

MARINE RESOURCES AND AQUACULTURE PROGRAMS IN THE STATE OF HAWAII

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FOREWORD

This report on Marine Resources and Aquaculture Programs in the State of Hawaii was prepared in response to Senate Resolution No. 186, adopted during the 1978 legislative session.

The report traces the role of the ocean and the practice of aquaculture in ancient Hawaii, and the surge of interest in marine and aquaculture affairs since the publication of Hawaii and the Sea in 1969; and sets forth the present status of the marine resources and aquaculture programs in Hawaii's state government.

The report was initiated, organized, and conducted by Lloyd K. Migita of the Office of the Legislative Reference Bureau until his departure from the Bureau. In mid-1982, Ann M. Ogata of the Bureau was assigned to update and complete the report.

We wish to express our sincere appreciation and gratitude to the following individuals for providing us with personal interviews and information required in the course of this study: Dr. John Craven, Chairman of the Marine Council, University of Hawaii; Dr. Noel P. Kefford, Dean of the College of Tropical Agriculture and Human Resources, University of Hawaii; Rose T. Pfund, Acting Associate Director of the Sea Grant College Program, University of Hawaii; Kent M. Keith, Deputy Director of the Department of Planning and Economic Development; Edgar A. Hamasu, Deputy Director of the Department of Land and Natural Resources; John S. Corbin, Manager of the Aquaculture Development Program, Department of Land and Natural Resources; Henry M. Sakuda, Director of the Division of Aquatic Resources, Department of Land and Natural Resources; Paul Y. Kawamoto, Chief of the Fisheries Branch, Department of Land and Natural Resources; Eugene S. Imai, Administrative Services Officer, Department of Agriculture; Wilbert Kubota, Food and Drug Inspector, Department of Health; Harry Murakami, Chief Engineer of the Harbors Division, and Staff, Department of Transportation; Artemio Delos Reyes, Section Head of Property Management of the Harbors Division, and Staff, Department of Transportation; David E. Parsons, State Boating Manager of the Harbors Division, Department of Transportation; Dennis E. Ruthrauff, Oahu District Manager of the Harbors Division, Department of Transportation; and Clarence Okamura, Assistant Chief for Administration of the Harbors Division, Department of Transportation.

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SUMMARY

This report, Marine Resources and Aquaculture Programs in the State of Hawaii, identifies and sets forth the marine and aquaculture programs of the State Departments of Agriculture; Land and Natural Resources; Planning and Economic Development; Health; Transportation; and the University of Hawaii. It touches as well upon the significance of the ocean in ancient Hawaii, and upon the early practice of aquaculture by the Hawaiians.

The report finds that substantial strides have been made in recent years by the State in defining and implementing its goals in these important areas of industry, and that no major reorganization of state programs is necessary at this time.

The report makes two recommendations to the Legislature to further the realization of the State's goals in these areas:

- (1) The statutory designation of the Department of Land and Natural Resources as the lead agency for aquaculture; and
- (2) The statutory creation of an Aquaculture Coordinating Advisory Council and an Ocean Resources Coordinating Advisory Council.

Chapter 1

INTRODUCTION TO MARINE RESOURCES AND AQUACULTURE IN HAWAII

Part I. Introduction

The following report is a study of the marine resources and aquaculture programs in Hawaii state government. This report was conducted pursuant to Senate Resolution No. 186-78, which requested the Office of the Legislative Reference Bureau to "conduct an in-depth study regarding the feasibility and practicality of combining all relevant and related state departments and agencies into a separate Department of Marine Resources and Aquaculture for the purpose of streamlining and making more efficient the administration of the development and growth of this important and necessary industry".¹

As used in this report:

- . "Aquaculture" means the enculturation of plant and animal life for food or fiber in natural ponds, lakes, oceans, or other bodies of water, or in artificial enclosures.
- . "Marine resources" include the ocean and shores and their physical and chemical manifestations and properties such as waves, tides, and temperature differentials. It also includes all substances and materials of value, living and nonliving, such as fishes, crustaceans, mollusks, plankton, mariculture products, seaweed and other sea plants, precious corals, sand, minerals including manganese nodules, and the like that may be cultured, harvested, collected, or otherwise utilized from the ocean and shores.

Part II. Background

A. Ancient Hawaii

The early Hawaiians, living on islands born from the sea, existed in perfect harmony with the ocean that surrounded them. In old Hawaii, most of the people lived along the coast and were in constant touch with the sea. They were excellent swimmers, navigators, and fishermen.

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The ancient Hawaiians divided their land so that parcels extended from the mountain to the outer edge of the reef. The ocean was relied upon as a highway, a playground and as the main source of food. The majority of the population's protein came from i'a or marine life, with only a small amount coming from the animals of the land. Fish was the favorite food of the early Hawaiians; they ate everything that was edible from the sea...

The Hawaiians' relationship with the sea and the i'a was also a spiritual one. They worshipped Ku'ulakai, the god of fishing, and erected fishing shrines or ko'a along the shore. In addition to Ku'ulakai, fishermen also had personal fishing gods called 'aumakua. The 'aumakua usually took the form of a specific plant or animal such as a shark or an eel. A fisherman would give prayer and tribute to his 'aumakua and offer his first fish to the god at the simple ko'a shrine.²

The ocean was a very significant part of the ancient Hawaiian lifestyle. It had value as a food, recreation, transport, and religious resource.

The Hawaiians loved and respected the ocean, and had a thorough knowledge of the waters and its living resources; and they were excellent managers of marine resources.

The early Hawaiians also practiced aquaculture. There were approximately 360 fishponds scattered throughout the island chain prior to Captain James Cook's 1778 arrival in Hawaii. The total annual fish production is estimated to have been over two million pounds.³ Young milkfish, mullet, and other estuarine species of fish were grown in enclosed areas of shallow water. This early system of aquaculture did not focus on high yields per pond; rather, the ponds were primarily used as holding facilities.⁴

This harmonious relationship with the ocean was disrupted with the arrival of new cultures to Hawaii. The kapu systems and spiritual beliefs broke down, and were replaced with government regulations.⁵

The changing lifestyle and land use patterns also affected the practice of aquaculture. Urban development, storm damage, and neglect contributed to the destruction and deterioration of the fishponds and the concomitant drastic decline of aquaculture.⁶ The practice of aquaculture, however, persisted at a low level until the 1960's.

B. Recent Developments

Marine Resources. Marine affairs have enjoyed increased interest in recent years. Interest in marine affairs was sparked by the publication of Hawaii and the Sea in 1969.⁷ This report was aimed at helping Hawaii better adapt to, benefit from, and coexist with the sea. The report identified the

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vast opportunities and problems in the marine field for Hawaii, and included twenty-two major recommendations for State action in marine affairs.

The Legislature acted on many of the recommendations, including the creation of the Office of the Marine Affairs Coordinator in 1970. The establishment of the Marine Affairs Coordinator gave Hawaii, for the first time, a statewide focus on marine affairs.

Hawaii and the Sea was updated in 1974, assessing new developments and progress, and identifying problems and opportunities.⁸ This was followed by the publication of other studies indicating the vast economic potential of marine resources and aquaculture.⁹ The marine resources and activities which are frequently mentioned as having development potential include mariculture, manganese nodule processing, commercial tuna fishing, and precious coral jewelry manufacturing.

The enactment of the federal Fishery Conservation and Management Act of 1976 added further impetus to marine activities in Hawaii. The Act, effective since March 1977, extends the United States' jurisdiction over offshore fisheries within two hundred miles of its coasts and possessions.¹⁰ It also establishes Regional Councils to work with the National Marine Fisheries Service of the Department of Commerce in managing fishery resources and setting out regulations. The Western Pacific Regional Fishery Management Council, of which Hawaii is a member, is preparing fishery management plans for the fishery resources within the two hundred mile boundaries of this area, concentrating on billfishes, precious corals, lobsters, and other fishery resources. Including the two hundred mile fisheries zone, Hawaii's land and water mass covers 600,000 square miles, from South Point to Kure Island.

The State Department of Land and Natural Resources published the Hawaii Fisheries Development Plan in 1979, which identifies the fisheries resources of the Hawaiian chain, examines the constraints which have restricted the growth of the industry, and presents a series of programs to remove existing constraints.¹¹

Aquaculture. State government became involved in aquaculture in 1959 when the Legislature appropriated funds for the construction and operation of the first aquaculture station in Hawaii known as the Keehi Bait Station. Its program at that time involved, among other things, research into the use of tilapia as bait for the tuna industry.¹² The bait station now known as Anuenue Fisheries Research Center was subsequently moved to its present site on Sand Island.

The introduction of Malaysian prawns to Hawaii in 1965 by the Anuenue Fisheries Research Center scientists signaled a new era for aquaculture in Hawaii. These scientists were able to develop mass larval rearing and other culturing techniques to produce large quantities of juvenile prawns. Under the Anuenue Fisheries Research Center program of providing free prawn juveniles and advisory services to farmers, Hawaii's prawn industry grew from its first commercial farm in 1970 (1.5 acres of ponds) to more than twenty in 1982 (271 acres of ponds).¹³ In addition to prawn, other

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aquaculture species including oysters, marine shrimp, milkfish, brine shrimp, and catfish are also being reared by aquaculturists commercially.

To sustain the growth of the burgeoning aquaculture industry, the 1976 Legislature appropriated \$150,000 to the Department of Planning and Economic Development for a statewide aquaculture planning program to develop a statewide plan for aquaculture, including economic studies and site surveys.¹⁴ In 1977, the Legislature appropriated the major portion of the Aquaculture Planning Program's costs, to sustain the Program's planning efforts and to qualify Hawaii for participation in federally assisted programs and projects in aquaculture.¹⁵ The resulting masterplan, Aquaculture Development for Hawaii: Assessments and Recommendations, was completed in late 1978.¹⁶

In January 1981, the Governor transferred the Aquaculture Development Program from the Department of Planning and Economic Development to the Department of Land and Natural Resources.

Chapter 2

PRESENT ORGANIZATION OF THE STATE MARINE RESOURCES AND AQUACULTURE PROGRAMS

PART I. LEGAL BASIS

The Constitution of the State of Hawaii provides the basic legal foundation for state government. It outlines the principles and functions of government and provides a broad framework for the organization of state government.

Several constitutional provisions guide the development and organization of marine resources and aquaculture programs of the state government.

A. Constitutional Provisions

Article XI of the Constitution generally provides for the conservation, development, management, and use of the State's natural resources.

Article XI, Section 1, provides that the State and its political subdivisions shall:¹

...conserve and protect Hawaii's natural beauty and all natural resources, including land, water, air, minerals and energy sources, and shall promote the development and utilization of these resources in a manner consistent with their conservation and in furtherance of the self-sufficiency of the State.

Article XI, Section 2, generally provides for the management of these resources as follows:²

The legislature shall vest in one or more executive boards or commissions powers for the management of natural resources owned or controlled by the State, and such powers of disposition thereof as may be provided by law; but land set aside for public use, other than for a reserve for conservation purposes, need not be placed under the jurisdiction of such a board or commission.

The mandatory provisions of this section shall not apply to the natural resources owned by or under the control of a political subdivision or a department or agency thereof.

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Article XI, Section 6, relating to marine resources, provides that:³

The State shall have the power to manage and control the marine, seabed and other resources located within the boundaries of the State, including the archipelagic waters of the State, and reserves to itself all such rights outside state boundaries not specifically limited by federal or international law.

All fisheries in the sea waters of the State not included in any fish pond, artificial enclosure or state-licensed mariculture operation shall be free to the public, subject to vested rights and the right of the State to regulate the same; provided that mariculture operations shall be established under guidelines enacted by the legislature, which shall protect the public's use and enjoyment of the reefs. The State may condemn such vested rights for public use.

The constitutional framework for the organization of the executive branch of state government is provided in Article V relating to the Executive. Article V, Section 6, states in part that:⁴

All executive and administrative offices, departments and instrumentalities of the state government and their respective powers and duties shall be allocated by law among and within not more than twenty principal departments in such a manner as to group the same according to common purposes and related functions. Temporary commissions or agencies for special purposes may be established by law and need not be allocated within a principal department.

Prior to the 1978 constitutional amendment, the foregoing provision relating to the grouping of departments and duties according to common purposes and related functions required grouping of the same "according to major purposes so far as practicable".⁵

This 1978 constitutional amendment appears to require a reassessment and possible realignment of the executive branch. The purpose and intent of this amendment was noted in the committee report accompanying the proposed amendment.⁶ Concern was expressed that the previous language of the Constitution allowed the assignment of some offices and agencies to principal departments without sufficient consideration of commonality of purpose or function. The report also noted that the committee agreed with the Commission on Organization of Government that a realignment of the executive branch should be considered to address the problem of duplication of functions and purposes between departments. It further noted that the intent in requiring groupings according to common purposes and related functions was to indicate that function, along with purpose, should form a

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basis for departmental organization, and that the two prerequisites should be considered together.

B. Summary

The legal bases for the conservation, development, and management of the State's natural resources, including marine and aquaculture resources, are provided by the Constitution of the State of Hawaii. The Constitution also provides a general framework for the organization of state government. The formulation of details regarding management and organization has been left to the Legislature. Over the years, the Legislature has enacted laws establishing executive departments and other related agencies. It has also delegated the responsibility and power of management of the State's natural resources to these departments and agencies.

PART II. STATE AGENCIES INVOLVED IN THE DEVELOPMENT, PROTECTION, OR USE OF MARINE RESOURCES AND AQUACULTURE

A. Organization of the Executive Branch of the State of Hawaii

There are seventeen executive departments in the State of Hawaii. Each major department is under the supervision of the Governor and, except as provided by the Constitution or by law, is headed by a single executive. Six of these seventeen departments perform identifiable marine resources or aquaculture-related activities. These departments include the Department of Agriculture, the Department of Land and Natural Resources, the Department of Planning and Economic Development, the Department of Health, the Department of Transportation, and the University of Hawaii.

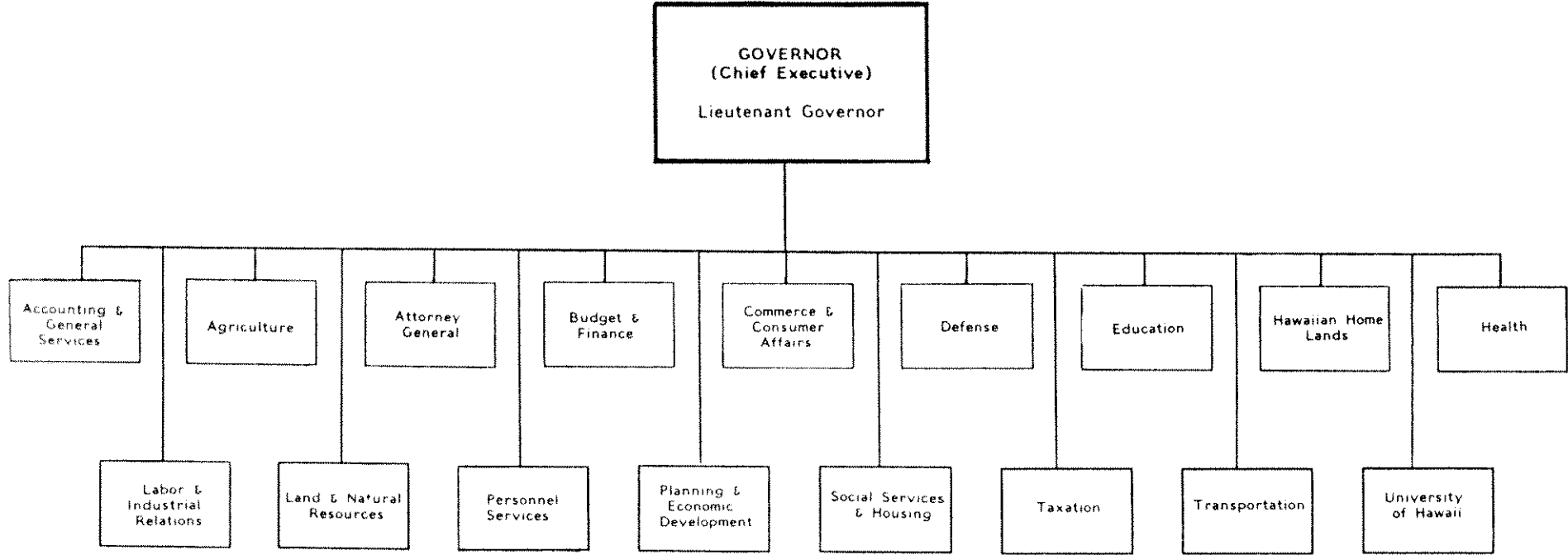
B. Department of Agriculture

The Department of Agriculture is headed by the Board of Agriculture, an executive board which frames the broad operating policies of the Department.

The general duties of the Department of Agriculture are set out in the Hawaii Revised Statutes:⁷

The department shall promote the conservation, development, and utilization of agricultural resources in the State; assist the farmers of the State and any others engaged in agriculture by research projects, dissemination

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of information, crop and livestock reporting service, market news service, and any other means of improving the well-being of those engaged in agriculture and increasing the productivity of the lands, and administer the programs of the State relating to animal husbandry, entomology, farm credit, development of agricultural products, and the establishment and enforcement of the rules on the grading and labeling of agricultural products.

The Department of Agriculture is organized into a Planning and Development Office and an Administrative Services Office and six divisions which carry out the responsibilities of the Department. Technical advisory committees administratively attached to the Department of Agriculture provide the expertise necessary for informed decision-making.⁸

Marine Functions and Activities

The Department of Agriculture regulates the importation of marine species under its statutory authority to regulate the importation of any:⁹

...plant-growth or plant-product, unprocessed or in the raw stage; soil, live bird, reptile, bacteria, fungus, nematode, virus, insect or other animal in any stage of development...

The Department has also contracted with the United States Department of Commerce to conduct sanitation inspections at fishcake processing sites.¹⁰

Aquaculture Functions and Activities

Aquaculture Loan Program. The Aquaculture Loan Program was established by Act 181, Regular Session of 1971, to financially assist in the development of aquaculture in Hawaii, and is administered by the Board of Agriculture.¹¹ Act 88, enacted by the 1978 Legislature, amended certain portions of the statutes relating to this Program:¹²

- (1) It established a state liability ceiling of \$1,000,000 in insuring loans or participating in loans made by private lenders to qualified aquaculturists.
- (2) It required the Department of Agriculture to maintain a proper reserve in the Aquaculture Loan Revolving Fund to guarantee payment of such loans.

The Program assists aquaculturists in securing credit from private lenders, in participation with lenders, or on a direct basis.¹³

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Aquaculture Disease Prevention Service. In accordance with the Aquaculture Disease Prevention Service established by the Department of Land and Natural Resources' Aquaculture Development Program, an aquaculture disease specialist: (1) provides disease prevention services for aquatic animals in Hawaii and catalogues diseases which may affect them, and (2) inspects live shipments of imported aquaculture species and follows up with visits to aquaculture farms, through the Department of Agriculture's Plant Quarantine Branch. The facilities of the Department of Agriculture's Veterinary Laboratory are utilized for this purpose.

This service is considered crucial to the development of Hawaii as a major aquatic seed production center, exporting "clean" stocks to domestic and foreign markets.¹⁴

Other functions and activities of the Department of Agriculture which, while not directly focusing on aquaculture, have some relationship to aquacultural products, include:

- (1) Administration of the certification program for food products on a fee-for-service basis.¹⁵ (Animal Industry Division and Marketing and Consumer Services Division)
- (2) Administration of permits for importation of animals, including freshwater and marine species.¹⁶ (Animal Industry Division and Plant Industry Division)
- (3) Control of all matters relating to inspection of animals and prevention and eradication of diseases.¹⁷ (Animal Industry Division and Plant Industry Division)
- (4) Quarantine and inspection of any plant, animal, sand, soil, earth; prohibition on importation of certain substances and articles.¹⁸ (Plant Industry Division and Animal Industry Division)
- (5) Administration of programs providing for the inspection and grading of processed foods,¹⁹ the enforcement of labeling requirements,²⁰ and the promotion of fair trade and honesty in the marketing of agricultural products.²¹ (Marketing and Consumer Services Division)
- (6) Administration of all agricultural pest eradication programs. Control of the sale and use of pesticides to minimize adverse effects on people and the environment.²² (Plant Industry Division)
- (7) Agricultural product promotion and market development and state agricultural fairs. (Transferred in 1982 from the Department of Planning and Economic Development to the Department of Agriculture's Marketing and Consumer Services Division.)²³

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C. Department of Land and Natural Resources

The Department of Land and Natural Resources is headed by the Board of Land and Natural Resources, an executive board which frames the broad operating policies of the Department.

The major duties, powers, and authority of the Department are set out in the Hawaii Revised Statutes:²⁴

The department shall manage and administer the public lands of the State and the water resources and minerals thereon, including the soil conservation function; shall manage and administer the forest, fish, and game resources of the State; and manage the forest reserve and state parks, including historical sites.

The Department of Land and Natural Resources is organized into seven divisions which carry out the responsibilities of the Department.

In addition, the following technical advisory or development bodies are administratively attached to the Department:

- (1) The **Animal Species Advisory Commission** advises the Board of Land and Natural Resources on all matters affecting fishing or hunting, aquatic life, and wildlife conservation, including its proposals for the deliberate introduction of any animal species into the State.²⁵ The chairperson of each of the county Aquatic Life and Wildlife Advisory Committees, and the chiefs of the Divisions of Forestry and Wildlife; Aquatic Resources; and Conservation and Resources Enforcement are among the members of the Commission.²⁶
- (2) Each county has an **Aquatic Life and Wildlife Advisory Committee**, which considers all matters that may affect fishing, hunting, or aquatic life and wildlife conservation including the enforcement of proposed rules within its county.²⁷ The Committees act as advisory bodies to the Divisions of Forestry and Wildlife; Aquatic Resources; and Conservation and Resources Enforcement.²⁸
- (3) The **Natural Area Reserves System Commission** conducts studies of areas for possible inclusion within the Hawaii Natural Area Reserves System; recommends criteria to be used in determining whether an area is suitable for inclusion within the Reserves System; recommends to the Governor and the Department of Land and Natural Resources areas suitable for inclusion within the Reserves System; recommends policies regarding required controls and permitted uses of areas which are part of the Reserves System; advises the Governor and the Department of Land and Natural Resources on any matter relating to the preservation of Hawaii's unique natural

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resources; and develops ways and means of extending and strengthening presently established preserves, sanctuaries, and refuges within the State.²⁹

- (4) The **Hawaii Fisheries Coordinating Council** advises the Board of Land and Natural Resources on matters relating to fisheries and the coordination of fisheries development plans and policies; on activities among the various federal, state, and county agencies and private industry, including promoting communication between the fishing industry and government; and on coordinating fisheries activities as they relate to commercial enterprises and public, private, and governmental organizations of the State.³⁰
- (5) The **Pacific Tuna Development Foundation** engages in cooperative activities to develop the latent skipjack tuna resource and other fisheries resources in the Central, Western, and Southern Pacific.³¹ Formerly attached to the Economic Development Division of the Department of Planning and Economic Development, the Foundation was transferred to the Department of Land and Natural Resources in 1980 when the Chairperson of the Board of Land and Natural Resources was appointed as the Chairperson/Director of the Foundation.

Marine and Aquaculture Functions and Activities

The major marine and aquaculture programs of the Department of Land and Natural Resources are located in the Division of Aquatic Resources. This Division administers the State's programs in commercial fishery and aquaculture, aquatic resources and habitat protection, and aquatic recreation; and is concerned with the research, development, and management of the State's fisheries resources.³²

Commercial Fishery and Aquaculture Program. The commercial fishery and aquaculture program is designed to broaden the State's economic base by promoting the growth, quality, and diversification of Hawaii's commercial fishery and aquaculture industries.³³

Specific marine functions and activities include:

- (1) Implementation of the Hawaii Fisheries Development Plan through a Fisheries Development Project, which includes planning specific and detailed development projects and integration of these projects into an overall coordinated fisheries development program; coordination of fisheries infrastructure projects, including liaison with government and industry; implementation of commercial feasibility surveys; liaison with other governmental agencies involved with fisheries development and financial assistance programs and contract and coordination with industry; and staff work for the Hawaii Fisheries Coordinating Council.³⁴

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- (2) Participation in the Midway Albacore Fishery project to assess the potential of this fishery as liaison between the U.S. Navy and the domestic albacore fleet fishing in North Pacific waters in the vicinity of Midway Islands.³⁵
- (3) Funding support of a Mullet/Milkfish Baitfish Development Project at the Oceanic Institute to find a suitable baitfish for the Hawaiian aku fleet.³⁶
- (4) Operation of the Statewide Fish Aggregating System of twenty-six fish buoys to improve high seas commercial and recreational fishery opportunities.³⁷
- (5) Initiation of commercial surveys to determine the availability of bottomfish resources and deep swimming tunas.³⁸
- (6) Initiation of a program, in conjunction with the Pacific Tuna Development Foundation, to develop the deep-sea shrimp resources of the Hawaiian Chain.³⁹
- (7) Participation in numerous other research and development programs in conjunction with the Pacific Tuna Development Foundation.⁴⁰
- (8) Compilation of commercial fish catch statistics by all licensed commercial fishers to gather information about commercially important species of fish and shellfish to aid the determination of the best way to manage and protect the various species.⁴¹
- (9) Participation in the Coastal Zone Management Fisheries Management Study, in conjunction with the Department of Planning and Economic Development, to develop a framework to facilitate the formulation of fisheries management recommendations consistent with protection of the State's coastal ecosystem.⁴²
- (10) Participation in the Western Pacific Regional Fisheries Management Council.⁴³

The Division of Aquatic Resources' aquaculture functions and activities are located at the Anuenue Fisheries Research Center on Sand Island, Oahu. The Center is world famous for its research and development activities relating to the giant freshwater Malaysian prawn, Macrobrachium rosenbergii. Since the prawn's 1965 introduction to Hawaii, the industry has grown to twenty commercial farms comprising two hundred seventy-one acres of ponds.⁴⁴ The Center also does research on other marine and freshwater animals.

The specific functions and activities of the Anuenue Fisheries Research Center include:

- (1) Continued laboratory and field extension work on the development of the Malaysian prawn as a commercial industry.

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- (2) Cooperative studies with the University of Hawaii to develop a more desirable genetic strain of prawn for culture, and to increase understanding of ecological processes within commercial prawn ponds.⁴⁵
- (3) Extension services to prospective prawn farmers including chemical analysis of soil and water; site topography studies; provision of plans (blueprints and sketches) for the design and construction of a farm system; inspection of the completed construction; recommendations for ground cover (grass and plants); and initiation of plankton bloom in ponds and instruction of methods to control plankton bloom.
- (4) Provision of free juvenile prawns to new farmers. The Board of Land and Natural Resources in 1982 adopted a policy, subject to revision, which will phase out larval prawn production for distribution by December 31, 1985, as this function is assumed by private hatcheries.⁴⁶
- (5) Demonstrations and instructions on various aspects of pond stocking and management techniques.
- (6) Instruction on prawn marketing techniques, such as methods to blanch and ice prawns, and the transport of live prawns.
- (7) Provision of other services needed, such as stopping mortalities and increasing productivity to expected levels.
- (8) Assistance to small prawn farmers in establishing a cooperative.
- (9) Dissemination of aquaculture-related information through letters, telegrams, reports, and various other means.
- (10) Participation in an aquaculture technical training program, in conjunction with Sea Grant, the University of Hawaii, the Oceanic Institute, and various other government and private organizations.
- (11) Research and development of various aspects of other marine and freshwater species such as brine shrimp, oysters, channel catfish, and white amur (grass carp).
- (12) Stocking of Nuuanu Reservoir on Oahu with catfish fingerlings (includes gathering of eggs and rearing to fingerling size); Kokee park on Kauai with rainbow trout fingerlings.
- (13) Hatching of freshwater game eggs (including rainbow trout).⁴⁷
- (14) Aquaculture disease prevention service, in conjunction with the Department of Agriculture.
- (15) Development of a working library for aquaculture research.⁴⁸

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Aquaculture Development Program. The Aquaculture Development Program was established in 1977 to encourage and assist the development of Hawaii's aquaculture industry. Initially assigned to the Department of Planning and Economic Development, the Program was transferred by the Governor to the Department of Land and Natural Resources in January 1981 to further consolidate state aquaculture activities.⁴⁹

The Program's responsibilities include maintaining cognizance of actions taken by federal, state, county, and private agencies; promoting and supporting public and private sector aquaculture activities; serving as an information clearinghouse for international, national, and local inquiries; assisting commercial developments with conceptual planning, start-up and operating problems; seeking non-state funds for aquaculture development activities in Hawaii; and undertaking such activities as may be required in developing an aquaculture industry.⁵⁰

Program activities of the Aquaculture Development Program focus on three major areas: (1) statewide planning and coordination; (2) provision of support services, including information collection and dissemination, species and site counseling, seafood marketing and economics, permit assistance, and disease diagnosis and prevention assistance; and (3) funding and co-funding research, development, and demonstration projects to increase the profitability of existing aquafarms and develop new species and systems.⁵¹

1. Planning and Coordination

The Program has provided input into various national, state, and county planning efforts, including the National Aquaculture Plan, the National Sea Grant Aquaculture Plan, the United States Department of Agriculture Aquaculture Plan, the state functional plans, aquaculture research facilities plans (the Tropical Aquaculture Center, the Natural Energy Laboratory of Hawaii's Seacoast Test Facility, and the Maui County Baitfish Facility), county aquaculture plans for Maui and Kauai, University and secondary-education curriculum planning, and various land use plans throughout the State. Moreover, the program assists in interpreting the objectives and policies of the state aquaculture plan to other state and county agencies and the private sector.⁵²

2. Support Services

The Program's support services include a variety of expertise which are aimed at assisting developers in defining start-up risks and costs, evaluating Hawaii as a site for their operations, and succeeding at being profitable. The production of publications, lectures, exhibits, and "one-on-one" counseling are major activities.⁵³

A major study published by the Program, Aquaculture Development for Hawaii: Assessments and Recommendations, (1) assesses sites, technical resources, and economic benefits of aquaculture to the State, (2) identifies the necessary steps to develop an aquaculture industry in Hawaii, and (3) recommends state actions required to achieve the optimum level of expansion.⁵⁴

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Another publication of special importance to aquaculturists is the 1977 report entitled Permits and Environmental Requirements for Aquaculture in Hawaii (revised in 1980). This publication presents all governmental requirements necessary for the establishment of an aquaculture venture in Hawaii, and serves to "inform policy and decision makers of the complexities inherent in the permit approval process."⁵⁵

The Program has also recently published other significant reports on such subjects as ocean leasing for Hawaii and Hawaiian prawn production economics.⁵⁶ In addition, an occasional information bulletin, "Aquaculture in Hawaii", is published by the Program three to four times a year and is distributed worldwide.

The Program's staff also provides permit assistance and counseling to prospective commercial operators concerning federal, state, and county permit procedures and environmental regulations.⁵⁷ In concert with this activity, the staff advises prospective aquaculturists on species feasibility and location of sites on Oahu and the Neighbor Islands. In addition, the staff continues to assist the Hawaii Prawn Producers Association in various industry development and promotion activities.⁵⁸

The Program's Disease Diagnosis and Prevention Program serves Hawaii's aquaculture community by conducting trips into the field to discuss methods of disease prevention and by collecting data for laboratory analyses. The aquaculture veterinarian works closely with officials of the state Department of Agriculture to monitor importations of aquatic species and serves on the Shellfish Pathogen Committee, a subcommittee of the Pacific Marine Fisheries Commission.⁵⁹

The Aquaculture Advisory Council and Liaison Committee, created on July 1, 1977, advised the Director of Planning and Economic Development on aquaculture-related issues. Various members of the aquaculture community including representatives of the State Legislature and executive departments, county governments, the University of Hawaii, and the private sector are represented on the Advisory Council and Liaison Committee. The Council was transferred to the Department of Land and Natural Resources in conjunction with the transfer of the Aquaculture Development Program; however, the Council has not been formally established in the Department.⁶⁰

3. Research and Development

The Program provides direct funding and matching support for research, development, and demonstration projects which improve yield and reduce production costs for existing industries and which develop new, economically important species and systems. The Program also actively seeks non-state sources of support to share the cost of projects.

According to the Department of Land and Natural Resources annual report:⁶¹

In 1981, research focused on improving production management and processing/handling techniques for Hawaiian prawns. Projects jointly funded by the University of

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Hawaii Sea Grant College Program assisted the industry in the areas of pond management, nutrition and feed management, disease prevention, controlled domestication, product handling, system development, and processing. Other projects which are jointly supported by the Aquaculture Development Program and Sea Grant include a program to develop techniques for the backyard aquaculture of freshwater animals and conducting a toxicological survey of shrimp and prawn production facilities. In addition, the State continued its support for a market development program for Hawaiian prawns.

Aquatic Resources Protection Program. The objectives of the Aquatic Resources Protection Program are to preserve and enhance endangered and other resident fish and aquatic life and their habitats through active protection, propagation, and other management measures including monitoring the resources, establishing sanctuaries, and evaluating proposed projects that may affect the resources or their habitats.⁶²

Specific marine activities include:

- (1) Administration of Marine Life Conservation Areas (all marine waters of the State).
- (2) Designation, operation, and management of Marine Life Conservation Districts in the marine waters of the State. Designated conservation districts include Hanauma Bay (Oahu), Lapakahi (Hawaii), Kealahou Bay (Hawaii), Honolulu-Mokuleia (Maui), Manele-Hulopoe Bay (Lanai), and Molokini Shoal (Maui) Marine Life Conservation Districts.
- (3) Evaluations of environmental impacts of various proposed construction projects and activities on fish and aquatic life habitats.
- (4) Monitoring activities of aquarium fish collectors who use fine-mesh nets under a permit system.⁶³
- (5) Investigations of fish-kill incidents in cooperation with the Department of Health or other pollution incidents.
- (6) Determination of rules regarding open and closed fishing seasons, size limits, bag limits, specifications of fishing gear which may be used or possessed in fishing areas, and conditions for entry into fishing areas.
- (7) Participation on the Federal Hawaiian monk seal recovery team, which is preparing a recovery plan for this endangered species.⁶⁴

Aquatic Recreation Program. The activities of the Aquatic Recreation Program are aimed toward enriching the leisure time and recreational opportunities available to the public.⁶⁵

Specific marine activities of this program include:

- (1) Assessment of the marine resources of the Northwestern Hawaiian Islands, in conjunction with the federal Departments of Commerce and the Interior, to formulate a resource management plan which would protect the area as well as allow for rational use of the fishery resources for commercial and recreational purposes.⁶⁶
- (2) Building and maintenance of artificial fish shelters (reefs) to increase the fish carrying capacity of inshore waters and to concentrate fish. This will increase the availability of fish for recreational fishing.
- (3) Designation, operation, and management of special management areas known as kapuku (to restore life). The Waikiki-Diamond Head Shoreline Fisheries Management Area, between Kapahulu Groin and Diamond Head Lighthouse, Oahu, is opened and closed at specified intervals of time. This system is aimed at revitalizing the fishing potential of the area.
- (4) Development, maintenance, and administration of freshwater public fishing areas.
- (5) Propagation and stocking of channel catfish in public fishing areas.⁶⁷

Other Functions and Activities

The Division of Water and Land Development directs and coordinates state programs in water and mineral resources management, the planning and development of water projects, irrigation systems operation, flood protection, and geothermal exploration. It also provides administrative support to the fifteen Soil and Water Conservation Districts of the State.⁶⁸

The Division of Land Management is responsible for the economical and productive management of public lands.⁶⁹ It performs its duties by: assuring the availability of public lands for public or private use in accordance with established plans and policies; negotiating for the acquisition or disposition of public lands; supervising performance and payments under terms of lease and rental agreements; maintaining an inventory of all public lands; reviewing land acquisition documents; and maintaining a central depository of state land acquisition-disposition documents.

The Board of Land and Natural Resources manages, administers, and exercises control over public lands, water resources, and all mineral and other interests therein.⁷⁰ The Board is also empowered to dispose of public lands as provided by law.⁷¹

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In 1978, the State Legislature enacted Act 191,⁷² which includes aquaculture and mariculture among the activities over which the Board of Land and Natural Resources may:

- (1) Modify or eliminate restrictions imposed by the public land lease restriction law;
- (2) Extend or modify the fixed rental period of the lease; or
- (3) Extend the term of the lease to the extent necessary to qualify the lease for mortgage lending or guaranty purposes with federal mortgage lending agencies qualified to do business in the State, private loans guaranteed by the State, or any loan in which the State and any private lender participates; provided the private lender shall be qualified to do business in the State.

The Legislature found that this Act would contribute to the development of new aquaculture and mariculture industries, which would in turn increase business activity, employment, and state revenues.⁷³

D. Department of Planning and Economic Development

The Department of Planning and Economic Development is headed by a single executive, the Director of Planning and Economic Development.⁷⁴

The Hawaii Revised Statutes describes the general objectives, functions, and duties of the Department of Planning and Economic Development:⁷⁵

It shall be the objective of the department of planning and economic development to make broad policy determinations with respect to economic development in the State and to stimulate through research and demonstration projects those industrial and economic development efforts which offer the most immediate promise of expanding the economy of the State. The department shall endeavor to gain an understanding of those functions and activities of other governmental agencies and of private agencies which relate to the field of economic development. It shall, at all times, encourage initiative and creative thinking in harmony with the objectives of the department.

The Department of Planning and Economic Development consists of seven divisions: the Research and Economic Analysis Division, Planning Division, Land Use Division, Economic Development Division, Energy Division, Foreign-Trade Zone Division, and the Hawaii International Services Agency. There are four staff offices: the Administrative Services Office, Hawaii Film Office, Information Office, and Office of Tourism. The Department has proposed that

an Office of Ocean Resources be established to assume the functions of the former Office of the Marine Affairs Coordinator.

Five agencies are assigned to the Department for administrative purposes: the Aloha Tower Development Corporation, Hawaii Community Development Authority, Land Use Commission, Natural Energy Laboratory of Hawaii, and the State Commission on Population and the Hawaiian Future.

Marine Functions and Activities

Financial Assistance Programs. The Economic Development Division administers two loan programs, the Large Fishing Vessel Loan Program⁷⁶ and the Small Fishing Vessel Loan Program,⁷⁷ which support Hawaii's commercial fishing industry. These programs provide loans for the purchase, construction, renovation, maintenance, and repair of large and small fishing vessels.

Natural Energy Laboratory. The Natural Energy Laboratory of Hawaii, a body corporate and a public instrumentality of the State of Hawaii, was placed within the Department of Planning and Economic Development for administrative purposes by the State Legislature in 1979.⁷⁸ This outdoor research facility at Ke-ahole Point on the Big Island engages in research, development, and demonstration of natural energy resources and other compatible scientific and technological investigations.⁷⁹ Significant progress in ocean thermal energy conversion research and development has been achieved at the Laboratory,⁸⁰ including cold water aquaculture research.⁸¹

Manganese Nodule Project. The Office of the Director of Planning and Economic Development administers the State's Manganese Nodule Project. In cooperation with the University of Hawaii and the County of Hawaii, the Project has focused on assessing the potential of the mining and processing of deep ocean manganese nodules as a major new industry for Hawaii. The Department has published two major reports on the feasibility and potential impact of such an industry to Hawaii,⁸² as well as a comprehensive bibliography and index to literature on manganese nodules.⁸³ The Project also has been monitoring international, national, and local developments and has been in continuous contact with several international consortia which have expressed interest in establishing manganese nodule processing plants in Hawaii.

Office of the Marine Affairs Coordinator. The Office of the Marine Affairs Coordinator was established in the Office of the Governor by the 1970 State Legislature to coordinate marine activities and to bring about the most effective and efficient use of resources in developing the marine environment.⁸⁴

Ten years later, the 1980 State Legislature assigned the Office of the Marine Affairs Coordinator to the Department of Planning and Economic Development for administrative purposes.⁸⁵ During 1981, the Marine Affairs Coordinator and the Department of Planning and Economic Development merged their programs in support of marine research and development.⁸⁶ Projects and programs under the merger include marine education and training, marine

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resource inventory, facilities support and development, new public uses of the sea, and institutional development.⁸⁷ The first draft of an updated Hawaii and the Sea was completed in late 1981.⁸⁸

Act 281 of the 1982 State Legislature repealed the law creating the Office and position of the Marine Affairs Coordinator, and enacted new provisions transferring the majority of the powers and duties of the Marine Affairs Coordinator to the Department of Planning and Economic Development.⁸⁹ The Conference Committee Report on the bill which became Act 281 stated that the Committee found that "if Hawaii is to capitalize on the immediate and long-term opportunities to develop and utilize marine resources, the total efforts of the State's planning, research, development, and promotion of the marine environment need to be effectively addressed."⁹⁰

The former functions of the Marine Affairs Coordinator are presently located in the Ocean Resources Program of the Department of Planning and Economic Development.

Other Functions and Activities

The Planning Division conducts statewide planning activities and assists in developing state policies and strategies to meet current planning issues and problems related to social, economic, and environmental concerns. The Division has been engaged in the development of the Hawaii State Plan and is carrying out the Hawaii Coastal Zone Management Program.

Planning for the establishment of the Hawaii Coastal Zone Management Program began in 1973.⁹¹ This Program is intended to meet state and national goals for the beneficial use, protection, and development of Hawaii's coastal resources.⁹² The scope of the Program extends seaward to the limits of the State's jurisdiction.

The objectives and policies of the program relate to the provision and protection of recreational opportunities, the protection and restoration of historic resources, improvement of scenic and open space areas, the protection of coastal ecosystems, the provision for coastal-dependent economic uses, the reduction of coastal hazards, and improvements in the review process involving development activities, including permit coordination and opportunities for public participation.⁹³ The Hawaii Coastal Zone Management Program was approved by the Office of Coastal Zone Management, U.S. Department of Commerce, in September 1978.

The Land Use Commission, established in 1961, is charged with the responsibility of classifying all public and private lands into one of four districts: urban, agricultural, rural, or conservation.⁹⁴ The Commission is attached to the Department of Planning and Economic Development for administrative purposes.⁹⁵

The Economic Development Division's Industry and Product Promotion Program engages in the market development and sales promotion of local products and goods. The Division promotes state manufactured products locally and as exports, engages in business research and development, and

attracts new industries while promoting the expansion of existing local industries.⁹⁶

E. Department of Health

The Department of Health is headed by a single executive, the Director of Health. The Director is advised by the Board of Health on all matters within the jurisdiction of the Department.⁹⁷

The Department of Health is generally responsible for the planning, execution, and coordination of programs for the protection and improvement of the physical and mental well-being of the people of the State. It enforces the State's public health laws and administers various programs to improve the delivery of health services.

The Hawaii Revised Statutes sets forth the general powers of the Department:⁹⁸

The department of health shall have general charge, oversight, and care of the health and lives of the people of the State. It shall have authority in matters of quarantine and other health matters and may declare and enforce quarantine when none exists and modify or release quarantine when it is established. All county health authorities, sheriffs and police officers, and all other officers and employees of the State, and every county thereof, shall enforce the rules and regulations of the department. All such powers in health matters as have been or may be conferred upon any county shall be concurrent with those of the department.

Marine Resources and Aquaculture Activities

Food and Drug Branch. The Food and Drug Branch of the Environmental Protection and Health Services Division generally establishes rules relating to the display, sale, storage, and transport of food and drugs to prevent adulteration and mislabeling; and handles food complaints and inquiries.

The Branch is also responsible for the development and administration of the State Shellfish Sanitation Program, under which rules controlling the production, harvesting, processing, packaging, storage, and distribution of shellfish (oysters, clams, and mussels) grown in natural or artificial environments have been adopted in conformity with the National Shellfish Sanitation Program of the United States Food and Drug Administration.⁹⁹

More specifically, the Branch:¹⁰⁰

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- (1) Conducts inspections and investigations of wholesale and retail seafood outlets to determine adulteration or misbranding of products.
- (2) Conducts field inspections of aquaculture facilities which process products prior to sale, including blanching, heading, gutting, and packing.
- (3) Conducts field inspections of aquaculture facilities which produce aquacultural products which may be consumed raw, such as peneid shrimp.
- (4) Reviews aquaculture development programs for potential health problems, such as the use of waste products in aquaculture ponds, and the potential of fecal contamination.
- (5) Coordinates with other branches and programs in the Department of Health, including the Sanitation Branch; Drinking Water Program; Environmental Permits Branch; and Pollution, Investigation, and Enforcement Branch.
- (6) Answers public inquiries regarding seafood and health.
- (7) Conducts sample collections and investigations of shellfish growing areas and facilities, including oysters, clams, water (for bacterial levels), and heavy metals and pesticides (for paralytic shellfish poisoning).
- (8) Conducts inspection of imported shellfish for bacterial levels and determines whether the shellfish are obtained from certified sources (in coordination with the Plant Quarantine Branch of the Department of Agriculture).
- (9) Conducts field inspections of natural growing areas for shellfish, and the potential of poaching or selling of shellfish from the areas. Coordinates inspections with the Aquatic Resources Division of the Department of Land and Natural Resources; and the Pollution, Investigation, and Enforcement Branch of the Department of Health.

Sanitation Branch. The Sanitation Branch of the Environmental Protection and Health Services Division inspects aquaculture facilities, including buildings and sanitary facilities. The Branch also reviews plans for the construction of aquaculture facilities.¹⁰¹

Office of Environmental Quality Control. The Office of Environmental Quality Control was established in 1970 to foster efforts to maintain the optimum quality of the environment of the State.¹⁰² The Director of the Office of Environmental Quality Control serves as an advisor to the Governor on all matters relating to environmental quality control, and to government agencies and private industry. The Director formulates policies relating to environmental protection, enhancement, and education in order to promote a clean environment and prevent its abuse. The Office also reviews and

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comments on State Environmental Impact Statements and participates in the federal and county process. An Environmental Council, with up to fifteen members representing various public and private entities and groups, serves as liaison between the Director and the general public.¹⁰³

The 1980 State Legislature authorized the transfer of the Office of Environmental Quality Control from the Governor's Office to the Department of Health for administrative purposes.¹⁰⁴

F. Department of Transportation

The Department of Transportation is headed by a Director of Transportation appointed by the Governor. The Director is advised on all matters within the jurisdiction of the Department by a nine-member Commission on Transportation.¹⁰⁵ The Hawaii Revised Statutes describes the functions of the Department:¹⁰⁶

The department shall establish, maintain, and operate transportation facilities of the State, including highways, airports, harbors, and such other transportation facilities and activities as may be authorized by law.

The Department operates its programs through the three divisions of Airports, Harbors, and Highways.

Marine and Aquaculture Activities

Marine and aquaculture activities may be subject to the regulatory activity of the Harbors Division, since all "ocean shores below mean highwater mark, shore waters and navigable streams, and all harbors and roadsteads, and all harbor and waterfront improvements, belonging to or controlled by the State, and all shipping within the harbors, roadsteads, waters, and streams"¹⁰⁷ are under the care and control of the Division.

The Division's programs are aimed at developing, improving, and maintaining safe, efficient, and economical water transportation facilities in Hawaii. The Division is responsible for the operations of the state harbor system; maintains existing facilities; and plans, designs, and constructs improvements to the harbor system. The Division in cooperation with the Department of Planning and Economic Development is currently in the process of developing a study of current and future cargo movement, including potential new industries.

G. University of Hawaii

The University of Hawaii is a multi-campus system of higher education serving the State by providing education, research, and public services

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programs. The University system consists of the University of Hawaii at Manoa, Hilo College, West Oahu College, and seven community colleges; four on Oahu and one each on Maui, Kauai, and Hawaii.

The University governance is vested in an eleven-member Board of Regents appointed by the Governor and confirmed by the State Senate. The Board of Regents formulates University policies and exercises control of the University system through its appointed executive officer, the President of the University.

Marine and Aquaculture Programs and Activities

The University of Hawaii at Manoa provides major programs and services related to marine resources and aquaculture.

Marine Council. Marine programs and activities are performed by various academic and research units on the Manoa campus. While there is no single college or department of the University which has sole responsibility for marine curricula or research, there is a focus on marine programs and activities at the Manoa campus provided by the Marine Council. The Chairperson of the Marine Council, who is also designated as Coordinator of Marine Programs, functions in a staff capacity to the Chancellor of the University of Hawaii at Manoa, serving as an advisor on marine affairs.¹⁰⁸

Marine Programs. A number of programs formerly under the line responsibilities of the Dean of Marine Programs now report to various administrative authorities. These include the Sea Grant Program, the Waikiki Aquarium, the Law of the Sea Institute, the Marine Option Program, the Blue-Water Marine Laboratory, and the University marine vessels AEGIR and MAKALII.¹⁰⁹

Sea Grant College Program. The Sea Grant College Program is part of the National Oceanic and Atmospheric Administration of the United States Department of Commerce. This Program combines federal, state, local, and private support to bring the resources of the nation's leading educational institutions to bear on marine-related problems.

The University of Hawaii was designated as the fourth Sea Grant College in October 1972. The University's Program consists of research, education, and advisory programs. Research programs and projects focus on marine resources development, socioeconomic, and legal studies, marine technology research and development, and marine environmental research. Two major multidisciplinary programs which have emerged under the marine resources development area include the Hawaiian Prawn Aquaculture Program and the Northwestern Hawaiian Islands Fisheries Investigations.¹¹⁰

Marine education projects and programs range from elementary to postgraduate studies.¹¹¹ Lower education programs include the Blue-Water Marine Laboratory, a hands-on-the-water program for high school students; the Makahiki Kai, a five-year traveling marine exhibit; marine science curriculum for secondary schools, a semester-long course; and teacher in-service workshops in Hawaii and the Marshall Islands.¹¹² Higher education

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programs include the Marine Option Program, which provides undergraduate students in any academic discipline an opportunity to acquire a marine orientation and an increased awareness of Hawaii's marine resources.¹¹³

The advisory services of the Sea Grant Program consist of the Marine Advisory Program, a statewide network of field agents and support staff established on Oahu, Kauai, Maui, and Hawaii. The Marine Advisory Program serves as the principal vehicle through which existing marine information and the results of Sea Grant research are disseminated to the general public and to various segments of the marine community. The Program reaches these various groups of people through workshops and seminars (on such topics as drownproofing, bodysurfing, the feasibility of prawn farming on proposed sites, and small boat repair and maintenance), demonstrations, various brochures and other publications (including the newsletters: Hawaii's Coastal Zone News, Sea Grant Quarterly, and Makai), and the use of media (including slideshows on such topics as water safety and coastal flora).¹¹⁴

College of Tropical Agriculture and Human Resources. The College of Tropical Agriculture and Human Resources consists of the Department of Animal Sciences; Food Science and Human Nutrition; Agricultural and Resource Economics; and Agricultural Engineering.¹¹⁵

The College conducts marine and aquacultural research in the following areas:¹¹⁶

- (1) Solar-biogass system for drying fish.
- (2) Diseases of aquacultural species (mainly *Macrobrachium* prawns).
- (3) Development of improved feeds and better feed management systems for prawns. Development of improved culture and management systems for prawns.
- (4) Determination of the current and expected costs and returns for the commercial production of catfish, oyster, mullet, marine shrimp, and brine shrimp in Hawaii. Design of a computerized budget generator for pond aquaculture in Hawaii.
- (5) Assessment of the market structure and characteristics of consumer demand for locally produced seaweed, opihi, oysters, marine shrimps, catfish, and mullet.
- (6) Design and development of: (a) prawn sizing and grading technologies, (b) more efficient prawn harvesting technology, (c) improved pond maintenance procedures and equipment, and (d) improved live transport systems.
- (7) Development of low-temperature storage systems for prawns.
- (8) Land disposal and agricultural potential of manganese nodule tailings.

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Other Academic Departments

College of Arts and Sciences. The following academic departments of the College of Arts and Sciences conduct marine and aquacultural research and education in the following areas:

- . Botany Department (seaweed research, courses in marine phytoplankton and agronomics).
- . Chemistry Department (manganese nodule processing research).
- . General Sciences Department (opihi research).
- . Oceanography Department (manganese nodules and other environmental research).
- . Zoology Department (marine animals and organisms; administers the Hawaii Cooperative Fishery Research Unit jointly with other state and federal agencies).

College of Engineering. The College of Engineering is responsible for the Hawaii Natural Energy Institute and plays a major role in administering the Natural Energy Laboratory of Hawaii. The college through the Department of Ocean Engineering also oversees the James K. K. Look Laboratory of Ocean Engineering.

School of Medicine-College of Health Sciences and Social Welfare. The Departments of Physiology and Genetics conduct marine and aquacultural research in the following areas:

- . Department of Physiology (research on pressurized diving and hyperbaric medicine).
- . Department of Genetics (research on Malaysian prawns).

Research and Service Units¹¹⁷

Center for Engineering Research. The Center for Engineering Research encourages development of new engineering research programs and provides technical and administrative support to existing projects. Some pertinent activities related to marine resources and aquaculture include research in water resources, wastewater treatment and disposal, ocean thermal energy, coastal engineering, and ocean structures.

Cooperative Extension Service in Agriculture and Human Resources Development. The Cooperative Extension Service, administered through the College of Tropical Agriculture and Human Resources, is an off-campus noncredit educational program conducted jointly by the College and the United States Department of Agriculture. The services are provided statewide through a network of thirteen satellite offices distributed throughout the four

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major counties. The program is devoted to the advancement of agriculture in Hawaii, the improvement of family living, and the encouragement of community improvement. An important activity of the program is the practical demonstration of new knowledge and techniques generated by experiment stations and other research units. While the program primarily focuses on agricultural activities, it also provides information and assistance on various aspects of aquatic farming.

Environmental Center. The Center coordinates the University's education, research, and service efforts relating to ecological relationships, natural resources, and environmental quality with particular regard to human needs and social institutions. The Center also reviews State and Federal Environmental Impact Statements as part of its service function.

Hawaii Agriculture Experiment Station. The Hawaii Agriculture Experiment Station, administered by the College of Tropical Agriculture and Human Resources, promotes scientific investigations and experiments relating to the principles and applications of agricultural science. Research includes the physiology of plants and animals, diseases, insects, and parasites, agronomy, soils, food science, food processing, agricultural engineering, biochemistry, human and animal nutrition, breeding and genetics, culture, production, and marketing.

The program and services are provided through facilities located at the Manoa campus, in rural Oahu, and on the neighbor islands.

Hawaii Cooperative Fishery Research Unit. The Hawaii Cooperative Fishery Research Unit operates under the joint sponsorship of the University of Hawaii (Department of Zoology), the Department of Land and Natural Resources, and the United States Fish and Wildlife Service. The Unit promotes graduate training and research in fishery biology by providing students with support, counseling, and facilities. The research program centers on fishery biology and ecology of inshore marine and inland waters.

Hawaii Institute of Geophysics. The Hawaii Institute of Geophysics conducts oceanographic, geological, geochemical, and geophysical research in the broad field of earth sciences. Programs include research and advanced training in geodesy, physical oceanography, solid earth geophysics, geology, geochemistry, underwater acoustics, and tsunamis. The Institute also maintains the University's Marine Expeditionary Center (Snug Harbor) and several research vessels including the MOANA WAVE, KANA KEIKI, and NOI'I.

Hawaii Institute of Marine Biology. The Hawaii Institute of Marine Biology maintains facilities on Coconut Island in Kaneohe Bay and at Kewalo Basin. The Institute conducts research programs in the marine biological sciences and aquaculture. It provides facilities and services for University faculty members, graduate students, and visiting scientists. Its research programs include studies in the ecology, physiology, behavior, and systematics of marine animals and plants, pollution studies, biology, chemistry, and pharmacology of toxic marine organisms, interrelationship of organisms and their environment, and aquaculture research.

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Hawaii Underseas Research Laboratory. The Hawaii Underseas Research Laboratory maintains facilities at Makapuu, Oahu, under the sponsorship of the National Oceanic and Atmospheric Administration of the United States Department of Commerce. These facilities include the two-person submarine MAKALII and the currently inactive undersea habitat AEGIR. The Laboratory conducts a national program of manned undersea research focused on science problems of direct interest to the National Oceanic and Atmospheric Administration.¹¹⁸

James K. K. Look Laboratory of Oceanic Engineering. The James K. K. Look Laboratory is part of the College of Engineering's Department of Ocean Engineering. It conducts research on ocean engineering problems related to structures in the coastal zone and the coastal zone itself. The Laboratory provides services to researchers on problems related to human performance in the sea and the calibration of wind measuring instruments. It supports education through student participation in its tasks and aids in the planning, analysis, and design features of ocean-related physical problems occurring throughout the State.

Waikiki Aquarium. The Waikiki Aquarium is a state-owned museum which features Hawaiian aquatic exhibits. It is located in Waikiki and is operated by the University as a place for the education and recreation of Hawaii's residents and visitors.

Water Resources Research Center. The Center plans and conducts interdisciplinary research related to Hawaii's water resources, assists and promotes instruction in water resources in several academic departments, provides training opportunities for engineers and scientists through research, and performs information and technology transfer of research results to users. The Center operates research laboratories and field research facilities and conducts research in the area of hydrology and hydraulic engineering, geology, geophysics and geochemistry, sanitary engineering and public health, climatology and soil physics, agricultural engineering and forestry, and socioeconomic and legal aspects.

Chapter 3

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Part I. Findings

Senate Resolution No. 186 of 1978 was based upon the premise that the fragmentation of marine resources and aquaculture programs among various state departments and agencies could only lead to "a duplication of effort and possible conflicts regarding priorities, goals, and implementation."¹ The Resolution focused upon one possible solution to these concerns: the creation of a new State Department of Marine Resources and Aquaculture.

In performing this study, the Office of the Legislative Reference Bureau determined that a more useful approach would consist of first ascertaining whether the fragmentation of functions and activities in these areas constituted a problem in need of a solution.

The Bureau's findings on the issue of fragmentation are as follows.

1. Some fragmentation of programs is inevitable.

Hawaii's executive departments are grouped according to a mixture of functions and subject areas. Under this kind of organizational strategy, some fragmentation is inevitable. For example, departments organized according to broad functional responsibilities such as the Department of Planning and Economic Development, which by statute is charged with the development and promotion of industry (including fisheries development), and tourism,² will sometimes overlap the activities of other departments organized by subject area, such as the Department of Land and Natural Resources, which is charged with the management of the State's fisheries resources.³

2. Programs dealing with major natural resources tend toward diffusion.

Generally, it appears that programs dealing with major natural resources such as land or the ocean tend to be diffused to a greater extent than other subject area programs. In the case of land, a large number of state departments are involved in some aspect of land development, management, regulation, or conservation. For example, the Department of Land and Natural Resources manages conservation lands; the Department of Planning and Economic Development is involved with land use management and coastal zone management; the Department of Health administers sanitation, solid waste, and other land pollution abatement programs; the Department of Hawaiian Home Lands manages Hawaiian Homes Commission Act lands; and the Department of Land and Natural Resources and the Department of Agriculture cooperatively implement the agricultural park program.

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

3. Major organizational and reorganizational efforts have taken place since the adoption of Senate Resolution No. 186-78.

- (a) **Establishment of the Hawaii Fisheries Coordinating Council.** The Hawaii Fisheries Coordinating Council was established by Act 282 of the 1980 legislative session,⁴ for the purpose of advising the Board of Land and Natural Resources on fisheries matters and coordinating fisheries activities among the various federal, state, and county agencies and private industry.

The Council is charged with advising the Board of Land and Natural Resources on matters relating to fisheries development including:⁵

- (1) Proposing and preparing programmatic fisheries development plans and policies;
 - (2) Coordinating all state fisheries activities as they relate to the federal and county governments, public and private organizations, and commercial enterprises;
 - (3) Coordinating state agency requests for federal grants and technical assistance;
 - (4) Promoting communication between industry and government sectors, including the consideration of problems, requirements, and available financial and technical assistance;
 - (5) Performing such services as may be required by the Governor and the Legislature; and
 - (6) Preparing and submitting an annual report to the Governor and the Legislature prior to each regular session.
- (b) **Transfer of the Aquaculture Development Program to the Department of Land and Natural Resources.** The Aquaculture Development Program was transferred by the Governor from the Department of Planning and Economic Development to the Department of Land and Natural Resources in January 1981 to consolidate state aquaculture activities. Administratively, the Program was placed in the Office of the Chairman of the Board of Land and Natural Resources.

This transfer was consistent with a major recommendation of the State's aquaculture development plan, Aquaculture Development for Hawaii: Assessments and Recommendations, which set forth the need for a permanent aquaculture lead agency to consolidate efforts and provide a focal point to promote and expedite the development of aquaculture production in Hawaii.⁶

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The Plan listed three important requirements to be considered in determining the most suitable lead agency for aquaculture: (1) involvement in economic development, (2) functions compatible with aquaculture and involvement with fisheries, natural resource management, and/or food production, and (3) adequate facilities and support services. The Plan found that the Department of Agriculture and the Department of Land and Natural Resources were the most logical candidates for lead agency, with no distinct advantage in selecting one department over the other.⁷

- (c) **Reorganization of the Department of Land and Natural Resources' responsibilities in fisheries, wildlife, and enforcement into separate divisions.** This reorganization was accommodated by Act 85 of the 1981 legislative session.⁸ Act 85 restructured Title 12 of the Hawaii Revised Statutes, Conservation and Resources, to: (1) transfer the management of terrestrial animals from the Division of Fish and Game to the Forestry Division, which was redesignated as the Division of Forestry and Wildlife, and (2) redesignate the Division of Fish and Game as the Division of Aquatic Resources.⁹

The Division of Aquatic Resources administers the State's programs in commercial fisheries and aquaculture, aquatic resources and habitat protection, and aquatic recreation. Act 85 defined "aquatic life" to mean "any type of species of mammal, fish, amphibian, reptile, mollusk, crustacean, arthropod, invertebrate, coral, or other animals that inhabit the freshwater or marine environment", including any part, product, egg, or offspring thereof; or freshwater or marine plants,¹⁰ including seeds, roots, and other parts thereof. This definition brings marine as well as aquacultural resources under the jurisdiction of the Division, in accord with the State's efforts to consolidate aquaculture activities.

- (d) **Transfer of the functions of the Marine Affairs Coordinator to the Department of Planning and Economic Development.** Act 302 of the 1980 legislative session transferred the Office of the Marine Affairs Coordinator to the Department of Planning and Economic Development for administrative purposes.¹¹ Act 281 of the 1982 legislative session abolished the Office and transferred all rights, powers, functions, duties, and positions of the Office of the Marine Affairs Coordinator to the Department of Planning and Economic Development.¹²

These powers and duties include the following:¹³

- (1) Develop plans, including objectives, criteria to measure accomplishments of objectives, programs through which the objectives are to be attained, and financial requirements for the total and optimum development of Hawaii's marine resources, including plans, objectives, and criteria for the expenditure of State matching funds

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

for federally funded projects based on the needs and goals of the State;

- (2) Conduct systematic analysis of existing and proposed marine programs, evaluate the analysis conducted by the agencies of state government, and recommend to the Governor and the Legislature programs which represent the most effective allocation of resources for the development of the marine environment;
- (3) Assist those departments having interests in marine affairs, coordinate those activities which involve the responsibilities of multiple state agencies, and insure the timely and effective implementation of all authorized marine projects and programs;
- (4) Establish a continuing program for informing the federal government, other state governments, governments of nations with interests in the Pacific basin, private and public organizations involved in marine science and technology, and commercial enterprises of Hawaii's leadership potential as the center for marine affairs;
- (5) Coordinate the State's involvement in national and international efforts to investigate, develop, and utilize the marine resources of the Pacific basin;
- (6) Develop programs to continuously encourage private and public marine exploration and research projects which will result in the development of improved technological capabilities in Hawaii; and
- (7) Formulate specific program and project proposals to solicit increased investment by the federal government and other sources to develop Hawaii's marine resources and coordinate the preparation and submission of program and project proposals of State agencies.

The Conference Committee report attached to Act 281 stated that "Your Committee finds that if Hawaii is to capitalize on the immediate and long-term opportunities to develop and utilize marine resources, the total efforts of the State's planning, research, development, and promotion of the marine environment need to be effectively addressed."¹⁴

To implement Act 281, the Department of Planning and Economic Development has proposed establishing an Office of Ocean Resources, under the supervision of the Director of Planning and Economic Development, to bring a coordinated approach to marine activities in the State, and to ensure that Hawaii derives maximum economic and societal benefits from its surrounding marine environment.¹⁵

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The Office would assume the former functions of the Office of the Marine Affairs Coordinator transferred by Act 281.¹⁶

4. Masterplans in the areas of aquaculture and commercial fisheries have been completed and are being implemented; an ocean management plan is nearing completion.

The State's aquaculture masterplan, Aquaculture Development for Hawaii: Assessments and Recommendations, has been in the process of implementation by the Aquaculture Development Program since January 1979. A major recommendation of the State's commercial fisheries masterplan, Hawaii Fisheries Development Plan, was the legislative establishment of the Hawaii Fisheries Coordinating Council in 1980.

A draft of the State's new ocean management plan is now being circulated by the Department of Planning and Economic Development's Hawaii Coastal Zone Management Program for review to various state and federal agencies. It is intended to provide consistency in management by setting forth objectives and policies, and could also provide a forum for conflict resolution as well as for the determination of priorities relating to ocean resources. The draft resulted from ten issue papers on fisheries management, marine conservation and preservation, mariculture, ocean thermal energy conversion, coastal energy facilities, harbors development, beach erosion, near-shore recreation, ocean dumping, and manganese nodule mining.¹⁷

Part II. Conclusions

The Bureau's conclusions are as follows.

1. The creation of a new State Department of Marine Resources and Aquaculture would not necessarily remedy any problems allegedly caused by the present organizational structure of the State's marine resources and aquaculture programs. A system to coordinate existing programs would effect a less disruptive yet effective alternative.

It appears that the major problem allegedly caused by the present organization of programs is one of coordination among the state departments having marine resources and aquaculture programs. Even with a new department, constant coordination efforts would be required among the state departments to maximize the benefits of the State's marine resources and aquaculture programs.

Many of the existing marine resources and aquaculture programs are so closely tied to major functions and expertise of existing departments that to separate them and place them in a new department would create more problems of coordination than previously existed. For example, health and sanitation concerns would still have to be addressed by the Department of Health, and

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water and land development and land management issues would still need to be directed to the Department of Land and Natural Resources.

It is therefore neither necessary nor desirable to include all related programs that are diffused throughout the state government and that require policy, program, and procedural coordination, or technical assistance, into a new department of marine resources and aquaculture at this time. What is needed is a means of achieving such coordination while leaving existing programs in those locations where they can be administered most effectively.

2. The creation of a new State Department of Marine Resources and Aquaculture would be premature at this time.

The projections of the growth of the State's aquaculture industry have not been fulfilled, and the manganese nodule mining and ocean thermal energy programs are still in early stages of their development. Regarding commercial fisheries, Hawaii has historically ranked near the bottom among coastal states in terms of commercial fish landings, consequently requiring importation of most of its seafood products. Until these and other major marine industries have evolved, stabilized, and realized their full potential, the creation of a new department would be premature. This, of course, is not to dismiss the possibility that a new department may be justified at some later date.

3. Duplication and overlapping of functions and activities are not necessarily signs of waste and inefficiency; undesirable duplication and the possibility of conflicts have diminished since adoption of Senate Resolution No. 186-78.

In 1969, Martin Landau first alerted administrative scientists to the benefits of redundancy and overlapping in administrative organizations. He found that:¹⁸

At one and the same time, thus, redundancy serves many vital functions in the conduct of public administration. It provides safety factors, permits flexible responses to anomalous situations and provides a creative potential for those who are able to see it. If there is no duplication, if there is no overlap, if there is no ambiguity, an organization will neither be able to suppress error nor generate alternate routes of action. In short, it will be most unreliable and least flexible...

"Streamlining an agency," "consolidating similar functions," "eliminating duplication," and "commonality" are powerful slogans which possess an obvious appeal. But it is just possible that their achievement would deprive an agency of the properties it needs most--those which allow rules to be broken and units to operate defectively without doing critical injury to the agency as a whole. Accordingly, it would be far more constructive, even under conditions of scarcity, to lay aside easy slogans and turn attention to a principle which lessens risks without foreclosing opportunity.

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Much of the undesirable and unnecessary duplication of efforts which was the impetus for adoption of Senate Resolution No. 186-78 has been alleviated by the organizational and reorganizational changes which have taken place since 1978.

The possibility of conflicts regarding priorities, goals, and implementation has also diminished with the publication of masterplans in the areas of aquaculture and commercial fisheries, which provided overall implementation guidelines for the State's programs in these areas by providing a structure in which all program components were identified, guidelines for development were formed, required financial resources were determined, and implementation schedules were developed.

4. The establishment of coordinating advisory councils would provide mechanisms for information exchange and aid the State's efforts towards coordination of programs.

Coordinating advisory councils composed of federal, state, and county government officials and individuals in private industry knowledgeable in the fields of ocean resources and aquaculture could advise the state departments with lead agency responsibilities on all matters relating to aquaculture and ocean resources, and generally promote communication between industry and government, and among governmental agencies. In particular, private industry council members can provide direct external review of the effectiveness of the State's programs. The importance of interaction with private industry was recognized in Hawaii and the Sea--1969:¹⁹

For the State to advance boldly and wisely in the marine field, it must go outside the State Government to get advice on a regular basis from highly knowledgeable people having strong interests in a broad range of marine activities...

In the relatively short time the Task Force has existed, it has made a number of important recommendations and contributions to the State's marine effort.

Part III. Recommendations

The State has made great strides in the past four years in defining and implementing its goals in the areas of marine resources and aquaculture. The benefits of these first steps, however, can only be enhanced by further action. Therefore, the Bureau makes the following recommendations to the Legislature:

1. The Department of Land and Natural Resources should be statutorily designated as the lead agency for aquaculture.

Although the Aquaculture Development Program and the Aquatic Resources Division of the Department of Land and Natural Resources have

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been assigned the responsibilities necessary for the overall implementation and management of the State's aquaculture program, the statutory designation of the Department of Land and Natural Resources as the State's lead agency for aquaculture will clarify the Department's role as the agency with foremost responsibility for aquacultural activities.

2. An Aquaculture Coordinating Advisory Council and an Ocean Resources Coordinating Advisory Council should be established by statute.

Although informal coordinating committees in each of these areas presently exist,²⁰ statutory establishment of these two bodies will clearly set forth their powers, duties, and membership. Official establishment of the coordinating advisory councils is also important because of the number of members which should be included at a minimum, and to assure the performance of duties.

At a minimum, state departments with responsibilities in the field of aquaculture should be represented on the Aquaculture Coordinating Advisory Council, including the Department of Agriculture, the Department of Land and Natural Resources, the Department of Health, the Department of Hawaiian Home Lands, the Department of Planning and Economic Development, and the University of Hawaii; and state departments with ocean-related responsibilities should be represented on the Ocean Resources Coordinating Advisory Council, including the Department of Land and Natural Resources, Department of Planning and Economic Development, Department of Health, Department of Transportation, and the University of Hawaii.

Legislation appropriately patterned after Act 282 of the 1980 legislative session, which established the Hawaii Fisheries Coordinating Council, will additionally assure membership of the various industries and county government officials, and an annual report to the Governor and the Legislature.

Logically, the Aquaculture Coordinating Advisory Council should be administratively attached to the Department of Land and Natural Resources; and the Ocean Resources Coordinating Advisory Council to the Department of Planning and Economic Development.

FOOTNOTES

Chapter 1

1. Senate Resolution No. 186, Ninth Legislature, 1978, State of Hawaii.
2. Hawaii, Division of Fish and Game, and the University of Hawaii Marine Advisory Program, *Ancient Hawaii: In Harmony with the Sea*, 1977.
3. Hawaii, Aquaculture Planning Program, Department of Planning and Economic Development, *Aquaculture Development for Hawaii: Assessments and Recommendations* (Honolulu: 1978), p. 3.
4. Hawaii, Department of Planning and Economic Development, *Hawaii and the Sea--1969* (Honolulu: 1969), p. 83.
5. *Ancient Hawaii: In Harmony with the Sea*.
6. Hawaii, Department of Planning and Economic Development, *Aquaculture in Hawaii - 1976* (Honolulu: 1976), Appendix E, p. 2.
7. *Hawaii and the Sea--1969*.
8. Hawaii, Department of Planning and Economic Development, *Hawaii and the Sea--1974* (Honolulu: 1974).
9. These studies include the following Department of Planning and Economic Development reports: *Aquaculture in Hawaii - 1976*; *Hawaii Tuna Fishery Development Plan*; *The Feasibility and Potential Impact of Manganese Nodule Processing in Hawaii*; and *Aquaculture Development for Hawaii: Assessments and Recommendations*.
10. Fishery Conservation and Management Act of 1976, Pub. L. 94-265, 90 Stat. 331.
11. Hawaii, Department of Land and Natural Resources, *Hawaii Fisheries Development Plan*, (Honolulu: 1979).
12. "Development of Prawn Aquaculture in Hawaii," *The Commercial Fish Farmer and Aquaculture News*, March 1978, p. 14.
13. *Report to the Governor 1980-81*, Department of Land and Natural Resources, State of Hawaii (Honolulu: 1982), p. 9.
14. 1976 Haw. Sess. Laws, Act 226.
15. 1977 Haw. Sp. Sess. Laws, Act 12.
16. *Aquaculture Development for Hawaii: Assessments and Recommendations*.

Chapter 2

1. *Hawaii Const.* art. XI, sec. 1.
2. *Hawaii Const.* art. XI, sec. 2.
3. *Hawaii Const.* art. XI, sec. 6.
4. *Hawaii Const.* art. V, sec. 6.
5. *Hawaii Const.* art. IV, sec. 6 (1968).
6. Hawaii, Constitutional Convention, 1978, *Proceedings*, Vol. I, Standing Committee Report No. 51, pp. 613-616.
7. *Hawaii Rev. Stat.*, sec. 26-16.
8. The technical advisory committees include: the Animal Quarantine Station Advisory Committee, the Advisory Committee on Agricultural Products, the Advisory Committee on Flowers and Foliage, the Advisory Committee on Markets, the Advisory Committee on Pesticides, and the Advisory Committee on Plants and Animals.
9. *Hawaii Rev. Stat.*, sec. 150A-5.
10. Interview with Eugene S. Imai, Administrative Services Officer, Department of Agriculture, September 30, 1982.
11. *Hawaii Rev. Stat.*, sec. 219-1 and 219-3.
12. 1978 Haw. Sess. Laws, Act 88.
13. Hawaii, *The Multi-Year Program and Financial Plan and Executive Budget for the Period 1981-1987, Budget Period: 1981-1983*, vol. I, AGR 102, Financial Assistance for Aquaculture, p. 635.
14. Department of Planning and Economic Development Newsletter, June 14, 1978, p. 1.
15. Hawaii, Department of Planning and Economic Development, *Aquaculture in Hawaii - 1976* (Honolulu: 1976), p. 14.
16. *Ibid.*
17. *Hawaii Rev. Stat.*, sec. 142-3.
18. *Hawaii Rev. Stat.*, sec. 141-2.
19. *Hawaii Rev. Stat.*, sec. 147-57.
20. *Ibid.*
21. *Annual Report Fiscal Year 1980*, Department of Agriculture, State of Hawaii, p. 6.
22. *Hawaii Rev. Stat.*, sec. 149A-3.
23. Hawaii, Executive Order No. 82-2 (April 16, 1982).
24. *Hawaii Rev. Stat.*, sec. 26-15.
25. *Hawaii Rev. Stat.*, sec. 187-1.2.

26. *Ibid.*
27. *Hawaii Rev. Stat.*, sec. 187-1.4.
28. Joint interview with Edgar A. Hamasu, Deputy Director; Henry M. Sakuda, Director, Division of Aquatic Resources; and Paul Y. Kawamoto, Chief, Fisheries Branch; Department of Land and Natural Resources, October 29, 1982.
29. *Hawaii Rev. Stat.*, sec. 195-7.
30. *Hawaii Rev. Stat.*, sec. 188E-1 and 188E-2.
31. *1979 Annual Report, Pacific Tuna Development Foundation* (Honolulu: 1980), p. I.
32. *Report to the Governor 1980-81*, Department of Land and Natural Resources, State of Hawaii (Honolulu: 1982), p. 7.
33. *Hawaii, The Multi-Year Program and Financial Plan and Executive Budget for the Period 1981-1987, Budget Period: 1981-1983*, vol. I, LNR 153, Commercial Fishery and Aquaculture, p. 639.
34. *Report to the Governor 1980-81*, Department of Land and Natural Resources, p. 7.
35. *Ibid.*
36. *Ibid.*
37. *Ibid.*, p. 8.
38. *Ibid.*, pp. 8-9.
39. *Ibid.*, p. 8.
40. Joint interview with Edgar A. Hamasu, Deputy Director; Henry M. Sakuda, Director, Division of Aquatic Resources; and Paul Y. Kawamoto, Chief, Fisheries Branch; Department of Land and Natural Resources, October 29, 1982.
41. *Ibid.*
42. *Report to the Governor 1980-81*, Department of Land and Natural Resources, p. 9.
43. Joint interview with Edgar A. Hamasu, Deputy Director; Henry M. Sakuda, Director, Division of Aquatic Resources; and Paul Y. Kawamoto, Chief, Fisheries Branch; Department of Land and Natural Resources, October 29, 1982.
44. *Report to the Governor 1980-81*, Department of Land and Natural Resources, p. 9.
45. *Ibid.*, p. 10.
46. *Ibid.*
47. Joint interview with Edgar A. Hamasu, Deputy Director; Henry M. Sakuda, Director, Division of Aquatic Resources; and Paul Y. Kawamoto, Chief, Fisheries Branch; Department of Land and Natural Resources, October 29, 1982.
48. *Report to the Governor 1980-81*, Department of Land and Natural Resources, p. 10.
49. *Ibid.*, p. 4.
50. 1977 Haw. First Sp. Sess. Laws, Act 12; interview with John S. Corbin, Manager, Aquaculture Development Program, Department of Land and Natural Resources, October 15, 1982.
51. *Report to the Governor 1980-81*, Department of Land and Natural Resources, p. 5; interview with John S. Corbin, Manager, Aquaculture Development Program, Department of Land and Natural Resources, October 15, 1982.
52. *Ibid.*
53. *Ibid.*
54. *Hawaii, Aquaculture Planning Program, Aquaculture Development for Hawaii: Assessments and Recommendations* (Honolulu: 1978).
55. *Hawaii, Aquaculture Planning Program, Permits and Environmental Requirements for Aquaculture in Hawaii* (Honolulu: 1977), p. ix; and *Hawaii, Aquaculture Development Program, Permits and Environmental Requirements for Aquaculture in Hawaii* (Honolulu: 1980).
56. *Hawaii, Aquaculture Development Program, Ocean Leasing for Hawaii* (Honolulu: 1981); *Hawaii, Aquaculture Development Program and University of Hawaii Sea Grant College Program, Freshwater Prawn (Macrobrachium Rosenbergii) Production in Hawaii: Practices and Economics* (Honolulu: 1981).
57. *Report to the Governor 1980-81*, Department of Land and Natural Resources, p. 5.
58. Interview with John S. Corbin, Manager, Aquaculture Development Program, Department of Land and Natural Resources, October 15, 1982.
59. *Report to the Governor 1980-81*, Department of Land and Natural Resources, p. 5.
60. Interview with John S. Corbin, Manager, Aquaculture Development Program, Department of Land and Natural Resources, October 15, 1982.
61. *Report to the Governor 1980-81*, Department of Land and Natural Resources, p. 6.
62. *Ibid.*, p. 10.
63. *Ibid.*
64. *Ibid.*, p. 11.
65. *Ibid.*
66. *Ibid.*
67. *Ibid.*, pp. 12-13.
68. *Ibid.*, p. 49.
69. *Ibid.*, p. 57.
70. *Hawaii Rev. Stat.*, sec. 171-3.
71. *Hawaii Rev. Stat.*, sec. 171-3 and 171-13.
72. 1978 Haw. Sess. Laws, Act 191.
73. Senate Standing Committee Report No. 816-78 on House Bill No. 2837-78, Ninth Legislature, 1978, State of Hawaii.
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78. 1979 Haw. Sess. Laws, Act 213.
79. *Ibid.*
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81. Interview with Kent M. Keith, Deputy Director, Department of Planning and Economic Development, October 14, 1982.
82. Hawaii, Department of Planning and Economic Development, *The Feasibility and Potential Impact of Manganese Nodule Processing in Hawaii* (Honolulu: 1978); and Hawaii, Department of Planning and Economic Development and U.S. Department of Commerce, National Oceanic and Atmospheric Administration, *The Feasibility and Potential Impact of Manganese Nodule Processing in the Puna and Kohala Districts of Hawaii* (Honolulu: 1981).
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88. *Ibid.*, p. iii.
89. 1982 Haw. Sess. Laws, Act 281.
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92. *Hawaii Coastal Zone Management Program 1981 Annual Report*, Department of Planning and Economic Development, State of Hawaii (Honolulu: 1982), p. 1.
93. *Ibid.*
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96. 1981 *Annual Report*, Department of Planning and Economic Development, p. 25.
97. *Hawaii Rev. Stat.*, sec. 26-13.
98. *Hawaii Rev. Stat.*, sec. 321-1.
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101. *Ibid.*
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105. *Hawaii Rev. Stat.*, sec. 26-19.
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111. *Ibid.*
112. *Ibid.*, p. 26.
113. *Ibid.*, p. 27.
114. *Ibid.*, pp. 30-32.
115. Letter from Dr. Noel P. Kefford, Dean, College of Tropical Agriculture and Human Resources to Samuel B. K. Chang, Director, Legislative Reference Bureau, October 12, 1982.
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118. Interview with Dr. John Craven, Chairman, Marine Council, University of Hawaii at Manoa, September 28, 1982.

Chapter 3

1. Senate Resolution No. 186, Ninth Legislature, 1978, State of Hawaii.
2. *Hawaii Rev. Stat.*, sec. 26-18.
3. *Hawaii Rev. Stat.*, sec. 171-3.
4. 1980 Haw. Sess. Laws, Act 282.
5. *Ibid.*
6. Hawaii, Aquaculture Planning Program, *Aquaculture Development for Hawaii: Assessments and Recommendations* (Honolulu: 1978), pp. 183-190.
7. *Ibid.*, pp. 186-187.
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9. *Report to the Governor 1980-81*, Department of Land and Natural Resources, State of Hawaii (Honolulu: 1982), p. 13.
10. 1981 Haw. Sess. Laws, Act 85.
11. 1980 Haw. Sess. Laws, Act 302.

12. 1982 Haw. Sess. Laws, Act 281.
13. *Ibid.*
14. House Conference Committee Report No. 15-82 on House Bill No. 2183-82, H.D. 1, S.D. 1, C.D. 1, Eleventh Legislature, 1982, State of Hawaii.
15. Hawaii, *The Multi-Year Program and Financial Plan and Executive Budget for the Period 1981-1987*, Budget Period: 1981-1983, vol. I, PED 109, General Support for Marine Programs; and attachment to letter from Hideto Kono, Director, Department of Planning and Economic Development to Samuel B. K. Chang, Director, Legislative Reference Bureau, December 15, 1982.
16. Attachment to letter from Hideto Kono, Director, Department of Planning and Economic Development to Samuel B. K. Chang, Director, Legislative Reference Bureau, December 15, 1982.
17. *Honolulu Star-Bulletin*, November 2, 1982, p. A-3.
18. Martin Landau, "Redundancy, Rationality, and the Problem of Duplication and Overlap", *Public Administration Review*, July/August, 1969, p. 356.
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APPENDIX

(To be made one and seven copies)

THE SENATE

...NINTH..... LEGISLATURE, 1978..

STATE OF HAWAII

S.R. NO. 186

SENATE RESOLUTION

REQUESTING THE LEGISLATIVE REFERENCE BUREAU TO CONDUCT A STUDY
REGARDING THE FEASIBILITY OF ESTABLISHING A SEPARATE
DEPARTMENT OF MARINE RESOURCES AND AQUACULTURE.

WHEREAS, marine resources and aquaculture are an integral and essential part of the economy of the State of Hawaii, and are slated to play an even greater part in the future expansion of the State's acutely narrow economic base; and

WHEREAS, Hawaii is ideally situated for the development of marine resources and aquatic animal and plant life because of its favorable climate, good water quality, and abundance of warm water which is one of the principal requirements for year-round culture and rapid growth of many marine species; and

WHEREAS, the administrative procedures necessary to insure the successful development of the State's marine resources are delegated to various departments and agencies within the Department of Land and Natural Resources, the Department of Agriculture, the Department of Planning and Economic Development and the Marine Affairs Co-ordinator; and

WHEREAS, a proposal has been made that the Department of Agriculture be established as the lead agency for the aquaculture industry; and

WHEREAS, the fragmentation of authority and duties with respect to marine resources and aquaculture development can only lead to a duplication of effort and possible conflicts regarding priorities, goals, and implementation, thereby limiting the potential growth of this extremely promising industry; and

WHEREAS, the practical and realistic solution to this problem would be to combine all departments and agencies with functions relating to marine resources and aquaculture into one separate and distinct department; and

WHEREAS, the coordination and implementation of policy decisions regarding marine resources and aquaculture which affect the State of Hawaii and its economic plans and goals would be most efficiently handled by a separate department charged with responsibility in these matters; now, therefore,

BE IT RESOLVED by the Senate of the Ninth Legislature of the State of Hawaii, Regular Session of 1978, that this body request that the Legislative Reference Bureau conduct an in-depth study regarding the feasibility and practicality of combining all relevant and related state departments and agencies into a separate Department of Marine Resources and Aquaculture for the purpose of streamlining and making more efficient the administration of the development and growth of this important and necessary industry; and

BE IT FURTHER RESOLVED that certified copies of this Resolution be transmitted to the Legislative Reference Bureau, Department of Agriculture, Department of Land and Natural Resources, Department of Planning and Economic Development, the Marine Affairs Co-ordinator, Senator T. C. Yim, Chairman of the Committee on Energy and Natural Resources and Senator Francis Wong, Chairman of the Committee on Economic Development.

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