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AQUACULTURE DOCUMENTS

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HEARINGS

BEFORE THE

SUBCOMMITTEE ON AGRICULTURAL RESEARCH
AND GENERAL LEGISLATION

OF THE

COMMITTEE ON AGRICULTURE,
NUTRITION, AND FORESTRY
UNITED STATES SENATE

NINETY-FIFTH CONGRESS

SECOND SESSION

ON

S. 1043

A BILL TO PROVIDE FOR THE DEVELOPMENT OF AQUACUL-
TURE IN THE UNITED STATES, AND FOR OTHER PURPOSES,

S. 2218

A BILL TO ESTABLISH A NATIONAL AQUACULTURE POLICY,
ASSESS THE STATUS OF THE AQUACULTURE INDUSTRY,
ESTABLISH A STRATEGY TO PROMOTE THE DEVELOPMENT
OF AQUACULTURE IN THE UNITED STATES, AND FOR OTHER
PURPOSES, AND

S. 2762

A BILL TO PROVIDE FOR THE DEVELOPMENT OF AQUACUL-
TURE IN THE UNITED STATES, AND FOR OTHER PURPOSES

APRIL 18 AND 20, 1978

Printed for the use of the Committee on Agriculture, Nutrition, and Forestry



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AQUACULTURE

TUESDAY, APRIL 18, 1978

U.S. SENATE,
SUBCOMMITTEE ON AGRICULTURAL RESEARCH
AND GENERAL LEGISLATION OF THE
COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY,
Washington, D.C.

The subcommittee met, pursuant to notice, at 11:15 a.m. in room 324, Russell Senate Office Building, Hon. Richard Stone presiding.
Present: Senators Stone and Lugar.

STATEMENT OF HON. RICHARD B. STONE, A U.S. SENATOR FROM FLORIDA

Senator STONE. Ladies and gentlemen, this will convene the hearing on aquaculture of the Subcommittee on Agricultural Research and General Legislation of the Committee on Agriculture, Nutrition, and Forestry.

I want to start by apologizing to you all for the late and delayed start of this hearing. We did not realize that the Senate would schedule back-to-back rollcall votes on a 10-minute basis, starting shortly after 9 this morning. Senator Lugar and I both want to apologize to you all for having kept you waiting.

We will go as fast as we can. Unfortunately, it looks like we are going to be interrupted. But we have at least a half an hour or maybe more until the next rollcall vote.

I would like to start by making a few opening remarks to help us structure these hearings.

It is a pleasure for me to open these aquaculture hearings. As the author of S. 2218 and the chairman of the Subcommittee on Foreign Agriculture, I appreciate greatly the potentials of aquaculture for our country and for the world.

This food source and the cultural practices involved are nearly as old as civilization. But aquaculture has not been exploited, nor has its potential been realized.

When I introduced S. 2218, I suggested that aquaculture and agriculture were the right and left hands of food production, and I continue to believe this. When we talk about aquaculture, we are basically talking about the production of food.

I know that we have several nonfood activities in aquaculture, just as we have nonfood agricultural enterprises. For instance, in my home

State of Florida, we have a multimillion-dollar business in ornamental fish.

We also have a significant aquaculture industry in the production of bait, primarily minnows. There is also the potential of using aquatic plants in water pollution control systems to remove the various materials.

However, the overriding factor that will give impetus to aquaculture is the potential to produce food—especially high-quality protein. This fact is true of aquaculture in fresh, marine, and brackish waters.

When we look to world aquaculture's prime contribution, it is again food. Many of our protein-deficit regions could adapt aquacultural systems to their economies and climates, and provide themselves with high-quality protein.

In the executive branch there are three agencies that have responsibilities and programs dealing with aquaculture. These include the Department of Commerce, which has had significant experience with the marine fisheries, as well as the research grants effort of the sea grant program.

The Department of the Interior has worked for many years to supplement and maintain the stocks and quality of fish in our freshwater. While the principal effort was to help sport fishing, Interior's specie selection and fish genetics work is the basis for many of the currently cultured species. The third is the Department of Agriculture.

The Department of Agriculture has had relatively limited direct work with aquaculture species. However, there are numerous support functions which have been vitally important to the development of aquaculture in the United States. First, the Soil Conservation Service has devoted a significant amount of effort to the development of raceways and ponds.

The Farmers Home Administration has made loans to aquatic enterprises, and it continues to be a source of credit for starting aquatic enterprises.

Farmers Home also provides emergency loans to aquaculture producers on the same terms as they provide these loans to agriculture producers.

The food processing and distribution work of the Department of Agriculture is as applicable to aquatic foods as it is to terrestrial foods.

However, the greatest amount of aquaculture work is done through the cooperative State research at the land-grant universities—many of which are also sea-grant institutions.

I am very pleased that we will have witnesses on Thursday from three of these institutions, including the University of Florida, Auburn University, and the University of Delaware.

The Farm Credit System, once very closely tied to the Department of Agriculture but now a privately funded lending institution, has been very active in supporting aquaculture.

It is my understanding that the Farm Credit System has some \$70 to \$80 million in aquaculture loans outstanding at this time, and I am happy that the Farm Credit System will be testifying today.

Ladies and gentlemen, I am extremely impressed with the need for a coordinated and balanced national program for aquaculture.

I realize that there is now significant debate about who should be the czar of the fishes and we have become embroiled in a battle for surf and turf. However, at least all concerned do recognize the potential of aquaculture. When we tally current legislative authorities, it is clear that we have more tools than have yet been used. We need to coordinate these dispersed efforts. I am also sure there are numerous inadequacies in the current authorities. However, the best solutions are not always the most glamorous or the most complex.

Nor can I see how anyone will be served by applying the wisdom of Solomon and splitting the baby. I personally believe there is basis for sharing the baby, but I also think we need to identify a guardian of these programs.

Today we are looking at several legislative initiatives, including S. 2218, S. 1043, S. 2762, S. 2582 and H.R. 9370, as we seek the best legislative approach to support aquaculture in the United States.

However, the legislative responsibility is not only to pass good laws. In addition, it requires vigorous oversight of these laws to see that they are effectively carried out.

Part of the current failure of aquaculture development is the failure of Congress to fulfill this latter role of oversight.

In the future we are going to need to do the oversight to see that legislative packages are carried out. Oversight is not as much fun as creating new programs. However, it can be even more important.

I call on each witness today to assess as honestly and objectively as possible what they believe to be the best direction for this Nation to proceed to help aquaculture flourish in America.

I also want to remind the witnesses that the Government of the United States is not many little governments, but in fact a single government with the singular purpose of helping all of the people of this Nation—and, I might add, as efficiently and effectively as possible.

Senator LUGAR, I call on you for any opening remarks.

Senator LUGAR. I have no statement. I look forward, as you do, Mr. Chairman, to the testimony we are going to hear this morning.

Senator STONE. Thank you, Senator Lugar.

At this point I will insert copies of S. 1043, S. 2218, and S. 2762 along with a Department of Agriculture report on S. 1043.

[The bills and report follow:]

95TH CONGRESS
1ST SESSION

S. 1043

IN THE SENATE OF THE UNITED STATES

MARCH 18 (legislative day, FEBRUARY 21), 1977

Mr. BENTSEN (for himself, Mr. ALLEN, Mr. CRANSTON, Mr. GRAVEL, Mr. HATFIELD, Mr. INOUE, Mr. JOHNSTON, Mr. LONG, Mr. MATSUNAGA, Mr. STONE, and Mr. WEICKER) introduced the following bill; which was read twice and referred to the Committee on Agriculture, Nutrition, and Forestry

A BILL

To provide for the development of aquaculture in the United States, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*
3 That this Act may be cited as the "National Aquaculture
4 Organic Act of 1977".

FINDINGS AND STATEMENT OF PURPOSE

5 SEC. 2. (a) The Congress finds that—
6 (1) the world production of seafood has declined
7 since 1970 and that the harvest of some populations of
8 fish and shellfish have exceeded levels of maximum sus-
9 tainable yield;
10

II

1 (2) certain stocks of fish and shellfish of importance
2 to the United States are depleted, or are declining, and
3 such depletion or decline has an undesirable impact on
4 both commercial and recreational fisheries;

5 (3) there is an extensive market for seafood in the
6 United States, but the United States imports 50 per
7 centum of its fish and shellfish for human consumption,
8 and this dependence on imports as a source of protein
9 makes it difficult to insure continuous supplies and
10 suggests that alternatives such as aquaculture be de-
11 veloped;

12 (4) aquaculture is contributing significantly to the
13 economies of many countries; for example, Japan and
14 Czechoslovakia rely on aquaculture for over 10 per
15 centum of their total fisheries production, whereas less
16 than 3 per centum of the United States fisheries produc-
17 tion results from aquaculture;

18 (5) the stocking of advanced life stages of fish and
19 shellfish produced by aquaculture is a means of rebuild-
20 ing and augmenting fish and shellfish populations and
21 establishing new fisheries;

22 (6) where as commercial fishing suffers from an-
23 nual fluctuation in the natural supply of fish and shell-
24 fish, and these supplies could be stabilized by the stock-
25 ing of juvenile fish and shellfish by aquaculture;

1 (7) the application of aquaculture technology offers
2 opportunities for the recovery of thermal energy, nutri-
3 ents, and other resources, generated by nuclear, con-
4 ventional, ocean upwelling, and other current and poten-
5 tial energy production methods;

6 (8) lands and waters, whether fresh, brackish, or
7 marine, which are suitable for aquaculture are diminish-
8 ing, and those which are so suitable are underutilized;

9 (9) current efforts to develop aquaculture in the
10 United States are highly diffuse, and a strong commit-
11 ment by the Federal Government could make aquacul-
12 ture more efficient and competitive, thereby stimulating
13 public and private investment and development;

14 (10) while many scientific and technological prob-
15 lems are unsolved, there is sufficient knowledge to fur-
16 ther the development of aquaculture production systems
17 for many species of fish and shellfish;

18 (11) that the lack of marketing knowledge and
19 application has frustrated the proper fulfillment of com-
20 mercial aquaculture ventures; and

21 (12) that the Federal funding levels for aquacul-
22 tural research have never been commensurate with
23 needs, and new research initiatives are necessary to re-
24 duce uncertainty in aquaculture developments.

25 (b) The purposes of this Act are to promote commercial

1 aquaculture in the United States by establishing and imple-
2 menting a national plan for aquaculture in order to develop
3 programs and to encourage activities which will result in the
4 coordination of domestic aquaculture efforts, the conservation
5 and increased availability of fisheries resources, the creation
6 of new industries and job opportunities, and other national
7 benefits.

8 DEFINITIONS

9 SEC. 3. As used in this Act the term—

10 (1) "Secretary", when used alone, means the
11 Secretary of Commerce;

12 (2) "aquaculture" means the propagation and
13 rearing of aquatic species in controlled or selected
14 environments;

15 (3) "aquaculture facility" means any land, water
16 area, structure, or other appurtenance used for aquacul-
17 ture, including, but not limited to, any laboratory, hatch-
18 ery, rearing pond, raceway, pen, incubator, or other
19 equipment;

20 (4) "aquatic species" means any species of finfish,
21 mollusk, or crustacean (or other invertebrate), amphi-
22 bian, reptile, or aquatic plant;

23 (5) "fund" means the Federal Aquaculture Assist-
24 ance Fund established by section 9;

1 (6) "person" means any citizen of the United
2 States;

3 (7) "citizen of the United States" means any per-
4 son who is a United States citizen by law, birth, or
5 naturalization, any State, any agency of a State or a
6 group of States, or any corporation, partnership, or asso-
7 ciation organized under the laws of any State which
8 has as its president or other chief executive officer and
9 as its chairman of the board of directors, or holder of
10 a similar office, a person who is a United States citizen
11 by law, birth, or naturalization, and which has at least
12 75 per centum of the interest of therein owned by citi-
13 zens of the United States. Seventy-five per centum of
14 the interest in the corporation shall not be deemed to
15 be owned by citizens of the United States—

16 (A) if the title to 75 per centum of its stock is
17 not vested in such citizens free from any trust of
18 fiduciary obligation in favor of any person not a
19 citizen of the United States;

20 (B) if 75 per centum of the voting power in
21 such corporation is not vested in citizens of the
22 United States;

23 (C) if through any contract or understanding
24 it is so arranged that more than 25 per centums of

1 the voting power may be exercised, directly or
2 indirectly, in behalf of any person who is not a
3 citizen of the United States; or

4 (D) if by any other means whatsoever con-
5 trol of any interest in the corporation in excess of
6 25 per centum is conferred upon or permitted to
7 be exercised by any person who is not a citizen of
8 the United States;

9 (8) "State" means any of the several States, the
10 District of Columbia, the Commonwealth of Puerto
11 Rico, American Samoa, the Virgin Islands, Guam, and
12 any other Commonwealth, territory, or possession of
13 the United States; and

14 (9) "United States", when used in a geographical
15 context, means all States.

16 NATIONAL AQUACULTURE DEVELOPMENT PLAN

17 SEC. 4. (a) (1) Within one year after the date of
18 enactment of this Act, the Secretary of Commerce after
19 consultation with the Secretary of Agriculture and the Sec-
20 retary of the Interior, shall by regulation establish a
21 National Aquaculture Development Plan (hereinafter in
22 this Act referred to as the "plan"). The Secretary shall give
23 interested individuals an opportunity to participate in the
24 rulemaking (with opportunity for oral presentation) with

1 respect to the plan in such areas of the United States as he
2 deems appropriate.

3 (2) (A) After consultation with the Secretary of the
4 Interior and the Secretary of Agriculture, the Secretary of
5 Commerce shall establish, and appoint members of such
6 advisory committees as he deems appropriate to assist in
7 the initial development of the plan. Individuals appointed
8 to such committees shall be knowledgeable or experienced
9 in the principles or practices of aquaculture. The committees
10 shall include, but not be limited to, representation from
11 research, scientific, and educational institutions, the fishing
12 and aquaculture industries, and other private industries.

13 (B) While away from their homes or regular places of
14 business in the performance of services on any advisory com-
15 mittee established pursuant to paragraph (2) (A), mem-
16 bers of the committee shall be allowed travel expenses,
17 including per diem in lieu of subsistence, in the same manner
18 as persons employed intermittently in the Government serv-
19 ice are allowed expenses under section 5703 (b) of title 5
20 of the United States Code.

21 (b) The plan shall—

22 (1) identify each aquatic species (hereafter referred
23 to in this Act as "priority aquatic species") which the

1 Secretary determines can be cultured on a commercial
2 basis, after taking into account—

3 (A) the extent of commercial aquaculture, if
4 any, currently being carried out with respect to such
5 species, and the projected economic feasibility of
6 culturing such species;

7 (B) the extent to which aquaculture research
8 and development have been undertaken, within the
9 public and private sectors, with respect to such
10 species;

11 (C) the time and resources which will be re-
12 quired to develop aquaculture technology to the point
13 where the species can be cultured on a commercial
14 basis; and

15 (D) such other factors as the Secretary deter-
16 mines to be appropriate;

17 (2) contain a program of aquaculture development
18 for each priority aquatic species; and

19 (3) contain a program for providing technical,
20 economic, and marketing advisement to those involved
21 in aquacultural production.

22 (c) The program contained in the plan for each priority
23 aquatic species shall set forth those actions which the Secre-
24 tary determines should be undertaken, and the period of
25 time within which each such action should be completed, to

1 encourage the culture, processing, and marketing of each
2 such species on a commercial basis. Such actions, with respect
3 to each priority aquatic species, shall include—

4 (1) such research and development as may be
5 necessary and appropriate regarding—

6 (A) aquaculture facility design and operation,

7 (B) water quality management,

8 (C) utilization of waste products (including
9 thermal effluents),

10 (D) nutrition and the development of economic
11 feeds, and

12 (E) life history, genetics, physiology, and
13 pathology, and disease control (including research
14 regarding organisms which may not be harmful to
15 fish and shellfish but are injurious to humans);

16 (2) research with respect to processing and market-
17 ing;

18 (3) research with respect to production manage-
19 ment and quality control;

20 (4) the construction, purchase, lease, or acquisition
21 of necessary research and/or developmental aquaculture
22 facilities; and

23 (5) such other actions as the Secretary deems nec-
24 essary and appropriate.

1 (d) In preparing a program under the plan for any
2 priority aquatic species, and in reviewing any such program
3 pursuant to subsection (e), the Secretary shall, to the extent
4 practicable, take into account any significant action which
5 has been, or which is proposed to be, undertaken by any
6 other Federal or State agency or by any person, which may
7 affect the accomplishment of the program.

8 (e) (1) The Secretary shall review on an annual basis—

9 (A) each aquatic species not identified as a priority
10 aquatic species; and

11 (B) the program established under the plan for
12 each priority aquatic species to determine whether the
13 actions specified in the program are being accomplished
14 on a successful and timely basis.

15 (2) If as a result of the review conducted pursuant to
16 paragraph (1) (A), the Secretary finds that any aquatic
17 species can be cultured on a commercial basis after taking
18 into account the criteria set forth in subsection (b) (1), the
19 Secretary after consultation with the Secretary of Agriculture
20 and the Secretary of the Interior, shall by regulation amend
21 the plan to identify such species as a priority aquatic species
22 and establish a program for such species pursuant to sub-
23 section (c).

24 (3) If as a result of the review conducted pursuant to
25 paragraph (1) (B), the Secretary finds that—

1 (A) any action so specified should be revised, the
2 Secretary shall make such revisions as he deems neces-
3 sary and appropriate; or

4 (B) sufficient progress is not being made with
5 respect to any such program or that actions taken under
6 any such program indicate that culture of the priority
7 aquatic species concerned on a commercial basis is doubt-
8 ful, the Secretary after consultation with the Secretary of
9 Agriculture and the Secretary of the Interior, shall can-
10 cel the program.

11 FUNCTIONS

12 SEC. 5. (a) The Secretary in cooperation with the Sec-
13 retary of Agriculture and the Secretary of the Interior shall—

14 (1) implement the plan established pursuant to
15 section 4;

16 (2) provide advisory, educational, marketing, and
17 technical services (including training) with respect to
18 aquaculture to interested public and private organizations
19 and individuals, but in providing such services, shall, to
20 the maximum extent practicable, avoid duplication of like
21 services regarding aquaculture which are provided by
22 other Federal agencies;

23 (3) consult and cooperate with interested persons,
24 Federal, State, and local government agencies, regional

1 commissions, and educational institutions regarding the
2 development of aquaculture technology;

3 (4) identify legal and regulatory constraints which
4 inhibit the development of aquaculture;

5 (5) establish and maintain a public aquaculture
6 information center which shall function as a national
7 clearinghouse for the collection, selection, analysis, and
8 dissemination of scientific, technical, legal, and economic
9 information relating to aquaculture;

10 (6) maintain an inventory of public and private
11 aquaculture being carried out in the United States with
12 respect to each aquatic species, which shall include, but
13 shall not be limited to, information on acreages, water
14 use, production, marketing, and culture techniques;

15 (7) arrange for the mutual exchange of information
16 relating to aquaculture with foreign nations;

17 (8) coordinate with the Environmental Protection
18 Agency to investigate the utilization of aquacultural and
19 other forms of waste water in carrying out the purposes
20 of this Act; and

21 (9) prescribe such regulations as may be necessary
22 to carry out the provisions of this Act.

23 (b) The Secretary in cooperation with the Secretary of
24 Agriculture and the Secretary of the Interior may—

1 (1) for the purpose of assessing the economic feasi-
2 bility of any aquaculture system—

3 (A) conduct scale tests of the system, and, if
4 necessary for the conduct of any such test, construct,
5 operate, and maintain developmental aquaculture
6 facilities; and

7 (B) conduct such other tests or analyses as may
8 be necessary;

9 (2) develop methods to enhance and stabilize nat-
10 ural fish and shellfish stocks by aquaculture;

11 (3) carry out such studies and research with respect
12 to aquatic species as may be appropriate regardless of
13 whether such species is or has been identified as a pri-
14 ority aquatic species; and

15 (4) take such other actions as the Secretary deems
16 necessary and appropriate to carry out the purposes of
17 this Act.

18 COORDINATION OF FEDERAL AGENCY ACTIVITIES

19 REGARDING AQUACULTURE

20 SEC. 6. (a) (1) There is established the Interagency
21 Committee on Aquaculture (hereafter in this Act referred
22 to as the "Committee") which shall be composed of the fol-
23 lowing officers or their designees:

1 (A) The Secretary of Commerce, who shall be the
2 Chairman of the Committee.

3 (B) The Secretary of the Interior.

4 (C) The Secretary of Agriculture.

5 (D) The Administrator of the Environmental Pro-
6 tection Agency.

7 (E) The Administrator of the Energy Research
8 and Development Administration.

9 (F) The Commissioner of Food and Drugs.

10 (G) The chief executive officer of any other
11 Federal agency which the committee finds to have
12 significant functions which relate, or may relate, to
13 the development and implementation of aquaculture.

14 (2) The functions of the committee shall be—

15 (A) to insure that there is a continuing exchange of
16 information among the agencies represented on the com-
17 mittee with respect to the nature and status of the pro-
18 grams or projects being carried out by such agencies
19 which relate, or which may apply, to aquaculture in gen-
20 eral or to the implementation of the plan;

21 (B) to review on a continuing basis the relevant pro-
22 grams and projects of all Federal agencies to determine
23 whether they are being carried out in compliance with
24 subsection (b); and

25 (C) to keep informed of and provide encourage-

1 prescribe as being necessary and appropriate to protect the
2 interests of the United States; except that no contract may
3 be entered into, and no grant may be made, pursuant to
4 this section unless the applicant submits with his application
5 therefor a certification from each appropriate State agency
6 and each appropriate local government agency stating that
7 nothing in the laws administered by such agency prevents
8 the carrying out of the project to which the contract or
9 grant will be applied.

10 (c) The amount of any grant made pursuant to this
11 section (other than a grant made to support a program of
12 research by a public agency or educational institution), shall
13 not exceed 50 per centum of the estimated cost of the proj-
14 ect for which the grant is made.

15 (d) Any person who receives a grant or contract under
16 this section shall make available to the Secretary and to the
17 Comptroller General of the United States, or any of their
18 authorized representatives, for purposes of audit and ex-
19 amination, any books, documents, papers, and records that
20 are pertinent to the funds received by such person under
21 such grant or contract.

22 LOAN GUARANTEES OF OBLIGATIONS ISSUED FOR

23 AQUACULTURE FACILITIES

24 SEC. 8. (a) (1) The Secretary may, subject to the pro-
25 visions of this section, guarantee, or make a commitment to
26 guarantee, the payment of interest on, and the principal

1 amount of, any obligation issued by an obligor for any
2 of the following purposes:

3 (A) The financing of the construction, reconstruc-
4 tion, or reconditioning of any aquaculture facility within
5 the United States (including the financing of the pur-
6 chase cost of any aquaculture facility to be reconstructed
7 or reconditioned).

8 (B) The financing of the initial operating expenses
9 of any aquaculture facility within the United States.

10 (C) The refinancing of any existing obligation
11 issued for any of the purposes specified in subparagraph

12 (A) or (B), whether or not guaranteed under this
13 section, including, but not limited to, any short-term
14 obligation incurred for the purpose of obtaining tem-
15 porary funds for refinancing.

16 (2) The full faith and credit of the United States is
17 pledged to the payment of all guarantees made under this
18 section with respect to both principal and interest, includ-
19 ing any interest, if provided for in the guarantee, which
20 may accrue between the date of default under a guaranteed
21 obligation and the payment in full of the guarantee.

22 (3) Any guarantee, or commitment to guarantee, made
23 by the Secretary under this section shall be conclusive
24 evidence of the eligibility of the obligations for such guar-
25 antee, and the validity of any guarantee, or commitment
26 to guarantee, so made shall be incontestable.

1 (4) The aggregate unpaid principal amount of all obli-
2 gations guaranteed under this section and outstanding any
3 one time shall not exceed \$100,000,000.

4 (b) (1) Obligations guaranteed under this section—

5 (A) shall have an obligor approved by the Sec-
6 retary as being responsible and possessing the ability,
7 experience, financial resources, and other qualifications
8 necessary for the adequate operation and maintenance
9 of the aquacultural facilities;

10 (B) shall be in an aggregate principal amount
11 which does not exceed 80 per centum of the actual
12 cost involved or the depreciated actual cost, as deter-
13 mined by the Secretary;

14 (C) shall have maturity dates satisfactory to the
15 Secretary, but not to exceed twenty-five years;

16 (D) shall provide for payments by the obligor
17 satisfactory to the Secretary; and

18 (E) shall bear interest (exclusive of charges for
19 the guarantee and service charges, if any) at rates not
20 to exceed such percentage per annum on the unpaid
21 principal as the Secretary determines to be reasonable,
22 taking into account the range of interest rates prevailing
23 in the private market for similar loans and the risks
24 assumed by the Secretary.

25 (2) No obligation shall be guaranteed under this section

1 unless the obligor conveys or agrees to convey to the Secre-
2 tary such security interest as the Secretary may require to
3 reasonably protect the interests of the United States.

4 (c) (1) The Secretary may charge a fee for any obli-
5 gation guaranteed under this section, the amount of which
6 shall be established by the Secretary by regulation but which
7 may not exceed one-half of 1 per centum per annum of the
8 outstanding principal balance of the obligation. Fee payments
9 shall be made by the obligor to the Secretary when moneys
10 are first advanced under a guaranteed obligation and at least
11 sixty days before each anniversary date thereafter.

12 (2) The Secretary shall charge and collect from the
13 obligor such amounts as he may deem reasonable for the
14 investigation of the application for any guarantee, for the
15 appraisal of properties offered as security for any guarantee;
16 and for the inspection of such properties during construction,
17 reconstruction, or reconditioning; except that such charges
18 shall not aggregate more than one-half of 1 per centum of the
19 original principal amount of the obligation to be guaranteed.

20 (3) All fees and other amounts received by the Secre-
21 tary under the provisions of this subsection shall be deposited
22 in the fund.

23 (4) Obligations guaranteed under this section, and
24 agreements relating thereto, shall contain such other provi-
25 sions with respect to the protection of the security interests

1 of the United States (including acceleration and subrogation
2 provisions and the issuance of notes by the obligor to the
3 Secretary), liens and releases of liens, payments of taxes,
4 and such other matters as the Secretary may prescribe.

5 (d) (1) In the event of a default, which has continued
6 for thirty days, in any payment by the obligor of principal
7 or interest due under any obligation guaranteed under this
8 section, the obligee or his agent shall have the right to
9 demand, at or before the expiration of such period as may
10 be specified in the guarantee or related agreements, but not
11 later than ninety days from the date of such default, payment
12 by the Secretary of the unpaid principal amount of said
13 obligations and of the unpaid interest thereon to the date of
14 payment. Within such period as may be specified in the
15 guarantee or related agreements, but not later than thirty
16 days from the date of such demand the Secretary shall
17 promptly pay to the obligee or his agent the unpaid principal
18 amount of the obligation and unpaid interest thereon to the
19 date of payment; except that the Secretary shall not be
20 required to make such payment if before the expiration of
21 such period he finds that there was no default by the obligor
22 in the payment of principal or interest or that such default
23 has been remedied before any such demand.

24 (2) Payments required to be made by the Secretary
25 under paragraph (1) shall be made by the Secretary from

1 moneys which may be appropriated to the fund or obtained
2 from the Secretary of the Treasury pursuant to paragraph
3 (5).

4 (3) In the event of any payment by the Secretary under
5 paragraph (1), the Secretary shall have all rights in any
6 security held by him relating to his guarantee of such obliga-
7 tions as are conferred upon him under any security agree-
8 ment with the obligor. Notwithstanding any other provision
9 of law relating to the acquisition, handling, or disposal of
10 property by the United States, the Secretary may, under such
11 terms and conditions as the Secretary prescribes or approves,
12 complete, recondition, reconstruct, renovate, repair, maintain,
13 operate, or sell any property acquired by him pursuant to a
14 security agreement with the obligor.

15 (4) After any default referred to in paragraph (1),
16 the Secretary shall take such action against the obligor or
17 any other parties liable thereunder that, in his discretion,
18 may be required to protect the interests of the United States.
19 Any suit may be brought in the name of the United States
20 or in the name of the obligee and the obligee shall make
21 available to the United States all records and evidence
22 necessary to prosecute any such suit. The Secretary may ac-
23 cept a conveyance of title to and possession of property from
24 the obligor or other parties liable to the Secretary and may
25 purchase the property for an amount not greater than the

1 unpaid principal amount of such obligation and interest
2 thereon. In the event the Secretary receives through the sale
3 of property an amount of cash in excess of any payment
4 made to an obligee under paragraph (1) and the expenses
5 of collection of such amounts, he shall pay such excess to the
6 obligor.

7 (5) If at any time the moneys in the fund are not
8 sufficient to pay any amount the Secretary is obligated to
9 pay under paragraph (1), the Secretary shall issue to the
10 Secretary of the Treasury notes or other obligations (only
11 to such extent and in such amounts as may be provided for
12 in appropriation Acts) in such forms and denominations,
13 bearing such maturities, and subject to such terms and con-
14 ditions as the Secretary of the Treasury prescribes. Such
15 notes or other obligations shall bear interest at a rate de-
16 termined by the Secretary of the Treasury, taking into con-
17 sideration the current average market yield on outstanding
18 marketable obligations of the United States of comparable
19 maturities during the month preceding the issuance of such
20 notes or other obligations. The Secretary of the Treasury
21 shall purchase any notes and other obligations to be issued
22 hereunder and for such purpose he may use as a public debt
23 transaction the proceeds from the sale of any securities issued
24 under the Second Liberty Bond Act, as amended, and the
25 purposes for which securities may be issued under such Act,

1 as amended, are extended to include any purchases of such
2 notes and obligations. The Secretary of the Treasury at any
3 time may sell any of the notes or other obligations acquired
4 by him under this paragraph. All redemptions, purchases,
5 and sales by the Secretary of the Treasury of such notes or
6 other obligations shall be treated as public debt transactions
7 of the United States. Moneys borrowed under this para-
8 graph shall be deposited in the fund and redemptions of
9 such notes and obligations shall be made by the Secretary
10 from such fund.

11 (e) For purposes of this section the term—

12 (1) “actual cost” of an aquaculture facility, as of
13 any specified date, means the aggregate, as determined
14 by the Secretary of—

15 (A) all amounts paid by, or for the account of,
16 the obligor with respect to such facility on or before
17 that date; and

18 (B) all amounts which the obligor is then
19 obligated to pay from time to time thereafter, for
20 the construction, reconstruction, or reconditioning
21 of such facility.

22 (2) “construction”, “reconstruction”, or “recondi-
23 tioning” include the design, inspection, outfitting, and
24 equipping of the aquaculture facility involved;

25 (3) “obligee” means the holder of any obligation;

1 (4) "obligor" means any person primarily liable
2 for payment of the principal of or interest of any
3 obligation;

4 (5) "depreciated actual cost" means the actual cost
5 depreciated on a straightline basis over the useful life of
6 the property involved as determined by the Secretary;
7 and

8 (6) "obligation" means any note, bond, debenture,
9 or other evidence of indebtedness.

10 FEDERAL AQUACULTURE ASSISTANCE FUND

11 SEC. 9. (a) There is established in the Treasury of the
12 United States a Federal Aquaculture Assistance Fund (here-
13 inafter referred to as the "fund"). The fund shall be avail-
14 able to the Secretary as a revolving fund for the purpose
15 of carrying out the provisions of section 8. The fund shall
16 consist of—

17 (1) any sums appropriated to the fund;

18 (2) any fees received in connection with any
19 guarantee made under section 8; and

20 (3) recoveries and receipts under security, sub-
21 rogation, and other rights and authorities described in
22 section 8.

23 (b) All payments made by the Secretary to carry out
24 the provisions of section 8, including reimbursements to
25 other Government accounts, shall be paid from the fund,

1 (B) \$12,500,000 for each of the fiscal years
2 1979, 1980, 1981, and 1982.

3 (2) there are authorized to be appropriated to
4 the Secretary of the Interior not to exceed—

5 (A) \$1,000,000 for fiscal year 1978;

6 (B) \$7,500,000 for each of the fiscal years
7 1979, 1980, 1981, and 1982.

8 (3) there are authorized to be appropriated to
9 the Secretary of Agriculture not to exceed—

10 (A) \$1,000,000 for fiscal year 1978; and

11 (B) \$7,500,000 for each of the fiscal years
12 1979, 1980, 1981, and 1982.

13 (b) There are authorized to be appropriated, without
14 fiscal year limitation to the fund not to exceed \$100,000,000
15 for purposes of section 9.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D.C., August 8, 1977.

HON. HERMAN E. TALMADGE,
Chairman, Committee on Agriculture, Nutrition, and Forestry, U.S. Senate,
Washington, D.C.

DEAR MR. CHAIRMAN: This report is in reply to your request of March 25, 1977, concerning S. 1043, a bill "To provide for the development of aquaculture in the United States, and for other purposes."

This Department recommends that the bill not be enacted in its present form.

The bill establishes a national program designed to increase fresh, brackish, and salt water sources of protein as well as its quantity and quality. It also provides for developing, improving, or maintaining fishery resources for both recreational and commercial purposes as well as initiating aquaculture and related business, industry, and employment.

This Department supports the need for accelerating the development of aquaculture and feels that the Department of Agriculture has a vital role in this arena.

The Department of Agriculture believes the production of fish and other aquatic species under controlled conditions for commercial purposes in farm-owned or operated ponds and other water areas to be an agricultural enterprise. This enterprise is directly comparable in scope, effect, and result to other time-honored agricultural enterprises such as the raising of livestock or crops. The Department also recognizes the need for scientific research and technical and other assistance in connection with disease, nutrition, breeding, marketing, and other aspects of fish farming and management. The raising of aquatic species under controlled conditions on farms can be easily incorporated into other farming activities at reasonable costs and substantial additional income can be derived by individuals adding aquaculture to their operations.

In recognition of the importance and needs of this industry, the Department has ongoing efforts in a number of areas to assist in aquacultural development. These efforts are as follows:

Advice and technical assistance are being provided to individuals in connection with land and water resource appraisals, basic biological principles, and the design and layout of fish farming facilities. Educational services are provided in all aspects of aquacultural production. The Department, through a memorandum of agreement between its Extension Service and the Department of Commerce's Office of Sea Grant, cooperates in providing field advisory services on marine aquaculture. Support is being provided to colleges and universities for research on many aspects of aquaculture. Research on nutritional value, safety, and marketing of aquacultural products and on the economics of various facets of the industry is being conducted. Vaccines for controlling aquacultural diseases are produced by private industry but under Departmental licensing and supervision. Assistance is provided in disease diagnosis. Emergency loans may be provided to certain aquacultural operators suffering losses because of a natural disaster.

As with other food-animal species, successful aquaculture requires knowledge and careful attention to nutrition, growth, reproduction, disease control, management, product processing, marketing, and economics. These are areas in which the Department has successfully assisted livestock and poultry producers to achieve the present abundant and reasonably priced supplies of food animals and food-animal products. This Department can, with adequate authority and resources, provide assistance which will result in similar success in the development of aquaculture as a major agricultural source of food-animal protein.

This Department, with its in-place delivery system, is ready to assume the leadership for accelerating freshwater aquaculture related to fish farming. Any legislation being considered must bring together all aquacultural programs in a coherent manner and provide for new programs only after a careful analysis of the need.

We agree that a national aquacultural plan to identify the needs, concerns, and this Department's role is needed. In developing this plan, the Department of Agriculture should have the responsibility to support activities of farmers operating on private land where a large part of aquaculture is practiced.

The Department of Agriculture supports efforts to nurture, encourage, and assist with aquaculture for the benefit of individual farmers (including small

operators), the public in general, and in the interests of strengthening the agricultural industry, the production of nutritious food, and the economy of the Nation. We stand ready to help develop legislation which will insure an effective national program to further integrate aquaculture into the present system of food production.

While we support the concepts of aquaculture, we believe that S. 1043 should be broadened to reflect this Department's abilities and capabilities to provide assistance on aquaculture as a food source to meet our continued need.

The Office of Management and Budget has advised that there is no objection to the presentation of this report from the standpoint of the Administration's program.

Sincerely,

JOHN C. WHITE, *Deputy Secretary.*

95TH CONGRESS
1ST SESSION

S. 2218

IN THE SENATE OF THE UNITED STATES

OCTOBER 19, 1977

Mr. STONE (for himself, Mr. ALLEN, Mr. BENTSEN, Mr. HUMPHREY, Mr. SPARKMAN, Mr. TALMADGE, Mr. MATSUNAGA, and Mr. HAYAKAWA) introduced the following bill; which was read twice and referred to the Committee on Agriculture, Nutrition, and Forestry

A BILL

To establish a national aquaculture policy, assess the status of the aquaculture industry, establish a strategy to promote the development of aquaculture in the United States, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SHORT TITLE**

4 SECTION 1. This Act may be cited as the "Aquaculture
5 Policy Act of 1977".

6 **STATEMENT OF POLICY AND PURPOSES**

7 SEC. 2. (a) It is declared to be the policy of Congress
8 to encourage and support the aquaculture industry of the
9 United States for the benefit of farmers, small businessmen,

1 and the American people in general, and the economy of
2 the Nation.

3 (b) The purposes of this Act are to encourage the effi-
4 cient production and utilization of aquacultural products so as
5 to improve the health and welfare of our people, provide
6 viable economic alternatives for rural America and main-
7 tain employment and national prosperity; to assure aquacul-
8 ture a position of equality with other economic pursuits in
9 the areas of market development, credit, research, and ex-
10 tension; and to designate the Department of Agriculture as
11 the lead Federal agency for aquaculture to assure coordina-
12 tion and effectiveness of the national aquaculture policy.

13 DEFINITIONS

14 SEC. 3. When used in this Act—

15 (1) The term "aquaculture" means the commercial
16 propagation and rearing of aquatic species in controlled
17 environments and includes the cultural practice known
18 as "fish farming".

19 (2) The term "aquaculture facility" means any
20 land, structure, or other facility used for aquaculture,
21 including, but not limited to, any laboratory, hatchery,
22 rearing pond, raceway, pen, or incubator.

23 (3) The term "aquatic species" means any species
24 of finfish, mollusk or crustacean (or other aquatic in-

1 vertebrate), amphibian, reptile, or aquatic plant being
2 cultured or capable of being cultured.

3 (4) The term "person" means any individual or
4 corporation, partnership, association, or other entity or-
5 ganized or existing under the laws of any State.

6 (5) The term "State" means any of the several
7 States, the District of Columbia, Commonwealth of
8 Puerto Rico, American Samoa, the Virgin Islands of
9 the United States, Guam, and any other commonwealth,
10 territory, or possession of the United States.

11 (6) The term "Secretary" means the Secretary of
12 Agriculture of the United States.

13 AQUACULTURE ASSESSMENT AND STATUS REPORT

14 SEC. 4. (a) Within one year after the enactment of this
15 Act, the Secretary of Agriculture, in cooperation with the
16 Secretary of Commerce, the Secretary of the Interior, and
17 other Federal departments or agencies, shall make a compre-
18 hensive assessment of aquaculture in the United States.

19 (b) The assessment shall include—

20 (1) a complete profile of the United States aqua-
21 culture industry as to incidence, size, and status of com-
22 mercial aquaculture enterprises;

23 (2) identification of private and public institutions
24 and organizations involved in aquacultural research, ex-
25 tension, credit, and market development;

1 (3) identification of the various aquatic species
2 currently being cultured and a description of the status
3 of commercial development with respect to each such
4 specie;

5 (4) to the extent possible, identification of aqua-
6 cultural production regions, species, and markets that
7 have significant potential for development;

8 (5) a catalog and description of all Federal pro-
9 grams and activities which directly or indirectly en-
10 courage, support, or assist aquaculture; and

11 (6) identification of legal, regulatory, economic,
12 physical, and social constraints which inhibit the de-
13 velopment of aquaculture in the United States.

14 (c) The Secretary shall submit a report with respect
15 to the status of aquaculture in the United States to the Presi-
16 dent and the Congress upon completion of the assessment.

17 (d) The Secretary shall use the assessment in develop-
18 ing the national aquacultural development strategy as pro-
19 vided in section 5 of this Act.

20 NATIONAL AQUACULTURAL DEVELOPMENT STRATEGY

21 SEC. 5. (a) To achieve the objectives of this Act, the
22 Secretary is authorized and directed to develop and imple-
23 ment a national aquaculture development strategy and to
24 provide the leadership for all Federal activities relating to
25 the development of aquaculture.

1 (b) In implementing the national aquaculture develop-
2 ment strategy, the Secretary is authorized and directed to—

3 (1) initiate programs and activities to alleviate the
4 constraints on aquacultural development identified in
5 the assessment performed pursuant to the provisions of
6 section 4 of this Act;

7 (2) provide advisory, education, marketing, and
8 technical assistance with respect to aquaculture to in-
9 terested public and private organizations and individuals;

10 (3) establish and maintain an aquaculture infor-
11 mation system for the collection, selection, analysis, and
12 dissemination of scientific, technical, legal, and economic
13 information relating to aquaculture;

14 (4) compile and maintain data concerning public
15 and private aquacultural production in the United States
16 including, but not limited to, information on acreages,
17 water use, and culture techniques;

18 (5) arrange for the mutual exchange with foreign
19 nations of information relating to aquaculture; and

20 (6) provide leadership and coordinate the national
21 aquaculture effort and, to the extent practicable, take
22 steps to eliminate unnecessary duplication of aquacul-
23 tural programs or activities conducted by the various
24 Federal departments or agencies.

CONTRACTS AND GRANTS

1
2 SEC. 6. (a) The Secretary may carry out any function
3 under this Act through grants to, or contracts with, other
4 Federal departments or agencies, States or political sub-
5 divisions thereof, regional commissions, State agricultural
6 experiment stations, colleges and universities, or individuals.

7 (b) The Secretary shall provide that each recipient of
8 assistance under this section shall submit an annual report,
9 at such times and in such forms as the Secretary shall pre-
10 scribe, stating the accomplishments of projects (on a project-
11 by-project basis) for which such assistance was used and ac-
12 counting for the use of all such assistance. If the Secretary
13 determines that any portion of funds made available under
14 this section has been lost or applied in a manner inconsistent
15 with the provisions of this section or regulations issued there-
16 under the recipient of such funds shall reimburse the Federal
17 Government for the funds lost or so applied, and the Secre-
18 tary shall not make available to such recipient any additional
19 funds under this Act until the recipient has so reimbursed
20 the Federal Government.

21 (c) Three per centum of each such grant or contract
22 shall be retained by the Secretary for the purpose of ad-
23 ministration.

24 (d) The Secretary shall establish appropriate criteria
25 for grant and assistance approval and necessary regulations

1 pertaining thereto: *Provided*, That the Secretary shall limit
2 allowable overhead costs, with respect to grants or contracts
3 awarded under this section, to those necessary to carry out
4 the purposes of the grants or contracts. The Secretary shall
5 give priority consideration, in awarding grants or contracts,
6 to persons or entities which are also contributing resources to
7 aquacultural programs or activities that complement the
8 Federal effort.

9 AMENDMENT TO FEDERAL CROP INSURANCE ACT

10 SEC. 7. Section 508 of the Federal Crop Insurance Act
11 (7 U.S.C. 1508) is amended by adding at the end thereof
12 a new subsection as follows:

13 “(g) To insure, or to reinsure insurers of, aquatic spe-
14 cies propagated and reared in aquaculture operations. Such
15 insurance shall be against loss of the insured aquatic species
16 due to unavoidable causes, including drought, flood, hail,
17 wind, frost, freeze, winterkill, fire, excessive rain, snow,
18 wildlife, hurricane, tornado, insect infestation, plant or ani-
19 mal disease, and such other unavoidable causes as may be
20 determined by the Board. Aquatic species shall be insured
21 under this Act on the same basis and in the same manner
22 as agricultural commodities except to the extent that the
23 Board determines it necessary or appropriate to insure
24 aquatic species on a different basis or in a different manner
25 because of the differences between the propagation and rear-

1 ing of such species and the production of agricultural com-
2 modities. As used in this subsection, the terms 'aquatic
3 species' and 'aquaculture' shall have the same meaning as
4 provided in section 3 of the Aquaculture Policy Act of
5 1977."

6 RULES AND REGULATIONS

7 SEC. 8. The Secretary is authorized to issue such rules
8 and regulations as the Secretary deems necessary to carry
9 out the provisions of this Act.

10 AUTHORIZATIONS OF APPROPRIATIONS

11 SEC. 9. There are authorized to be appropriated such
12 sums as may be necessary to carry out the provisions of this
13 Act.

95TH CONGRESS
2D SESSION

S. 2762

IN THE SENATE OF THE UNITED STATES

MARCH 17 (legislative day, FEBRUARY 6), 1978

Mr. GRAVEL introduced the following bill; which was read twice and referred to the Committees on Agriculture, Nutrition, and Forestry and Commerce, Science, and Transportation jointly by unanimous consent

A BILL

To provide for the development of aquaculture in the United States, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*
3 That this Act may be cited as the "National Aquaculture
4 Organic Act of 1978".

5 **SEC. 2. FINDINGS, PURPOSE, AND POLICY.**

6 (a) The Congress finds the following:

7 (1) The world production of seafood has declined
8 since 1970 and the harvest of some populations of fish
9 and shellfish has exceeded levels of maximum sustain-
10 able yield.

II

1 (2) Certain stocks of fish and shellfish of impor-
2 tance to the United States are depleted, or are declining,
3 and such depletion or decline has an undesirable impact
4 on both commercial and recreational fisheries.

5 (3) There is an extensive market for seafood in
6 the United States, but the United States imports in
7 excess of 50 percent of its fish and shellfish for human
8 consumption (which imports are ten times the level of
9 exports), and this dependence on imports as a source of
10 protein makes it difficult to insure continuous supplies
11 and suggests that alternatives such as aquaculture be
12 developed.

13 (4) Many segments of the world population are
14 now facing serious nutritional deficiencies and food
15 shortages due to adverse climatic conditions and the
16 steady growth of population. These problems will be-
17 come more severe, and the resulting demand for in-
18 creased food production will have to be met chiefly
19 through the application of scientific and technological
20 advances from research on aquaculture and other food
21 production systems.

22 (5) Aquaculture is contributing significantly to
23 world food supplies with production equal to 10 percent
24 of current landings of seafoods and has the potential for
25 increase by a factor of five before the end of this century.

1 (6) Less than 3 percent of current United States
2 fisheries production results from aquaculture but there
3 is a good potential for expanding production from aqua-
4 culture to equal or exceed the worldwide average, there-
5 by helping to provide United States consumers with
6 stable supplies of high quality aquatic foods.

7 (7) Growth of aquatic plants is a source of food for
8 human and animal consumption as well as a source of
9 industrial materials and energy. The Congress recognizes
10 the importance of developing aquaculture of both plant
11 and animal species.

12 (8) The stocking of advanced life stages of fish
13 and shellfish produced by aquaculture is a means of
14 rebuilding and augmenting fish and shellfish populations
15 and establishing new fisheries.

16 (9) The application of aquaculture technology
17 offers opportunities for the recovery of wasted thermal
18 energy, nutrients, and other resources and may be a more
19 efficient use of these resources for food production than
20 current methods of agriculture.

21 (10) Where water, whether fresh, brackish, or
22 marine is suitable for aquaculture, appropriate considera-
23 tion should be given to the utilization of such water for
24 aquaculture along with the other uses of such water.

1 (11) Where land-use management policies may in-
2 hibit the development of aquaculture facilities in areas
3 suitable for aquaculture, appropriate consideration should
4 be given to the utilization of these areas for aquaculture
5 along with the other uses of such areas.

6 (12) Current efforts to develop aquaculture in the
7 United States are highly diffuse, and a strong commit-
8 ment by the Federal Government will make aquaculture
9 more efficient and competitive, thereby stimulating pub-
10 lic and private investment and development.

11 (13) While many scientific and technological
12 problems are unsolved, there is sufficient knowledge to
13 further the development of aquaculture production sys-
14 tems for many species of fish and shellfish.

15 (14) The development of aquaculture in the United
16 States has been limited by the inability of producers of
17 aquatic species to obtain adequate capital and a relia-
18 ble source of seed stock.

19 (15) Aquaculture in the United States has tradi-
20 tionally concentrated on a few aquatic species, but many
21 others have a potential for commercial and other culture.
22 However, the culture of additional species may include a
23 higher degree of risk than the culture of traditional
24 species, especially during the initial stages.

25 (16) Government programs that help to reduce the

1 risks associated with production of agricultural com-
2 modities have not been generally available to producers
3 of those aquatic species in which the risk is high.

4 (17) The rehabilitation and enhancement of the
5 publicly owned fish and shellfish resources are desirable
6 applications of aquaculture technology as a means to
7 increase the general public benefits to be derived from
8 the utilization of these common property resources.

9 (18) Extensions of jurisdiction over marine re-
10 sources by numerous nations have resulted in the ex-
11 clusion of many fishing nations from traditional fishing
12 areas and created a demand in those nations for aquatic
13 foodstuffs. Aquaculture could supply this new demand.

14 (19) The Select Committee on Nutrition and Hu-
15 man Needs of the Senate has recommended an increase
16 in the fish consumption of the American family. Aqua-
17 culture can help to carry out this recommendation.

18 (b) The purpose of this Act is to promote aquaculture
19 in the United States by—

20 (1) declaring a national aquaculture policy;

21 (2) establishing and implementing a national plan
22 for aquaculture; and

23 (3) developing programs and encouraging activ-
24 ities;

1 which will result in the coordination of domestic aqua-
2 culture efforts, the conservation of existing aquatic resources,
3 the rehabilitation and enhancement of the publicly owned
4 fish and shellfish stocks, the encouragement of commercial
5 aquaculture activities, the creation of new industries and
6 job opportunities, and other national benefits.

7 (c) Aquaculture has a high potential for agumenting
8 existing commercial and sport fisheries, thereby increasing
9 the supply of aquatic protein for both human and animal
10 consumption and assisting the United States in meeting its
11 future food needs and contributing to the solution of world
12 food problems. It is, therefore, in the national interest, and
13 it is the national policy, to encourage the development of
14 aquaculture.

15 **SEC. 3. DEFINITIONS.**

16 As used in this Act—

17 (1) The term "aquaculture" means the propaga-
18 tion and rearing of aquatic species in controlled or
19 selected environments, including ocean ranching.

20 (2) The term "aquaculture facility" means any
21 land, structure, or other appurtenance, if such land,
22 structure, and appurtenance is located within the United
23 States, which is used for aquaculture, including, but
24 not limited to, any laboratory, vehicle, hatchery, rearing
25 pond, raceway, pen, incubator, or other equipment.

1 (3) The term "aquatic species" means any species,
2 native or introduced, of finfish, mollusk or crustacean
3 or other aquatic invertebrate, amphibian, reptile, or
4 aquatic plant, other than any such species which is
5 primarily used for ornamental purposes.

6 (4) The term "Fund" means the Federal Aquacul-
7 ture Assistance Fund established by section 11.

8 (5) The term "person" means any individual who
9 is a citizen or national of the United States and any
10 corporation, partnership, association, or other entity
11 (including, but not limited to, any community develop-
12 ment corporation or fisherman's cooperative) organized
13 or existing under the laws of any State.

14 (6) The term "Secretary" means the Secretary of
15 Commerce.

16 (7) The term "State" means any of the several
17 States, the District of Columbia, the Commonwealth of
18 Puerto Rico, American Samoa, the Virgin Islands,
19 Guam, the Trust Territory of the Pacific Islands, and
20 any other Commonwealth, territory, or possession of the
21 United States.

22 (8) The term "United States", when used in a geo-
23 graphical context, means all States.

1 SEC. 4. NATIONAL AQUACULTURE DEVELOPMENT PLAN.

2 (a) (1) Before the close of the 1-year period beginning
3 on the effective date of this Act, the Secretary, after consulta-
4 tion with the Secretary of the Interior and the Secretary of
5 Agriculture, shall prepare a national aquaculture develop-
6 ment plan (hereinafter in this Act referred to as the "plan").

7 (2) (A) The Secretary shall, after consultation with the
8 Secretary of the Interior and the Secretary of Agriculture,
9 establish an advisory committee for the purpose of assisting
10 the Secretary in formulating a plan responsive to the various
11 regional needs, interests, and approaches to the concept of
12 aquaculture.

13 (B) Such advisory committee shall be composed of
14 regional subcommittees. The subcommittee regions shall be
15 established as follows:

16 (i) Eight regional subcommittees shall be created
17 which correspond in geographical composition to the
18 eight regional divisions created under section 302 (a) of
19 the Fishery Conservation and Management Act of 1976.

20 (ii) Other regional subcommittees shall be created
21 by the Secretary to represent the remaining nonoceanic
22 States which are not a part of the regional subcommittees
23 created by clause (i) of this subparagraph. Such other
24 regional subcommittees shall be established on the basis
25 of the following criteria:

1 (I) geographical proximity of States to one
2 another,

3 (II) similarity of States in aquacultural activ-
4 ities and potential, and

5 (III) other relevant factors.

6 (C) Membership of the regional advisory subcommittee
7 from any region must include representatives of at least the
8 following groups, where such groups exist in that region:

9 (i) State fish and game department;

10 (ii) commercial fishermen;

11 (iii) fishfood processors;

12 (iv) private sector aquaculture organizations;

13 (v) regional fishery management councils;

14 (vi) Federal Fish and Wildlife Agency;

15 (vii) recreational fishermen; and

16 (viii) educational institutions.

17 (D) The Governors of the various States shall appoint
18 members to the regional advisory subcommittees.

19 (E) The members of the regional advisory committees
20 established under subparagraph (B), while away from their
21 homes or regular places of business in the performance of
22 services for the committee, shall be allowed travel expenses,
23 including per diem in lieu of subsistence, in the same manner
24 as persons employed intermittently in the Government serv-

1 ice are allowed expenses under section 5703 of title 5, United
2 States Code.

3 (b) The plan shall be formulated at the regional level
4 and coordinated and finalized at the secretarial level. The
5 final plan shall—

6 (1) identify those aquatic species (hereinafter re-
7 ferred to in this Act as “priority aquatic species”)
8 which the Secretary determines to have a potential for
9 culturing on a commercial or other basis, which deter-
10 mination shall be made by the Secretary after taking into
11 account—

12 (A) the extent of commercial aquaculture, if
13 any, currently being carried out with respect to such
14 species, and the projected biological and economic
15 feasibility of culturing such species;

16 (B) the extent to which aquaculture research
17 and development have been undertaken, within the
18 public and private sectors, with respect to such
19 species;

20 (C) the time and resources which will be re-
21 quired to develop aquaculture technology to the
22 point where such species can be cultured on a com-
23 mercial or other basis; and

24 (D) such other factors as the Secretary deter-
25 mines to be appropriate; and

1 (2) contain an aquaculture development program,
2 prepared by the Secretary, for each priority aquatic
3 species.

4 (c) The aquaculture development program contained
5 in the plan for each priority aquatic species shall set forth
6 those actions which the Secretary determines should be
7 undertaken, and the period of time within which each such
8 action should be completed, to provide for the culture of
9 each such species on a commercial or other basis. Such ac-
10 tions, with respect to each priority aquatic species, shall
11 include—

12 (1) such research and development, technical assist-
13 ance, demonstration, extension education, and training
14 as may be necessary and appropriate regarding—

15 (A) aquaculture facility design and operation,

16 (B) water quality management,

17 (C) utilization of waste products (including
18 thermal effluents),

19 (D) nutrition and the development of economi-
20 cal feeds,

21 (E) life history, genetics, physiology, and
22 pathology and disease control (including research
23 regarding organisms which may not be harmful to
24 fish and shellfish but are injurious to humans),

- 1 (F) processing and market development, and
2 (G) production management and quality
3 control;
- 4 (2) research with respect to the effect of the culture
5 of such species on estuarine and other water areas;
- 6 (3) the identification and analysis of any legal or
7 regulatory constraints which may affect the culture of
8 such species;
- 9 (4) the development of adequate supplies of seed
10 stock;
- 11 (5) the construction, purchase, lease, or acquisition
12 of necessary developmental aquaculture facilities; and
- 13 (6) such other actions relating to research and
14 development, technical assistance, demonstration, exten-
15 sion education, and training as such Secretary deems
16 necessary and appropriate.
- 17 (d) In preparing an aquaculture development pro-
18 gram for any priority aquatic species, and in reviewing any
19 such program pursuant to subsection (f), the Secretary
20 shall, to the extent practicable, take into account any sig-
21 nificant action which has been, or which is proposed to be
22 undertaken by any other Federal agency, any State agency,
23 or any person, and which may affect the accomplishment
24 of the program.
- 25 (e) Each action under each aquaculture development

1 program prepared under this section for a priority aquatic
2 species shall be implemented, either individually, jointly, or
3 collectively, by the Secretary, the Secretary of the Interior,
4 or the Secretary of Agriculture, as specified by the Secretary
5 in the program on the basis of—

6 (1) responsibilities vested in the respective Secretaries
7 by law or any executive action having the effect
8 of law (including, but not limited to, Reorganization
9 Plan Numbered 4 of 1970); and

10 (2) in cases where paragraph (1) does not apply,
11 the experience, expertise, and other appropriate resources
12 which the department, over which the Secretary con-
13 cerned has jurisdiction, may have with respect to the
14 action required under the program.

15 (f) (1) The Secretary, in consultation with the Secre-
16 tary of the Interior, the Secretary of Agriculture, and the
17 chief executive officer of any other Federal agency, any ap-
18 propriate Regional Fishery Management Council, and any
19 State agency which has significant functions which relate to
20 aquaculture, shall review on an annual basis—

21 (A) each aquatic species not identified as a priority
22 aquatic species; and

23 (B) the aquaculture development program estab-
24 lished under the plan for each priority aquatic species to
25 determine whether the actions specified in the program

1 are being accomplished on a successful and timely basis.

2 (2) If as a result of the review conducted pursuant
3 to paragraph (1) (A), the Secretary determines, after taking
4 into account the criteria set forth in subsection (b) (1), that
5 any aquatic species has a potential for culturing on a com-
6 mercial or other basis the Secretary shall by regulation
7 amend the plan to identify such species as a priority aquatic
8 species and prepare an aquaculture development program
9 for such species pursuant to subsection (c).

10 (3) If as a result of the review conducted pursuant to
11 paragraph (1) (B), the Secretary finds that—

12 (A) any action so specified should be revised, the
13 Secretary shall make such revision to the program as
14 he deems necessary and appropriate; or

15 (B) sufficient progress is not being made with re-
16 spect to any such program or that actions taken under
17 any such program indicate that culture of the priority
18 aquatic species concerned is doubtful, the Secretary
19 shall cancel the program.

20 The Secretary shall by regulation amend the plan whenever
21 any revision or cancellation is made pursuant to this sub-
22 section.

23 **SEC. 5. FUNCTIONS AND POWERS.**

24 (a) In implementing the aquaculture development pro-
25 gram prepared under section 4 for any priority aquatic

1 species, the Secretary, the Secretary of the Interior, or the
2 Secretary of Agriculture, as the case may be, shall—

3 (1) provide advisory, educational, and technical
4 assistance (including training) with respect to culture
5 of the species to interested public and private organiza-
6 tions and individuals, but in providing such assistance,
7 shall, to the maximum extent practicable, avoid dupli-
8 cation of like assistance provided by other Federal
9 agencies;

10 (2) consult and cooperate with interested persons,
11 Federal, State, and local government agencies, regional
12 commissions, and educational institutions regarding the
13 development of aquaculture technology;

14 (3) produce, under the authority of section 4 (c)
15 (4), and sell at cost seed stock for the priority aquatic
16 species when privately produced seed stock is unavail-
17 able, unreliable, or not sufficient to meet production
18 needs;

19 (4) encourage the implementation of aquaculture
20 technology in the rehabilitation and enhancement of
21 the publicly owned fish and shellfish stocks, as well
22 as the promotion of private commercial aquacultural
23 enterprises;

24 (5) assist the development of aquaculture by
25 requiring that in areas where multiple land and water

1 uses exist, aquaculture should be viewed as an important
2 use which should be given appropriate consideration;
3 and

4 (6) prescribe such regulations as may be necessary
5 to carry out such program.

6 (b) The Secretary, the Secretary of the Interior, or the
7 Secretary of Agriculture may, incident to such Secretary's
8 implementation of any aquaculture development program—

9 (1) for the purposes of assessing the biological and
10 economic feasibility of any aquaculture system—

11 (A) conduct scale tests of the system, and, if
12 necessary for the conduct of any such test, construct,
13 operate, and maintain developmental aquaculture
14 facilities, including, but not limited to, pilot plants
15 for testing laboratory-scale results; and

16 (B) conduct such other tests or analyses as
17 may be necessary;

18 (2) develop methods to enhance aquatic species
19 stocks by aquaculture;

20 (3) carry out such studies and research with re-
21 spect to aquatic species as may be appropriate regard-
22 less of whether such species is or has been identified as
23 a priority aquatic species; and

24 (4) take such other actions as such Secretary deems
25 necessary and appropriate.

1 (c) In addition to carrying out such other functions
2 as are required under this Act, the Secretary shall—

3 (1) establish and maintain an aquaculture infor-
4 mation center which shall function as a national clear-
5 ighthouse for the collection, selection, analysis, and
6 dissemination of scientific, technical, legal, and economic
7 information relating to aquaculture;

8 (2) conduct appropriate surveys, in coordination
9 with other agencies, of public and private aquaculture
10 being carried out in the United States with respect to
11 each aquatic species for the purpose of acquiring infor-
12 mation on acreages, water use, production, culture tech-
13 niques, and other relevant matters;

14 (3) arrange for the mutual exchange of informa-
15 tion relating to aquaculture with foreign nations; and

16 (4) conduct a continuing study to determine which
17 existing capture fisheries could be adversely impacted
18 in the marketplace by competition from products pro-
19 duced by commercial aquaculture enterprises signifi-
20 cantly aided under this Act, which study shall include
21 an assessment of economic impact by species and by
22 geographical region, and recommended measures to
23 ameliorate any adverse impact. The Secretary shall re-
24 port to Congress on the findings made under such study

1 no later than 2 years following the effective date of this
2 Act and every 2 years thereafter.

3 Any production information submitted to the Secretary by
4 any person under paragraph (2) shall be confidential and
5 shall not be disclosed except to the Secretary, the Secretary
6 of the Interior, or the Secretary of Agriculture, as the case
7 may be, for purposes of carrying out this Act, the advisory
8 committee which may be established under section
9 4(a)(2)(A), or when required under court order. The
10 Secretary shall by regulation prescribe such procedures as
11 may be necessary to preserve such confidentiality, except
12 that the Secretary may release or make public any such
13 information in any aggregate or summary form which does
14 not directly or indirectly disclose the identity or business of
15 any person who submits such information.

16 (d) (1) The Secretary, the Secretary of the Interior,
17 and the Secretary of Agriculture are each authorized to
18 accept any gift, temporary donation, or devise or bequest of
19 real or personal property, or the proceeds therefrom, or
20 interests therein, for use in carrying out any function that
21 such Secretary may have under this Act. Any such accept-
22 ance may be subject to the terms of any restrictive or affirma-
23 tive covenant, or condition of servitude, if such terms are
24 deemed by the Secretary concerned to be in accordance with

1 law and compatible with the purpose for which acceptance
2 is sought.

3 (2) Any gift or bequest of money, and any proceeds
4 from the sale of other property received as a gift or bequest
5 under this subsection, shall be deposited in a separate account
6 in the Treasury and shall be disbursed upon the order of
7 the Secretary concerned.

8 **SEC. 6. COORDINATION OF FEDERAL AGENCY ACTIVITIES**
9 **REGARDING AQUACULTURE.**

10 (a) (1) There is established the Interagency Commit-
11 tee on Aquaculture (hereinafter in this section referred to as
12 the "Committee") which shall be composed of the following
13 officers or their designees:

14 (A) The Secretary, who shall be the Chairman of
15 the Committee.

16 (B) The Secretary of the Interior.

17 (C) The Secretary of Agriculture.

18 (D) The Administrator of the Environmental Pro-
19 tection Agency.

20 (E) The Administrator of the Energy Research
21 and Development Administration.

22 (F) The Commissioner of Food and Drugs.

23 (G) The Administrator of the Small Business Ad-
24 ministration.

1 (H) The Chief of Engineers.

2 (I) The chief executive officer of any other Fed-
3 eral agency and any Regional Fishery Management
4 Council which the Secretary finds to have significant
5 functions which relate, or may relate, to the development
6 of aquaculture.

7 (2) The functions of the Committee shall be—

8 (A) to ensure that there is a continuing exchange
9 of information among the agencies represented on the
10 Committee with respect to the nature and status of the
11 programs or projects being carried out by such agencies
12 which relate, or which may relate, to aquaculture in
13 general or to the implementation of the plan; and

14 (B) to review on a continuing basis the relevant
15 programs and projects of all Federal agencies to deter-
16 mine whether they are being carried out in compliance
17 with subsection (b).

18 (b) Each Federal agency which has any function or re-
19 sponsibility with respect to aquaculture or has jurisdiction
20 over any activity which affects, or may affect, the achieve-
21 ment of the purposes of this Act, shall, in consultation with
22 the Secretary and to the maximum extent practicable, carry
23 out such function, responsibility, and activity in a manner
24 which is consistent with the purposes of this Act.

25 (c) Nothing in this Act shall be construed to amend,

1 repeal, or otherwise modify the authority of any Federal
2 officer or any Federal agency to carry out any functions
3 relating to aquaculture which are authorized under any
4 other provision of law.

5 **SEC. 7. CONTRACTS AND GRANTS.**

6 (a) The Secretary may carry out any function under
7 this Act, and the Secretary of the Interior or the Secretary
8 of Agriculture may carry out any function relating to any
9 aquaculture development program which he is specified to
10 implement under the plan, through grants to, or contracts
11 with, any other Federal agency, any agency of any State
12 and, subject to the approval of the State, any agency of any
13 political subdivision thereof, any regional commission, any
14 educational institution, or any other person.

15 (b) Any contract entered into, or any grant made,
16 pursuant to this section shall contain such conditions and
17 limitations as the Secretary concerned shall by regulation
18 prescribe as being necessary and appropriate to protect the
19 interests of the United States; except that no contract may
20 be entered into, and no grant may be made, pursuant to this
21 section unless the applicant submits with his application
22 therefor a certification from each appropriate State agency
23 and each appropriate local government agency stating that
24 nothing in the laws administered by such agency prevents

1 the carrying out of the project to which the contract or grant
2 will be applied.

3 (c) The amount of any grant made pursuant to this
4 section may not exceed one-half the estimated cost of the
5 project for which the grant is made.

6 (d) Any person who receives a grant or contract under
7 this section shall make available to the Secretary concerned
8 and to the Comptroller General of the United States, or any
9 of their authorized representatives, for purposes of audit and
10 examination, any book, document, paper, and record that
11 is pertinent to the funds received by such person under such
12 grant or contract.

13 **SEC. 8. GUARANTEES OF OBLIGATIONS ISSUED FOR**
14 **AQUACULTURE FACILITIES.**

15 (a) (1) The Secretary may, subject to the provisions
16 of this section, guarantee, or make a commitment to guaran-
17 tee, the payment of interest on, and the principal amount
18 of, any obligation issued by an obligor for any of the follow-
19 ing purposes:

20 (A) The financing of the construction, reconstruc-
21 tion, or reconditioning of any aquaculture facility
22 (including the financing of the purchase cost of any
23 aquaculture facility to be reconstructed or recondi-
24 tioned); except that no obligation may be guaranteed
25 under this section later than 2 years after the date

1 of the completion of the construction, reconstruction, or
2 reconditioning of the aquaculture facility involved.

3 (B) The acquisition of stocks of aquatic species
4 for any aquaculture facility.

5 (C) The financing of the initial operating expenses
6 of any aquaculture facility.

7 (D) The financing of marketing operations exclu-
8 sively for aquaculture products.

9 (E) The refinancing of any existing obligation
10 issued for any of the purposes specified in subparagraph
11 (A), (B), (C), or (D), whether or not guaranteed
12 under this section, including, but not limited to, any
13 short-term obligation incurred for the purpose of ob-
14 taining temporary funds for refinancing.

15 Guarantees and commitments to guarantee may be made
16 under this section without regard to section 3679 (a) of the
17 Revised Statutes of the United States (31 U.S.C. 665 (a)).

18 (2) The full faith and credit of the United States is
19 pledged to the payment of all guarantees made under this
20 section with respect to both principal and interest, including
21 any interest, if provided for in the guarantee, which may
22 accrue between the date of default under a guaranteed obli-
23 gation and the payment in full of the guarantee.

24 (3) Any guarantee, or commitment to guarantee, made
25 by the Secretary under this section shall be conclusive evi-

1 dence of the eligibility of the obligation for such guarantee,
2 and the validity of any guarantee, or commitment of guaran-
3 tee, so made shall be incontestable.

4 (4) The aggregate unpaid principal amount of all obli-
5 gations guaranteed under this section and outstanding at
6 any one time shall not exceed \$500,000,000.

7 (b) (1) Obligations guaranteed under this section—

8 (A) shall have an obligor approved by the Secre-
9 tary as being responsible and possessing the ability, ex-
10 perience, financial resources, and other qualifications
11 necessary for the adequate operation and maintenance of
12 the aquaculture facilities;

13 (B) shall be in an aggregate principal amount
14 which does not exceed $87\frac{1}{2}$ percent of the actual cost
15 involved or the depreciated actual cost, as determined
16 by the Secretary;

17 (C) shall have maturity dates satisfactory to the
18 Secretary, but not to exceed 25 years;

19 (D) shall provide for payments by the obligor
20 satisfactory to the Secretary; and

21 (E) shall bear interest (exclusive of charges for
22 the guarantee and service charges, if any) at rates not
23 to exceed such percentage per annum on the unpaid prin-
24 cipal as the Secretary determines to be reasonable, tak-
25 ing into account the range of interest rates prevailing in

1 the private market for similar loans and the risks as-
2 sumed by the Secretary.

3 (2) In guaranteeing any obligation under this section,
4 the Secretary shall give preference to any person with 40 or
5 fewer employees which, together with its affiliates, is pri-
6 marily engaged in the business of aquaculture or commercial
7 fishing for aquatic species.

8 (3) No obligation shall be guaranteed under this sec-
9 tion unless the obligor conveys or agrees to convey to the
10 Secretary such security interest as the Secretary may re-
11 quire to reasonably protect the interests of the United
12 States.

13 (c) (1) The Secretary may charge a fee for any obli-
14 gation guaranteed under this section, the amount of which
15 shall be established by the Secretary by regulation but
16 which may not exceed one-half of 1 percent per annum of
17 the outstanding principal balance of the obligation. Fee
18 payments shall be made by the obligor to the Secretary
19 when moneys are first advanced under a guaranteed obliga-
20 tion and at least 60 days before each anniversary date
21 thereafter.

22 (2) The Secretary shall charge and collect from the ob-
23 ligor such amounts as he may deem reasonable for the in-
24 vestigation of the application for any guarantee, for the ap-
25 praisal of properties offered as security for any guarantee,

1 and for the inspection of such properties during construc-
2 tion, reconstruction, or reconditioning; except that such
3 charges shall not aggregate more than one-half of 1 percent
4 of the original principal amount of the obligation to be
5 guaranteed.

6 (3) All fees and other amounts received by the Secre-
7 tary under the provisions of this subsection shall be deposited
8 in the Fund.

9 (4) Obligations guaranteed under this section, and
10 agreements relating thereto, shall contain such other provi-
11 sions with respect to the protection of the security interests
12 of the United States (including acceleration and subroga-
13 tion provisions and the issuance of notes by the obligor to
14 the Secretary), liens and releases of liens, payments of
15 taxes, and such other matters as the Secretary may prescribe.

16 (d) (1) In the event of a default, which has continued
17 for 30 days, in any payment by the obligor of principal or
18 interest due under any obligation guaranteed under this
19 section, the obligee or his agent shall have the right to
20 demand, at or before the expiration of such period as may
21 be specified in the guarantee or related agreements, but not
22 later than 90 days from the date of such default, payment
23 by the Secretary of the unpaid principal amount of said
24 obligation and of the unpaid interest thereon to the date
25 of payment. Within such period as may be specified in the

1 guarantee or related agreements, but not later than 30 days
2 from the date of such demand, the Secretary shall promptly
3 pay to the obligee or his agent the unpaid principal amount
4 of the obligation and unpaid interest thereon to the date of
5 payment; except that the Secretary shall not be required
6 to make such payment if before the expiration of such period
7 he finds that there was no default by the obligor in the pay-
8 ment of principal or interest or that such default has been
9 remedied before any such demand.

10 (2) Payments required to be made by the Secretary
11 under paragraph (1) shall be made by the Secretary from
12 the Fund.

13 (3) In the event of any payment by the Secretary
14 under paragraph (1), the Secretary shall have all rights in
15 any security held by him relating to his guarantee of such
16 obligations as are conferred upon him under any security
17 agreement with the obligor. Notwithstanding any other pro-
18 vision of law relating to the acquisition, handling, or disposal
19 of property by the United States, the Secretary may, under
20 such terms and conditions as the Secretary prescribes or
21 approves, complete, recondition, reconstruct, renovate, re-
22 pair, maintain, operate, or sell any property acquired by
23 him pursuant to a security agreement with the obligor.

24 (4) After any default referred to in paragraph (1),
25 the Secretary shall take such action against the obligor or

1 any other parties liable thereunder that, in his discretion, may
2 be required to protect the interests of the United States.
3 Any suit may be brought in the name of the United States
4 or in the name of the obligee and the obligee shall make
5 available to the United States all records and evidence neces-
6 sary to prosecute any such suit. The Secretary may accept
7 a conveyance of title to and possession of property from the
8 obligor or other parties liable to the Secretary and may pur-
9 chase the property for an amount not greater than the un-
10 paid principal amount of such obligation and interest there-
11 on. In the event the Secretary receives through the sale of
12 property an amount of cash in excess of any payment made
13 to an obligee under paragraph (1) and the expenses of
14 collection of such amounts, he shall pay such excess to the
15 obligor.

16 (5) Whoever, for the purpose of obtaining any loan
17 or advance of credit from any person with the intent that
18 an obligation relating to such loan or advance of credit shall
19 be offered to or accepted by the Secretary to be guaranteed,
20 or for the purpose of obtaining any extension or renewal of
21 any loan, advance of credit, or mortgage relating to an
22 obligation guaranteed by the Secretary, or the acceptance,
23 release, or substitution of any security on such a loan, ad-
24 vance of credit, or for the purpose of influencing in any
25 way the action of the Secretary under this section, makes,

1 passes, utters, or publishes, or causes to be made, passed,
2 uttered, or published any statement, knowing the same to be
3 false, or alters, forges, or counterfeits, or causes or procures
4 to be altered, forged, or counterfeited, any instrument, paper,
5 or document, or utters, publishes, or passes as true, or causes
6 to be uttered, published, or passed as true, any instrument,
7 paper, or document, knowing it to have been altered, forged,
8 or counterfeited, or willfully overvalues any security, asset,
9 or income shall be punished by a fine of not more than
10 \$5,000, or by imprisonment for not more than 2 years, or
11 both.

12 (e) The Secretary shall promulgate such rules and regu-
13 lations as may be deemed necessary or appropriate to carry
14 out the purposes and provisions of this section.

15 (f) For purposes of this section—

16 (1) The term “actual cost” of an aquaculture
17 facility, as of any specified date, means the aggregate,
18 as determined by the Secretary, of—

19 (A) all amounts paid by, or for the account
20 of, the obligor with respect to such facility on or
21 before that date; and

22 (B) all amounts which the obligor is then obli-
23 gated to pay from time to time thereafter, for the
24 construction, reconstruction, or reconditioning of
25 such facility.

1 (2) The terms "construction", "reconstruction", or
2 "reconditioning" include, but are not limited to, design-
3 ing, inspecting, outfitting, and equipping of the aqua-
4 culture facility involved.

5 (3) The term "depreciated actual cost" means the
6 actual cost depreciated on a straightline basis over the
7 useful life of the property involved as determined by the
8 Secretary.

9 (4) The term "obligation" means any note, bond,
10 debenture, or other evidence of indebtedness issued for
11 one of the purposes specified in subsection (a).

12 (5) The term "obligee" means the holder of any
13 obligation.

14 (6) The term "obligor" means any person pri-
15 marily liable for payment of the principal of or interest
16 on any obligation.

17 **SEC. 9. DISASTER LOANS.**

18 (a) (1) The Secretary may make one or more loans
19 from the Fund to any person if—

20 (A) an aquaculture facility, or stock of aquatic
21 species at the facility, or both, that is owned by such
22 person is damaged or destroyed as a result of a natural
23 disaster; or

24 (B) the stock of aquatic species at an aquaculture
25 facility owned by such person is damaged or destroyed

1 by disease, pollution, or contamination (caused by rea-
2 sons other than a natural disaster or the willful or negli-
3 gent action of such person).

4 The purpose of any loan made by the Secretary under this
5 section shall be to accomplish one or more of the following
6 objectives:

7 (i) The repair, rehabilitation, or replacement of
8 such facility.

9 (ii) The replacement of aquatic species stock.

10 (iii) To continue aquaculture operations while any
11 such repair, rehabilitation, or replacement is in progress.

12 (iv) The purchase, construction, or reconstruction
13 of an aquaculture facility at another location if the
14 Secretary finds that—

15 (I) the damage to the facility is so exten-
16 sive that its repair or rehabilitation is impracticable;

17 (II) the replacement of the destroyed facility
18 at the same location is impracticable; or

19 (III) the pollution or contamination referred
20 to in subparagraph (B) is likely to persist for such
21 period of time that continued aquaculture operations
22 at the same location are impracticable.

23 (v) To meet payments of principal and interest on
24 any obligation of such person with respect to the facility
25 or stock so damaged or destroyed for such period of time

1 as the Secretary deems appropriate, taking into account
2 the degree of such damage or destruction.

3 (vi) To retire in full any such obligation.

4 (2) No loan may be made under this section for any
5 damage or destruction—

6 (A) which is fully compensated for by insurance
7 (including insurance paid under section 10) or other-
8 wise; or

9 (B) for which assistance is available under any
10 other Federal disaster assistance program.

11 (b) Any loan made pursuant to this section shall—

12 (1) mature in not more than 20 years;

13 (2) bear interest at a rate not less than the rate
14 determined by the Secretary of the Treasury taking
15 into consideration the average market yield on outstand-
16 ing Treasury obligations of comparable maturity;

17 (3) be approved only upon the furnishing of such
18 security or other reasonable assurance of repayment
19 as the Secretary may require; and

20 (4) be subject to such other terms and conditions
21 as the Secretary may require to protect the interests
22 of the United States.

23 (c) The Secretary may consent to the modification of
24 any term or condition of any loan made under this section,
25 including, but not limited to, reduction of the rate of inter-

1 est, deferment of any installment of principal or interest,
2 or change in any security requirement.

3 (d) All payments of principal and interest on loans
4 made under this section shall be deposited into the Fund.

5 (e) For purposes of this section, the term "obligation"
6 means any note, bond, debenture, or other evidence of indebt-
7 edness issued for the purpose of financing (1) the construc-
8 tion, reconstruction, or reconditioning of an aquaculture
9 facility, (2) the initial operating expenses of any such
10 facility, and (3) the acquisition of stock of aquatic species
11 for any such facility.

12 (f) (1) Whoever makes any statement knowing it to be
13 false, or whoever willfully overvalues any security for the
14 purpose of obtaining for himself or for any applicant any
15 loan under this section, or extension thereof by renewal,
16 deferment of action, or otherwise, or the acceptance, release,
17 or substitution of security therefor, or for the purpose of
18 influencing in any way the action of the Secretary under this
19 section, or for the purpose of obtaining money, property, or
20 anything of value under this section, shall be punished by a
21 fine of not more than \$5,000, or by imprisonment for not
22 more than 2 years, or both.

23 (2) Whoever, with the intent to defraud, knowingly
24 conceals, removes, disposes of, or converts to his own use or
25 to that of another, any property mortgaged or pledged to,

1 or held by, the Secretary pursuant to this section shall be
2 punished by a fine of not more than \$5,000, or by imprison-
3 ment for not more than 5 years, or both.

4 (g) No loan may be made by the Secretary under this
5 section for any damage to, or destruction of, any aquaculture
6 facility or stock of aquatic species which occurs on or after
7 the close of the 5-year period beginning on the effective date
8 of this Act.

9 **SEC. 10. INSURANCE AGAINST CERTAIN LOSSES IN-**
10 **CURRED IN AQUACULTURE FACILITY OPERA-**
11 **TIONS.**

12 (a) As used in this section, unless the context otherwise
13 requires—

14 (1) The term “direct insurance” means any insur-
15 ance described in paragraphs (2), (3), and (4).

16 (2) The term “essential liability insurance” means
17 insurance against all sums which the owner of an aqua-
18 culture facility becomes legally obligated to pay as dam-
19 ages because of bodily injury or property damage caused
20 by the aquaculture facility, the operation of such facility,
21 or the aquatic species cultured at such facility.

22 (3) The term “essential property insurance” means
23 insurance against direct loss of, or direct damage to, the
24 real or personal property of an aquaculture facility
25 caused by perils as they are defined and limited in

1 standard fire policies and extended coverage endorse-
2 ments thereon as approved by the State insurance au-
3 thority, and insurance against loss of, or damage to,
4 the real or personal property of an aquaculture facility
5 from such perils as the Secretary by regulation shall
6 specify, including, but not limited to vandalism, mali-
7 cious mischief, burglary, and theft.

8 (4) The term "essential stock insurance" means
9 insurance against loss of, or damage to, any aquatic
10 species being cultured at an aquaculture facility due to
11 unavoidable or natural causes, including, but not limited
12 to, drought, pollution, hail, frost, wind, winterkill, freeze,
13 lightning, fire, excessive rain, flood, snow, wildlife, hurri-
14 cane, tornado, insect or parasite infestation, disease, and
15 such other unavoidable or natural causes as the Secre-
16 tary by regulation shall specify.

17 (5) The term "insurer" includes any insurance
18 company or group of companies under common owner-
19 ship which is authorized to engage in the insurance
20 business under the laws of any State.

21 (6) The term "owner" means any person having
22 an insurable interest in an aquaculture facility or
23 aquatic species stock.

24 (7) The term "pool" means any pool or association
25 of insurers in any State which is formed, associated, or

1 otherwise created for the purpose of making insurance
2 more readily available.

3 (8) The term "reasonable premium rate" means
4 that premium rate determined by the Secretary, which
5 would permit the purchase of any direct insurance cov-
6 erage by a reasonably prudent person in similar circum-
7 stances with due regard to the costs and benefits in-
8 volved.

9 (b) The Secretary may by regulation define any tech-
10 nical or trade term necessary in the administration of this
11 section, insofar as any such definition is not inconsistent
12 with the provisions of this section.

13 (c) (1) The Secretary shall conduct, within 6 months
14 after the effective date of this Act, and annually thereafter,
15 a study to determine whether direct insurance is generally
16 available to owners at reasonable premium rates, through
17 insurers, pools, or a suitable program adopted under State
18 law.

19 (2) (A) If the Secretary finds, as a result of the study
20 referred to in paragraph (1), that essential property insur-
21 ance or essential liability insurance is not available at rea-
22 sonable premium rates in any State and such insurance has
23 not been provided by State action, the Secretary may estab-
24 lish a program to provide such insurance in such State, if
25 the Secretary considers the issuance of such insurance neces-

1 sary and appropriate to carry out the purposes and policy of
2 this Act.

3 (B) Any essential property insurance or essential lia-
4 bility insurance issued by the Secretary under this para-
5 graph shall be subject to such terms and conditions, and to
6 such deductibles and other restrictions and limitations as the
7 Secretary deems appropriate; except that the Secretary may
8 not provide essential property insurance or essential liability
9 insurance with respect to—

10 (i) any aquaculture facility or stock of aquatic
11 species which the Secretary determines to be uninsurable
12 due to the failure of the owner to follow established
13 principles for operating aquaculture facilities or cultur-
14 ing aquatic species, as the case may be; or

15 (ii) any aquaculture facility which the Secretary
16 determines to lack reasonable protective measures to pre-
17 vent loss or damage.

18 (3) (A) If the Secretary finds, as a result of the study
19 referred to in paragraph (1), that essential stock insurance
20 is not available at reasonable premium rates in any State
21 and that such insurance has not been provided by State
22 action, the Secretary shall establish a program to provide
23 such insurance in such State.

24 (B) Any essential stock insurance issued by the Secre-
25 tary under this paragraph shall be subject to such terms

1 and conditions and to such deductibles and other restrictions
2 and limitations as the Secretary deems appropriate; except
3 that the Secretary may not provide essential stock insurance
4 with respect to any stock of aquatic species if the Secretary
5 determines such stock to be uninsurable due to the failure of
6 the owner to follow established principles for culturing
7 aquatic species or due to the lack of reasonable protective
8 measures at the aquaculture facility concerned to prevent
9 the loss of, or damage to, the stock being cultured.

10 (d) (1) In determining the premium rate for any direct
11 insurance offered from time to time under subsection (c)
12 (2) or (3), the Secretary shall consult with persons knowl-
13 edgeable and experienced in insurance, including, but not
14 limited to, State insurance regulatory authorities, and may
15 take into consideration with respect to the insurance con-
16 cerned, the nature and degree of risk involved, the protective
17 devices employed, the extent of past and anticipated losses,
18 the prevailing rate for similar coverages, the economic im-
19 portance of the insurance, and the relative abilities of the
20 particular classes and types of insureds to pay the actual
21 premium for such coverage.

22 (2) (A) The Secretary may not establish the premium
23 rate for any direct insurance at less than 50 percent of the
24 actual premium rate for such insurance.

25 (B) For purposes of subparagraph (A), the actual

1 premium rate for any direct insurance offered under this sec-
2 tion shall be determined as follows:

3 (i) If insurance of the same kind is generally of-
4 fered by insurers or pools in the State concerned, the
5 actual premium rate shall be that rate which the Secre-
6 tary determines to be the median premium rate for all
7 such insurance so offered.

8 (ii) If insurance of the same kind is not generally
9 offered by insurers or pools in the State concerned, the
10 actual premium rate shall be that rate which the Secre-
11 tary determines to be the rate at which insurers or pools
12 in such State would offer such insurance, taking into ac-
13 count actuarially sound principles applicable to the ele-
14 ments making up such rate, including, but not limited to,
15 claim losses, general administrative expenses, acquisition
16 expenses, taxes, license fees, and profits.

17 In making determinations under clauses (i) and (ii), the
18 Secretary shall consult with the insurance regulatory author-
19 ity of the State concerned and any rate advisory organiza-
20 tion licensed by such State.

21 (3) Nothing in this section shall be construed to pro-
22 hibit or require either the adoption of uniform national rates
23 or the periodic modification of the currently estimated rea-
24 sonable premium rates for any particular coverage, class,

1 State, or risk on the basis of additional information or actual
2 loss experience.

3 (e) (1) The Secretary may enter into any contract,
4 agreement, treaty, or other arrangement with any insurer
5 or pool to provide reinsurance coverage with respect to any
6 direct insurance issued by such insurer or pool, in considera-
7 tion of payment of such premiums, fees, or other charges by
8 insurers or pools which the Secretary deems to be appro-
9 priate, after consultation with persons knowledgeable and
10 experienced in insurance.

11 (2) Reinsurance issued under this subsection shall re-
12 imburse an insurer or pool for its total proved and approved
13 claims for covered losses resulting from providing the direct
14 insurance concerned during the term of the reinsurance con-
15 tract, agreement, treaty, or other arrangement, over and
16 above the amount of the insurer's or pool's retention of such
17 losses, as provided in such reinsurance, contract, agreement,
18 treaty, or other arrangement entered into under this section.

19 (3) Such contracts, agreements, treaties, or other ar-
20 rangements may be made without regard to section 3679
21 (a) of the Revised Statutes of the United States (31
22 U.S.C. 665 (a)), and shall include any terms and conditions
23 which the Secretary deems necessary to carry out the pur-
24 poses of this section. The premium rates and terms and con-
25 ditions of such contracts, agreements, treaties, or other ar-

1 rangements with an insurer or pool shall be uniform in any
2 one year throughout the country.

3 (f) (1) All premiums received by the Secretary under
4 this section shall be deposited into the Fund.

5 (2) The Secretary, in a suit brought in the appropriate
6 United States district court, shall be entitled to recover from
7 any owner, insurer, or pool the amount of any unpaid
8 premium lawfully payable to the Secretary by such owner,
9 insurer, or pool under any direct insurance or reinsurance
10 issued under this section.

11 (3) No action or proceeding shall be brought for the
12 recovery of any premium due the Secretary, or for the re-
13 covery of any premium paid to the Secretary in excess of
14 the amount due, unless such action or proceeding is com-
15 menced within 5 years after the right accrued for which
16 the claim is made; except that, if the insurer has made or
17 filed with the Secretary a false or fraudulent statement or
18 other document with intent to evade, in whole or in part,
19 the payment of premiums, the claim shall not be deemed
20 to have accrued until its discovery by the Secretary.

21 (g) In order to provide for maximum efficiency in the
22 administration of the insurance and reinsurance program
23 provided under this section, and in order to facilitate the
24 expeditious payment of any claims under such program, the
25 Secretary may enter into contracts with any insurer, pool,

1 or person, for the purpose of providing for the performance
2 of any of the following functions:

3 (1) The estimation or determination of any amounts
4 of payments for reinsurance or direct insurance claims.

5 (2) The receipt, disbursement, and accounting for
6 funds in making payments for reinsurance and direct
7 insurance claims.

8 (3) The auditing of the records of any insurer, pool,
9 or person to the extent necessary to assure that proper
10 payments are made.

11 (4) The establishment of the basis of liability for
12 reinsurance or direct insurance payments, including the
13 total amount of proved and approved claims which may
14 be payable to any insurer, pool, or owner, and the total
15 amount of premiums earned by any insurer or pool in
16 the respective States from direct insurance or re-
17 insurance.

18 (5) The provision of assistance in any manner pro-
19 vided for in the contract to further the purposes of this
20 section.

21 (h) The Secretary may, with the consent of the agency
22 concerned, accept and utilize, on a reimbursable basis, the
23 officers, employees, services, facilities, and information of any
24 Federal agency with respect to any insurance matter which
25 is within the purview of this section.

1 (i) The Secretary may prescribe regulations establish-
2 ing the general method or methods by which proved and ap-
3 proved claims for losses are paid under any direct insurance
4 or reinsurance issued under this section. Proved and approved
5 claims shall be paid from the Fund.

6 (j) The Secretary, in providing any direct insurance or
7 reinsurance under this section may adjust and pay all claims
8 for proved and approved losses covered by such insurance
9 and, upon the disallowance by the Secretary, or upon the
10 refusal of the claimant to accept the amount allowed upon
11 any such claim, the claimant, within one year after the date
12 of mailing of notice of disallowance or partial disallowance
13 of the claim, may institute an action on such claim against
14 the Secretary in the United States district court for the dis-
15 trict in which the insured owner or reinsured insurer or pool
16 resides or principally conducts business, and jurisdiction is
17 hereby conferred upon such court to hear and determine
18 such action without regard to the amount in controversy.

19 (k) The face amount of direct insurance and reinsurance
20 coverage outstanding and in force at any one time under this
21 section shall not exceed \$1,000,000,000.

22 (l) No direct insurance or reinsurance may be issued
23 by the Secretary under this section after the close of the
24 5-year period beginning on the effective date of this Act.

1 **SEC. 11. FEDERAL AQUACULTURE ASSISTANCE FUND.**

2 (a) There is established in the Treasury of the United
3 States a Federal Aquaculture Assistance Fund. The Fund
4 shall be available to the Secretary as a revolving fund for
5 the purpose of carrying out, and administering, sections 8,
6 9, and 10. The Fund shall consist of—

7 (1) any sums appropriated to the Fund;

8 (2) any fees received by the Secretary in connec-
9 tion with any guarantee made under section 8;

10 (3) recoveries and receipts received by the Secre-
11 tary under security, subrogation, and other rights and
12 authorities under sections 8, 9, and 10;

13 (4) payments of principal and interest received
14 by the Secretary under any loan made under section 9;

15 (5) premiums paid to, or recovered by, the Secre-
16 tary for any direct insurance or reinsurance issued by
17 the Secretary under section 10; and

18 (6) moneys deposited pursuant to the last sentence
19 of subsection (b).

20 All payments made by the Secretary to carry out the provi-
21 sions of sections 8, 9, and 10 (including reimbursements to
22 other Government accounts) shall be paid from the Fund,
23 only to the extent provided in appropriation Acts. Sums
24 in the Fund which are not currently needed for the pur-
25 poses of sections 8, 9, and 10 shall be kept on deposit or

1 invested in obligations of, or guaranteed by, the United
2 States.

3 (b) If at any time the moneys in the Fund are not
4 sufficient to pay any amount the Secretary is obligated to
5 pay under section 8 (d) (1) or any direct insurance or re-
6 insurance claim under section 10, the Secretary shall issue
7 to the Secretary of the Treasury notes or other obligations
8 (only to such extent and in such amounts as may be provided
9 for in appropriation Acts) in such forms and denominations,
10 bearing such maturities, and subject to such terms and con-
11 ditions as the Secretary of the Treasury prescribes. Such
12 notes or other obligations shall bear interest at a rate deter-
13 mined by the Secretary of the Treasury, taking into consid-
14 eration the current average market yield on outstanding
15 marketable obligations of the United States of comparable
16 maturities during the month preceding the issuance of such
17 notes or other obligations. The Secretary of the Treasury
18 shall purchase any notes and other obligations to be issued
19 hereunder and for such purpose he may use as a public debt
20 transaction the proceeds from the sale of any securities issued
21 under the Second Liberty Bond Act, as amended, and the
22 purposes for which securities may be issued under such Act,
23 as amended, are extended to include any purchases of such
24 notes and obligations. The Secretary of the Treasury at any
25 time may sell any of the notes or other obligations acquired

1 by him under this subsection. All redemptions, purchases,
2 and sales by the Secretary of the Treasury of such notes
3 or other obligations shall be treated as public debt trans-
4 actions of the United States. Moneys borrowed under this
5 subsection shall be deposited in the Fund and redemptions
6 of such notes and obligations shall be made by the Secretary
7 from the Fund.

8 **SEC. 12. REPORT AND RECOMMENDATIONS.**

9 Before the close of the 90th day after the close of the
10 3-year period beginning on the effective date of this Act, the
11 Secretary shall review the operation and effectiveness of the
12 disaster loan program provided for under section 9 and the
13 insurance program provided for under section 10 and shall
14 submit a report thereon to the Congress, together with the
15 recommendation of the Secretary as to whether or not either
16 such program should be continued and, if the Secretary rec-
17 ommends continuation, such suggestions as the Secretary may
18 have for improving the operation and effectiveness of such
19 program.

20 **SEC. 13. AUTHORIZATION OF APPROPRIATIONS.**

21 (a) For purposes of carrying out the provisions of this
22 Act (other than sections 8, 9, or 10), there are authorized
23 to be appropriated, notwithstanding any authorization for
24 appropriations in any other Act in effect before the date of
25 the enactment of this Act—

1 (1) to the Department of Commerce, not to
2 exceed—

- 3 (A) \$4,000,000 for the fiscal year 1979,
4 (B) \$15,000,000 for the fiscal year 1980, and
5 (C) \$17,000,000 for the fiscal year 1981;

6 (2) to the Department of the Interior, not to
7 exceed—

- 8 (A) \$2,000,000 for the fiscal year 1979,
9 (B) \$7,500,000 for the fiscal year 1980, and
10 (C) \$8,500,000 for the fiscal year 1981; and

11 (3) to the Department of Agriculture, not to ex-
12 ceed—

- 13 (A) \$2,000,000 for the fiscal year 1979,
14 (B) \$7,500,000 for the fiscal year 1980, and
15 (C) \$8,500,000 for the fiscal year 1981.

16 (b) There are authorized to be appropriated, without
17 fiscal year limitation, to the Fund such sums as may be
18 necessary and appropriate for purposes of carrying out sec-
19 tions 8, 9, and 10; but not to exceed \$500,000,000 for the
20 purposes of section 8 and not to exceed \$250,000,000 for the
21 purposes of section 9.

22 **SEC. 14. EFFECTIVE DATE.**

23 This Act shall take effect October 1, 1978.

[Subsequent to the hearings on April 18 and 20, 1978, the following report was submitted by the Department of Agriculture:]

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D.C., May 26, 1978.

Hon. HERMAN E. TALMADGE,
Chairman, Committee on Agriculture, Nutrition, and Forestry,
U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: This is in reply to your request of March 2, for a report on S. 2762 a bill "To provide for the development of aquaculture in the United States, and for other purposes."

The Department of Agriculture recommends that the bill not be enacted.

The bill provides for a national program designed to promote aquaculture development which will result in increased sources of protein for human consumption. It also provides for developing, improving, or maintaining fishery resources for both recreational and commercial purposes as well as stimulating aquaculture related business, industry, and employment.

The bill authorizes the Secretary of Commerce to establish a National Aquaculture Development Plan which would identify aquaculture needs and implement a program to promote aquaculture development. The plan would be developed in consultation with the Secretaries of Interior and Agriculture, who would also assist the Secretary of Commerce in implementing the program. The bill provides for disaster loans and direct insurance to aquaculturists and authorizes appropriations for fiscal years 1979, 1980, and 1981 to the Departments of Commerce, Interior, and Agriculture for carrying out the provisions of this bill.

The Department opposes this legislation because authority currently exists within USDA to accomplish the primary purposes of this bill. The Department has historically exercised its authority in providing services to fish farmers as it has to those involved with other farming enterprises. The Department's interest in aquaculture is supported by the enactment of the Food and Agriculture Act of 1977 (PL 95-113) which authorized the Department to have a lead role in supporting food and agricultural sciences; including aquaculture. The Department of Agriculture has been instrumental in helping freshwater fish farming achieve its current success. A summary of the USDA past and ongoing efforts in aquaculture is included in an enclosure.

The Department of Agriculture believes the production of fish and other aquatic species under controlled conditions for commercial purposes in farm-owned or -operated ponds is an agricultural enterprise. This enterprise is directly comparable in scope, effect, and result to other time-honored agricultural enterprises such as the raising of livestock or crops. The Department of Agriculture has the staff, experience, and organization to carry out the necessary aquaculture support services and linkages at State and county levels.

Title XIV, the "National Agriculture Research, Extension and Teaching Policy Act of 1977" of the "Food and Agricultural Act of 1977" (PL 95-113) authorized the Department of Agriculture to expand its aquaculture support programs. Title XIV states, "The Department of Agriculture is designated as the lead agency of the Federal Government for agricultural research. . . . extension, and teaching in the food and agricultural sciences . . . sciences related to food and agriculture in the broadest sense, including the social, economic, and political considerations of . . . aquaculture" (Sec. 1404 and 1405). Title XV of PL 95-113 also includes aquaculture, in addition to agriculture, rural development, and human nutrition, as a basic function of the Department (Sec. 1502(a)). Title XV of PL 95-113 includes loan authority for aquacultural purposes as a function of the Department by amending title III of the Bankhead-Jones Farm Tenant Act and subtitle A of the Consolidated Farm and Rural Development Act (Sec. 1503).

Since 1976, USDA has increased its emphasis on aquaculture to give it a higher profile within the Department. A USDA interagency work group was established in January 1976 composed of personnel from 11 USDA agencies. The work group has been active since its inception to make the Department responsive to and involved with the aquaculture industry. USDA personnel have actively participated in an interdepartmental committee on aquaculture to coordinate aquacultural efforts at the Federal and non-Federal levels, to avoid duplication with

other agencies and to assure optimum Federal involvement to the aquaculture industry. A USDA Aquaculture Coordinator was hired in February 1978 to provide leadership, coordinate aquaculture activities, and develop plans and procedures which would enable the Department to give appropriate consideration to the needs of aquaculture.

In view of the Department's historical support of aquaculture, the new USDA authority for aquaculture under PL 95-113, and the increased recent activity of USDA to promote aquaculture development, the Department opposes this legislation.

The Office of Management and Budget has advised that there is no objection to the presentation of this report from the standpoint of the Administration.

Sincerely,

CAROL TUCKER FOREMAN, *Assistant Secretary.*

Enclosure.

ENCLOSURE TO LEGISLATIVE REPORT ON S. 2762

The following is the detailed explanation of U.S. Department of Agriculture agency roles in aquaculture.

SOIL CONSERVATION SERVICE (SCS)

With field offices in nearly all counties in the United States, the Soil Conservation Service is able to work directly with land owners and operators whose desires and farm resources indicate a satisfactory opportunity for some aspect of aquaculture.

The Soil Conservation Service assists the would-be aquaculturists to assess the potential of his resources for growing and marketing his product and to match his resources with the right kind of enterprise. Assistance is primarily with freshwater fish farming.

Assessment of resources included: (1) water quality (field testing), (2) water quantity, (3) general soils information, (4) market potential (general), (5) human resources, and (6) financial resources.

The small percentage of survivors of this initial resource appraisal (estimated to be less than five percent) then are given detailed assistance in developing a resource conservation plan considering: (1) water quality (monitoring and laboratory), (2) water quantity (monitoring and measuring), (3) cost-return analysis (break-even point), (4) fish habitat management, (5) specific soils information, (6) site limitations (physical), and (7) design and layout. Where FmHA financing is involved, the SCS may be requested to inspect construction as it proceeds.

SCS technicians usually do not aid in day-to-day management of the operating facilities. They do occasionally assess specific problems that may develop such as oxygen deficiencies and bank erosion and provide fish farmers new research results and results of experience gained by others. The matter of diagnosis and treatment of diseases is specifically against SCS policy. The cooperator is referred to other agencies or private consultants for assistance with those problems.

In Fiscal Year 1976, the SCS provided technical assistance with fish management on 44,901 pounds, 2,376 acres of commercial fish ponds, and 13,235 feet of fish raceways.

SCIENCE AND EDUCATION ADMINISTRATION-EXTENSION (SEA-E)

The Science and Education Administration-Extension (SEA-E), as the educational arm of the Department of Agriculture, is charged under the Smith-Lever Act "to aid in the diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to encourage the application of the same." The act further provides that "this work shall be carried out in such manners as may be mutually agreed upon by the Secretary of Agriculture and the State agricultural college or colleges . . . receiving the benefit of this act."

Thus, using research information provided by the State Experiment Stations and other research agencies, SEA-E has been actively engaged in fish pond

management in 26 States; and added programs on marine resource education, the commercial fish industry, and the Sea Grant Program. In the freshwater area, activities include: fish bait production (17 States), catfish farming (15 States), and trout farming (5 States). A demonstration project was initiated in 1976 by the Texas SEA-E to evaluate catfish production as a supplemental source of food and income for small and low income farmers.

Activities have been expanded in the marine areas since SEA-E negotiated a memorandum of understanding with the Sea Grant Program. In 20 States, SEA-E is carrying out educational programs under mutual agreement.

Recently, SEA-E personnel have been conducting educational programs on economics and management in aquatic animal harvesting, processing, storage, and marketing.

SCIENCE AND EDUCATION ADMINISTRATION-COOPERATIVE RESEARCH (SEA-CR)

The Science and Education Administration-Cooperative Research (SEA-CR) supports financial research on freshwater aquaculture at the State Agricultural Experiment Stations of Land-Grant Colleges. This involves 48 research projects having a total scientific manpower input of about 20 scientist-years. The combined total effort on all aquaculture projects at these State institutions was about 50 scientist-years in 1975.

Research is being conducted on several major aspects of freshwater aquaculture, including the breeding of aquaculture species for more efficient growth and more uniformity of product at harvesting; nutritional studies to define requirements for more efficient production of the various species; cultural methods for optimum production, such as water temperature and quality, stocking rates, harvesting methodology, raceway culture, and other practices for optimum production. Methods of disease and parasite control to reduce losses are being studied. Processing and marketing studies are in progress to improve product quality and nutritional value, product acceptability, and greater efficiency in processing and marketing aquaculture products.

The SEA-CR funds also support a Regional Research Project (S-S3) entitled, "Freshwater Food Animals." Through this project, scientists can exchange unpublished research information, jointly plan future research activities, and avoid duplication of research. Nine State institutions and several Federal agencies (TVA, USDI, USDC, and USDA) participate in the project.

SCIENCE AND EDUCATION ADMINISTRATION-FEDERAL RESEARCH (SEA-FR)

The Science and Education Administration-Federal Research (SEA-FR) is not currently conducting research directly related to aquaculture. While the agency does have authority to conduct research in this area because of its responsibility for food production, current policy directs our research to terrestrial food production or agriculture due to resource limitations.

The SEA-FR does conduct research indirectly related to aquaculture. Such areas include the prevention of water quality degradation by pesticides, animal waste, and sedimentation from agricultural operations. The thrust, however, is not directed to aquacultural production.

This agency does have the capability for research many problems in the aquaculture field due to its expertise developed in answering many of the needs of agriculture. These areas would include hydrology (the management of run-off from watersheds) including development of ponds and hydraulics of structures such as dams, raceways, and channels including aeration of water.

In the area of aquacultural production, we could contribute to solving problems such as viral, bacterial, and fungal diseases, parasitology, and nutrition. Our marketing research expertise could also easily contribute to similar problem areas in aquaculture such as in the development of new methods and processes for preserving aquatic foods to maintain flavor.

Besides food processing, we have considerable experience in the transportation, storage, wholesaling, and retailing of products to reduce costs, to maintain quality, and reduce losses from waste spoilage. Additionally, we are concerned with problems associated with human health and safety to ensure that food and food

products are free from toxic, potentially dangerous residues, harmful chemicals, micro-organisms and from naturally occurring toxins.

In summary—while SEA-FR is not researching the aquacultural field directly, it does have the capability for contributing to an aquacultural research program.

FARMERS HOME ADMINISTRATION (FmHA)

The Farmers Home Administration of the U.S. Department of Agriculture channels credit to farmers, rural residents, and communities. It helps borrowers gain maximum benefit from loans through counseling and technical assistance.

Farmers and rural people have several credit programs they can call upon through FmHA to help purchase or operate farms, provide new employment and business opportunities, enhance environment, acquire homes, and upgrade the standard of living for all who wish to live in small towns or open country. Agency personnel are active on State and county committees involved with the improvement or development of local areas. They have learned the need for local ideas and initiative, for leadership from private individuals and local officials.

Some loan programs are strictly for individuals and their families. Some involve associations of people. Other loans are made to partnerships, corporations, or public bodies. FmHA employees work in concert with all types of borrowers as well as with State and local officials, planning groups, and Government agencies.

The agency's loan authorities provide a supplemental source of credit augmenting the efforts of the private lenders rather than competing with them. Most FmHA programs require that a borrower "graduate" to commercial credit when able to do so. The nature of the agency's operation makes it possible for FmHA to increase the supply of rural credit by drawing money from the major finance center.

Major purposes of FmHA's rural credit program include :

1. To help build the family farm system, the economic and social base of many rural communities.
2. To expand business and industry, increase income and employment, and control or abate pollution.
3. To install water and waste disposal systems and other community facilities that will help rural areas upgrade the quality of living and promote economic development and growth.
4. To provide or improve modest homes in suitable rural environments at prices and on terms that families of low or moderate income can afford.

Most of the loan programs fall into two categories :

Guaranteed loans, in which the loan is made and serviced by a private lender. FmHA guarantees to limit any loss to a specified percentage. Interest rates are determined between borrower and lender unless the rate is established by law.

Insured loans, that are originated, made, and serviced by the personnel of the agency. Notes are sold to investors, backed by the full faith of the Government, and the investor's money replenishes a revolving loan fund. For most programs, interest rates to borrowers are determined by the current cost of Federal borrowing, although some rates are established by statute.

Farmer loans.—Borrower must be family-sized operator, living on and operating his farm, at least on a part-time basis. Among the purposes for which farmer ownership, soil and water, and operating loans may be made are hydroponic farming and the production of fish under controlled conditions for human consumption.

Emergency loans.—Emergency loans are only made in counties where property damage or severe production losses have occurred as a result of a natural disaster and the area has been named as eligible for assistance.

Emergency loans are made to eligible farmers, ranchers, and *aquaculture* operators for losses, major adjustments, operating expenses, and other essential needs arising from natural disasters so that they may continue their operations and return to local sources of credit as soon as possible.

Aquaculture.—This term as defined by Public Law 94-68 means the husbandry of aquatic organisms under a controlled or selected environment.

Aquatic organism planters—perform or actively manage the aquatic operations. Such operations must be conducted on the applicant's owned, leased, or permit grounds. Such grounds are grounds under water on which the planting operations are conducted. Other types of operations, such as contract operations, gathering such organisms, and harvesting those planted in public water, are not eligible for emergency loans unless these waters are identified and a permit is issued to the applicant. An applicant who performs the aquatic functions in connec-

tion with such operations owned by others (share operators), or is employed by others in any type of aquatic operation is not eligible.

Among the purposes for which emergency loans may be made are :

1. Production of water plants.
2. Operation of aquaculture farms or hydroponic farms.
3. Production of aquatic organisms under a controlled or selected environment.
4. Production of fish under controlled conditions for human consumption.
5. Production of oysters under controlled conditions.

Business and industrial loans.—Loans to promote development of business and industry, including aquaculture may be made for projects in cities and towns below 50,000 population, but not in larger cities or in areas adjacent to them where population density is more than 100 persons per square mile. Preference is given to applications for projects in open country, rural communities, and towns of 25,000 and smaller.

ANIMAL AND PLANT HEALTH INSPECTION SERVICE (APHIS)

The Animal and Plant Health Inspection Service (APHIS) consists of Veterinary Services and Plant Protection and Quarantine. Veterinary Services activities in aquaculture are as follows :

1. Provide differential diagnoses of infections and toxicological conditions of fish through our facilities at the Veterinary Services Laboratories, National Animal Disease Center, USDA, Ames, Iowa.
2. Provide consultation of field veterinary epidemiologists, on a request basis, to local officials, and individual fish producers in the areas of infections and toxicological conditions.
3. Administration of the Virus-Serum-Toxin Act of 1973 which pertains to biological products developed for fish. Currently Enteric Redmouth Bacterin and *Vibrio Anguillarum* Bacterin are licensed.

ECONOMIC, STATISTICS, AND COOPERATIVE SERVICE (ESCS)

The Economic, Statistics, and Cooperative Service (ESCS) responds to requests for information relating to the economics of aquaculture. The most active involvement of ESCS has been in conjunction with the Resource Conservation and Development (RC&D) Program of the U.S. Department of Agriculture. Under that program, ESCS performs economic studies on typical problems encountered in the 178 RC&D project areas in the United States. In addition, the National Economic Analysis Division of ESCS has conducted and maintains an interest in marketing studies relating to aquaculture as an element of the U.S. consumer's food purchasing patterns. Although the last published ESCS study relating to the economics of aquaculture was released in May 1973, ESCS maintains an active interest and regularly responds to requests for information on the economics of aquaculture. ESCS is not currently, however, conducting research in the economics of aquaculture.

Senator STONE. Let me call first Mr. James Walsh, the Deputy Administrator of NOAA, the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce.

And, Mr. Walsh, if you would tell us who you have brought with you, for the record.

STATEMENT OF JAMES P. WALSH, DEPUTY ADMINISTRATOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE; ACCOMPANIED BY TERRY LEITZELL, ACTING ASSISTANT ADMINISTRATOR FOR FISHERIES, AND DAVE WALLACE, HEAD, INTERNATIONAL FISHERIES PROGRAM

Mr. WALSH. All right, Senator. I have Terry Leitzell, who is our Acting Assistant Administrator for Fisheries in NOAA, and Dave Wallace, who has been with us in several capacities but is presently serving as head of our international fisheries program.

Senator STONE. Thank you. Just proceed as you wish.

Mr. WALSH. Senator, because the time is short, I have constricted somewhat my statement before you, but I would like to have the statement in its entirety put in the record.*

Senator STONE. Without objection, that will be done. And I thank you for summarizing.

Mr. WALSH. I understand the problem on the floor, Senator.

Mr. Chairman and members of the committee, I welcome the opportunity to appear this morning to comment on the three aquaculture bills now before you, S. 1043, the National Aquaculture Organic Act; S. 2218, which is your bill, Senator Stone, the Aquaculture Policy Act; and S. 2762, the National Aquaculture Organic Act.

S. 1043 and S. 2762 would establish a mechanism to promote aquaculture and make it a profitable industry, supplying food, recreation, employment, and other benefits to this Nation. S. 2218 would authorize a study of aquaculture activities in the United States and the development of a national aquaculture strategy.

Let me begin by talking briefly about what the Department of Commerce feels is the future of aquaculture.

Based on present stock estimates, the amount of fish that can be harvested in the ocean at optimal sustainable levels is limited; it may be considerably less than twice the present world catch of 65 million metric tons, or about 150 million metric tons. At the same time, the demand for fish and for animal protein in general, especially in the Third World nations, is projected to more than double in a few decades. On a worldwide basis, aquaculture produces about 6.5 million metric tons or 10 percent of the world fish supply. This amount doubled in the last 5 years.

Worldwide, the potential is great. Aquaculture production may reach 50 million metric tons by the year 2000. In the United States, aquaculture production is about 65,000 metric tons or 3 percent of our fish supply. Although this is a significant level of increase compared to the 1950's, aquaculture production generally has remained static over the past few years. If the United States were to achieve the world average production of 10 percent of total production of fish, the amount would be approximately 254,000 metric tons. With proper management, U.S. aquaculture production could reach 1 million metric tons by the year 2000.

Many analyses of U.S. aquaculture, including the recent study by the National Academy of Sciences, have concluded that aquaculture has developed more slowly in the United States than in other advanced nations. At the same time, certain cultured species are being developed and expanded on a profitable basis. U.S. aquaculture has the potential in the long run to play a significant role toward providing increased food production. In order to achieve this potential, advances are needed in many areas, especially in the political and administrative area.

Mr. Chairman, the administration supports the development of the aquaculture industry in the free enterprise market. We believe that

*See p. 147 for the prepared statement of Mr. Walsh.

Federal policies and programs should be responsive to the needs of this industry in a manner that encourages a timely, balanced, and cost-effective development responsive to market demands, priority use of our coastal resources, and health and environmental concerns.

The Department of Commerce and its predecessors have been active without interruption for over 100 years in research and development, training, information transmittal, and many other phases of aquaculture. These activities have primarily been in the marine field. NOAA and its predecessor agencies have been most active and successful in three kinds of aquaculture: for salmon and trout, mollusks—mostly oysters and clams—and shrimp. NOAA and other agencies have worked jointly with the States to develop hatchery programs for restocking depleted salmon resources. There are over 100 Federal and State hatcheries which release young salmon and provide more than a quarter of the commercial and recreational catch of the Pacific coast. Oyster work, and to a lesser extent, research and development on clams and mollusks, has been carried out by NOAA and its predecessor agencies for years. Much of the modern kinds of oyster and clam culture, involving the full control of the life history of the animal, that permits the production of brood stock and replaces the older and less efficient method of obtaining young from wild stock, were developed in NOAA programs.

Shrimp culture is less advanced than that for the salmonids and mollusks. However, much of the U.S. shrimp culture industry both in this country and in Latin America with U.S. capital depends to an important degree on research conducted by the National Marine Fisheries Service or supported by Sea Grant.

NOAA's Office of Sea Grant supports a very large program in aquaculture research and development—about \$4 million in Federal funds, roughly equivalent to funds expended by the National Marine Fisheries Service. The scope and variety of projects is considerable, and there are about 30 universities engaged in about 90 projects under our programs. NOAA also supports aquaculture research and development projects in the States through grants under the Commercial Fisheries Research and Development Act and the Anadromous Fish Conservation Act.

One of our major products in recent years has been the development of the NOAA aquaculture plan. The plan summarizes the present status of aquaculture in NOAA, summarizes the problems, and proposes methods of dealing with the culture of certain priority species. We also indicate what NOAA proposes to do in terms of research and development, and in information transmittal in the future.

Mr. Chairman, before I summarize the administration's views on the bills, I would like briefly to discuss some program considerations which I regard as especially significant and ought to be highlighted.

First of all, the bills before you highlight the need to increase the coordination among Federal agencies engaged in aquaculture. The recent creation of the Subcommittee on Aquaculture of the Interagency Committee on Marine Science and Engineering—referred to as ICMSE—has already provided highly valuable coordination. NOAA provided leadership in the establishment of this subcommittee and presently supplies its chairman, and that is Dr. David Wallace,

with me today. The subcommittee held its eighth meeting in March of this year, and through the committee we have provided a mechanism of interagency exchange of results of programs and plans, and we will do so in the future. This kind of interagency committee will continue to promote the development of aquaculture in the United States.

Also in my testimony, which I will skip, there is a summary of the various areas in which the subcommittee has worked, primarily in statistics, in translations, in planning and coordinating the Federal program, regulations in environmental pollution, I understand. Those are the principal areas in which the interagency committee has been working.

Now, Mr. Chairman, let me set forth for you the views of the administration with regard to this legislation. We recommend against enactment of aquaculture legislation at this time. We concur that there is a need for better coordination of the Federal aquaculture efforts through an interagency process which recognizes the expertise of each agency and overall tradeoffs with the food production efforts.

For many years, there has been a considerable effort in the Federal Government in the field of aquaculture. At this time there are some 16 Federal agencies conducting programs in support of aquaculture in the United States. However, studies, surveys, and congressional hearings have demonstrated that there are instances of duplication of effort and lack of responsiveness to the needs of the industry from current programs. With the national need to make better use of our limited financial resources, it seems obvious to us that we should insure that there is a most cost-effective aquaculture program for the Federal Government. This coordination concern is being considered in the President's reorganization studies, and we believe that it is premature of us to recommend a lead agency for aquaculture until the President has submitted his reorganization recommendations.

Senator STONE. I do not normally interrupt an opening presentation, but in the interest of time, I wonder if I could ask you whether the President's reorganization effort has a time limit as far as aquaculture is concerned?

Mr. WALSH. The two principal areas that relate to this, Mr. Chairman, are in the area of natural resources and environment and with regard to food. As I understand it, the natural resources effort is higher in priority, and they are presently putting together final recommendations to the President. I am not aware of the status of the reorganization project with regard to food resources. Perhaps someone from the Agriculture Department might know better about that.

Mr. CUTLER. Yes. It will be about 9 months, Mr. Chairman, before the Food and Nutrition Bureau forms any specific proposals.

Senator STONE. Would you be kind enough to say your name and title for the benefit of our record. I would appreciate it.

Mr. CUTLER. Rupert Cutler, Department of Agriculture.

Senator STONE. Thank you.

Mr. WALSH. Presently, NOAA and the Departments of Agriculture and the Interior have the major roles, which are reasonably well

defined, and the interagency subcommittee can be used to coordinate the development of our programs and policies.

In terms of a Federal role, we are opposed to the establishment of major aquaculture specific financing, particularly loan and demonstration financing, and insurance programs. Although evidence indicates that existing Federal assistance programs and nongovernmental lending institutions have not been as supportive of aquaculture as desired by the industry and interested groups, we believe that insufficient marketing, cost-benefit, and technology assessment studies have been undertaken to justify providing this industry with major special Federal subsidies. In certain cases where the potential returns to the general taxpayer are very great and the risks are too high for industry to underwrite the front end R. & D. costs, the Federal Government should provide such assistance.

Senator STONE. I wonder if you could conclude in the next minute or two. I should have announced that we were going to use the 10-minute rule, in order to try to cover everything.

Mr. WALSH. Mr. Chairman, that really sets forth the basic views of the administration at this time.

Senator STONE. Do I take it that the administration is not ready to submit its recommended lead agency, but does that mean that you are not ready to comment on the other provisions of the bill, or the bills?

Mr. WALSH. I think we are ready to say that at this time, we are opposed to those provisions of the bill as I specified, principally the new spending authorities. In particular, we are indicating that we feel the interagency process needs to be improved, and that, of course, is an aspect of the bills that are presently before you. It is our view that before any kind of definitive provisions relating to low interest loans, guaranteed loans, or disaster assistance, of that sort, can be put into final form, considerably more work has to be done.

Senator STONE. Just one question, and then I am going to call on Senator Lugar for his comments. In your prepared statement, you state that U.S. aquaculture accounts for 65,000 metric tons of aquatic products. Could you tell us more or less what share of that 65,000 tons catfish, trout, salmon, mollusks, shrimp, or others are?

Mr. WALSH. We can provide that for the record; yes.

Senator STONE. I would appreciate that.

[The following material was subsequently submitted by Mr. Walsh:]

ESTIMATED AQUACULTURE PRODUCTION, UNITED STATES, 1977

Species	mt	Percent	Pounds
Salmon (public).....	27,000	34.7	59,400,000
Salmon (private).....	450	.6	990,000
Trout.....	13,600	17.5	29,920,000
Catfish.....	21,800	28.0	47,960,000
Oysters.....	9,070	11.6	19,954,000
Clams.....	1,180	1.5	2,596,000
Shrimp.....	200	.2	440,000
FW prawns.....	2	-----	4,400
Crawfish.....	4,500	5.8	9,900,000
Total.....	77,802	99.9	171,164,400
Marine species.....	-----	48.6	-----
Freshwater species.....	-----	51.4	-----

Senator LUGAR?

Senator LUGAR. I have one basic question. In your judgment, is our situation with regard to food such that you see no particular urgency about proceeding in this direction?

At least, as I interpreted your statement and read through it, it is a fairly relaxed viewpoint with regard to all of this, that in due course, the administration will come to some findings as to what its emphasis ought to be, but even those, as Mr. Cutler said, will be 9 months hence.

This would lead me to believe that you feel that things are in at least a reasonable state, without need for the agitation that would be involved in demonstration loans, programs, other things to which you object. Is that a fair characterization of where you stand?

Mr. WALSH. I think, Senator, that speaking for the Department of Commerce, we have always felt very strongly that aquaculture provides a fairly important potential to add to the food production of this country, and have for sometime funded programs. In fact, I believe we spend probably on aquaculture programs as much as any agency and have been supporting these programs for a long time.

And we have been doing much of the basic research and development of certain of these products. I think we believe as an agency that more can and should be done in this area. The question of urgency, of course, is a debatable one. But the issue which we are not certain of and which we recommend further analysis of is that of a better definition of exactly what should be the Government role, particularly in terms of dealing with high risks and making commitments of the taxpayers' dollars.

At this time, we would like to do more, but we think further analysis needs to be done for us to come up with a better scope program before we commit Federal moneys to the project.

Senator LUGAR. Thank you, Mr. Chairman.

Senator STONE. Thank you very much. We appreciate your testimony.

Now, for the rest of his testimony, Mr. Rupert Cutler, Assistant Secretary of Conservation, Research and Education of the U.S. Department of Agriculture.

STATEMENT OF M. RUPERT CUTLER, ASSISTANT SECRETARY FOR CONSERVATION, RESEARCH AND EDUCATION, U.S. DEPARTMENT OF AGRICULTURE, ACCOMPANIED BY DR. RUDY SCHMITTOU, AQUACULTURE COORDINATOR

Mr. CUTLER. Thank you, Mr. Chairman.

I am accompanied this morning by Dr. Rudy Schmittou, Aquaculture Coordinator for the Department of Agriculture.

The Department of Agriculture is pleased to have this opportunity to discuss the proposed legislation before your committee which would promote aquaculture for food and other purposes in the United States, and our prepared remarks will be brief, Mr. Chairman.

The Department of Agriculture recognizes that aquaculture—the production of fish and other aquatic species under controlled conditions for food and other purposes in farm-owned or operated ponds and other freshwater environments—to be an agricultural enter-

prise. The Department's authorities in aquaculture were further supported by the enactment of the Food and Agriculture Act of 1977, Public Law 95-113.

Title XIV of last year's farm bill, the National Agricultural Research, Extension, and Teaching Policy Act of 1977, authorized the Department to expand its aquaculture support programs.

Title XIV states that the Department of Agriculture is designated as the lead agency of the Federal Government for agricultural research, extension, and teaching in the food and agricultural sciences, sciences related to food and agriculture, in the broadest sense, including the social, economic and political considerations of aquaculture.

Title XV of the same law includes aquaculture, in addition to agriculture, rural development, and human nutrition, as a basic function of the Department of Agriculture. That title includes loan authority for aquacultural purposes as a function of the Department by amending the Bankhead-Jones Farm Tenant Act and the Consolidated Farm and Rural Development Act.

The aquaculture enterprise is directly comparable in scope, effect, and result to other time-honored agricultural enterprises such as the raising of poultry, livestock, or crops.

The Department of Agriculture has the staff, the experience and the organization to carry out the necessary aquaculture support services and linkages at State and county levels, and has been instrumental in helping freshwater fish farming reach its current success.

Advice and technical assistance are being provided to individuals in connection with land and water resource appraisals, basic biological principles, and the design and layout of fish farming facilities.

With field offices in nearly every county in the United States, the Soil Conservation Service is able to work directly with landowners and operators whose desires and farm resources indicate a satisfactory opportunity for some aspect of aquaculture.

The SCS assists the would-be aquaculturist to assess the potential of his resources for growing and marketing his product and to match his resources with the right kind of enterprise. Assistance again is primarily with freshwater fish farming.

In the last fiscal year, SCS provided technical assistance with fish management on 37,923 ponds and 4,442 acres of commercial fish ponds.

Educational services are provided in all aspects of aquaculture production. The Science and Education Administration Extension unit, as the educational arm of the USDA, is charged under the Smith-Lever Act "to aid in the diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to encourage the application of the same."

Thus, using research information provided by the State Experiment Stations and other research agencies, the Extension has been actively engaged in the fish pond management program in 26 States; and added programs on marine resource education, coastal zone management in the commercial fish industry, in coordination with the Department of Commerce and the sea grant program.

In the freshwater area, Extension program activities include fish bait production in 17 States, catfish farming in 15 States, and trout farming in 5 States. A demonstration project was initiated in 1976 by the Texas cooperative extension service to evaluate catfish production as a supplemental source of food and income for low-income farmers.

The Department, through a memorandum of agreement between Extension and the Department of Commerce's Office of Sea Grant, cooperates in providing field advisory services on marine aquaculture. In 20 States, the Extension in the USDA is carrying out educational programs under such a mutual agreement with the Department of Commerce.

Recently, Extension personnel have been conducting educational programs on economics and management in aquatic animal harvesting, processing, storage, and marketing.

Support is being provided by USDA to colleges and universities for research on many aspects of aquaculture. The Science and Education Administration's Cooperative Research arm supports financial research on freshwater aquaculture at the State Agricultural Experiment Stations of the Land Grant Colleges.

This involved 48 research projects having a total scientific manpower input of about 20 scientist-years. The combined total effort on all aquaculture projects at these State institutions combining all sources of support was about 50 scientist-years in 1975. Research is being conducted on several major aspects of freshwater aquaculture, at these experiment stations.

Cooperative research within our Science and Education Administration also supports a regional research project, entitled "Freshwater Food Animals."

Our Federal Research Branch within the Science and Education Administration has the authority to conduct research in this area, but is not, because of budgetary limitations at the present time. It does conduct research indirectly related to aquaculture, and it has the capability for researching many problems in the aquaculture field because of its expertise developed in answering many of the needs of agriculture.

The Farmers Home Administration channels credit to farmers, rural residents and communities, and helps borrowers gain maximum benefit from loans through counseling and technical assistance.

Farmers Home makes loans for hydroponic farming and the production of fish under controlled conditions for human consumption.

Senator STONE. Please proceed on. I am going to leave and vote and come back. Senator Lugar will stay as long as he can, and then we will suspend until he comes back.

Mr. CUTLER. The Animal and Plant Health Inspection Service consists of veterinary services and plant protection and quarantine and provides veterinary services to aquaculture through providing diagnoses of infections and toxicological conditions of fish; providing consultation of field veterinary epidemiologists; administration of the Virus-Serum-Toxin Act of 1913, which pertains to biological products developed for fish.

The Economics, Statistics, and Cooperative Service responds to requests for information relating to the economics of aquaculture.

Since 1976, the Department of Agriculture has increased its emphasis on aquaculture to give it a higher profile within the Department.

A USDA interagency work group was established in January 1976, composed of personnel from 11 USDA agencies. The work group has been active since its inception to make the Department responsive to and involved with the aquaculture industry.

USDA personnel have actively participated in an interdepartmental committee on aquaculture to coordinate aquaculture efforts at the Federal and non-Federal levels, to avoid duplication with other agencies and to assure optimum Federal involvement in the aquaculture industry.

A USDA Aquaculture Coordinator, Dr. Schmittou, was hired in February 1978, to provide leadership, coordinate aquaculture activities, and develop plans and procedures which would enable the Department to give appropriate consideration to the needs of aquaculture.

In view of the Department's historical support of aquaculture, the new USDA authority for aquaculture under Public Law 95-113, and the increased recent activity of the Department to promote aquaculture development, the Department believes we can conduct an adequate aquaculture program without additional legislative authority. We will seek the funds to do this.

Thank you, Mr. Chairman.

Senator LUGAR. Thank you, Dr. Cutler.

What do you anticipate, after the 9 months pass that you mentioned when called upon earlier, might be a new emphasis or a new role or any change in the situation with regard to aquaculture as we take a look at national food policies or priorities?

Mr. CUTLER. Aquaculture cuts across many of our missions in the Department of Agriculture. Assistant Secretary Carol Foreman is an enthusiastic proponent of aquaculture because of the nutrition qualities of fish.

Those of us concerned about energy consumption appreciate that fish farming is a low consumer of energy relative to other agricultural pursuits. It fits into our rural development mission because it offers opportunities for small-scale farmers to become involved, maximizing their capital, and it gives our Extension Service people an alternate crop to recommend to small-scale farmers.

It obviously relates to sport fisheries, and close coordination is in place now with the Department of the Interior and the Department of Commerce, as the sport fishing laboratories of the Fish and Wildlife Service and the saltwater activities of the Department of Commerce interrelate.

It is a little hard to predict what will become of aquaculture in the context of interdepartmental reorganization. One hears a variety of predictions as to the time of the Presidential recommendation on reorganization. The reorganization projects tend to be awkwardly divided as pertains to aquaculture, because the natural resources

and environment thrust takes into account perhaps only a portion of those agencies that are directly related to aquaculture—for example, it has been suggested that the Soil Conservation Service might be split in two, with the water work going in one direction and the land work in another, and of course, that tends to create problems in respect to what remains in USDA, for example, with respect to the aquacultural expertise.

Whether or not the agricultural research program would remain in Agriculture and the Soil Conservation Service would be elsewhere, whether or not the Fish and Wildlife Service might be moved, whether or not NOAA might be moved, are all subject to consideration in the reorganization program.

We also know that the food and nutrition study may result in some moves of the nutrition research and education programs. So, for all of these uncertainties, it is probably premature from the administration's standpoint to make a firm recommendation with regard to aquaculture organization.

I think probably the best thing we can do is pursue for the time being the close coordination and cooperation we have among the three interested departments. But we do recognize that the farm bill of 1977 gave the Department of Agriculture the lead role in this program.

Senator LUGAR. Given the advantages, nutritionwise, energy saving, and small farm emphasis, why do you anticipate there has not been more participation in aquaculture by farmers in this country.

Mr. CUTLER. Why don't I let Dr. Schmittou respond to that, since that is his area of expertise. Rudy?

Dr. SCHMITTOU. I think it is because it is a very young industry. I think aquaculture dates back about 4,500 years in China and Southeast Asia, but science has been applied to aquaculture for only about 30 years, since World War II, essentially.

And then, in 1960, there was no aquaculture industry to speak of in the United States, and it all has developed since that time. And it takes time, I think, for Government agencies to start responding to something, to recognize that it exists and then start to treat its needs, so to speak.

Senator LUGAR. I appreciate your testimony.

We may take a recess. I think within moments, Senator Stone will reappear, but for the moment, I must vote. It is good to see both of you again this morning.

If you will stay for just a moment, Senator Stone may have questions that he wants to address, and I think it will probably occur before 12.

[Short recess.]

Senator STONE. Do you have anything you want to add?

Dr. SCHMITTOU. No, sir.

Senator STONE. All right. Well, I just want to thank you very much for appearing, and we will go on to the next witness. Thank you very much.

Our final witness today is Mr. Lee R. Brobst, Chief of Staff for the Senior Deputy Governor, Farm Credit Administration.

And again, please let me apologize for these constant interruptions. I think we will probably be able to finish in good order now.

**STATEMENT OF LEE R. BROBST, CHIEF OF STAFF FOR THE SENIOR
DEPUTY GOVERNOR, FARM CREDIT ADMINISTRATION**

Mr. BROBST. Mr. Chairman, it is a pleasure for us to have the opportunity to visit with your committee. I am Lee Brobst, the Senior Deputy Governor's Chief of Staff for the Farm Credit Administration. The Farm Credit Administration is an independent Federal agency, with the responsibility to supervise this Farm Credit System which, as you mentioned earlier, has some involvement in the financing of aquaculture.

The System is essentially a farmers' cooperative organization; it extends about \$42 billion worth of credit to agriculture in toto.

We are not here to present or pronounce an official view of either FCA or the System which we supervise, and as a result, we have not cleared our comments with OMB, and we have not provided a copy of these comments.

I think we can probably provide the most assistance by giving you a bit of information about the limited experience that the organization has had in financing aquaculture and the fishery industry in the broader sense, and also to provide some information on the Farm Credit System, indicating what capability it has to participate in financing of this type.

The Farm Credit System is a cooperatively owned farm credit organization. It operates under the authority of the Farm Credit Act of 1971. Its primary purpose is to provide credit to farmers, ranchers and their farmer cooperatives. It does have authority to extend credit to producers and harvesters of aquatic products. It also has limited authority to finance farm-related businesses of certain types and to extend credit to rural homeowners. But those are in the minority; the principal interest and authority is in financing farmers.

The Farm Credit System is composed of three different units: The Federal land banks, which extend farm mortgage credit through about 540 Federal land bank associations; the Federal intermediate credit banks, which provide funds to about 430 production credit associations, and hold the responsibility to supervise those organizations. They extend principally seasonal credit, intermediate term credit, perhaps as much as 7 to 10 years. Loans are made for any agricultural purpose, including the needs of a family, a pretty broad spectrum of authority. The third unit consists of the banks for cooperatives which extend credit only to farmer cooperatives.

To give you an idea of their respective involvement, the Federal land banks have about \$22 billion of mortgage credit outstanding; the production credit associations, about \$13 billion; and the banks for cooperatives, about \$7 billion.

The objective of the authority in the 1971 act is to improve the income and well-being of farmers and ranchers, and I think it would be appropriate to note that the System operates without Government assistance or cost to the taxpayer.

The funds are obtained by selling bonds and debt instruments on the open market without any Government guarantee, and the cost of operation, even including our Farm Credit Administration costs, are assessed back to the cooperatives that make up the System.

Now, over the years, the System has had some involvement in financing aquaculture. And the System does make a distinction, somewhat along the lines of the U.S. Department of Agriculture, in that it terms aquaculture that which is under controlled conditions—freshwater, catfish farming, oyster farming, in the bay areas—that type of involvement.

Going back 25, 30 years, the System has financed oyster growers, in which it has had only mediocre success. It has lost some money in the midsixties, when disease hit the industry on the east coast. The associations there had a number of loans that were distressed, and there were some losses.

The most successful involvement has probably been in the catfish area in the mid- and deep-South. I would estimate—and we do not have accurate statistics on this part of it, because it is considered right along with other agricultural lending—that the System has today \$18, \$20 million dollars in loans to catfish farmers and miscellaneous aquacultural loans.

The largest involvement, as you indicated, is about \$82 million, and that is in loans to the general fishing industry. It is concentrated on the two coastal areas, the heaviest involvement being on the west coast. The Sacramento Bank, which includes California, has the largest amount; the Spokane Bank, which includes Oregon, Washington, and Alaska, would have the next larger amount; Springfield, which is the New England area, would be third; and Columbia, S.C., which is the Southeast coastal area, would be next.

The problem that has been encountered is the difficulty of finding creditworthiness among those people attempting to get involved in aquaculture. This has been less of a problem in the open fisheries industry. The viability of that industry, it seems, is better established than it is in the controlled environment growing of aquatic products.

The Farm Credit System has no authority to extend so-called “soft” credit. Any losses that are sustained on its loans, of course, are sustained by the farmers who own and use the System. So the loans that are made are, of necessity, creditworthy in the normal sense that any banker would look at a package of credit.

This is necessary additionally because we depend on the market to sell bonds, and the quality of the loans that support these bonds determines the salability and the price we pay for money.

I think this gives you a bit of an idea what our involvement has been, the opportunity that there is for further involvement. The System certainly is ready and willing to finance any of the fishing industry to the extent authorized and when it presents a creditworthy and viable package.

This, if it expanded rapidly, might involve some reorientation. We saw this happen in the catfish industry, rice farmers who converted some of their land to ponds and went into the catfish industry. But if we were to find aquaculture developing in Iowa and Nebraska, I think those people would have some reorientation necessary to get acclimated to that type of lending.

But to the extent that it can, the System is ready and willing to participate in the financing.

Senator STONE. May I ask you, Mr. Brobst, what new ingredients would the System most benefit from in extending further loans? What assistance from the Government to the borrowers would be relevant to increasing the creditworthiness of those borrowers in aquaculture?

Mr. BROBST. It seems to me there are two areas. The first would be the production efficiency in the industry itself; and to get the industry on a competitive and a viable standard, where the person getting into aquaculture could see the same profit potential as the soybean farmer, the corn farmer, and any other segment of agriculture.

That, I guess, would take further support in the way of technological assistance. The other would be in the financing itself. The only alternative to the lack of equity and viability is the guarantee route. The System does participate with the Farmers Home Administration and, to a very limited extent, with the Small Business Administration, in extending guaranteed loans to farmers. That same principle could apply to the fishing industry.

Senator STONE. If there were guaranteed loans to fish farmers and aquaculture producers, would such loans assist in a trend toward profitable opportunities for aquaculture, or would it be a permanent situation in which the margin is made up by the guarantee?

In other words, after a period of years, would you foresee more creditworthiness on their own by these producers and less need to lean on a guarantee situation?

Mr. BROBST. Yes. I would envision the two going hand in hand. I think the industry is in its infancy, and it has a lot of maturing to do to be economically competitive. And I think the two segments would need to be developed side by side.

I think the guaranteed credit could hasten the development, but I do not think it can happen in isolation. I think the two would need to go hand in hand.

Senator STONE. What about the fact that both Farmers Home and SBA now have authority to extend loans to aquaculture producers?

Mr. BROBST. I am not too familiar with the authority that they hold. To the extent that the System could participate in aquaculture loans that were subject to their guarantee, that authority would help the facilitation of credit at the present time, I suppose.

I am sure that we have no such combined credit for aquaculture in the System at the present time.

Senator STONE. Is there anything you would like to add?

Mr. BROBST. No; I think not. I appreciate the opportunity for appearing before your committee, and I hope that we have been a bit of help to you.

Senator STONE. Thank you, Mr. Brobst. We will be calling on you.

Ladies and gentlemen, this will conclude this afternoon's hearings. We start the remainder of our witnesses Thursday at 9 a.m., in this same room, the day after tomorrow.

Thank you all. The meeting is recessed.

[Whereupon, at 12:15 p.m., the subcommittee recessed to reconvene Thursday, April 20, 1978, at 9 a.m., in room 324, Russell Senate Office Building.]

The first part of the report deals with the general situation in the country. It is noted that the economy is showing signs of recovery, but that inflation remains a serious problem. The government has implemented various measures to control inflation, but these have had limited success. The report also discusses the state of the labor market, which remains weak, and the need for further reforms to improve productivity and growth.

The second part of the report focuses on the financial sector. It highlights the challenges faced by banks and other financial institutions, including high levels of non-performing loans and limited access to credit. The government has introduced measures to strengthen the financial system, but more needs to be done to restore confidence and attract investment.

The third part of the report examines the social and human development indicators. It notes that while there has been some progress in reducing poverty and improving access to basic services, the pace of improvement is slow. The report emphasizes the need for a comprehensive social policy to address the needs of the most vulnerable populations and to promote sustainable development.

In conclusion, the report calls for a coordinated effort between the government, the private sector, and international partners to address the country's economic and social challenges. It stresses the importance of maintaining macroeconomic stability while pursuing structural reforms that will create jobs and improve the quality of life for all citizens.

AQUACULTURE

THURSDAY, APRIL 20, 1978

U.S. SENATE,
SUBCOMMITTEE ON AGRICULTURAL RESEARCH
AND GENERAL LEGISLATION OF THE
COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY,
Washington, D.C.

The subcommittee met, pursuant to recess, at 8:55 a.m. in room 324, Russell Senate Office Building, Hon. Richard Stone presiding.

Present: Senators Stone and Hayakawa.

Senator STONE. Ladies and gentlemen, believe it or not, we are going to start early. Since we do have a long list of witnesses and to convenience everybody on the witness list, and since our first witness is here and ready, I will convene the hearing of the Subcommittee on Agricultural Research and General Legislation into the question of aquaculture. Our first witness this morning is Mr. Lynn A. Greenwalt, Director of the U.S. Fish and Wildlife Service of the U.S. Department of the Interior.

Mr. Greenwalt.

STATEMENT OF LYNN A. GREENWALT, DIRECTOR, FISH AND WILDLIFE SERVICE, U.S. DEPARTMENT OF THE INTERIOR

Mr. GREENWALT. Good morning, Mr. Chairman.

It is indeed a pleasure to be here. I appreciate the opportunity to come before you and share with you some of my thoughts about aquaculture.

Mr. Chairman, if I might, I will paraphrase my prepared statement, which I think may be inserted into the record.*

Senator STONE. Thank you. It will appear in the record.

Mr. GREENWALT. I would like to indicate the Department's support of the concept of aquaculture. More importantly, I would like to describe the role that the Fish and Wildlife Service has played in the development of aquaculture. The Service has an excellent performance record in scientific research and development that has in the past and will in the future, contribute to the aquaculture program. In effect, we want to participate in any meaningful U.S. aquaculture program.

*See p. 150 for the prepared statement of Mr. Greenwalt.

The Fish and Wildlife Service, as I am sure you know, is an agency which for a very long time has been involved in research into a variety of matters relating to fish and wildlife. For purposes of my discussion today, I will emphasize our role in fisheries research, which is a fundamental factor in a successful aquaculture program anywhere.

The Fish and Wildlife Service operates a number of laboratories which are designed to do research into such areas as fish nutrition, fish disease, fish genetics, and the development of cultural techniques. Our research directly supports aquaculture; that is, the production of the greatest amount of fish or fish-related protein in the most efficient way.

Mr. Chairman, in order that the committee may understand a little more fully how the Fish and Wildlife Service is presently constituted to deal with this research, I would like, if the chairman permits, to introduce into the record a list of our laboratories, their location and a very brief resume of the kind of research into which we are not intensely engaged.

[The following material was subsequently submitted by Mr. Greenwalt:]

FISH AND WILDLIFE SERVICE LABORATORIES ENGAGED IN FISHERIES RESEARCH

Fish and Health Research Laboratory, Leetown, West Virginia—disease identification, control and treatment; field evaluation. Also the site of a developmental hatchery and Fish Health Academy.

Tunison Fish Nutrition Laboratory, Cortland, New York—basic nutritional requirements of trout; practical least cost diet formulation; assessment of diet efficiency; nutritional energetics. Tunison also provides extension services.

Fish Farming Experimental Station, Stuttgart, Arkansas—diagnostics; nutrition research; water reuse and purification; drug testing. Also provides extension services.

Southeast Fish Cultural Laboratory, Marion, Alabama—environmental contaminants; culture methods for selective warm water species; environmentally controlled intensive culture systems. Also provides extension services.

Fish Genetics Laboratory, Beulah, Wyoming—strain characteristics of trout; breeding and selection methodology.

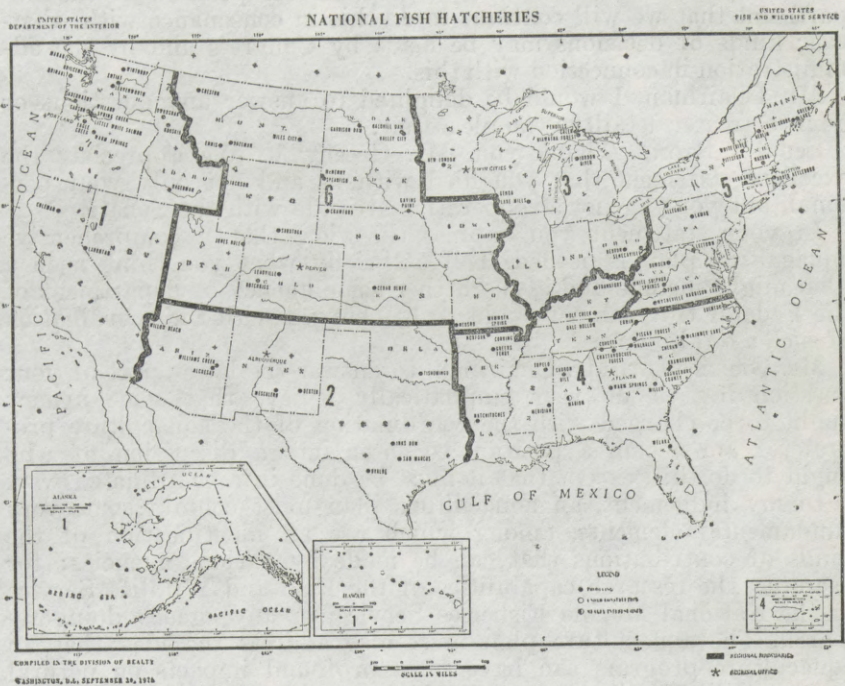
Northeast Pennsylvania Fisheries Research Development Laboratory, Wellsboro, Pennsylvania—reproductive physiology of cool water species; research of cultural methodology for cool water species; cultural techniques for selective species.

Fish Control Laboratory, LaCrosse, Wisconsin—clearance of chemicals used in aquaculture.

Western Fisheries Laboratory, Seattle, Washington—diagnostics; diseases of fish in the wild.

In addition, there is available a map of fish hatcheries manned and run by the Fish and Wildlife Service which contribute to aquaculture. In those fish hatcheries we produce fish that are available not only to the sports fisherman, but also in many cases to the commercial fisherman as well.

Senator STONE. Thank you.



Mr. GREENWALT. Mr. Chairman, I would like to emphasize the point that research is extremely important to the success of any aquaculture program. The Service has developed nutritional techniques that have, for example, enabled the growth of Atlantic salmon through their entire lifecycle within a closed system, without their having to go to sea.

This kind of combination of nutritional and fish cultural techniques, of course, have a direct relationship to aquaculture. I point this out, frankly, Mr. Chairman, in order that you and the committee can more fully understand the reservoir of knowledge that is available within the Fish and Wildlife Service and to show that

we are capable of making further contributions in the development of aquaculture.

You are aware of the administration's basic position about the act. I am present primarily to explain to you and to offer you some insights into what the Interior Department and the Fish and Wildlife Service does and can do in an aquaculture program and to reassure you and the committee that it is the position of the Department that we will continue to do this in consonance with whatever kinds of decisions may be made by Congress and by the administration in connection with this.

Mr. Chairman, I would be delighted to answer any questions or go into greater detail, as you please, sir.

Senator STONE. Thank you, Mr. Greenwalt. We appreciate the excellent statement that you filed with us and not only your personal, but your agency's cooperative attitude with the Senate.

In your statement you express the view that a comprehensive aquaculture plan is needed. Tell us briefly what you think such a plan might include and also whether some agency or department of the Federal Government ought to be charged with the coordination of such a total plan.

Mr. GREENWALT. Mr. Chairman, to answer the latter part of your question first, I do very emphatically believe that some agency ought to be charged with the coordination of the aquaculture program. I am not in a position to enter into a discussion of who ought to do this, except that it must be done in a coordinated way.

In my judgement, an aquaculture plan must contain some very fundamental elements, among which are an identification of the kinds of contributions that can be made by various agencies; for example, the research capabilities of the Fish and Wildlife Service or the National Marine Fisheries Service, or any agency doing research. The aquaculture plan must also address the idea that an aquaculture program can have some profound impacts on natural systems. I would like to explain this concept a little.

While I strongly support the idea of aquaculture, I am concerned as an ecologist that it can, when carried out without a lot of forethought, impinge on natural systems to the degree that the natural system may, in the long run, suffer a very serious loss.

The Japanese, for example, use estuaries to raise certain species of fish very successfully, but in so doing they may have diminished the value of these estuaries to all of the other fisheries. I suggest that these kind of impacts must be recognized in an aquaculture plan.

The plan, I think, in order to be successful in the economic sense, has to address such things as have been addressed in the several bills being considered such as insurance and loans. We have not had any experience with loans or insurance, but I recognize them as being very important factors, in the long run, Mr. Chairman, the most important aspect of a plan must be that it draws together the capabilities of the Federal Government, properly identifies them and focuses their attention on the needs of aquaculture. Otherwise the bureaucracy, as it has a tendency to do, will go away in nine different

directions, none of which will be fully contributive to aquaculture.

Senator STONE. Page 5 of your prepared testimony makes the statement:

While considerable public attention recently has been focused on marine species, culture of fresh and brackish water species comprise the major portion of cultured species worldwide. This pattern is likely to continue because the medium is more readily controllable.

You also suggest that some of the major problems aquaculture must overcome are nutrition, disease control, and drug control, basic management problems exactly analogous to problems of livestock and poultry producers, and we all, of course, recognize that the ultimate objective of aquaculture is to produce food.

In light of those statements, do you have any feeling about what agency or department might be the most logical to coordinate an aquaculture effort?

Mr. GREENWALT. Mr. Chairman, the ultimate intention of an aquaculture program is, obviously, to produce food—hopefully, at a profit. That creates a dilemma immediately as between an agency devoted primarily to food, like the Department of Agriculture, and one devoted to economics and marine resources, like the Department of Commerce.

Mr. Chairman, I feel somewhat reluctant to identify for you the one that is best constituted to take the lead in such a thing.

Senator STONE. In other words, you are all right on the thing?

Mr. GREENWALT. I try to be quite honest. A bureaucrat, and I am a bureaucrat of the most ordinary sort, might very well say, that his own agency is the one that ought to take the lead, I am, however, pragmatic enough to admit that Interior, let alone the Fish and Wildlife Service, is ill-equipped to deal with the full array of things that aquaculture entails, such as financing, insurance, and marketing.

I am inclined to believe, and this is a purely personal judgment, having watched this go by like a kaleidoscope for several years, that it is very likely that the greatest efficiency, the greatest payoff may very well come if the leadership lies with the Department of Commerce. NOAA has a very effective history in fish management and fish production, as well as, experience, in insurance programs and financing for fisheries.

It is my own opinion, and I would not pretend to speak for the Secretary, it might best be accomplished, within the Department of Commerce. In expressing this opinion, I have considered aquaculture as a source of food and its impact on nutrition.

Senator STONE. Thank you, Mr. Greenwalt. We appreciate your starting early and your thorough preparation.

Mr. GREENWALT. Thank you, sir, and I might say I appreciate your starting early. It is indeed a pleasure. Thank you.

Senator STONE. We are going to take one witness out of order because of a conflict of appointments. I will ask the witness from the EPA, Mr. Mackenthun, to come forward.

Mr. Ken Mackenthun, from the Office of Water Planning and Standards, Environmental Protection Agency. Welcome.

STATEMENT OF KEN M. MACKENTHUN, DIRECTOR, CRITERIA AND STANDARDS DIVISION, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. MACKENTHUN. We are delighted to have the opportunity to appear before this committee to comment on aquaculture and the role of EPA in the Nation's aquaculture activities.

Suitable water is a necessary requisite for any aquaculture activity. The protection of water, both surface and ground, is a responsibility of the Environmental Protection Agency, as mandated by the Congress.

The culture of aquatic animals or plants results in a waste product. Wastes discharged from aquaculture facilities not conducted in navigable waters are subject to regulations and control under the National Pollutant Discharge Elimination System, so-called NPDES system. Effluent guidelines for this industry have not yet been promulgated. Permits for the discharge of wastes from an aquaculture facility are based on best engineering judgment on a case-by-case basis to fit the situation of the product being grown in the aquaculture facility and the waters receiving the discharged wastes.

Under section 318, the Clean Water Act, the Administrator of EPA is authorized, after public hearing, to permit the discharge of a specific pollutant or pollutants under controlled conditions associated with an approved aquaculture project under Federal or State supervision. Each State desiring to administer its own aquaculture permit program within its jurisdiction for discharge of a specific pollutant or pollutants under controlled conditions associated with an approved aquaculture project may do so if upon submission of such program the Administrator determines that the program is adequate to carry out the objectives of the act. Regulations are now being prepared that provide procedures for States to administer such an aquaculture program.

Pursuant to section 318, requirements for approval of discharges from aquaculture projects were promulgated as final rules on May 17, 1977. These regulations provide the mechanism by which discharge of pollutants to an aquaculture project in navigable waters from a point source can be permitted. They provide a means for beneficially utilizing nutrients and other specified pollutants for the growth, maintenance, or propagation of aquatic organisms. Crops which can be grown include both plant and animal species which can be used for human food directly or when processed used as fiber or animal fodder. Aquaculture facilities such as fish hatcheries, fish farms, and similar projects which do not utilize discharges of waste from a separate industrial point source for the maintenance, propagation, and/or production of harvestable freshwater, marine, or estuarine organisms must have an NPDES permit. The 318 regulations do not apply to such facilities; these regulations pertain only to those projects which are located in navigable waters and into which there is a discharge of pollutants in a controlled manner from a point source.

No permit is to be issued under the section 318 regulations unless it has been demonstrated that the use of the pollutant to be discharged

to the aquaculture project will result in an increased harvest of the organisms under culture over what would naturally occur in the area. The crop that is cultured must not have a significant potential for human health hazards resulting from its consumption. The migration of pollutants from the designated project area outside of the aquaculture project may not violate water quality standards or applicable effluent limitations, and the total commercial value of the introduced species must at least equal that of the displaced or affected indigenous species.

Aquaculture projects using pollutants within navigable waters will be unique since discharges in excess of those permitted pursuant to effluent limitations are to be allowed within the project area. Therefore, in order to define, monitor, and control both the pollutants added to the project and those migrating or being discharged from the project, it is necessary that both the supplier of pollutants and the aquaculture operator apply for a joint permit and each be responsible for discharges to navigable waters. The holder of an aquaculture permit does not need to obtain an NPDES permit. However, in many instances both the NPDES permit and the aquaculture permit may be required. For example, a discharger of heat in Maine to a lobster cultivation project would require an aquaculture permit during the winter when heat is added to the project area, and also would require an NPDES permit during the summer if the discharge is returned directly into navigable waters, rather than to the project area.

Further development of aquaculture as an alternative method for municipal wastewater treatment and recycling should receive serious consideration. Our wastewater management branch at the Robert S. Kerr Environmental Research Laboratory in Ada, Okla., has for several years had the assignment for research related to utilizing aquaculture systems for wastewater treatment and management. Since early efforts in wastewater aquaculture have been largely exploratory in nature, supporting technology has not been available, and our past activities in this area have been minimal. Technological progress has been sufficient in the past year or 2 to create a growing interest in the potential for aquaculture systems to treat and manage municipal wastewater. Because of this interest, the Environmental Protection Agency recently completed a state-of-the-art report on aquaculture as it applies to wastewater management. This report is about ready to go to the printers. Several types of aquaculture systems were considered, including those focusing on aquatic plants, natural and artificial wetlands, aquatic invertebrates, finfish, and highly structured food chain processes. This report concludes that an increased developmental research effort in municipal wastewater aquaculture is warranted and needed in order to establish reliable system design criteria.

Establishing culture techniques and determining critical ranges of environmental variables for specific organisms are requirements common to both production-oriented and wastewater management-oriented areas of aquaculture. We recognize the value of developing an aquaculture program aimed at production of aquatic organisms by utilizing nonwaste sources. Such an effort would strengthen our research and development activities in municipal wastewater aquaculture by providing additional support technology.

Under provisions of the Federal Insecticide, Fungicide and Rodenticide Act, the Environmental Protection Agency is responsible for the registration of many pesticides that may be used in aquaculture. Among these are piscidia, insecticides, and herbicides. Registration procedures for these materials are designed to protect water quality and those persons who may come in contact with such materials.

In the near future we expect aquaculture to have increased attention in our areawide and statewide planning processes which are authorized under section 208 of the Federal Water Pollution Control Act. Pen culture of fishes is a developing industry in estuarine areas. The intensive culture of fish and attendant intensive feeding results in large quantities of waste food and fecal material passing into neighboring water. Controls of such wastes and their consideration in future areawide planning activities will be necessary.

Our comments today have been directed to the environmental considerations of aquaculture, and do not address the bills you are considering. We defer to the Departments of Agriculture, Commerce, and the Interior on the administration's position on those bills.

This concludes my prepared statement, Mr. Chairman. I would be happy to answer any questions you may have.

Senator STONE. Thank you.

I was interested in your description of the EPA's state-of-the-art report on the use of aquaculture for wastewater management. I wonder, Does that include any analysis of the use of aquaculture for waste management of aquaculture. For example, waterplants to control the discharges from aquaculture itself.

Mr. MACKENTHUN. I must confess, Mr. Chairman, that I am in the area of management and regulatory development. This report was developed by our research arm in Ada, Okla. It will be out soon, and I personally have not read a draft of the report. I cannot specifically answer that question. I think principally it would be oriented toward wastewater treatment.

Senator STONE. It would be of interest to the committee, I think, if you could inquire of your research people as to whether they have done any thinking or work at all in the area of the use of aquaculture to treat effluents and other pollution problems common or possible to aquaculture itself.

Mr. MACKENTHUN. I would be happy to.

Senator STONE. It seems to me the resources of the EPA could be very useful to this whole effort in that area.

Mr. MACKENTHUN. I will, and we would be happy to submit a copy of the report to the committee.*

Senator STONE. That would be most helpful, and also, if you would, have the EPA write me a response to that particular inquiry, of the possibility, if you haven't already done so, of applying the knowledge you have acquired in the analysis of aquaculture for control of waste in municipal and other waste disposal problems to aquaculture itself. Since you have to license aquaculture in terms of the possible pollution problems anyway, the EPA has to issue that kind of license, as you described it—

* Retained in committee files.

Mr. MACKENTHUN. A permit.

Senator STONE. It seems to me some creative research along this line might advance the practice of aquaculture in a most practical way. In some parts of the country, such as the South, where I come from, the use of hyacinths or some other form of waterplants, might well tie right into some form of aquaculture for food production and solve both problems in a natural way and without the use of excessive chemicals.

Mr. MACKENTHUN. All right, I shall do that.

[The following material was subsequently submitted by Mr. Mackenthun:]

ENVIRONMENTAL PROTECTION AGENCY

GENERAL DISCUSSION OF AQUACULTURE

Two types of aquaculture systems are identified and described for clarification and background. We recognize that many combinations of the components of these systems are possible, and effluent water quality would be dependent on a wide variety of potential inputs to a particular system.

One type of aquaculture system places primary emphasis on obtaining a valuable product. Aquatic organisms are cultured under intensive or high population conditions. Water is provided from a non-waste source, and large inputs of feed and/or fertilizer are required. The primary concern in relation to the water quality of effluents from these product oriented systems is usually based upon the amounts of wastes contributed by the metabolic processes of the organisms being cultured. Other waste sources such as feed or fertilizer which have not been fully utilized, and special chemical additions may, however, contribute significantly to changes in the quality of effluent from such systems.

Another type of aquaculture system emphasizes the culture of aquatic organisms for wastewater treatment and management. Production is a secondary feature of these systems. Wastewater is utilized as the source of feed and nutrients for the organisms being cultured. Conditions of culture are usually less intensive than those associated with product oriented systems. Both removal of pollutants and contribution of waste materials by the culture organisms must be considered in terms of water quality of the effluent.

Production oriented aquaculture is much more advanced from the standpoint of a technology base than wastewater aquaculture. Municipal wastewater aquaculture is in the early stages of technology development.

Question. EPA permits aquaculture projects in navigable waters. How can the knowledge gained from your research on using municipal wastewaters in aquaculture be used to ensure that wastes from aquaculture projects meet applicable water quality standards and effluent limitations?

Answer. Further development of aquaculture wastewater treatment would have potential for identifying the types of organisms and the culture practices desirable for use in product oriented systems to maintain a high quality of effluent. There is also the possibility of developing wastewater aquaculture systems to be used in combination with product oriented units as highly structured cyclic processes for removal of specific pollutants and better utilization of nutrients.

Question. Have you done research on wastes from aquaculture projects,

Answer. Our research effort has been limited to evaluating the effluent for wastewater aquaculture systems. As technology develops for supplementing wastewater inputs with feed and fertilizers, we expect to evaluate wastes from aquaculture systems having a greater emphasis on production.

Senator STONE. Thank you very much. I appreciate your coming and we thank you.

Our next witness, speaking of Florida, is Dr. Arnett Mace, Jr., director of the School of Forest Resources and Conservation, University of Florida, Gainesville, Fla.

Dr. Mace.

STATEMENT OF DR. ARNETT MACE, JR., DIRECTOR, SCHOOL OF FOREST RESOURCES AND CONSERVATION, UNIVERSITY OF FLORIDA, GAINESVILLE, FLA.

Dr. MACE. Mr. Chairman, it is my privilege to appear before you today to discuss Senate bill 2218 on aquaculture, the proposed Aquaculture Policy Act.

I support the objectives of this bill to establish a national aquaculture policy, assess the present status of the aquaculture industry and develop a strategy to promote this industry in the United States.

Mr. Chairman, I endorse the passage of a national policy on aquaculture to encourage an orderly development of the aquaculture industry as a means of expanding our food supply and providing an economic stimulus to rural America. Presently only approximately 3 percent of our total U.S. fisheries production is from aquaculture, a rate well below other nations, such as Japan, with 10 percent. World production of seafood is decreasing due to annual harvesting exceeding the level of maximum sustained yields, thus we have declining population of some marine and freshwater species. Presently we import over 50 percent of our seafood, and the demand for and costs of these imports will certainly increase.

Senator STONE. I would like to interrupt you right there. I think you have touched on a point that really hasn't come up sufficiently in these hearings and that is the conservation of wildlife and natural resources. To the extent that we increase food production from aquaculture, we lessen the pressure on the wildlife species that you have just correctly described as declining because of, in effect, food seeking, overfishing isn't that true?

Dr. MACE. Yes, Mr. Chairman.

Senator STONE. I think that we ought to have the support of the conservation leaders of this country in this aquaculture effort far more than we have up to this point just from the point of view of the long run preservation of natural wildlife species, ocean species.

I just thought I would make that pitch because I have not really seen the kind of support that the logic indicates ought to be coming from those people and from anybody that wants to protect wildlife species.

Go ahead, Dr. Mace.

Dr. MACE. Thank you, Mr. Chairman.

It is my understanding that the quality of some of these imports is below expected standards, which may be, in part, the reason that the U.S. per capita consumption is 12 pounds, as compared to 70 pounds per capita in Japan. Furthermore, our domestic catch has not increased since 1970.

The need for a national policy on aquaculture is due to the fragmentation of activities, efforts, and programs by Federal, State, and private institutions. The aquaculture industry has had difficulty in ascertaining which Federal agency—the Department of Commerce, Interior, or Agriculture—to contact for technical information, compliance with Federal and State regulations, and assistance. An article entitled "Government Seeking Ways To Encourage Aqua-

culture" in the April 7, 1978, issue of *Science*, cites an example of an aquaculture businessman who must deal with 42 different agencies in his commercial operation.

I commend the recent Federal effort to develop coordinated programs. Congressional action in designating the U.S. Department of Agriculture as the lead agency through the Food and Agriculture Act of 1977, Public Law 95-113, the report of the Special Committee on Aquaculture of the National Research Council/National Academy of Sciences, and the creation of the Department of Agriculture Aquaculture Work Group were essential. The Aquaculture Work Group recognized the need for immediate attention to increased inventory and analysis capability, appraisal of the state of the art of technological development, increased financial assistance, and increased educational and technical assistance in the form of formal training, advisory service, and technical onsite assistance. These actions are a step forward in coordinating aquaculture activities within the Federal Government. However, further actions, such as those proposed in S. 2218, are required for the development of a fully coordinated Federal aquaculture program. In this content, coordination between Federal and State agencies must exist, if this industry is to progress.

A prerequisite to the establishment of strategies to promote the development of aquaculture is the assessment of the state of the art of the industry, organizations involved in research, extension, technical and financial assistance, and market development. This assessment, coupled with a status report on biological, technological, economic, and market feasibility and limiting factors by species, would enhance our ability to establish priorities for research, information transfer, and technical and economic assistance. The selection and breeding of appropriate species is absolutely necessary to fully maximize the aquaculture industry in the United States. Furthermore, an assessment of the nature called for in S. 2218 would reduce unnecessary duplication of effort by various agencies and institutions presently involved in aquaculture activities. The annual report to the President and Congress would provide further coordination and impetus at the national level.

I would suggest that the definition of aquaculture in S. 2218 may be interpreted to exclude marine aquaculture. In my opinion, the definition should be sufficiently broad to include all aquaculture activities.

Senator STONE. In other words, the best possible definition would clearly specify saltwater as well as freshwater aquaculture?

Dr. MACE. Yes; in my view, Mr. Chairman.

Aquaculture has the potential for substantially increasing world production of marine and freshwater food products through the development of new efficient culture systems. This technological advance can only be accomplished by increasing our information based on the biological, technological, and economic aspects of aquaculture, and particularly by removing existing institutional problems and the maze of Federal and State regulations. The development of the aquaculture industry is not without problems. Environmental re-

relationships; food and drug laws; social, legal, and political ramifications must be carefully evaluated. Also, scientists must work closely with regulatory agencies to develop realistic legal requirements for this industry.

Finally, Mr. Chairman, I believe that the U.S. Department of Agriculture is the appropriate lead agency. This position stems from the long and successful history of this agency to provide agriculture from the farmer and farm family to the consumer with research, information, and technical assistance to meet increased demand for food and fiber. In this context, some have likened aquaculture to agriculture prior to the establishment of the land grant system and intensive programs of the Department of Agriculture, which was more than 100 years ago. We need to capitalize on this experience and expertise. One of the major reasons for the success of this agency is the existing framework and relationship with our universities and colleges for the conduct of research, extension, education, and economic assistance. This is necessary to further the development of an aquaculture industry, and gain the cooperation of the other agencies.

Mr. Chairman, this concludes my formal statement. I would be very pleased to respond to questions you might have.

Senator STONE. Thank you, Dr. Mace.

I do have one question. You mentioned the multitude of licenses that are needed in order for an aquaculture venture to be permitted and to continue, and this, of course, has been the affliction of any form of business or development in this country now for the last 20 years or more, which is one of the reasons why it is very difficult for this economy to get out of the recession. It is very hard for a willing investor to get permits to start doing a venture. Would you be in a position over the next weeks, or even months, if that is required, to do a study of how the number of licenses could be consolidated so that instead of a multitude of licenses, only several or, if possible, one might be required, but that would be the ultimate paradise goal—so let's just say "several"—in lieu of all of the variety of licenses that are already required and that, I am fearful, might even multiply in the face of the legislation we might have. Could that be reduced, legislated to reduce it to just several, so that whether freshwater, brackish water or saltwater aquaculture were ventured that the licensing and permitting would be efficient, done in a minimum of time and with a minimum of investor expense, and yet with proper safety to the environment, the consumer, and others?

It is a big order, but the point is, I have been involved in this at the State and national level before, and when we try to make things better, we make it worse. We pass wonderful philosophy and we end up with 100 licenses, and that kills the goose—in this case, the fish.

Dr. MACE. I am sure that we could provide you with a study that would be rather broad. I think we are looking at more than a month or a few months in trying to work this out.

Senator STONE. If you could give me a preliminary idea what you could do, then I would ask each of the agencies that are testifying before this committee and other committees to pick that up and make

their own suggestions, not for how well they could issue licenses, but how few licenses could be issued and still protect the environment, the consumer, and the industry. The first idea coming from outside the industry and outside Government I think best could come from the scientific side, those such as the University of Florida, that deal with all of these phases and all of these groups, and I think that would be one of the finest contributions the university could make to us in this stage of our work.

Dr. MACE. Thank you, Mr. Chairman.

Senator STONE. Thank you, Dr. Mace.

Our next witness is Mr. Paul Mulvihill, Aquaculture Research & Environmental Associates, Homestead, Fla.

Mr. Mulvihill, are you in the group that turns out fish that tastes like lobster?

STATEMENT OF PAUL MULVIHILL, AQUACULTURE RESEARCH & ENVIRONMENTAL ASSOCIATES, HOMESTEAD, FLA.

Mr. MULVIHILL. That is my old group. My son now runs that. It is now a Weyerhaeuser Co. operation, and my two sons are deeply involved in that.

Senator STONE. We have high hopes for that.

Mr. MULVIHILL. We hope so, too.

Mr. Chairman, my name is Paul Mulvihill. The principals of our firm, Aquaculture Research/Environmental Associates, have been involved in aquaculture for a decade. We believe we were the first to develop freshwater shrimp culture within the continental limits of the United States. We must recognize the fact that the Division of Fish and Game in Hawaii had previously entered this field and advanced the state of the art considerably, thereby providing us with a base for research and development. Considerable support and advice was received from the Department of Commerce, National Marine Fisheries Service and other agencies, but the information was fragmented. In the case of one State agency, we received a report of their research 4 years after we had completed the same research. It is urgent that research data as it develops be disseminated to user groups or agencies. We have kept abreast of aquaculture developments in all areas on a national and international basis, and it has been very frustrating to note its slow development in the United States.

I think that the Senators remember the days when freshwater mussels were harvested from the respective rivers. In 1961, the Mississippi River yielded 11,000 tons of shells with an export value of \$2,750,000 to \$4,400,000, which were shipped to Japan as nuclei for pearls. We believe that exports of this product to Japan have terminated. Way back in 1921, the bulletin of the Bureau of Fisheries cited a potential for freshwater mussel culture and stated: "The use of mussels for food in addition to the present use of the shell alone would aid greatly in making the culture of mussels commercially profitable." It would not have been a viable industry because the American public as a whole has not accepted mussels as part of the

American diet, but we cite this because it shows at least some thought was given to mussels for food some 56 years ago.

It would appear what has inhibited the development of aquaculture is inadequate funding and a lack of coordination between programs in a coherent manner.

When considering the future of aquaculture, we look back historically at agriculture. The first agriculture revolution ended about 1880, which was 100 years or more after the establishment of our country. The first efforts by the Government to assist agriculture occurred in the Agriculture Adjustment Act of 1933. The Consolidated Farmers Home Administration Act of 1961, section 401, states:

The term "farmers" shall be deemed to include persons who are engaged in, or who, with assistance afforded under this title, intend to engage in fish farming; and the term "farming" shall be deemed to include fish farming. We believe possibly this is one of the first actions by the Department of Agriculture to try to provide assistance to the aquaculturist.

In evaluating the prospects for significantly large production from aquaculture, a stimulus is needed. At the present time, except for perhaps, catfish, trout, crawfish, and other nonluxury aquatic products, the stimuli for shrimp, oysters, lobsters, crabs, abalone, and other like products is based on business models that indicate a relatively high return on investment because of the demand for these luxury items.

The tropical fish industry in Florida is another segment of aquaculture and is one of the major producing areas in the United States. There is no current data available to us on the amount of imports, but a sampling of aquarium fish imports conducted by Dr. John S. Ramsey of Auburn University in October 1971 showed 41 countries shipping aquarium fish into the United States. There were 7,969,529 fish imports in that month alone. As the National Academy of Sciences recent poll indicates, some \$700 million is spent annually on aquarium fish and supplies. If support were given this industry, domestic production would reduce dollar outflow and the dependence on imports.

If the Department of Agriculture is to follow its present pattern of support of the agricultural industry wherein it provides guidance and extension service to the ornamental plant industry, then we would assume that such extension would apply to the tropical fish industry.

The tropical fish industry in Florida could become a testing base for various drugs and chemicals, which knowledge might later be used in the production of aquatic foods for human consumption.

We have mentioned the requirement for stimuli in order to promote aquaculture. Probably the greatest stimulus will be the fact that although the birthrate has just recently declined, for the first time in the history of the world, by the year 2019 the world population will have doubled, to 8,400 million. There will then be a need for all types of protein. You are aware of the food conversion factors of terrestrial animals. As the U.S. and world population increases, the food normally utilized for feeding these terrestrial animals might well have to be diverted to human use. A portion of it might be utilized by energy-efficient aquatic life of low food-conversion ratios. Even though we have made tremendous strides in agri-

culture, it has still taken hundreds of years to achieve the efficiency levels we have today. In reality, most of this development has occurred in the last 30 years.

The major countries that have developed aquaculture programs, such as China, Taiwan, Hungary, and other European countries, generally incorporate farming and fish farming into one coordinated effort. For instance, in China pig manure is composted in tanks, and canals convey the product to fish ponds. Collection of pond humus is applied to row crops. Mulberry trees are planted between the ponds to increase the land utilization. Rice paddy fields are utilized to raise fish because the fish eat insects that threaten the rice plants, such as the leaf hopper and weed buds. Fish movements stir the mud and promote nutrient uptake between rice plants, fish excrement enriching both the water and rice plant.

Senator STONE. I saw similar integrated efforts in the Philippines when I was there just last year.

Mr. MULVIHILL. That is correct, and you will find it in southeast Asia and all the Mekong Delta countries.

Senator HAYAKAWA. Yes; there was great progress in the Mekong Delta. I remember that.

Mr. MULVIHILL. Ducks and fish, referred to as fish-cum-duck culture, are often raised in the same pond, using the excrement of the ducks to fertilize the pond.

In the aquaculture field, laws and regulations that control development are often referred to as the "regulatory web." The aquaculturist himself is under the jurisdiction of a variety of Government agencies. These agencies are generally ignorant of aquaculture. Their jurisdictions overlap and become unknowingly damaging to aquaculture development.

Let me give one example: FDA has the authority which establishes the appropriate action levels for contaminants that appear in food and fishery products. USDA is responsible for regulatory action with respect to terrestrial animals, such as horses, steers, sheep, cows, chickens, goats, turkeys, ducks and geese. Those action levels cover chlorinated hydrocarbons, antibiotics, organo-phosphorous compounds and trace metals. These are clearly defined acceptable limits, whereas FDA has a very limited number of contaminants that are considered in edible flesh or fishery products. They are there and are some of the things we recognize very blurringly, but at any time could declare an aquaculture product as unmarketable because of contaminant levels that have not as yet been defined.

Aquaculture is virtually a nonentity in the legislative world. There is no specific branch of the Government funded to truly direct and regulate the interest of aquaculture.

The fish farmer is the same as any other farmer in the United States and should be entitled to the same benefits. The USDA has the infrastructure and logistics capability to accomplish this task. With the passage of Senate bill S. 275, House bill H.R. 7171 and the signing into law by the President of the United States on September 29, 1977, a light appeared on the horizon whereby we could foresee the growth of aquaculture in the United States. The enactment of Senate bill S. 2218 would now move the United States forward in the field of aquaculture as the Agricultural Act of 1933 did agriculture.

Do you have any questions, sir?

Senator STONE. Thank you very much. I am going to ask one or two questions and then I have to leave because I am testifying before the Senate Agriculture Appropriations Subcommittee and there are some things that are quite important in research that I am asking for over there, so I will have to leave. Senator Hayakawa has graciously consented to chair the remainder of the hearings, which consists of about five witnesses.

I would like to ask if you would be in a position to do for the committee the same as I asked Dr. Mace to try to do, and that is to write us your suggestions for a consolidation of licensing and permitting procedures based on your background, practically, in aquaculture ventures.

Mr. MULVIHILL. I would be very glad to assist you, but I think you will find, Senator, that NOAA has already done a study. A gentleman back there mentioned they had done a study. There is a study of requirements for licenses done in Hawaii, so a lot of this is in existence.

Senator STONE. I am asking for not what is in existence, but how we could reduce this redtape burden to some extent. You must have come up with some ideas in the course of your ventures. Didn't you ever say what if we only had to go here or go there for a permit or license?

Mr. MULVIHILL. Roger.

Senator STONE. That is what I am interested in.

Mr. MULVIHILL. Right.

Senator HAYAKAWA. I am very grateful for Mr. Mulvihill's testimony. I have had an interest in aquaculture for a long time, without ever having had any occasion to get practical firsthand knowledge of what it is all about.

Senator STONE. He started a venture in Homestead, Fla., which raises freshwater shrimp, and I think you had your first major commercial yield recently, is that right?

Mr. MULVIHILL. Five years ago. That was another firm called Farm Fresh that announced that this past year.

Senator HAYAKAWA. Freshwater shrimp?

Mr. MULVIHILL. Yes; the prawn was actually developed by Dr. S. W. Ling and later by Takuji Fujimura. They have done an excellent job.

Senator HAYAKAWA. We have no further questions to ask you. I am very grateful for having had the opportunity to hear a portion of your statement, and I will read the balance of the statement. We are very appreciative of your testimony.

Mr. Porter Briggs, publisher of the Commercial Fish Farmer, representing Catfish Farmers of America and Trout Farmers of America.

Senator HAYAKAWA. Would you go ahead, and since your statement is several pages—

Mr. BRIGGS. I don't intend to read it.

Senator HAYAKAWA. Yes; would you summarize it and the statement will appear in the record in full.*

*See p. 152 for the prepared statement of Mr. Briggs.

STATEMENT OF PORTER BRIGGS, EXECUTIVE SECRETARY, CATFISH FARMERS OF AMERICA; ALSO REPRESENTING THE UNITED STATES TROUT FARMERS ASSOCIATION

Mr. BRIGGS. I would like to elaborate on my statement a little. Events in the last week on this aquaculture legislation have moved rather rapidly. There is, as you may know, simultaneous hearings going on in the Senate Commerce Committee on aquaculture legislation.

Let me begin by just mentioning that the U.S. Trout Farmers Association, on whose behalf I am speaking, has been in existence since 1952 and represents about 85 percent of the commercial trout production in the United States.

The Catfish Farmers of America, of which I am executive secretary, represents about 80 percent of the commercial catfish production in the United States. We have been in existence since 1968.

Senator HAYAKAWA. 1968 and what was the other date?

Mr. BRIGGS. 1952.

Senator HAYAKAWA. They are both pretty young, are they not?

Mr. BRIGGS. Yes, sir, compared to the aquaculture industry, however, they are about the most mature industries that we have. In any event, both of these two associations have come out in support of Senator Stone's bill and concomitantly we have opposed H.R. 9370, the one the House passed, and Mr. Gravel's bill and Mr. Weicker's bill.

I just would like to say generally that we do feel that the Government should articulate a policy for aquaculture. We feel a lead agency should be designated. We think that it is important that be done so the Government policy can be coordinated through one person, whoever the secretary or director of that agency may be. We think it should be USDA, for a number of reasons I have outlined in my testimony. We think there is a role for Agriculture and Interior to play and in each department we believe the funding level should be at least somewhat higher than it is now in the dollar amount for the development of aquaculture.

We think, however, the funding level authorized by H.R. 9370, is too high and we think it should be increased incrementally and arithmetically. We think there is a sense of—

Senator HAYAKAWA. Wait a minute. You think the level of funding is too high?

Mr. BRIGGS. Yes, sir.

Senator HAYAKAWA. And then you say it should be increased?

Mr. BRIGGS. Yes, sir, we should increase the funding to aquaculture right now, presumably through aquaculture legislation. However, that legislation increases the funding, I think, 2½—no; it is \$5 to \$16 to \$19 million, I believe. Yes; it goes from \$4 to \$15 to \$17 million in the Department of Commerce and half of that, 2 to 7½ to 8½ in the Department of Interior and Agriculture. We think that level is too high and it should be increased more gradually and arithmetically, as I say. We also think there is no basis in fact for the funding for the Department of Commerce to have higher funds

than the Department of Interior and Agriculture. At least if there is, that hasn't been exposed to us in either the testimony or any reports from any agencies or institutions.

Senator HAYAKAWA. Just back up for a moment. Both Commerce and Agriculture are involved in this and Interior, did you say?

Mr. BRIGGS. Yes.

Senator HAYAKAWA. In what way is each of these involved in that aquaculture?

Mr. BRIGGS. The Department of Commerce is involved through the National Marine Fisheries Service and the sea grant program, principally. The Department of Interior is our Nation's oldest existing source of expertise in freshwater fish culture, estuarian fish culture, and to a degree in saltwater areas. Agriculture is involved through the Soil Conservation Service, to a very limited degree through the Farmers Home Administration, the Agricultural Research Service, the Statistical Research Service and several other agencies that I am not competent to give off the top of my head, but it is extensive.

Senator HAYAKAWA. What it means then is that aquaculture has developed as an interest in at least three separate departments incidentally to the development of the other projects they had on hand?

Mr. BRIGGS. Yes, sir.

Senator HAYAKAWA. So there has been no concentrated attention to aquaculture as such?

Mr. BRIGGS. From any of these three agencies?

Senator HAYAKAWA. Yes.

Mr. BRIGGS. There has been a modicum of concentration. The Department of Commerce designated an aquaculture coordinator several years ago, which was very helpful as a step forward, and they provided some very important service to the catfish farming industry. It has been a comparatively small amount of funds, about \$100,000.

The Department of Interior has a fish farming experiment station where they provide assistance to new freshwater, warm water, freshwater fish farmers. The Department of Agriculture has a broad, but shallow scope of service, shallow in the sense it doesn't go very deep into the agency and it certainly has not been a priority. When Mr. Butz was there, he made it clear to us he wanted nothing to do with increasing the profile of aquaculture because he didn't want to take on the jurisdictional struggle he thought would follow any effort on their part.

Senator HAYAKAWA. Is there any necessity of jurisdictional battle in this matter?

Mr. BRIGGS. No, sir, we don't think so, but there is a problem right now in that you have two committees holding hearings simultaneously and our great fear is each one will pass a different bill. What I mainly want to encourage you to do today, is to try to get together with the Senate Commerce Committee, and through the auspices of these two committees convene all of the leaders of the aquaculture industry together to see if the two committees, together with the

leaders in the various interests in aquaculture, can't come up with a bill we can all support. Right now there is an apparent division in the aquaculture industry, primarily between the fresh- and saltwater industries, to call a spade a spade, and that is going to hurt our chances to pass it because we are going to oppose the bill they are for and we have probably very extensive political clout and I don't want to oppose something they need, so I would hope there is ground for compromise.

Senator HAYAKAWA. What are you opposing in their bill, that is, the commerce bill?

Mr. BRIGGS. We are opposing the fact it designates the Department of Commerce as the lead agency, which means that they would coordinate the program. It would not take anything away from other agencies, but we think the lead agency should logically be the Department of Agriculture, because it is the food-producing agency of our Government.

Second, we oppose the funding level. We think it is too high and should be done more gradually. We think we are courting a veto from the President because OMB is opposing this. We think giving Commerce twice as much funding as Agriculture and Interior is not based on fact and, third, we feel that the loan and insurance programs established by H.R. 9370 should not be established until the Department of Agriculture is given a reasonable amount of time to implement programs under the authority of Public Law 95-113.

H.R. 9370 calls for the Department of Commerce to set up a loan program and insurance program. The Department of Commerce has very limited outreach in the country. They don't go out to all the nooks and corners as does the USDA. The USDA has the system intact, the experience, the personnel and management. There is no sense in setting up a new agency unless the Department of Agriculture says they don't want it, and those are our reasons for opposing that bill. There may be grounds for compromise, however.

Senator HAYAKAWA. Thank you very much. Please proceed.

Mr. BRIGGS. Just a couple more statements. I do want to say we feel a disaster loan program and insurance program is needed. The question is how much, who and how. We think that, as I believe I mentioned, the Department of Agriculture, Commerce, and Interior, each have a role that they are playing and should continue. The question is the lead agency and level of funding for each of these.

There is one specific issue I want to mention to you, and it is in my testimony, but I want to elaborate on it briefly. It is a small part of this whole issue, but a very important one in the long term. The way we know aquaculture today, it is producing food for the marketplace and what we want to urge you to do is in your national aquaculture policy statement to recognize that aquaculture fits into the mold of what is popularly called appropriate technology. The prime advocate of that was the late Mr. E. F. Schumacher, and we think that the committee and staff should be mindful of this long-range opportunity when they are drafting this legislation. We are a clever Nation and I think that as food prices continue to consume a higher proportion of our disposable income we are going to see more people producing victory gardens, their own food in their own backyards.

Our Nation should begin to prepare for the possibility there may be aquacultural victory gardens in the future. Right now there are millions of people in this country that keep live fish in their home as a hobby, so the technology is there, generically speaking. The technology, as far as knowing how to produce fish in and around people's home, where they can get food cheaper than what they pay for it, does now exist. What we think should be done is that some way the language of this bill should commit the Federal Government to spending a small portion of the authorization, perhaps 1, 2 or 3 percent, to the development of small-scale aquaculture facilities so that we can begin to work on this technology. It is years away, but if we don't begin now, it will stay years away. We would like to encourage you and the committee staff to go out and visit fish farms. When you do, we would like to also encourage you to visit some of these appropriate technology research facilities where they are trying to develop backyard-type fish farming operations.

For example, the New Alchemy Institute in Woods Hole, Mass., has an outstanding facility and I think it would be worthwhile for you and the members of the staff to visit that facility.

Also, if you do say 2 percent, for example, of the program should go into the development of appropriate technology—and by that we mean people producing foods for themselves, rather than the marketplace—then we think you should also state in the language that a significant portion of these funds should be spent by small-scale research institutions, rather than larger government and large university type institutions. It is my own personal intuitive feeling that significant research breakthroughs in appropriate technology will come from small institutions with two, three, five and eight people doing research work. So, I feel it is important that the statute, if you do include this, specify that some of these funds for appropriate technology research go to small institutions.

Finally, Mr. Chairman, we would like to say that we have been in this business, the catfish farming industry, for virtually 10 years and the trout industry for about 25 years and it is great to see so many people in Congress interested in this legislation.

Lastly, I want to say for the record that the first couple of years of this debate we supported this bill, which we now oppose, and the reason we supported it was because Mr. Butz shut the door on us and said he didn't want the USDA doing it, so we had no alternative. When the farm bill passed and put aquaculture in the USDA, we did a flip-flop and are now supporting the Stone bill. This has created quite a bit of disappointment from people, primarily in the House, that we worked with a long time developing this, and we would like to work with them and with you to find a compromise bill.

Thank you.

Senator HAYAKAWA. On this matter of appropriate technology, have you or your organization talked to Governor Brown in California about this? He is a real enthusiast on appropriate technology, as you know. In fact, he went to Schumacher's funeral in London.

Mr. BRIGGS. I talked to Governor Brown about it on a personal basis, but not on behalf of the organization. He has given it a lot of

visibility, which has been a good thing, and right now it is kind of fashionable to be for appropriate technology, but, you know, the victory garden concept, I think, can become a reality. Our industry is never going to be impacted by that, but it would have an impact on increasing people's consciousness of the fact they can eat fish. Our Nation eats very little fish, so it would be good for us in the long term if we could have more fish consumption, so certainly there is a selfish interest there.

Senator HAYAKAWA. Thank you very, very much. We are very encouraged to hear you talk about this.

Mr. BRIGGS. Thank you, Senator.

Senator HAYAKAWA. The next witness is Dr. Wayne Shell of Auburn University.

Good morning, Dr. Shell. I had the pleasure of lecturing at your distinguished institution a few years ago. I remember it very, very vividly.

STATEMENT OF DR. E. WAYNE SHELL, HEAD, DEPARTMENT OF FISHERIES AND ALLIED AQUACULTURES, AUBURN UNIVERSITY, AUBURN, ALA.

Dr. SHELL. It is certainly a pleasure to appear before you, Mr. Chairman.

Senator HAYAKAWA. You have a whole department of aquaculture in your university?

Dr. SHELL. Yes.

Senator HAYAKAWA. There are not many of those, are there?

Dr. SHELL. No; there are very few departments that are set up specifically for that purpose.

Senator HAYAKAWA. I am glad to know about that. That is another distinction for the university then.

Dr. SHELL. Yes. I might comment that we have been in the business of helping to service the need for fish farmers since 1934. In that time we have worked with farmers in our own country, our State, the region, the Nation, and even around the world.

As you probably are aware, we also do a lot of work in international aquaculture development. We have 11 people overseas primarily assisting USAID in international aquaculture development.

Senator HAYAKAWA. Where?

Dr. SHELL. We have a man in Brazil, we have two men in Jamaica, one in Honduras, three in Columbia, two in the Philippines, one in Nigeria, and two in Indonesia.

Senator HAYAKAWA. I had the very good fortune to meet with Taiwanese aquacultural experts who were helping Vietnam in developing their agriculture and their fish farms, too. That is how I got very deeply interested in this several years ago. Please proceed.

Dr. SHELL. The Taiwanese are some of the best aquaculturalists in the world. They are extremely effective.

I have prepared written testimony and I request it be put in the record. I will summarize my statement. I have just a few comments to make about aquaculture and I hope that these comments might be of some value to the committee.

Senator HAYAKAWA. Your statement will appear in the record.*

Dr. SHELL. First let me make a comment about appropriate technology as it relates to aquaculture. We got into the business of aquaculture at Auburn by doing research on appropriate technology.

There are 2½ million ponds on private farms in the United States where people are producing their own fish, bass, and bluegills primarily. This was an appropriate technology developed at Auburn. That project was established to help farmers in the south who had no refrigeration and no fresh meat during the summertime. Fish ponds were encouraged to provide them with fresh meat. This was an appropriate technology development that started back in 1934, and it is still the basis for quite a considerable amount of fish production in the United States that does not go into commercial channels at all, but provides food, for the farm families.

I have had several opportunities in the past few years to be involved in this process of developing the methodology by which the public sector might become involved in support of aquaculture. In all of these activities and in all of my testimony I have maintained that aquaculture, based upon the best available technology, could compete effectively in the marketplace for land, labor, and capital. The economic well-being of the catfish industry and crayfish farming and the ornamental fish farming is effective evidence that aquaculture can compete and compete well in the marketplace.

Over the past few years we felt the most crucial need for fish farming in the United States was for USDA to take a strong positive stance, regarding the development of aquaculture and that aquaculture be provided with equity under the law. With the signing into law of Public Law 95-113, the Food and Agriculture Act of 1977, the Congress provided aquaculture equity under the law and unequivocally designated the Department of Agriculture as the lead agency for aquacultural development in the United States.

Now if we can assume that the Department of Agriculture will accept the mandate assigned to it by Public Law 95-113, and assume that Congress will fund the USDA initiative, I think that aquaculture will develop very rapidly in the United States without very much additional legislation.

What I am saying here is that we do have a considerable amount of legislation already. There may be some need to tidy up some of the things that have been said in rather terse language in Public Law 95-113, but certainly we have most of the legislative tools that we need already.

One of the primary questions that has been under discussion in these hearings is that of a lead agency. I have a comment to make on this subject. The agency that leads a conglomeration of Federal agencies in meetings to "show-and-tell" is relatively of little consequence. What is important is who is going to take the leadership role in providing service to farmers. For 99 percent of the practicing fish farmers of the United States, those people trying to grow fish for food and profit, the question of the leadership role was settled when Congress passed Public Law 95-113, and especially when the

*See p. 158 for the prepared statement of Mr. Shell.

Secretary of Agriculture made a decision to bring aquaculture in out of the cold as far as his Department was concerned.

Senator HAYAKAWA. Was that Secretary Bergland?

Dr. SHELL. That is correct.

Another comment, and this is regarding the variety of legislation advanced being in support of aquaculture. I think we need to be reminded of a wise old proverb here: "Bring up the child in the way it should go, it will not depart from that path when it is old." I choose to paraphrase that by saying "bring up aquaculture without undue Federal assistance when it is young and, hopefully, it will not depart from that path when it is old."

I hope we are wise enough regarding Federal assistance problems in food production in the case of agriculture to avoid similar problems for aquaculture.

One of the things that is especially worthwhile in S. 2218 is it does not promise "pie in the sky." I think aquaculture can compete at the marketplace. It does not need legislated advantages to make it compete.

My last comment has to do with mariculture. The best possible thing that could happen to mariculture is to experience approximately 10 years of reduced public expectation. With good luck, it will take at least that long for commercial farming of shrimp and pompano and red snapper to come on line. One of our minor problems is that the public expects to purchase these products at the market within a relatively short period of time. This is a number of years away. We have raised public expectation a little too high in mariculture. There should be a quiet period to give us time to do the research and development that we are going to have to do to bring these systems on line.

One other comment in this connection. Regardless of what we might hear, the jury is still out on commercial mariculture in the United States. The future of sea farming is somewhat in limbo. We had an inkling of this problem yesterday in hearings conducted by Senator Magnuson. Apparently there are strong opposing views concerning sea ranches. Mr. Greenwalt alluded to a similar problem in Japan, where some of the fish turned loose in the estuaries for mariculture may in fact compete with some of the natural population. With these types of problems confronting mariculture, it is going to take the wisdom of Solomon to straighten them out. I think the public should be aware of the potential problems, also the potential rewards in mariculture.

This concludes my statement. If you have any questions, I will be happy to answer them.

Senator HAYAKAWA. Thank you very much.

What you said about the term you used, "mariculture," that is fish culture in the ocean and that has, as you say, almost unpredictable possibilities?

Dr. SHELL. The problem is one of common use. The water and the land out there is often common use property and there are many users—people that want to build hotels on the shoreline, people that want natural shrimp nurseries, people that want the marshlands left intact. Then there are the pollution problems, the oil spill prob-

lems, and the hurricanes. All of these things make this small strip of complex environment extremely valuable to a lot of people. In order to function there in a commodity market, aquaculture is going to have to go in and compete with all of these other users. I hope mariculture will be suggested because we need these products and need them badly. We will need them more as time goes on.

Senator HAYAKAWA. You said like a child growing up, an industry growing up should learn to get along without the Government if they get along that way in their infant stages. To what degree then would you have Government aid, intervention, and so on? I think you have clearly indicated in mariculture it might well be necessary.

Dr. SHELL. Yes.

Senator HAYAKAWA. But certainly for your, what Mr. Briggs called the victory garden and so on and appropriate technology and those ponds out of which farmers supply their own protein, with the products never going into the market because it is going directly into people's stomachs, that whole area is something that needs very little Government regulation or even assistance at all.

Dr. SHELL. The primary services needed from Government are the extension and the information exchange.

Senator HAYAKAWA. That is Agriculture Extension?

Dr. SHELL. That is right. The extension services are already in place. That is how the transfer of this appropriate technology that I mentioned earlier took place. It started, at least in the case of bass and bluegills, at Auburn and spread throughout the United States as a result of extension activities.

Senator HAYAKAWA. I know about bass and bluegills. You guys are responsible for that. That is very, very nice. And how many Agriculture Extension Services, how many universities are involved in providing these services in various States? Are there many of them?

Dr. SHELL. There are several across the southern tier of States, and in Wisconsin with the yellow perch.

Senator HAYAKAWA. I was curious about Wisconsin, because I used to be in Wisconsin and I knew their Department of Agriculture was a very powerful one. They have gotten into it, too?

Dr. SHELL. Yes; they are interested in trying to grow yellow perch.

Senator HAYAKAWA. How about California?

Dr. SHELL. California lagged behind for a while, but they have made some real strides recently. California is one of the few States that is really putting a good bit of money into aquaculture.

Senator HAYAKAWA. California is?

Dr. SHELL. Yes. The legislature there made a commitment to aquaculture. They hired an aquaculture coordinator at the University of California in Davis, and they are beginning to hire some staff. I think they will make some rapid strides.

Senator HAYAKAWA. It is about time they told me about some of these things.

Thank you very much.

Our next witness is Mr. John Datt, director, Washington Office, American Farm Bureau Federation.

STATEMENT OF JOHN C. DATT, DIRECTOR, WASHINGTON OFFICE,
AMERICAN FARM BUREAU FEDERATION

Mr. DATT. Thank you. We appreciate the opportunity to present the views of the Farm Bureau with regard to legislation to establish a program to promote the development of aquaculture.

Farm Bureau is the Nation's largest general farm organization, representing more than 2.8 million families who are voluntary, dues-paying members in more than 2,800 county Farm Bureaus in 49 States and Puerto Rico. Farm Bureau members are engaged in the production and marketing of every major commodity, including the farm production of fish both for human consumption and for other purposes.

At the most recent annual meeting of the American Farm Bureau Federation, the voting delegates of the member State Farm Bureaus adopted the following statement on fish farming, and I quote:

Fish farming is an agricultural enterprise and should be treated as such. We will oppose any proposal that would unreasonably impede the movement of farm-produced fish to market.

We commend this committee for its interest in legislation to promote the development of aquaculture in the United States. The issue to be resolved is whether this program should be administered by the Department of Agriculture or the Department of Commerce.

We believe that the interests of producers and consumers would be best served if authority for programs having to do with the production, marketing, and regulation of farm-produced fish were to be placed in the U.S. Department of Agriculture. Such action would be consistent with section 1502(b) of the Food and Agriculture Act of 1977, which amended the USDA's Organic Act to include aquaculture." USDA, through the Agricultural Experiment Stations, the Cooperative Extension Service, and the Soil Conservation Service, to name a few agencies—has had many years of successful experience with programs to improve the production and marketing of live animals and poultry.

Let me say, Senator, one of the reasons we are here is that in recent years, as a result of the work of Dr. Shell and others, there has been a substantial increase in interest in this area among Farm Bureau people, particularly in the Southeast. We have today, for instance, the Alabama Farm Bureau Federation which has a full-time person working with the farmers in Alabama who are producing fish. Also, in Mississippi, Arkansas, and other States in the Southeast, we have set up fish farmers' advisory committees where we can get input from these people, so in this area fish farming has become very important in terms of farmers and in the production of fish. We are working with the land grant college people. Our president, Allan Grant, has a very longtime, deep personal interest in this area. So that is why we are here today, because we have a substantial membership who now have become very much involved in this and who feel very strongly that the program as it relates to aquaculture should be administered by the Department of

Agriculture and that they should, as done in the farm bill, be designated the lead agency and coordinate the activities of the other Government agencies.

Senator HAYAKAWA. Thank you very much.

There is something I want to ask you about. Let's take the family farmer, a man and his wife and children and so on, and they all have farm chores to do. Let's say it is dairy farming, which requires hours of work every day. Does fish farming take an awfully lot of labor?

Mr. DATT. I think probably Dr. Shell could answer that better than I can, but, for instance, let's take the president of the Mississippi Farm Bureau, Hugh Arant, who farms cotton, soybeans, and so on. I would guess about 5 or 6 years ago he got involved in fish farming, and he now has five or six ponds there, and over the years he has increased the number that he is producing. From a labor-intensive standpoint, it requires a limited amount of labor, although at the same time it is not like a dairy farm. You know you have to milk the cows every day, but you still have to check, as I understand it, the ponds almost daily to make sure nothing has gone wrong and that something hasn't occurred to them, so there are periods where there is substantial labor involved, when the fish are put in the ponds, when the fish are removed, and then the interim periods is a matter of checking, as I understand it.

I was in Arkansas last week and I saw the first fish farms I had seen in that State. I had seen others in Mississippi and Alabama, but I had not seen any in Arkansas. And it depends a little bit upon the size of the operation.

Senator HAYAKAWA. Yes; I am sure it does.

Mr. DATT. Increasingly, these folks have found this to be, frankly, a profitable business, and it is expanding, thanks to the work of the land grant college people who are working with them.

What I am saying is you can take a person like, as I say, a person in Mississippi who can fit this into his other farming operations very successfully, and they have found out that they can do it very successfully.

Senator HAYAKAWA. Now, there is another question: There is a point at which fish farming is mainly useful as a food supplement to the family, without marketing indications, but beyond a point there is a marketable surplus. What is the point at which the fish farming operation becomes big enough for the market, so that you have a surplus for sale?

Mr. DATT. I can't answer that because I don't know the economics of it to that extent. I can say this, though, that what we have found and my knowledge of it is that you start out as sort of a supplement to the family and then they discover how productive it is and then they move from there into the commercial—I say commercial operation.

I think Dr. Shell probably could answer both of those questions better than I can.

Senator HAYAKAWA. I wonder if I could ask Dr. Shell that question. Would you care to comment on that question?

Dr. SHELL. It would depend on the species. In the bass and blue-gill ponds, an acre or so would provide all of the fish a family would need, and then provide some for the neighbors. If you get into catfish pond where you are feeding them, production is often about 3,000 pounds per acre, so most of that becomes surplus and available to the market.

Senator HAYAKAWA. That requires how many acres?

Dr. SHELL. We have a number of people in Alabama that are operating 2- and 3-acre ponds, that work in factories. They maintain these small ponds and then allow people in the surrounding communities to come in and catch those fish for a fee. This helps them maintain a small family farm, to maintain a farming activity there and to make a considerable amount of extra money, in addition to providing recreation through a free enterprise mechanism.

Senator HAYAKAWA. That is wonderful.

Mr. DATT. You also have those who are in it for commercial or who are farmers in it for commercial purposes.

Dr. SHELL. There are different gradations of it. Some are in it entirely as a business venture. Most catfish farming though is a part of an overall agricultural enterprise, where farmers use surplus land, lands that are not completely suitable for agriculture, and surplus labor.

There are a number of spinoffs from aquaculture in an agricultural operation. One is the more efficient use of labor and equipment on the farm. There are a number of ways in which agriculture and aquaculture dovetail into mutual advantages.

Senator HAYAKAWA. It sounds as if it makes farm life more enjoyable to have a variety of things going on.

Dr. SHELL. Recreational aquaculture also helps rural development. It encourages city people to get out into the countryside. It provides recreation for them and builds a better interchange between the people that live in the city and those that live on the farm.

Mr. DATT. Another thing it does, of course, is provide another source of farm income for these poor farmers that are mainly involved in cotton and soybeans and other crops.

Senator HAYAKAWA. Gentlemen, I am getting sold on your program.

Thank you very much.

Dr. Kent Price, Jr., director of Marine Studies Center, University of Delaware.

Dr. PRICE. Senator, I have a prepared statement for the record, but, of course, I will summarize it.*

Senator HAYAKAWA. If you please.

STATEMENT OF DR. KENT S. PRICE, JR., DIRECTOR OF MARINE STUDIES CENTER, UNIVERSITY OF DELAWARE, NEWARK, DEL.

Dr. PRICE. I am here today to present my views as a faculty member and administration staff member at the University of Delaware, which is both a land-grant and sea-grant college.

*See p. 159 for the prepared statement of Dr. Price.

The University of Delaware initiated mariculture research 10 years ago due to a severe decline in the oyster industry of Delaware Bay. Although the collapse of this seafood industry appeared to be a local problem, it has since become apparent that many natural fisheries are declining due to overfishing, pollution, disease, and natural events. Further analysis of the situation shows that we are just now crossing the frontier from hunting and collecting marine species for man's use to properly managing and husbanding them for uses equivalent to those seen in terrestrial food and fiber production.

In agriculture, man began to cross that frontier several thousands of years ago. For some time knowledgeable people have been asking why the development of aquaculture has not kept pace with the development of agriculture in this country. The question was recently addressed by the Committee on Aquaculture of the National Academy of Sciences, as mentioned earlier, a study which I participated in. However, I won't repeat the committee's findings because, of course, you have them before you. I can, however, amplify them, particularly along the lines of the University of Delaware's experience.

In 1968, shortly after the establishment of the national sea grant program, the University of Delaware began research supported by sea grant to revitalize the shellfish industry in Delaware. Research centered on shellfish diseases, controlled reproduction, predators, water quality and food for the animals. After 2 years of research it became apparent to us that a new approach was needed. Natural water quality was highly variable and subject to human and industrial contamination. Harvest times were seasonal and animal quality was not uniform.

As a result of these problems in nature, our sea grant research was redirected in 1971 to the development of commercial methods to grow shellfish in a fully controlled environment. The advantages we foresaw in using a closed system or controlled environment approach included spawning on command to insure year-around production, growth at increased rates due to optimum diet and feeding rates, uniformity of product, certification of disease-free product and, finally, recycling of materials and conserving energy.

Thus far our expectations have been borne out by solid progress in research. As you know, in nature oysters and clams grow to 3-inch market size in 3 to 5 years. Our research has shown that this long growing period is due principally to an inadequate food supply. We have perfected methods to grow algae monocultures which can be blended to provide shellfish with optimally nutritious diets for animals of various ages. Most important, though not surprising, our research showed that most shellfish growing in natural waters were almost always undernourished and that if adequate quantities of the proper types of food were made available then growth rates could be accelerated to produce marketable animals in roughly one-quarter the time required in nature. In our laboratory we now raise small quantities of oysters to 3-inch market size and clams to "little neck" market size in just 9 months.

Major recent advances include: (1) Harnessing the growth of nutritious algae by controlling the availability of plant nutrients, carbon dioxide, light and appropriate PH to produce cell densities of over 10 billion per liter, or about 1,000 times the densities found in nature. Algae grown in controlled reactors are capable of photosynthetically capturing about 4 percent of the Sun's energy which reaches the Earth. By comparison the best producing corn crop captures about 3.3 percent of the Sun's energy.

Second, definition of the components of a recirculating system and the ranges of temperature, water quality, and nutritive constituents necessary for continuous system operation. Third, preparation of a design for a 200 bushel per year shellfish culture prototype for determining the economic viability of recirculated system mariculture, and, finally, the process is now being patented so that commercial investors can be protected by licenses.

As you know, universities conduct research both for the education of future leaders in business, government, and research, as well as for the discovery of new knowledge. In addition, we make full use of sea grant sponsored marine advisory service capabilities to bring the results of our research to commercial uses at the earliest possible time. Strong interest has been shown by major food industries in the potential of our research. Their interest is continuing and, in fact, increasing, as evidenced by a 5-year grant by the Campbell Soup Co. to support our shellfish nutrition work and a 3-year commitment by Unilever, Ltd. of England and Borden's, Inc. to become mariculture industry partners and to support our research.

As our work proceeds, we are involving engineers and economists to a greater degree so that the selling price of shellfish produced in a closed system can be estimated with greater accuracy to determine when an attractive return on investment can be achieved by a commercial operator.

Our next step then would be to conduct the 200 bushel per year prototype study, to increase research activity over the next several years, to plan with industry an 8,000 bushel per year facility or one that can produce about 100,000 pounds of meat per year, and finally to continue to involve the commercial sector in expanding this new industry.

The question of designation of a single lead agency for administering all aquaculture programs is a difficult one, as you well know. The Department of Agriculture has shown leadership in the development of catfish farming and other freshwater aquaculture and is an agency charged with developing onland food resources. On the other hand, the Department of Commerce has shown leadership in developing fisheries and marine aquaculture, or mariculture, and is the agency charged with developing saltwater food resources. In our opinion, to designate either agency as the sole lead agency for the cultivation of all plants and animals which may be of benefit to man, and the whole panoply of corollary and derivative subjects as presently known in agriculture alone would have serious shortcomings.

It is the considered opinion of the University of Delaware that the Department of Agriculture should be designated the lead agency

for freshwater aquaculture and the Department of Commerce should remain the lead agency for brackish and salt water aquaculture. We feel that this is consistent with the current strength of the two agencies and should benefit the development of aquaculture in the United States.

Commercial aquaculture can become a reality in the near future if we make full use of the resources and knowledge now available to us. Our objective as a nation needs to be to create a viable food source and thus new bases of national wealth.

Thank you. I will be glad to attempt to answer any questions you may have.

Senator HAYAKAWA. Dr Price, I would like to discuss first of all or ask a question first of all about your last statement about mariculture properly belonging with the Department of Commerce and the freshwater situation belonging to the Department of Agriculture. Does that make sense? It makes verbal sense to me right on the surface. Would there still remain areas of conflict of interest or overlapping research problems? What would be the objections if one were objecting to that provision?

Dr. PRICE. The specific objection that I would have is that over several centuries, actually, what is now known as the Department of Commerce has been developing expertise in the area of marine fisheries life cycles, understanding management practices and, of course, has not only developed a good deal of information, but has quite a few trained personnel involved. If you were going to transfer that entire cadre of people to the Department of Agriculture or to create a new food agency, I think you could capitalize on that expertise, but if you simply transfer the mantle of designating the lead agency to Agriculture alone, I don't believe that that expertise and body of knowledge can be capitalized on quite as easily.

Senator HAYAKAWA. The two areas, freshwater aquaculture and mariculture, can really be separated enough so there will be no overlapping of functions or areas of responsibility? Is that what you are implying in your statement?

Dr. PRICE. There may be some minimal overlapping, but I think the distinction really is fairly clear and, as I have been trying to point out, it is an historical distinction, as well as a real one, in terms of the differences between salt and freshwater.

Senator HAYAKAWA. Since many of the people who are about to testify or have testified are still in the room, I would invite them to make a comment on this, if anybody feels ready to. Does that make sense to divide these, Mr. Briggs, Dr. Shell, or any of you, in this way, the mariculture with the Commerce Department, freshwater aquaculture with the Agriculture Department?

Dr. SHELL. As I said earlier. I don't think this jurisdictional dispute is all that important anymore now that USDA has taken its position stance on fish farming. The thing that is still most important is who is going to provide service to farmers, not who has the mantle of leader on them, but who really is going to provide the farmers with the assistance they need. The leadership role will finally rest, with the agency serving the industry.

Senator HAYAKAWA. Mr. Mulvihill, would you like to comment on this?

Mr. MULVIHILL. Yes. I think you have to look at the animal which I particularly addressed, which is the freshwater prawn, and it starts its life cycle in brackish water and grows up in freshwater, so you can split jurisdiction if you think of brackish water and freshwater.

Senator HAYAKAWA. Can't you train them to do something else and stay in one jurisdiction?

Mr. MULVIHILL. I think I have found one species that will do it all in freshwater.

Senator HAYAKAWA. In the testimony of the last two or three people that testified, there has been no further mention of this recreational fish culture that it might be called, that is, tropical fish and fancy fish that people keep in aquariums and so on. Is that a big enough trade to warrant serious attention to by the Federal Government?

According to the figures given earlier, it seems to be.

Dr. PRICE. I would say so. If my memory serves me correctly, it is about a \$300 million a year business.

Senator HAYAKAWA. An enormous amount of those fish are imported from foreign countries?

Dr. PRICE. Yes.

Senator HAYAKAWA. Do they provide problems of health or introduction of fish diseases or anything like that, that are a danger to us in any way?

Mr. MULVIHILL. Yes.

Senator HAYAKAWA. All of that is adequately supervised and managed, is it, at the present time?

Mr. MULVIHILL. I don't know whether you are addressing me or not, but I think probably the doctor can address it better than I.

Senator HAYAKAWA. Since there are no other Senators here, I am just inviting you that have comments to pitch in.

Mr. MULVIHILL. We have had introduction of diseases already from imports and I think Dr. Shell can address it better because he knows some of the biological functions better than I do.

Senator HAYAKAWA. Your recommendation, Mr. Price, is very specifically that the functions be fairly clearly divided between Commerce and Agriculture, with each of these Departments taking major responsibility for, one for the freshwater and one for the ocean, with the understanding, of course, that there will be overlap.

You see the reason I worry about the question at all is that two different levels of funding for the support of aquaculture has been suggested by two different Departments and obviously it would be desirable if they got together before coming to us or to the Department of Commerce, for that matter, and present a united front.

The University of Delaware has a fairly vast program in all of this, has it not?

Dr. PRICE. It is one that has been in being for 10 years, which is about the extent of the national sea grant program.

Senator HAYAKAWA. And you sure are not involved with bluegills and crappies, are you? You are in a different area—oysters and shrimp?

Dr. PRICE. I should point out that our College of Agricultural Sciences does work with that area and actually 5 or 6 years ago

even looked at the potential of catfish culture in Delaware, but unfortunately we are a little too far north to capitalize on that from a commercial point of view.

Senator HAYAKAWA. Thank you, Dr. Price.

Dr. PRICE. Thank you.

Senator HAYAKAWA. Mr. Everett Tolley, executive director, Shellfish Institute, Baltimore, Md.

I just want to say, incidentally, that I am glad that the circumstances have put me in the position of having to chair this meeting because it is one of considerable interest to me ever since my doctor said I should stop eating meat and should restrict myself to a seafood diet, so whatever you guys have to say on shellfish or lobsters or bluegills or catfish is all of intense personal interest to me.

STATEMENT OF EVERETT TOLLEY, EXECUTIVE DIRECTOR, SHELLFISH INSTITUTE OF NORTH AMERICA, BALTIMORE, MD.

Mr. TOLLEY. My name is Ed Tolley and I am known by that in many areas. However, Everett Tolley is the official name.

I am the executive director of the Shellfish Institute of North America, in Baltimore. We are a trade association, going back to 1908, and the oldest fisheries trade organization in the United States. We have as members, producers, processors, distributors and suppliers of oysters, clams, crabs, scallops, etc. as well as abalone on the west coast. We have members in all the coastal States of the United States and we do try in a conservative manner to understand the needs of aquaculture and all of the various complex needs of the industry.

We have, for example, members of our association that go back to the founding in 1908 because there are three generations still with the institute, and there are many members in the aquaculture field that have hatcheries. We believe there is a commonsense approach to bringing together all of the technology we have in the United States and all of knowledge and information, much of which we have from other countries, Japan and others.

I might say that Mr. Loring, who has a prepared statement for the record that we would like to offer, could not be here today and I am speaking on his behalf, and I would like to summarize that statement, if I may, and then make some additional comments to try to address some of the questions you raised which I didn't reply to while I was sitting back there.*

Senator HAYAKAWA. Please do.

Mr. TOLLEY. First let me say I appreciate the opportunity to be here.

When we talk about H.R. 9370, we are also talking about S. 2582, 2762, and all of the legislation on which we have testified in the past 3 years, and we believe in concept all of the bills are good.

We think that there has been too much preoccupation with a lead agency concept and who ought to do the job and this, in our opinion, is not that important. The important thing is to get the job done and supply the food and protein and so forth for the American

*See p. 168 for the prepared statement of Mr. Loring.

people and for shipment abroad to change the whole picture from a balance of trade deficit standpoint.

So far as your own personal interest in seafood and diet is concerned, I was raised on the Eastern Shore of Maryland, on an island, and I used to be a fisherman. My family were in the seafood industry for many years and still are, and I had an opportunity to be a consultant nationally with the people in the seafood industry, as well as steel mills and others, to gain a broad overall picture of the operations of business, both small, medium and large. I have had the opportunity in the past 7 years with the Shellfish Institute to travel extensively and visit many shellfish plants around the United States, and I believe quite sincerely we are at the point where the Senate, if they carry the ball, which I honestly believe they will, and carry on with the House bill which was passed, and forget some of the things that are not important at this point, we will get the job done properly and then can consider who ought to speak for whom, if it is advisable, at a later date.

Insofar as going along with the prepared statement and additional comments, I would like to say this: Mr. Loring, who is immediate past president of the Shellfish Institute of North America, has been in the aquaculture field for the past 20 years and has prepared this statement with the benefit, incidentally, of much information from people all over the United States, not only the abalone people in Monterey, but also people in the gulf and the east coast and so forth, so you have the combined thinking of people on this.

Insofar as getting on with the comments is concerned, I would like to paraphrase in this manner: I think the confusion about what the bill does or should do or which bill is best, should be forgotten for the moment. I think we ought to talk about the needs of the industry. There are those in the industry who would not take advantage of any loans or insurance; there are those who would. There is a great difference, in our judgment, in the needs of the freshwater as compared to the saltwater. One has advanced more than the other. Some have gone further from a technological standpoint and so forth, and I would just say that in the judgment of the institute there is no limit to the good which can be done if you don't worry about who gets the credit, and that is the basis on which we operate the institute. We all work together as a team.

Carrying it further, it is agreed by all interested parties that the principles of aquaculture are not only sound, but are essential. We think that the world must develop other sources of food production and the fact is that the United States is falling behind other countries. We have a great potential here and it is that thought we would like to talk about.

For example, you have about a \$2 billion trade deficit and it could be reduced substantially, perhaps cut in half, some experts say, if we went ahead with an aquaculture program without worrying about who is going to do what; just use the basis of the information we have at the present time and then find means of going further from a technological standpoint, et cetera.

What we are saying is there is a fine point where the Government should give assistance of any kind and where the industry

should run with the ball. From an economic standpoint, if the industry goes too far, it will stifle, perhaps, and will spend too much money. We think there should be better input from all of industry, both small, medium, and large, in the areas in which they have an interest, whether freshwater, saltwater, brackish water. It doesn't matter. The main thing is they are very knowledgeable, learned, and competent people, many of whom have testified here today, and so we don't need that many committees to be formed and all of that, but what we need is to get on with the job. We feel that while there have been successes in this area, we feel that we have only scratched the surface of what could be done.

Now when we consider that in the neighborhood of about 65 percent of the seafood product consumed in this country comes from other countries, it gets alarming, and other countries get on with an overall policy, it appears to me, much better than we do. And I think this: I think that the industry has a responsibility, and we certainly do accept that responsibility without any reservation, of communicating with all of the appropriate Senate committees, House committees, other associations and all of the people with whom they supply input, or do it independently and then know what their needs are so when the Senate is given a proposal of the amount of funds needed for what and the rationale, they will know that there are those who have responsibility, who are learned in this country, and we would be more than happy, insofar as our responsibility is concerned, to supply the economic data. What the potential is for this we believe should be based upon information that we have available or can obtain quickly, and we would be glad to help in any way that we can. I am really very thrilled personally at the prospects of what can be done if we all get together on it properly.

Insofar as the financial assistance programs are concerned, which I touched on briefly, I think that those having to do with the Department of Agriculture, as I look over the picture, there is little hope for funding new and imaginative ventures which must predominate during the formative years of the industry. We feel that their policy, loan policy, is ultraconservative and we do not believe that their needs should have anything to do, let's say, with shaping the needs of an industry where you are going out in the wild blue yonder, so to speak, out in the ocean and you are taking grave risks. You never know when you are going to have an Agnes or a disaster or what have you, and there are those who have lost millions of dollars doing this, and there are those that invested millions and made money and those who invested, say, \$100,000 and made money, and we feel that one agency that is not entirely familiar with everything that is going on in the industry, are not specialized, we feel that they should do their thing up to a certain point and do it well, and that we should do likewise. I think that it should be considered on an individual basis as to who is going to take care of the needs of the industry, and it should go on up through the Senate and the House and finally the conferee stage.

Now there is another factor. In the freshwater end of it there are fewer people involved per installation or per farm as compared to the number of people that would be involved in the saltwater

area, consequently there is more money that has to be invested, in order to realize a return.

I think that covers the main thrust of our comments and we certainly thank you for your time. If there should be any questions, I would be very glad to try to answer them.

Senator HAYAKAWA. I am very grateful to you. I am especially grateful to you for pointing out the fact that perhaps we shouldn't worry near as much about what the lead agency is or who has jurisdiction and so on.

I really don't have any questions for you on what you have said. I think you are the last one to testify this morning. What you have said and what all of you other gentlemen have said stimulates me to make a few remarks on my own, based especially on my trip to Japan. In Japan one of my missions, representing both the Agriculture Committee and California farmers, was to investigate to what degree we can increase our exports of cotton, prunes, citrus fruits, raisens, et cetera, to Japan. During the course of the testimony you gentlemen have presented this morning, it seems to me that this is an area that would be quite seriously overlooked: In a good Japanese banquet, as I discovered several times in the short time I was there, they are likely to serve—Japanese dinners have many courses, but every course is very small and out of 10 courses, about 8, as a rule, are seafood courses, and seafood is especially regarded as great delicacies in Japan, are both expensive and hard to get, but they insist on consuming it. All of this reminded me of several things which occurred to me in the last few years. Do you know that sea urchins, those pincushion-like things with the pins sticking outward, which is very disagreeable to step on, has a roe which the Japanese prize very much, and there are some California divers that have learned to gather the sea urchin, and whether you ship the whole sea urchin or just the roe to Japan, I don't know, but they are making a very good living on this.

To us the sea urchin is a terrible nuisance, but what is a nuisance in one country may be a very, very valuable gourmet product in another.

There are an enormous number of trash fish, so-called, like carp and buffalo and in some places catfish is regarded as that. There are many other kinds in different parts of the world that are regarded as trash fish, and sometimes they go to work and clear whole lakes of that trash fish in order to get bass or bluegill instead, and much of that trash fish is not at all trash, from the point of view of the Chinese or Japanese market; much of it is made into fishloaf, known in Japanese as komo-boco, and the Jews call it giltefische. They are not dissimilar products. But we throw away that trash fish or use it for fertilizer. It may be commercially valuable.

I have noticed that smelt loaded with roe are sold here in Washington salted and a little package of four of them, a little less than one-quarter of a pound, costs \$2, and they come from Japan. But you know they give them away in northern Wisconsin and Minnesota, and they are the same bass smelt.

I wonder if the aquaculture or American fishery in general shouldn't send a small delegation to Japan to eat at banquets all

over Japan for a few weeks and discover this incredible market for really far out tastes in seafood that is to be found there.

I am sure the same thing could be found in Taiwan or perhaps Singapore and other places where they are really quite desperate for more seafood supplies.

As you know, Japanese fishermen fish off Greenland, down in the Mediterranean, down in the south. They are all over the world looking for enough seafood to supply themselves and if we have an unfavorable balance of trade with Japan, maybe we can help out even with our trash fish from Lake Mendota in Madison, Wis. Maybe that would help.

I just wanted to call this to your attention, that there are so many things we refuse to eat that are valuable somewhere else in the world.

Well, that completes my statement.

Mr. TOLLEY. If I may make one additional comment.

Senator HAYAKAWA. Please do.

Mr. TOLLEY. You stimulated my thinking.

Last October I had the pleasure to be invited—it was through local industry—and went to the sea urchin plant you are speaking of in California. It is interesting what they do. The Japanese take out the roe, place it very carefully into small Japanese boxes and they grade it to make sure everything is absolutely A-1. It is then packaged and shipped in cartons to Japan. I did know what they get for it at that time. Some was given to us because the people I was with in the industry had a small party later and they served the roe to the people. It was interesting to watch all of the faces after we all tried the roe, but that is another story.

In any event, I agree with you wholeheartedly and I think it is a shame in our country the amount of trash fish that is discarded and wasted. I believe sincerely in aquaculture but we should not dwell too much on the leadership role aspect now. A lot of technology has been developed and some needs to be developed, but let's look at the marketing potential, the export possibilities and all of those things at the same time. It is a total package which must be considered and without that we are just going to continue to talk about the whole thing for the next few years.

Senator HAYAKAWA. Thank you very much.

I want to make note of the fact that Senator Mike Gravel wants to submit a statement to this committee on this subject. He was not able to stay to present the testimony himself, so this will be tendered for the record.*

If there are no other comments to be made, and I invite anybody else that has a comment to make them, but if not, then, gentlemen, the hearing is adjourned.

[Whereupon, at 11 a.m., the hearing adjourned, subject to call of the Chair.]

*See p. 142 for the prepared statement of Senator Gravel.

APPENDIX

STATEMENT OF HON. LLOYD BENTSEN, A U.S. SENATOR FROM TEXAS

Mr. BENTSEN. Mr. Chairman, I am submitting testimony to the Senate Committee on Agriculture, Nutrition and Forestry to urge endorsement of the concept of Aquaculture. Recognizing an existing need, National legislation on Aquaculture would enable us to increase our supplies of valuable foodstuffs and lower our dependence on other countries for these commodities.

Currently, U.S. aquaculture is responsible for all trout produced in this country, for over half our catfish and crawfish, and for sizable portions of our oysters and salmon.

A growing demand is evidenced by studies indicating an increase in U.S. consumption of fish and shellfish. However, the technology for U.S. aquaculture has not yet been perfected, and there is still high risk in the industry. Consequently, venture capital, already scarce in these difficult economic times, is not available in sufficient quantity for further development of aquaculture. With more practical knowledge and with a few demonstrations of success, of practicality, and of commercial viability, private industry will increase investment in the industry.

There are several good reasons for us to make aquaculture more attractive to the private sector right now, rather than in the distant future:

Normal international supplies of fish appear to be diminishing while demand is increasing. Also, due to the increase in fuel prices it has become more expensive to send fishing vessels thousands of miles to distant international waters. Greater production of fish and shellfish in inland, coastal and near-coastal waters will both increase supply and cut down on energy costs.

Currently, the U.S. imports more than fifty percent of our fishery products. With an improved aquaculture industry, we could increase domestic production and help alleviate our balance of payments problems.

Aquaculture is an ideal industry for coastal wetlands, many of which are now being underutilized. In addition, it can make use of thermal effluents from power plants, and bring value to a resource that is now regarded as a nuisance and largely wasted. Currently, power plants in New York, Florida, Texas, and California are experimenting with this type of system.

In general, protein-rich foods are in short supply around the world. Increased yield in the fishing industry, brought about by aquaculture, can make significant contributions towards increasing these supplies of necessary protein-rich foods.

Aquaculture has benefitted small farmers and large corporations alike. Facilities may range from small tanks and ponds to multi-million dollar operations yielding thousands of tons per year. For several species, current technology is sufficient to allow only small operations; what is needed is the perfection of marketing systems designed to bring fish from small producers to consumers. A National Aquaculture Act could provide the support needed to achieve a viable marketing system.

My interest in this industry was prompted by the successful aquaculture projects carried out by and through the Cooperative State Research Service of the Department of Agriculture. These projects include studies on breeding and genetics, nutrition, disease and parasite control, and quality control.

Many of the techniques developed by CSRS are being employed throughout the U.S. Texas experiments are encouraging with respect to both coastal industries and inland areas.

Shrimp are now being raised successfully in Corpus Christi, utilizing the thermal effluent from a nearby power plant, and hundreds of miles inland near Pecos we are, on an experimental basis, raising these same shrimp in ponds located in a semi-arid region. These ponds are fed by the salt waters pumped from an ancient ocean which still exists deep underground.

Too, in the farmlands Texas catfish are raised in ponds and tanks. They are then sold to local markets or are used to stock other ponds, rivers and lakes.

In the northeast, oysters and lobsters are now being raised like farm animals. In the Northwest, juvenile salmon are being released into native streams which carry them out to sea where they mature. In just a few years these salmon return to those same streams to spawn, and there they are harvested by local citizens. On the Western coastlands abalone are now being grown commercially and in the South, several aquaculture species are being raised.

These are just a few examples of what is happening now in the early stages of the industry. What can happen in the future is even more exciting: the production of fish from old offshore oil platforms; the release of shrimp into coastal waters where they will mature and be harvested by the shrimping industry; the breeding and development of super-species, larger, better and more nutritious than those that now exist.

As we farm the land, so can we farm the waters. A National Aquaculture Act is a major step in that direction. I hope that my Colleagues will join me in support of an Act which will bring more progress in an area on which we must place increasing reliance.

STATEMENT OF HON. MIKE GRAVEL, A U.S. SENATOR FROM ALASKA

Mr. Chairman, members of the committee, I thank you for the opportunity to appear before you today to comment on the several pieces of aquaculture legislation which are presently under consideration by the senate agriculture committee. Aquaculture is practiced in varying degrees of intensity throughout the world and I believe the time is now right to provide legislative encouragement for aquaculture activity in the United States.

AQUACULTURE—AN OVERVIEW

The world activity in aquaculture is wide and varied. China has been cultivating fish for over 2000 years. Japan now produces more than ten per cent of its seafood needs through aquaculture. And Russia has been giving aquaculture increased attention.

The United States has been dabbling in various forms of aquaculture for a considerable period of time, but a Library of Congress report indicates that aquaculture in the U.S. has grown insignificantly compared to such activities in other parts of the world.

My home State of Alaska has been involved in the cultivation of fin fish since the late 1800s. With more than 50% of the entire U.S. coastline located within the State of Alaska, one can understand why my interest in aquaculture is great. The potential for marine aquaculture development within Alaska is truly incredible, not to mention the vast possibilities for future fresh-water cultivation.

AQUACULTURE—MARKET POTENTIAL

World fishery resources were once thought to be practically unlimited. This has been clearly shown not to be the case. The world fishery resources are now estimated by some experts to be capable of yielding a maximum global harvest of 100 to 150 million metric tons per year. More conservative estimates rarely exceed 100 million metric tons, including that of the National Oceanic and Atmospheric Administration, which estimates that the 100 million metric ton figure will be met by 1980. This suggests that a world shortage of fish products is possible in the foreseeable future.

World per capita fish consumption has increased over the past several years and in the U.S. alone has risen to a present level of 12.9 pounds per person per year. Reliable estimates project American consumption to increase to 15.2 pounds by the year 2000. A Library of Congress study has predicted that in the same period of time overall demand for seafood products in the U.S., both edible and industrial, is expected to increase by a full 80%.

All these indicators suggest that the demand for fish products will only continue to increase in the years to come. With wild fish stock exploitation reaching maximum levels, per capita consumption of fish products on the rise and the world population expected to increase from a level of 4 billion today to 6 billion by the turn of the century, aquaculture must be viewed as a promising possibility in helping to meet these food demands.

AQUACULTURE—ECONOMIC POTENTIAL

For a nation practically surrounded by water and replete with possible sites for raising inland fish species, fishery imports into the U.S. are surprisingly high. In 1976 the U.S. imported 6.2 billion pounds of fishery products valued at \$2.2 billion. The U.S. fishery exports in 1976 amounted to 241 million pounds, valued at only \$330 million.

This leaves a net annual trade deficit of practically \$2 billion for foreign fish products where close to 65% of fish consumed in the U.S. is imported from foreign countries.

The studious application of aquaculture techniques could help to reverse this unfavorable balance of trade situation. A promotion of aquaculture will result in the creation of many new jobs, fishery employment on a year-round rather than a seasonal basis, and an overall stability to the historical boom or bust fishery economy.

NATIONAL AQUACULTURE ORGANIC ACT—INTENT

Mr. Chairman, the National Aquaculture Organic Act of 1978 will provide long overdue impetus to the promotion of aquaculture in the United States. My desire is to encourage the development of aquaculture of all types in all parts of the U.S. This would include encouraging aquaculture for marine, as well as fresh water, species: for aquatic plants, as well as aquatic animals: for presently cultured species, as well as species as yet untested by the techniques of aquaculture; and for the rehabilitation and enhancement of public fisheries, as well as the promotion of commercial enterprises.

To accomplish these goals, my legislation designates the Department of Commerce as the agency with ultimate responsibility. The Commerce Department will, however, operate in close conjunction with the Departments of Agriculture and Interior, as both those Departments have proven themselves expert in many important aspects of aquaculture. There are many facets to aquaculture, and I believe no single agency can or should be named the exclusive authority. The better approach is to tap the existing expertise of the several Departments and coordinate all aquaculture efforts through the Department of Commerce.

An Interagency Committee on Aquaculture will be formed to facilitate and coordinate information and activities among the three Departments, as well as all other agencies and parties involved.

My legislation also provides for the formulation of a national aquaculture development plan. This plan, to be drawn up in the year following enactment, will embody concrete suggestions on specific directions and priorities to pursue in the development of aquaculture in the U.S.

A grant program will encourage participation in what is generally considered a rather expensive enterprise. These grants will allow the private entrepreneur to get involved in a venture that would otherwise, by virtue of prohibitive start-up costs, be reserved for large corporations or the individual of great wealth.

A Federal aquaculture assistance fund is created for three purposes: (a) To facilitate aquaculture financing by guaranteeing loans made to aquaculture operations since such loans have historically been unreasonably difficult to obtain; (b) to make disaster loans for aquaculture stocks which are destroyed by unavoidable disease; and (c) to provide insurance coverage to aquaculture operations in those instances where insurance is not otherwise available.

NATIONAL AQUACULTURE ORGANIC ACT—COMPARISON TO OTHER AQUACULTURE LEGISLATION

Mr. Chairman, my aquaculture bill, S. 2762 is in many respects similar to the other two pieces of aquaculture legislation under consideration by your committee today. S. 1043, the Bentsen bill which I cosponsored, and S. 2218, the Stone aquaculture bill, both contain numerous points which coincide with the proposals I make in S. 2762.

There are, however, three important new areas which my bill emphasizes, and I should like briefly to explain them:

First, unlike the other aquaculture legislation, I would require that the national aquaculture development plan be formulated only after information is systematically gathered from all parts of the United States. To ensure adequate input from interests as diverse as shrimp farmers in Florida, salmon ranchers in Alaska, oyster raisers in Maine and catfish farmers in the Midwest, information must be gathered on a regional basis. Only after these suggestions are received from all parts of the country should a national plan be drawn up. This will guarantee that the plan will be tailored to the varied interests and needs of aquaculturists throughout all 50 States.

Second, I add the enhancement and rehabilitation of traditional publicly owned fish stocks as a major goal to be addressed by this legislation. It seems obvious that in addition to encouraging development of commercial aquaculture for the private sector, we should not overlook the desirability of rehabilitating the numerous depleted fish stocks which are of vital importance to the public sector.

The third and final issue of importance my bill addresses is the problem of land and water access for aquaculture facilities. I believe the contributions which aquaculture can make in helping to meet nutritional needs, stimulating commercial activity, and enhancing existing fisheries warrant its being given due consideration in land and water use management deliberations.

CONCLUSION

Mr. Chairman, aquaculture is certainly an activity that has been neglected in this country for too long. The numerous benefits to be gained—commercial, nutritional and conservational, to name but three—have not yet been fully appreciated. Passage of this legislation will be a positive step towards translating these numerous potential benefits into tangible realities.

STATEMENT OF HON. SPARK MATSUNAGA, A U.S. SENATOR FROM HAWAII

Mr. Chairman and members of the Subcommittee, as a Senate cosponsor of S. 2218—and might I add as a long time supporter of proposed aquaculture legislation spanning my previous years of service in the other body—I would like to share with you my views on why I believe passage of the Aquaculture Policy bill, during this session of the 95th Congress, is both timely and in the very best interests of the Nation. Specifically, I would like to address three areas of concern which I feel merit your attention.

First, Mr. Chairman, as you may know, the United States at present has no comprehensive aquaculture policy despite the fact that studies indicate that the development of such a policy statement is long overdue. Second, as you may also know, Mr. Chairman, my State, the State of Hawaii is already moving forward with a bold aquaculture planning program with the anticipation that a commercially viable aquaculture industry can be created in Hawaii which will attract substantial investment capital and thus bolster the State's economy. Finally, Mr. Chairman, it is a well known fact that the institutional base for the development of a national aquaculture policy is already firmly established in the Department of Agriculture. Designating, as this bill does, the Department of Agriculture as the lead federal agency for aquaculture planning and development is, in my judgment, most appropriate.

If I may, permit me to elaborate more fully on each of these topics.

With regard to the question of whether or not this legislation is needed, I direct your attention to the overwhelming amount of evidence in support of the position that a national aquaculture policy should be established by the federal government as soon as possible. Mr. Chairman, hunger and malnutrition prevail throughout the world in substantial segments of the population of many, many regions. Based on a survey conducted in 161 countries, the United Nations Food and Agriculture Organization estimated recently that the world's undernourished stood at approximately 450 million, or a quarter of the underdeveloped world. Moreover, the UN group also predicted that the number is likely to increase in the years ahead.

Ironically, most of that population is located in the southern hemisphere of the world in areas most suitable for the development of aquaculture enterprises. Nonetheless, as populations continue to increase explosively, the ability to provide them with adequate nutrition is decreasing, because more land is being reclaimed from agriculture to support more people, and because naturally occurring animal and plant life is being over-exploited to fill the food gap. In particular, aquatic resources are in trouble.

Take commercial fisheries, for example. From 1950 to 1970, the total fish harvest for commercial operations increased from 21 million tons to about 70 million tons. Since 1970, however, the yield has remained more or less static or has actually decreased in some categories. Some authorities believe that the total world fish catch cannot much exceed the 100 million ton level without imperiling seriously the reproductive potential of valuable commercial stocks. At the same time, it is estimated that the total demand for commercial fisheries products will more than likely eclipse the 100 million ton level within the next two decades. Other authorities believe that serious depletion of certain commercially exploited fish has already occurred with irreversible consequences. One example cited is the blue-fin tuna whose numbers have decreased precipitously in recent years. Another example is the green sea turtle, an animal which is now receiving attention in Hawaii's aquaculture program.

The only logical way to counteract such a perilous trend is to learn how to manage living aquatic resources. Aquaculture offers such a possibility just as land based agriculture has developed technologies for managing a wide variety of plant and animal life.

I realize that it would be naive to suggest that aquaculture will be a cure-all for the world's nutrition problems. But at the same time, it would be equally naive not to recognize aquaculture's potential to contribute significantly to the alleviation of this problem. Some additional statistics are worth mentioning in this context.

According to a 1975 National Academy of Sciences Study, the United States produced 65,000 metric tons of fish through aquaculture that year. This represented slightly more than 3.4 percent of the total United States seafood demand. Although commercial aquaculture operations are located at various sites throughout the entire United States and its coastal waters, it is not yet a large industry (only about \$100-\$200 million in total worth). Nevertheless, it has been estimated that the industry will double its output by 1982 to about \$375-\$400 million.

Even more optimistic projections have been made both in this country and abroad:

Biologists at the National Marine Fisheries Service in Seattle have estimated that aquaculture developments totaling 500,000 acres could produce 20 billion pounds of fish in 25 years, enough to maintain per capita fish consumption in an expanded U.S. population of 300 million.

One estimate holds that in the U.S., with the *present* state of aquaculture technology, production by aquaculture could be increased between three and five times from current production levels and that a more concentrated effort could result in a 15-20 fold increase in production. That means that the United States could theoretically produce up to 1.4 million tons of seafood from aquaculture, given the stimulus to do so. Such a production level would account for nearly one-half the present, annual U.S. consumption of seafood (3.2 million tons).

A recent Senate Committee Print on Soviet Oceans Development (1976) acknowledges the Soviet's interest in aquaculture and concludes that Soviet emphasis on aquaculture is increasing for two fundamental reasons: First, the Soviets perceive that the future return from ocean fisheries will decrease as demand increases; and second, the rapid development of marine biology, ecology, and engineering has made it possible to develop aquaculture as a major component of the economy, like agriculture. Some Soviet officials have predicted that maritime areas will be eventually utilized for aquaculture, "up to a depth of 100 yards and up to one mile off the shore by the end of the century". It is apparent, then, that the Russian emphasis on aquaculture anticipates that the production potential of the fisheries industries will dwindle while the demand for fisheries products will continue to increase. They have chosen aquaculture to help fill the anticipated supply-versus-demand gap.

Moreover, in a report prepared for Congressional hearings held on the House side in 1976, two important conclusions were reached. The first was that a

review of the status of aquaculture in the world indicates aquaculture projects are contributing significantly to the economies of other countries but very little to the U.S. economy, despite an extensive import market for seafood. The second conclusion was that aquaculture could co-exist very profitably with agriculture in the United States and provide an added benefit by reducing the balance of payments deficit resulting from the importation of seafood and related products into the U.S. markets.

Finally, Mr. Chairman, with respect to the question of why this legislation is needed, I would like to bring to your attention the statement contained in the just completed National Research Council report entitled, "Aquaculture in the United States, Constraints and Opportunities." It reads as follows:

"Our analysis of the production, science, technology, economics, business, law, and administration of aquaculture indicates that, in the United States, aquaculture will have only a minor impact on food production in the near term, in comparison with other food production systems. We have been unable to make a definitive statement about the exact future role of aquaculture as a source of food in the United States. It is, however, our considered opinion that in the long term, aquaculture will be a means of increasing protein supplies. We believe that aquaculture has the potential to contribute to increased food production. If this potential is to be tested, expenditures for current programs and for research and development must be increased."

Mr. Chairman, moving to the second point I made in my opening statement, I would like to comment briefly on the bold aquaculture initiatives currently being undertaken in my home State, Hawaii. The March 1978 issue of the prestigious trade journal, *The Commercial Fish Farmer*, was devoted exclusively to articles describing these initiatives. Indeed, the subtitle of that issue was headlined: "Aquaculture in Hawaii".

Because Hawaii experiences year-around climatic conditions favorable to aquaculture development, it has, in my view, the potential for becoming the aquaculture capital of the United States. Freshwater prawn (related to shrimp) and certain species of fish are already being produced commercially. The potential for the production of other forms of aquatic life in Hawaii, is, according to all available reports, almost limitless. We have the potential for raising and producing commercially both freshwater forms (catfish, turtles, prawn, crayfish, etc.) and saltwater forms (oysters, marine shrimp, lobster, sea turtles, seaweeds, etc.). But by all accounts, Mr. Chairman, the development of this potential is going to be a costly undertaking. Land suitable for aquaculture is both scarce and expensive. Furthermore, government regulations, both Federal and local, tend both to inhibit aquaculture development and escalate project costs. Finally, the economics of aquaculture (e.g., supply versus demand; market expansion and perishability of aquaculture products) render it a risky investment.

As a developing technology, Hawaii recognizes that aquaculture programs are going to require large infusions of money for research. Specifically, funding is needed to broaden the scope of research in basic biology, genetics, disease control, and a wide range of husbandry management techniques for virtually all of the aquatic life forms identified now as having commercial potential. Like agriculture in its infancy, it isn't yet known how to manage aquatic animals and plants with absolute reliability when they are crowded together in a cost efficient, intensive aquaculture environment. Fiscal and tax incentives will also be needed to encourage the technological and commercial development of aquatic life forms under these conditions. I submit further, Mr. Chairman, that it is asking too much of entrepreneurs and venture capitalists to produce the funds themselves to undertake the research and development costs necessary for commercial success.

The issue of funding research and development costs for aquaculture leads me to the last topic I wish to discuss, Mr. Chairman, and that is the question of agency leadership. I firmly believe that the Department of Agriculture has already demonstrated that it has the professional personnel, technical expertise, and managerial resources necessary to carry out the Congressional mandates of this legislation in an efficient and thorough manner superior to any other Agency currently being considered to assume the role of lead agency in aquaculture planning and development.

Because the Department of Agriculture has already pioneered in the development of freshwater aquaculture, it is, I believe, in a unique position to capitalize on this experience and assume the major responsibility for all phases of

aquaculture development. In my judgment, Congress will accomplish two fundamental objectives in designating Agriculture as the lead agency in this endeavor. First, in one clean stroke we will eliminate the need for establishing a new federal bureaucracy to support aquaculture policy planning, research and development. And second, by assigning Agriculture the leadership in coordinating aquaculture related activities, we will avoid a good deal of wasteful duplication and overlap of effort by personnel within other federal agencies.

In conclusion, Mr. Chairman, I would like to reaffirm my strong support for S. 2218. There is no question in my mind that this proposed legislation will enable the United States to move ahead aggressively to establish a well managed national aquaculture program.

Mr. Chairman, I thank you and members of the Subcommittee for your attention.

STATEMENT OF JAMES P. WALSH, DEPUTY ADMINISTRATOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE

Mr. Chairman and Members of the Committee: I welcome the opportunity to appear before this Committee to comment on the three aquaculture bills before the Committee—S. 1043, the National Aquaculture Organic Act of 1977, S. 2218, the Aquaculture Policy Act of 1977, and S. 2762, the National Aquaculture Organic Act of 1978. S. 1043 and S. 2762 would establish a mechanism to promote aquaculture and make it a profitable industry, supplying food, recreation, employment and other benefits to this nation. S. 2218 would authorize a study of aquaculture activities in the U.S. and the development of a national aquaculture strategy.

FUTURE OF AQUACULTURE

Based on present stock estimates, the amount of fish that can be harvested in the ocean at optimal sustainable levels is limited; it may be considerably less than twice the present world catch of 65 million metric tons; or about 150 millions mt. At the same time the demand for fish and for animal protein in general, especially in the third world nations is projected to more than double in a few decades. On a worldwide basis, aquaculture produces about 6½ million metric tons or 10 percent of the fish supply. This amount doubled in the last 5 years. For example, Japan aquaculture production increased from 110,000 metric tons in 1971 to 500,000 metric tons in 1975. Israel obtains almost half of her fish from culture and China may also approach this proportion. Worldwide, the potential is great: aquaculture production may reach 50 mmt by the year 2000.

In the United States aquaculture production is about 65,000 metric tons or 3 percent of our fish supply. Although this is a significant level of increase compared to the 1950's aquaculture production generally has remained static over the past few years. If the United States were to achieve the world average production of 10 percent of total production of fish, the amount would be significant, and be in the order of 254,000 metric tons. With proper management U.S. aquaculture production could reach one million metric tons by the year 2000. Recreational fishing, employment and other national values could increase in the same order of magnitude.

Many analyses of United States aquaculture, including the recent study by the National Academy of Sciences, have concluded that aquaculture has developed more slowly in the U.S. than other advanced nations but some cultured species are being developed and expanded on a profitable basis. U.S. aquaculture has the potential *in the long run* to play a significant role toward providing increased food production. In order to achieve this potential, advances are needed in many areas especially in the political and administrative area.

The Administration supports the development of the aquaculture industry in the free enterprise market and believes that Federal policies and programs should be responsive to the needs of this industry in a manner which encourages a timely, balance, and cost effective development responsive to market demands, priority use of our coastal resources, and health and environmental concerns.

The Department of Commerce and its predecessors have been active without interruption for over 100 years in research and development, training, infor-

mation transmittal, and many other phases of aquaculture. These activities have primarily been in the marine field. The United States Commission of Fish and Fisheries, the first ancestor of NOAA's National Marine Fisheries Service, was established in 1871 with the express purpose of operating hatcheries to augment fish stocks of the East Coast which showed signs of depletion. Our fish culture on the West Coast began in 1872 when the first salmon hatchery was established in northern California. At the time of the creation of NOAA, the Sea Grant Program of the National Science Foundation was transferred to NOAA. Sea Grant has supported numerous aquaculture activities since it was originally created in 1966. NOAA and its predecessor agencies have been most active and successful in three kinds of aquaculture: for salmon and trout, mollusks (mostly oysters and clams), and shrimp (both marine and the freshwater shrimp (*Macrobrachium*)). A considerable number of other animals and plants have also received attention.

NOAA and other agencies have worked jointly with the states to develop hatchery systems for restocking depleted salmon resources. Over 100 Federal and state hatcheries release young salmon, which provide more than a quarter of the commercial and recreational catch of the Pacific Coast. In recent years NOAA (through NMFS and the Sea Grant Program at the universities on the West Coast) has developed successful techniques which permit pen and raceway raising of salmon on a profitable commercial basis. Further, the same research over many years past has been the basis for the promising ocean ranching industry that is already established in Alaska and Oregon, and to a smaller extent by the Indians in Washington State.

Oyster work (and to a lesser extent, research and development on clams and mussels) has been carried out by NOAA and its predecessor agencies for years. Much of the necessary life history information and data on nutrition, diseases and other biological aspects of these shellfish have been obtained in NOAA laboratories. Further, a significant amount of the culture procedures have been developed by our scientists, mostly in direct cooperation with the industry. Much of the modern kinds of oyster and clam culture, involving the full control of the life history that permits the production of brood stock and replaces the older and less efficient method of obtaining young from wild stocks, were developed in NOAA programs.

Shrimp culture is less advanced than that for the salmonids and mullusks. However, much of the U.S. shrimp culture industry (both in this country and in Latin America with U.S. capital) depends to an important degree on research conducted by NMFS or supported by Sea Grant.

The Office of Sea Grant supports a very large program in aquaculture research and development (about \$4 million in Federal funds, roughly equivalent to funds expended by NMFS on aquaculture). The scope and variety of projects is wide, and about 30 universities are engaged in about 90 projects. Many advances have been made in industry aquaculture as a result of this work.

NOAA also supports aquaculture research and development projects in the states through grants under the Commercial Fisheries Research and Development Act of 1964 and the Anadromous Fish Conservation Act of 1965. Projects include work on freshwater shrimp, oysters, clams, abalone, polyculture of freshwater fish, and conservation, development and enhancement of anadromous fishery resources. The combined programs support work in all 50 states and in many territories and possessions. NOAA has consistently demonstrated interest in promoting aquaculture and its commercial potential in the United States. Ours was the first Federal agency to appoint an aquaculture coordinator. One of our major products in recent years has been the NOAA Aquaculture Plan. This document is significant in the perspective it gives to this activity. The Plan summarizes the present status of aquaculture in NOAA, summarizes the problems, proposes methods for dealing with the culture of the most important species ("priority species"), shows what NOAA proposes to do in terms of research and development, and in information transmittal and related activities.

NOAA has taken the lead in keeping abreast of foreign aquaculture. In particular, a NOAA scientist is Chairman of the Panel on Aquaculture of the United States/Japan Natural Resources Program. Several other NOAA scientists are members of the Panel, and help to make its operations effective. Another NOAA scientist is Chairman of the Aquaculture Panel of the U.S./French Cooperative Program in Science.

Mr. Chairman, before I summarize the Administration's views on the bills, I would like briefly to discuss Federal program consideration which I regard as especially significant.

The bills highlight the need to increase the coordination among Federal agencies engaged in aquaculture. The creation of the Subcommittee on Aquaculture of the Interagency Committee on Marine Science and Engineering (ICMSE) has already provided highly valuable coordination. NOAA provided leadership in the establishment of this Subcommittee, and supplies its present chairman. The Subcommittee held its eighth meeting in March of this year. It has provided an exchange of results of programs and plans for the future. This kind of interagency committee will continue to promote the development of aquaculture in this country. The existing Subcommittee has created seven panels. As examples of the useful services such a group can perform I would like to summarize briefly the accomplishments of four of these:

1. Industrial development of aquaculture and the effective conduct of research by Federal or state laboratories or by academic or commercial scientists is handicapped by the lack of reliable statistics of production, manpower, acreage and related data. The Subcommittee *Panel on Statistics*, consisting of experts from Commerce, Agriculture and Interior, have developed plans for a system of aquaculture statistics. This includes the design of the necessary forms, and proposals for linking the new machinery to existing statistical systems of the Departments.

2. The United States can benefit by making use of the research and experience of foreign countries which have skills in aquaculture. The Subcommittee's *Panel on Translations* authorized the translation of foreign literature, financing this by money made available by agencies to the Translation Service of NOAA's National Marine Fisheries Service. This program has resulted in the preparation of 49 translations, completed or in process.

3. NOAA has helped lay the groundwork for the preparation of a National Aquaculture Plan through its own independent activities and through cooperation with other Federal agencies. The NOAA Aquaculture Plan was issued last year after three years of concentrated effort, involving information and advice from scientific and industrial groups in NOAA and elsewhere. Information in the NOAA Plan, and much of the background and experience gained in its preparation can be applied to development of a National Plan for Aquaculture. The *Panel on Planning*, consisting of staff from NOAA, Agriculture, and State, have produced a detailed outline for a national plan.

4. Those associated with United States aquaculture have recognized that legal and institutional barriers have constrained the commercial development of aquaculture and will probably be the major hurdles. The Subcommittee's *Panel on Regulations* has recommended a preliminary study, involving examination of the regulations imposed on aquaculture by Federal, state, and other agencies in a small area of the country as a trial before the national problem is addressed. The study will be pursued as a cooperative project involving Commerce, Agriculture, and FDA.

In our 1979 budget request which is currently pending before the Appropriations Committee, we are asking for additional funds (about \$1 million) to improve and expand our NMFIS and Sea Grant aquaculture programs. With the additional funds we will improve the coordination and effectiveness of our existing program, work with other concerned agencies in the development of a Federal aquaculture plan, provide additional research and advisory services to those individuals who are developing aquaculture programs, and conduct research in the most promising new areas for profitable aquaculture development. We also plan to work closely with the states' coastal zone management programs to assure that as the coastal areas are allocated for various use, the needs of the aquaculture industry are taken into consideration. In other words, in marine aquaculture, we are addressing many of the concerns raised in the bills before you.

Mr. Chairman, the Administration recommends against enactment of aquaculture legislation at this time.

We concur that there is a need for better coordination of the Federal aquaculture efforts through an interagency process which recognizes the expertise of each agency and overall tradeoffs with the food production efforts.

For many years there has been a considerable effort in the Federal Government in the field of aquaculture. At this time there are some sixteen Federal agencies conducting programs in support of aquaculture in the United States.

However, studies, surveys, and Congressional hearings have demonstrated that there are instances of duplication of effort, and lack of responsiveness to needs of the industry from current programs. With the national need to make better use of our limited financial resources it seems obvious to us that we should ensure that there is a most cost effective aquaculture program for the United States.

This coordination concern is being considered in the President's reorganization studies and we believe that it is premature of us to recommend a lead agency for aquaculture until the President has submitted his reorganization recommendations. Presently, we and the Departments of Agriculture and the Interior have the major roles which are reasonably well defined and the inter-agency subcommittee can be used to coordinate the development of our programs and policies.

In terms of a Federal role, we are opposed to the establishment of major aquaculture specific financing (loan and demonstration) and insurance programs. Although evidence indicates that existing Federal assistance programs and non-governmental lending institutions have not been as supportive of aquaculture as desired by the industry and interested groups, we believe that insufficient marketing, cost-benefit, and technology assessment studies have been undertaken to justify providing this industry with major special Federal subsidies. In certain cases where the potential returns to the general taxpayer are very great and the risks are too high for industry to underwrite the front end R&D costs, the Federal Government should provide such assistance. But with aquaculture the potential payoff is a decade or two away and significant benefits to the general taxpayer have not been demonstrated. Furthermore, a thorough analysis has not been conducted as to what changes could be made in existing financing programs to better assure that economically viable, but risky, aquaculture development projects are undertaken.

We presently believe that the principal role the Federal Government should play in the support of aquaculture in the United States is to conduct biological, engineering, and economic research, and advisory services. These efforts should be made to address the complicated problems faced by fish farmers in their attempts to establish profitable businesses. However, the economic viability of aquaculture systems developed in the laboratory must be determined by industry with limited Federal assistance.

We and our fellow agencies are carefully scrutinizing our aquaculture efforts and will continue to assess the appropriate level of Federal involvement. In connection with the development of a comprehensive Federal ocean policy, our national marine aquaculture goals and Federal role are high on our list of issues for further consideration. We expect that further policy alternatives in this area will be developed over the summer months and presented to the President for his decision later this year.

In summary, we support the goals of these bills and are in agreement with you that the coordination and focus of the Federal aquaculture policies and programs should be better developed especially in the research, regulatory, environmental, health, technology transfer, and advisory area. We believe that we are working toward improvements in these areas and appreciate your support. Nevertheless, at this time we cannot support the provisions in S. 1043, S. 2218, and S. 2762, which would establish major new financing programs. We believe that until sufficient study has been completed which justifies a program expansion current funding levels are adequate.

Mr. Chairman, I appreciate the opportunity to testify on these important bills. I look forward to a fruitful working relationship with this committee and the Congress on developing an American aquaculture program.

STATEMENT OF LYNN A. GREENWALT, DIRECTOR, U.S. FISH AND WILDLIFE SERVICE, U.S. DEPARTMENT OF THE INTERIOR

I am Lynn A. Greenwalt, Director of the U.S. Fish and Wildlife Service, Department of the Interior. I appreciate the opportunity to appear before this Committee to discuss aquaculture. At the outset, I would like to state that, while the Department of the Interior agrees that a more coordinated approach to aquaculture is called for and endorses some of the concepts embodied in these bills, we recommend against enactment of this legislation. Other Administra-

tion witnesses have stated the specific reasons for the Administration's opposition to these bills and we support this position. Like the other agencies, we are especially concerned with the establishment of major aquaculture financing and insurance programs.

With your permission, I think it would be useful to the Committee if I provide some background on the Fish and Wildlife Service's long and significant history in the field of aquaculture.

The Fish and Wildlife Service has the most extensive aquacultural system for finfish in existence in the United States. Our Division of Fish Hatcheries has evolved from two fish hatcheries in 1872 to 88 such facilities today which produce 268 million fish and fish eggs annually.

The Service's research activities include a nutrition laboratory in Cortland, New York, and a fish disease laboratory in Leetown, West Virginia. These laboratories, because of the excellence of the facilities and staffs, are among the most highly respected of their kind in the world. Research at the nutrition laboratory succeeded in not only defining the basic nutritional and mineral requirements for cultured fish, but was primarily responsible for the development of the dried fish food which revolutionized aquaculture both in the United States and abroad. A diet of this type of fish food has been proven to be sufficient to carry such fish as the Atlantic salmon through their entire life cycle.

The research effort also encompasses two fish farming experimental stations in Stuttgart, Arkansas, and Marion, Alabama. These stations have as a prime mission the development of all phases of aquaculture. The station in Stuttgart, which is devoted mainly to research on catfish and bait minnows, also provides extension services for aquaculture.

The vast majority of the research necessary to obtain Food and Drug Administration approval of chemical compounds used in aquaculture is performed at the Service's Fish Control Laboratory in LaCrosse, Wisconsin. In addition, the Service is constructing another research laboratory to investigate the propagation of cool water species such as walleye, perch and pike. This facility, to be located in Wellsboro, Pennsylvania, should be operational next spring. We also operate the Western Fish Disease Laboratory in the State of Washington which, in addition to the work on diseases of salmon, also investigates the physiology of smoltification which will most certainly lead to greater returns of sea run salmon on the west coast to the benefit of both commercial and sport fishing interests.

The Service also has five development centers which coordinate the findings of the research laboratories and the production techniques of the hatchery system. These centers are presently working in the areas of environmental controls, pollution abatement, diet formulation, quality control, production methods and equipment, and training workshops and short courses.

In cooperation with State universities and conservation agencies, the Service operates 25 Cooperative Fishery Units. Over 50 percent of these units conduct investigations concerning various aspects of aquaculture. These and other institutions have expertise and facilities which have already made many meaningful contributions to aquaculture. Findings produced through research and development programs are channeled into the extension services of the States, the Department of Agriculture and Sea Grant.

In fiscal year 1979, the Service will spend approximately \$22 million on various aquaculture activities, \$4.5 million of which is on aquaculture related research.

As you can see, we practice aquaculture daily on a nationwide basis to enhance both sport fishing and commercial aquaculture. Our technical research and development effort on freshwater finfish have and will continue to benefit aquaculture regardless of the purposes for which the fish will be used. We intend to press forward vigorously with our work in aquaculture under our present mandates.

I might also point out, Mr. Chairman, that Indian tribes are governmental entities and retain jurisdiction over the natural resources of their reservations. Many tribes carry out their responsibilities in this regard through tribal or inter-tribal resource management agencies which have considerable technical competence. The Lummi Tribe of Washington, for example, has been operating an aquaculture project involving salmon and oysters for five years. Indian Tribal activities also include regulation of tribal fisheries and watershed management and they are working with the States to establish uniform guiding principles for fisheries management and research.

Before I close, I would like to share with the Committee the Department's views on how we could best support the private aquaculture industry, an essential element of a comprehensive aquaculture plan.

Efficiency of the industry as it presently exists could undoubtedly be improved by sound research on nutrition, disease control and drug clearance, genetics and production systems. While considerable public attention recently has been focused on marine species, culture of fresh and brackish water species comprise the major portion of cultured species worldwide. This pattern is likely to continue because the medium is more readily controlled.

The profitability in the industries which culture finfish is very modest because of high production costs. The single most costly production item is fish food. Food costs in aquaculture account for up to 80 percent of the total production costs depending upon the type and efficiency of the operation. Therefore, every slight reduction in the cost of food will be favorably reflected in the profit structure. The work done at our Nutrition Laboratory in Cortland is making tremendous strides in this area. Dr. Gary Rumsey has programmed much of our knowledge relating to fish nutrition into a computer and is now using this computer to develop dried food diets for a wide variety of fish species. Using these diets, composed of agricultural products available commercially, private aquaculture operations will be able to raise a wide variety of fish species under completely controlled conditions. Rather than the labor-intensive pond cultures or cage cultures that now characterize aquaculture activities both here and abroad, mechanized operations could be developed that would be highly profitable. Raising fish in a completely controlled environment would also allow for early detection and control of the various viral diseases that can decimate fish stocks in pond or cage cultures.

The second most costly production problem is fish health. The Service became interested in this problem in the 1930's and, accordingly, established the laboratory at Leetown, West Virginia, which has pioneered in the identification of fish parasites and diseases as well as preventive measures and treatments. These problems are all too frequently the bane of the fish culturist's existence as well as his budget. The Service provided the research necessary to obtain Food and Drug Administration clearance for two drugs—sulfamerazine and oxytetracycline—that have been responsible for increasing production at our fish hatcheries by approximately twenty percent. These drugs are now widely used in commercial aquaculture activities involving salmonoids, including trout, and catfish. The Service also developed the method of administering the drug to large numbers of fish. The Service has pioneered in the identification of the sources of such fish viruses as infectious pancreatic necrosis. We believe that control of this rather common fish disease can significantly enhance the overall production of aquaculture facilities.

The Leetown facility is now being renovated and expanded into a National Fisheries Center. When completed, the facility will be the most advanced fishery research, development and training center in the world. One of the primary functions of the National Fisheries Center will be to continue research on the diagnosis, treatment and control of fish diseases.

In summation, it would not be an exaggeration to state that, in the crucial fields of fish health and fish nutrition, the Service's research and training programs are the most advanced in the world. We have also made significant contributions to other areas of aquaculture and we are well prepared to participate in a coordinated Federal effort in this field. We look forward to working with the Committee to develop a coordinated aquaculture program.

STATEMENT OF PORTER BRIGGS, EXECUTIVE SECRETARY, CATFISH FARMERS OF AMERICA, ALSO REPRESENTING THE UNITED STATES TROUT FARMERS ASSOCIATION

My name is Porter Briggs and I am Executive Secretary of Catfish Farmers of America (CFA). I would like to thank the Committee for this opportunity to present the views of our organization and of the United States Trout Farmers Association (USTFA) on the referral of H.R. 9370 and S. 2582.

Catfish Farmers of America is a national association with members located in over 30 states. The members of our organization frequently produce other species of fish as well as catfish. Our interest principally is freshwater fish

culture. Our Association represents approximately 80 percent of the commercial catfish production in the United States and our members pay dues ranging from \$30 to \$625 a year. We have been in existence since 1968.

The United States Trout Farmers Association is a national association with members located in over 40 states. The principal interest of the USTFA is also freshwater fish culture. The United States Trout Farmers Association represents approximately 85 percent of the commercial trout production in the United States and its membership pays dues ranging from \$50 to \$500 a year. It has been in existence since 1952. The USTFA publishes a bimonthly called *Salmonid* which is the official journal of the organization with readers in all 50 States and several foreign countries.

In addition to serving as Executive Secretary of CFA, I am also publisher of the *Commercial Fish Farmer* which is the largest aquaculture magazine in the world with readers in 80 countries and all 50 states.

We would like to take this opportunity to thank the Senators and their staffs for their interest in this legislation. We think that aquaculture has now proven its potential to become an important new source of protein in the future of our nation and the world. It seems appropriate to give a brief history of our position on these and other proposals for aquaculture legislation on which testimony has been given since May of 1975. Long before the first testimony was held on any aquaculture bill, Catfish Farmers of America sought unsuccessfully an appointment with the Secretary of Agriculture, Earl Butz, to try to encourage the U.S. Department of Agriculture (USDA) to take a higher profile in aquaculture. Secretary Butz showed no interest in a meeting or in the USDA providing such services and thus, we were left with the prospect of turning to the Departments of Commerce and Interior for certain unmet aquaculture services. Both of these agencies had given long and excellent service to the field of aquaculture as well as the U.S. Department of Agriculture. Because of the lack of interest in the Department of Agriculture, our industry gave enthusiastic qualified support to several aquaculture proposals which were discussed during the last three years. However, with the change of Administrations in 1976, the Department of Agriculture showed an increased interest in the field of aquaculture. The introduction by Senator Talmadge of S. 275, which eventually resulted in the passage of Public Law 95-113, the U.S. Department of Agriculture began to manifest a substantially increased interest in providing more services to the field of aquaculture. With the passage in September 1977 of Public Law 95-113, which authorized the USDA to provide services to aquaculture, the CFA's position on aquaculture legislation changed dramatically from what it had been in the past.

At this time, it is the position of Catfish Farmers of America and the United States Trout Farmers Association that only minimum legislation is needed in order for the Federal Government to provide the needed services to the field of aquaculture. It is the position of these organizations that a lead agency of the Federal Government is needed it should be the Department of Agriculture.

Any discussion of Federal legislation in aquaculture should rely heavily on the report, "Aquaculture in the United States: Constraints and Opportunities," prepared by the National Academy of Sciences, under contract from the National Oceanic and Atmospheric Administration, and published at the beginning of this year. We think the Academy study is critical to an intelligent debate on any aquaculture legislation and this testimony will rely heavily on its contents. We endorse the report with a few minor reservations and one major reservation—we feel that the report should have made a recommendation for a lead agency within the Federal Government.

We think that it is imperative that any aquaculture legislation passed by Congress coordinate the involvement of all agencies. For this reason, we feel that S. 2582 should be given no serious consideration because it ignores the principal issue—that of which agency will take the lead. Further funding of one agency and leaving the other unfunded would create competition between the agencies for funds from Congress and this is the last thing that aquaculture needs. This industry must work together, and designating a lead agency will help it assure that we do indeed work together as an industry and not be fractionalized into special interests.

In regards to S. 2762 introduced by Senator Gravel of Alaska, we again wish to applaud his interest in the development of aquaculture and for presenting his most interesting proposal. The trust of the legislation however, is so seri-

ously flawed that it just does not represent a clear understanding of the state of aquaculture at this time. It, again, assigns the responsibility of coordinating the program to the Secretary of Commerce which is an error. The proposal for an advisory committee is not needed—the reason is that subcommittees would not only be unneeded, they would be flawed in that many of the regions, where the committees of the appointed members would be located, have little or no aquaculture underway at the present and little, if any, aquaculture potential. The industry is simply too small to create numerous advisory committees throughout the country. It would create unnecessary layers of bureaucracy and be divisive to the development of aquaculture. The proposed membership of the regional advisory committees would include numerous institutions who have little or any involvement or interest in aquaculture. Further, having them appointed by the governors of the various states would result in unnecessary politicizing the composition of these advisory committees and would render their work virtually worthless because of the fact that aquaculture, at this time, is such a small industry.

We acknowledge that our principal interest is in the development of freshwater aquaculture. We recognize the critical importance of the development of saltwater aquaculture and feel that the Departments of Commerce, Agriculture, and Interior each have important contributions to make in the development of saltwater as well as freshwater aquaculture. We recognize that the intelligent use of the oceans is one of the highest priorities in the future of our planet. We also recognize the critical importance of the preservation and proper development of our extremely limited freshwater resources.

In the future freshwater will become the planet's most precious commodity. It has concerned us that there has been, from almost the beginning of the deliberations on aquaculture testimony, an apparent feeling that the development of saltwater aquaculture resources is Congress' number one priority. This bias against freshwater aquaculture is most pronounced in H.R. 9370, which the Merchant Marine and Fisheries Committee reported to the House, in that it appropriated twice as much money to the Department of Commerce as to the Departments of Interior and Agriculture. It is an unwise precedent and there is no factual basis for such an action to be taken—that is, the Department of Commerce has no greater expertise or responsibilities in aquaculture than either of the other two agencies.

We assume that this Committee will, in its deliberation, be referring to the Report of the Merchant Marine Fisheries Committee on H.R. 9370 dated October 28, 1977 and thus, we would like to make several comments on the Report itself.

The Report quotes extensively the aquaculture production figures in other countries of the world in order to substantiate its claim that the United States is not doing as well as other nations in developing aquaculture. On page 20, it mentions the fact that China, which leads the world in the production of fin fish, produces 50 times more than the United States. It does not point out however, that China has been engaged in aquaculture for 2000 years and is a nation of fish eaters whereas, we are a nation of meat eaters. It refers extensively to the development of aquaculture in Japan, which like China, is a nation of fish eaters. (We note, parenthetically, that our nation will probably consume more fish. That will happen as nature takes its due course. Artificial government inducements will not accelerate the process without causing a concomitant economic disruption. The marketplace will create the proper conditions for the profitable development of aquaculture. That is, more fish per capita will be consumed when people want it, not because of large government expenditure on aquaculture programs.) It quotes figures showing that in 1965, aquaculture accounted for 6 percent of Japan's total fish and shellfish production whereas the United States figure was less than one-half of one percent in the same year. In 1970 it reports that the respective Japanese and U.S. figures for the United States are wrong. For the other three years the relative cent; and in 1975 approximately 10 percent versus 3 percent. We think the 1975 figures for the United States are wrong. For the other three years the relative increase in production for the years 1965 to 1970 to 1974 shows that the portion of Japan's consumption of fish and shellfish accounted for by aquaculture increased from 6 percent in 1965 to 9.6 percent in 1974 as compared to one-half of one percent for the U.S. in 1965 to 3.6 percent in 1974. In other words, Japan increased its production over this 9 year period a little more than 50 percent whereas the U.S. increased its production seven fold.

The report goes on to state that Japan is spending \$333 million for coastal fishery development programs for aquaculture. We hope that the Committee will remember the growth which the U.S. experienced with limited Federal funds when it weighs any possible authorizations and subsequent appropriations for the development of aquaculture.

The report states that a Library of Congress study indicates that aquaculture in the United States has grown only slightly during the period 1970 to 1974, which is insignificant compared to aquaculture activities in other parts of the world. Again, we remind the Committee that these reports must be reviewed in light of relative increases in production and in terms of well established consumption habits in this country. The Library of Congress report is further quoted as saying that the annual per capita consumption of seafood products in the U.S. would increase from 12.9 pounds per year in 1976 to 15.2 pounds per year by the year 2000. It compares this to present world per capita annual consumption of about 24 pounds, mentioning that Japan and Iceland have an average per capital consumption of 79 pounds per year. The report goes on in the following paragraph to state that the demand for catfish in the year 2000 is expected to be 84 percent greater than in 1975. The Library of Congress figures on the catfish farming industry are wrong. Catfish farming will increase our demand and production by over 100 percent by 1985 and the demand for trout will increase by 60 percent in 1985. We would encourage the Committee to look into the source of this information from the Library of Congress to determine exactly who prepared this and how.

The report includes a letter from John White, Deputy Secretary of Agriculture, which states:

"This Department, with its in-place delivery system, is ready to assume the leadership for accelerating freshwater aquaculture related to fish farming. Any legislation being considered must bring together all aquaculture programs only after a careful analysis of the need.

"We agree that a national aquacultural plan to identify the needs, concerns, and Departmental roles is needed. In developing this plan, the Department of Agriculture must have co-equal development responsibilities along with any other department. This co-equal role is necessary because of this Department has traditionally had the responsibility to support activities of farmers operating on private land where a large part of aquaculture is practiced."

Catfish Farmers of America and the United States Trout Farmers Association endorse the role of the USDA as the lead agency for coordinating Federal aquaculture policy and practice.

We next wish to address ourselves to the debate which took place on the Floor of the House on February 15th at the time of the passage of H.R. 9370. It was pointed out that the Committee on Merchant Marine and Fisheries estimated that the bill would cost a total of \$268,800,000 for the current fiscal year and the next five succeeding years. We think that this amount of money is so far beyond the scope of what the needs are for the development of aquaculture and the role of the Federal Government therein so as to be totally unreasonable. Whatever the outcome of your deliberations, we encourage that you dramatically scale down the amount of money to be appropriated if you choose to pass this legislation which we oppose.

The debate pointed out the fact that the Small Business Administration (SBA) made only eight (8) aquaculture loans amounting to \$125,000 in 1975 and a grand total of two such loans in 1976 amounting to \$26,000. It pointed out the SBA limit of \$150,000 on direct loans. Congressman Leggett went on to point out, "Given the fact that an aquaculture facility could cost several million dollars, it is clear that existing SBA programs do not provide an adequate source of investment capital." We think that it is important for the Committee to take a look at existing and proposed aquaculture facilities to determine how large these loans really do need to be and what the need is for such a loan program. Mr. Leggett pointed out that the aquaculture loan programs administered by the USDA were restricted to businesses where the technology had been established and proven "which would effectively exclude aquaculture." We encourage the Committee to ask the credit granting agencies of the USDA what in fact is their policy on granting loans to aquaculture and if, in fact, they are not considering changing them. Mr. Leggett pointed out that the Farmers Home Administration had made seven (7) loans totaling 7.6 million dollars in 1975 and 1976 to aquaculture related operations.

The authority for such a program clearly exists within the USDA. To establish another similar program would be unnecessary duplication, would add substantial administrative costs and overhead for the creation of a new program, and the government would also have the problems of working out the bugs of a new program and creating delivery mechanism within the U.S. Department of Commerce which has very limited outreach compared to the USDA. We call to the attention of the Committee the discussion which took place between Congressmen Skelton and Leggett on page H 1034 of the *Congressional Record* dated February 15, 1978, where Mr. Skelton asked Mr. Leggett about the possible duplication of effort between the Departments of Commerce and Agriculture in the implementation of the loan program which Mr. Leggett's bill would implement. We feel like the question of duplication of services was not adequately addressed in the Floor Debate of the House and that, in fact, there may well be an unacceptable and unnecessary duplication of services. We have reviewed all of the testimony given before the House Merchant Marine and Fisheries Committee on this aquaculture legislation and cannot find a sufficient number of examples of businesses who were unable to find financing to justify a loan program of the magnitude proposed.

During the debate Mr. Leggett in answer to a question as to whether the amounts of the bill would be \$37 million answered, "that it should be compared to the \$500 million spent by the one State of Alaska." This scope and thrust of the program in the State of Alaska in no way compares to the aquaculture program as proposed by Mr. Leggett and these figures have little, if anything, to do with one another.

In the House Debate, we would call the attention of the Committee members to the discussion which took place between Congressmen de la Garza, Forsythe and Leggett, in regards to the duplication of services which would result in the establishment of the loan program. We feel that the Department of Agriculture statement before this Committee will be most interesting in light of the fact that Mr. Leggett and Mr. Forsythe both indicated "that the Department of Agriculture is not one to make loans in this area" referring to aquaculture. We trust that when the Department of Agriculture testifies before your Committee you will learn that this is not in fact the case.

It is indeed appropriate for Congress to establish a national policy for the development of aquaculture in this country and to provide certain assistance programs for the development of aquaculture. There is a role for the Departments of Commerce, Interior, and Agriculture as well as other Federal agencies in the provision of these services. However, as Assistant Secretary of Agriculture Cutler stated in his testimony before the Merchant Marine and Fisheries Committee on May 2, 1977, "The Department of Agriculture believes that that the production of fish and other aquatic species under controlled conditions for commercial purposes in farm-owned or operated-ponds and other water areas to be an agriculture enterprise. The enterprise is directly comparable in scope, effect, and result to other agricultural enterprises such as the raising of livestock or crops." We are in agreement and feel that the U.S. Department of Agriculture fundamentally has the authority as granted to them under Public Law 95-113. We feel that a lead agency is indeed needed and that it should be the U.S. Department of Agriculture. The National Academy lists eight functions which the lead agency should perform and makes 11 recommendations which the lead agency should implement. We commend this to the Committee for your consideration.

A lead agency must be designated by Congress. After a lead agency is designated, Congress must give them time to propose and implement a plan. We feel that the initiative for the details on how to implement a program and the levels of authorization could best come from the Executive Branch of government and, specifically, the U.S. Department of Agriculture. Based upon their experience of working with practicing food producers they would be knowledgeable of and sensitive to exactly what could be practically done in the industry without creating disruption and yet still allowing for orderly growth. We do not feel that it is appropriate for Congress to create such a program, authorize amounts of money to be spent and tell the management of the Executive Branch lead agency what to do until the Executive Branch has had time to study all options. After it has done so, it should then make proposals to Congress which would be subjected to the scrutiny of the public, private and university sector.

Any aquaculture program established by Congress must be entered into carefully and incrementally. Any program which dramatically increases the funds flowing into the field of aquaculture from the Federal Government will create substantial disruption within the industry. Federal salaries are often higher than those paid in private industry. This fact will result in federally funded programs hiring away experienced personnel from private aquaculture businesses and moving them into the public from the private sector. No one will benefit from this because of the fact that there is already very limited experienced management in the field of aquaculture. This is one of our principal reasons for opposing any substantial funding in the field of aquaculture and that is, it will create an unacceptable level of competition for experienced personnel—and this a time when the industry is critically in need of these people whom it has developed.

As with any young and highly technological industry, experienced management is limited and this situation is not expected to change for at least the next five years. The expenditure of the amount of money authorized by H.R. 9370 could not be intelligently expended and could result not only in waste, but in unnecessarily high salaries being paid which would cause massive economic disruption with the industry and result in a giant step backwards with no steps forward. Further, this amount of capital could result in universities increasing the number of fish culturists being trained and this at a time when there is already a surplus in the field of aquaculture. As an example, the *Commercial Fish Farmer Magazine*, which I publish, formally had a job placement service. Typically, we would receive 100 applications for every job opening of which we became aware. This practice was stopped a year and a half ago and the situation appears to be worse based upon the number of resumes coming into our office. This fact was pointed out on page 64 of the Academy Study on Aquaculture.

We think there is another situation which Congress should give special attention and which we feel has not been properly addressed. This is the matter which we have not mentioned previously in testimony, however, our awareness has been increased because of recent events—most notably the extensive exposure being given to the so-called "Appropriate Technology" movement by a number of leading thinkers, the most significant being the late E. F. Schumacher. The Committee's attention is called to the Academy Study comments on page 31 dealing with the potential production systems. The Report points out that to this date most U.S. aquaculture has been devoted to luxury food species that are, for the most part, high on the food chains, fed prepared diets high in animal protein, and grown in intensive production systems. This is indeed the state of aquaculture at this time and what the market is demanding. Thus, aquaculture, as we now know it, is headed in this direction and it will continue to do so, as it should. We feel that Congress should, either through legislative language or legislative intent, direct that some small part (perhaps 5 percent) of the efforts of the appropriate participating federal agencies be devoted to the development of new species which can be produced less expensively and with low technology. Attention should be given to encouraging small scale ("appropriate technology" sized) aquaculture so that farm and perhaps urban families may someday produce their own fish for their own consumption in their homes. We should be mindful of the fact that a very large number of exotic fish hobbyists in this country—hundreds of thousands—grow fish in their homes. In the process they have learned a simple technology, on a small scale, to keep billions of exotic fish alive in their homes. This hobby could become the harbinger of small scale home production systems to produce fish for one's own consumption. The thrust here should be on the technology rather than the marketplace.

Finally, one last specific issue which we wish to call to the Committee's attention is the fact that we feel that not only is the USDA the appropriate agency to lead the Federal Government's efforts in aquaculture, but that the appropriate place for the consideration of this legislation is the Agriculture Committee. We are talking about the production of food and this is appropriately a concern of the Agriculture Committee. The Senate Commerce Committee does have a responsibility in the drafting of this legislation but the lead committee should be Agriculture.

We wish to thank the Committee for its interest in this legislation and encourage you to continue your support to the aquaculture programs of the National Marine Fisheries Service and the Sea Grant Program. The National

Marine Fisheries Service is an extremely well administered and highly productive agency of the Federal Government. It has its ear close to the ground and understands the problems and needs of the industry as well as the consumer. The Sea Grant Program has been a great investment for the Federal Government and speaking on behalf of the catfish farming industry and the trout farming industry, we encourage your continued support of the program.

Thank you for the opportunity to appear before you today.

STATEMENT OF DR. E. WAYNE SHELL, HEAD, DEPARTMENT OF FISHERIES AND ALLIED AQUACULTURES, DIRECTOR, INTERNATIONAL CENTER FOR AQUACULTURE, AUBURN UNIVERSITY, AUBURN, ALA.

My name is Wayne Shell. I am Head of the Department of Fisheries and Allied Aquacultures and Director of the International Center for Aquaculture at Auburn University. Auburn has been involved with the development of aquaculture since 1934. We probably have been more closely associated with the development of the inland aquaculture industry in this country than any other American Institution. Since 1967 we have been deeply involved in the development of aquaculture in the emerging nations of the world. In fact, we have during this time assisted 54 of these nations in a formal manner.

In March 1977, I testified before the House Committee on Merchant Marine and Fisheries regarding H.R. 1833. The primary thrust of my testimony was that aquaculture did not require special treatment or special recognition for orderly development, but it did need equity under the law. In 1977, I also served as a member of the Committee on Aquaculture, Board on Agricultural and Renewable Resources, Commission on Natural Resources, National Research Council. Throughout the Committee's deliberations I maintained the position that if aquaculture or fish farming was afforded equal status with other forms of farming or commodities that little additional recognition would be required. I am pleased to say that the report resulting from the Committee's efforts, "*Aquaculture in the United States, Constraints and Opportunities*" published by the National Academy of Sciences took a similar position. The Committee on Aquaculture made one other significant recommendation. They made a strong plea for the designation of a lead agency at the Federal level for aquaculture. With the signing into law of PL 95-113, the Food and Agriculture Act of 1977, Congress provided equity under the law and unequivocally designated the Department of Agriculture as the lead agency.

Assuming that the Department of Agriculture will accept the mandate assigned to it by PL 95-113, I see no need for additional legislation at this time. There is every indication that the Department is moving rapidly to assume the assigned responsibility. I have been amazed at the amount of progress they have been able to make relative to aquaculture in spite of the pressing national agricultural problems that they have had to deal with.

If there is a need for any legislation it would be to define more specifically what Congress expected of a lead agency for aquaculture. Because this Committee was responsible for developing the legislation designating the Department of Agriculture as the lead agency, it would be appropriate for you to initiate legislation to define its responsibilities in that area. The Committee on Aquaculture considered the problem of the responsibilities of a Federal lead agency for aquaculture. Following are the results of our deliberations, essentially as printed on pages 93-95 of the report issued by the National Academy. I recommend them to you as a point of departure in defining the responsibilities of the Department of Agriculture as it moves to implement the Congressional mandate.

The lead agency should:

- (1) Take steps to develop appropriate means to coordinate activities among other federal agencies with aquaculture programs,
- (2) Annually submit a report on aquaculture in the United States to the President and the Congress containing a review of existing problems, progress to date, the allocation of funds, and an outline for action,
- (3) Develop an integrated program that recognizes the assets and skills of existing aquaculture programs within other federal agencies. Such a program should include a National Aquaculture Plan that specifically considers the resources of other federal agencies and contains a timetable for action,

(4) Disseminate information concerning federal and state permits and licenses necessary for aquaculture operations and facilitate their acquisition,

(5) Develop and promulgate guidelines for state use in enactment of laws and regulations relevant to aquaculture development.

(6) Encourage the U.S. Environmental Protection Agency to review and establish specific effluent guidelines and standards for aquatic animal production,

(7) Initiate with the U.S. Fish and Wildlife Service a review of the Lacey Act (18 USC 42) to: (1) identify species of importance to aquaculture; (2) establish a mechanism permitting entry of such species if the public interest will be best served by such entry; (3) develop and distribute to state authorities model regulations for interstate aquatic species disease certifications, and (4) compose and publish a listing of species whose entry into the United States is controlled by statute, but which are approved for use in aquaculture under specified conditions,

(8) Ensure that aquaculture enjoys parity of opportunity with related food production systems in terms of regulations, governmental support and insurance programs, and small business development programs,

(9) Take legal administrative steps to clarify the rights of both public and private hatcheries to harvest the ocean stocks they have planted.

(10) Coordinate efforts directed at obtaining funds from Congress for aquaculture activities and

(11) Ensure adequate long-range research and development in aquaculture which requires a level of funding that cannot be sustained by private business.

STATEMENT OF KENT S. PRICE, JR., ASSOCIATE DEAN AND ASSOCIATE PROFESSOR,
COLLEGE OF MARINE STUDIES, UNIVERSITY OF DELAWARE

Mr. Chairman and committee members, my name is Kent S. Price, Jr., and I am Associate Dean and Associate Professor of the College of Marine Studies and Associate Sea Grant Director at the University of Delaware. I also recently had the privilege of acting as rapporteur for the Committee on Aquaculture of the National Academy of Sciences. I understand that the report of that committee was reprinted for use by your committee. Finally, my professional qualifications include ten years of experience in research and research management at the University of Delaware directed toward the development of controlled environment (recirculated) systems for growing commercially valuable filter feeding bivalve shellfish.

As you might expect, I agree with most of the findings and recommendations of the National Academy of Sciences Committee of Aquaculture since I participated directly in the study. However, rather than speaking to you as a member of the Aquaculture Committee, I am here today to present my views as a staff member at the University of Delaware which is both a Land Grant and Sea Grant College.

BACKGROUND

The University of Delaware initiated mariculture research ten years ago due to a severe decline in the oyster industry of Delaware Bay (Fig. 1). Although the collapse of this seafood industry appeared to be a local problem, it has since become apparent that many natural fisheries are declining (See Fig. 1 for trend of oyster production in Chesapeake Bay) due to overfishing, pollution, disease, and natural events. Further analysis of the situation shows that we are just now crossing the frontier from hunting and collecting marine species for man's use to properly managing and husbanding them for uses equivalent to those seen in terrestrial food and fiber production. In agriculture, man began to cross that frontier several thousands of years ago. For sometime, knowledgeable people have been asking why the development of aquaculture has not kept pace with the development of agriculture in this country. The question was recently addressed by the Committee on Aquaculture of the National Academy of Sciences as mentioned earlier.

I won't repeat the Committee's findings because you have them before you. I can, however, amplify them particularly along the lines of the University of Delaware's experience.

In 1968, shortly after the establishment of the National Sea Grant Program, the University of Delaware began research supported by Sea Grant to revitalize the shellfish industry in Delaware. Research centered on shellfish

diseases, controlled reproduction, predators, water quality and food for the animals. After two years of research it became apparent to us that a new approach was needed. Natural water quality was highly variable and subject to human and industrial contamination. Harvest times were seasonal and animal quality was not uniform.

As a result of these problems in nature, our Sea Grant research was redirected in 1971 to the development of commercial methods to grow shellfish in a fully controlled environment. The advantages we foresaw in using a closed system or controlled environment approach included: (1) spawning on command to insure year around production, (2) growth at increased rates due to optimum diet and feeding rates, (3) uniformity of product, (4) certification of disease-free product, and (5) recycling of materials, and conserving energy. Table 1 elaborates further a comparison of closed (recirculated) and open systems, while Fig. 2 depicts a closed system.

Thus far our expectations have been borne out by solid progress in research. As you know, in nature, oysters and clams grow to three-inch market size in three to five years. Our research has shown that this long growing period is due principally to an inadequate food supply. We have perfected methods to grow algae monocultures which can be blended to provide shellfish with optimally nutritious diets for animals of various ages. Most important, though not surprising, our research showed that most shellfish growing in natural waters were almost always undernourished and that if adequate quantities of the proper types of food were made available then growth rates could be accelerated to produce marketable animals in roughly one quarter the time required in nature. In our laboratory we now raise small quantities of oysters to three-inch market size and clams to "little neck" market size in just nine months (Fig. 3).

ADVANCES IN CLOSED (RECIRCULATED) SYSTEM MARICULTURE

Major recent advances include: 1) harnessing the growth of nutritious algae by controlling the availability of plant nutrients, carbon dioxide, light and appropriate pH to produce cell densities of over 10 billion per liter or about 1000 times the densities found in nature. Algae grown in controlled reactors are capable of photosynthetically capturing about 4.0 percent of the sun's energy which reaches the earth. By comparison the best producing corn crop captures about 3.3 percent of the sun's energy, (2) definition of the components of a recirculating system and the ranges of temperature, water quality, and nutritive constituents necessary for continuous system operation, (3) preparation of a design for a 200 bushel per year shellfish culture prototype for determining the economic viability of recirculated system mariculture, and (4) the process is now being patented so that commercial investors can be protected by licenses.

Mariculture research at the College of Marine Studies is now in its ninth year. It has progressed steadily from the establishment of a modest oyster hatching effort to a highly integrated scheme for the controlled environment cultivation of algae and shellfish in recirculating seawater (Fig. 2). The present program embraces work in the intensive cultivation of oysters (*Crassostrea virginica*, the American east coast oyster), clams (*Mercentaria mercenaria*, the east coast hard clam), and single celled marine algae, principally diatoms and flagellates. This work is supported by research in the chemistry and microbiology of seawater in recirculated systems, shellfish nutrition, and the biochemical and structural aspects of bivalve shell growth. Five full-time professional scientists and engineers, three part-time University academic staff scientists, ten highly qualified full-time technical assistants and five full-time graduate students constitute the mariculture staff. The activity is funded in large part by the Sea Grant College Program of the National Oceanic and Atmospheric Administration of the Department of Commerce and substantially by the University of Delaware, the State Government of Delaware, and industry through the College's Industry Partner's Program. The current year's support of research operations is approximately \$450,000 from all sources.

Two years ago advances in mass algae culture, hatchery techniques and shellfish husbandry made clear in the need for expanded physical facilities to grow algae under daylight rather than artificial illumination. Consequently, a 3000 square foot greenhouse was installed and operated successfully to culture algae in 10,000 liter batches. It was also evident that this expedient would

need to be superceded by an advanced facility. A mariculture laboratory, including a unique 200 bushel controlled environment prototype shellfish culture unit, was planned (Fig. 4). The Economic Development Administration made available \$1,200,000 toward the Mariculture Laboratory and construction commenced in November, 1977. The activities at this new facility, to be occupied early in 1979, will be under the guidance of the Center for Mariculture Research established in the College of Marine Studies.

A prime mission of the laboratory is to operate a 200-bushel per year shellfish culture prototype system which will employ recirculating seawater in a controlled environment (Fig. 5). This unique prototype has evolved through nearly a decade of research and has as its initial objective a thorough technical and economic analysis of a controlled environment mariculture system. It will serve as a model for systems elsewhere in the United States and abroad which will produce high quality marine protein in the most efficient manner available through present technology.

The prototype system will be housed in a greenhouse with about 5000 square feet of enclosed area. Eighteen cylindrical algae reactors approximately 30 inches in diameter and 10 feet high will provide, daily, the 8×10^{14} (sic) cells required to feed that population of shellfish which when harvested monthly will provide 200 bushels per year. These algae reactors consist of transparent vertical cylinders of a diameter specified to optimize the carbon fixed by photosynthesis. They are to be managed so that growth of the algae takes place during daylight hours, and they are harvested during early evening to minimize the impact of dark respiration. The cultures will be harvested and the shellfish fed at 10^7 cells/ml. This high density will allow minimum water recirculation rate and lower capital cost for water treatment facilities. This facility will, for the first time, permit detailed cost analysis of a controlled environment mariculture system by which to judge feasibility of commercialization.

COMMERCIAL STATUS

As you know, universities conduct research both for the education of future leaders in business, government, and research as well as for the discovery of new knowledge. In addition, we make full use of Sea Grant sponsored marine advisory service capabilities to bring the results of our research to commercial uses at the earliest possible time. Strong interest has been shown by major food industries in the potential of our research. Their interest is continuing, and in fact increasing, as evidenced by a five year grant by the Campbell Soup Company to support our shellfish nutrition work and a three year commitment by Unilever Limited of England and Borden's Incorporated to become mariculture industry partners and to support our research.

As our work proceeds, we are involving engineers and economists to a greater degree so that the selling price of shellfish produced in a closed system can be estimated with greater accuracy to determine when an attractive return on investment can be achieved by a commercial operator.

NEXT STEPS

Now I want to address the question "What should we do next?" In our view, there are several logical actions. First, we must continue as planned with our Sea Grant sponsored research and operate the planned 200 bushel per year prototype.

The second action we believe is logical to accelerate this work to a commercial scale is to follow the recommendations of the NOAA aquaculture plan and increase the level of annual research support to the University of Delaware to \$800,000 per year for the next few years. This will be an increase from our present Sea Grant research budget of approximately \$450,000. The increase will be used for such important work as selective breeding, hybridization, experiments using faster growing species and other desirable marketable marine animals and plants, development low-cost automatic monitoring and control instruments for commercial controlled environment systems, and the development of satisfactory artificial seawater sources to name just a few. This step to increase funding might logically be made by designating the Delaware aquaculture project as a National Project under the existing Sea Grant authorization.

The third action should be to plan how to build a prototype commercial production facility to produce 100,000 pounds of meat per year, or approxi-

mately 8000 bushels. We will be ready to design such a facility during the coming 12 to 18 months based on experience with the 200 bushel system we will build and start operating within the next year. The 100,000 pound per year prototype will be an industrial demonstration unit. This would be built and operated in close cooperation with industry or a cooperative of existing fishermen who would like to become part of this new business. It would be set up on a full commercial footing to try to reduce operating costs as low as possible and to maximize the inventive talents of the individuals who worked there. It is our belief that industry will need to see a facility of this size in operation before it will begin investing its own capital though I may be pleasantly surprised by their earlier unilateral action. Our research team would be in close contact with this commercial scale facility to bring in new ideas and to solve new problems which will most certainly arise.

The fourth and final action should be a continued effort to involve the commercial sector. We envision a widespread seafood production industry using controlled environment techniques springing up throughout the United States and abroad using U.S. licenses. It may take the form of our extremely successful poultry industry. These industries, through a commercial association, could be expected to begin picking up some of the costs of the future research which will be required to support a maturing and increasingly sophisticated industry.

It is clear from the results of records cited earlier in the testimony that commercial shellfish production has a long history of steady decline. What is not yet widely known, except by commercial offshore clambers, large food companies and the National Marine Fisheries Service, is that offshore sources are being depleted steadily. This means that in the near future even our existing markets, not to mention new potential markets, will not be satisfied. The rapidly rising prices of oyster and clam meat verifies this situation.

LEAD AGENCY DESIGNATION

The question is the designation of a single lead agency for administering all aquaculture programs. The Department of Agriculture has shown leadership in the development of catfish farming and other freshwater aquaculture and is an agency charged with developing on-land food resources. On the other hand, the Department of Commerce has shown leadership in developing fisheries and marine aquaculture (or mariculture) and is the agency charged with developing salt-water food resources. In our opinion, to designate either agency as the sole lead agency for the cultivation of all plants and animals which may be of benefit to man, and the whole panoply of corollary and derivative subjects as presently known in agriculture alone would have serious shortcomings.

It is the considered opinion of the University of Delaware that the Department of Agriculture should be designated the lead agency for freshwater aquaculture and the Department of Commerce should remain the lead agency for brackish and salt water aquaculture (mariculture). We feel that this is consistent with the current strength of the two agencies and should benefit the development of aquaculture in the United States.

In our view, the most important and logical provisions to make in any and all aquaculture legislation is to provide adequately for equivalent states of both Land-Grant and Sea-Grant institutions as participants in research, development and demonstration activities.

Government should exercise reasonable regulation of commercial aquaculture and to provide services such as production data and information of use to individuals and businesses who wish to enter commercial aquaculture. This latter can be handled by expanded Sea Grant marine advisory service. The federal government should not dominate aquacultural research. Basic and applied research can often best be handled by universities and by business. The federal government nevertheless has a serious responsibility to ensure that problems of national needs are adequately met. There are many incentives for universities and industry to work in concert toward the success of aquaculture. The incentives needs to be enlarged and intensified to help ensure success in the near term.

Commercial aquaculture can become a reality in the near future if we make full use of the resources and knowledge now available to us. Our objective, as a nation, needs be to create a viable food source and thus new bases of national wealth.

Table 1
WHY CLOSED-CYCLE MARICULTURE?

	<i>Closed Cycle</i>	<i>Open Cycle</i>
LENGTH OF GROWING SEASON	Optimal growing temperatures can be maintained year-round with minimal energy and expense due to recirculation of the growth media;	Energy costs are extremely high due to once through heating and cooling of the growth media. The alternative is no temperature control which tends to lengthen the growing season for the crop in question in temperature latitudes.
FEED	Foods can be fed at higher densities than in nature and can be selected for nutritional suitability for the mariculture crop.	Phytoplankton densities generally are relatively low and highly variable in nutritional quality and quantity.
WATER QUALITY	Water quality parameters may be optimized to promote maximum health and growth in the mariculture crop.	Water quality parameters, such as oxygen levels and salinity, may vary in an uncontrollable fashion.
PURITY	Contaminants, such as chemicals and human and shellfish pathogens, can be avoided and/or treated if need be.	Little or no control can be exercised over contaminants.
RAW MATERIALS	Food and other growth factors can be recirculated to conserve raw material input into the system and, therefore, cost of these materials can be controlled.	Food and other growth factors can be lost to the system if the animals do not assimilate them in a timely manner.
ENERGY	Good potential exists for harnessing solar energy for growing food and other energy requirements in the system.	Although solar energy is available as an input, it is difficult to manage in an open system.
LOCATION	The system may be located anywhere as long as seawater or sea salts can be shipped to that location. Recirculated systems require relatively small amounts of make-up water.	Must be located on the coast where competition for use of space and water may be prohibitively expensive.
LABOR	Substantial potential exists for mechanization and automation reducing need for hand labor.	Due to husbandry and level of technology, substantial hand labor commitment is required.
OUTPUT	Reliable output rates are possible, based on year-round production that is not substantially affected by seasonal variations in climate.	Crops are seasonal and occasionally succumb to natural catastrophes, such as storm Agnes.

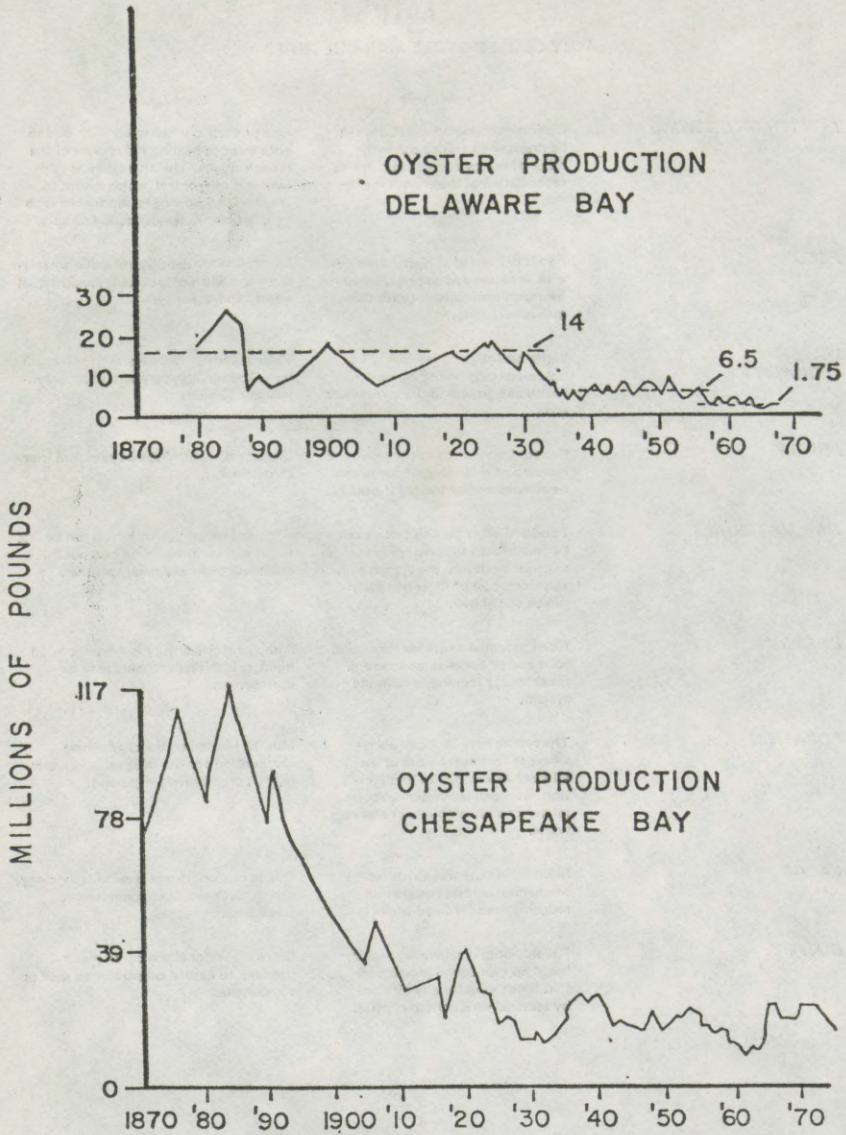


Figure 1.

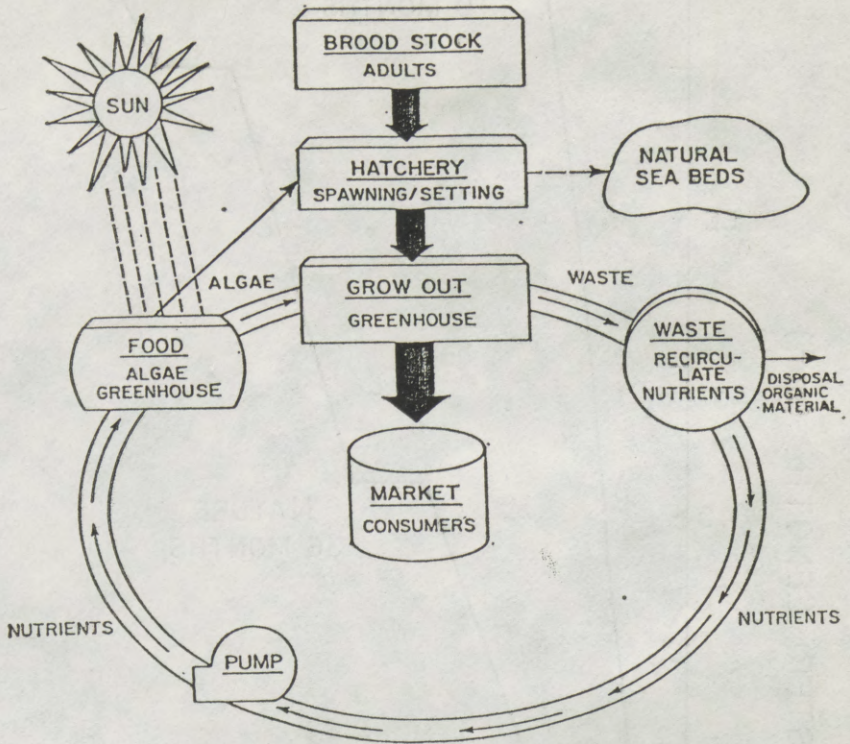
CLOSED CYCLE SYSTEM

Figure 2.

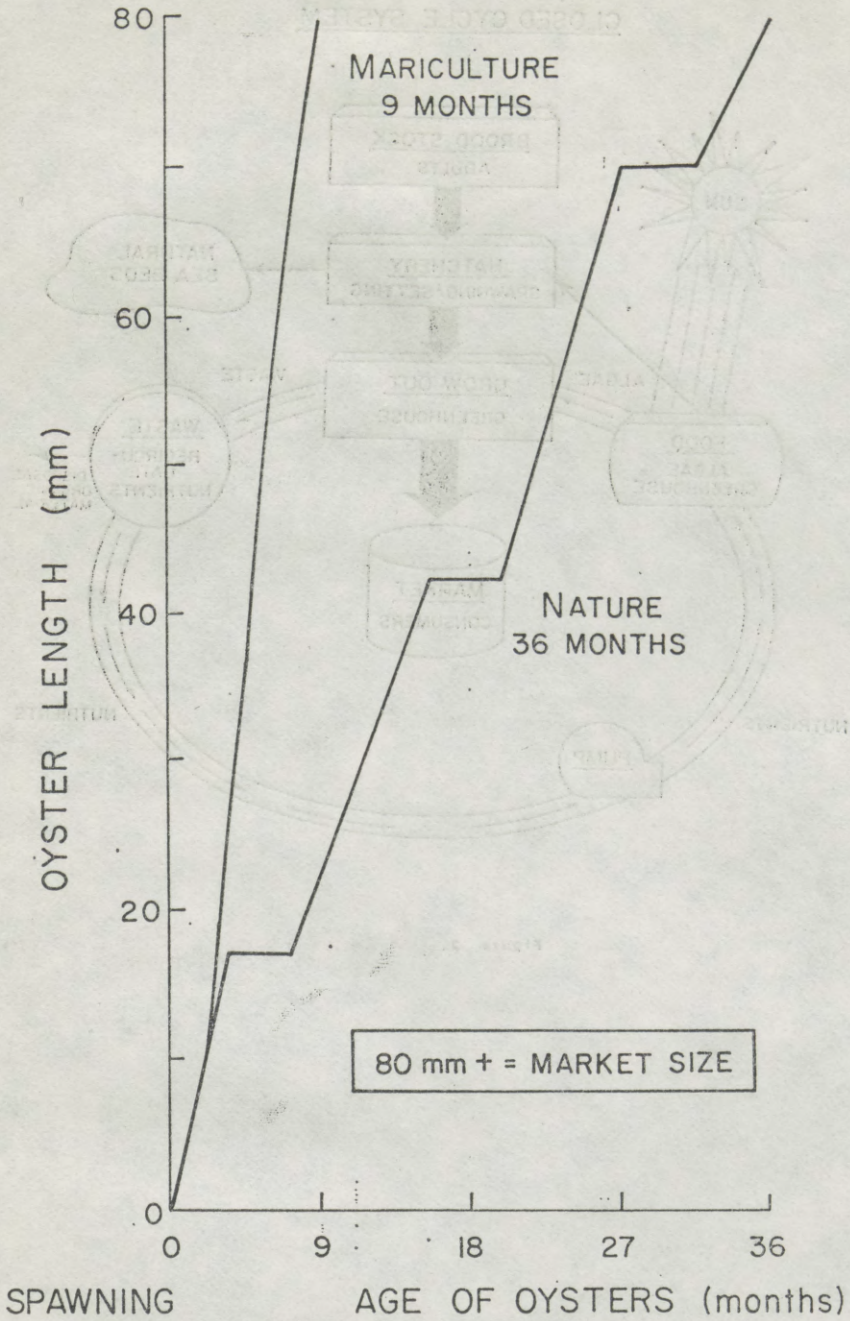


Figure 3. Oyster growth

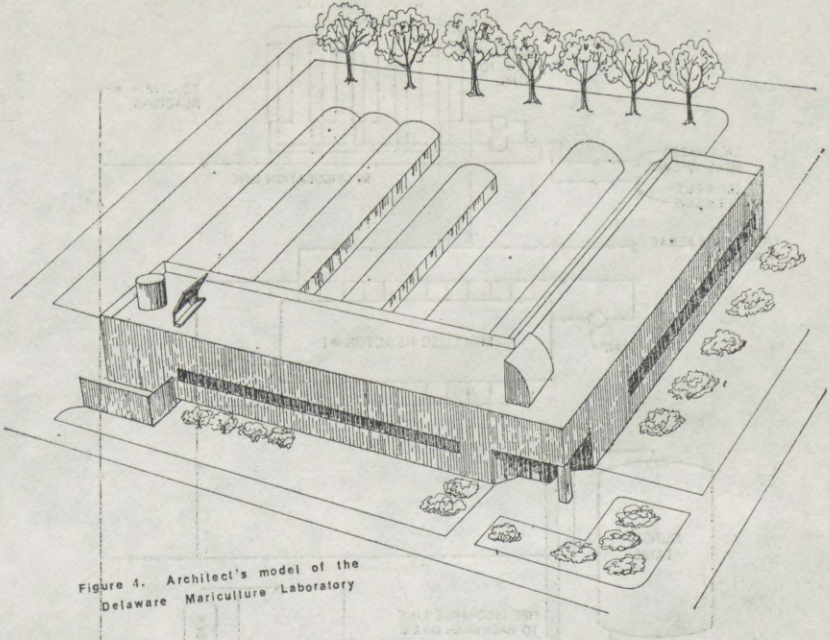


Figure 4. Architect's model of the Delaware Mariculture Laboratory

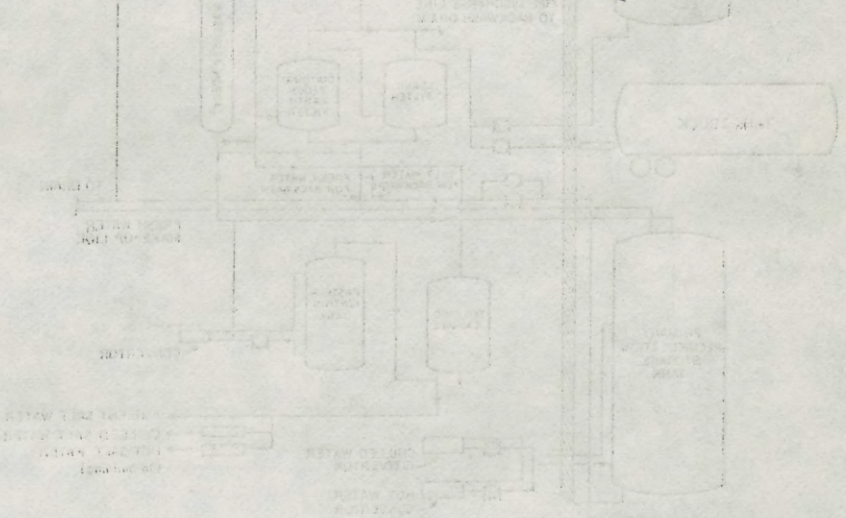


FIGURE 5. Prototype flow diagram of Delaware Mariculture Laboratory

The laboratory and research of the Delaware Mariculture Laboratory is a part of the Delaware State University system. The laboratory is located on the campus of Delaware State University in Dover, Delaware. The laboratory is a part of the Delaware State University system and is a part of the Delaware State University system. The laboratory is a part of the Delaware State University system and is a part of the Delaware State University system.

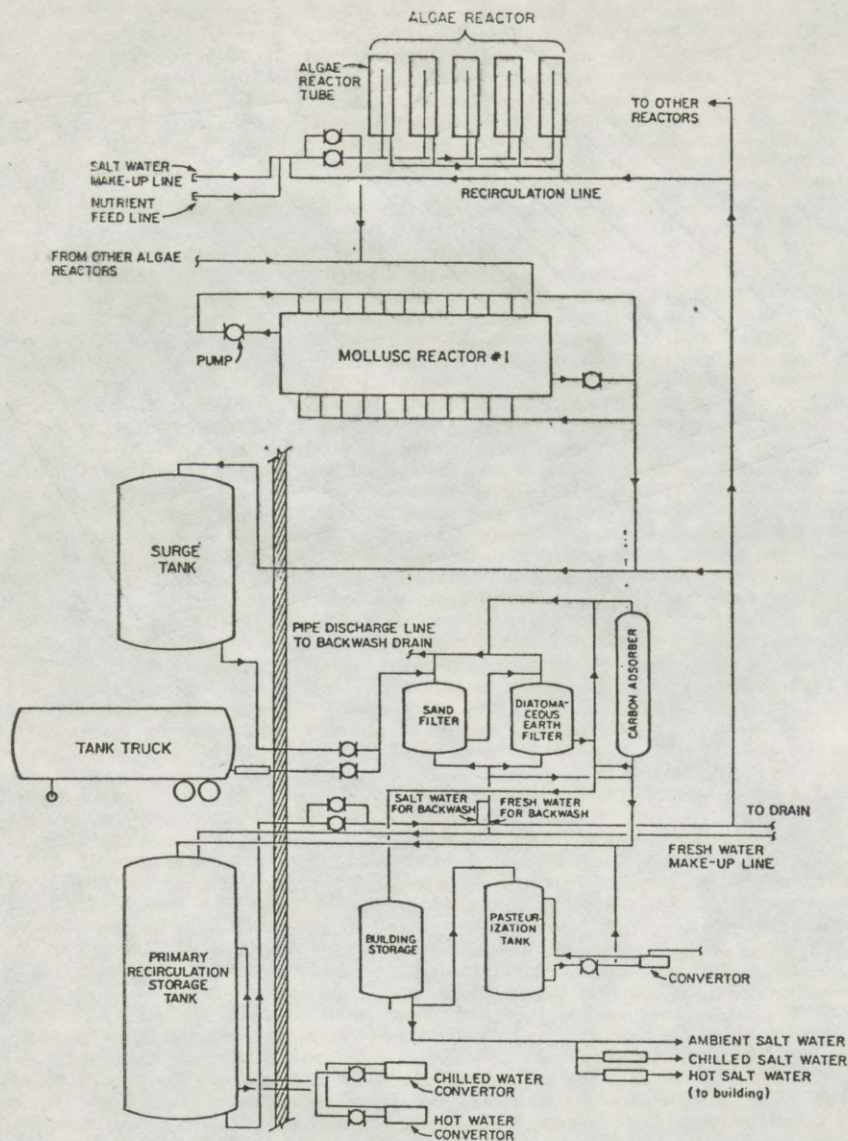


FIGURE 5. Prototype flow diagram of Delaware's 200 bushel System

STATEMENT OF RICHARD H. LORING, REPRESENTING THE SHELLFISH INSTITUTE OF NORTH AMERICA

Mr. Chairman and members of the committee, it is a pleasure to be here to testify before you today on legislation to promote the development of aquaculture in the United States—primarily within the framework of H.R. 9370.

I am Richard H. Loring, immediate past president of the Shellfish Institute of North America. We represent the molluscan industry in the United States since 1908 with members in all 22 coastal States. The discussion today involves principles of all marine aquaculture interests.

I, personally have been deeply committed to aquaculture for the past 20 years. I am the executive vice-president of Aquaculture Research Corporation on Cape Cod, Massachusetts. We have developed and are producing regular crops of hard-shell clams from our hatchery. We sell clam seed as well as grow some out to market size.

We have been fortunate to accomplish this without the benefits of H.R. 9370, but it has been most difficult.

Unfortunately, there has been, of late, a great deal of confusion about what the bill does, or should do, particularly in regard to where administrative authority for aquaculture programs would be placed in the executive branch. Before discussing the specific details of the pending legislation, let me first try to simplify some of the problems that have arisen.

First and foremost, it is agreed by all interested parties that the principles of aquaculture are not only sound but essential. The world must develop other sources of food production, and in fact is. It is the U.S. that is lacking and falling behind. It is true that we have successfully developed the technology to raise and grow catfish, trout, salmon and some mollusks, namely oysters and clams. These businesses have their own special set of developmental problems. However, these aforementioned businesses are, by no means, the end all. There are countless species of plants and animals, fresh water, brackish, and salt water varieties that need developing. Some of these species are today being developed in the private sector. Some are being studied in public laboratories and universities. The problems of financing and technology relative to these areas of expertise are far different from the existing operations.

Thus, the only means that I can see to resolve all these differences is to seek a common ground and move forward from a position of strength.

Turning our attention back to the pending legislation, specifically H.R. 9370, I suppose the primary point of contention is "lead agency." Well, perhaps we can just avoid this pitfall and utilize the concept of management by committee, a triumvirate or interagency committee, if you will, comprised of the Departments of Commerce, Agriculture, and Interior. This will give the aquaculture community the best of all worlds.

There are presently 21 Federal agencies involved in aquaculture development. An interagency committee should be able to coordinate these agencies' activities, and, to the extent possible, avoid unnecessary duplication of each other's work. Coordination in this sense means, more than anything else, exchange of information. The committee's primary responsibility would be to see to it that all information on aquaculture is circulated and disseminated.

Since the bill explicitly states that *no existing authority* is to be taken away from any agency involved with aquaculture, there should be no fears, real or imaginary, from any agency or segment of the industry that anyone will "lose" something. To the contrary, we should all gain in the long run.

Probably the other area of universal concern about this legislation is the funding problem. Some facets of the industry needs large amounts of risky development funds other elements don't need any and consequently, don't want any.

The aquaculture industry as a whole has much to gain from the provisions of H.R. 9370. Historically, the financial assistance programs of USDA and their administration gives little hope for funding new and imaginative ventures which must predominate during the formative years of this industry. The ultra-conservative loan policy of USDA precludes loans to much of the aquaculture community.

Here again, the differences and needs of the aquaculture endeavors vary so markedly that it is hard to find the common ground in this area. The fresh water people, although not against this high level funding, would prefer to move slower—but while they are moving slower—they are in production! On the other hand the marine endeavors are much more complicated, larger in size, containing built-in hatcheries, and have a longer way to go. They need assistance now or else the small operations will be swallowed up by big corporations with bulging research and development budgets. A solution: fund it now and look upon each case on its own merits considering some protection for ongoing operations, but be imaginative for new projects—a characteristic often lacking in Federal administrators.

Some of the more important areas to be considered concurrently with financing assistance is (1) the need to produce an environment conducive to the development of aquaculture. The socio-bio-political constraints are prodigious: the more government involvement, the more difficult it is to operate. Government, unfortunately the way it is administered, has little consideration for the hard facts of life of being in business. Not only do aquaculture businesses strive to break through the technological frontier, but they must face the hard realities of all businesses—the payrolls, the funding problems—the financial responsibilities as well. In a word the aquaculture industry is looking for a little co-operation and consideration not a series of energy and resource absorbing constraints.

It has been suggested that at whatever level aquaculture becomes administered, that there be created an "Office of Aquaculture Advocacy" to participate in all aspects of rule making in government. This is not a new concept and in our case it might be a tremendous boost.

H.R. 9370 suggests an advisory committee to assist in the initial development of the national aquaculture plan. Herein lies a key point to developing the much needed harmony between government and the private sector. This bill is not oriented towards business, but instead towards government and research. Industry needs an active role in key decision-making process. Section 4 should be rewritten to recognize the importance of small business. The Advisory Committee should be a mandatory body which should have to approve the national plan before it is implemented, and should continue in its capacity for the life of the program, not just the initial phases. Finally, the makeup of this committee is critical. We feel that 50% of the committee should be from the private sector, one-half of which should be from small aquaculture operators. The other 50%, of course, can be made up of knowledgeable people in our universities and governmental agencies.

A small point to be also addressed is that under definitions: the word "aquatic species" should include marine, brackish-water, or fresh water species of animal or plant.

I hope I have conveyed sound, helpful ideas to you and that we can move forward with some progress towards the development of aquaculture. I think H.R. 9370, with a few minor changes can do the job. Thank you for your time Mr. Chairman. If you have any questions, I will try to answer them for you.

STATEMENT OF DR. JEAN MAYER, PRESIDENT OF TUFTS UNIVERSITY,
MEDFORD, MASS.

We at Tufts University are pleased to offer this testimony in regard to the development of aquaculture in the United States. We have long supported the notion that the resources of the sea are becoming increasingly important to this country and to the rest of the world, and that it is imperative that we address the major issues now confronting us.

We want to emphasize the importance of designating a single lead agency to coordinate the activities in the field of aquaculture. While we would not want to suggest which agency that might be, we are convinced that our current fragmented approach is insufficient to the task at hand, and that the enormity of the work which faces us demands a coordinated effort.

There are several major themes in aquaculture which we feel should be considered. First and foremost is the field of nutrition. The continued growth in the world's population and the steady increase in the demand for protein have made all of us more aware of the tremendous resource potential of the seas. Recent experience, however, indicates that a simple rise in the world's fish catch is neither prudent nor, in many cases, possible. Despite a general agreement that we will turn more and more to the oceans for our food supplies, there has been no adequate endeavor to determine the efficacy of various approaches to harvesting that supply. Indeed, we do not even know if such action is feasible at this time.

In addition to the better utilization of the food resources of the seas, it is necessary to investigate the more general nutritional requirements of various species and the nutritional effects on the humans who consume them. We must examine the relative value of individual species, their efficiency in converting carbohydrates into protein and their actual nutritional value in humans.

The advances in agriculture serve as an appropriate model which we should strive to emulate in the seas. A comparable "green revolution" of the seas, whose purpose would be to increase the yield of the marine species, the same way as scientific achievements affected agricultural output through the development of new strains, should be made a national priority. It seems logical that if we can mobilize our research resources in aquaculture, we can achieve a dramatic increase in our ability to utilize the wealth of the oceans to feed a hungry world.

It is clear that the United States must take the lead in the development of aquaculture on an international basis, just as we have consistently set the pace in the development of all other food resources. We have the scientific and technological capability to make a major contribution to the solution of the world's food problems through decisive action in this area. Of particular importance is the field of intermediate technology transfer whereby we can provide to the less developed nations of the world the means by which they can feed themselves. We do not envision the creation of massive, capital-intensive processes, but rather the methodologies which will make it possible for less developed countries to rationally exploit their marine resources.

It has been our experience that one of the major barriers to the enhancement of aquaculture is the lack of adequate communication among the scientists who have expertise in this area. Tufts has made a first step in addressing this problem by signing an affiliation agreement with the Oceanic Institute in Hawaii, but this is only a beginning. For us to make significant advances in aquaculture, we must consider the development of a permanent vehicle to bring together the world's aquatic scientists, for this is truly an international undertaking.

One possible solution would be the development of an aquaculture nutrition research institute whose purpose would be to foster international cooperation in the field. There are numerous parallels for such a center, and the benefits which would accrue from it would be dramatic. Certainly, our knowledge of the nutrition-related aspects of the seas is miniscule in comparison with our considerable expertise in land-based nutrition science. Yet, it is abundantly clear that we require a massive effort if we are to make a contribution to the world's need for food.

New England has always had a special interest in the sea. Our history is replete with examples of our people's commitment to their marine environment, from the early days of settlement, to the development of the clipper ships which brought the world together, to the whalers of New Bedford and Gloucester, to the present emphasis on commercial exploitation of the seas. We have a unique set of resources including the world famous Woods Hole Oceanographic Institution, the Marine Biological Laboratories, the New England Aquarium and the soon-to-be-established School of Veterinary Medicine at Tufts University which will have a major mission in aquatic animal medicine.

At the same time, New England is confronted with problems from her neighbor, the sea. Off-shore oil drilling is expected to get underway in the near future in the very area noted for its abundance of fish. We are not prepared for the impact of such industrial activity, ecologically or socially. As we race headlong into the search for new energy sources, we have yet to investigate the permanent effects of drilling on the ecosystems of the seas. We do not, for example, know how to gauge the long-term effects of oil rigs, tankers and spills on the marine life in the open ocean. We believe that oil wells and fish can co-exist, but we do not have the scientific expertise to determine how that existence should be regulated. In addition, we are aware of the potential impact of thermal effluent from atomic reactors, but we are only beginning to understand if, and how, that energy by-product can be harnessed for food production. At the same time, we must determine what the long-term effects of thermal effluent are on the growth of marine life.

Along with nutrition and environmental effects, we are very concerned with the area of aquatic animal disease. We are beginning to acquire some knowledge on the specific strains of disease which affect aquatic animals, particularly those which also affect terrestrial animals and humans. It is our belief that we can make great strides in biomedical research by working with marine species, and through the study of animal diseases we may be able to overcome some of the problems which inhibit aquaculture. Accordingly, we strongly support efforts in the area of marine pathology and toxicology.

In summary, I think it is reasonable to assume that our nation will benefit from an expanded effort in aquaculture which is coordinated and which addresses both scientific and social issues. The development of our great resources in the seas is a paramount importance not only to New England, but to the nation and the world. We urge the Congress to take action in this vital area and to begin the work at hand.

STATEMENT OF DR. G. W. KLONTZ AND DR. R. T. DAILEY

AQUACULTURE IN IDAHO

In 1976 the commercial food fish industry in the State of Idaho produced an estimated 20 million pounds of rainbow trout and channel catfish. This represents nearly 90% of the nation's commercial processed trout production. The annual gross value of the Idaho food fish industry is estimated at \$30-\$35 million.

The food fish industry is perhaps the fastest growing food animal industry in the state. In 1965 the trout production was less than one million pounds. Since then it has increased steadily, year-by-year. Some food fish farmers speculate that by the year 1980, the annual production of trout will exceed 40 million pounds (round weight) and the production of channel catfish will exceed 10 million pounds.

The primary reason for the phenomenal growth rate of the industry is the abundance of water supplies suitable for growing both rainbow trout and channel catfish. Water sources for both—59°F for trout and 80°F for channel catfish—are primarily free-flowing springs in the Twin Falls—Buhl area of the state. At this time, more than 2,000 cubic feet per second are used in the commercial food fish industry with more water supplies being developed as capital funding permits.

The rapid growth of the food fish industry in Idaho has focused attention on the several constraints to achieving the optimum production potential. There are a myriad of diseases—both infectious and noninfectious—posing a potential threat to production. In addition to the disease threat there are production-limiting problems with marketing and sales, with continuing education for fish producers, and initiating new fish raising techniques developed by universities and public agencies. In this regard, the basic problem is that there is no public agency—state or federal—administratively organized to provide on-going extension services to the food fish producers. At the present time, the College of Forestry, Wildlife and Range Sciences—by legislative action in 1939—has the primary extension responsibility for commercial fish culture activities in the State of Idaho. Several requests have been made to the Idaho Legislature for extension funds but funds have not been provided.

Information is needed on the competitive position of the food fish industry in Idaho relative to other states. Furthermore, economic analyses are needed to determine the structure of the industry and measure its potential in the overall Idaho economy. Producers are facing serious economic problems in the costs of production, distribution, and marketing of their fish products.

The report of the Select Committee on Nutrition and Human Needs of the United States Senate, "Dietary Goals for the United States," second edition, December 1977, listed as goal number six "a reduction of cholesterol in the American diet to about 300 mgs. per day." One method of achieving this goal while at the same time maintaining the current level of high quality protein in the American diet is through the increased consumption of fish. Thus, a great deal of economic data would be required by food fish producers in order to meet the increased production requirements.

The relationships need to be explored between the energy requirements to produce protein in the form of fish compared with protein produced from red meats and poultry. With energy costs increasing more rapidly than most other production costs, fish may become more competitive in price with other sources of protein.

It is therefore requested that the CSRS under PL 95-113 provide funds to the various states in which aquaculture is a commercial enterprise. These funds will provide salaries for professional and technical personnel and operating expenses for both extension services and applied research in the areas of aquaculture technology, fish genetics, fish disease control and prevention, economic analyses, marketing assistance, and continuing education.

STATEMENT OF DR. DON WALSH, DIRECTOR, INSTITUTE FOR MARINE AND COASTAL
STUDIES OF THE UNIVERSITY OF SOUTHERN CALIFORNIA

I am pleased to have this opportunity to comment on your committee's hearings with respect to S. 2218, S. 1043, H.R. 9370, S. 2582 and S. 2762. During the past two years I have served as Chairman of the Committee on Aquaculture under the National Academy of Sciences' National Research Council. This committee was established to conduct a comprehensive study of the present state of aquaculture in the United States. The study entitled "Aquaculture in the United States—Constraints and Opportunities" was approved by the National Academy of Sciences in December, 1977. It was published by the Academy in February of this year. I am particularly delighted that the Senate Committee on Agriculture, Nutrition and Forestry chose to publish the entire report as a committee print. This certainly will help to present our findings to a much broader constituency.

I will not attempt to make specific, section-by-section comment on the bills before your committee. This type of comment is well represented by those parties who are concerned with the daily practice of aquaculture activities. What I can offer as my "specialty" are some views on how the government should address the question of supporting the advancement of this important field.

In the conduct of our study, the Aquaculture Committee approached the problem by simultaneously looking at the current state of U.S. aquaculture in 4 distinct areas: production systems; science and technology; economics and business; and law and public administration. We wanted to examine each of these areas concurrently to determine where problems could be identified that cut across the entire spectrum of activities. Solutions to those problems then would offer the greatest leverage to effect significant improvements.

It was interesting, though perhaps not surprising, that we quickly came to the conclusion the major obstacles and constraints were in the law and public administration area. To be sure, there were many problems identified in the other subject areas, but the solutions to many of them were dependent upon better government policies and programs in support of aquaculture. In other words, the scientific and technical questions were increasingly dependent for their solutions upon better government programs in this area. These government programs would require certain policies and procedures to be established which would support the overall advancement of aquaculture.

It is difficult to attempt to pick from our total study effort *the* key recommendation. I strongly recommend our entire report to the person seriously concerned with these issues. It represents our committee's tightest, most economic statement on a very complex set of questions.

Nevertheless, I believe the central issue of our study is the question of a federal lead agency for aquaculture. No such designated agency exists and therefore no one is really in charge of looking after the development of aquaculture policies and problems within the federal government.

Compared to agriculture or fisheries, aquaculture is a very small effort by any index of measurement you'd care to use. Yet if we agree that aquaculture offers important food options for the future then we basically imply an active governmental role in advancing this field. We need this to insure that we can move from the research laboratories into commercial practice. The "end point" of the whole chain of development is effective food production as a viable business enterprise.

Thus early government involvement is vital to help shape national policies, provide assistance, support research and stimulate commercial development. But this cannot be done effectively with the present scheme of having three different departments of government (Commerce, Interior and Agriculture) working in this area with little coordination and with no one agency responsible for the lead function. As my committee noted in its report:

"... a lead agency should:

"Develop, direct, and coordinate all U.S. aquaculture activities within the Federal Government;

"Represent and report on executive branch programs in this area to the President and Congress on a regular basis;

"Represent the United States in international matters relating to aquaculture;

"Recognize and enhance aquaculture programs in other relevant Federal agencies;

"Coordinate efforts directed at obtaining funds from Congress for aquaculture activities;

"Lead efforts at all levels of government to insure that aquaculture interests are adequately considered in the development of regulatory requirements for protection of the environment, public health, land use management, et cetera;

"Insure adequate long-range research and development in aquaculture which requires a level of funding that cannot be sustained by private business; and

"Insure that aquaculture enjoys parity of opportunity with related food production systems in terms of regulations, governmental support and insurance programs, and small business development programs."

In addition to the key question of the lead agency and its functions, we also considered the secondary question of which federal agency offers the optimum institutional characteristics to become the lead agency for aquaculture. It was the sense of the committee that the Department of Agriculture best met the need. The Food and Agriculture Act of 1977, passed prior to the completion of our report, seemed to point in this direction. Therefore we did not make this specific recommendation in our final report.

When the 1977 act appeared to give USDA the potential lead agency role, our concern then shifted to how well this agency might carry out this new responsibility. In other words, aquaculture now had a home in the federal government, but how good was that home? As a relatively new field, aquaculture is a minor element in the national food production picture. Also USDA had virtually no experience in saltwater aquatic problems. Therefore we felt it is incumbent upon this agency to recognize the special situation of scale and diversity of programs involved in this developing field if there is to be orderly growth. I personally believe that the present steps taken within the office of the Assistant Secretary of Agriculture for Conservation, Research and Education indicate an understanding of the special needs of aquaculture.

I recognize that there is considerable difference of opinion as to which government agency or agencies should have principal aquaculture responsibilities; whether or not there should be a lead agency, and if freshwater and saltwater aquaculture should be split into different program areas. My answer is simply that the end point of aquaculture is food production and we have a "department of food" in our government, USDA. This is not a revolutionary concept. I note that many maritime states have fisheries and aquaculture under their "Ministry of Agriculture."

To insure a strong program, with orderly growth, someone has to be in charge. Interagency coordination is useful only if one of the parties has the responsibility for the final decisions and organization of the program to secure its support through the executive and legislative processes. Without the lead function mere interagency coordination is impotent and useless. While this option of only creating an interagency committee might offer a tidy political compromise between those wanting to do nothing and those pushing for a lead agency, it would gravely harm the chances of aquaculture to move out of its present mode of stagnated development.

My strong belief in the need for a lead agency, and that this agency should be USDA, does not in any way overlook or liable the excellent work that has been done for many years in both Commerce and Interior departments. Our committee report emphasized that the lead agency, whatever department of government designated, should recognize and work with the existing structure of excellent research conducted by NOAA's National Marine Fisheries Service and their National Sea Grant Program as well as Interior's U.S. Fish and Wildlife Service. In addition to these major "players," there are also numerous other federal agencies which have recognized aquaculture interests to a lesser degree. Thus we do not propose starting over in this field. We wish a consolidation and coordination of effort as the basis for the development of an institutional mechanism for the creation and implementation of national policy for aquaculture.

In short, I support and strongly urge the designation of a federal agency for aquaculture. Congressional action would help insure that this designation has the required permanency. I basically subscribe to the notion that *some* lead agency is better than *none*. However it is my considered belief that this agency should be the Department of Agriculture.

I appreciate having this opportunity to bring my views before your committee.

