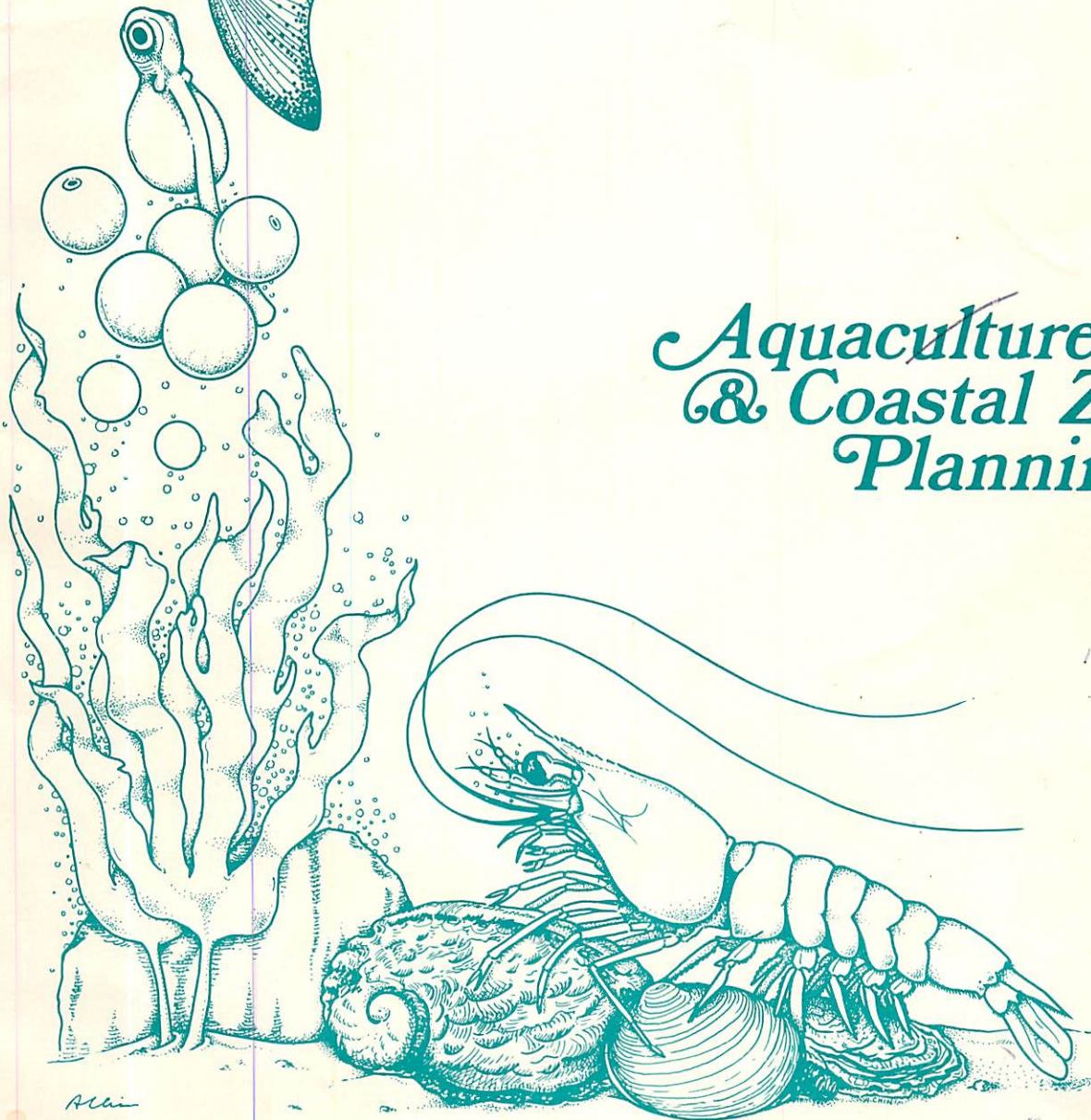


Aquaculture & Coastal Zone Planning



AQUACULTURE
AND
COASTAL ZONE PLANNING

by

Fred S. Conte
Aquaculture Specialist

Andrew T. Manus
Area Marine Advisor -
Coastal Resources Specialist

University of California Cooperative Extension
Sea Grant Marine Advisory Program

1980

This work is the result of marine advisory activities sponsored by the NOAA Office of Sea Grant, Department of Commerce, under grant no. UC NOAA 04-8-M01-189, to the University of California. The U.S. government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon.

CONTENTS

I. PREFACE.....	1
A. Abstract.....	2
B. Introduction.....	3
C. Purpose of Report.....	3
D. Definitions.....	4
E. Coastal Act Policies.....	4
F. Recent Legislation.....	5
II. BACKGROUND INFORMATION.....	6
A. Aquaculture Systems.....	6
- Extensive and Intensive Culture.....	6
- Impact on Coastal Utilization.....	6
B. Profitable Marine Aquaculture Enterprises.....	7
C. Aquaculture: Research and Development.....	8
D. Impetus for Aquaculture Development in the U.S.....	9
- Historical Response to a Depleted Fishery.....	9
- Enhancement of a Natural Resource.....	9
E. Aquaculture and Its Relation to World Fisheries.....	10
- Aquaculture Projections in the U.S.....	11
III. ISSUES.....	12
A. Land Use.....	12
B. Lack of Specific Site Criteria.....	13
C. Aquaculture Policy.....	13
D. Economics.....	13
E. Water Quality.....	13
F. Permit Process.....	13
IV. POLICY CONSIDERATIONS.....	14
A. Coastal Dependence.....	14
B. Encouragement of Aquaculture Development.....	14
C. Siting Considerations.....	14
V. REFERENCES.....	14
VI. APPENDIX.....	16
A. Case Study: San Mateo County Aquaculture Policies.....	16
B. California Aquaculture Development Act.....	17
C. Potential Interactions of Marine Activities in Close Proximity.....	20
D. California Senate Bill 269: Experimental Salmon Ranching.....	21

I. PREFACE

This report was conceived early in 1978, when the California Sea Grant Marine Advisory Program (MAP) was queried by Sea Grant's Aquaculture Industry Advisory Committee and coastal planners regarding the status of aquaculture in the state with respect to the local coastal planning process. Realizing that information on new industries, such as marine aquaculture, is difficult to obtain, the California Sea Grant Program made a commitment to work with industry representatives and coastal planners regarding consideration of aquaculture in the local coastal planning process.

Initial efforts involved working directly with Santa Barbara and San Mateo counties and several other coastal jurisdictions as they requested. Meetings with aquaculture industry representatives and coastal planners were arranged to discuss issues of interest to both groups. These meetings helped identify the areas of concern addressed in this report.

The MAP role in this endeavor was advisory in nature. Efforts were concentrated in pulling together materials which would be of most use to coastal planners and, at the same time, adequately describe the aquaculture industry. Portions of this report were used by San Mateo County and incorporated into a background report for that county's Local Coastal Plan (LCP). The county's use of our technical assistance for this purpose provided useful feedback. As an illustration of this feedback, included in Appendix A is a copy of the county's policies relative to aquaculture development in the coastal zone. We neither recommend nor encourage the adoption of these specific policies in other LCP's, rather, they are included as a case study example.

Because of the numerous requests received from other jurisdictions and interested groups, the California MAP decided to publish this work as a technical assistance report. It is our belief that materials and information contained within this report are transferable to other jurisdictions that must deal with aquaculture and coastal zone planning.

A. Abstract

New and evolving industries like marine aquaculture must compete for coastal locations along with the myriad of traditional coastal zone uses. Unfortunately, information regarding aquaculture as an industry is not readily available. In addition to just basic information about aquaculture as an industry, little is known about the issues and policy considerations confronting its development.

This technical report traces the historical development of marine aquaculture in California. Included is background information on the industry's present and potential contribution to the state as a food source and economic activity. This information is further analyzed within the context of the issues that are facing marine aquaculture as a coastal dependent activity. Consequently, this report should be of interest to coastal planners, managers, and decision-makers charged with formulating and implementing coastal policy.

B. Introduction

Aquaculture is defined as the culture of plants or animals in an aquatic medium. Other terms have been introduced to further delineate these activities; for example, mariculture meaning the culture of plants or animals in salt water. For simplification we will apply the broad term aquaculture to describe the aquatic culture of plants or animals in the coastal zone. Where necessary, to differentiate between fresh and salt water activities, we will refer to fresh water aquaculture and salt water or marine aquaculture.

California has gained world recognition with its agricultural accomplishments. Its geological diversity and wide range of climates allow the culture of a multitude of agriculture products. These same characteristics favorable to agriculture are also highly advantageous to aquatic husbandry. The favorable climate, the diversity of water from cold mountain runoff to geothermal springs and the 1100 miles of coastal water all contribute to California's potential as a major producer of aquaculture products.

California aquaculture, at present, is a hidden force in the economy of the state. Significant contributions are already being made in areas of protein production, fisheries enhancement, and recreation. The contribution made by state aquaculture hatcheries to salmon and trout production is immeasurable. The exvessel value of the California salmon fishery is approximately 10 million dollars and approximately 40% of the salmon industry's catch consists of hatchery-produced fish. Conservative estimates of wholesale figures place aquaculture producer income at 6.5 million dollars in 1977. Once in the retail market as food items, or as fish and bait for the recreational industry, this figure increases three to five times.

Aquaculture is not only viewed as a significant contributor to the state's economy, but as a potential major food producer that will have a national and international impact. Demand for fisheries products has tripled in the past 20 years. In the U.S. 60% of these products are being imported and the international community plans to expand its harvest of the world's fisheries to supply needs of individual countries and to supply an export market. It is estimated that the annual maximum sustained yield of the world's fishery is 100 to 120 million metric tons and by the year 2000 the total harvest will meet or exceed this limit. Recognition that aquaculture enhances natural fisheries and contributes significantly to the void between demand and the maximum sustained yield of the world fishery has stimulated congressional action to accelerate aquaculture's development. Because aquaculture has been identified by Congress as being in the national interest, legislation has been introduced to support its expansion.

California is currently developing local coastal plans that will set priorities on coastal utilization and maintain our natural resources. Realizing the positive contributions aquaculture offers these same natural resources and its impact on human nutritional needs, this is an opportune time for consideration of aquaculture in coastal planning. The desire of coastal planning for clean, productive marine waters and the needs of aquaculture as a coastal dependent entity are concurrent, as neither can thrive without maintaining ocean quality. It is essential to the future of California's developing aquaculture industry that it be given serious consideration in coastal planning.

C. Purpose

The purpose of this background report is to present basic information on the significance and status of commercial aquaculture. It is organized to provide interested individuals and decision makers with a brief overview of the aquaculture industry as an important emerging coastal dependent activity.

D. Definitions

The following definitions are given to facilitate a better understanding of this report.

Aquaculture - is the culture of plants or animals in aquatic media. The term is also used to describe specific types of culture such as fresh water aquaculture, or salt water (marine) aquaculture.

Mariculture - is another term used to describe salt water or marine aquaculture. The terms aquaculture and mariculture will be used interchangeably in this report, and refer to existing and/or proposed commercial enterprises in one of the various stages of development.

Hatchery - facility used to spawn adult animals and rear the resultant eggs through successive larval stages to a form suitable for stocking in a grow-out system.

Grow-out Systems - systems used to grow the animals to a commercial size.

Extensive Culture - culture systems that incorporate a low density population of animals relative to the water volume, and where the nutritional and environmental requirements of the animals are provided through the natural productivity of the water system.

Intensive Culture - culture systems where a high density of animals require supplementary food and environmental manipulation.

Maximum Sustainable Yield - the level of continuous harvest a fishery can sustain without suffering adverse impacts to the resource.

Mollusk - a group of animals including oysters, clams, mussels, and abalone.

Anadromous - an organism that lives in the sea and returns to fresh water to spawn.

Smoltification - the physiological process by which anadromous fish adjust to life in salt water. Once changed, these young fish are called smolts.

Imprint - the process in which young salmon pick up a given stimulus from a specific site and use this stimulus to return to that site during spawning season.

E. Coastal Act Policies

Until recently in California, planning policy with respect to aquaculture was non-existent. Therefore, it is relatively easy and useful to trace the emergence of aquaculture as a coastal planning issue in the state. During the development of the Coastal Plan (1975), aquaculture was documented as a marine use. In the chapter on the marine environment (page 26), the findings relative to aquaculture in coastal waters state that:

Aquaculture (water agriculture) involves the cultivation and harvest of aquatic organisms. Currently it produces most of the mollusks marketed on the West Coast. In the future, aquaculture techniques may be improved and applied to other species, reducing costs and increasing availability of fish and shellfish as sources of protein, etc.

Several sections of the Coastal Act (1976) apply to aquaculture. Aquaculture/mariculture is specifically mentioned only twice in the entire Act. The most important policy areas addressed are Sections 30230 and 30231. These sections have been identified as having implications for aquaculture development.

Section 30230: Marine Resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.

Section 30231: The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of groundwater supplies and substantial interference with surface waterflow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that project riparian habitats, and minimizing alteration of natural streams.

Section 30233:

- (a) The diking, filling or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this division, where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects, and shall be limited to the following:
 - (8) Nature study, aquaculture, or similar resource-dependent activities.

Section 30255: Coastal-dependent developments shall have priority over other developments on or near the shoreline. Except as provided elsewhere in this division, coastal-dependent developments shall not be sited in a wetland.

Coastal dependency is the most important policy which will guide the future development of aquaculture. The test of coastal dependency is stated in Section 30101 of the Coastal Act. Coastal-dependent development or use is defined as that "which requires a site on, or adjacent to, the sea to be able to function at all."

F. Recent Legislation

The California Aquaculture Development Act was recently passed by the state legislature (Appendix B). This Act amends Section 30411 of the Coastal Act. Of major significance to the LCP effort is Section 30411(c) which reads:

- (c) The Legislature finds and declares that salt water or brackish water aquaculture is a coastal-dependent use which should be encouraged to augment food supplies and to further the policies set forth in Chapter 4 (commencing with Section 825) (see SB 52) of Division 1. The Department of Fish and Game may identify coastal sites it deems appropriate for aquaculture facilities. Such sites shall be identified in conjunction with the appropriate local coastal program prepared pursuant to this division. The commission, and where appropriate, local governments, shall consistent with the coastal planning requirements of this division, provide for as many coastal sites identified by the Department of Fish and Game for uses as are consistent with the policies of Chapter 3 (commencing with Section 30200) of this division.

The Act further specifies that "the operative provisions of this Act shall be implemented by the DFG and the Resources Agency as funds are available within the department or the agency, or may hereafter become available through legislative appropriation for the purposes of this Act."

II. BACKGROUND INFORMATION

This section provides information basic to the discussion of issues and the formulation of policies related to aquaculture.

A. Aquaculture Systems

Extensive and Intensive Culture

Aquaculture technology can be applied in either extensive or intensive culture systems. Extensive culture incorporates a relatively low density population of aquatic animals maintained in large aquatic systems such as large ponds, bays or estuaries. In these systems, animals are provided adequate nutritional and environmental requirements through the natural productivity associated with the body of water. This form of production usually requires leasing state-owned submerged lands or alteration of topography to accommodate large water enclosures. In the United States, and especially in California, land values and restricted use of submerged lands limit this form of aquatic husbandry. The California oyster industry uses extensive culture techniques to grow oysters to a marketable size, using approximately 4,000 acres of leased submerged land distributed over four bay systems. The advantage of using extensive methods of oyster cultivation is the compatibility of the two biological systems. The impact of oyster culture on the water quality of these bays is negligible and it has been demonstrated that production activities and maintenance of a good biological environment are compatible.

In intensive aquaculture systems, animals are maintained in ponds, raceways or tanks, and in high densities requiring supplementary feeding and environmental manipulation. Because of economic and social factors in California, many marine aquaculture systems are evolving towards more intensive applications. A number of species and associated intensive culture systems are being examined for commercial application, however, most still fall under the category of research and development. At present, viable commercial intensive marine aquaculture in California is limited to the culture of mollusks. Oysters, clams and mussels are spawned and the eggs are maintained in controlled systems where they are reared through their successive larval stages. When the oyster larvae, for example, settle as individual mollusks, they are further cultured in trays using water supplemented with algae for food or given access to the rich waters of bays or estuaries. The young seed oysters are then used to seed commercial systems in the U.S. or are sold on the international market.

Impact on Coastal Utilization

When extensive culture techniques are used, the possibility of impacts on other coastal uses is greater than when intensive systems are employed. For example, with extensive oyster culture, it is sometimes necessary to fence large areas for protection from predators. Fencing of such waters could impact or restrict free passage, recreational boating and fishing within the area⁽¹⁾.

In contrast, intensive culture systems have a minimal impact on coastal utilization. Production facilities are designed to accommodate intensive units in the smallest space possible to facilitate maximum environmental control. These activities can be housed in a building or incorporated in external tank systems. With the trend toward high density intensive closed or semi-closed systems requiring less acreage, fewer coastal use conflicts are anticipated.

A common misconception concerning marine aquaculture involves the nature of the metabolic waste products of the cultured animals and the impact of these products on coastal waters. The effluent discharged from marine culture systems is the natural metabolic waste product of marine animals and a natural component of the marine environment. These discharges are comparable to the natural metabolic discharges of oyster reefs and fish populations, and when properly disposed under permit regulations have a negligible impact on either ocean or bay systems. Aquaculture is subject to environmental quality

standards and regulations imposed at various levels of government. In fresh water aquaculture, the effluent from fish farming operations is being used as a source of supplementary fertilizer for agricultural products. Research is now being conducted on the use of salt water for the irrigation of barley and tomatoes to expand production in arid lands, and the nutrients from salt water aquaculture are viewed as an additional benefit when applied to salt water culture of agricultural products(2).

In contrast to many existing coastal uses, most aquaculture (exclusive of oyster culture) represents a relatively new coastal/ocean use(3). Because of this, it is difficult to fully document conflicts which might exist between aquaculture and other nearby marine activities. One effort which attempts to illustrate potential conflicts in a general way is the U.N. Economic and Social Council Report, Uses of the Sea: Report of the Secretary General (E/5120). A summary matrix titled "Potential Interactions of Marine Activities in Close Proximity" is included in Appendix C of this background report.

B. Profitable Marine Aquaculture Enterprises

Marine aquaculture in the form of oyster culture has been practiced in California since the early 1850's. Native oyster, *Ostrea lurida*, production could not meet the market demand, and oysters were shipped from the Puget Sound and the eastern U.S. for replanting in San Francisco Bay. The industry expanded, with production reaching almost three million pounds of meat a year at the turn of the century. As the San Francisco Bay Area was developed, water quality declined. Oystermen had discontinued rearing oysters from seed by 1921 and had abandoned the Bay Area by 1939. The industry remained depressed until the introduction of the Pacific Oyster, *Crassostrea gigas*, at which time it experienced rapid growth in other bay systems in the state(4). The current oyster aquaculture industry, located primarily in Humboldt, Tomales, Drake and Morro Bays, accounts for over 90% of all oysters produced in California waters. The industry produced over 4,700,000 pounds of oyster meat between 1972 and 1977. The wholesale value of the 1977 oyster harvest was approximately 1.8 million dollars (Table 1). This form of extensive aquaculture has been active in California for more than a century, contributing significantly to the state's economy through its fisheries markets and tourist restaurant trade.

Table 1. State aquaculture oyster production in lbs. packed weight* and gallons of shucked oysters.

	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
Pounds	885,001	726,875	799,742	799,689	706,358	828,538
Gallons	102,907	84,520	92,993	92,987	82,134	96,341

*Packed weight is estimated to be 15.1% of live weight for *C. gigas* and 10.9% for *C. virginica*. Live weight includes the shell. Shucked gallons are calculated as 8.6 lbs/gal for *C. gigas* and 8.5 lbs/gal for *C. virginica*.

Data provided by California Department of Fish and Game.

In the mid-1960's, the oyster industry took on new dimensions with the development of molluscan hatcheries. Progress in molluscan larval technology has been rapid in the past seven years and hatcheries have been established on the central California coast. The development of these facilities is a direct result of a strong market demand for quality seed stock coupled with limited availability, both here and abroad. These hatcheries are undergoing the transition from commercial research and development projects to viable commercial industries producing Pacific, Olympia, European, Eastern, and Samino oysters and several species of clams. Seed stock is sold to buyers in France, Spain, Holland, the Scandinavian countries and Asia as well as the United States.

Shellfish hatcheries are an example of intensive aquaculture. Adult mollusks are maintained and spawned in controlled environment systems and the larvae are reared in intensive tank culture requiring precise environmental control. Because of the extremely delicate nature of the larvae, subtle influences of environmental contaminants can result in a complete loss in the hatchery. In addition, because of the capital costs involved in establishing a hatchery, short-term occupation of these facilities is not feasible. As a result of this, hatcheries avoid discharges that could be detrimental to their water supply, in this case marine waters. Several hatcheries pump water from the shoreline and use the water to transport cultured algae to the animals and to maintain adults, larvae and seed oysters in tank systems. The metabolic load discharged is comparable to that of a small oyster reef and is regulated through the permitting process.

The activities of hatcheries are viewed as one of the most valuable aspects of aquaculture. The production of seed stock for food production and natural fisheries enhancement identifies hatchery aquaculture as a beneficial coastal activity.

C. Aquaculture: Research and Development

With increased interest in aquaculture and the recognition of its potential, many commercial organizations in California are investing in the research and development (R&D) of species previously not cultivated through aquaculture. These R&D species include, among others, abalone of the genus Haliotis, and salmon of the genus Oncorhynchus produced through salmon ranching.

The California abalone fishery was first harvested intensively by Chinese divers in the early 1850's and accounted for landings in excess of 4 million pounds per year by 1879. Records kept by the California Department of Fish and Game since 1916 show a southward shift of commercial populations and a decline in total landings beginning in 1969. Current landings amount to approximately one million pounds a year⁽⁵⁾.

Prior to 1945 the abalone fishery was concentrated on the red abalone because of its large size, color and quality. Due to market demand and declining abundance of reds, pink abalone were added to the fishery in 1945 and small numbers of greens in 1950. With declining abundance in the late 1960's, the more inaccessible white and less desirable black abalones were added to the fishery. Despite these adjustments, declining populations of abalone in California and the world, coupled with increasing market demands, have stimulated R&D abalone aquaculture. Since 1971, several companies have developed commercial hatchery and grow-out techniques and are predicted to make the transition from R&D aquaculture to viable commercial entities in the near future. The aquaculture industry working primarily with red and pink abalone has technologies available for spawning, feeding, and larval settlement. Once the larvae settle on a substrate, they soon adopt the characteristic shell of the adult. Various methods are employed to grow the animal to market size including intensive tank culture and offshore container culture where habitats are provided to the abalone, along with a diet of kelp. In demand are 1/2 to 1 inch abalone for fisheries enhancement programs, 4 inch abalone for the Asian market and larger abalone for the U.S. market.

Salmon ranching, only recently introduced to California, has been successful in the Soviet Union and Japan, and is developing in Alaska, Oregon and Canada. The concept uses the same basic principles as traditional salmon hatcheries which rely on the homing instinct of anadromous fish during spawning seasons. Traditional public hatcheries spawn and rear the young of salmon that are captured miles upstream from the river's mouth. The young fish are raised to juveniles then released at the hatchery site. The fish move downstream, undergo smoltification and move into the sea. Coho and chinook salmon released under these conditions remain at sea from 30 to 50 months then return to the hatchery site where they were released. Return figures vary between 0.5 and 1.0 percent depending on losses incurred during the trip downstream, those due to disease, predations, and the harvest, and those incurred during the return trip in spawning season.

Salmon ranching employs the same basic techniques as traditional hatcheries, with few exceptions such as fish vaccination against kidney disease and a separation of the hatchery and release sites. Fish are spawned and reared in intensive systems at fresh water sites, some of which use heated water to accelerate growth and cut this portion of the cycle from 18 months to 7 months. When the fish are ready to undergo smoltification they are vaccinated against disease and then transported by tank downriver to a holding facility at the release site. The fish are held for several weeks at the release site where they are "imprinted" before they are released to sea(6). The "imprinted" fish then return to the release site after feeding at sea over a period of time characteristic for the species. With the initial trip downriver and the return river trip removed, and increased health precautions, returns range from 1.0 to 6.0 percent. This represents a significant increase over the traditional hatchery-release system and has provided an economic incentive to commercial aquaculture. Special legislation in California has allowed a R&D salmon ranching facility to operate in Santa Cruz County (Appendix D).

Both commercial R&D abalone culture and salmon ranching offer means of increasing available seafood and enhancing the existing fisheries. The California Department of Fish and Game is looking to commercial abalone hatcheries to provide small abalone for seeding programs on the central California coast. Young salmon are utilized by both commercial and sportfishermen from the time they are released until they return to the release site as adults. This form of aquaculture, whether it is operated through private ownership under state regulations or through state cooperatives, can have a positive impact on available salmon.

These two forms of marine R&D aquaculture were chosen as examples from a number of species being investigated. They were discussed because they are approaching commercial viability and show promise in contributing as a food source. Other species such as bay scallops, lobsters, seaweed and additional finfish all have similar promise as a result of R&D efforts.

D. Impetus for Aquaculture Development in the U.S.

Historical Response to a Depleted Fishery

Aquaculture practices began in the eastern United States as a direct result of depletion of the natural oyster fishery. In the early 1800's before the development of the cattle industry, the annual consumption of oyster meat on Long Island was 7 million bushels per year. By the 1850's the oyster fishery in Long Island Sound was depleted to the extent that oyster seedlings were transported from Chesapeake Bay and planted in the Sound for cultivation. As other centers of populations developed throughout the country, the sequence of supplementation of the natural fishery through aquaculture was repeated. Oyster aquaculture spread along the Atlantic Coast, throughout the Gulf of Mexico into the Pacific Northwest. Today 40% of the oysters consumed in the U.S. are produced through aquaculture, representing 22 million pounds of oyster meat valued at 21.2 million dollars in the wholesale market(7).

Enhancement of a Natural Resource

Aquaculture's role in supplementation and enhancement of a natural fishery was dramatically repeated in the U.S. salmon industry. Between 1880 and 1930 human activities including construction of dams, logging practices and fishing pressure resulted in an approximate 80% reduction in the harvest of chinook, coho, pink, chum and sockeye salmon. The industry from the Puget Sound through California remains depressed in relation to historical runs; however, aquaculture has been instrumental in maintaining the commercial fishery, and in the case of chinook and coho has reversed the trend of declining abundance and harvest. The majority of salmon on the West Coast uses the Columbia River for spawning and early life stages. Records show that 50% of all salmon returning to the Columbia to spawn were hatchery produced. It is estimated that 30% of all Pacific salmon in the U.S. catch were hatchery produced in the state and federal aquaculture facilities(8).

E. Aquaculture and its Relation to World Fisheries

Because of its potential both as an economic stimulus and as a major contributor to available protein, aquaculture has gained national attention. This interest has accelerated because of the international realization that there are limitations to the world's natural fisheries. Our traditional fisheries, once thought to be unlimited, are now estimated to be capable of producing an annual maximum level of harvest of 100 to 120 million metric tons (MMT)*. Excessive fishing beyond these limits is predicted to have adverse effects on the fisheries abilities to recover and to remain a viable resource(9).

In the late 1940's, the world harvest of fisheries products was approximately 20 MMT. The harvest was expanded to 69.7 MMT by 1975 and is predicted to reach 94 MMT in the next 20 years. With expanding world population, the demand for fisheries products will exceed availability. In the early 1950's, the U.S. with a fisheries landing of 2.8 MMT was ranked second to Japan with a harvest of 4.8 MMT. Since 1955 U.S. landings have remained the same and our fishing efforts are ranked sixth internationally. To meet the expanding market demand, the U.S. imports two-thirds of its fisheries products, representing an import expansion from 700 million pounds in 1946 to 4.7 billion pounds in 1976. Demand for fisheries products in the U.S. continues to expand, concurrent with increasing competition for the limited resource (9;10).

The majority of our traditional fisheries including cod, haddock, many flatfish, redfish, shrimp and lobster are estimated to be at or near their limits of natural production. Some species including the abalone, dungeness crab, American lobster, anchovy and sardine have disappeared as an existing fishery or have exhibited a marked decline in traditional fisheries grounds. These identified limits in production and marked declines in our traditional fisheries have accelerated interest in aquaculture as a tool to supplement the existing supplies of fisheries products, and in some cases enhance the fishery through hatchery and reseeding programs. Aquaculture produces approximately 10% of the world's fisheries products and in 1975 the U.S. was ranked fifth in aquaculture production (Tables 2,3).

Table 2. World aquaculture production in 1975.¹

<u>Species Groups</u>	<u>Production in Metric Tons</u>
Finfish	4,000,000
Seaweeds	1,000,000
Oysters	600,000
Mussels	240,000
Scallops	63,000
Clams	38,000
Cockles & Other Mollusks	30,000
Shrimps & Prawns	15,000

¹Source: Glude, J.B. 1978. The contribution of fisheries and aquaculture to world and U.S. food supplies. In Drugs and Food From the Sea. University of Oklahoma Press. pp. 235-247.

*MMT = 2,204.6 pounds

Table 3. Production in the major aquaculture countries in 1975.¹

<u>Country</u>	<u>Production in Metric Tons</u>
China	2,500,000
Japan	945,000
India	494,000
USSR	210,000
USA	151,000
Indonesia	144,000
Taiwan	126,000
The Philippines	125,000
Korea	83,000
Thailand	83,000
Bangladesh	76,000

¹ Source: Glude, J.B. 1978. The contribution of fisheries and aquaculture to world and U.S. food supplies. *In* Drugs and Food From the Sea. University of Oklahoma Press. pp. 235-247.

The international fishing community has set goals for fisheries harvest that are predicted to meet natural production limits of our traditional fisheries within 25 to 30 years. The two major fishing nations, Japan and the Soviet Union, have identified aquaculture as the primary means of supplementing the natural harvest and have accelerated aquaculture development to match natural harvest by 17 to 40% in 25 years⁽¹¹⁾. The U.S. has recognized these international objectives, and although the mechanisms to implement these programs have not been established in the U.S., they are being pursued. U.S. aquaculture has been identified as being in the national interest and given priority status through congressional mandates^(12;13). The contributions that aquaculture have made are significant and its future role warrants consideration in coastal planning.

Aquaculture Projections in the U.S.

In 1974, the National Marine Fisheries Service gathered available data to project the estimated fisheries supplies that could be achieved by U.S. aquaculture. The data presented here represent projections of marine species gathered from public and private sources that were incorporated in the aquaculture plan of the National Fisheries Plan (Table 4). In the aquaculture plan total production from 21 selected species groups represents a current U.S. aquaculture contribution of 172 million pounds. It is estimated that, with proper support, production of 1.2 billion pounds annually can be achieved by the year 2000^(9;14).

Table 4. Projected marine animal aquaculture production based on estimates from the 1974 National Fisheries Plan.

SPECIES GROUP	FISHERIES PRODUCTION	CURRENT AQUACULTURE	POTENTIAL AQUACULTURE PRODUCTION IN THOUSANDS OF POUNDS		
	Thousands of Pounds	Thousands of Pounds	1983	1988	1993
Pacific Salmon					
Public	213,000*	60,000	70,000	90,000	100,000
Private		1,000	14,000	60,000	120,000
Oysters	48,500*	20,000	40,000	80,000	200,000
Shrimp					
Penaeids	372,200*	500	7,000	23,000	43,000
(marine)					
Pandalids	70*	0	100	1,000	5,000
Lobster	29,000*	0	1,000	5,000	10,000
Clams (Hard and soft shell)	23,600*	2,600	5,000	10,000	25,000
Bay Scallops	1,800*	0	500	2,000	5,000
Abalone	700*	0	500	1,000	5,000
Mussels	800**	0	1,000	10,000	25,000
Pompano	1,400**	0	100	500	3,000

*1973

**1972

Source: Abbreviated from Glude, J.B. 1978. The contribution of fisheries and aquaculture to world and U.S. food supplies. In *Drugs and Food From the Sea*. University of Oklahoma Press. pp. 235-247.

III. ISSUES

A. Land Use

Unregulated aquaculture developments have the potential to be damaging to the environment. If not properly sited and designed, sensitive habitats could be harmed. However, if properly sited and designed, salt water or brackish water aquaculture is a coastal-dependent use that can be compatible with a variety of existing coastal land uses.

One of the most articulated issues cited by the aquaculture industry, concerned citizens, and local planning agencies regarding aquaculture development is the availability of sites. The problem is not one of finding suitable locations, rather it is one of locating development where it is permissible. This is not to mean that aquaculture is to be treated as an excluded activity in coastal areas. Rather the absence of aquaculture as a permissible use in most local jurisdictions' land use ordinances is attributable to the newness of the industry and the limited experience of jurisdictions in dealing with such developments. Because of this, aquaculture development is emerging as a permissible coastal use.

B. Lack of Specific Site Criteria

The state-of-the-art technologies used by the marine aquaculture industry are undergoing experimentation and modification. Specific site criteria on a species by species basis do not exist. The selection of suitable coastal sites is governed by a variety of factors, environmental requirements being only part of the total considerations. Factors that influence site selection range from the accessibility to a market place to the previously stated concern of a high quality water supply.

C. Aquaculture Policy

A 1978 National Academy of Sciences report states that the principal constraints on the orderly development of aquaculture tend to be political and administrative, rather than scientific and technological⁽¹²⁾. Currently, most of the federal activity in aquaculture is dispersed in as many as 16 different agencies. Several bills have been introduced in the Congress to define the federal role with respect to aquaculture. Although not complete, efforts at the state and national levels are underway toward developing a unified policy aimed at encouraging aquaculture development.

Several states have developed policies which encourage aquaculture development. The most notable example is Hawaii. Several reports dealing with streamlining the permit process to recommending programs and management strategies to encourage aquaculture development have been published^(15;16). It is too early to evaluate the impacts of these studies but they can be considered as a positive start. California appears to be following Hawaii's lead as evidenced by the recent passage of the California Aquaculture Development Act of 1979 (Appendix B).

D. Economics

The aquaculture industry is often compared to the agriculture industry in the U.S. Many believe that aquaculture as an industry has the potential to develop along the same lines as agriculture. Unfortunately, aquaculture suffers from a lack of marketing research and financial programs which have been the traditional backbone of the agriculture industry. Areas in which information, capital, and research are deficient include: determination of markets, public and private support for marketing research, costs of operating inputs to produce species, and expanding the availability of financial programs to aquaculture^(12;13).

E. Water Quality

One of the goals that the aquaculture industry shares with regulatory agencies is the maintenance of a high quality marine environment. Water quality requirements are of paramount concern to the aquaculturist. Coastal waters which are most favorable are those that are pollution-free, possess suitable temperature and salinity regimes and are in an area that is environmentally suitable to the culture of aquatic organisms.

F. Permit Process

Numerous agencies at the local, state and federal level regulate use of the ocean and coastal land. Lack of central control has led to a very complicated permit process which is not encouraging to potential aquaculturists. Because the state has not yet developed a policy for aquacultural developments, conflicts can develop among the permitting agencies, themselves. The California Aquaculture Development Act provides for planning policies for aquaculture and provides that the Department of Fish and Game may identify coastal sites deemed appropriate for aquaculture facilities in conjunction with the local coastal program.

IV. POLICY CONSIDERATIONS

The development of aquaculture facilities on the coast should be conditionally permitted subject to the policies of the Coastal Act. Since there are no specific standards for facility development, detailed policies are not offered at this time. Several general policy statements regarding the development of an aquaculture industry on the coast are discussed.

A. Coastal Dependence

Aquaculture should be treated as a coastal dependent use that is compatible with a variety of existing coastal land uses. Since the siting requirements for aquaculture differ depending upon, among other things, species to be cultured and available technology, aquaculture should be permitted conditionally or permitted in as many land use categories possible. For this reason, jurisdictions should favor a flexible approach in the planning and permitting of aquaculture facilities. Such an approach will expand future development options for the industry as well as for counties and cities.

B. Encouragement of Aquaculture Development

Jurisdictions should work with regional, state, and federal agencies and the aquaculture industry to encourage the location and development of aquaculture facilities which are environmentally sound and hold economic promise. Planning departments should assist applicants in securing the necessary permits for project approval. Aquaculture is a coastal dependent use that should be encouraged to increase the available supply of protein, enhance and restore fisheries stocks and contribute to the stability of the area's coastal economy.

C. Siting Considerations

Encourage the siting of aquaculture facilities at coastal sites of minimum elevational difference from sea level to reduce costs related to water-pumping. Promote aquaculture facilities designs that minimize visual impacts on scenic roads and corridors. Coordinate and communicate with the appropriate regional, state, and federal agencies the review of aquaculture development permit requests to ascertain compliance with existing pollution control criteria. Additionally, the jurisdictions should suggest ways to streamline permit requirements to assist aquaculturists in securing the necessary approvals to initiate operation. Request that aquaculturists consult with planning staff during the early stages of project planning to learn which permits will be required. Work with the applicant in the design and siting stages to minimize potential conflicts with other coastal activities.

V. REFERENCES

- (1) Ketchum, B.H. 1972. The Waters Edge: Critical Problems of the Coastal Zone. The MIT Press. Cambridge MA.
- (2) Epstein, E. and J.D. Norlyn. 1977. Seawater-Based Crop Production: A Feasibility Study. Science 197: 249-251.
- (3) Smith, O.J. and D.L. Marshall. 1974. Mariculture: A New Ocean Use. Ga. J. Intl & Comp. L. 42, pp 307-342.
- (4) Barrett, E.M. 1963. The California Oyster Industry. The Resources Agency of California, Dept of Fish and Game, Fish Bulletin 123. pp 103.
- (5) Cicin-Sain, B., J.E. Moore and A.J. Wyner. 1977. Management Approaches for Marine Fisheries: The Case of the California Abalone. California Sea Grant Publication 54, IMR 77-101.

- (6) McNeil, W.J. and J.E. Bailey. 1975. Salmon Rancher's Manual. NOAA Northwest Fisheries Center Auke Bay Fisheries Laboratory Processed Report.
- (7) Dressel, D.M. and D.S. Fitzgibbon. 1978. The United States Molluscan Shellfish Industry. In Drugs and Food From the Sea. University of Oklahoma Press. pp 251-261.
- (8) Henry, K.A. 1978. Pacific Coast Salmon Industry: Status of Natural and Artificial Production. In Drugs and Food From the Sea. University of Oklahoma Press. pp 359-365.
- (9) Glude, J.B. 1978. The Contribution of Fisheries and Aquaculture to World and U.S. Food Supplies. In Drugs and Food From the Sea. University of Oklahoma Press. pp 235-247.
- (10) U.S. Dept. of Commerce. 1978. Fisheries of the United States, 1977. Current Fisheries Statistics No. 7500, NOAA, NMFS.
- (11) Nishiyama, T. 1977. Japanese and Soviet Attitudes Towards Aquaculture. Sea Grant Report 77-2. University of Alaska.
- (12) National Academy of Science. 1978. Aquaculture in the United States Constraints and Opportunities. NAS Washington D.C.
- (13) Committee on Merchant Marine and Fisheries. 1975. Joint Hearings of the Subcommittee on Fisheries and Wildlife Conservation and the Environment and the Subcommittee on Oceanography. November 7, 1975. Serial No. 94-31. U.S. Government Printing Office, Washington D.C.
- (14) Glude, J.B. Ed. 1977. NOAA Aquaculture Plan. U.S. Dept Comm. NOAA/NMFS/OSG.
- (15) Corbin, J.S. 1976. Aquaculture in Hawaii 1976: Progress, Resources and Organization. Dept. Planning and Economic Development. State of Hawaii.
- (16) Corbin, J.S. 1978. Aquaculture Development for Hawaii: Assessment and Recommendations. Dept. Planning and Economic Development. State of Hawaii.

APPENDIX A

Case Study: San Mateo County Aquaculture Policies

POLICIES FOR AQUACULTURE

The County will:

1.1 Definition of Aquaculture

Define aquaculture as the culture and husbandry of aquatic organisms, including, but not limited to, fish, shellfish, mollusks, crustaceans, kelp and other algae.

1.2 Appropriate Location for Aquaculture

Permit aquaculture in the Light Industrial and Resource Management District zones.

1.3 Permit Conditions for Shoreline Facilities

Require that aquaculture facilities to be sited on or near the shoreline be coastal-dependent developments or uses.

1.4 Definition of Coastal-Dependent Development or Use

As stated in Section 30101 of the Coastal Act, define coastal-dependent development or use to mean:

Any development or use which requires a site on, or adjacent to, the sea to be able to function at all.

1.5 Sensitive Habitats

- a. Require that development be sited and designed to prevent adverse impacts on areas designated as sensitive habitats.
- b. Require that natural vegetation buffer areas be maintained to protect riparian habitats.

DEVELOPMENT STANDARDS

1.6 Coastal Visual Resources

Require that facilities be compatible with natural surroundings. Shoreline facility structures should be well screened and depressed below grade where feasible.

1.7 Intake and Outfall Lines

Require that intake and outfall lines be placed underground unless not feasible for a certain activity such as salmon culture.

1.8 Coastal Access

Require that aquaculture facilities adjacent to high use recreational areas erect barriers designed to discourage encroachment.

ROLE OF THE COUNTY

1.9 Permit Policy

Work with the state to identify coastal sites appropriate for aquaculture facilities.

Senate Bill No. 52

CHAPTER 187

An act to amend Section 8345 of the Fish and Game Code, to amend Section 30411 of, and to add Chapter 4 (commencing with Section 825) to Division 1 of, the Public Resources Code, relating to aquaculture, making an appropriation therefor, and declaring the urgency thereof, to take effect immediately.

[Approved by Governor June 29, 1979. Filed with
Secretary of State June 29, 1979.]

LEGISLATIVE COUNSEL'S DIGEST

SB 52, Keene. Aquaculture.

(1) Under existing law, it is unlawful for any person to sell or purchase any rock scallops or scallops.

This bill would allow such scallops, cultivated pursuant to specified provisions, to be sold or purchased under such regulations as the Fish and Game Commission may prescribe.

(2) Under existing law, every person engaged in the business of cultivating marine life, with specified exceptions, is required to procure a license for such purpose, and existing law permits the leasing, in accordance with specified procedures, of state water bottoms for the cultivation of marine life.

This bill would enact the California Aquaculture Development Act to require the Director of Fish and Game to appoint an aquaculture advisory committee which includes specified representatives, require the advisory committee to conduct an investigation, as specified, relating to aquaculture development, require the director to select and the Department of Fish and Game to contract on behalf of the advisory committee with a qualified nongovernmental institution to conduct a study addressing specified matters, require the advisory committee to report to the Governor and Legislature on or before June 30, 1980, and specify related duties of the advisory committee.

The bill would make legislative findings and declarations in connection with the practice of aquaculture, and would provide for related matters.

The bill would also authorize the department to identify, in conjunction with the appropriate local coastal program, coastal sites it deems appropriate for aquaculture facilities, and if such sites are identified, would require the department to take specified action. It would also require the California Coastal Commission and local governments to provide for as many coastal sites identified by the department for such uses as are consistent with the coastal resources planning and management policies specified in the California Coastal Act of 1976.

The bill would specify that the operative provisions of the bill shall be implemented by the Department of Fish and Game and the Resources Agency as funds are available within the department or the agency, or may hereafter become available through legislative appropriation, for the purposes of the bill.

(3) The bill would reappropriate to the department for the same purpose the unencumbered balance of a \$50,000 appropriation to the department from the California Environmental Protection Program Fund which was made in the Budget Act of 1978.

(4) The bill would go into immediate effect as an urgency statute. Appropriation: yes.

The people of the State of California do enact as follows:

SECTION 1. Section 8345 of the Fish and Game Code is amended to read:

8345. It is unlawful for any person to sell or purchase any rock scallops (*Hinnites multirugosus*) or scallops (*Pecten circularis*), except that such scallops cultivated pursuant to Article 4 (commencing with Section 6480) of Chapter 5 of Part 1 of Division 6 may be sold or purchased under such regulations as the commission may prescribe.

SEC. 2. Chapter 4 (commencing with Section 825) is added to Division 1 of the Public Resources Code, to read:

CHAPTER 4. AQUACULTURE DEVELOPMENT

825. This chapter shall be known and may be cited as the California Aquaculture Development Act.

826. The Legislature finds and declares that it is in the interest of the people of the state that the practice of aquaculture be encouraged in order to augment food supplies, expand employment, promote economic activity, increase native fish stocks, enhance commercial and recreational fishing, and protect and better use the land and water resources of the state.

827. The purpose of this chapter is to establish a policy and program toward improving the science and practice of aquaculture as a means of expanding aquaculture industry and related economic activity in the state.

828. As used in this chapter, "aquaculture" means the culture and husbandry of aquatic organisms, including, but not limited to, fish, shellfish, mollusks, crustaceans, kelp, and algae. Aquaculture shall not mean the culture and husbandry of commercially utilized inland crops, including, but not limited to, rice, watercress, and bean sprouts.

829. As used in this chapter, "director" means the Director of the Department of Fish and Game.

830. As used in this chapter, "department" means the

Department of Fish and Game.

831. As used in this chapter, "advisory committee" means the aquaculture advisory committee appointed pursuant to Section 834. 832. The advisory committee shall investigate the status of aquaculture research and practice and shall identify those current and prospective actions most likely to contribute to significant and economic aquaculture development compatible with the environmental policies of the state. The director shall select, and the department shall contract on behalf of the advisory committee with, a qualified nongovernmental institution to conduct a study. The advisory committee may disapprove the design of the study or the qualifications of the nongovernmental institution. The study shall address, but not be limited to, the following areas:

- (a) Development for adoption by the Legislature of a state policy on aquaculture for California. The policy shall include a finding that describes the relationship between the practice of aquaculture and the agricultural industry.
- (b) Development and recommendation of criteria for determining the suitability of species for use in aquaculture.
- (c) Development and recommendation of criteria for the identification of those geographic areas, both coastal and inland, suitable for aquaculture.
- (d) Recommendation of criteria for allocation of those areas determined to be suitable for aquaculture.
- (e) The impact of aquaculture on existing fisheries, including, but not limited to, the release and capture of domestically reared anadromous fish in state waters.
- (f) Compatibility with other land use policies, including recreation, scientific studies, and protection of estuarine and wetland areas.

(g) The use of waste waters in aquaculture.

(h) Existing constraints, both governmental and private, with emphasis on the constraints to small-business oriented and labor intensive aquaculture.

(i) Needed future governmental actions, including any incentives that might be appropriate and useful.

The advisory committee shall report the results of the study, together with the recommendations for administrative and legislative actions, to the Governor and Legislature on or before June 30, 1980.

833. The department shall be the lead agency for purposes of the California Environmental Quality Act (commencing with Section 21000 of the Public Resources Code) for any project involving the issuance of a permit required pursuant to Chapter 5 (commencing with Section 6400) of Part 1 of Division 6 of the Fish and Game Code.

834. The director shall appoint an aquaculture advisory committee to assist the department in carrying out the provisions of this chapter. The advisory committee shall include, but not be

limited to, the director; a representative of the Department of Food and Agriculture; representatives of a public institution of higher education; the commercial fishing industry, the recreational fishing industry, the freshwater fish farming industry, and the marine and brackish water aquaculture industry; a representative of the Assembly, to be selected by the Speaker of the Assembly; and a representative of the Senate, to be selected by the Senate Committee on Rules. Before selecting industry members of the advisory committee, the director shall consult with, and consider qualified delegates nominated by, organizations representing the aquaculture industry.

The advisory committee shall, in addition to its duties under Section 832, hold regular meetings, exchange information concerning activities of any state agency or institution involved in aquacultural activity, comment on the design of the study required pursuant to Section 832, and periodically review the progress of the study.

SEC. 3. Section 30411 of the Public Resources Code is amended to read:

30411. (a) The Department of Fish and Game and the Fish and Game Commission are the principal state agencies responsible for the establishment and control of wildlife and fishery management programs and neither the commission nor any regional commission shall establish or impose any controls with respect thereto that duplicate or exceed regulatory controls established by such agencies pursuant to specific statutory requirements or authorization.

(b) The Department of Fish and Game, in consultation with the commission and the Department of Boating and Waterways, may study degraded wetlands and identify those which can most feasibly be restored in conjunction with development of a boating facility as provided in subdivision (a) of Section 30233. Any such study shall include consideration of all of the following:

(1) Whether the wetland is so severely degraded and its natural processes so substantially impaired that it is not capable of recovering and maintaining a high level of biological productivity without major restoration activities.

(2) Whether a substantial portion of the degraded wetland, but in no event less than 75 percent, can be restored and maintained as a highly productive wetland in conjunction with a boating facilities project.

(3) Whether restoration of the wetland's natural values, including its biological productivity and wildlife habitat features, can most feasibly be achieved and maintained in conjunction with a boating facility or whether there are other feasible ways to achieve such values.

(c) The Legislature finds and declares that salt water or brackish water aquaculture is a coastal-dependent use which should be encouraged to augment food supplies and to further the policies set

forth in Chapter 4 (commencing with Section 825) of Division 1. The Department of Fish and Game may identify coastal sites it deems appropriate for aquaculture facilities. If the department identifies such sites, it shall do so by October 1, 1980, and shall by the same date transmit information identifying such sites to the commission and the relevant local government agency. The commission, and where appropriate, local governments shall, consistent with the coastal planning requirements of this division, provide for as many coastal sites identified by the Department of Fish and Game for such uses as are consistent with the policies of Chapter 3 (commencing with Section 30200) of this division.

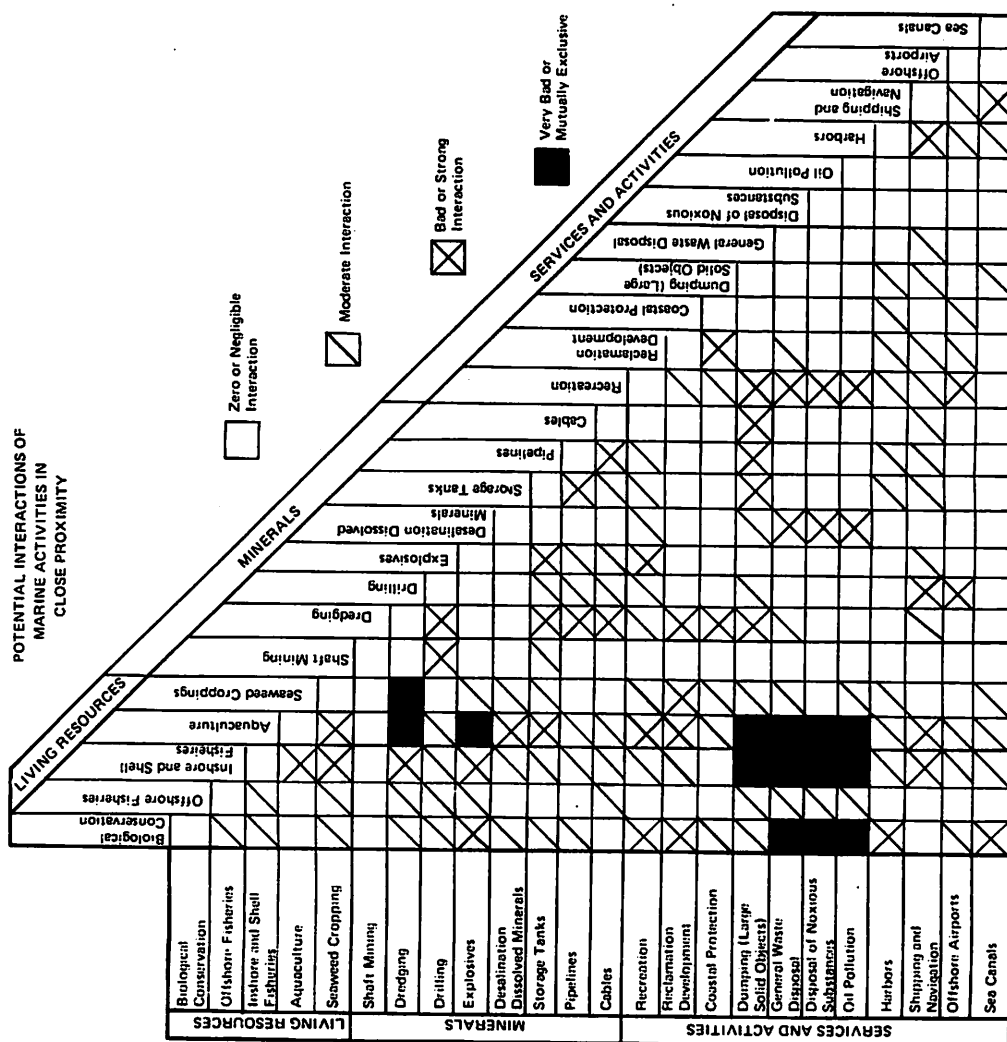
SEC. 4. The operative provisions of this act shall be implemented by the Department of Fish and Game and the Resources Agency as funds are available within the department or the agency, or may hereafter become available through legislative appropriation, for the purposes of this act.

SEC. 5. The unencumbered balance of the money appropriated in category (c) of Item 171 of the Budget Act of 1978 is hereby reappropriated to the Department of Fish and Game for expenditure for the purpose specified therein. Such money shall be available for encumbrance until June 30, 1980.

SEC. 6. This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting such necessity are:

In order that the aquaculture program contemplated by Item 171 of the Budget Act of 1978 for the 1978-79 fiscal year may be commenced during the 1978-79 fiscal year, it is necessary that this act go into immediate effect.

APPENDIX C



¹United Nations, Economic and Social Council, *Uses of the Sea: Report of the Secretary General E/5120* (New York: United Nations, 1972), p. 35.

Senate Bill No. 269

CHAPTER 793

Ch. 793

— 2 —

An act to amend Section 6576 of, and to add Sections 6577 and 6578 to, the Fish and Game Code, and to repeal Sections 2, 3, and 4 of Chapter 398 of the Statutes of 1973, relating to fish.

[Approved by Governor September 19, 1979. Filed with
Secretary of State September 19, 1979.]

LEGISLATIVE COUNSEL'S DIGEST

SB 269, Nimmo. Fish: domestic fish breeders.

Under existing law, the Fish and Game Commission may grant a permit, as specified, to release and capture domestically reared anadromous fish in state waters to the holder of a domestic fish breeder's license. The provisions relating to such permit and its issuance are effective until January 1, 1981, and on such date are repealed.

This bill would extend such provisions until January 1, 1986.

Existing law provides that permits issued under such provisions are experimental and apply to the waters of the Elk Creek and the Davenport Landing Creek only. It also requires that on July 1, 1979, the Department of Fish and Game report to the commission on any permit granted and on recommendations relating to such permits.

The bill would exclude the waters of Elk Creek from the program, and would require that the department from time to time require reports from a permittee regarding such permittee's operations and make its findings regarding such operations available to the commission.

The people of the State of California do enact as follows:

SECTION 1. Section 6576 of the Fish and Game Code is amended to read:

6576. The provisions of this article shall be applicable only to the waters of Davenport Landing Creek which is contained in the County of Santa Cruz and located near the town of Davenport Landing. Any activities conducted pursuant to this article are conducted as a pilot program for the release and capture of domestically reared anadromous fish.

SEC. 2. Section 6577 is added to the Fish and Game Code, to read: 6577. This article shall remain in effect only until January 1, 1986, and as of such date is repealed, unless a later enacted statute, which is chaptered before January 1, 1986, deletes or extends such date.

SEC. 3. Section 6578 is added to the Fish and Game Code, to read: 6578. The department shall from time to time require reports from a permittee operating pursuant to this act on such permittee's

operations, and the department shall then make findings regarding such operations available to the commission.

SEC. 4. Section 2 of Chapter 398 of the Statutes of 1973 is repealed.

SEC. 5. Section 3 of Chapter 398 of the Statutes of 1973 is repealed.

SEC. 6. Section 4 of Chapter 398 of the Statutes of 1973 is repealed.