

AQUACULTURE IN PUGET SOUND: AN EMERGING PUBLIC POLICY ISSUE

by

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A Research Paper Prepared in
Partial Fulfillment of the Requirements
for Public Policy 593, 594, and 595 --
Policy Development and Administration:
Natural Resources

The University of Washington

May 1970

PERSONAL NOTE

Materials for examination of the policy process on aquaculture in Puget Sound was based on personal interviews and on review of various reports and records. Evaluation is interpretive and does not necessarily reflect the official views or policies of the departments of the interviewees.

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INTRODUCTION

The Report of the Commission on Marine Sciences, Engineering, and Resources defines aquaculture as the controlled rearing of aquatic animals and plants. Unlike other fisheries which operate on natural (wild) populations and whose harvestable surplus is limited, the harvest of of cultured species of fish, shellfish, and aquatic plants are limited only by the acreage to be farmed and the ability to compete economically with other marine stocks. For this reason, the Report suggests that aquatic culture of certain species can contribute substantially to food supplies and to the economy of the nation. The Commission, however, also recognizes the complexities and problems of aquaculture in the United States;

"Although research is rapidly demonstrating the feasibility of aquaculture, full-scale commercial application is limited by legal, organizational, political, and technical constraints. As these constraints are removed, aquaculture should become a powerful new global resource."

The Commission views as constraints, those organizations and arrangements that limit full-scale commercial application of aquaculture. In a public policy process, however, constraint or support depend on one's viewpoint or belief.

For this paper, a policy process is viewed as a confluence of behavior patterns. People as individuals possess a basic property, or values, consisting of patterns of belief which govern their activities in the form of behavior. As social beings, collectivities of these values give rise to patterns of behavior that contribute to the setting

of social goals. These patterns are not only observable but are identifiable and can be analyzed. In the totality of a society then, we may view the institutions and the organizations within them as a collection, or structure of values and behavior. Social action is the dynamic process where the complex of behavior patterns respond and react to changes and influences that are both internal and external to the process. Policy as a social process serves as the framework for behavior directed towards achievement of a goal. Public policy is the process that centers around a public prescription.⁽⁴⁾ An emerging public issue in this area is the uses of the resources of Puget Sound, Washington.

POLICY FIELD

The policy field under investigation in this research paper is natural resources, more specifically the water and adjacent land resources of Puget Sound and their utilization by man to satisfy his needs and wants, aesthetically or materially. Preemptive or general social values which underlie this field would be expressions, in part, such as individualism, freedom, egalitarianism, Democracy, and fair play. These are advocated at the governmental levels as political obligation and responsiveness, governmental responsibility, or equality of opportunity. At the community level these may take the form of local autonomy, social and economic advantages (or disadvantages) from resource utilization, and general obligation to community well-being.

Many institutions and organizations are interlocked in the policy field. Utilization is expressed basically as public versus private. Within it, however, are complex expressions directed to satisfying needs and wants in commerce, recreation, industrial processes, aesthetics, or fisheries. The commercial sector of the latter (fisheries) is the subarea of our concern. An examination of the policy process concerning aquaculture in Puget Sound is the specific objective of this paper.

ENVIRONMENTAL SETTING

Puget Sound is a large body of water representing an extension of the Pacific Ocean; it is located in the northwestern part of the state of Washington (Figure 1). The Sound and the Strait of Juan de Fuca offer nearly 1,800 miles "inside" marine shoreline.⁽⁵⁾ The eastern shores of the Sound are lined by some of the most populous port cities of the State -- Olympia, Tacoma, Seattle, Everett, and Bellingham. The population of the central Puget Sound area alone was reported as 1.8 million in 1968 with a projection of 3.2 million by 1990.⁽⁶⁾ This ready access to the water and adjacent land areas of Puget Sound by commerce and population puts ever greater pressure on this resource complex.

There is general agreement, however, that compared to the eastern seaboard and Great Lakes areas of the United States, the Sound is relatively unspoiled and unpolluted. More recent examples and notoriety on the destruction of water areas in other parts of the United States has resulted in an increased concern by state and Puget Sound area residents as to the "wise" use of this resource. Toward this concern and overall policy process,

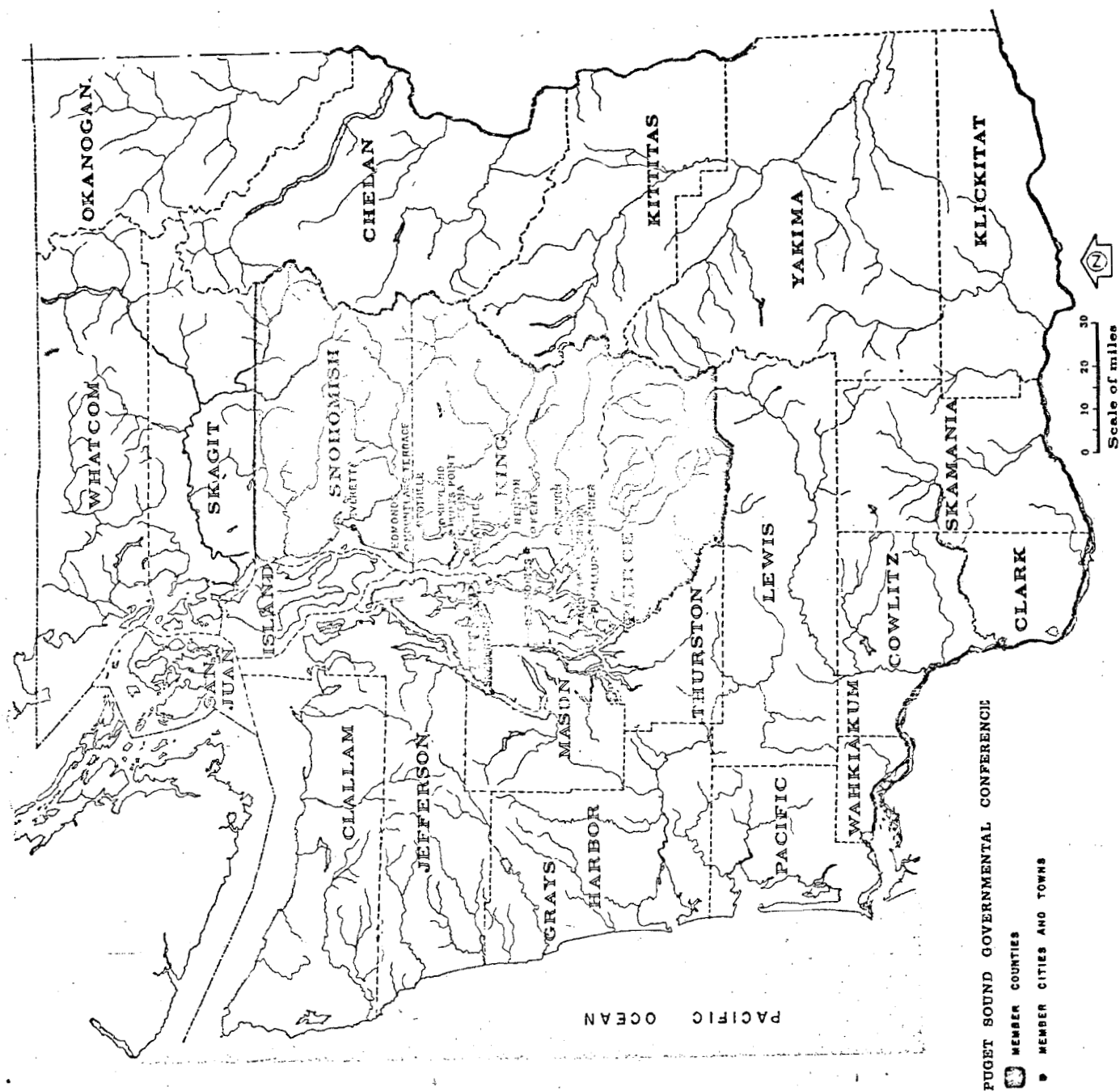


Figure 1.--Puget Sound, Washington (from 1968 Annual Report of the Puget Sound Governmental Conference).

proponents have begun to articulate the need for proper consideration of aquaculture as one of the desirable uses of Puget Sound.

INSTITUTIONAL AND ORGANIZATIONAL SETTING

With the advent of statehood in 1889, the state of Washington was permitted to retain title to beds of navigable waters within its political confines. Administrative control over activities in navigable waters, however, is vested in the federal government, based on an 1899 United States statute.⁽⁷⁾ Since statehood, some of the tidelands of Washington have gone into private ownership under laws giving the abutting upland owners the "right" to buy the tide and shoreland. Since 1957, under a policy of retention of public marine lands for the state, only six miles of tideland have been sold. It is reported that the state currently⁽⁸⁾ owns more than 1,300 miles of "second class" tidelands.

The use of abutting upland areas of Puget Sound is characterized by local autonomy -- the control or management of land uses by municipalities and counties through their zoning regulations. These land uses affect or interact with uses of the tidelands, beds, and waters of Puget Sound. What emerges, then, is a complex of federal, state, county, and municipal jurisdictions on public and private uses of the waters and adjacent land areas in Puget Sound. Inherent to this complex are the changing expressions of needs and wants of the public, business enterprises, and interest groups. Events external to the state will also affect activities ---for example, the United States Seacoast Management Act.

Currently, there are more than 12 government agencies directly or indirectly connected with aquaculture activities:

Federal government

- 1) Corps of Engineers, U.S. Army
- 2) Bureau of Commercial Fisheries, U.S. Department of Interior
- 3) Bureau of Indian Affairs, U.S. Department of Interior
- 4) Economic Development Administration, U.S. Department of Commerce
- 5) Office of Economic Opportunity, U.S. Department of Health, Education, and Welfare
- 6) U.S. Department of Labor

State government

- 1) Department of Natural Resources, Washington State Commission on Public Lands
- 2) Department of Fisheries, Washington State
- 3) Department of Health, Washington State
- 4) Water Pollution Control Commission, Washington State
- 5) Colleges and universities, Washington State

Local governments and institutions

- 1) County governments and municipalities, Puget Sound region
- 2) Puget Sound Governmental Conference

Table 1 shows the role of some of these agencies as viewed under a
(9)
typology of governmental intervention. Salient features of the seven
major forms of governmental intervention are:

Table 1.--Classification of some public agencies involved in aquaculture along major forms of governmental intervention

<u>Form</u> ^{1/}	<u>Agency</u>
1. <u>Self-help</u> . Most often a civil action brought by one private party against another private party. A governmental jurisdiction may be a party.	
2. <u>Coercive; Non-determinative</u> . Imposition of formal penalties through a process inconclusive until final judicial determination; e.g. criminal law enforcement.	Dept. of Fish.
3. <u>Coercive; Determinative</u> . Restraint imposed or positive action forced without routine resort to judicial proceedings.	
a. <u>Prior Restraint</u> . A license or permit authorizing exercise of a specific privilege.	Dept. of Fish., Corps of Eng.
b. <u>Corrective Intervention</u> . Persons are ordered to "cease and desist" from specified activities.	Dept. of Fish., Dept. of Health
4. <u>Non-Coercive</u> . Restraints and penalties not imposed. Services or other supports extended to those eligible or applying.	
a. <u>Service</u> . Generally available, no specific charges or eligibility standards applied; e.g., highways, public education, research, etc.	Dept. of Fish., Bur. Comm. Fish., Puget Sound Gov. Conf., Colleges and Universities
b. <u>Assistance</u> . Money grants or other benefits made available to those specifically qualified, public assistance, social insurance, loans, subsidies, etc.	Dept. of Fish., Bur. Comm. Fish., Dept. Nat. Resources, Bur. Ind. Aff., Econ. Dev. Adm., Off. Econ. Oppty., Dept. of Labor
c. <u>Proprietary</u> . Activity, serving the public, conducted on a self-supporting basis; e.g., municipal utilities, liquor monopolies, etc.	Dept. Nat. Resources

^{1/} From Lyden et al., see supra note 9. See also Appendix A for details on administrative and judicial activities, and functional effect associated with each form of governmental intervention.

- 1) In self-help, the governmental role is essentially passive. The process in this form can be tortuous and the standard at any point in time can be thoroughly ambiguous. (Further types of governmental action involve increasingly positive roles on the part of government institutions).
- 2) Governmental action designated under "coercive" emphasizes the central point that legal standards are established and enforced as an expression of the public interest. The coercive, non-determinative form is so designated because administrative activity is involved, but it is not conclusive.
- 3) The coercive, determinative form makes governmental action more conclusive. In use of the two subtypes under this form, administrative action becomes the central thrust for development and expression of public policy.
 - (a) Prior restraint: this form of governmental action can result in the tightest of controls.
 - (b) Corrective intervention: this form is especially applicable where the need is to explore toward a realistic balance between toleration and restraint, one that reflects a workable accommodation of private initiative and the general public interest.
- 4) Non-coercive forms of governmental action are so designated as they do not rely upon coercion as such. They fall into the three general categories of:
 - (a) Service
 - (b) Assistance
 - (c) Proprietary

All three involve direct action through the public sector to instigate the "public interest" in a positive way. In these, administration is dominant and administrative decision-making is controlling. Private rights are rarely affected.⁽¹⁰⁾

From Table 1 we see a mixture or combination of seven forms of action exercised by federal, state, and local agencies on the development, advancement, and management of aquaculture activities. Taking oyster culture by a private entrepreneur on public marine lands, as an example, these governmental actions represent:

- 1) Proprietary activity by the Department of Natural Resources through lease of public tidelands (essentially the purchase of a "right" to grow oysters).
- 2) Service, primarily in the form of research (oyster biology and pathology), extension services by the Department of Fisheries, Bureau of Commercial Fisheries, and the University of Washington, and the regional study function of the Puget Sound Governmental Conference.
- 3) Assistance, in the form of funds and research grants (federal-state-local-universities), in loans and subsidies to fishermen and to native Americans (for the latter through Bureau of Indian Affairs, Economic Development Administration, Office of Economic Opportunity, and the Department of Labor), and in the training of native Americans in oyster culture by the Bureau of Commercial Fisheries.

- 4) Control over private individuals is exercised through prior restraint by the issue of fishery licenses by the Department of Fisheries and permission from the Corps of Engineers on construction or placement of materials in navigable waters.
- 5) Corrective intervention is exercised by the Department of Fisheries on oyster seed transfer and plant. This form is also exercised by the Department of Health (federal and state) when oyster products do not meet health standards.
- 6) Violation of state fishery regulations is handled through the coercive, non-determinative form. The Department of Fisheries is the investigator and initiator of this action.
- 7) Self-help is exemplified by the recent civil action brought by abutting upland owners against a fisherman using the raft method of oyster culture. Complaint was primarily on grounds
(11)
of aesthetics.

Thus, even for a single private activity there are many forms of intervention exercised by public agencies in the policy process.

AQUACULTURE:PUBLIC POLICY PROCESS

Aquaculture in Puget Sound is not a new activity. The harvest of natural-bed oysters by small, commercial enterprises on tidelands privately owned or leased from the state dates back to the late 19th century. (12) Although government agencies were involved in the process, the policy in the past was essentially one of limited articulation and intervention on the part of public agencies with emphasis on service and proprietary forms of activities. Oyster fishermen were thus subject primarily to forces of our market economy. [For more recent years data for 1962-66 show average annual oyster production (meat weight) of the United States to be 56.2 million pounds and of Washington State, 8.0 million pounds, of which Puget Sound supplied 3.4 million pounds -- or 6 percent of the U.S. and 42 percent of the Washington State (13) productions.]

In recent years the policy and process have experienced changes and direction. The increasing concern for national and regional welfare and economy, in overall context of quest for health and environmental quality and awareness of ecological impacts, have prompted public agencies to greater participation and leadership in aquaculture. Based on their belief that (a) aquaculture can be an important source of sea food, (b) represents (14) an economically and politically advantageous form of fishery, and (c) is essentially a non-polluting use of water, proponents have begun to articulate the need for proper consideration of aquaculture as one of the desirable uses of Puget Sound. The patterns of behavior at present indicate attempted changes in policy toward expanded aquaculture activities but one under a framework of tighter governmental control on all potential uses of Puget Sound.

Expanded Aquaculture Activities

A survey on the potential of natural-bed oyster culture and of commercial clam operations on indian reservation tidelands was carried out in 1964 by the Washington State Department of Fisheries. The first articulation for expanded aquaculture in Puget Sound, however, appears to be the report issued in 1967 by the Washington State Department of Fisheries which indicated a potential raft culture acreage for oyster production in Greater Puget Sound alone of 187,408 acres. ⁽¹⁵⁾ ⁽¹⁶⁾

Next, apparently, is the series of preliminary bioeconomic reports of the Bureau of Commercial Fisheries, indicating for Puget Sound the potentials in production and economic benefits from (a) oyster production on 4,685 acres of raft, (b) production of marine protein concentrate from cultured mussels, (c) production of market oysters, oyster seeds, and salmonids using thermal power effluents, and (d) production of marketable size salmonids from controlled, saltwater rearing pens in the Sound. Pilot studies by the Seattle Biological Laboratory, BCF, are in progress on the latter. Potentials for shellfish (shrimp and others) culture is also expressed. ⁽¹⁷⁾

Expansion into sea-weed culture under the auspices of the Department of Natural Resources is evident. Experimental harvest of sea-weed by the Lummi Indians is in progress with statements by the Department on expanded sea-weed culture for industrial purposes. (See also Appendix B). ⁽¹⁸⁾

Aquaculture on the geoduck clam (in the form of semicontrolled rearing) is being initiated by the Washington State Department of Fisheries. Commercial harvest will be undertaken by private individuals obtaining a lease on marine beds from the Department of Natural Resources and a fishery license from the Department of Fisheries. ⁽¹⁹⁾

A private venture in oyster, rainbow trout, and sea-weed culture was recently undertaken in the Bellingham area of Puget Sound by the Lummi Indians. Research by and administrative and financial assistance of many federal and state agencies underlie this aquaculture project (see page 7). Concern is felt by some, however, that present operations should be augmented by additional bioeconomic studies on its operations and market before Phase II of their aquaculture project plan (construction of a dyke) is put into operation.⁽²⁰⁾

Lastly, a concept of oyster culture, but for harvest by the public, is expressed as a possible alternative aquacultural use of some of the state tidelands.⁽²¹⁾

The foregoing activities indicate increased interest in aquaculture by public agencies who are the prime forces in the policy process. There was general agreement among all interviewed for this research report that the multiple-use concept needs to be employed for Puget Sound, but that aquaculture must also be given proper consideration in planned uses of the Sound. Perceptions as to types and magnitude of aquaculture activities for the Sound, however, differed among those interviewed. Differences appear to be a function of orientation and belief of the individuals. For example, Dr. T. Joyner of the Bureau of Commercial Fisheries operates in the context of national fishery needs and goals. This is implied from his expressions of (a) increasing world competition for fish and shellfish products and thus concern as to the effect on U.S. consumers, (b) declining domestic production, especially of oysters from the eastern coast of the U.S., (c) increasing import into the U.S. of fishery products capable of culture in the Sound, (d) advantage of

aquaculture in the Sound in the form of protection from foreign activities, and (e) a strong personal conviction that national and regional welfare and economy will greatly benefit by primary use of the resource (Puget Sound) for seafood production. At state and local levels, however, orientations and beliefs, by necessity, would largely be in terms of state or community needs and welfare. Aquaculture, therefore, would be viewed more in those terms.

Present research and development is directed at information on the feasibility of various types of aquaculture through pilot operations. In the context of multiple-use of the Sound, studies are underway on (a) the hydrodynamics of the Sound to determine suitable areas for aquaculture based on temperature, flow, and current properties, (b) an inventory on location and movement of effluents such as oil which may affect fish and shellfish, and (c) an expressed need for a comprehensive inventory on Puget Sound resources and their users.

As to cooperation and coordination of research and development activities directed at expansion of aquaculture in Puget Sound, the general consensus of those interviewed was that it exists to some degree but, admittedly, a concerted effort is improbable in view of the realities of tradition, jurisdictional matters, administrative policies, individual orientations and beliefs, and the like. The vehicle for aquaculture policy expression by proponents appears to be primarily through informal channels at present -- personal contacts, seminars, meetings, and unpublished reports.

The fishing industry, general public, and interest groups (industrial and social) appear not to be involved in the policy process to any great degree. Aquaculture in Puget Sound is not as visible, nor emotional an issue as, say, negative aspects such as potentials of oil pollution (see Appendix C). It is indicated, however, that some influential social groups, such as the Washington Environmental Council and the League of Women Voters, are showing increased and favorable interest in aquaculture. (26) These, along with legal, economic, social, and political aspects of the policy process are discussed in a later section of this report.

Governmental Intervention

A new actor has entered the policy field and process in the form of the newly created (but not yet operational) Washington State Department of Ecology (Chapter 62, Laws of 1970, State of Washington; Senate Bill No. 1, Second Extraordinary Session, 41st Legislature. See Appendices D and E). This agency will be exercising many of the major forms of governmental actions (described earlier on pages 7-8 and in table 1) on air and water resources of the state. Indicative of the legislative mood and direction is the overwhelming votes in the final passage of the bill in both House and Senate (see Appendix E). Greater authority is anticipated for this agency in relation to legislative attempts at reserving broad seacoast management functions for the state.

Recognition of aquaculture by the political community is indicated by its classification, among others, as one of the "desirable and appropriate uses" of the seacoast of the State of Washington (Senate Bill No. 6 and House Bill No. 58, Second Extraordinary Session, 41st

Legislature, State of Washington. See Appendix F and G). The bill was passed by the House in the third reading as amended (yeas, 65; nays, 27; absent, 7) but in the Senate the bill, by resolution, was indefinitely postponed after first reading and referral to the Departments of Natural Resources, Fisheries, and Game (see Appendix H and I). The bill is reported undergoing redraft by a committee. What changes are being made in the bill are not known to the writer.

Based on the content of the original bill, however, it appears that its passage will result in tighter as well as centralized control over uses of the Sound under one state agency. A digest of the bill reads:

"Declares that the preservation and management of the seacoast is in the public interest and provides for program of seacoast management and control so that its value as a public resource is not impaired.

Establishes the limits of the seacoast subject to management by the state department of environmental quality, requires the department to establish guidelines for seacoast management, development, and protection; requires local governments and individuals to comply with these guidelines and other rules and regulations of the department; establishes procedure for requiring legal compliance with this act; establishes penalties for violations of this act.

Requires the department to establish councils to promote better understanding of its activities and to achieve cooperation between affected public agencies and private parties.

Provides that in the event the department of environmental quality is not enacted by the legislature prior to the effective date of this act, the powers and duties given by this act shall be given to such an agency as designated by the governor.

Declares an emergency and provides that this act shall take effect immediately and shall be known as the "Seacoast Management Act of 1970." (Underline mine. See also Appendix H or I).

If the authority structure does not change in the redraft of the bill, then the effect of the bill on the traditional local autonomy of counties and municipalities is clearly indicated. The Department of Natural Resources of the State Land Commission will be affected also, in part. Lease or sale of state marine lands will probably have to follow the guidelines of the Department of Ecology into which they themselves will have input.

Assuming a passage of the seacoast bill as presented essentially in the original form, the policy on aquaculture and formal statement thereof (from the department vested with this authority) will be shaped by the confluence of values that will go into the development of guidelines -- the beliefs of individuals in government agencies (federal, state, and local) and of competing users in the areas of commerce, industry, recreation, fishery, and aesthetics. (This is a euphemism ^{my} on part to describe what is in reality the sociopolitical community characterized by brokerage politics, interest group articulations, power plays, professionalism, and the like.

For aquaculture it was indicated earlier that a change in policy to that of expanded aquaculture in Puget Sound has emerged under the leadership of some government agencies and individuals. Favorable interest is also being generated by several social groups. As stated in the introduction of this report, however, a public policy process is a confluence of behavior patterns. What, then, are some of the other value expressions which may affect the policy process on aquaculture? These are covered briefly in the following section.

AQUACULTURE: SUPPORT AND CONSTRAINT

The policy field is composed of many groups competing for the uses of Puget Sound. Each use is, to some degree, subject to governmental intervention. Competing uses and governmental intervention are thus sources of support or constraint of an individual activity in the policy process. For aquaculture a brief examination is made here as to types and sources of support and constraint under the general headings of legal, economic, social, and political.

Legal Aspects

Support: By law fish and shellfish are legitimate users of waters of the state. ⁽²⁷⁾ Currently the oyster, mussel, salmon, and most species of shellfish are classified as food fishes of the State of Washington and implies a legitimization of their commercial undertaking under the management of the Department of Fisheries. ⁽²⁸⁾ Trout is classified as a game fish of the state, and management over commercial, saltwater culture is under the Department of Game.

Constraint: Although salmon are food fish thus open to commercial enterprise, there is the problem of their implementation, as the concept of private ownership (or private stock of salmon) embodied in the saltwater rearing approach is contrary to existing laws. Current conditions would also restrict the sale or transfer of salmon spawners, eggs, or fry ⁽²⁹⁾ (which are state property) to private individuals.

Economic Aspects

Support: Economic feasibility of expanded commercial application of aquaculture in Puget Sound is indicated, in part, by the preliminary estimates (especially of the Bureau of Commercial Fisheries) showing economic potentials of oyster production from raft culture, marine protein concentrate from cultured mussels, and production of oyster, oyster seed, and salmonids through utilization of thermal power effluents. Market potentials are also indicated in the demand projections for major U.S. fishery products of the Bureau of Commercial Fisheries (see Appendix J). Studies and pilot operations are underway to further isolate and define bioeconomic variables.

Constraint: Private enterprise appears not to have responded to any great degree at present (exception is the Lummin Indian aquaculture project). Aquaculture will require substantial investment, and market mechanisms must be set up as well. The primary source of constraint may be a combination of economics and attitudes of the fishermen themselves. On oyster culture, it was reported that some natural-bed oyster fishermen view the incremental increase in production and attending revenues from a change to raft culture as not worth the economic and social costs. Tradition, along with comfortable incomes and least demand on their time from natural-bed oyster operations are some of the attitudes underlying their views. For salmon aquaculture, strong opposition may come from traditional salmon fishermen and their associations as this presents new competition (perceived as economic threat) to their activities and market; even though proponents of salmon aquaculture show that the

trout-size salmon is for a new "gourmet" market and one to be supplied primarily during the off-season of the regular salmon fisheries. (31)

Opposition may also come from freshwater trout enterprises as well as from other competing non-fish industries.

Social Aspects

Support: The apparently favorable interest in aquaculture currently expressed by social groups such as the Washington Environmental Council and League of Women Voters would lend support to proponents in the policy process. In context of growing concern for environmental quality, the multitude of social groups emerging into the overall policy field may be additional sources of support for aquaculture -- a support, however, that may be influenced not by a genuine belief in aquaculture but as a tool against other uses of Puget Sound viewed as destructive in their beliefs.

Constraint: Realities are that visibility and proximity of events serve to effect great impact on individual and group behavior. Thus, benefits to the national and state welfare and economy from aquaculture may not be as visible, nor appear to be of immediate benefit to individuals and groups in the social sector of society. For example, "conservation" groups may initially support aquaculture, but a perceived or actual visual impact of , say, large expanses of rafts may cause a complete reversal of their position. (32) There was general agreement on the part of all interviewed that some opposition to aquaculture can be expected from the recreation group (swimming, boating, water skiing, scuba diving, or sport fishing) and strong opposition from abutting upland owners, primarily on grounds of aesthetics.

Political Aspects

Support: Generally, some support by the legislature is evident by the inclusion of "aquaculture" as a desirable and appropriate use in the Seacoast Management Bill. Intensity of support may depend, however, on the type, magnitude, and location of the enterprises. Assuming the authors of the bill in both House and Senate (see Appendix F and G) to be the leaders, as first approximation, support for aquaculture may be found in some of them.

Constraint: It is assumed that constituent needs and wants will primarily influence members of the political community in their support of or opposition to aquaculture in the policy process. An example would be the possible opposition from a public agency, the Washington State Parks and Recreation Commission.

SUMMARY

In the past, aquaculture in Puget Sound was limited to commercial enterprises on natural-bed oyster culture. Although government agencies were involved in the process, public policy was essentially one of limited articulation and intervention by government agencies with emphasis on service and proprietary forms of activities.

In recent years the policy and process have experienced changes and direction. The increasing concern for national and regional welfare and economy, in overall context of quest for health and environmental quality and awareness of ecological impacts, have prompted public agencies to greater participation and leadership in aquaculture. The pattern of behavior

at present indicates attempted changes in policy toward expanded aquaculture activities (oyster, mussel, clam, shellfish, salmonids, sea-weed), but under a framework of tighter governmental control (by Washington State agencies) over all potential uses of Puget Sound resources.

Aquaculture in Puget Sound is not a visible nor emotional issue at present. Increased awareness of plans for or actual expansion of aquaculture, however, will bring into the policy field and process both support and constraint associated with the legal, economic, social, and political aspects of aquaculture as a competing use of Puget Sound. The confluence of these behavior patterns will shape the policy on any full-scale commercial application of aquaculture in Puget Sound.

NOTES

- (1) Our Nation and the Sea, Report of the Commission on Marine Science, Engineering and Resources. 91st Congress, 1st Session, House Doc. No. 91-42 at 12 (1969).
- (2) Id. at 12.
- (3) Id. at 12.
- (4) M. Kroll, Policy and Administration, in Policies, Decisions and Organization (F. J. Lyden, G. A. Shipman and M. Kroll ed. 1969) at 9.
- (5) Natural Resources of Washington, U.S. Dept. of Int., Off. of Secty., Div. of Info. at 26 (1970).
- (6) Perspectives: 1968 Annual Report, Puget Sound Governmental Conference, Seattle, Wash. at 22 (1969).
- (7) Class notes, Law 574, Natural Resources Law, School of Law, Univ. of Wash., Fall Qtr., 1969.
- (8) B. Cole, Commentary, State-Owned Marine Lands Under DNR Multiple-Use Management. The Totem, Vol. 12, No. 1, Jan. 1970. Dept. of Natural Resources, St. of Wash.
- (9) Froms of governmental intervention were taken from J. Lyden, G. A. Shipman, and R. W. Wilkinson, Jr., Decision-Flow Analysis: A Methodology for Studying the Decision-Making Process, Graduate School of Public Affairs, Univ. of Wash., 5-10 (-965). Processed report.
- (10) Lyden et al., see supra note 9.
- (11) T. Joyner, Bur. Comm. Fish., personal interview.
- (12) D. Jamison, Dept. of Natural Resources, and C. Lindsay, Dept. of Fish., personal interview.
- (13) Estimated from Fishery Statistics of the United States, Bur. Comm. Fish., U.S.F.W.S., 1962-1966.
- (14) Political advantage in terms of protection from foreign fisheries since aquaculture is primarily an inside territorial water activity.
- (15) R. Westly, C. Lindsay, and C. Woelke, Shellfish Culture Potential: Swinomish and Lummi Reservation Ridelands. Wash. St. Dept. Fish., Res. Div., May 1964. Contract No. 14-20-0500-1623, Bur. of Indian Affairs, U.S. Dept. of Int. Processed.

- (16) R. E. Westley, The Oyster Producing Potential of Puget Sound, Wash. St. Dept. Fish., Res. Div., Aug. 1967.
- (17) T. Joyner, Improvement of Coastal & Estuarine Living Resources: Shellfish Culture in the Pacific Northwest (Nov. 1968); Competing Uses of Environment: Use of Thermal Power Effluents for Oyster Seed Production (Feb. 1969); and Artificial Propagation -- Rearing: Salt-Water Rearing of Salmonids (Apr. 1969). Bur. Comm. Fish. Form 2-116, Program/Project Proposal (Processed).
- (18) D. Jamison, see supra note 12. See also supra note 8.
- (19) C. Lindsay, see supra note 12.
- (20) T. Joyner, see supra note 11, and C. Lindsay, see supra note 12.
- (21) C. Lindsay, see supra note 12.
- (22) T. Joyner, see supra note 11.
- (23) Id.
- (24) Id.
- (25) D. Jamison, see supra note 12.
- (26) T. Joyner, see supra note 11.
- (27) C. Lindsay, see supra note 12.
- (28) See Washington Administrative Code, Chapter 220. Specifically, WAC 220-12-010, Classification -- Food Fish, 220-12, pp. 1-4, Feb. 1969.
- (29) C. Lindsay, see supra note 12.
- (30) T. Joyner, see supra note 11.
- (31) Id.
- (32) T. Joyner, see supra note 11, and C. Lindsay, see supra note 12.

APPENDICES

(AQUACULTURE IN PUGET SOUND: AN EMERGING PUBLIC POLICY ISSUE)

Appendix A - Major forms of governmental intervention.

- " B - Commentary. Land Commissioner, Bert Cole.
- " C - Seattle newspaper articles on oil activities in Puget Sound.
- " D - Chapter 62, Laws of 1970, Washington State. Sections 1 and 2.
- " E - Digest of Senate Bill No. 1, State of Washington, 41st Legislature.
- " F - Senate Bill No. 6, State of Washington, 41st Legislature.
- " G - House Bill No. 58, State of Washington, 41st Legislature.
First page only.
- " H - Digest of Senate Bill No. 6, State of Washington, 41st
Legislature.
- " I - Digest of House Bill No. 58, State of Washington, 41st
Legislature.
- " J - Demand projections for major U.S. fishery products to the
year 2000.