they are at the initial stages of the capital allocation process. Both firms are interested in developing open-ocean operations. Pacific Ocean Farms of Carmel, California, has a fifty-acre lease situated 1,000 yards off shore near Point Sur. Another party, Richard Hirschkind, is presently acquiring capital to finance an open-ocean venture off Carmel.

2.5 The Costs of Public Regulations

In order to assess the costs imposed by regulations, a presentation of the permits obtained by each of the three firms actively engaged in abalone aquaculture will be given. The number of permits required before operations could commence, the total cost of obtaining the permits, the amount of time which elapsed while acquiring the permits, and the percentage of total capitalization expended on the permit process are presented.

a) Ab Lab: Because the Ab Lab is located on land leased from the Federal Government, State governmental requirements do not apply. When the Ab Lab began aquaculture activities in 1975, only two permits were required. Chart 1 displays the required permits, the agencies involved, the fees required for each, and the time interval from application to issuance.

The experimental nature of the facility, coupled with its location, have held the number of agencies with jurisdiction over their activities to few. The total cost of regulatory compliance was $685. The total time elapsing was three months.

b) California Marine Associates: Established in 1968, CMA is located in the coastal zone[36] on privately owned land. Chart 2 displays the permits obtained during California Marine Associates's initial acquisition process. Only three permits were required, and all were obtained from the California Department of Fish and Game. The cost of obtaining these permits was $440, and thus was an insignificant amount compared to the $680,000 capital requirement. The time interval from application to issuance was six months.

c) Monterey Abalone Farms: Monterey Abalone Farms, established in 1972, is situated in the coastal zone in the City of Monterey, California, on privately

Chart 1

AB LAB
Established 1975
Situated in Coastal Zone
Located on Federal Land

Agency	Permit	Description	Fee	Time	Citation	Cost
California Department of Fish and Game	Mariculture License	Approves commercial and experimental marine aquaculture activities	$25	30 days	California Fish and Game Code, §6481, 1973	$100 Administrative
United States Department of the Navy, Port Hueneme, CA	General Purpose Lease	Permits the Ab Lab to use Naval facilities for commercial aquaculture activities.	$360 per quarter	30 days	Contract #NF(R) 32763, NAFVAC 11011/ 24A)	$200 Administrative

Total number of permits: 2
Total cost: $685
Total time: 60 days
Total percentage of capitalization:
insignificant

Chart 2

CALIFORNIA MARINE ASSOCIATES
Established 1968
Situated in Coastal Zone
Located on Private Land

Agency	Permit	Description	Fee	Time	Citation	Cost
California Department of Fish & Game Sacramento, CA	Mariculture License	Approves commercial and experimental conducting of marine aquaculture activities	$25	30 days	California Fish and Game Code, $6481, 1973	$100 Administrative time
	Kelp Harvesting license	Approves commercial harvesting of kelp	$10	30 days	California Fish and Game, $6651, 1973	$100 Administrative time
	Scientific Collector's Permit	Approves collecting of abalone for breeding purposes	$5	180 days	California Fish and Game, $1002, 1973	$200 Administrative time

Total Number of Permits: 3
Total Cost: $440
Total Time: 6 months
Total Percentage of Entire Capitalization: Insignificant

owned land. During an initial two-year period of planning and start-up, the firm was required to deal with at least thirty-seven different government agencies and sub-agencies.[37] Not all of the agencies required MAF to obtain written permits. Many required MAF to only gain verbal approval.

Chart 3 lists the permits MAF was required to obtain. The cost of each permit, the time expended on acquiring each permit, the administrative cost of preparing each permit application, and the agency issuing each permit are also presented.

Direct permit process expenditures amounted to $22,705. However, if one includes monitoring and investigation costs, the total cost of MAF's acquisition process was $34,705. The breakdown is as follows:

Monterey Abalone Farms[38]

Permit Fees:	$ 205
Administrative Time Expended on:	
1) Permit Preparation:	11,500
2) Agency Interaction:	10,000
Engineering:	1,000
Laboratory Investigation and Monitoring:	12,000
Total	$34,705

It took MAF two years[39] to obtain all of the permits required. During this period, fifty percent of MAF's management time was spent on the regulatory process. The exceptionally long time period and large expenditures of capital and energy associated with this process may represent a considerable opportunity cost. According to MAF's management, if one includes this opportunity cost with the direct costs of permit acquisition, the total cost of complying with the regulatory process approaches $100,000.[40]

Chart 3

MONTEREY ABALONE FARMS
Established 1972
Situated in Coastal Zone
Located Within a City on Private Land

Agency	Permit	Description	Fee	Time	Citation	Cost
Montery City Building Dept.	Building Use Permit	Approves commercial usage of building	$40	28 days	Local Ordinance	$500 Administrative Time
Monterey City Planning Dept.	Variance	Allows commercial usage of building	$40	28 days	Local Ordinance	$500 Admin. Time $1000 Eng. Time
Cent. Calif. Coastal Comm., Santa Cruz, CA	Administrative Permit	Approves commercial usage of building in the coastal zone	$25	15 days	Cal. Pub. Res. Code, $30624, 1976	$2000 Administrative Time
Cal. Dept. of Fish & Game Sacramento, CA	Mariculture License	Permits commercial and experimental marine aquaculture activities	$25	30 days	$6481, California Fish & Game Code, 1973	$350 Administrative Time
Cal. Dept. of Fish & Game	Kelp Harvestin License	Approves commercial harvesting of kelp	$10	30 days	$6651, California Fish & Game Code 1973	$350 Administrative Time
Cal. Dept. of Fish & Game	Wholesale Fishdealer's License	Permits the selling and buying of wholesale fish	$50	30 days	$8042.5, California Fish and Game Code, 1973	$300 Administrative Time
Cal. Dept. of Fish & Game	Special Letter Permit	Allows MAF to hold abalone for breeding purposes	no fee	60 days	$1002, California Fish & Game Code, 1973	$500 Administrative Time
Cal. Dept. of Fish & Game	Scientific Collection Permit	Permits collecting of oceanic rocks for purposes of constructing artificial habitats	$5	60 days	$1002, California Fish & Game Code, 1973	$2000 Administrative Time

MONTEREY ABALONE FARMS (con't)

Agency	Permit	Description	Fee	Time	Citation	Cost
Cal. Dept. of Fish & Game	Scientific Collection Permit	Permits the collecting of abalone for propagation purposes	$5	60 days	§1002, California Fish and Game Code, 1973	$500 Administrative Time
Bureau of Alcohol, Firearms, and Tobacco, San Francisco, CA	License to obtain undenatured alcohol	Permits the purchasing of undenatured alcohol for laboratory purposes	no fee	30 days	37 CFR §213.101(b)	$1500 Administrative Time
Drug Enforcement Administration, San Francisco, CA	Controlled Substances Registration Certificate	Permits the purchasing of anti-biotics	$5	60 days	Controlled substances Act of 1970, §304(a)	$2000 Administrative Time
Food and Drug Administration, San Francisco, CA	Investigation of New Animal Drugs (INAD)	Permits the purchase of animal sedatives (six were issued)	no fee	30 days	21 CFR §511-514	$1000 Administrative Time

Total Time: 2 years
Total Cost: $22,705
Total Percentage of Capitalization:
Insignificant

2.6 Factors Determining the Cost of Regulations

The amount of time and money an abalone aquaculture operation must spend on the permit acquisition process ranges from three months to two years, and from $400 to $23,000. What factors have contributed to these wide ranges?

Three variables contribute to the differing costs of regulations: (1) choice of culturing technique employed; (2) year the permit acquisition process was initiated; and (3) choice of facility siting.

a) Culturing Techniques

Off-shore abalone production appears to be a less expensive venture than on-shore production, provided that the aquaculturalist can gain access to an oil platform. Arrangements with oil companies eliminate the need for a firm to obtain many of the permits from government agencies which would normally be required if an individual sought to build a culturing platform in the ocean.

In-door techniques which require on-shore laboratories seem to require the approval of a great many more government agencies. However, on-shore techniques do provide the advantage of greater control over animals and environmental conditions.

b) Year of Initiation

Little environmental legislation was enacted before 1969. Since that year, the National Environmental Policy Act,[41] the California Environmental Quality Act,[42] and the California Coastal Act[43] have been adopted. These laws serve an important function in that they conserve and regulate California's land and water resources. However, they also may create expensive barriers to the development of a coastal aquaculture industry. One need only examine the differences in the costs paid by CMA and MAF to substantiate this.

c) Location

Since the Ab Lab is located on federal land, very few state and local agencies have jurisdiction over its activities. The Ab Lab has also minimized the role of federal agencies by working closely with Union Oil which has already acquired federal navigation and construction permits. It remains to be seen, however, whether the Ab Lab can operate commercially on publicly-owned land when it moves beyond the experimental stage.

Monterey Abalone Farms, on the other hand, by choosing to operate in a city, has in effect chosen to pay a higher regulatory cost. As a consequence, it is regulated by the whole panoply of local, state, and federal government.

2.7 Conclusion

There is much to be learned from this chapter. Site selection and growing techniques will continue to be primary factors in determining the cost of regulations. More importantly, however, it should be noted that a tangled web of legal and administrative intricacies exists. Until alternative regulatory procedures are implemented, those who engage in abalone aquaculture must be more than simply competent in marine biology or business. They must be prepared to persevere in an extremely challenging and difficult regulatory environment which is constantly becoming more challenging and more difficult with time. They must also have a high degree of political sophistication if they are to be at all successful. Unfortunately, such sophistication is often developed only through direct experience.

CHAPTER THREE: THE REGULATORY COSTS ASSOCIATED WITH ANADROMOUS FISH AQUACULTURE

3.1 Introduction

In the past, U.S. fishers have landed as much as 600 million pounds of salmon yearly.[1] Over the past decade, however, annual salmon harvests have decreased to one-third this amount.[2] These decreases have coincided with increases in consumer demand for salmon products. Rising demand continues to exceed levels of Maximum Sustainable Yield.[3] International markets continue to place larger and larger burdens upon domestic supplies. These burdens, coupled with a projected decline in available salmon imports,[4] indicate that it may be necessary to turn to other sources of salmon production.

Anadromous fish aquaculture may offer a technically and economically feasible method of alleviating current and projected shortages. Two techniques have been developed: pen rearing, and ocean ranching.

a) Pen Rearing

In 1969, the National Marine Fisheries Service (NMFS) demonstrated the feasibility of rearing two species of salmon. In less than one year, the NMFS researchers raised Coho (Oncohynchus Kitsuch), and Chinook (O. Tschawytscha) species to a marketable size of 12 ounces or more utilizing pen rearing methods.[5] Pen rearing requires an off-shore site in which net enclosures containing young salmon float in salt water.[6] These net enclosures protect the young fish, or smolts[7] from predators, thereby increasing substantially their chances for survival. While contained, the smolts are fed scientifically balanced diets until marketable size is reached.

The combination of restrictive coastal zoning regulations on development and specific environmental requirements for pen rearing severely limit the

number of facility sites available in California. Due to these factors, no operations have been undertaken in the State.

b) Ocean Ranching

Ocean ranching as a system for salmon aquaculture was originally developed by National Oceanic and Atmospheric Administration (NOAA) researchers at Oregon State University.[8] Subsequently, NMFS and the Alaska Department of Fish and Game applied this concept to Alaskan waters in joint research effort.[9] Oregon and Alaska amended their laws in 1971 and 1974, respectively, to accommodate ocean ranching.[10] In 1968, California laws were amended to allow a single firm, SilverKing Oceanic Farms (SKOF) to engage in commercial anadromous aquaculture.[11]

3.2 SilverKing Oceanic Farms (SKOF)

SilverKing Oceanic Farm's culturing method is typical of those employed in most ocean ranching operations. In order to understand SKOF's technique, it is necessary to turn briefly to the basic biological cycles of the salmon.[12] Two members of the Salmonidae family are used in the SKOF operation: Silver and King Salmon. Both species spend the majority of their lives in the ocean and then ascend streams to spawn. While in the ocean, they attain the greater part of their growth and reach sexual maturity. Female salmon deposit their eggs in nests (called redds) which are dug in the gravel of stream bottoms. Immediately following deposition and simultaneous fertilization by the male, the female covers the eggs with gravel. The gestation period depends upon water temperature, oxygen levels, and other localized environmental factors. Upon hatching, the newborn salmon work their way through the gravel to the surface of the stream bed.

Following emergence from the gravel, the young Silver salmon spend a year or more in the stream and then descend to the ocean. King

salmon usually descend to the ocean in approximately ninety days after hatching.

All three species exhibit a "homing instinct": the young fish which descend from fresh water streams to the ocean return to the parent stream to spawn. The time between descent and return varies. Silver salmon is considered a "three year" fish, spending one year in the stream and two years in the ocean before returning. King salmon spend four to five years in the ocean before returning to spawn.

SilverKing Oceanic Farms incorporates this homing instinct into their aquaculture enterprise. They buy Salmonidae fry from sources in the State of Washington and transport the fry by tanker truck to the SKOF hatchery located in the Salinas Valley outside of King City. (See Figure 2.) There the young fish are placed in large fresh water ponds. Controlled segments of the pond population are transferred to tanker trucks, and transported to the SKOF release-and-recapture facility located on Davenport Landing Creek in northern Santa Cruz County. The fish are placed in a freshwater pond situated upstream and are allowed to begin their descent to the ocean. During this descent the fish acclimate[13] to their new salt water environment moving from fresh water to brackish water and finally to the ocean. (See Figure 3.)

While in the ocean, the salmon are "common" property, free to be captured by predators. During a pilot program at Waddell Creek in northern Santa Cruz

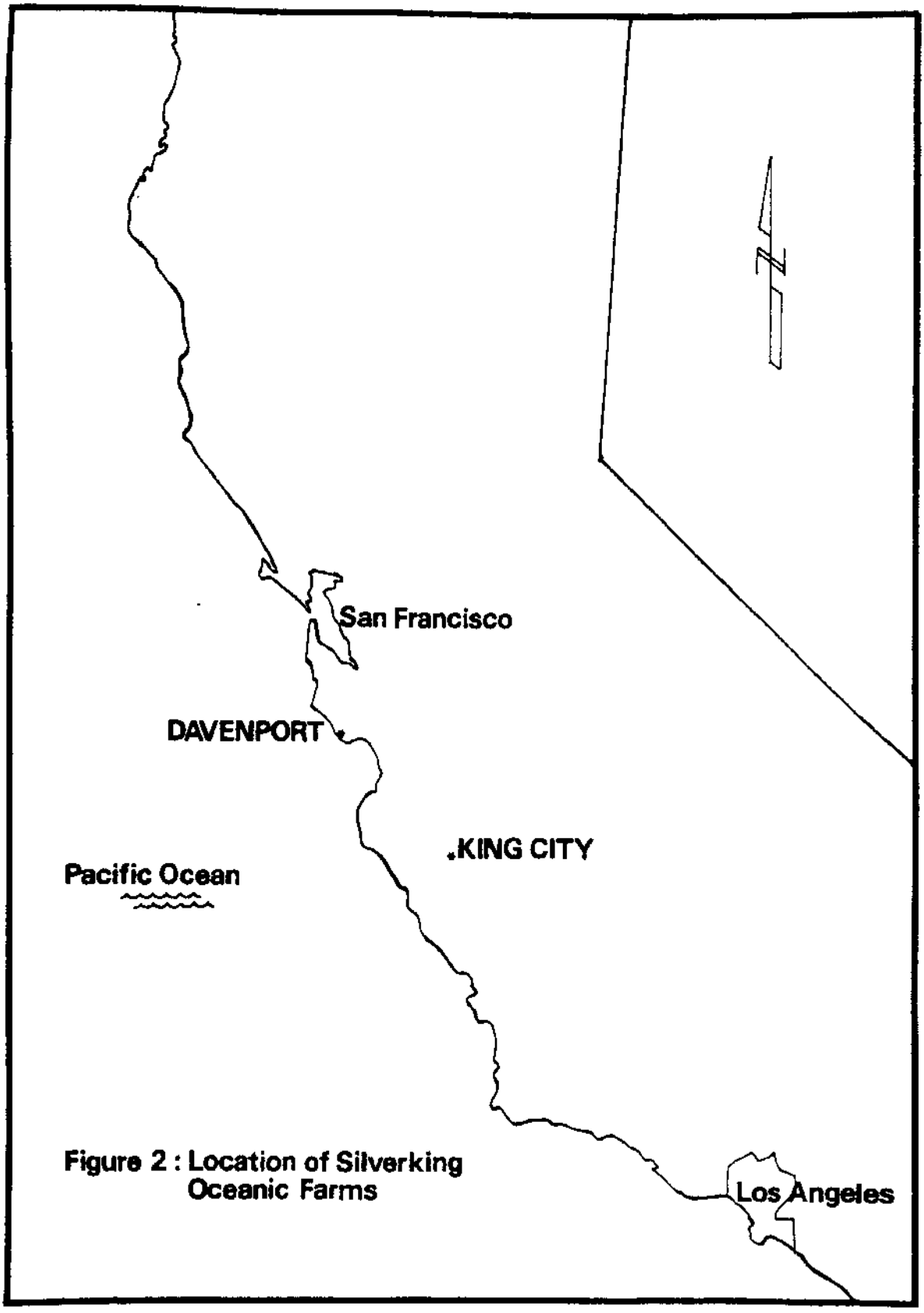

Figure 2 : Location of Silverking Oceanic Farms

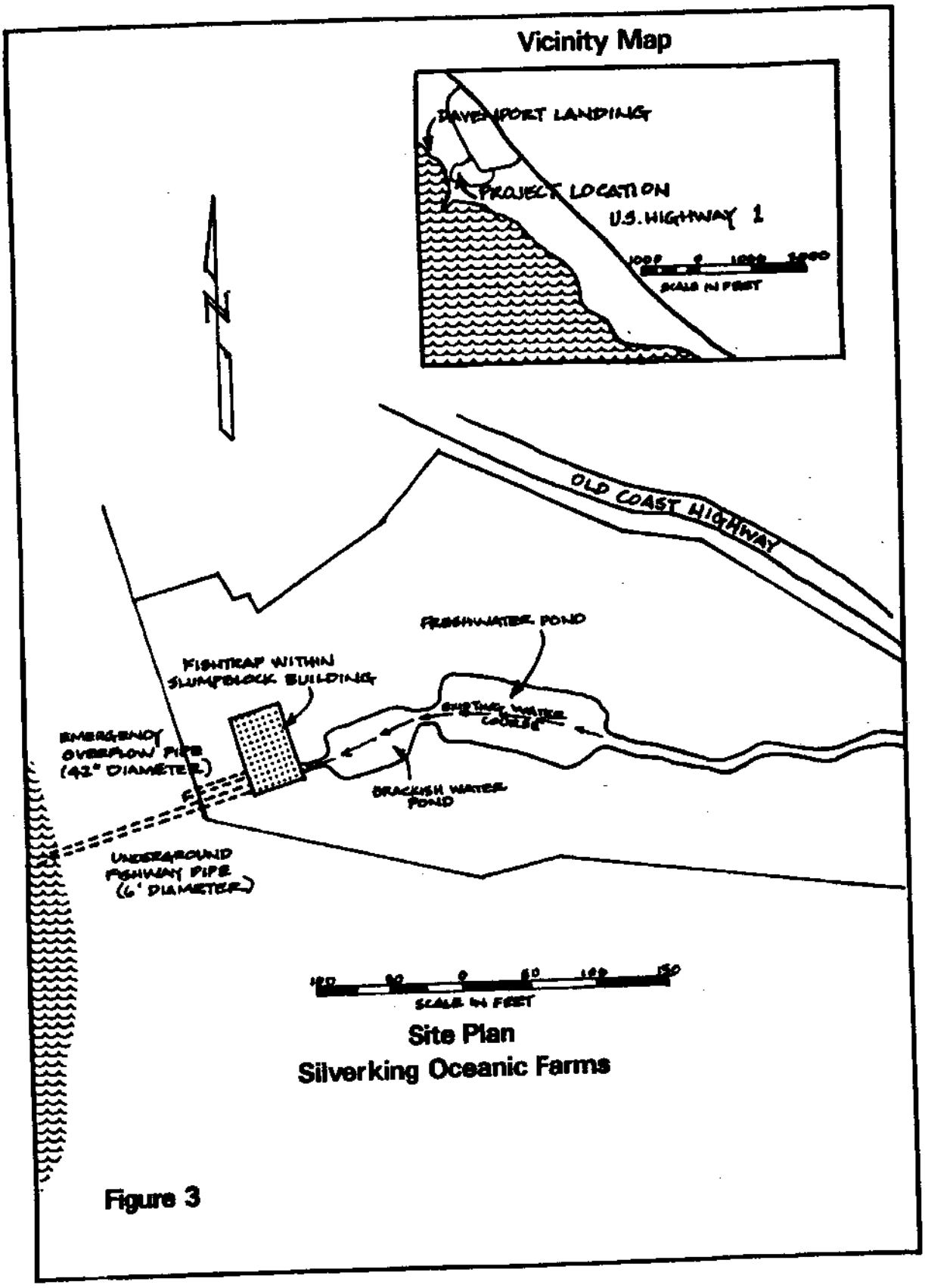
Vicinity Map
DAVENPORT LANDING
PROJECT LOCATION
U.S. HIGHWAY 1
SCALE IN FEET
N
OLD COAST HIGHWAY
FRESHWATER POND
FISHTRAP WITHIN SLUMPBLOCK BUILDING
EMERGENCY OVERFLOW PIPE (42" DIAMETER)
BRACKISH WATER POND
UNDERGROUND FISHWAY PIPE (6' DIAMETER)
SCALE IN FEET
Site Plan
Silverking Oceanic Farms

Figure 3

County, tagged SKOF salmon were captured by fishers working in Northern California and Southern Oregon waters. Indeed, the greater part of salmon released into the ocean are captured by fishers or serve as a food source for other marine organisms.[14]

Upon returning to Davenport Landing Creek, the salmon make their way up a fish ladder and are captured in a fish trap. The salmon are diverted into two holding pens. The majority are then killed and sold to buyers. The remaining fish are used for spawning purposes.

3.3 Economic Incentives

SKOF's goal is to release 20 million King salmon smolts and 20 million Silver salmon smolts annually.[15] Capacity releases, however, are not expected to be reached until the late 1980's.[16] Yet, by employing these capacity release figures and a handful of assumptions, the economic incentives which prompted SKOF to first engage in anadromous fish aquaculture may be determined.

Five assumptions must be made in order to assess potential net revenues. First, six-tenths of one percent (0.6%) of the King smolts released will be harvested by sport and commercial fishers, while two-tenths of one percent (0.2%) will return to the SKOF release-and-recapture facility.[17] Second, three percent (3%) of the Silver smolts released will serve as the contribution to the ocean fishery, while one percent (1%) will return to the SKOF facility.[18] Third, twelve pounds will be the average dressed weight[19] of returning King salmon,[20] and eight pounds will be the average dressed weight of returning Silver salmon.[21] Fourth, the 1977 wholesale price range for salmon of $2.50 to $3.00 per pound is assumed to represent the lowest and highest wholesale prices which SKOF's returning salmon will command on the market.[22] Finally, SKOF's cost per pound of incoming fish is assumed to be $0.08 per pound.[23]

Employing these assumptions, approximately 40,000 King salmon and 200,000 Silver salmon will return to the SKOF facility. This represents 480,000 pounds of King salmon and 1.6 million pounds of Silver salmon. Annual gross revenues will be between $5,200,000 and $6,240,000. Total costs will be $166,400. Annual net revenue before taxes will range from $5,033,600 to $6,073,600.

The economic incentive to engage in this form of aquaculture is clear: anadromous aquaculture yields a rate of return of 3000-4000 percent. The question then becomes: why aren't more firms engaging in anadromous fish production?

3.4 Public Regulations

A key factor preventing the entrance of other firms into the ocean ranching market is the nearly insurmountable barrier created by local, state, and federal regulatory requirements. The costs of public regulations can be more clearly examined upon considering Silver King Oceanic Farm's history in this regard. A disclosure of the regulatory requirements which SKOF faced and the specific costs associated with each follows.

a) Legislation

The first regulatory requirement which the prospective ocean rancher faces is unique to anadromous aquaculture. In California an anadromous operator must secure enabling legislation from the State which ratifies the proposed operation for each desired coastal site.

Ratification provides a mechanism for considering each proposed operation individually. It is required because biologists still do not know enough about the pressures anadromous aquaculture will exert on the marine ecosystem. While this form of aquaculture may indeed enhance salmon supplies, biologists fear that as hatchery-bred salmon continue to reproduce, many undesirable recessive characteristics will surface and cause a loss of species vigor. Biologists worry that the loss of vigor will make hatchery-bred salmon more susceptible to diseases which may be transmitted to natural stocks.

There is also concern over the effects hatchery-bred salmon may exert on the marine food chain. A potential exists for these salmon to consume large amounts of oceanic organisms which serve as food sources for other important species of fish. In addition, hatchery-bred salmon may compete too heavily with natural stocks causing an overall reduction in annual harvests. Finally, biologists fear that the introduction of large numbers of salmon may generate an imbalance in the predator-prey relationship. Organisms located in the

higher tiers of the food chain may multiply rapidly as a result of consuming the more readily available food source. As the population of salmon diminishes, these predators may turn to smaller marine organisms. When the small organisms are sufficiently depleted, large numbers of these predators may die. Thus, because scientists do not know enough about the effects of this type of aquaculture, legislation must be passed for each proposed operation.

SKOF has secured such legislation three times. The first site located on Waddell Creek in Northern Santa Cruz County was ratified in 1968 for experimental purposes.[24] After experimental operations proved potentially profitable, SKOF attempted to expand in Mendocino County. In 1973, the original bill of 1968 was amended to provide for a full-scale venture at Elk Creek.[25] Approximately one year elapsed between SKOF's initial action to introduce the bill and ratification of the Elk Creek site.

After receiving legislative approval, SKOF attempted to gain the other necessary regulatory instruments from federal, state, and local agencies. Although SKOF received state and federal approval of the project, the local citizenry objected to the proposal. After three Environmental Impact Report drafts and a number of local hearings, the Mendocino County Planning Commission refused to allow construction of the SKOF facility. Thus, after $100,000 had been expended on consultant fees, legal fees, administrative salaries, land options and permits,[26] SKOF was forced to locate elsewhere.

SKOF found a third site for their facility in late 1974. The new site, located at Davenport Landing Creek, proved to possess the physical characteristics necessary to support an ocean ranching endeavor. SKOF did not want to repeat what had happened at Elk Creek, and therefore sought local approval of the site before requesting legislative ratification. In 1975, SKOF returned to Sacramento to add a second amendment to the original bill. One year later the amendment passed.[27]

b) Local, State, and Federal Permits[28]

SKOF began the permit acquisition process on 17 April 1975 by applying for two local permits and one local approval. SKOF applied to the County of Santa Cruz, Department of Public Works for an Encroachment permit[29] which would allow SKOF to build a driveway on the Davenport Landing Creek property and connect the driveway to Old Coast Highway. The permit was issued the same day. No fees were required to be paid.

The second permit which SKOF filed for on 17 April 1975 was a use permit.[30] SKOF applied to the Zoning and Permits division of the Santa Cruz County Planning Department for this permit which would allow SKOF to use their property for the release-and-recapture facility. The permit was issued the following day. A permit fee of $10 had to be paid.

The approval SKOF applied for on 17 April 1975 was an Environmental Assessment of their site.[31] An Environmental Assessment is a preliminary site analysis undertaken by the Santa Cruz County Planning staff in order to determine whether an Environmental Impact Report will be required for a proposed development. A $25 filing fee was required. SKOF paid the fee to Zoning and Permits on the following day.

On 18 April 1975, SKOF submitted an application to Zoning and Permits for a change in the zoning district designation within which their property was located.[32] Their parcel was originally located in a district zoned for residential development. Therefore no commercial activity could take place unless the zoning district designation was changed to accommodate such activity. SKOF filed the application in an effort to change the zoning to provide for agriculture. SKOF spent many hours convincing the County Planning staff to accept ocean ranching as a form of agriculture. The filing fee for the zoning change was $150.

Two months later, County Planning issued a "negative declaration" for SKOF's proposed development. This meant that SKOF would not have to file an Environmental Impact Report. A negative declaration[33] is granted when a proposed development has been determined by the Planning staff to have insignificant environmental effects on a proposed site. In this case, Davenport Landing Creek was a very shallow, small stream with little aquatic life. Members of the Planning Department staff believed that minimal environmental damage would result from constructing the SKOF facility. A report was then prepared which supported SKOF's proposed change in the zoning district designation.

On 16 July 1975, SKOF received approval from the County Planning Commission for the zoning change. The district was designated an agricultural district with a two-acre minimum lot size planned development. A planned development is a device which allows the County Planning Department to set conditions on the way in which a parcel is developed. Plans of a proposed development must be reviewed and approved by the County Planning staff.

SKOF submitted site plans and an application for a Planned Development on 27 July 1975.

On 12 September 1975, SKOF applied to the Central Coast Regional Coastal Commission for an administrative permit.[34] The permit would allow SKOF to construct: a driveway; a parking lot; a building to house an office, storage room and fish trap; 12-foot deep ponds in the stream bed; and a 6-foot diameter fishway pipe placed under the beach from the fish trap to the sea; and a saltwater intake line. A $25 application fee was required.

On 16 September 1975, SKOF received final approval for the change in zoning from the Santa Cruz County Board of Supervisors. A total of 164 days had elapsed between submission of the zoning change and issuance of approval.

On 29 September, SKOF obtained the Planned Development. A fee of $244.68 was paid. A total of 64 days had elapsed between permit application and issuance.

On 23 October, SKOF applied to the U. S. Army Corps of Engineers for a permit to extend a galvanized steel pipe into the ocean.[35] Salt water would be pumped through the pipe and fill the fish trap and brackish water pond. SKOF submitted a $50 filing fee with the application.

On 28 October, SKOF contacted the California Department of Fish and Game (CFG) to arrange an agreement[36] which would allow SKOF to divert and dam Davenport Landing Creek. No fees or permits were required. The agreement was issued on 7 November 1975.

SKOF then applied to CFG for a Domesticated Fishbreeder's license.[37] Any anadromous firm in California is required to obtain this license each year to operate a release-and-recapture facility. A $15 fee is required. SKOF received the license approximately 30 days later.

On 10 November 1975, SKOF applied to the California State Regional Water Quality Control Board for a National Pollution Discharge Elimination System permit (NPDES).[38] The permit would allow SKOF to discharge waste water into the ocean from the fish trap building. A fee of $100 was required.

On 12 November 1975, SKOF applied to the State Lands Commission for a "Lease of State Lands."[39] SKOF needed to place the fishway and salt water intake line under the beach and some submerged acreage, all of which was owned by the State of California and managed by the State Lands Commission. A $25 filing fee accompanied the application.

On 12 December 1975, SKOF received approval from the Central Coast Regional Coastal Commission for the administrative permit. The cost of the permit was $250. The total time elapsing from application to issuance was 130 days.

On 1 April 1976, SKOF received approval from the State Regional Water Quality Control Board. The NPDES permit was issued. A total of 143 days had elapsed from permit application to issuance.

On 16 April, the U. S. Army Corps of Engineers issued approval for construction of the sea water intake line. A total of 161 days had elapsed from submission of the application to agency approval.

After obtaining the Corps approval SKOF returned to the Inspection Services division of the County Planning Department. On 1 July 1976, SKOF submitted an application for a building permit which would allow them to construct the fish trap structure. On 27 July 1976, Inspection Services granted the permit.

SKOF then returned to the Zoning and Permits division to inquire about building a retaining wall which would serve as a dam and a one-acre pond to be constructed as an upstream smolt depository. Zoning and Permits required SKOF to pay for an environmental assessment. However, there were no specific permits which SKOF had to acquire because the County Planning Department considered the dam and pond part of the previously approved facility.

On 6 August 1976, SKOF returned to the Central Coast Regional Coastal Commission and filed an application for a permit to construct the proposed dam and pond. A $75 filing fee was required.

On 24 August 1976, SKOF received a Negative Declaration for the dam and pond project. However, during the environmental assessment an archeological investigation of the site revealed that many Indian relics were imbedded in the ground in the area where the dam and pond would be built. The County Planning Department required that SKOF pay a total of $5000 to have approximately five percent of the entire site excavated.

When SKOF's management agreed to pay for archeological reconnaissance, the Central Coast Regional Coastal Commission approved the dam and pond. On 4 October 1976, a permit was issued which approved the project but stipulated that a $15,000 bond would have to be posted. The bond money would be used to return the site to its original condition if the venture failed. SKOF considered this

demand to be unfair and sought legal assistance. SKOF's attorney negotiated with the Central Coast Regional Coastal Commission and countered the Commission's approach to protecting the site with an alternative. Rather than posting a bond, SKOF would deposit $15,000 in a time-certificate savings account at a local bank. SKOF would be allowed to accrue interest on the account. The Regional Coastal Commission agreed to this alternative and SKOF deposited the money. On 20 October 1976, the administrative permit was issued. A total of 75 days had elapsed from permit application to issuance.

SKOF then returned to Inspection Services to get a building permit for the dam.[40] SKOF applied for the permit on 8 November 1976. It was issued on 15 November 1976. SKOF spent a total of $376.68 on building permits, including the fish trap structure.

Upon further consideration of the costs involved, SKOF's management decided not to build the dam and pond. Alternatives are currently being formulated. The one most likely to be selected is a set of fresh runways which will be constructed on top of landfill which will cover the area of the site where the Indian artifacts were discovered.

Seven months after SKOF received the building permit, it was discovered that the salt water intake pipe that had been constructed was filling up with sand because it did not extend far enough off shore. SKOF returned to the Central Coast Regional Coastal Commission and applied for an administrative permit[41] that would allow the pipeline to be extended. SKOF filed for the permit on 14 June 1977.

On 5 July 1977, SKOF submitted an application to the U. S. Army Corps of Engineers[42] for a permit to extend the pipeline. A $100 filing fee was required.

On 11 July, the Central Coast Regional Coastal Commission issued their approval for the pipeline extension. A $25 fee was required.

On 22 July 1977, SKOF applied to the Central Coast Regional Coastal Commission for an administrative[43] permit which would allow them to construct a pump and pipeline for fresh water. The water would be used to fill the one-acre smolt depository pond and supply fresh water to the fish trap building. On 29 July 1977, an additional administrative[44] permit was filed for the fresh water system. Another pipe was needed in order to supply water to the fresh-

and brackish-water ponds. This permit was issued on 19 August 1977. Three days later, the Commission issued the pump and pipeline permit.

On 29 August, the Corps issued the sea water intake pipeline extension permit. This was the last permit SKOF had to acquire. The permit fee was $100.

To simplify the reader's task of assimilating all of the information presented thus far, Chart 4 is provided. The chart discloses: (1) each agency involved in the regulatory process; (2) each required permit; (3) respective citations for each permit; (4) a short description of the rights provisioned by each permit; (5) the respective fees involved; and (6) the time elapsing between submission of each permit application and notification of agency approval. In addition, total direct monetary expenditure for the Davenport site, the total time required to gain all necessary permits, and an estimate of the total entrepreneurial expense attributable to the permit acquisition process are presented.

3.5 Indirect Costs Attributable to Public Regulations

Regulatory requirements are also the cause of less easily quantified indirect costs. The major indirect costs paid by SKOF stem from the effects or regulations on the siting of their hatchery facility SKOF could not find a site that could support both the hatchery and the release-and-recapture facility and be approved by all governmental agencies involved.[45] Thus, SKOF was forced to situate their hatchery inland, nearly 100 miles from the Davenport site.

The separation of these facilities has increased the level of inefficiency in SKOF's production in two ways. First, because the smolts must be transported a considerable distance, the cost per smolt increases. Contributing to this increase in cost are the additional expenditures made on energy, labor, and transportation machinery used in the transfer process. Second, transporting

Chart 4

SILVERKING OCEANIC FARMS
Established 1973
Situated in Coastal Zone
Located on Private Land

Agency	Permit	Description	Fee	Time	Citation	Cost
Dept. of Public Works, Santa Cruz County, CA	Encroachment Permit	Permits SKOF to construct driveway and hook up to old Coast Highway	None	1 day	Local Ordinance	$40 Administrative Time
Santa Cruz Co. Planning Dept. Santa Cruz, CA	Use Permit	Permits SKOF to use property for a release-and-recapture facility	$10	1 day	Local Ordinance	$40 Administrative Time
Santa Cruz Co. Planning Dept	Change in Zoning	Changes zone district designation from residential usage to agricultural usage	$150	151 days	Local Ordinance	$1000 Administrative Time
Santa Cruz Co. Planning Dept	Planned Development	Sets land use restrictions on SKOF property	$244.68	64 days	Local Ordinance	$200 Administrative Time
Cen.Cst.Reg. Coast. Comm. Santa Cruz, CA	Administrative Permit	Permits SKOF to construct release-and-recapture facility in coastal zone	$250	130 days	Cal. Pub. Res. Code, §30601, 1976	$1000 Administrative Time $25 Filing Fee
US Army Corps of Eng., San Francisco, CA	To engage in construction navigable waterways	Permits SKOF to construct saltwater intake line	$50	161 days	33 USC 403 (1970)	$500 Administrative Time
Cal. Dept. of Fish & Game, Sacramento, CA	Domesticated Fish Breeder's License	Permits SKOF to operate a release-and-recapture facility	$15	30 days	Cal. Fish & Game Code, §6452 (1973)	$50 Administrative Time

SILVERKING OCEANIC FARMS (con't)

Agency	Permit	Description	Fee	Time	Citation	Cost
Cal. State Reg. Water Quality Contr. Board, San Luis Obispo, CA	NPDES Permit	Permits SKOF to discharge waste water into the ocean	$100	143 days	33 USC 1342 (1972)	$200 Administrative Time
Cal. State Lands Comm., Sacramento, CA	Lease of State Lands	Leases to SKOF submerged acreage for fishway and pipe	$450	30 days	2 Cal. Adm. Code 2000(a)(1)(1976)	$200 Administrative Time
Santa Cruz Co. Planning Dept. Santa Cruz, CA	Building Permit	Permits SKOF to construct fish trap building	*	26 days	Local Ordinance	$40 Administrative Time
Cen.Cst.Reg. Coast. Comm. Santa Cruz, CA	Administrative Permit	Permits SKOF to construct a dam and one acre smolt depository pond	$75	75 days	Cal. Pub. Res. Code $$30601, 30604.5, 1976	$15,000 Time Cert. Sav. Accnt. Dep. $5000 Arch. Reconnaisance Fees $1000 Admin. Fees $1000 Legal Fees
Santa Cruz Co. Planning Dept. Santa Cruz, CA	Building Permit	Permits SKOF to construct retaining wall (dam) and safety fence	*	7 days	Local Ordinance	$40 Administrative Time
Cen. Cst. Reg. Coast. Comm. Santa Cruz, CA	Administrative Permit	Permits SKOF to extend salt water intake pipeline	$25	27 days	Cal. Pub. Res. Code, $30601, 1976	$100 Administrative Time
US Army Corps of Engineers San Francisco, CA	Special Letter of Permit	Permits SKOF to extend salt water intake pipeline	$100	55 days	33 USC 325.5(b) (1976)	$100 Administrative Time
Cen. Cst. Reg. Coast. Comm. Santa Cruz, CA	Administrative Permit	Permits SKOF to construct fresh water system on property	$25	30 days	Cal. Pub. Res. Code, $30601, 1976	$200 Administrative Time
Cen. Cst. Reg. Coast. Comm., Santa Cruz, CA	Administrative Permit	Permits SKOF to construct fresh water system on property	$25	21 days	Cal. Pub. Res. Code, $30601, 1976	$50 Administrative Time

*The cost of these building permits totaled $376.68.

'SILVERKING OCEANIC FARMS (con't)

Total Time: 2 years, 135 days
Total Cost: $27,671
Total Percentage of Capitalization:
Unknown

the smolts is a risky, problematic affair. Tanker trucks must hold great densities of smolts in order to keep costs low. Ammonia concentrations deriving from fish wastes cause water temperatures to rise. This contributes to a high rate of smolt mortality. In 1977, nearly a million smolts expired during the transfer process. Monetary losses were considerable.

Regulations have also served to increase SKOF's difficulty in obtaining financial backing. The risks associated with the production process, and the lengthy time period associated with the permit acquisition process have contributed to this difficulty. These factors decrease the chance that SKOF will succeed and, in turn, decrease the willingness of investors to provide venture capital.

Finally, because so many rules exist which apply to aquaculture, and because these rules are often highly complex, some agencies have made informal regulatory arrangements with SKOF.[46] Changes in agency policy or personnel may place SKOF in jeopardy with respect to enforcement. A potential cost exists here that is equal to the penalty for violating the law which has been waived without formal authority.

3.6 Conclusion

It is clear that Silver King Oceanic Farms has faced a barrage of governmental regulatory requirements and that dealing with these requirements has had an impact on the firm's productive capabilities. Yet SKOF still remains the sole anadromous aquaculture operation in California. Four qualities held by SKOF have contributed to the firm's present status.

a) Political Sophistication

SKOF's management has become skilled at dealing with local, state, and federal regulatory agencies. In addition, they have become familiar with the

legislative process and know individuals who are capable of exerting beneficial influence on that process.

b) Management Skills

SKOF has learned to use time and resources wisely. Because so many agencies had little or no previous experience in regulating anadromous aquaculture, SKOF has learned to educate the next regulatory agency while waiting for the last permit application to yield results. This has economized on the total amount of time expended on the acquisition process.

c) Accessibility to Capital

SKOF's management has developed a working knowledge of banking and finance. Without this knowledge, it is doubtful that SKOF would have been able to get through the permit process.

d) Perseverance

Perhaps the most important quality held by SKOF's management is perseverance. Silver King Oceanic Farms was founded in 1968. Ten years and millions of dollars later SKOF has yet to realize a return on investments. SKOF has had to contend with difficult regulatory and financial environments at all times. Surely the ability to persevere through this complex maze of regulatory intricacies has proved to be a most vital contribution to the firm's present status.

However, individuals wishing to engage in anadromous aquaculture will need more than simply these four qualities to succeed. Indeed, the regulatory environment continues to become more complex with time. Until the public decides that anadromous aquaculture is a viable use of California's coastal and marine resources, and until scientists determine the effects it will have on the marine ecosystem, Silver King Oceanic Farms will continue to operate as California's only anadromous aquaculture firm.

CHAPTER FOUR: THE REGULATORY COSTS ASSOCIATED WITH OYSTER AQUACULTURE

4.1 Introduction

This chapter will discuss the costs imposed by regulations on the growers of oysters and oysterseed. First, an introduction will be presented which focuses on the techniques employed by oyster aquaculturalists, the characteristics of the industry, and annual yield and productivity. Second, the costs of regulations borne by oyster producers will be given. This will be followed by a presentation of the regulatory costs borne by oysterseed producers. Finally, a concluding analysis of the effects of regulatory expense will be presented.

Oysters constitute approximately one-third of the 379 million pounds of fish harvested annually from the coastal waters of California.[1] There are four major production areas in the State: Humboldt Bay, Tomales Bay, Drakes Estero, and Morro Bay. (See Figure 4.) Approximately 6,600 acres of subtidal lands are leased to commercial aquaculturalists for purposes of oyster cultivation by state, local, and private sources.[2] California Fish and Game officials estimate that this acreage represents all of the suitable lands available for oyster cultivation in the state.[3] However, only a fraction of the land which is presently under lease is actually farmed.[4]

There are two species of oyster raised in California: Crassostrea virginica, commonly referred to as the Eastern oyster; and, Crassostrea gigas, known as the Giant Pacific oyster.[5] The majority of the oysters cultivated in California are of the genus Crassostrea gigas.

a) Harvesting Techniques

The two techniques used in California oyster production are bottom culture and rack culture.

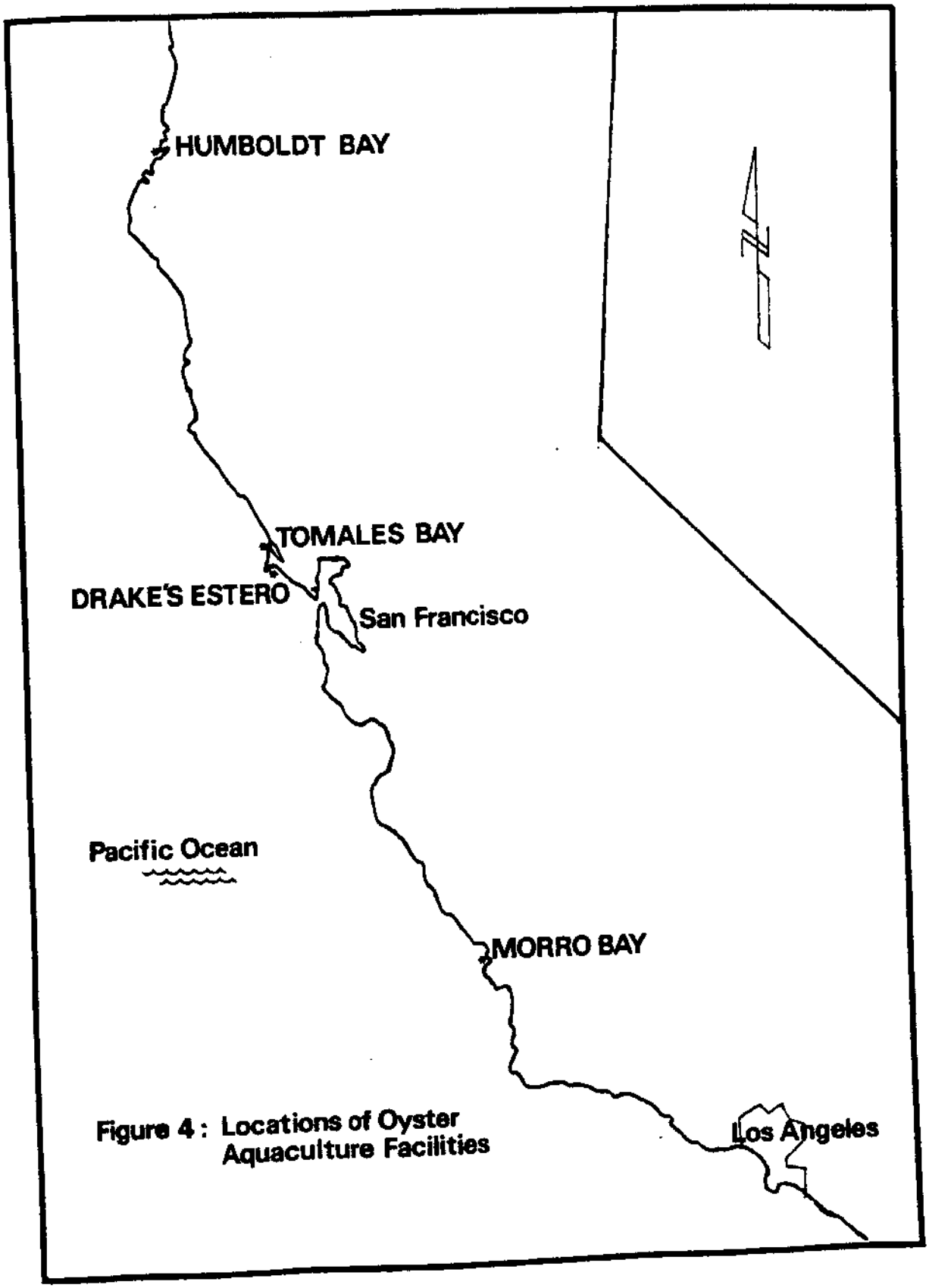

Figure 4 : Locations of Oyster Aquaculture Facilities

1) Bottom Culture: The majority of oysters produced in the state are raised using bottom culture methods.[6] Water bottoms are leased by growers from the State or other landowners.[7] Almost all of the acreage leased to cultivators is administered by the California Department of Fish and Game.[8]

Oyster cultivators employing the bottom culture method prefer areas with a firm mud or sand base for use as oyster beds. Firm beds insure against excessive loss of oysterseed. Seed oysters are young, one inch oysters. They are also commonly referred to as spat. Many times, on softer bottoms, the seed oysters are covered by mud or silt and are very difficult to harvest. Mud bottoms that are considered too soft by an operator may be covered with crushed oyster shell as a preparation. Since the majority of oyster growers sell only shucked oysters, which have had the meat separated from the shell, and the shells alone have little market value, they are crushed and used as bed-cover at minimal cost to the operator.

Seed oysters are imported from Japan or the Pacific Northwest for planting. Two kinds of seed are available for purchasing: culched seed (seed that is attached to a substrate), and culchless seed (which is unattached). The California companies which supply seed produce only the culchless variety which is exported to Europe. No market has been established yet in California.

Approximately 15-20 young oysters are attached to each shell imported from Japan,[9] and 15-30 seed oysters are affixed to each shell imported from Dabob Bay, Washington, and Pendrell Sound, British Columbia.[10] There are 900 shells to the Japanese case of seed, and 600 shells to the Washington or Canadian case.[11] The cost of one case of Japanese seed is approximately $40.[12] A single case of Washington seed sells for about $25.[13] While Japanese seed is more expensive, it is thought to have greater productivity because there are fewer seed to the shell. The fewer the number of young oysters attached to each shell, the larger

the growth of each of the oysters, and the faster they mature.[14]

The majority of seed purchased by California oyster growers continues to come from the Pacific Northwest. In the 1974-1975 season, 11,884 cases of Pacific oyster seed were imported from Dabob Bay, Washington, by commercial oyster cultivators.[15] Imports for that season represented $297,100 in expenditures by California oyster cultivators. If harvest levels in the Pacific Northwest had been low, and cultivators had turned to Japan for seed, the cost incurred by them would have been $475,360, an increase of $178,260. Thus, while the productivity of the Japanese seed may be greater than that of the seed supplied by Washington and Canadian sources, the additional cost of Japanese seed acts as a disincentive and encourages the grower to buy from Northwestern suppliers.

After the oyster spat have been purchased, they are placed on the prepared beds by laborers who shovel them over the side of a boat, or, in cases of large acreages, by a mechanical spreader. Bottom cultured oysters usually require a period of between two and one-half to four years to mature to marketable size.[16] The exact maturation period largely depends on water quality, temperature, concentration of food organisms naturally present in the water, and rate of movement of water carrying suspended food to the animals.[17]

In deeper waters harvesting of bottom cultured oysters is done by employing a mechanical dredge. The dredge acts as a scoop and picks up the oysters from the water bottoms.[18] In shallow waters manual harvesting is done by workers who use hand tongs and collecting baskets to retrieve the animals. The oysters are then brought to a processing facility to be shucked and sold.

2) Rack Culture: Rack culture techniques are used in Humboldt Bay, Tomales Bay, and Drakes Estero. Culched seed oysters are attached to ropes or galvanized steel wires that hang from racks which float on the water or are situated on top of the leased beds. The racks are built to a variety of

specifications. A typical structure is 10-15 feet in length and width, containing 8-12 vertically hanging wires. Each wire is approximately ten feet in length and holds 10-15 spat-covered shells. Floating racks or rafts are affixed to the water bottom by cable. In the case of wooden racks, supports, which extend 3-5 feet into the mud bottom, hold the structures firmly in place.[19]

Rack culture is an initially more expensive method of oyster cultivation. Constructing the racks is a time-consuming process and very labor intensive. Construction costs vary considerably and are dependent upon labor costs, structural design, and materials used.

Many growers think that the advantages inherent in rack culture may significantly lower costs in the long run. Since the oysters are grown vertically in the water, use of space is more efficient. Thus, greater productivity per acre of leased land results. Also when oysters are not grown on mud bottoms, fewer are lost to predation and siltation. California Fish and Game officials report that mortality figures for bottom cultured oysters approached 55 percent in 1971, while mortality for oysters suspended from racks was 20-25 percent.[20] Finally, rack cultured oysters mature in 15-18 months, much faster than those raised directly on beds. Hence, return on seed investments may be realized at a much faster rate. Also, such oysters are considered to have a better physical shape than bottom cultured oysters, and therefore are easier to market to the half-shell trade.[21]

Harvesting of rack cultured oysters is very simple; no mechanical devices are employed. The hanging strings of cultured oysters are simply removed from the racks by hand, and returned for processing.

b) Size of Workforce

Approximately 80-100 individuals are employed in the California oyster industry.[22] There are four categories of workers: (1) management, (2) bed

workers, (3) permanent oyster processors, and (4) seasonal processors. The number of individuals employed in a given firm depends upon two factors: the amount of land cultivated, and the type of culture method employed.

A large firm, using a bottom culture technique, may employ more than fifty individuals. Coast Oyster Company of Humboldt Bay employs a three-member management staff, 6-8 bedworkers, and 35-40 oyster processors.[23] A smaller firm, such as Morro Bay Oyster Company, employs 8-10 individuals.[24]

Firms using a rack culture technique employ fewer individuals. Johnson Oyster Company of Drakes Estero employs 4-6 individuals[25] and has an average annual output of 1.25 times that of Morro Bay Oyster Company.[26]

Seed producing companies require technical expertise and must therefore have professional marine biologists working full time. International Shellfish Enterprises of Moss Landing has one marine biologist, a business manager, and a staff of two to three technicians.[27] Pidgeon Point Shellfish Hatchery of Pescadero, California, employs six individuals with backgrounds in marine biology and business management.[28]

Thus, the number of workers in a given firm varies greatly and is not dependent on output exclusively but rather on the size of the allotment cultivated and the culture technique employed.

c) Yield and Productivity

Chart 5 describes the production of oysters in each of the four production areas of the State from 1972-1974 and the total amount of revenue generating from each.

Total gross revenue attributable to State oyster cultivation contributed more than $1,116,000 to the California macroeconomy in 1974. In addition to the absolute dollar value generated by the California oyster industry, there are

Chart 5

	PRODUCTION AREA	PRICE PER POUND*	HARVEST BY AREA IN POUNDS**	REVENUE PER AREA	REVENUE TOTAL
1972	Humboldt Bay	$0.87	751,832	$654,094	
	Tomales Bay	0.87	21,541 +	18,741	
	Drakes Bay	0.87	74,014 +	64,392	
	Morro Bay	0.87	28,586	24,870	$762,097
1973	Humboldt Bay	1.15	567,557	652,691	
	Tomales Bay	1.15	16,928 +	19,467	
	Drakes Bay	1.15	128,035	147,240	
	Morro Bay	0.62	13,207	8,188	$827,586
1974	Humboldt Bay	1.40	478,633	670,086	
	Tomales Bay	1.40	26,714	37,400	
	Drakes Bay	1.40	161,840	226,576	
	Morro Bay	1.40	130,378	182,529	$1,116,591

* All prices are for Crassostrea Gigas

** In packed weight (packed weight is 15.15% of live weight)

+ Emil Smith, Department of Fish and Game, July 8, 1977

Source: California Marine Fish Landings, 1972, 1973, 1974, Fish Bulletins 161, 163, 166

additional economic impacts which are measured in terms of total dollar value and total employment generated. Economists refer to these impacts as "multipliers." The total value added multiplier for fisheries products has been estimated to be $3.87, and the employer multiplier has been estimated to be 3.38 persons. This means that for every one dollar of oyster products produced and every one oyster related job, $3.87 and 3.38 jobs are generated in the macroeconomy.[29] Therefore, in 1974, with $1,116,590 in revenue generated by commercial oyster production in California, approximately $4,320,000 and 338 jobs were added to the California macroeconomy.

In addition, substantial revenues accrued to private enterprises during this period. An individual firm holding 1,013 acreas of water bottoms in Drakes Bay and using rack culture earned an average of approximately $150,000 per year in gross revenues by retailing shellfish to restaurants and visitors.[30] The State's largest firm, Coast Oyster Company, which holds 4,000 acres of tidal and subtidal lands in Humboldt Bay, had gross revenues of over $650,000 for each of the three years.[31]

Thus, the California oyster industry is contributing to the State of California macroeconomy and at the same time providing a substantial monetary incentive for individuals to engage in oyster cultivation at the entrepreneurial level.

4.2 Oyster Operations

This section will present an assessment of the direct and indirect expenses borne by oyster producers which are attributable to the present regulatory system. Two firms will be considered.

a) Coast Oyster Company

In 1954, Coast Oyster Company of Washington state expanded operations into California. At that time, Coast was required to obtain two permits from the

California Department of Fish and Game (CFG): an oyster cultivator's license,[32] and a fish processor's permit.[33] Coast was also required to obtain an oyster allotment from CFG.[34]

In November of 1954, Coast's business manager filed the necessary applications with CFG. No fees were paid. Coast received approval within ninety days.[35]

During Coast's "scale-up" phase, no other permits were required, although the company adhered to state and federal health requirements.[36] During the next fifteen years, other individuals interested in oyster production faced a similar situation of relatively easy entrance into the oyster production market. (See Chart 6.)

b) Buchan Oyster Company

In the early seventies, several businesses became interested in oyster cultivation in California. In late 1969, Neil Buchan, a graduate student at San Diego State University, began investigating oyster aquaculture. After a year of research, Buchan decided to become an oyster cultivator.[37]

1) Construction and Operating Permits: In late January of 1971, Buchan applied to CFG for a 42-acre oyster allotment in Tomales Bay and an oyster cultivator's license. He intended to use the allotment for growing oysters by bottom and stack culture techniques. In early May of that year, Buchan received notice from CFG approving his request.[38] Ninety days had elapsed.

On 25 June 1971, Buchan filed an application for a tidelands permit with the Marin County Department of Public Works. Buchan included construction plans for a fence to keep out stingrays with his application for permission to use tidal waterways for oyster cultivation. Construction plans for the fence specified eucalyptus poles and nylon mesh as building materials. The fence was to be 30" in height above the mean high tide mark and extend the perimeter of the 42-acre allotment. Approval was granted in the third week of October, 1971.

Chart 6

COAST OYSTER COMPANY
Established 1954
Situated in Coastal Zone
Leasing Public Land

Agency	Permit	Description	Fee	Time	Citation	Cost
Cal. Dept. of Fish & Game, Sacramento, CA	Oyster Cultivating License	Permits Coast to engage in oyster aquaculture	None	30 days	Cal. Fish & Game Code, §6481, 1973	$150
	Fish Processor's Permit	Allows Coast to shuck and package oysters for sale	None	14 days	Cal. Fish & Game Code, §8011, 1973	$100
	Oyster Allotment	Allots Humboldt Bay Tidelands to Coast	*	30 days	Cal. Fish & Game Code, §§6510-6536, 1973	$150

*See California Fish and Game Code, §§6510-6536, 1973.

Total Time: 30 days
Total Expense: $400
Total Percentage of Capitalization:
Insignificant

On 1 October 1971, Buchan applied to the U.S. Army Corps of Engineers for permission to construct the fence.[39] The Corps issued the required public notice in accordance with standard review procedures.[40] During the thirty-day public review period, individuals opposing construction of the fence submitted written objections to the Corps offices in San Francisco. These individuals were property owners who held land adjacent to Buchan's oyster allotment. They believed that the stingray fence would be ugly and would contribute to a dimunition in the value of their bay-front property. The Corps forwarded these objections to Buchan and instructed him to settle differences with the opposing parties.

During negotiation, Buchan applied to the Corps for permission to construct oyster racks 8' X 12' in size. The application was filed on 6 April 1972.

The Corps issued public notice for the racks on 11 April 1972. During the standard thirty-day review period, the same adjacent landholders sent written objections to the Corps concerning the proposed racks. These objections were almost identical to those submitted in opposition to the fence.[41] Once again, the Corps sent the written objections to Buchan to resolve.

The Corps's review process provides that when differences among interested parties in a given development cannot be reconciled, the permit applicant may submit a written rebuttal to all charges. The Corps then considers both sides of the dispute and makes a decision.

In early July 1972, Buchan submitted a rebuttal to the charges submitted by the landowners concerning the stingray fence. On 17 July 1972, the Corps approved construction of the fence.

During the month of July, the Corps also issued an interagency notification to those public agencies with possible jurisdiction in the matter. In August, the State Resources Agency, CFG, and the Department of the Interior approved

Buchan's plans. The Corps, however, could again not issue approval because of the opposition demonstrated by the adjacent landholders.

Buchan submitted a second rebuttal to the Corps, and on 3 January 1973, approval of the racks was granted. A total of 272 days had elapsed.

After receiving the Corps's approval, Buchan went before the North Coast Regional Coastal Commission to obtain permission to construct the racks and stingray fence.[42] The North Central Coast Regional Coastal Commission issued approval of the racks and stingray fence on 19 April 1973. This concluded the initial permit acquisition process. Construction of the fence and racks began in late May of 1973, over one year after the first application was filed.

On 5 September 1973, Buchan was required to report water quality conditions to the California Regional Water Quality Control Board (CRWQCB). Buchan sent a letter to Permit Branch Chief Donald Dalke of the San Francisco Region which described processes used in the operation.[43] He concluded his letter by stating that approximately 500 gallons of oyster processing wastes were discharged daily. CRWQCB responded in March of 1974 requesting that Buchan file an annual "Report of Waste Discharge." No fees were required.

Scale-up operations began during late September of 1973 when Buchan filed an application with CFG requesting an additional seventeen acres in Tomales Bay.[44] This request was approved on 15 January 1974.

During the year, Buchan revised the design of the oyster racks. On 17 October 1974, he submitted letters to the Marin County Department of Public Works, the Corps, and the North Central Coast Regional Coastal Commission, attesting to these changes. No permits had to be obtained.

In February of 1975, Buchan submitted an application for an additional 133-acre oyster allotment to CFG.[45] Concurrently, Buchan submitted plans for the construction of an overhead rail system which would extend offshore and lighten the chore of harvesting oysters. Buchan submitted applications for the

same purpose to the Corps and the Environmental Protection Committee of the Marin County Planning Department (EPC).

On 30 May 1975, CFG approved both requests. The other agencies, however, had not arrived at the same conclusion.

The Corps issued public notice for the proposed rail system and stingray fence during this period, and again letters of opposition written by the same adjacent landholders were received. The Corps forwarded these objections to Buchan. Negotiations commenced and continued for two and one-half months. Buchan finally agreed to modify the fence design. However, one party refused to approve construction regardless of modifications. Thus, Buchan submitted a written rebuttal to the Corps.

In late November of 1975, while the Corps was still deciding, the Environmental Protection Committee denied construction of the overhead rail system, but approved the stingray fence. However, the EPC refused to allow Buchan to use nylon mesh in construction. Determined to conduct operations according to his plans, Buchan reapplied to EPC for approval to construct the overhead rail system. Notice of reapplication was sent to the Corps and Public Works.

Buchan met with EPC twice between 24 November 1975 and 15 January 1976. In these meetings, Buchan presented a demonstration of the advantages of nylon mesh. Buchan also gave two site tours to EPC members to explain the purpose of the rail system.

On 15 January 1976, EPC approved the nylon mesh, but denied construction of the overhead rail system. Buchan reapplied to construct a wooden pier instead of the rail system. After receiving EPC's approval,[46] Buchan sent notice of his plans to the Corps.

Again, landowners sent opposing letters to the Corps. During the following months, Buchan negotiated with these individuals. Because no compromise could be reached, Buchan again sent a written rebuttal to the Corps.

In March of 1976, EPC determined that the pier would be ugly and requested that Buchan build a cable system instead. The cable system would extend offshore, just as the pier had been designed to do, but would carry baskets of ripe oysters via a trolley system. Because the plans for the cable system called for a narrower structural width than the pier, EPC felt that the cable-trolley system would minimize visual impact. Buchan sent word of the modifications to the Corps, and received the Corps's approval on 15 October 1976. The Corps also approved the oyster racks and stingray fence extension. On 4 November 1976, EPC approved the cable-trolley system. Buchan then went to the North Central Coast Regional Coastal Commission and received their approval in January of 1977. Thus, a total of three years and ninety-eight days elapsed between the date the first scale-up application was filed and the last approval was issued. The total amount of time expended on permit acquisition was five years and three hundred forty-three days.

2) The Cost of Buchan's Permit Process: Chart 7 presents a summary of the Buchan permit process, including: (1) the agencies involved; (2) required permit(s); (3) the permit fees; (4) the time elapsing from application to issuance; (5) a brief description of the rights provisioned by each of the permits; (6) respective citations; and (7) any additional costs involved. Buchan spent $410 on permit fees. Additional expenses (engineering, administrative, and legal) brought the total figure for permit process expenditures to $20,260.[47] The breakdown is as follows:

Initial Acquisition Expenditures:		
Administration:	$7,600	
Engineering:	1,500	
Permit Fees:	210	
Sub-Total:	$9,310	$ 9,310
Scale-Up Acquisition Expenditures:		
Administration:	$10,750	
Permit Fees:	200	
Sub-Total:	$10,950	$10,950
Total:		$20,260

This represents approximately five percent of total capital outlays of $400,000. Annual gross revenues presently exceed $350,000.[48]

4.3 Seed Operations

The effect of governmental regulations extends to aquaculture operations which engage in seed production. Three seed producing companies are operating at present. Two of these firms, International Shellfish Enterprises, and Pacific Mariculture, are located at Moss Landing Harbor in Monterey County. The third, Pidgeon Point Shellfish Hatchery, is situated in San Mateo County, a few miles north of Pescadero. Of the companies, International Shellfish Enterprises (ISE) was the last to complete the permit process. Thus, a disclosure of ISE's experience with the regulatory environment may represent the most accurate description of the effect of the present permit system on individuals seeking to produce shellfish seed.

a) International Shellfish Enterprises[49]

In 1970, ISE began developing a commercial shellfish company at Moss Landing. ISE's intention at this time was to develop a fully integrated shellfish culture

Chart 7

BUCHAN OYSTER COMPANY
Established 1971
Situated in Coastal Zone
Leasing Public Land

Initial Aquisition Process

Agency	Permit	Description	Fee	Time	Citation	Cost
Cal. Dept. of Fish & Game, Sacramento, CA	Oyster Cultivator's License	Permits Buchan to engage in oyster aquaculture	$25	30 days	Cal. Fish & Game Code, §6481, 1973	$100 Administration
Cal. Dept. of Fish & Game, Sacramento, CA	Oyster Allotment	Allots 42 acres of Tomales Bay Tidelands to Buchan for oyster planting	$50	90 days	Cal. Fish & Game Code, §§6510-6536	$500 Administration
Marin County Dept. of Public Works, San Rafael, CA	Tidelands Permit	Allows Buchan to engage in oyster cultivation and build a stingray fence	$10	119 days	Local ordinance	$500 Administration $1500 Engineering
US Army Corps of Engineers, San Francisco, CA	To engage in construction in navigable waterways	Allows Buchan to build a stringray fence	$50	290 days	33 USC 403 (1970)	$4000 Administration
US Army Corps of Engineers, San Francisco, CA	To engage in construction in navigable waterways	Allows Buchan to build oyster racks	$50	272 days	33 USC 403 (1970)	$2000 Administration
No. Cent. Coast Reg. Coast Comm.	Administrative Permit	Allows Buchan to build racks and fence	$25	90 days	Cal. Pub. Res. Code, §30601	$500 Administration

Initial Process Time: 2 years, 80 days

Initial Process Cost: $9310

Scale-up Process

BUCHAN OYSTER COMPANY

Agency	Permit	Description	Fee	Time	Citation	Cost
Cal. Dept. of Fish & Game	Oyster Allotment	Allots 17 additional acres of Tomales Bay Tidelands	$50	112 days	Cal. Fish & Game Code, §§6570-6536	$500 Administration
Cal. Dept. of Fish & Game	Oyster Allotment	Allots 133 additional acres of Tomales Bay Tidelands	$50	90 days	Cal. Fish & Game Code	$1000 Administration
Marin County Planning Dept. San Rafael, CA	Tidelands Construction Permit	Allows Buchan to construct oyster retrieval system	$25	637 days	Local ordinance	$7000 Administration (required reapplication)
U. S. Army Corps of Engineers, San Francisco, CA	Permit to engage in construction in navigable waterways	Allows Buchan to construct oyster retrieval system	$50	608 days	33 USC 403 (1970)	$2000 Administration (required reapplication)
North Central Coast Regional Coastal Commission, San Rafael, CA	Administrative Permit	Allows Buchan to construct oyster retrieval system	$25	58 days	Cal. Pub. Res. Code, §30601 (1976)	$250 Administration

Scale-up Time: 1194 days (3 years, 99 days)
Scale-up Costs: $10,950

Total Time: 5 years, 343 days
Total Expense: $20,260
Total percentage of capitalization: 5 percent

operation which would produce oysters and clams from spawn to marketable adult. To date, ISE has erected a shellfish hatchery which is capable of spawning and rearing several million 1/10th-inch culchless shellfish seed per month, and a shellfish nursery system in Elkhorn Slough, which is capable of growing several million 1/10th-inch to one-inch oyster seed per month. Presently, ISE is selling its seed to oyster growers throughout the U. S. and abroad.

ISE is in a mature phase of development. Attempts are now being made to culture oysters and clams to marketable size. In this aspect of the operation, ISE-produced seed will be planted in slough waters and cultivated through rack and raft methods.

1) ISE's Facility: The present facility is located on the shore of Moss Landing. (See Figure 5.) The facility includes a 6,000 square-foot hatchery on a 2.5 acre site. Source water for the hatchery is obtained via a submerged intake line which projects into the ocean adjacent to the hatchery. The original source of hatchery water was a delivery system which drew water from the Pacific Gas and Electric (P.G.&E.) Moss Landing Power Plant circulating cooling water discharge system. That system runs parallel to the ISE property and pumps warm effluent water offshore. Presently, ISE limits their connection to this system to the discharge of hatchery waste waters. In addition, ISE leases twenty acres in Elkhorn Slough from the Moss Landing Harbor District (MLHD) where nursery operations are conducted. Floating rafts are sited on 7.3 acres of the leased parcel.

2) The Permit Process: During their eight years of development and operation, ISE has had to deal directly with eight separate agencies and sub-agencies of federal, state, and local jurisdiction. Three aspects of the company's operations have required the acquisition of permits from public agencies: (1) establishing a shellfish nursery and oyster growing operation in Elkhorn Slough; (2) constructing a hatchery facility; and (3) constructing a water intake pipeline.

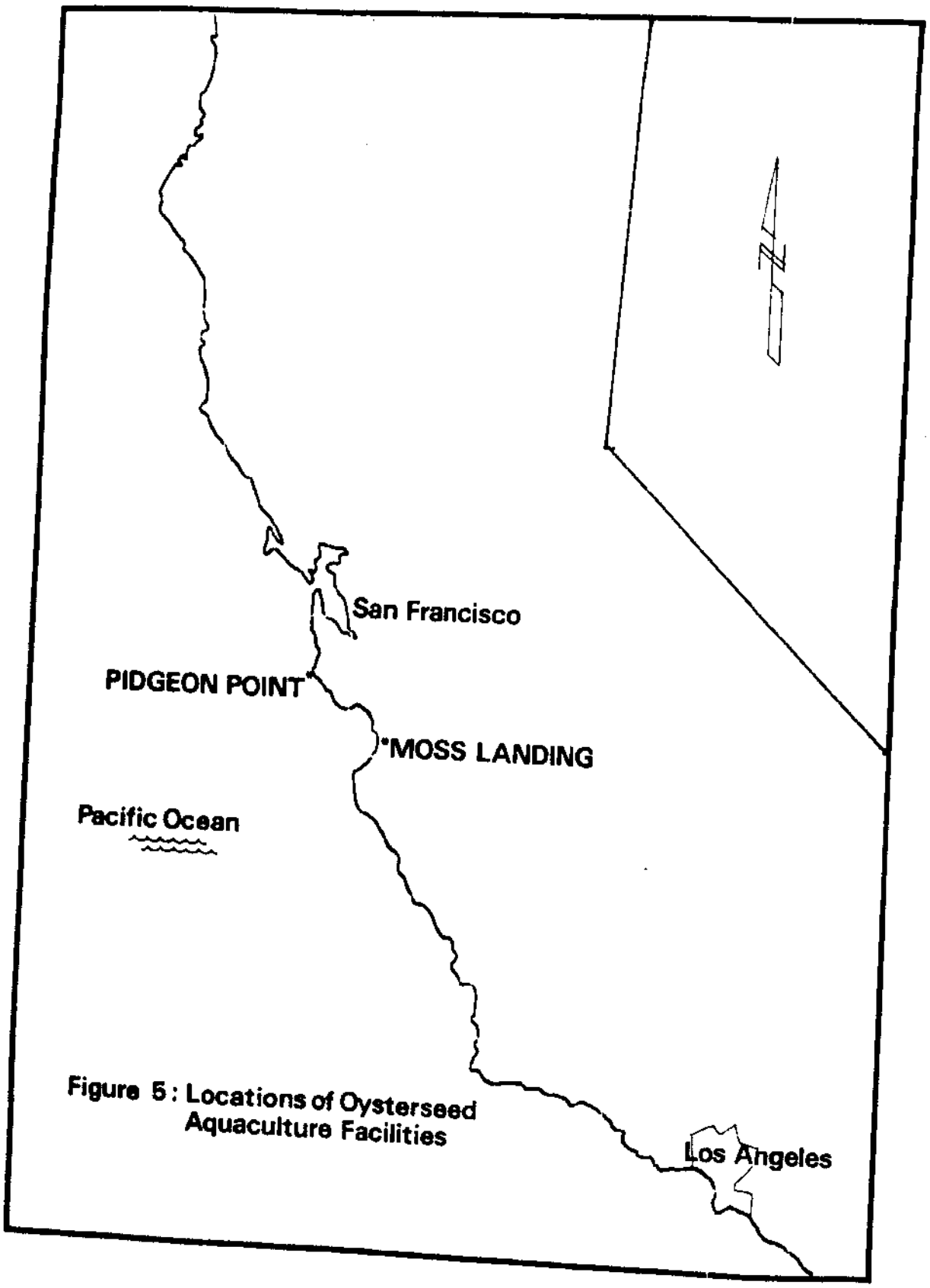

Figure 5 : Locations of Oysterseed Aquaculture Facilities

(a) Elkhorn Slough Permits: ISE was incorporated in late 1970, beginning mariculture efforts with a two-year feasibility study to evaluate the potential for mariculture at Moss Landing. The only permit that had to be obtained at this time was a Mariculture and Oyster Cultivator's license which was issued by the California Department of Fish and Game[50] (CFG). ISE spent $25 on the license, and received approval in thirty days.

The first phase of developmental planning called for experimental oyster culture techniques to be carried out in Elkhorn Slough, a large salt water marsh which empties into Moss Landing Harbor. In order to gain access to the slough waters, ISE had to obtain the direct approval of three agencies: the Moss Landing Harbor District (MLHD); the Central Coast Regional Commission of the California Coastal Commission;[51] and the U. S. Army Corps of Engineers (Corps).[52]

On 14 September 1971, ISE submitted an application, accompanied by a $100 fee, to MLHD for the use of five parcels in Elkhorn Slough, totaling twenty-five acres. After ISE submitted the application, MLHD began examining the possible environmental impacts of the proposed use. Research was conducted for over a year. On 14 April 1973, MLHD issued a "Negative Declaration" for ISE's experimental activities. Thus, the requirement for an Environmental Impact Report was waived. However, a permit for the use of the Slough acreage was not issued at this time. MLHD instructed ISE to contact the U. S. Army Corps of Engineers and obtain that agency's approval.

On 5 June 1973, ISE submitted an application along with a $100 filing fee to the Corps. ISE notified MLHD of this action.

On 14 June 1973, MLHD granted ISE a "Lease for the Cultivation of Marine Life in Elkhorn Slough." ISE was required to pay an annual fee of $500. The permit was valid for three years, and granted ISE access to the slough acreage.

Also, on 14 June 1973, ISE submitted an application and a $25 filing fee to the Central Coast Regional Coastal Commission for a permit which would allow ISE access to the Slough. On 6 August 1973, the Central Coast Regional Coastal Commission issued approval for the use of one of the parcels (approximately five acres in size). An individual living in Moss Landing voiced concern over the environmental impacts of the proposed aquaculture activities to the Central Coast Regional Coastal Commission. On 19 September 1973, a public hearing was held which solicited testimony from local citizens and ISE employees. The hearing resulted in the Central Coast Regional Coastal Commission prohibiting ISE from conducting experimental aquaculture activities in any part of the Slough. After obtaining legal counsel, ISE filed an appeal with the State Coastal Commission three weeks later. On 3 October 1973, the State Coastal Commission granted ISE access to the five-acre parcel that had been approved on 6 August 1973 by the Regional Commission.

On 2 November 1973, the Corps issued public notice and sent an interagency review to those agencies with possible jurisdiction in the matter. On 20 February 1974, the Corps granted a permit which allowed ISE to construct experimental culturing platforms in the Slough.

In October of that year, ISE decided to alter the culture system employed in the Slough. On 7 November 1974, ISE submitted revised engineering plans to the Corps and requested a change in the original permit. The new system would use floating rafts which would hold submerged trays of oyster seed, instead of fixed dock-like structures which were to hold developing oysters until they attained marketable size.

Six months later, on 14 April 1975, a letter of permission was issued by the Corps which approved the structural changes in the Slough. No fees were required to be paid.

During the following two years, ISE experimented with seed culturing techniques. When an appropriate technique was finally developed, expansion plans were formulated. On 12 February 1976, MLHD extended ISE's Slough permit expiration date to 1993. After receiving this extension and crystalizing expansion plans, ISE submitted new applications to the Corps and the Central Coast Regional Coastal Commission in an effort to gain access to the additional 20 acres of slough waters that had been denied to them in 1973. Applications were submitted to the Corps on 24 October 1977, and to the Central Coast Regional Coastal Commission on 27 October 1977. A $50 application fee was required by the Corps; $250 accompanied the Central Coast Regional Coastal Commission application.

Approximately one month later, on 22 November 1977, the Corps issued public notice and inter-agency review.

On 9 January 1978, the Central Coast Regional Coastal Commission held a hearing on the proposed acreage expansion. The commissioners debated for two consecutive meetings. Finally, on 23 January 1978, a second hearing commenced which was resolved in ISE's favor. The Coastal Commission issued approval of the twenty acres on 7 February 1978.

In mid-March of 1978, the Corps issued approval. The expansion phase of ISE's aquaculture activities in the Slough could thus commence. Seven years and six months had elapsed from the time the first application concerning the slough acreage was submitted and final approval was granted by all agencies with jurisdiction in the matter.

(b) Hatchery Permits: When ISE began the planning phase for the hatchery operation in 1972, the operation was planned around the use of waste water from the P.G.&E. power plant at Moss Landing. This involved gaining access to the P.G.&E. discharge pipelines from the power plant, which are located adjacent to the ISE hatchery. Hatchery waste discharges were also planned to empty into these pipelines. Because of the jurisdictional and administrative

complexity of the matter, it took ISE almost one year of negotiating with the California Water Quality Control Board and the Corps to get a decision as to the permit procedure for such an operation. It was finally decided that ISE's water source and discharge operations would be considered contributory to the P.G.&E. discharge system, and would be covered under permits already held by P.G.&E. On 6 December 1972, ISE signed a private contract with P.G.&E. The contract specified that ISE would pay $600 per year and a small percentage of annual profits to P.G.&E. for the right to use the effluent lines.

Construction of the hatchery complex began in early 1973, after building permits were obtained from the Monterey County Planning Department. Because the hatchery complex was under construction when the California Coastal Act was instituted ISE applied for and was granted an administrative permit from the Central Coast Regional Coastal Commission on 23 July 1973.[53] The application fee was $25.

(c) Water Intake Pipeline Permits: Poor water quality from the P.G.&E. source system forced ISE to explore alternative water sources. In late 1976, an off-shore sea water intake system was constructed. The events leading to the establishment of this system are given below.

On 6 October 1976, ISE filed a permit application for the off-shore intake system with the Central Coast Regional Coastal Commission. A $75 fee accompanied the application. On 11 November 1976, ISE also requested permission from MLHD to allow installation of the off-shore sea water system because the system was to be located in part on land within MLHD's jurisdiction. The system was approved by MLHD on 9 December 1976, and by the Central Coast Regional Coastal Commission on 13 December 1976.

On 31 December 1976, heavy storms in the Monterey Bay destroyed the newly installed pipeline; operations stopped.

During the month of January 1977, ISE revised their original engineering plans for the intake pipeline. On 2 February 1977, ISE submitted new plans for the pipeline and a permit application to re-establish the intake system to the Corps. A $100 fee was included. On 8 February 1977, the plans were submitted to the Central Coast Regional Coastal Commission. The Corps issued public notice of the proposed pipeline on 31 March 1977.

The Corps spent time during the review period determining their jurisdiction in the matter. They decided to approve the permit on the condition that the Central Coast Regional Coastal Commission grant approval. At the same time, the Central Coast Regional Coastal Commission decided to wait for a decision from the Corps before they made their decision. Thus, the lack of communication between the agencies and the absence of any explicit evaluatory criteria prolonged the process.

ISE could not afford to discontinue operations. On 28 June 1977, ISE approached the Corps to gain approval for an interim intake pipeline. The plans for the pipeline specified an inexpensive temporary water intake system which would provide water until a judgment was issued on the permanent system.

In mid-July, with still no word from the Corps, ISE requested similar approval from MLHD and the Coastal Commission. On 14 July 1977, ISE submitted their request to MLHD and received approval that day. On 15 July 1977, ISE asked the Coastal Commission for permission, and received it immediately. ISE informed the Corps of the other two agencies' decisions. The Corps issued approval on 29 July 1977. ISE then installed the interim pipeline.

On 21 July 1977, the Central Coast Regional Coastal Commission had issued a permit for the main system. ISE then notified the Corps of this development. The Corps, however, did not reach a decision on the main system until 7 October 1977. The Corps then notified MLHD, and MLHD granted approval of the main

system on 8 November. All necessary permits for the permanent intake system had been obtained.

The total time elapsing from submission of the first application to issuance of the last permit was approximately one year and one month.

A summary of the entire ISE experience is presented in Chart 8.

(d) The Direct Cost of Public Regulations: The ISE Experience:[54]

International Shellfish Enterprises spent $34,035 on the permit process. The breakdown is as follows:

Elkhorn Slough		
Administration:	$30,000	
Engineering:	20,000	
Legal:	12,000	
Permit Fees:	625	
Total:	$62,625	$62,625
Water Intake System		
Administration:	$6,500	
Engineering:	2,500	
Permit Fees:	700	
Total:	$9,700	$ 9,700
Hatchery		
Administration:	$3,000	
Engineering:	9,000	
Permit Fees:	810	
Total:	$12,810	$12,810
		$85,135

The total amount of time elapsing from application of the first permit to issuance of the last was approximately seven years and four months. Total capitalization of the venture over the past eight years has approached $1.5 million.

Chart 8

INTERNATIONAL SHELLFISH ENTERPRISES
Established 1970
Situated in Coastal Zone
Located on Private and Leased Public Land

Elkhorn Slough Nursery

Agency	Permit	Description	Fee	Time	Citation	Cost
Ca. Dept. of Fish & Game, Sacramento, CA	Mariculture & Oyster Cultivator's Lic.	Allows ISE to engage in oysterseed cultivation	$25	30 days	Cal. Fish & Game Code §6481 (1973)	$1800 Administration $500 Legal
Moss Landing Harbor Dist., Moss Landing, CA	For Cultivation of Marine Life in Elkhorn Sl.	Allows ISE to use Elkhorn Sl. waters to cultivate oysterseed (25 acres)	$100	639 days	Harbor Code	$500 Ann. Rent Pmt $4000 Legal Fees $12,000 Admin. $15,000 Engineer.
US Army Corps of Eng., San Francisco, CA	To operate in navigable waterways	Allows ISE to use Elkhorn Sl. waters to cultivate oysterseed (25 acres)	$50	260 days	33 USC 403 (1970)	$1800 Admin. $2000 Engineering
Cen. Cst. Reg. Coast. Comm., Santa Cruz, CA	Administrative Permit	Allows ISE to construct & operate oysterseed nursery in Elkhorn Sl. (5 acres)	$25	111 days	14 Cal. Adm. Code §13055 (1976)	$4800 Admin. $5000 Legal (on appeal)
US Army Corps of Engineers	Special Letter Permit	Approves engineering revision on racks	$100	158 days	33 USC 403 (1970)	$1200 Admin. $2000 Engineering
US Army Corps of Engineers	To operate in navigable waterways	Allows ISE to use 20 additional acres in Elkhorn Sl. for nursery	$50	142 days	33 USC 403 (1970)	$1800 Admin. $1000 Engineering
Cen. Cst. Reg. Coast. Comm., Santa Cruz, Ca	Administrative Permit	Allows ISE to use 20 additional acres in Elkhorn Sl. for nursery	$275	103 days	Cal. Pub. Res. Code, §30601 (1976)	$3600 Administration $2500 Legal

Hatchery

INTERNATIONAL SHELLFISH ENTERPRISES (cont'd)

Agency	Permit	Description	Fee	Time	Citation	Cost
Monterey Co. Planning Dept. Salinas, CA	Building Permit	Allows ISE to build a shellfish hatchery building at Moss Landing, CA	$560	1 day	Local Ordinance	$2500 Admin. $9000 Engineering
Central Coast Regional Coastal Commission, Santa Cruz, CA	Administrative Permit	Allows ISE to build a shellfish hatchery building at Moss Landing, CA	$250	1 day	Cal. Pub. Res. Code §30601 (1976)	$500 Administration

Water Intake System

Central Coast Regional Coastal Commission	Administrative Permit	Allows ISE to construct sale water intake pipeline	$75	68 days	Cal. Pub. Res. Code, §30601 (1976)	$1500 Administration
Moss Landing Harbor Dist. Moss Landing, CA	Permit to allow construction of salt water intake system	Allows ISE to construct salt water intake system	$100	28 days	Harbor Code	$1500 Administration
US Army Corps of Engineers, San Francisco, CA	Permit to operate in navigable waterways	Allows ISE to construct salt water intake pipeline	$50	279 days	33 USC 403 (1970)	$1800 Administration $1800 Engineering
Central Coast Regional Coastal Commission	Administrative Permit	Allows ISE to reconstruct salt water intake system	$250	163 days	Cal. Pub. Res. Code, §30601 (1976)	$1200 Administration
US Army Corps of Engineers	Special Letter of Permission	Allows ISE to construct emergency pipeline	$100	31 days	33 USC 325.5(b) (1976)	$700 Administration $400 Engineering
Moss Landing Harbor Dist.	Emergency Permit	Allows ISE to construct emergency pipeline	$100	1 day	Harbor Code	$200 Administration
Cent. Coast Reg. Coastal Commission	Emergency Permit	Allows ISE to construct emergency pipeline	$25	1 day	14 Cal. Adm. Code, §§13009, 13136 (1976)	$600 Administration

I.S.E. SUMMARY

Total Cost: $85,135
Total % of Capitalization: 5.7%
Total Time Expended: 7 years, 6 months

Total future outlay requirements are estimated to be $10 million. Total permit expenditures represent approximately one percent of capital expenditures to date.

4.4 Conclusion

International Shellfish Enterprises, Inc., and Buchan Oyster Company have had to spend considerable amounts of time and money acquiring those permits necessary to conduct operations. By examining these two firms, three important points surface.

First, it was almost twice as expensive for ISE to acquire the necessary permits to engage in oysterseed aquaculture as it was for Buchan to obtain those necessary to engage in oyster cultivation. In addition, it was considerably more expensive for the oysterseed producer to operate. Both a hatchery facility and a saltwater nursery are required. In fact, ISE has annual operating expenses that nearly equal Buchan's total capital outlay.[55] Greater capital requirements and a higher permit acquisition cost both in terms of money and time have had a substantial impact on ISE. These factors made it extremely difficult for ISE to continue to raise operating capital. Private investors were not attracted to a small business facing a high level of risk.

Yet, ISE was attractive to a larger conglomerate. In March 1978, ISE was purchased by American Factors Corporation (Amfac).[56] Amfac has also acquired other corporations including an oil manufacturer and a sugar producer. Amfac may use ISE as a tax write-off until ISE's endeavors yield economic returns.

In contrast, public regulations have not hit Buchan Oyster Company as hard. This is not to say that there are no economic impacts. Buchan must keep an attorney on retainer because regulatory barriers are constantly confronted. This represents a considerable expense.[57] Buchan has also had to move into other areas of business besides oyster cultivation. As Buchan states, "I have

had to go from marine biologist to economist to survive."[58] When he is not tending his crop of bi-valves, Buchan is brokering Eastern and Giant Pacific oysters to wholesalers and restauranteurs across the country.

Second, it is clear that there are few available oyster cultivation sites left. Regulations which conserve and protect our coastal resource eliminate access to many of the most appropriate aquaculture sites. It is therefore much more difficult for firms to engage in on-shore production. Furthermore, since all of the available publicly-owned oyster allotment acreage is presently leased, it is likely that few firms will be able to enter the oyster aquaculture field.

Third, it is obvious that obtaining a coastal site does not ensure success. As we have seen in this and the other chapters, the regulatory environment is becoming more complex with time. Perseverance, political sophistication, access to capital, and business knowledge are all required if one is to succeed.

Thus, it is quite apparent that few individuals will be engaging in oyster aquaculture in California in the near future. Even if an enterprising individual could obtain appropriate site and begin the acquisition process today, production could not begin for five to ten years.

Unless regulations are changed to provide for on-shore oyster aquaculture, the handful of oyster aquaculturalists that are presently operating in California will surely remain as the only producers of oysters and oysterseed for many years to come.

CHAPTER FIVE: AN ANALYSIS OF RESULTS

5.1 Introduction

The purpose of this final chapter is to present a summary of findings. First, the results of this research effort will be presented. The direct costs of the permit process will be examined, followed by an assessment of the indirect costs. An examination of these costs in light of the original thesis of this paper is then presented. Finally, suggestions for changes in the permit process are offered.

5.2 A Synopsis of Results

a) Direct Costs of the Permit Process

The amount of time and money expended on the regulatory permit process by each firm was dependent on the number of permits each had to acquire from regulatory agencies. The number of permits that had to be secured by each firm was a function of four variables: (1) the type of organism cultured; (2) the cultivating technique employed; (3) the location of the facility; and (4) the year the process was initiated. Chart 9 compares each of the aquaculture firms used as examples in this paper. In addition to the information stated above, the total amount of money expended on the process and the total length of time required to complete it are presented.

If one critically examines the chart, it appears that, in general, the greater the number of permits required, the larger the permit acquisition expense. The cost of the process ranged from $400 to $34,000, and the acquisition period ranged from three months to seven and one-half years.

Time requirements and acquisition expenses were generally lower for firms which began the process before 1969. Since that year, a number of new

SUMMARY CHART

Firm	Organism	Technique	Location	Year	Cost	Time
Ab Lab	Abalone	Off-shore	Federal Land	1975	$ 685	60 days
CMA	Abalone	Off-shore	Private Land in County	1968	$ 440	180 days
MAF	Abalone	On-shore	Private Land in City	1972	$22,705	2 years
SKOF	Salmon	Ocean-Ranching	Private Land in County	1973	$27,671	2 years 135 days
Coast	Oyster	Bottom and Rack	Public and Private Land in Bay	1954	$ 400	30 days
Buchan	Oyster	Rack	Public Land in Bay	1971	$ 9,310	2 years 80 days
ISE	Oyster Seed	On-shore and Raft	Private Land and Public Land in Slough	1970	$85,135	7 years 120 days

environmental, health, and safety laws have been enacted. New agencies have been founded and given the responsibility for administering the many regulations which have been generated by these laws. As a result, firms which have begun the permit process in the 1970's have encountered a more complex regulatory environment and have had to spend more time and money acquiring permits than firms which began ventures earlier.

A handful of factors contribute to this longer acquisition period. Aquaculturalists must spend time before and during the process determining which permits have to be obtained from the various agencies. After requirements surface, aquaculturalists must submit applications and then wait for each agency to consider their proposals against a unique set of criteria. Each agency then issues a judgment independent of the decisions of the other agencies involved. In addition, since no single agency is responsible for coordinating the activities of all agencies involved in the process, applicants often must wait long periods of time for decisions. In some cases, decisions have already been made by two agencies but neither will issue its judgment until the other agency issues its first. The final factor which contribute to lengthy acquisition periods is the lack of bureaucratic sophistication possessed by many beginning aquaculturalists. Most "aqua-pioneers" are scientists, technicians, businessmen, or a combination of the three. Few are politically sophisticated in governmental and agency processes.

b) Indirect Costs of the Permit Process

Two indirect costs of permit acquisition are borne by aquaculturalists. First, completing the permit process diverts important managerial energy from aquaculture operations. When permits are being obtained, vital entrepreneurial attention is removed from solving the critical economic, technical, and

engineering problems which must be solved if a new venture is to succeed. This diversion of attention decreases the rate of a considered firm's progress and increases the time it takes for that firm to yield economic returns. Second, the permit process increases the uncertainty of success. Since each agency possesses the ability to veto an operation by simply not issuing a permit, it is possible for an aquaculturist to spend thousands of dollars and many months of work on permit acquisition only to have the last agency refuse to grant approval. Established firms which have previously obtained the required permits for start-up operations are also subject to this uncertainty. When an established firm seeks to expand operations, management must return to many agencies for additional permits. Again, there is no guarantee that all necessary permits will be issued. Thus, the risk created by the permit process is a serious indirect cost to the aquaculturalist.

5.3 A Comparison of the Impacts of Direct and Indirect Costs

The purpose of this report was to determine whether the overhead monetary cost attributable to the regulatory permit process serves as a major barrier to the development of coastal aquaculture in California. After gathering data, reconstructing permit experiences, and examining the results, it is this author's contention that while the monetary cost of the process is indeed a barrier to the development of aquaculture, it is not a major one. Rather, the real barriers are the length of the process, the diversion of managerial energy, and the increased level of risk. Taken together these costs are insidiously and subtly impeding the development of a competitive coastal aquaculture industry in California.

As has been noted previously, the range of acquisition expense varied from $400 to $85,000. For firms which spent less than $1000, permit acquisition

expenditures were an insignficant amount when compared with capital outlays of $90,000 to $680,000. Each of the firms which spent in excess of $20,000 on the permit process had capital outlays exceeding $400,000.

The largest percentage of total capitalization attributable to the permit process for this set of aquaculture firms was 5.7 percent $85,135 of 1.5 million). While such a percentage represents a significant amount, it is by no means overwhelming. Given an adequate amount of capital, aquaculturalists can absorb the dollar cost of the permit process although few rejoice at that fact. What they cannot afford is the impact of the loss of time, managerial energy, and certainty. These costs are limiting the access of aquaculturalists to sources of investment capital and in doing so are adversely shaping the competitive structure of the industry.

5.4 The Impact of the Permit Process on Aquaculturalist's Accessibility to Investment Capital

In terms of financial posture, there are two types of coastal aquaculture firms.[1] The first type is the well-established, profitable business. Oyster aquaculturalists have firm capital foundations and can therefore obtain credit from banks. The second type of firm offers a potential for high profits but is full of risk and uncertainty. Abalone, anadromous fish, oysterseed, and lobster aquaculture ventures are virtually excluded from obtaining credit from financial institutions. These firms must turn to personal savings, risk-capital lenders, or large corporations to meet their capital requirements.

a) Personal Savings

Between $90,000 and $150,000 is required to begin an aquaculture venture.[2] Unless an individual is independently wealthy and willing to lose every penny of his savings, personal savings are a poor source of investment capital.

b) Risk-Capital Lenders

There are two sources of risk-capital: venture-capital companies, and individual investors. The attractiveness of an investment to lenders of risk-capital is determined by the perceived relationship between the risk involved in the investment and the potential return.[3] Relative risks are important since all investments possess some risk. In general, the greater the risk, the higher the earnings on an investment must be to reward investors for providing capital.

In addition to risk, investors consider the liquidity of an opportunity. Liquidity is the ease with which one can get his money out of a venture and the length of time required to do so.

The permit process contributes to making aquaculture a high-risk venture that offers low liquidity. As has been noted, the process creates a high level of uncertainty of success. This uncertainty of success, coupled with a normally high susceptibility to natural disaster, disease, and mechanical failure, lead to this high level of risk.

Liquidity is low because crops cannot be harvested for at least one year and sometimes as long as five years. The permit process can extend this period as much as two and one-half years. In addition, managerial energy is diverted from problem-solving during the acquisition process which may further extend this period. Few risk-capital companies and few individuals will invest in a venture having an investment profile like this. In sum, the permit process serves to increase risk, decrease liquidity, and thereby discourage investors from considering aquaculture opportunities.

c) Large Corporations

This inability to obtain capital is forcing aquaculturalists who have spent years perfecting cultivating techniques to submit to takeovers by larger

corporations that have access to investment capital.

The Atlantic-Richfield Company and American Factors Corporation are already in control of two operations. Union Oil Company is involved in the affairs of another. At aquaculture conferences, representatives of other large conglomerates hover over the pool of aqua-pioneers, monitoring each firm's progress and looking for promising opportunities to arise.

Accessibility to capital is not the only advantage large corporations have. Since they employ experienced legal staffs, complex regulations are more easily contended with. For example, when the Occupational Safety and Health Administration passed diving standards that would have sent California Marine Associates back to base one, ARCO's attorneys designed intricate and detailed methods of getting around them.[4]

Thus, the prospective for the market structure of coastal aquaculture in California looks very much like the market structure of agriculture today. The agriculture industry was once an almost perfectly competitive part of the American economy. There were many small farmers who competed heavily to provide quality food for the lowest possible prices. Over time, however, companies with unfarmlike names such as Tenneco, Dow, Standard Oil, and Kaiser Aluminum diversified into agriculture and began displacing small farmers. Now, for example, only three corporations--United Brands, Purex, and Bud Antle, a company partly owned by Dow Chemical--dominate lettuce production in this state.[5] Family farms have given way to "agribusiness." The result has been that consumers must now pay higher prices for food of poorer quality.[6]

The easiest way to ensure the lowest possible price for a high quality good is to ensure a competitive market. The only way to ensure competition is to support small business. Unfortunately, unless proponents of aquaculture are

willing to commit themselves to changing the regulatory permit process and creating ways to provide aquaculturalists with capital to begin, expand, and operate their ventures, aquaculture will one day be known as "aquabusiness."

5.5 Alternatives

In addition to the changes that must be made in the areas of law and finance, fundamental values must be revised. To "farm" is to "cultivate."[7] Therefore aquaculture can be considered farming. However, many Americans are not convinced. They believe that "farming" must involve turning soil, spreading fertilizer, planting, irrigating, and harvesting. If aquaculture is to reach its potential as a food producer, many policy-makers, bureaucrats, and members of the public must extend their notion of terrestrial farming to the ocean. It would be to the advantage of aquaculturalists to make a commitment to educating the public and striving to be classified by local, state, and federal governments as "farmers." Indeed farming is one of the least regulated industries in America.

Attitudinal shifts and changes in classification are idealistic notions which may or may not work in the long run. In the meanwhile, government must make a commitment to provide credit for beginning ventures similar to its policy toward terrestrial farmers. A report by the National Academy of Science[8] on aquaculture recommends that the Farm and Rural Development Loan Guarantee Program of the United States Department of Agriculture be used as a model for a program of financial assistance to aquaculturalists. When a loan guarantee is made, it ensures a lender (usually a bank) that the government will repay a loan if a venture that has borrowed funds fails. Thus, loan guarantees eliminate all risk involved in lending to normally high risk ventures. A

more extensive examination of loan guarantee programs should be undertaken to determine appropriate amounts that should be guaranteed and proper repayment periods. However, other devices must be implemented in addition to a loan guarantee program. Without changes in our laws and institutions, a program of this kind would serve only to manage the problem and not resolve it. The permit process must be revised to ensure that each firm is judged according to its economic merit and not its political stamina.

In his paper entitled "Marine Aquaculture in California: An Overview,"[9] Gerald Bowden cites four modifications of the present system that could be made: (a) creation of a permit register; (b) designation of a lead agency; (c) creation of a joint hearing panel; and (4) creation of an administrative advisor knowledgeable in permit procedures.

1. Permit Register: In order to shorten the amount of time aquaculturalists spend on determining which permits are required for their operations, a central permit register could be created. The register would list and explain each of the permits required by local, state, and federal agencies. Permits would be categorized by technique (pen rearing, ocean ranching, etc.) and cross referenced by organism. The register would contain information such a filing fees, processing times, and application requirements.

2. Lead Agency: A single agency could be designated to coordinate the regulatory activities of all other agencies involved in the permit process. An applicant would file a master permit with the "lead" agency which would then distribute copies to each federal, state, regional, county, and local agency that appeared to have interest. These agencies would then respond with specific requirements, applications, and information. The applicant would file the additional forms and submit the requested information to each agency.

3. Joint Hearing Panel: Whenever more than one agency is involved in the permit process of a venture, a joint hearing process would be instituted. The necessary applications would be filed with each agency just as they are now. After the filing stage, however, the applicant would be entitled to a hearing before a panel composed of representatives from each of the agencies involved. The hearing would conclude with the issuance of a collective decision. Time would be allowed after this decision for each agency to again consider the proposal and render individual decisions.

A joint hearing panel may help to uncover interagency conflicts so that they can be resolved. At the same time, individual agencies would be allowed to issue separate decisions based on fact.

4. Administrative Advisor: The Marine Advisory Service of the National Oceanic and Atmospheric Administration (NOAA) was set up in part to help aquaculturalists solve their technical, biological, and engineering problems. While marine advisors have done a fine job of relaying information about government, they have provided little information about how to contend with the permit process.

The Marine Advisory function could be broadened to include helping aquaculturists to solve political problems. Individuals knolwedgeable in permit procedures could provide a beneficial function for both the applicant and the agencies involved. Since applicants can increase the length of the permit process by failing to understand the highly complex regulatory requirements of certain agencies, a marine advisor could help to expedite the processing of a permit by providing the applicant with assistance. Agencies would benefit too because they would have more time to concentrate on aspects other than permit issuance.

The focus of the bureaucratic advisor would have to be different than the advisory systems of the past in order to secure competition. Bowden recommends that each advisor's goal should be to increase the total number of aquaculture firms in the market and not the total output generated by the industry. In this way, an aquabusiness situation could be avoided.

5.6 Conclusion

Aquaculture is at the point in its development where a critical evaluation of its future must be made.

A complex regulatory environment exists due in large part to the public's desire for laws which protect them against a variety of risks. Many of these laws have been set down with little regard for their cumulative effect on small businesses such as aquaculture. Each year new laws are introduced, and each year the regulatory environment becomes broader in scope and more complex.

The effects of the costs of this complexity are preventing the establishment of a competitive aquaculture industry in California. Aquaculture is clean industry. It has the potential to generate millions of dollars in revenue while promoting environmental quality. In order to encourage its proper development, federal, state, and local policy makers must seriously consider the role each regulatory agency plays in inhibiting the growth of aquaculture. Consideration must, however, give way to changes such as those presented in this final chapter.

NOTES FROM CHAPTER ONE

[1]Environment and Natural Resources Division, Congressional Research Service, "Prognosis and Prescription for Development of Commercial Aquaculture in the United States" (April, 1976), p. 6.

[2]"The 1974 fisheries statistics indicate that we import nearly one and one-half billion dollars worth of edible fisheries products compared to our exports of 195 million dollars." Source: Cong. Res. Serv. Report, p. 6, supra at note 1.

[3]Glude, J. (Ed.), NOAA Aquaculture Plan, U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Sea Grant, May, 1977, p. 1. (Hereinafter referred to as NOAA Aquaculture Plan.)

[4]Committee on Aquaculture, Board on Agriculture and Renewable Resources, National Research Council, National Academy of Sciences, Aquaculture in the United States, 1978, p. 10. (Hereinafter referred to as NAS Report.)

[5]Id.

[6]Id.

[7]Cong. Res. Serv. Report, p. 6, supra at note 1.

[8]NAS Report, p. 10 supra at note 4.

[9]"In the United States a significant portion of the supply of some species is produced by aquaculture. About 30% of our total landings of Pacific Salmon and over half of the Columbia River Salmon caught by commercial and recreational

fishermen were reared in hatcheries before being released to grow further in rivers, lakes, and sea. Private aquaculture produces over 40% of our oysters, half of our catfish and crawfish, nearly all of our rainbow trout, and small quantities of several other species for a total of 65,000 metric tons (143 million pounds). This is about 3% of U. S. landings or 2% of U. S. total consumption of fisheries products." Source: NOAA Aquaculture Plan, p. 1, supra at note 3.

[10] NOAA Aquaculture Plan, p. 1, supra at note 1.

[11] NAS Report, p. 10, supra at note 4.

[12] See: Cadet Hand, et al., Development of Aquaculture Systems, Sea Grant Publication 58, IMR Reference 77-105, March, 1974, Institute of Marine Resources, University of California, La Jolla, CA, 92093.

[13] Dr. Judith Hansen, Marine Biologist. University of California, Santa Cruz, personal communication, May 10, 1978.

[14] Id.

[15] Id.

[16] George Lockwood General Partner, Monterey Abalone Farms, Monterey, California, "Statement of George S. Lockwood, General Partner, Monterey Abalone Farms, to the Senate Committee on Commerce, Science, and Transportation," April 17, 1978, p. 8.

[17] George S. Lockwood, personal letter to Professor Gerald Bowden, Department of Environmental Studies, University of California, Santa Cruz, California, October 31, 1977, p. 5.

[18]"The Health Department, for example, requires the floors in fish processing plants to be smooth so that they can be easily cleaned. OSHA, on the other hand, requires them to be rough so that workers will not slip and fall." Gerald Bowden, "Marine Aquaculture in California: An Overview," unpublished paper, p. 11.

[19]This study only assesses the effects of the costs of acquiring land use, construction, and operating permits on the California coastal aquaculture industry. No attempt is made to determine the effects of the costs of acquiring regulatory devices that all businesses must have before engaging in commercial production, such as tax registrations, business licenses, etc.

NOTES FROM CHAPTER TWO

[1]"Abalone Farming in California: An Idea Whose Time Has Come?", The Commercial Fish Farmer, September 1976, Vol. 2, No. 6, p. 7 (hereinafter cited as "The Commercial Fish Farmer").

[2]John B. Gladd, NOAA Aquaculture Plan, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Sea Grant, May, 1977, p. 28 (hereinafter cited as "NOAA Aquaculture Plan").

[3]The Commercial Fish Farmer, p. 7, supra at note 1.

[4]"Abalone Prices Soar and Do[illegible] of Illegal Gathering," Wall Street Journal, January 2, 1976, p. 1 (hereinafter cited as "Wall Street Journal").

[5]"Cannery Row Abalone Farm Seeks 'Land'," The Sunday Peninsula Herald, September 4, 1977 p. 4 (hereinafter referred to as "Herald").

[6]"Abalones in California," California Fish and Game, Vol. 16, 1930, p. 15.

[7]The Commercial Fish Farmer, p. 7, supra at note 1.

[8]NOAA Aquaculture Plan, p. 28, supra at note 2.

[9]Herald, p. 4, supra at note 5.

[10]Wall Street Journal p. 1, supra at note 4.

[11]Herald, p[illegible] supra at note 5

[12]Aquaculture Digest, No. 5, Vol. 3, May, 1978, p. 28.

[13]Wall Street Journal, p. 1, supra at note 4.

[14]John E. Bardach, John H. Ryther and William O. McLarney, Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms (New York: Wiley-Interscience), 1972, p. 783.

[15]All information that follows is taken from an interview with J. N. Dichiacchio, Business Manager, and J. D. McMullen, Marine Biologist, of the Ab Lab, July 18, 1977.

[16]"Close Corporation. In the vernacular, a corporation in which the stock is held in a few hands or in a few families, and is not at all or only rarely, dealt in by buying and selling. . . ." 14 CJS, §32, p. 1276.

[17]"California Farm Rears Prized Red Abalone," Fish Farming International, Vol. 3, No. 4, December, 1976, p. 9 (hereinafter referred to as "Fish Farming International").

[18]Id.

[19]Id.

[20]Id.

[21]Id.

[22]Hugh Staton, General Manager, California Marine Associates, Personal Communication, July 27, 1977.

[23]Id.

[24]Id.

[25]Id.

[26]George S. Lockwood, An Analysis of Constraints and Stimulants to Aquaculture Development in the United States, July, 1977, p. 4 (hereinafter referred to as 'Lockwood").

[27]Herald, p. 3, supra at note 5.

[28]Id.

[29]Herald, p 4, supra at note 5.

[30]Herald, p 5, supra at note 5.

[31]Herald, p 4, supra at note 5.

[32]Herald, p 6, supra at note 5.

[33]Herald, p. 5, supra at note 5.

[34]Id.

[35]Herald, p 6, supra at note 5.

[36]For an explanation of the Coastal Zone see: Cal. Pub. Res. Code, Chapter 2, §30103 1976

[37]Lockwood p. 18, supra at note 27.

[38]George Lockwood, personal communication, April 24, 1978.

[39]Id.

[40]Id.

[41]42 U.S.C A §4321 et seq., 83 Stat. 852, Pub.L. 91-190.

[42]Cal. Pub. Res. Code, §21000, 1972.

[43]Cal. Pub. Res. Code, §30000, 1976.

NOTES FROM CHAPTER THREE

[1]John B. Glude, NOAA Aquaculture Plan, U. S. Department of Commerce, May 1977, p. 10. (Hereinafter cited as "NOAA Aquaculture Plan.")

[2]Id

[3]Maximum Sustainable Yield (MSY) " . . . an average, over a reasonable length of time, of the largest catch that can be taken continuously from a stock under current environmental conditions. When a population of fish is harvested beyond MSY, the remaining fish cannot produce enough off-spring to bring the size of the population back up to the MSY level, given the same future fishing pressure and environmental conditions." Source: Craig Weiss, "NPFMC Management Terms Spelled Out," Alaska Seas and Coasts, Vol. 6, No. 2, April 1978.

[4]NOAA Aquaculture Plan, p. 10, supra at note 1.

[5]Id.

[6]Emil Smith Jr., Assistant Chief of Marine Resources, California Department of Fish and Game, personal communication, June 23, 1977. (Hereinafter cited as "Smith ")

[7]Salmon are considered smolt size when they reach approximately two inches in length and have the following characteristics: a stripe from gills to tail, a complete digestive system, and visual capabilities.

[8]NOAA Aquaculture Plan, p. 10, supra at note 1.

[9]Id

[10]Id.

[11]Cal. Stats. 1968, Ch. 202, p. 863, Sec. 2.

[12]This explanation has been taken from Environmental Impact Statement: Silver King Oceanic Farms, Proposed Elk Creek Facility, Mendocino County, Jones and Stokes Associates, Inc., Sacramento, California, November 29, 1972, pp. 16-18.

[13]Acclimation is the biochemical process salmon experience as they move from a fresh water habitat to a salt water environment.

[14]Smith, supra at note 6.

[15]Roland Wentzel, Professor of Economics, San Francisco State University, Market Impact Analysis: Silver King Oceanic Farms, 1973, p. 2. (Hereinafter cited as "Wentzel.")

[16]Id.

[17]Wentzel, p. 3, supra at note 15.

[18]Id.

[19]Dressed weight is the weight of a fish after the head, tail, and digestive system have been removed.

[20]Wentzel, p. 7, supra at note 15.

[21]Id.

[22]Smith, supra at note 6.

[2]Robert Crompton, Jr., former engineering aide and biochemist for Silver King Oceanic Farms, Davenport Landing, California, personal communication, February 6, 1978. (Hereinafter cited as "Crompton.")

[24]Cal. Stats., 1968, Ch. 202, p. 863, Sec. 2.

[25]Cal. Stats., 1973, Ch. 398, p. 863, Sec. 2.

[26]T. Roger Haas, Vice President, Silver King Oceanic Farms, personal communication, June 28, 1977. (Hereinafter referred to as "Haas.")

SILK CREEK SITE

SLF, Permit Fees:	$ 10,000*
Land Options:	15,000
Adm. Salaries:	54,000
Legislative Costs:	1,000
Legal Services:	20,000
Total:	$100,000

*Source: Dr. Charles Hazen, Jones and Stokes, Inc. personal communication, April 24, 1978.

[27]Cal. Stats., 1968, Ch. 398, p. 863, Sec. 2, as amended by Cal. Stats., 1976, Ch. 367.

[28]SKOF's permit acquisition experience was reconstructed by conducting personal searches of agency files when possible and by telephoning agencies

when personal searches were not possible. The dates and expenses shown have been listed as accurately as possible.

[29]Local ordinance.

[30]Local ordinance.

[31]Cal. Pub. Res. Code, §§21080, 21089 (1972), and, local ordinance.

[32]Local ordinance.

[33]Cal. Pub. Res. Code, §21064 (1976).

[34]Cal. Pub. Res. Code §30601 (1976).

[35]33 U.S.C. 403 (1970).

[36]California Fish and Game Code, §1601, 1973.

[37]California Fish and Game Code, §6570, 1973.

[38]33 U.S.C. §1342 (1972).

[39]2 Cal. Adm. Code, §§2000-2012 (1977).

[40]Local ordinance.

[41]Cal. Pub. Res. Code, §30601 (1976).

[42]33 U.S.C. 403 (1970).

[43]Cal. Pub. Res. Code, §30601 (1976).

[44]Id.

[45]Haas, supra at note 27.

[46]Id.

NOTES FROM CHAPTER FOUR

[1]Emil Smith Jr., Assistant Chief, Marine Resources Division, California Department of Fish and Game, personal communication, July 8, 1977 (hereinafter referred to as "Smith").

[2]Smith, personal communication, August 2, 1977.

[3]Id.

[4]Under §6527 of the California Fish and Game Code (1973), an oyster grower who leases land from the State of California is required to plant oysters only on the number of acres for which he or she pays. Rent is paid only on ten percent of the allotted acreage in the first year, twenty percent in the second, thirty percent in the third, and one hundred percent in each year following. Thus, not all of the allotted acreage is presently cultivated.

[5]Ellinore M. Barrett, 'The California Oyster Industry," Fish Bulletin 123, California Department of Fish and Game, 1963, p. 9 (hereinafter referred to as "Barrett").

[6]Approximately seventy-one percent of the oysters harvested in 1975 were raised through bottom culture techniques. Source: Smith, July 8, 1977, supra at note 1.

[7]Other leasing agents include cities, harbor districts, and private citizens.

[8]See California Fish and Game Code §§6510-6536 (1973).

[9]Walter Dahlstrom, Unit Manager, California Department of Fish and Game, Menlo Park, California, personal communication, August 2, 1977 (hereinafter referred to as "Dahlstrom").

[10]Id.

[11]Id.

[12]Id.

[13]Id.

[14]Id.

[15]Walter Dahlstrom, "California Shellfish Importation and Planting Report 1974-1975," Marine Resources Administrative Report 75-10, California Department of Fish and Game, November 1975, p. 1.

[16]TVR Pillary, Coastal Aquaculture in the Indo-Pacific Region (London: Fishing News Books), 1972, p. 89.

[17]Id.

[18]Barrett, p. 84, supra at note 5.

[19]Neil Buchan, owner and operator of Buchan Oyster Company, personal communication, August 8, 1977.

[20]Stanley C. Katansky and Ronald W. Warner, "Pacific Oyster Disease and Mortality Studies in California," Marine Resources Technical Report #25, California Department of Fish and Game, 1974, p. 50.

[21]Id.

[22]Smith, supra at note 2; and Dahlstrom, supra at note 9.

[23]Id.

[24]J. R. Johnson, Morro Bay Oyster Company, personal communication, August 8, 1977.

[25]San Francisco Chronicle, "A Fat Farm for Seven Million Oyster," April 26, 1976, Section B, p. 7 (hereinafter referred to as "Chronicle").

[26]This statement is based on figures from Smith, personal communication, July 8, 1977, supra at note 1; and Fish Bulletin 166, "California Marine Fish Landings for 1974," California Department of Fish and Game, p. 34.

[27]Richard Eisenger, Operations Manager, International Shellfish Enterprises, Inc., Moss Landing, California, personal communication, June 21, 1977.

[28]Richard Grossberg, former research associate with Pidgeon Point Shellfish Hatchery, personal communication, July 29, 1977.

[29]"Economic Impacts of the U. S. Commercial Fishing Industry," Centaur Management Consultants, Inc., prepared for the National Marine Fisheries Service, January 1975, pp. 254-255.

[30]California Marine Fish Landings, #161, California Department of Fish and Game, 1972; California Marine Fish Landings, #163, California Department of Fish and Game, 1973; California Marine Fish Landings, #166, California Department of Fish and Game, 1974; and Chronicle, supra at note 25.

[31]Id.

[32]California Fish and Game Code, §6481 (1973).

[33]California Fish and Game Code, §8011 (1973).

[34]California Fish and Game Code, §§6516-6537 (1973).

[35]Frank Douglas, Business Manager, Coast Oyster Company, personal communication, July 22, 1977.

[36]Id.

[37]Neil Buchan, owner and operator of Buchan Oyster Company, Petaluma, California, personal communication, January 17, 1978. The following information concerning Buchan Oyster Company's permit acquisition experience was obtained by personally conducting file searches of Buchan's records. (Hereinafter referred to as "Buchan.")

[38]Allotment #430-03 was granted to Buchan " . . . for the purpose of cultivating oysters consisting almost entirely of bottom culture with some off-bottom culture in the form of tray and stack culture with the seed bearing shell being supported by not more than 18" above the bottom." Source: California Fish and Game Oyster Allotment #430-03, Public Legal Notice, January 27, 1971, Novato Advance, Section B, p. 32.

[39]33 USC 403 (1970).

[40]The U. S. Army Corps of Engineers has a specific review procedure set forth in the Corps's Code. A thirty-day public review is required. An interagency review is also required. Source: "Applications for Department of the Army Permits for Activities in Waterways," Department of the Army, Office of the Chief of Engineers, Washington, D.C., 20314, Pamphlet #1145-2-1, 1 October 1974.

[41]This statement is based upon this author's examination of Buchan's copies of letters submitted to the Corps by opposing parties.

[42]Cal. Pub. Res. Code, §30601.

[43]"Upon collecting the oysters from the oyster beds in Tomales Bay, they will be sprayed with sea water at the bay site to remove mud and other debris. They will be loaded in a dump truck and transported to the Petaluma Plant and unloaded onto a conveyor where they will be placed onto a concrete opening table. Here the oysters are individually opened and the meat is collected in stainless steel buckets. At the same time, the shells are removed by a second conveyor and returned to the dump truck and hauled back to the bay to be reused. The shucked meat is then washed in a 15-gallon holding tank for several minutes and spilled out onto a grading table where the meat is rinsed and graded according to size and quality and placed in various sized containers. The containers are held in cold storage until marketed. At the end of the day, both the opening and grading rooms and equipment in contact with the oysters are washed thoroughly." Source: Letter from Neil Buchan to Donald Dalke, Chief of Permit Branch, San Francisco Regional Water Quality Control Board, 364 14th Street, Oakland, California, September 5, 1973.

[44]California Fish and Game Code, §6510-6536 (1973).

[45]Id.

[46]"A permit was granted (#T-75-16) allowing the . . . stingray fence, substituting a pier for an overhead rail system and allowing the expanded oyster racks." January 19, 1976, Marin County Department of Public Works, letter to Mr. Neil Buchan.

[47]Buchan, supra at note 37.

[48]Id.

[49]The following information concerning the permit process is taken from a letter sent to the author by Richard A. Eisenger, Operations Manager, International Shellfish Enterprises, Inc., March 6, 1978. (Hereinafter referred to as "Eisenger.")

[50]California Fish and Game Code, §6510 (1973).

[51]Cal. Pub. Res. Code, §30601 (1976).

[52]33 USC 403 (1970).

[53]Cal. Pub. Res. Code, §30601 (1976).

[54]All cost information relating to the permit process was furnished by Stephen P. Henderson, President of ISE in a letter sent to this author on July 17, 1978.

[55]Buchan, supra at note 37; and Eisenger, supra at note 49.

[56]Eisenger, supra at note 49.

[57]Buchan, supra at note 37.

[58]Id.

NOTES FROM CHAPTER FIVE

[1]Committee on Aquaculture, Board on Agriculture and Renewable Resources, National Research Counsel, National Academy of Sciences, Aquaculture in the United States (Washington, D. C.: National Academy of Science), 1978, p. 149. (Hereinafter referred as "NAS Report.")

[2]This range was determined by taking the lowest and highest "seed" capital figures from the aquaculture operations used in this paper.

[3]The discussion on risk and liquidity in investment is taken from: George S. Lockwood, An Analysis of the Constraints and Stimulants to Aquaculture (Monterey, California: Monterey Abalone Farms), 1977, p. 54.

[4]Hugh Staton, General Manager, California Marine Associates, Cayucos, CA, personal communication, July 27, 1977.

[5]See: Richard Merill, Radical Agriculture (New York: Harper and Row), 1976.

[6]Id.

[7]Jean L. McKechnie, Webster's New Twentieth Century Dictionary of the English Language (Cleveland and New York: World Publishing, Co.), 1971, p. 664.

[8]NAS Report, p. 70, supra at note 1.

[9]Gerald Bowden, "Marine Aquaculture in California: An Overview," unpublished paper, 1977.

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3. Newspapers and Periodicals

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Anon., "Abalone Farming in California: An Idea Whose Time Has Come," The Commercial Fish Farmer, Vol. II, No. 6, Little Rock, Arkansas, 1976.

Anon, "Abalone in California," California Fish and Game, Vol. 16, 1930.

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Anon., "California Fish and Game Oyster Allotment #430-03, Public Legal Notice," Novato Advance, 27 January 1971, Sec. B, p. 32, Col. 2.

Anon., "Cannery Row Abalone Farm Seeks 'Land'," The Sunday Penninsula Herald, 1977.

4. Persons Consulted

Gerald Bowden, J. D., Assistant Professor of Environmental Studies, University of California, Santa Cruz.

Kathleen Bowden, J.D.

Neil Buchan, Owner and Operator of Buchan Oyster Company, Petaluma, California.

Richard Cooley, Ph.D., Professor of Environmental Studies, University of California, Santa Cruz.

Robert Crompton, Jr., Silverking Oceanic Farms, Davenport, California.

Walter Dahlstrom, Unit Manager, California Department of Fish and Game, Menlo Park, California.

Joseph N. Dichiacchio, Operations Manager, The Ab Lab, Port Hueneme, California.

Frank Douglas, Business Manager, Coast Oyster Company, Arcata, California.

Richard Eisenger, Operations Manager, International Shellfish Enterprises, Incorporated, Moss Landing, California.

Richard Grossberg, former Research Associate, Pidgeon Point Shellfish Hatchery.

T. Roger Haas, Vice President, Silverking Oceanic Farms, Davenport, California.

Susan Hansch, Coastal Planner, Central Coast Regional Coastal Commission, Santa Cruz, CA.

Judith Hansen, Marine Biologist, University of California, Santa Cruz.

Charles Hazen, Ph.D., Jones and Stokes, Inc., Sacramento, California.

Richard Hirschkind, Abalone Aquaculturalist, Carmel, California.

Suzanne Holt, Ph.D., Visiting Assistant Professor of Economics, University of California, Santa Cruz.

J. R. Johnson, Owner Operator, Morro Bay Oyster Company, Morro Bay, California.

George Lockwood, General Partner, Monterey Abalone Farms, Monterey, California.

Richard Mack, Garrapata Trout Farms, Carmel, California.

John D. McMullen, Operations Manager, The Ab Lab, Port Hueneme, California.

Peter Meyer, Ph.D., Assistant Professor of Economics, University of California, Santa Cruz.

Nate Schaffer, Manager, Pacific-Ocean Farms, Carmel, California.

Emil Smith, Jr., Assistant Chief, Marine Resources Division, California Department of Fish and Game, Sacramento, California.

Hugh Staton, General Manager, California Marine Associates, Cayucos, CA.

5. Agencies Contacted

California Coastal Commission.

California Department of Fish and Game.

California Regional Water Quality Control Board.

Environmental Protection Agency.

Marin County Department of Public Works.

Marin County Planning Department.

Monterey County Planning Department.

Moss Landing Harbor District.

Santa Cruz County Department of Public Works.

Santa Cruz County Planning Department.

U. S. Army Corps of Engineers.

U. S. Department of the Navy.