

EUROPEAN PARLIAMENT

# Working Documents

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4 May 1979

DOCUMENT 116/79

## Report

drawn up on behalf of the Committee on Agriculture

**on measures to be adopted for the development of fish farming within the  
Community**

**Rapporteur: Mr J. CORRIE**



By letter of 18 January 1978 the Committee on Agriculture requested authorization to draw up a report on measures to be adopted for the development of fish farming within the Community.

Authorization was given by the Bureau of the European Parliament in its letter of 8 February 1978. By letter of 1 March 1978 the Committee on Regional Policy, Regional Planning and Transport was asked for its opinion.

The Committee on Agriculture appointed Mr Corrie rapporteur.

The Sub-Committee on Fisheries considered the draft report at its meetings of 30 November and 18 December 1978. The Committee on Agriculture considered the draft report at its meeting of 4/5 April 1979 and adopted the motion for a resolution and the explanatory statement unanimously.

Present: Mr Liogier, vice-chairman and acting chairman, Mr Corrie, rapporteur, Mr Albertini, Mr Andersen, Mr Baas, Mrs Dunwoody, Mr Hoffmann, Mr Klinker, Mr L'Estrange, Mr Nielsen, Mr Pisoni, Mr Pucci and Mr Tolman.

The opinion of the Committee on Regional Policy, Regional Planning and Transport is attached.

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The Committee on Agriculture hereby submits to the European Parliament the following motion for a resolution together with explanatory statement:

MOTION FOR A RESOLUTION

on measures to be adopted for the development of fish farming within the Community

The European Parliament,

- having regard to the report of the Committee on Agriculture and the opinion of the Committee on Regional Policy, Regional Planning and Transport (Doc. 116/79),
  - whereas certain peripheral maritime regions of the Community find themselves at a disadvantage in terms of agricultural incomes and have traditionally been heavily dependent on the fishing and related industries,
  - whereas the Community should adopt all measures to ensure the rational use of available land and water resources, in order to provide for reasonable living standards within those regions,
  - whereas adoption of conservation measures for stocks of wild fish requires measures to create alternative employment for those in regions heavily dependent on traditional fisheries activities,
  - whereas increases in costs and, in particular, fuel have undermined the economic basis of certain inshore fishing activities,
  - whereas the EAGGF should be used to encourage vocational training and investment grants in order to attain the objectives of the Treaty, in particular to ensure reasonable living standards and to improve supplies,
  - whereas health regulations should be adopted to facilitate the free circulation of agricultural produce within the Community, and to reduce health risks,
  - whereas the Community should adopt measures to harmonize laws which at present constitute obstacles to the movement of investment within the Community,
1. Draws attention, with the greatest emphasis, to the Council, the Commission and Member States, of the major contribution that common measures to encourage fish farming could make to the economies and employment prospects of the maritime peripheral regions of the Community, which have been badly hit by measures to conserve wild stocks and increases in costs, particularly of fuel,

2. Considers that the basic technological advances have been made to permit an important expansion of fish farming within the Community;
3. Points out that fish farming has become a growth industry providing exports of live or processed fish, expertise, equipment and food-stuffs, and in which the Community, through lack of adequate encouragement to invest, is lagging seriously behind the United States and Japan;
4. Underlines the fact that a number of major obstacles to the development of fish farming within the Community are not technological, but the result of the lack of adequate administrative and legal framework, sufficient veterinary and inspection facilities, and a lack of organization of research throughout the Community;
5. Considers, therefore, that the Community should adopt, without delay, common measures to encourage fish farming within the Community including measures for the granting of aid for investment; to coordinate research programmes to control disease, to provide a proper administrative and legal framework and to encourage adequate marketing structures;
6. Believes that a register of qualified Fish Farming Consultants should be established, in order to ensure the sound development of the industry;

#### Investment grants

7. Considers that the scheme of investment grants provided for in the proposal on a structural policy for the in-shore fishing industry should be strengthened where it concerns fish farming and should be extended to cover, in particular,
  - (a) establishments for the rearing of ova and larvae, eliminating bacteria from molluscs and for the rearing of artemia salina and other scarce sources of food,
  - (b) projects for the improvement of techniques to identify and control diseases and to improve the selections of strains or genetic characteristics of breed stock, and
  - (c) vocational training schemes;
8. Points out that it is the sons of fishermen rather than fishermen themselves who will become farmers and that, therefore, vocational training schemes should be concentrated on the young;

### Coordination of research

9. Considers that the Community should adopt without delay common programmes so as to foster and coordinate research within the Community and to facilitate the exchange of information, particularly in the following areas:
- (a) the economic factors influencing aquaculture,
  - (b) disease control, prevention and diagnosis,
  - (c) nutritional requirements, improvement in feed and new feed services,
  - (d) the possibilities for using treated effluents,
  - (e) water requirements and control of pollution,
  - (f) pollution problems created by discharge of feed and fish excrement into adjacent waters,
  - (g) viral contamination,
  - (h) genetics and selective breeding, and
  - (i) the marketing of farmed fish;

### Control of disease

10. Emphasizes that one of the principal areas in which the Community can contribute to the development of fish farming is in the promotion and coordination of research on problems encountered in the identification, control and prevention of diseases.

Considers, therefore, that the Commission should draw up measures:

- (a) for coordinated research programmes to encourage and to provide a financial participation for research on the identification and prevention of disease,
- (b) to establish a centre for coordination of measures to combat diseases, and to disseminate the results of research,
- (c) to draw up a list of notifiable diseases and measures to be taken in the case of an outbreak of disease,
- (d) for regulations covering the trade within the Community and imports from Third Countries of live fish and ova, non-pasteurised dead fish, exotic and ornamental fish,
- (e) to lay down minimum requirements for production and managerial techniques so as to reduce the risk of an outbreak of disease, and
- (f) to encourage the establishment of specialized centres for the production of certified disease-free ova;

11. Believes that there can be no effective control of disease without the establishment of a register of fish farms and a licencing system which would cover:
  - (a) fish farms,
  - (b) hatcheries, and
  - (c) the imports of certain exotic species including those for farming, research or aquariums;

#### Regional planning

12. Points out that fish farms are in competition for a limited number of sites with other economic or leisure activities and that such sites may be lost by default without adequate planning;
13. Calls upon the Commission, therefore, to organize and provide for a financial participation in a survey of potential sites throughout the Community;
14. Points out that a licencing system will encourage the most rational use of the land and water resources of potential sites according to the social and economic requirements of each region;
15. Believes that the essential requirements of particular regions may be in part fulfilled by means of small fish farming units associated with individual villages or farms on the Norwegian model;

Calls upon the Commission, therefore, to implement research programmes to develop the techniques suitable for such small-scale units and to undertake feasibility studies;

#### Marketing structures

16. Emphasizes that the lack of adequate marketing structures poses a major obstacle to the development of fish farming, particularly in view of transport costs and the limited number of outlets;
17. Calls upon the Commission, therefore, to draw up measures to encourage the establishment of professional organizations;
18. Considers, furthermore, that the Commission should encourage new methods of processing and marketing farmed fish so as to increase demand;
19. Calls upon the Commission to re-examine the tariff protection afforded to species farmed within the Community and which face competition from subsidized producers in Third Countries;



Legal and fiscal problems

20. Points out that there are considerable legal and fiscal problems to the development of fish farming and in particular:
- (a) rights of ownership to fish farmed in the sea,
  - (b) to ensuring a right to use areas of water in which fish are farmed, particularly where navigational rights exist,
  - (c) regulations preventing the taking of immature fish, fishing during particular seasons, or the sale of fish below a minimum size;
21. Calls upon the Commission, therefore:
- (a) to ensure that its conservation proposals do not impose unnecessary restrictions upon the fish farming industry,
  - (b) to draw up recommendations for national governments to harmonize their legislation so as to minimize legal obstacles to the development of fish farming and the flow of investment within the Community;
22. Points out that there are considerable differences in tax, local charges, water costs and subsidies and tax relief for fish farmers throughout the Community and that a degree of harmonization is required in order to prevent distortions in competition.
23. Invites therefore the Commission to submit to the Council, on the basis of Articles 148, 149 and 155 of the Treaty establishing the European Economic Community, the following proposal for a regulation;
24. Instructs its President to forward this resolution to the Commission and Council of the European Communities and also to the European Council.

Proposal for a  
COUNCIL REGULATION (EEC) No  
of .....

on common measures for the development  
of fish farming within the Community

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and  
in particular Article 43 thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament,

Whereas Article 9(2) of Council Regulation (EEC) No 101/76 of 19 January 1976  
laying down a common structural policy for the fishing industry<sup>1</sup> provides that  
common measures may be decided upon for the attainment of the objectives  
mentioned in paragraph 1 of that Article provided that they relate to the  
objectives set out in Article 39(1) (a) of the Treaty; whereas these common  
measures may be financed by the Guidance Section of the European Agricultural  
Guidance and Guarantee Fund under Article 1(3) of Council Regulation (EEC)  
No. 729/70 of 21 April 1970 on the financing of the common agricultural  
policy<sup>2</sup>, as last amended by Regulation (EEC) No. 2788/72<sup>3</sup>;

Whereas some regions of the Community find themselves at a disadvantage from  
the point of view of agricultural revenues and under-employment both in the  
agricultural sector and elsewhere; whereas the action for structural development  
of these regions should be re-inforced in those areas where this would be most  
likely to improve the situation in a rapid and lasting way;

Whereas in a number of maritime regions of the Community measures are necessary  
in order to promote the rational use of the available resources and the best  
use of production factors and to ensure fair living standards for those who  
have traditionally lived by fishing and its associated industries;

Whereas the new geography of fishing has significantly altered traditional  
activities in certain regions of the Community; whereas the problems connected  
with these changes may be attenuated if the facilities offered by the EAGGF  
are used to ensure the vocational retraining of those concerned and to create  
favourable conditions for alternative employment for those presently occupied  
in traditional fisheries activities;

<sup>1</sup> OJ No. L 20, 28.1.1976, p.19

<sup>2</sup> OJ No. L 94, 28.4.1970, p.13

<sup>3</sup> OJ No. L295, 30.12.1972, p.1

Whereas, it is appropriate also that the Fund participate in projects for the further training of those no longer occupied in the fishing sector and young people in particular, so that the investments to which the Fund contributes may be used efficiently;

Whereas the development of aquaculture may help improve supplies of fishery products for Member States of the Community; whereas this common measure should therefore also include the encouragement of this activity;

Whereas, in order to qualify for aid from the Fund, equipment must conform to certain technical characteristics and safety standards so that in particular, the structural rationalization may be a lasting one and the living and working conditions of those employed in the sector may be improved;

Whereas a contribution from the Fund in the form of a capital subsidy not exceeding 25 per cent of the total investment is an appropriate contribution to this measure, but may be increased in particular cases;

Whereas, in order to ensure that beneficiaries observe the conditions laid down when support is granted by the Fund, an effective control procedure should be provided for together with the authority to suspend, reduce or withdraw Fund support;

Whereas Council Regulation (EEC) No. 1728/74 of 27 June 1974 on the coordination of agricultural research<sup>1</sup> provides for coordination at Community level of national agricultural research projects, in order to contribute towards attaining the objectives of the common agricultural policy;

Whereas Article 5 of the above Regulation provides that the Council is to decide upon specific measures for the coordination of research activities so as to allow rational organization of means employed, efficient use of results and the orientation of such work towards the aims of the common agricultural policy, as well as the implementation of joint projects designed to second or supplement work undertaken in the Member States in fields which are of particular importance to the Community;

Whereas numerous regions of the Community are lagging behind in development and there are serious problems, particularly in certain less-favoured areas within the meaning of Council Directive 75/268/EEC of 28 April 1975<sup>2</sup>, whereas measures must be taken in respect of these less-favoured areas so as to enable better use to be made of the human potential and to encourage a general mobilization of all means likely to increase the return from the land, and the productivity of land and sea resources.

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<sup>1</sup> OJ No. L 182 5.7.1974, p.1

<sup>2</sup> OJ No. L 128, 19.5.1975, p. 1

Whereas progress in research on the combating of diseases will help to eliminate major obstacles to the harmonization of laws and to trade, both within the Community and with non-member countries; whereas the lack of a standard Community method for diagnosing fish diseases constitutes an obstacle to the movement of fish and breeding stock;

Whereas the Commission and national authorities in order to be able to combat disease and to be able to determine quickly the extent of incidences of disease require prime and up-to-date information on the number and type of fish farms;

Whereas provisions must be laid down to ensure the adequate supervision of measures to prevent the spread of diseases; whereas it is necessary to ensure that unnecessary and restrictive health regulations do not prevent the normal trade exchange on the Community market of live fish, dead fish and ova; whereas to achieve these objectives Member States should establish a register of fish farms;

Whereas, in order to ensure that the register is compiled in the same way in all Member States, the minimum particulars to be included therein must be specified;

Whereas, in order to facilitate compilation of the register, provision should be made to finance the necessary operations by allocating thereto part of the aid payable to producers; whereas to the same end provision should be made for the relevant operations to be carried out by stages; whereas it is moreover appropriate to make provision for representatives of the trade interests concerned to take part in these operations;

Whereas, to ensure proper management to ensure control of disease, and to encourage the use of land and water resources in the most efficient manner to contribute to the development of the regions in question, a system for the licencing of fish farms should be implemented;

Whereas, in order to obtain the information needed to determine potential aquaculture sites within the Community and to ensure the most rational utilization of those sites for the development of the regions in question, a survey should be organized to determine sites within the peripheral maritime regions of the Community;

Whereas, the Community must adopt as soon as possible measures for adapting the common organization of the market in fishery products to the new situation created by current developments in the context of the Law of the Sea and in particular measures encouraging producer organizations to make the best possible use of available resources, and in particular by improving the supply of farmed fish to the market, measures to encourage consumption and the development of co-ordinated transport arrangements.

TITLE I - PROVISIONS CONCERNING STRUCTURAL MEASURES

Article 1

1. The Guidance Section of the European Agricultural Guidance and Guarantee Fund, hereinafter called the 'Fund', shall participate in the financing of investment projects for:

- the development of aquaculture in regions which are particularly suited to this activity.

2. The measures provided for by this Regulation shall constitute common measures within the meaning of Article 6(1) of Regulation (EEC) No. 729/70.

Article 2

For the purpose of this Regulation, 'project' means any investment project for:

- (a) the construction, equipping or modernization of aquaculture establishments for rearing fish, crustaceans, molluscs,
- (b) the construction, equipping or modernization of aquaculture establishments for rearing eggs and larvae,
- (c) the construction, equipping or modernization of aquaculture establishments for eliminating bacteria from molluscs and crustaceans,
- (d) the construction, equipping or modernization of aquaculture establishments for the rearing of artemia salina and other sources of scarce foods.

Article 3

In order to qualify for aid from the Fund, the equipment covered by the projects shall meet the following technical condition:

- it shall concern the breeding, rearing or stock improvement of fish, crustaceans and molluscs for commercial purposes.

Article 4

1. The projects shall provide an adequate guarantee of profitability and contribute to a lasting economic improvement in the structures of the industry in question.

Article 4 cont.

2. Priority for support from the Fund shall be given to projects which bring benefit to regions which have particular difficulties in developing satisfactory production structures and which also fulfil one or more of the following criteria:

- they are consistent with a rational production policy and serve to improve the market supply situation;
- they improve employment prospects in aquaculture;
- they improve the working conditions and in particular the safety of the workers concerned;
- they improve techniques for the identification and control of diseases and improve the genetic characteristics of breed stock.

Article 5

The Member State concerned shall submit to the Commission a summary document showing for each project or group of projects:

- that investments are related to modern breeding techniques and permit the development of new production structures in the regions concerned;
- that the species to which the projects relate have already been bred commercially or where governmental or government-approved pilot schemes have demonstrated that the species may be commercially bred on an economically viable basis.

Article 6

1. Aid from the Fund shall consist of a capital subsidy paid in one or more instalments.

2. For each project, in relation to the investment made,

- (a) the beneficiary shall finance at least 50 per cent of the total investment;
- (b) the Member State shall finance at least 5 per cent of the total investment;
- (c) the subsidy granted by the Fund shall not exceed 25 per cent of the total investment.

Article 6 cont.

3. By way of derogation from paragraph 2, in Greenland, Ireland, Scotland, Northern Ireland, Italy, Wales, Cumbria and Brittany:

- (a) the beneficiary shall finance at least 25 per cent of the total investment;
- (b) the Member State shall finance at least 5 per cent of the total investment;
- (c) the subsidy granted by the Fund shall not exceed 50 per cent of the total investment.

Article 7

1. Member States or their agencies or regional authorities and agencies may designate priority areas for the development of fish farming according to the provisions of Article 25.
2. For projects adopted for fish farms or breeding establishments located within a priority development area:
  - aid from the Fund may amount to 65 per cent
  - the beneficiary shall contribute at least 15 per cent.
3. For projects adopted within priority areas investment may be extended to include, in addition to projects provided for in Article 2, investment for research and development of equipment intended for the use of small scale units associated with individual villages or agricultural enterprises.
4. Member States, regional authorities or their agencies may draw up collective programmes for the development of fish farming within priority areas to improve infrastructures, establish training centres and coordinate transport facilities.

Such programmes shall benefit from aid as laid down in Article 6.

## TITLE II - PROVISIONS CONCERNING RESEARCH PROGRAMMES

### Article 8

1. The joint research programmes and the programmes to coordinate research concerning the identification and prevention of disease, the removal of obstacles to trade on intra-Community markets, the efficiency of production and alternative species, as specified in Annex IV are hereby adopted.
2. The programmes shall run for five years as from 1 January 1980.
3. The amounts needed to finance them shall be entered each year in the general budget of the Communities.

### Article 9

Detailed rules for the application of this Regulation, concerning in particular the scientific priorities to be observed in common programmes, the criteria for selecting the research centres and institutes invited to collaborate in implementing the specific measures and the Guidance of programme while they are being carried out, shall be adopted in accordance with the procedure laid down in Article 33.

### Article 10

The Commission shall ensure the implementation of the coordination programmes by organizing seminars, conferences, study visits, exchanges of research workers and scientific working meetings and by collecting, analyzing and publishing the results.

### Article 11

The Commission shall report annually to the European Parliament and the Council on the results of the activities carried out under the research programmes covered by this Regulation and on the use of the funds allocated for these measures.



TITLE III - PROVISIONS CONCERNING THE CONTROL OF DISEASE

Article 12

The free movement within the Community shall be ensured for all products of fish farms, live or dead, fresh, chilled or frozen, and for ova and larvae intended for fish farms, on condition that they are placed on the market by establishments approved according to the conditions laid down in Articles 17 to 21.

Article 13

1. The regulation shall cover all species, whether fresh water fish, marine fish, crustacea and molluscs farmed within the Community.
2. For imports of exotic, ornamental and certain wild species used for experimental purposes, the provisions of this regulation concerning import regulations shall apply.
3. A list of such species shall be drawn up by the Commission in accordance with the procedure laid down in Article 33.

Article 14

1. Imports of fish listed in Annex V, dead or live, fresh, chilled or frozen, whole or filleted, and their products, shall be permitted only on the grant of an import licence issued by the Member State concerned.
2. Such a certificate shall be granted by the Member State on the basis of:
  - a certificate of absence of notifiable disease from the farm or breedstock issued by a government-recognized authority of the country or origin, or
  - following an appropriate quarantine period.
3. All imports of frozen and smoked salmonids not cleared by the country of origin as being free of Infectious Haemopoietic Necrosis Virus (IHN) or Viral Haemorrhagic Septicaemia (VHS) shall be prohibited.

Article 15

1. Fish farms shall notify the competent authorities of the Member State of an outbreak of any of the diseases listed in Annex I.
2. For the diseases listed in Annex I total farm stocks shall be slaughtered by government inspectors, facilities disinfected and the farm shall remain empty of fish for a period to be determined in relation to each disease.
3. Inspectors shall investigate all waters likely to be affected by the outbreak and shall effect appropriate control measures.

4. For diseases listed in Annex II, the sale of ova and fish from the farm shall be prohibited for a period of two years.

5. For diseases listed in Annex III, farms shall be prevented from selling fish for a period of sixteen days.

#### Article 16

1. Producer Member States shall undertake a survey of the geographical distribution of diseases listed in Annex II in order to allow for the introduction of disease control schemes.

2. On the basis of the results of the survey, the Member State shall designate disease-free areas, disease-present areas, non-tested areas and areas from which specified diseases are to be eradicated.

3. On the basis of the classification laid down in paragraph 2, movements of fish and ova into disease-free or eradication areas shall be permitted from certified disease-free establishments only.

4. The guarantee section of the EAGGF shall finance up to 75 per cent of the costs of the survey.

5. Detailed rules concerning the supplementation of the survey and movement control provisions and the Community's formal participation shall be adopted according to the procedure laid down in Article 33.

TITLE IV - PROVISIONS CONCERNING A REGISTER, LICENCED, OF FISH FARMS AND  
EGG PRODUCING ESTABLISHMENTS

Article 17

1. Each producer Member State shall compile, in accordance with the provisions of this Regulation, a Community register of fish farms and egg producing centres approved by it and having been granted a licence to operate and a veterinary approval number.
2. Such registers shall cover all fish farming and egg producing holdings in the Community. They shall in respect of each holding provide the following information:
  - the number of farms
  - the variety of species held on the farm or the variety of egg produced
  - the system of farming employed, including
    - onshore tanks
    - offshore cages or enclosed areas
    - use of fresh, salt, ambient or heated water
    - egg producing facilities
  - the numbers of fish held, and their maturity.
3. The register shall be brought up-to-date at regular intervals and shall be published by the Commission in an Official Journal of the European Communities.

Article 18

The representatives of the trade interests concerned may participate in the work of the agencies charged with compiling each register.

Article 19

1. Such detailed implementing rules as may be necessary shall be adopted under the procedure set out in Article 33.
2. The Council, acting by a qualified majority on a proposal from the Commission, shall decide how to finance the register and determine the proportion for which the Guarantee Section of the EAGGF is to assume responsibility.

Article 20

The Member States shall inform the Commission at regular intervals of the progress achieved in compiling the register and of the manner in which it is being kept up-to-date.

## Article 21

1. A Member State shall not approve an establishment unless compliance with this Regulation is assured.

The Member State shall withdraw approval if the conditions for approval are no longer fulfilled.

If a check has been made in accordance with Article 22, the Member State concerned shall take account of the conclusions resulting therefrom.

The other Member States and the Commission shall be informed of the withdrawal of approval.

2. Inspection and supervision of approved establishments shall be carried out under the responsibility of the competent authority which may be assisted in purely technical tasks by personnel specially trained for the purpose.

The detailed rules governing this assistance shall be determined in accordance with the procedure provided for in Article 33.

3. If a Member State considers that the conditions for approval are not or are no longer complied with by an establishment in another Member State, it shall so inform the Commission and the competent central authority of the latter Member State.

4. If justified by the conclusions of the inspection report, the Member States may be authorized, in accordance with the procedure laid down in Article 33, to refuse entry to their territory of farmed fish products from the establishment in question.

## Article 22

Experts of the Member States and of the Commission shall carry out regular inspections of the approved establishments to ensure that the latter in fact apply this Regulation.

They shall provide the Commission with a report on the results of the inspection carried out.

The Member State in whose territory an inspection is carried out shall give the experts all the necessary help in performing their task.

The experts of the Member States who carry out the inspections shall be designated by the Commission acting upon a proposal from the Member States. They must be nationals of a Member State other than that in which the inspection is carried out.

Inspections shall be carried out on behalf of the Community, which shall bear the cost involved.

The frequency and the detailed rules for these inspections shall be determined in accordance with the procedure laid down in Article 33.

#### Article 23

Member States shall ensure that veterinary inspection and measures to prevent and control diseases shall be carried out under the authority of a single centralized agency.

TITLE V - PROVISIONS CONCERNING A SURVEY OF POTENTIAL SITES

Article 24

1. Each producer Member State shall carry out a survey of those regions in which the geomorphology, the quality of the water resources, water temperatures, transport facilities and the availability of labour render such regions suitable for fish farming, in order to determine the quantity and location of suitable sites.

2. For the purposes of proper regional planning, the survey shall also include information on the following other activities which use, or seek to use the land and water resources in question:

- other agricultural or fisheries activities,
- industrial activities,
- power stations,
- oil trans-shipment, refining or processing,
- maritime transport,
- leisure activities.

3. The results of the survey shall be communicated to the Commission and shall be published in the Official Journal of the European Communities.

Article 25

1. Member States, or the agencies appointed by them for the purpose, may designate priority areas for the development of fish farming based on the results of the survey and taking into account the general economic situation of the region, the contribution to employment to be made by the development of fish farming in those regions and the economic viability of fish farms in the regions concerned.

2. The projected priority areas shall be sent to the Commission.

3. The Commission shall examine whether, having regard to the production and employment potential, the designated priority areas constitute a suitable framework for projects to qualify for the special financial support provided for in Article 7.

4. Within six months of notification of each priority area a decision shall be taken on its approval, after consultation of the Fund Committee on the financial aspects, in accordance with the procedure provided for in Article 33.

TITLE VI - PROVISIONS CONCERNING PRODUCER'S ORGANIZATIONS, MARKETING  
ARRANGEMENTS AND PRICES

Article 26

1. For the purpose of this Regulation, 'producers' organization' means any recognized organization or association of such organizations, established on producers' own initiative for the purpose of taking such measures as will ensure that fish farming is carried out along rational lines and that conditions for the sale of their products are improved.

These measures, which shall be designed in particular to promote implementation of production plans, concentration of supply and regularization of prices, plans for the common transportation of products, plans to control disease and to establish common facilities for the production of ova, larvae or feedstuffs, shall require members:

- to dispose of their total output of the product or products by reason of which they have become members through the organization; the organization may decide that this requirement can be waived if products are disposed of in accordance with common rules established in advance;
- to apply, with regard to production and marketing, rules which have been adopted by the organization with the particular aim of improving product quality and adapting the volume of supply to market requirements;
- to employ common facilities for the transportation of fish to market countries;
- to obtain ova and larvae from common rearing establishments.

2. The Council, acting in accordance with the voting procedure laid down in Article 43(2) of the Treaty on a proposal from the Commission, shall adopt general conditions and rules for the application of this Article.

Article 27

Member States may make aid available to producers' organizations established after the entry into force of this Regulation to encourage their formation and to facilitate their operation.

This aid shall be granted during the three years immediately following recognition; for the first, second and third year this aid shall not exceed 3 per cent, 2 per cent and 1 per cent respectively of the value of production marketed under the auspices of the producers' organization nor shall it exceed 60 per cent, 40 per cent and 20 per cent of the organization's administrative expenses in the first, second and third year respectively.

The value of production marketed shall be established each year on a standard basis, namely:

- members' average marketed production during the three calendar years immediately preceding membership of the organization;
- average producer prices obtained by these members over the same period.

Article 28

The provisions of articles 6, paragraphs 2 to 5, 7 to 16 of Regulation (EEC) No. 2142/70 shall apply to the products of fish farms.



TITLE VII - FINANCIAL AND GENERAL PROVISIONS

Article 29

1. Applications for aid from the Fund shall be submitted to the Commission before . The Commission shall take a decision by .
2. The application for aid from the Fund shall be introduced through Member State concerned and shall have been approved by the said Member State.

Article 30

1. A decision shall be taken on aid from the Fund in accordance with the procedure laid down in Article 12, after the Fund Committee has been consulted on the financial aspects.
2. The decision on aid shall be notified to the Member State concerned and to the beneficiaries.

Article 31

1. Aid from the Fund shall be granted to natural or legal persons or groups thereof bearing the ultimate financial responsibility for the project.

Payments in respect of aid from the Fund shall be made by agencies designated for this purpose by the Member State concerned.

2. Throughout the period in which aid is being provided by the Fund, the department or agency designated for this purpose by the Member State shall send to the Commission on request all supporting documents and all documents showing that the financial or other conditions imposed for each project are fulfilled. The Commission may, if necessary, make an inspection visit.

After consulting the Fund Committee on the financial aspects, the Commission may decide to suspend, reduce or discontinue aid from the Fund, in accordance with the procedure laid down in Article 12.

- if the project is not carried out as planned or
- if some of the conditions imposed are not complied with or
- if the beneficiary, contrary to the particulars given in his application and repeated in the decision granting aid, has not, within two years from the date of notification of that decision, begun the work and if he has not, before the end of this period, supplied adequate assurances that the project will be carried out.

The decision shall be notified to the Member State concerned and to the beneficiary. The Commission shall take steps to recover any sums unduly paid.

### Article 32

The particulars which applications for aid from the Fund referred to in Article 1 shall contain and the form in which projects shall be presented shall be decided in accordance with the procedure laid down in Article 33 . after the Fund Committee has been consulted on the financial aspects.

### Article 33

1. Where the procedure laid down in this Article is to be followed, the matter shall be referred to the Standing Committee for the Fishing Industry, either on the initiative of the Chairman thereof or at the request of the representative of a Member State.
2. The representative of the Commission shall submit the draft of the measures to be taken. The Committee shall deliver its opinion within a time limit to be set by the Chairman according to the urgency of the matter. Opinions shall be adopted by a majority of forty-one votes, the votes of Member States being weighted in accordance with Article 148(2) of the Treaty. The Chairman shall not vote.
3. The Commission shall adopt the measures, which shall apply immediately. However, if they are not in accordance with the Opinion of the Standing Committee for the Fishing Industry, the Commission shall forthwith communicate them to the Council; in that event the Commission may defer their application, for not more than one month from the date of such communication. The Council, acting by a qualified majority, may adopt different measures within one month.

## EXPLANATORY STATEMENT

PART ONE: INTRODUCTIONThe advantages of fish farming

1. Fish farming in Western Europe is a new industry which, on the basis of techniques developed in the last two decades, is now in the position to make the breakthrough to commercial viability.

The basic biological and technical problems raised by the farming of species such as salmon, trout, turbot and eels have been mastered. In addition, new developments in the well-established methods of farming shellfish will allow for increased production and implantation in new areas of the Community.

2. The advantages of fish farming appear obvious at first. For centuries man has hunted fish in the sea. Now, however, costs of fuel have risen dramatically and stocks of fish have been depleted by over fishing. Instead of expensive operations to catch wild fish, it would seem logical to raise fish in enclosed areas where they can be harvested at will.

3. This prospect is attractive. But for the great majority of fish species it is neither biologically nor commercially feasible as yet.

Fish farming should not be seen as an alternative to traditional methods but as a complementary industry, in a position to make an immense contribution to the economics of the more disfavoured maritime regions of the Community - in Scotland, Ireland, western France, Italy, Wales and Cumbria - and which will allow the consumer and the processing industries to benefit from a more regular supply of the higher quality species at moderate prices.

4. The Community is ideally placed to develop fish farming techniques, combining pollution-free sites with a high level of capital and skilled manpower resources. An adequate framework would put the Community in the forefront of a new sector in world demand for technology; expertise and equipment will rapidly increase as the search for new sources of protein develops.

5. In wider terms, fish farming offers the opportunity to elaborate more efficient use of resources. The object is to transform low quality or unwanted protein, be it trash fish and offal, inedible species, or even skim milk powder and sewage, into high quality protein.

Types of fish farming

6. There are seven principal forms of marine fish farming:
- (a) repopulation of natural stocks by the release of eggs or fry;
  - (b) ranching of anadromous fish, salmon or sturgeon, which are released and return to their spawning sites;
  - (c) enclosures of sea bays;

- (d) off-shore submerged cages;
- (e) harvesting and cultivation of shellfish;
- (f) inshore floating pens;
- (g) onshore tanks which may employ waste heated water from power stations.

7. The last three methods only are of commercial importance in the Community at the moment.

Repopulation exercises have been undertaken, but it is unlikely that with present techniques the efforts of man will have a significant impact, given the scale of natural production and mortality.

Sea ranching is a highly specialized activity which should be considered separately.

Enclosures of the sea have been employed in the experimental stages but this extensive form of farming offers the disadvantages in western Europe of natural productivity with none of the advantages of increased control.

Submerged cages, employed in the Pacific, are unlikely to be successful in Community waters, apart from shellfish, given water temperature and natural nutrient levels.

8. Research and commercial development in the Community is concentrated, therefore, on intensive techniques employing floating pens or onshore tanks and upon an intensification of traditional techniques, such as the 'Valli' system of production in Italy, or upon shellfish harvesting and cultivation.

9. The advantages of pens and tanks lie in the ease of control of the environment and the end product. Predators are removed, feeding controlled and water quality monitored. Moreover, experimentation to refine techniques is greatly facilitated and the economics of commercial operations can be established on a clear basis.

10. Intensive techniques, however, involve a number of disadvantages. Fish farming is more akin to stockfarming such as dairy, than fishing. A high degree of capital investment and management skills are required. The high cost means that unless unnecessary legal and administrative obstacles are removed, the development of fish farming will be crippled.

#### The need for a coherent policy

11. The basic biological and operational techniques are now established.

The obstacles which remain are largely man-made: the lack of an adequate framework to allow the embryonic industry to develop to its full potential. As in many new developments, the national administrative structures are badly adapted. Policy decisions depend on different branches of the administration:

contradictory decisions may prevent sufficient encouragement being given. Furthermore, the lack of an adequate or coherent legislation creates many serious obstacles to investment and trade. This is particularly true for the critical question of the identification and treatment of diseases. It is essential that the Community avoids the trap of conflicting patterns of national aid which will distort the industry's development; and that obstacles to trade caused by conflicting trade and health regulations are eliminated.

12. The Community, until now, has not developed a policy for marine fish farming. The only measures adopted have been under the interim structural measures of July 1978<sup>1</sup>, to grant development aid.

It must be emphasized once more, however, that the needs of the emerging fish-farming industry go far beyond questions of aid: coherent policies for the organization of the industry, the development of sites, the combatting of diseases and marketing are required if the industry is to be allowed to reach its full potential.

The work undertaken so far by the Commission has been on an informal basis, and limited to a small number of specific topics. An Aquaculture Working Group has been set up, intended primarily to represent the interests of the professional fish and shellfish-rearing industry rather than to promote research.

Research has been promoted in the framework of COST (European Co-operation in the field of Scientific and Technical Research) representing 19 countries. A Mariculture Research Group was set up in 1977 and has drafted a programme for the co-ordination of research in the field of molluscs culture and is now in the process of preparing similar proposals for the sea ranching of lobsters.

13. The objective of this report is to identify those areas where Community measures could benefit most the development of fish farming. The present moment is opportune: technological and biological breakthroughs have made it possible to envisage a rapid commercial development. It is equally true that a Community policy should not be delayed. For example, it is likely that without greater foresight and planning, the limited number of sites available for fish farming will be lost by default as a result of pollution or the competition from industry and the leisure interests. A Community policy is justified. A Community policy is required now.

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<sup>1</sup> Council Regulation (EEC) No 1852 of 25.7.1978, OJ No L211, 1.8.1978, p. 30

## PART TWO: OBJECTIVES

14. There must be a clear understanding of the possibilities and objectives of policies to encourage fish farming if the industry is not to be inadvertently hindered. There are six possible objectives:

1. A new source of food;
2. The conversion of fishermen no longer able to exercise their profession as a result of the necessity to conserve fish stocks;
3. As a large-scale commercial industry;
4. For the creation of employment in peripheral coastal regions of the Community;
5. As an income supplement to farmers in the more disfavoured coastal regions, so continuing the traditional pattern of farming in those areas; and
6. Sales of expertise, equipment and feed within the Community and on the export market.

From a close examination it is clear that certain of these objectives should be discounted, while others should be seen as interdependent.

### A new source of food

15. It is unlikely that, in overall terms of food supply, fish farming will make a radical difference within the Community, though this is not true in the more under-developed regions of the world.

In terms of particular species, however, fish farming could both reduce prices to the consumers and improve availability throughout the year. For example, new developments in cultivating oysters could produce them in sufficient quantities to reduce prices dramatically and make available the Pacific oyster which is eaten all the year round. For other species such as salmon and turbot, the quantities available for consumption could be increased considerably.

### Re-conversion of fishermen

16. This is an objective which is unlikely to succeed, even though it appears attractive in view of the problems currently facing the fishing industries. The skills required of a fisherman are entirely different from those required for fish farming. The fisherman is a hunter while the fish farmer should be seen as a stockman more resembling the dairyman than the fisherman.

17. This is an important point to bear in mind when considering training schemes. A fisherman is unlikely to become a farmer of fish for reasons of temperament as well as skills. But his sons may become fish farmers: training therefore should be directed towards the young rather than towards re-conversion schemes.

### Large-scale commercial operations

18. It is imperative that fish farming be established on a commercially viable basis. This will initially demand larger production units for high profit which in turn requires large-scale capital investment. In the first stages operations will be developed by the larger companies which possess the required financial resources. In this sense fish farming should be looked at as any other industry, even though requiring in its initial stage of development a degree of financial assistance to reach the 'take-off' point.

19. The need to establish a commercially viable industry need not necessarily conflict with other policy objectives. The large commercial operations are required to act as 'locomotives' in this sector, supplying technology and young fish for smaller concerns, and bringing down the general level of costs, particularly of feed. It is evident that these large concerns will also constitute the most important source of employment in disfavoured regions.

### Regional policy

20. Fish farming has a potential to provide an important source of employment in those peripheral coastal regions of the Community faced with very high levels of unemployment and extreme difficulties in attracting industry, due to their distance from the main population centres. These problems have created immense social and economic problems as the young people have left to find jobs elsewhere and the social and economic infrastructure has run down. Fish farms at present can provide up to 15 - 20 jobs ideally suited to the younger population and providing on-the-site training. One estimate has forecasted that salmon farms could provide 700 new jobs in the Scottish Highlands.

21. While this is an important objective, one should not tie fish farming solely to certain selected regions, otherwise overall development of the industry may be handicapped, resulting in decline in the overall levels in investment by individual companies.

### Income supplement to farmers

22. Another way in which fish farming could help to develop disfavoured coastal regions is by providing an income supplement to farmers by means of small-scale units run by individual farmer on the Norwegian pattern. An extremely interesting development, this would be an extension of traditional patterns in many of these areas. The farmers' skills are well adapted to the needs of this industry.

23. The development of fish farming in the Community is not presently at the stage in which this could be developed on a wide scale. A considerable amount of research would be required on the ways of adapting present techniques to

smaller scale units and on the search for more suitable species. It is also likely that such developments would be closely linked to the large commercial enterprises which would act as a source of young fish from their hatcheries and also of feed at reasonable cost.

One can draw an analogy with the European broiler industry of 20 years ago and the European turkey industry in the last four or five years. One could envisage the contract rearing or fattening of marine species by individual crofters using fish supplied by a central hatchery which might well be linked to a large company which provides feed supplies, marketing services and expert advice. A great deal of this type of approach has taken place in the poultry industry, particularly in less developed parts of the world where labour is available and capital in short supply.

#### Sales of expertise, equipment and feed

24. It is a striking fact that marine fish farming is being developed in the United Kingdom on a commercial basis largely by companies which have little evident connection with the industry: British Oxygen Company and Unilever being the most striking cases. These companies, and others such as Fisons, are seeking to enlarge the market for their products, be it equipment or feed. This is one aspect of the question which is likely to be forgotten. But an expanding and viable Community industry will be well placed on the Community and world markets. Countries of the Third World are actively seeking new sources of protein. The Community should ensure that it is in the position to supply their demand for expertise, equipment and feed.

In Norway a major hydro-electric company is associated with the salmon farming enterprise of Mowi, which is either the largest or second largest in the world, and in the United Kingdom the CEEB is investing heavily in fish farming associated with its hydro-electric resources.



## PART THREE: THE POTENTIAL

### Problems in estimating potential development

25. It is extremely difficult at the present time to make an accurate estimate of the potential development of fish farming in the Community, particularly since the statistical information available is patchy and unreliable.

For species for which commercial operations are well established, certain shellfish and trout, production is likely to increase steadily but unspectacularly.

For species for which the commercial techniques have recently been developed, there is no past evidence on which to judge future performance.

26. Production will be determined by the relation of costs to the price of the finished product; and the factors determining both costs and prices are changing rapidly.

The availability and cost of feed is a vital factor. The majority of fish are carnivorous. Therefore potential development, according to certain experts, will be limited by total availabilities of fish protein. In addition, feed can represent up to 60 per cent of total annual costs. Availability and cost of feed should allow, therefore, the calculation of total potential and the rate of development. On the other hand, scientists are working on the problems of the use of single-cell protein and sewage, which, if solved, would alter, fundamentally, the picture.

On the price side, demand trends for particular species can be determined with reasonable certainty. Supply, however, is increasingly problematical as the effect of over-fishing on stocks is becoming more evident and measures to restrict fishing effort are being introduced.

27. Considerable caution is required therefore. The situation has been radically modified in the last five years, and is likely to be in the immediate future.

Potential development will depend on the economics of fish farming and these factors vary with techniques employed, species selected and the results of present research. These factors will be dealt with in greater detail below. At present we will simply try to introduce the overall potential for development in global terms and on the basis of the present state of research, development and market factors.

### World requirements

28. The present world catch for human consumption is approximately 40 million tonnes. This will need to be doubled by the 2000.

29. According to the FAO, 42 countries are engaged in fish farming, with a total production of 5.5 million tonnes. It is estimated that this will be increased to 45 million tonnes by the year 2000.

30. It is unlikely that a significant **proportion** of Community farmed production will go to the export market. However, given the rapid increase in fish farming in developing countries, a considerable export market will be available for expertise, equipment and feed. It is probable that large Community enterprises will be able to export development programmes as in other agricultural sectors.

#### The Community

31. At present the Community imports farmed fish. This is clearly a non-sensical situation for a region endowed with a number of natural sites and the expertise and financial resources.

32. Given the pressure on the Community's fish stocks and the increase in effectiveness of quota arrangements, supply of the premium species will be increasingly unable to match demand. The result will be higher prices which will in itself give much greater margin for the development of the fish-farming industry.

33. At the same time the consumption for fish and fish products is increasing in all the Member States, except for Germany. Moreover, for a number of species which can be farmed, particularly mussels, eels and certain white fish, demand can only be satisfied by increasing imports. At the same time, fish farmers are able to harvest fish of a **specific weight or size** which is required for the restaurant or frozen food trade.

34. The estimates of potential production are at best fragmentary, having been carried out by individual enterprises in each country. One desk study of the United Kingdom considers that the minimum potential production is in the region of 50,000 tonnes in the sea and 8,000 tonnes using waste heat from power stations. This is the equivalent of 5 per cent of the total UK fish consumption by weight but taking into account that the species farmed are those with the highest value, this figure could reach 20 per cent by value.

In Italy, a development programme has been recently drawn up which foresees, for the Sicilian region alone, an initial production of 3 million bass fry; while other projects in the Venetian area based, with new methods, on a production superior to 40 tonnes per hectare.

In France, numerous research projects are under way but one can cite the case of successful experiments to introduce methods developed in Japan which increased production from 7000 tonnes in 1967 to 100,000 tonnes in 1977.

Similarly, in Ireland, new techniques for the production of shellfish are being developed which will transform production in that country.

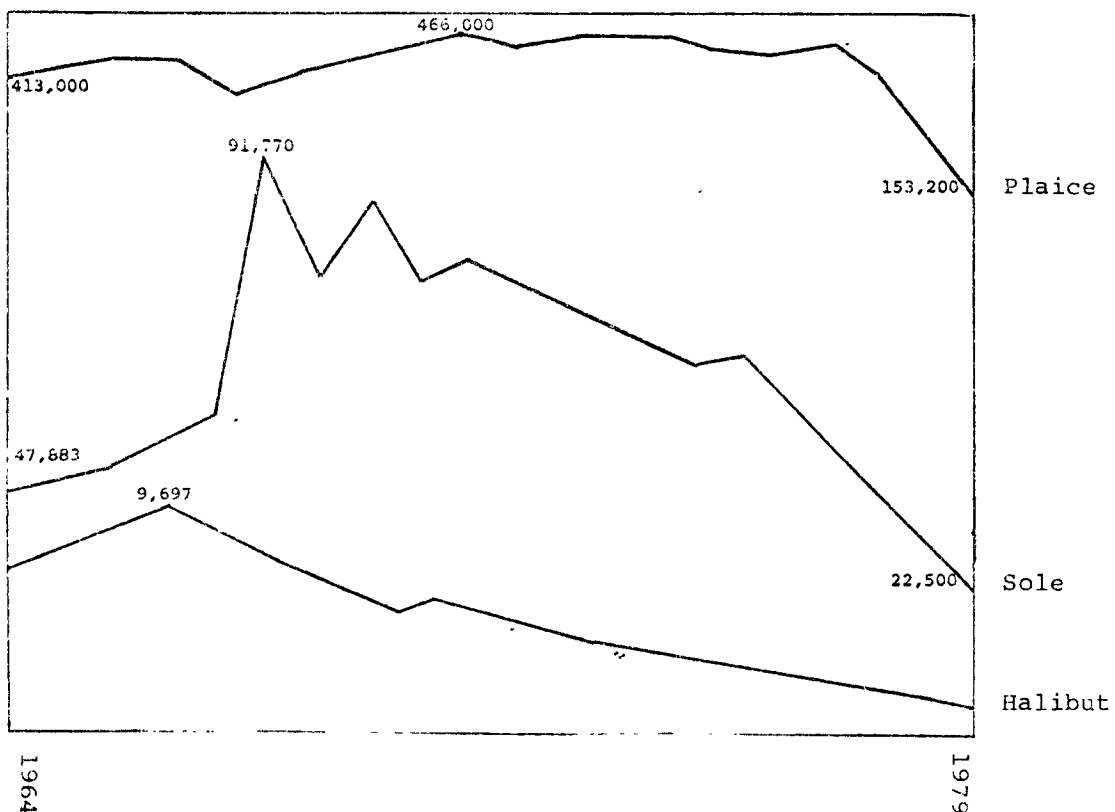
35. A comparison with the situation in the USA is informative, for while trout production has experienced a steady growth, catfish production has expanded by 40 times from 1962 to 1972. A recent market study has projected a 600 per cent growth over 3 years, to give a 380 million dollar business in 1982.

36. If one excludes factors, such as feed, which are likely to be fundamentally modified by present research, the potential development of fish farming will depend on the potential market, in which price trends will be dominated largely by non-farmed fish. The market, therefore, will be determined by factors outside the industry, and in particular:

- production trends, non-farmed and farmed fish;
- consumption trends, all fish and by species, and influence of taste factors concerning farmed fish;
- substitution of fish for other protein-rich foods; and
- balance of imports and exports.

As the result of overfishing, cost increases which affect certain types of fishing to a greater extent and the imposition of quotas, landings of species relevant to fish farming show a downward trend, though it is true that quotas and conservation measures may lead to the rebuilding of stocks.

CATCHES AND QUOTAS  
1964 - 1979



FINNISH FARMING IN THE COMMUNITY, 1976 (ESTIMATES)

| COUNTRY  | COMMERCIAL PRODUCTION  | DEVELOPMENT                                    | PRODUCTION (TONNES)                                      | POTENTIAL                        |
|----------|--|--|--|----------------------------------|
| D        | Trout<br>Carp<br>European eels<br>Tench<br>Common pike   |  | 5300<br>3600<br>10<br>300<br>restocking 1000             |                                  |
| F        | Trout<br>Carp<br>European eels   | Coho salmon<br>Sea bass<br>Mullet<br>Sea bream | 15000<br>10000<br>planned<br>120                         | +15-30%<br><br>3000              |
| I        | Trout<br>European eels<br>Black Bullhead (Catfish)<br>Carp<br>Mullet<br>Sea bass<br>Gilthead<br>Sole |  | 16500<br>2790<br>100<br>5<br>6000<br>300<br>6000<br>6000 | 90000<br>90000<br>90000<br>90000 |
| N        | Roach<br><br>Pike-perch<br>Carp<br>Pike<br>Rainbow trout   |  | mainly<br>restocking<br>"<br>"<br>"                      |                                  |
| B and L  | Trout<br>Carp<br>Tench and roach<br>Pike and pike perch  |  | 300<br>100<br>200<br>20                                  |                                  |
| UK       | Trout<br>Atlantic salmon   | Turbot<br>Dover sole<br>Plaice<br>Eels         | 4000<br>400<br><br>5<br>20                               | 10000                            |
| IRL      | Trout<br>Eels<br>Atlantic salmon   | Atlantic salmon                                | 6000<br>restocking<br>restocking<br>30                   | 1000                             |
| DK       | Rainbow trout<br>Brown trout<br><br>European eels  |  | 1400<br>100<br>1.1 million<br>fingerlings<br>restocking  |                                  |
| SPAIN    | Trout  | Atlantic salmon                                | 6000   | 10000                            |
| PORTUGAL | Trout<br>Carp  |  | 250<br>50  |                                  |

IMPORTS AND EXPORTS OF FARMED FISH

| COUNTRY | COMMERCIAL PRODUCTION   | IMPORTS TONNES                     | EXPORTS TONNES      | CONSUMPTION |
|---------|---|------------------------------------|---------------------|-------------|
| D       | Rainbow and brown trout<br>Carp<br>European eels<br>Tench                       | 10938<br>3831<br>5165              | 112<br>92<br>137    |             |
| F       | Trout<br>Carp<br>Crayfish<br>Eels   | 1756<br>232<br>1300<br>157         | 1690<br>772<br>2702 |             |
| I       | Trout<br>European eels<br>Carp  | 36<br>2426<br>460                  | 3263<br>277<br>26   |             |
| N       | Rainbow trout<br>Salmon<br>Eels<br>Carp   | 289<br>1000<br>4496<br>6           | 62<br>1389<br>15    |             |
| B and L | Rainbow trout<br>Carp<br>Tench and roach<br>Pike and pike perch<br>European eel | 4033<br>216<br>710<br>50.5<br>1852 | 494<br>155<br>225   |             |
| UK      | Trout<br>Carp<br>Eel  | 1131<br>134<br>381                 | 115<br>926          |             |
| IRL     | Trout<br>Eel  | -<br>-                             | 123<br>145          |             |
| DK      | Trout<br>Eel  | 275<br>1438                        | 13410<br>3095       |             |

## PART FOUR - THE DEVELOPMENTS

### Shellfish and finfish

41. When dealing with policy requirements of fish farming, a distinction has to be made between finfish and shellfish.

Shellfish farming is well established, many of the basic techniques have been developed and the economics (relation of costs to prices) are such that a steady expansion may be achieved.

Finfish farming on the other hand is a much more recent development for which considerably greater research and a higher level of financial encouragement will be required.

### Shellfish farming

42. Shellfish farming represents 30 per cent of world aquaculture output and accounts for the majority of West-European farm output. In a number of countries, particularly France, Belgium, the Netherlands and Ireland, it represents almost the totality of present, though not projected, production.

43. In the case of molluscs, **a rapid transition is now taking place**, particularly for certain species, from the traditional husbandry of naturally occurring beds of edible shellfish, such as mussels, to the prevention of adverse environmental changes and even to the modification of the environment in order to encourage the species.

44. The modern development of shellfish farming seeks to propagate the species by managing its reproduction in a semi-controlled environment and substantially reducing the excessive natural wastage in the early life stage. The main species farmed in this way is, of course, the oyster, but development work is progressing with the scallop and even the lobster.

45. In France, production is limited almost exclusively to oysters and mussels. In 1972, the average national production was between 60,000 and 70,000 tonnes of oysters and between 30,000 and 40,000 tonnes of mussels. This represents about 10 per cent of all fish landings but between 20 - 30 per cent of total value. France occupies first place in Europe for the production of oysters, and Holland for that of mussels.

Techniques of production are well established though they vary from country to country. In France, for example, mussels are cultivated on stakes planted on the sea-shore while in Holland mussels are produced in deeper water.

46. The main obstacles are not technical, but the difficulties of finding **suitable pollution-free sites**.

### New developments in shellfish farming

47. New developments in shellfish farming are mainly of two types:

- (a) establishment of production in new regions and sites, and
- (b) development of new techniques.

48. Mussel production is being introduced in Ireland using techniques largely based on the Spanish industry, that is growing on ropes suspended from rafts. Considerable research on the most suitable species and techniques is being undertaken in Ireland and in the United Kingdom, in the traditional areas of shellfish farming.

49. Other new developments are concerned with the more rational management and re-population of beds on the basis of techniques applied in other countries, particularly Japan, for related species.

In France, for example, research on the production of the scallops Coquille St. Jacques has achieved a scientific breakthrough which will allow the inshore fishing industry, following serious unemployment problems, to be maintained at its present level, so safeguarding the future livelihood of the young people of the western regions. Stocks of Coquille St. Jacques have been put under severe pressure from the increased mobility of boats, while the best fishing grounds are very unstable, which puts at risk the 1500 marine jobs dependent on the scallops.

The scallop is more important economically than such fish as cod and sole, and is the only shellfish to be in the top group of money earners. Successful experiments on the hand rearing of spat hold out the possibility of a production of 50,000 to 80,000 tonnes of coquilles in the Bay of St. Brieuc alone, compared to an annual production of 900 tonnes.

50. Another recent development has been the successful production of hybrid lobsters by the crossing of European females with American males. The success of such experiments makes possible the development of a commercially viable large-scale lobster farming.

### Finfish farming

51. The commercial farming of finfish is now at the point where large-scale investment can be justified by the degree of technological mastery and by the relations of prices to costs. In order to understand why finfish farming should now be at the point where it can leave the embryonic stage, the extent of the potential for development, as well as the problems still facing the industry, one must understand something of the varied lines of development within the industry.

52. Finfish farming has its origin in experiments on re-population to increase natural stocks in the seas and oceans. These experiments undertaken in Norway, the United Kingdom, Canada and the United States from the end of the 19th Century made it apparent that the costs of the release of hatchery-produced juveniles was not justified by the rate of survival. Clearly, billions of fry are produced in the seas and the addition of a further few million is unlikely to significantly alter stock levels.

53. In the course of these experiments, however, a number of discoveries were made which allowed for the development of modern fish farming. The Norwegian scientist G. Rollefsen made the important discovery that the newly-hatched young (nauplii) of the brine shrimp (*artemia salina*) were good food for the newly-hatched young (larvae) of cod and plaice. In the 1960's J E Shelbourne at Lowestoft succeeded in raising large numbers of juvenile plaice at a greatly-increased rate of survival, beyond the larval stage.

54. The second breakthrough made possible the current programmes to determine the species and techniques for rearing fish from the egg to the market size.

55. In the 1960's research work was mainly centred on the biological problems of determining whether certain species of fish - plaice, salmon, turbot and sea bass - could be farmed throughout their life cycle.

This early period of research confirmed the technological possibilities and the establishment of pilot schemes, often run jointly by semi-governmental organizations and private companies, confirmed that the management problems could be overcome and operations made commercially viable.

The years to 1973, therefore, were really experimental while the basic husbandry technologies were evolved. The results concerning growth rate, survival, diet formulation, food conversion ratios and equipment, allowed scientifically-based conclusions to be drawn as the proper direction of the programmes, and their commercial viability.

These conclusions are as follows:

- (i) It is feasible to rear fish from the egg to the market size in captivity, with fertilized eggs obtained from captive parent stock,
- (ii) It is possible to fatten juvenile stock in tanks and in floating cages or pens, but less successfully in inter-tidal ponds,
- (iii) The harvested fish were acceptable to the consumer, and not distinguishable by taste.



Increasingly fish farming can be seen as means of using resources that would otherwise be wasted, for example waste heat, fresh fish or sewage. For example: at Hinkley Point nuclear power station in Somerset, UK, Marine Farms are farming seed oysters and eels. An eel farming scheme is being tested at Drax coal-fired power station in Yorkshire, and a pilot scheme for raising turbot is being developed by a subsidiary of British Oxygen at Wylfa nuclear power plant in North Wales.

56. The Italians have developed intensive and semi-intensive methods using embanked and net enclosures and have developed very high yields of eels and mullet by the intensification of traditional methods, improvements in locks, fish and intensive early rearing and supplementary feeding.

57. In both the North Atlantic and the Mediterranean, public and private research and development has identified a number of fish species and the type of installations best suited to commercially viable fish farming, and is continuing research to improve and refine management techniques and to determine whether there are other species suitable to commercial farming.

#### Species

58. The species suitable for farming throughout the Community will vary from region to region, depending upon average annual water temperatures, production costs and market prices of each species. In the United Kingdom, for example, most research has been devoted to salmonid and flat fish. It has been demonstrated that there are no insuperable biological or technical difficulties to the commercial farm of salmon, turbot and sole.

In France, research and development programmes have been carried out principally with sea bass and catfish, more recently with turbot, sea bream, coho salmon and eels.

In Italy, a major government programme has been recently launched for the development of the farming of sea bass, sole, eels and mullet.

59. Without considering the collection of natural spat, when trying to list the different species presently cultured in hatcheries and nurseries, it appears that they can be classified in five different groups:

- Species for which larval rearing is technically possible, practiced, and commercially profitable on a large scale:

Salmonids (Salmo spp., Oncorhynchus spp.)

Oysters (Ostrea edulis, Crassostrea gigas, maybe C. virginica)

Macrobrachium rosenbergii

Penaeid shrimps (Penaeus japonicus, P. monodon)

Red sea bream (Chrysophrys major)

- Species for which larval rearing is technically possible, practiced, but commercially risky on a large scale:

Oysters (*Crassostrea virginica*)  
Clams (*Mercenaria mercenaria*, *Venerupis desussata*, *V. semi-decussata*)  
Abalones (*Haliotis* spp.)  
Penaeid shrimps (*Penaeus vannamei*, *P. stylirostris*)  
Lobster (*Homarus americanus*)  
Sea Bass (*Dicentrarchus labrax*)

- Promising species for the near future (from both the technical and the commercial point of view), which are already produced in quantities exceeding several thousands:

Scallops (*Pecten maximus*)  
Mullet (*Mugil cephalus*)  
Rabbitfish (*Siganus rivulatus*)  
Turbot (*Scophthalmus maximus*)  
Gilthead sea bream (*Sparus aurata*)  
Black porgy (*Mylio macrocephalus*)  
Yellowtail (*Seriola quinqueradiata*)  
Sturgeon (*Acipenser sturio*)

- Possible species for the future, which are promising from the commercial point of view, but whose larval rearing is still hardly successful:

Eels (*Anguilla* spp.)  
Black sea turbot (*Scophthalmus maeoticus*)  
Lates spp.  
Tuna spp.

- Possible species for the future for which larval rearing has been achieved on at least several thousand individuals, but that are hardly attractive from the commercial point of view:

Plaice (*Pleuronectes platessa*)  
Herring (*Clupea harengus*)  
Cod (*Gadus callarias*)

## Selection of species

60. Early experiments were with plaice. But given the moderate price of plaice it became apparent that costs could not be recovered.

The techniques developed, therefore, were directed to other more valuable species; and in particular salmon, turbot and Dover sole, which would allow the farmer to recover his investment. The major candidates for farming on this basis are:

Salmon  
Dover sole  
Halibut  
Eels  
Turbot  
Trout  
Sea Bass  
Sea Bream  
Mullet  
Coho salmon

### Trout

61. Trout is a commercially viable industry throughout most of the temperate regions of the world. The basic techniques have been mastered and include the artificial production of fertilized eggs, the growth of fish intensively, of prepared feed, in enclosed tanks and the use of water in large quantities. Research plans to improve costs are being carried on and a steady, if not spectacular, growth in farm production can be anticipated.

### Salmon

62. The salmon is becoming the front-runner in fish farming on the North-East Atlantic. This is particularly because of the ease with which techniques can be adapted from trout farming and also because of the high value of the fish. Salmon is, therefore, produced in closed tanks during the freshwater state and transferred into sea cages when smolting stage has been reached. The commercial companies at present have reached a production of up to 250 tonnes per farm and one estimate, admittedly by an interested participant, believes that a 10,000 tonne annual production in Scotland is not out of the question. This would represent a £15 million a year industry for the Scottish Highlands and would provide about 700 new jobs. So possibly sites exist on the coast of West Ireland, each with a potential of 200 tonnes (actual production 30 tonnes 1977).

### Turbot

63. On account of its fast growth rate, turbot was selected for further trials and by 1973 the techniques had been mastered effectively to begin large-scale trials. By 1977 juvenile turbot had been fattened in onshore tanks and in floating sea cages. At present, methods are adequate for the production of tens of thousands of fish. There is a market for turbot, amounting in Europe to some 6,000 tonnes per annum which could be expanded by farmed production.

### Dover sole

64. The high value and demand for Dover sole make this fish an extremely attractive one for fish farming. Renewed trials beginning in 1973 achieved good survival rates, feeding responses and growth. And in 1977 earlier spawning and improved growth rate were achieved as a result of manipulating daylight length and increased feeding of live diets.

In 1973, the European landings of Dover sole by fishing vessels totalled over 36,000 tonnes. Because of over-fishing, this quantity had been reduced by 1976 to 24,000 tonnes, thus leaving a considerable under-supply which could well be met in whole, or in part, by farming either sole or turbot.

### Eels

65. Another species occupying the attention of research today is the freshwater eel. There is considerable demand for smoked eel throughout the Community, and the decline in some of the traditional sources of supply, and EEC imports of 5000 tonnes suggests that eels could be a viable proposition. Initial research in Italy, Germany and the United Kingdom has been heartening and the day may not be too far away when eels will join trout, salmon and oysters as a significant source of farmed production, in Italy and in Northern regions particularly on the basis of waste industrial heated cooling water.

### Sea Bass

66. A major breakthrough was achieved in France in 1972 in the farming of sea bass (at the station de biologie marine at Sète) with the production of 12,000 juveniles. Commercial exploitation has begun nearby at Balarue-les-Bains.

Progress has been achieved also in Italy, where it is proposed to build a hatchery to produce four million fingerlings. With catches low (1,300 t) prices are high, particularly in the tourist season.

### Sea Bream

67. Recent successes in developing culture from the egg stage in France (at Balarue-les-Bains) should lead to a considerable development of sea bream farming in the Mediterranean. Prices are high, and since the Gilt Head and the White Bream species have distinct breeding seasons, tank use will be particularly economic. As the fish reach a marketable size in one year, a satisfactory return on investment should be made.

### Mullet

68. Mullet is presently farmed in Italy where the extensive and semi-intensive farming systems, together with the higher prices than found elsewhere in the Community, make this an economically viable species.

### Coho salmon

69. Coho salmon has an advantage over Atlantic salmon in that its freshwater life is much less difficult to manage. The Pacific Coast species is farmed in parts of its natural range but for portion-size fish not salmon-sized individuals. Its introduction into certain Community waters may be hampered by import controls because of disease legislation and there is also opposition on environmental grounds that the species could endanger indigenous fish and, in particular, the Atlantic salmon. One project in France provides for a production of 3,200 tonnes by 1982.

### Other species

70. Of fish currently supplied by the fishing industry some are worthy of comment in a fish farming context.

Cod is a highly favoured species which is subject to fluctuation in supply. Preliminary studies have indicated that larval rearing presents fewer problems for cod than for turbot and the juveniles seem easy to feed. Haddock seems a less robust species than cod but no precise information is available. Both species deserve a low-level scrutiny in view of present market values.

Halibut is a prime quality flatfish but hatchery experience has revealed intractable problems. This species spawns at very great depths (1000 m) and the eggs are bathypelagic, that is they exist suspended in mid-water at great depths. In the hatchery, the large but delicate-looking eggs have been hatched but no larvae have survived to complete yolk sac absorption - a phase without problems in all other fish species examined. The general philosophy of hatchery management of fish **has** been to create conditions representative of those in the natural environment. There are considerable difficulties in reproducing the halibut's deep water environment. The species is attractive, however, due to its high market price and its high growth rate in cold water.

One further species which should be considered is the dab. This has excellent eating qualities but is a small fish and is probably underrated on account of this. It is a very vigorous, catholic feeder, however, and likely to perform well in the hatchery phase and in on-growing.

Well over a hundred different species of fish are employed in one form or another of fish farming throughout the world but, of these, only a few contribute significantly to food production. They include, in roughly descending order of production, carp, channel catfish, yellowtail, and various species of Tilapia.

#### Need for research on alien or exotic species

71. Fish farming has developed almost exclusively by employing species which have been caught or harvested traditionally. These species represent only a fraction of the species available for investigation and possible development. Much more research is required into species that have good growth rates, good food conversion and are palatable.

The introduction of exotic species needs investigation in order to determine the advantages and also the drawbacks.

#### Marketing acceptability

72. Acceptability trials with salmon, turbot and plaice have demonstrated that farmed fish can be produced of a size ideally suited to requirements of the catering industry and of a quality acceptable to the consumer. Turbot of about 0.5 kg in weight form an ideal individual portion for serving in restaurants, cooked on the bone, in the same manner as for sole (and thus, in restaurant terms, are an alternative to Dover sole). Larger turbot have to be filleted or steaked, the latter method requiring fish of over about 2 kg each. The gelatinous layer of flesh adjoining the peripheral fin, containing the main characteristic turbot flavour is lost upon filleting, and consequently fillets of turbot are less highly regarded, or priced than steaks. By cooking the smaller 0.5 kg sized turbot whole, the culinary advantage of steaks is maintained, and a similarly high unit value has been obtained in sales of turbot.

Comparative acceptability trials of farmed and wild fish of the same age and storage history since death, have shown that for salmon, Dover sole and turbot, less than half of the consumers could distinguish between the wild and farmed varieties. Of those who could, preference was weak and roughly equally divided between the two sources of supply. Visual preference favoured the darker colouration of the skin of farm fish, which was associated with greater freshness.

A new technology

73. The arguments as to whether fish farming can be profitably established on a large scale has w-eged backwards and forwards over the relatively short period since adequate techniques have been developed. The issues are complex and it is not always easy to quantity with precision, all the relevant factors.

74. The most important fact to keep in mind is that the technology is very recent, the result of research over the last 10 years and is undergoing a rapid transformation, leading to significant reductions in costs. Farming systems costed are at a relatively immature stage of development, mainly pilot schemes, leaving scope for a considerable improvement in the production/cost ratio.

Present calculations are likely, therefore, to be valid for a short time only, and will almost certainly be shown to be excessively pessimistic. The objections, mainly from official quarters, can be compared to that widely held belief provoked by the early efforts of the pioneers of flying machines, that aviation had no future.

Present production is based very much on a first generation system: fish one generation from the wild with only marginal enhancement in growth rate; first generation equipment and techniques with the attendant higher costs. It is evident that with faster growing fish in lower cost facilities, reared with improved methods, costs will be reduced.

75. At the same time, decades of overfishing has drastically reduced stocks and led to the introduction of catch quotas for below previous catch levels. Species, such as plaice, presently discarded due to their relatively low market value, may be once more, in the near future, a viable proposition.

76. For those concerned with the elaboration of policy, rather than controlling commercial enterprises, it is important to examine the following aspects:

- (a) The structure and level of present costs of the industry as a whole;
- (b) Elements in the cost structure which may be significantly modified in the future;
- (c) Areas in which Community investment and research funds should be concentrated.

The economics of fish farming

77. There are fewer problems in demonstrating the economic viability of shellfish farming. Most shellfish, being plankton eaters do not require artificial feeding. The principal limiting factors have been lack of suitable new sites or the time required to develop new techniques.

78. For these reasons the greatest development, in terms of quantity if not value, is likely to be in finfish.

It is for finfish, however, that the problems of the economics are most starkly posed, particularly in Northern waters.

79. The capital investments of fish farming are high, in the range of 2000 to 3000 eua per tonne of production. The figure is, of course, much less if a firm were to use centralized hatchery facilities, being in the region of 1500 ua per tonne.

80. The annual cost of a unit of output is determined by the price of food and the conversion rate, together with the price of capital, the number of fish per unit of output, together with the time the fish are in holding facilities, the stocking density and the area of holding facilities, together with other costs.

| Item                              | Proportion of farm production cost (%) |                     |        |
|-----------------------------------|--|---------------------|--------|
|                                   | Dover Sole <sup>1</sup>                | Turbot <sup>1</sup> | Salmon |
| 1. Loan interest and depreciation | 31                                     | 35                  | 15     |
| 2. Food                           | 20                                     | 14                  | 40     |
| 3. Hatchery                       | 15                                     | 7                   | 14     |
| 4. Labour                         | 11                                     | 13                  | 20     |
| 5. Management/admin.              | 9                                      | 12                  | 5      |
| 6. Energy                         | 4                                      | 7                   | 1      |
| 7. Other                          | 9                                      | 12                  | 5      |

81. The primary objective must be to reduce these costs. To understand how this might be done, the overall cost has to be broken down into its component parts.

<sup>1</sup>

These figures are based on experimental rather than commercial units. Figures for commercial operations should resemble those given for salmon.



82. Excluding experimental stages, the most important cost component is feed: as fish farms grow in size and become more efficient, feed costs will get nearer to 50 per cent which is comparable with a poultry-type operation where the figure is often close to 70 per cent. Feed is also the item for which a significant reduction in cost can be predicted. Other costs are unlikely to be greatly reduced, unless changes in national legislation modify costs of interest, water, rent or taxes; increased use of inputs, however, will reduce their net cost.

83. The other ways in which the economics of the industry can be improved are on the output side - improvement in growth rates, reduction of losses through disease and improvements in the market value by a better marketing organization and a more adequate protection against competition from Third Countries.

84. Considerable research is going on at present to improve growth rates and to establish the optimum growth/cost ratio. This involves experiments to establish:

- (a) the correct stocking density and the ideal size of tanks and pens.
- (b) the correct feeding rates so as to avoid wastage of food,
- (c) the correct handling techniques so as to prevent losses due to damage to fish and to prevent the spread of disease,
- (d) methods to improve the control of the development and maturing of fish so as to improve conversion rates; this may include:
  - the control of water temperature,
  - the use of artificial lighting,
  - the careful selection of classes of fry or breeding stock to reduce the percentage of early maturing fish, and
  - the selection of breed stock with improved resistance to disease.

#### Feed

85. All the finfish species shown above as being suitable for farming are carnivorous. It is essential, therefore, to find a cheap food with a relatively high protein content. Early experimentors were concerned with success rather than cost. Expensive foods such as minced mussels were used. Since then there has been a gradual substitution from expensive types known to succeed to new substitutes and, in particular, trash fish and offal.

The success of such experiments has not solved all problems. Some species of juvenile fish are weaned and fed on artemia salina, the brine shrimp. Supplies are limited and increased demand has pushed up the price, and is likely to create bottlenecks in the future. In this context, experiments to establish artemia forms in Belgium (University of Ghent) are of considerable interest.

86. The most effective answer to the problem has been the development of moist pellets of minced frozen waste fish, improved by prawn flour and vitamin additives and bound with methyl celluloses to avoid wastage and resulting bacterial problems. A second type of food is based on deboned fish slurry for which there is little alternative demand.

87. There is still a considerable amount of research to be carried out, in order to determine:

- (a) new sources of protein that could be used in pelleted food,
- (b) the extent to which pre-digested vegetable protein can be used given low ability of fish to absorb them,
- (c) the requirements for feed in terms of amino acid, lipid, carbohydrates, minerals and vitamins, in order to ensure a nutritionally balanced diet,
- (d) the importance of moisture in fish diets,
- (e) the importance of food particle size for growth rates.

88. The most important future developments are likely to come from the introduction of completely new forms of protein. Work is currently being undertaken on single cell proteins, which, if successful, would improve dramatically the economic of fish farming.

89. Another development which holds out considerable promise is the use of sewage sludge or dried sewage either directly for feeding to fish or for the production of very small species such as worms which can clean waste and be fed to fish. Yields of up to 500 tonnes of carp per hectare have been reported using effluents<sup>1</sup>, while 50 per cent of dried sludge from paper processing waste has been fed to rainbow trout. In Britain, the commercial fish feed manufacturers are already using by products of the distillery industry in some of their diet formulations.

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<sup>1</sup> The high cost of such operations limits the commercial application of such techniques at present.

### Multispecies approach

90. There are many theoretical and practical advantages of a multi-species culture. Costs of production would be reduced by introducing bottom-living and mid-water living fish into the same tanks or cages. A combined culture of compatible species would make more efficient use of resources, for example, reducing food wastage. Farming of fish such as sole could also be conceived as an offshoot of marine farming which converts plankton into protein. Offal from processed molluscs or undersized specimens could be fed to fish.

91. Such concepts, which would increase efficiency and reduce costs, raise many practical problems of management which have meant that there has been no serious attempt to evaluate multiple culture methods.

92. The lack of research is due mainly to the overall lack of funds with the consequent need to establish rigid priorities. Given an increased research effort, considerable advances could be made in increasing efficiency and reducing costs.

### Genetic manipulation

93. Controlled hatching as practised in fish farms allows for the exploration of the possibilities for the genetic improvement of fish stocks. Genetic modification has played a dominant role in the animal and plant sectors of agriculture.

94. There has been, so far, no systematic and scientific attempt at the rational exploitation in fish farming of genetic methods, apart from limited work on salmonid species, particularly in Norway. The scale of the research makes it more suitable for governmental or University centres, though in close collaboration with private companies since results depend partly on management methods.

95. There are four areas of genetic research applicable to fish farming:

#### (a) hybridization

Fish hybridize readily, and crosses between plaice and halibut, turbot and brill, and between plaice and flounder, produce fish which grow faster and may be more resistant to disease. Crosses between American and European lobster appear to have provided the key to a commercially viable lobster farming. Consumer resistance may be a problem, though fishermen, faced with reduced catches of traditional species, have shown that species unheard of a short time ago can be sold as substitutes.

(b) selection

Given the uncertainties associated with cross-breeding it is certain that research will concentrate on developing fish strains of the pure species which put on weight faster and show a greater resistance to disease.

The traditional method to achieve this in agriculture has been through selective improvement. A degree of work has been achieved in Norway on salmonid species. A considerable amount of exploratory work is required, however, to evaluate the possibilities before large-scale efforts are likely to be undertaken.

(c) inbreeding

Inbreeding provides, from the crossing of two different inbred species, genetic uniformity and hybrid vigour. This basic principle of plant and poultry breeding can have equal importance for fish farming and, at the moment, rainbow trout, for which inbred strains already exist.

(d) sex control

The development, or early development, of reproductive organs constitutes a wasteful one of food. Male salmon or trout die or stop growing if they mature early.

A great deal of work is being undertaken, therefore, to produce either female or sterile offspring.

Light manipulation

96. The commercial value of fish farming would be enhanced considerably if the spawning season of fish stock could be manipulated and lengthened. The development of early and late spawners would allow a continuous flow through of fish.

Successful experiments with dab have been extended to turbot and it is expected that the future spawning season will extend from March to December. Experiments are also being carried out with salmon and trout.

## Future trends

97. The brief survey above shows clearly that progress in research and development of a wide range of factors will alter substantially the economics of the fish farming industry as it is presently understood. Progress is within reach. But for the breakthrough, or rather series of breakthroughs, to be realized and to bear fully their fruits, a much more imaginative and comprehensive framework of financial support for research and development, legislation for control of disease and trade, and organization for marketing is required.

## PART SIX: DISEASE CONTROL

### The problems of disease control

98. The identification, prevention and control of fish disease to the future of fish farming is of such paramount importance that a separate section must be devoted to considering the problems and the means of overcoming them.

As an intensive farming operation, based on water which can transfer diseases more rapidly and effectively than air, aquaculture development has been hampered by the heavy mortality caused by disease.

99. The problems of disease are related to six factors:

- (a) Insufficient husbandry techniques which creates stress and a weakened resistance to disease and parasites;
- (b) Problems of effectively identifying diseases affecting fish farms;
- (c) The lack of effective therapies. For example, viral infections of carp and salmonids, and diseases such as vibrio spp, an endemic bacterial disease somewhat akin to influenza, responds only in some cases to present treatment. There is no reason to believe, however, that effective remedies cannot be developed;
- (d) The similarity of wild and farmed fish creates the risk of cross-infection;
- (e) Fish diseases could be introduced by the importation of exotic species;
- (f) Disease can be transferred as a result of the transport of live fish ova and imported dead fish.

100. There is the additional problem that the danger of transmission of disease from farmed to wild stock or by the transport of ova will lead to the imposition of excessively strict rules which will effectively handicap the development of the industry by severely restricting trade and causing considerable increase in costs.

### Register of fish farms

101. The problems presented by fish disease must be tackled energetically and systematically. Furthermore, measures must be adopted on a Community-wide basis to be effective and to minimize impediments to trade. Measures must seek to minimize the risk of disease to fish farms and allay the fears of

those who believe that the implementation of fish farms will create a disease and pollution risk.

102. The first and most essential step is to establish a register of all fish farms. Farms would be required to record all movement of fish and ova on and off the farm. This would enable checks on the spread of disease and assessments of gravity of disease problems. Without a register of all farms, disease control is virtually impossible.

#### Licensing and inspection systems

103. A register would enable a licencing and inspection system to be established to ensure adequate disease control management on farms and controls of movement of fish and ova. On the basis of a register and a licencing system, it will be possible to classify farms as free of listed disease. Only disease-free farms would be permitted to sell live fish and ova.

An adequate and workable system of disease notification and control would provide the basis for the greater control and coordination of health regulations between Member States, so reducing disease risks and at the same time limiting obstacles to trade.

#### Specialist production of eggs

104. Certified egg production centres could play an important part in disease control programmes. Production by specialists allows for genetic and environmental improvement and disease control at the critical point of egg production. At present commercial producers of trout face unreliable supplies of guaranteed disease-free ova.

105. Grant aid schemes therefore should cover the setting-up of specialist egg production centres. Moreover, aid to fish farms should only be granted to projects which can demonstrate their ability to produce or obtain disease-free eggs (from certified centres or other schemes where no such centres at present exist), or to buy juveniles from farmers whose stock is certified as disease-free.

#### Harmonization of national legislation on health requirements

106. Health regulations present one of the most serious obstacles to trade in agricultural products. This fish farming sector is no exception to this general rule.

107. At the same time there exists discrepancies in national requirements for notification of diseases and even in notifiable diseases, control measures to be taken in the event of an outbreak of disease, and for import regulations from areas, and of species, for which a disease risk exists.

There is also a grave deficiency in most national legislation in that no disease controls exist for the import of non-pasteurized dead fish and fish products. Certain countries require proof that imported farmed products are free of certain diseases. Other countries do not.

108. There is clear need for Community proposals to harmonize national legislation so as to establish common rules on:

- categories of notifiable diseases,
- sanitary measures to be adopted for each category of disease, and
- import and export health regulations to cover all the relevant groups of fish, molluscs and crustacea, both live and dead fish and ova.

#### Exotic species

109. The danger that existing diseases may be spread, or new diseases introduced by imports of exotic and ornamental fish is extremely serious. Proper disease control procedures, including quarantine where appropriate, must be adopted.

A system of advanced warning and licencing for the introduction of alien and exotic species is required.

Uncontrolled introduction of exotic species must be prevented. Firstly, there is the obvious risk on introducing disease. Secondly, exotic species imported for pilot schemes may escape and threaten to drive native fish from their natural habitats. The case of the Coho and the Atlantic salmon is one such example.

The introduction of new species can lead to conflict between economic, leisure and environmental interests, and could even lead to conflict between Member States. For example, the new informal negotiating text of the UN Conference on the Law of the Sea states (Article 197) that all necessary measures must be taken to prevent or control the intentional or accidental introduction of alien species to the particular marine environments which may suffer thereby significant or harmful changes.

A system of advance notification and licencing for the introduction of exotic or alien stock should be introduced so as to reduce the risk of disease, environmental changes or unresolved conflicts of interest.



### Research programmes

110. In order to be effective, considerably greater scientific data is required to enable the prompt identification of diseases. This is particularly true since new diseases may be introduced which are at present unknown or may appear with the expansion of fish farming.

111. Similarly there are problems concerning the treatment of diseases. Certain diseases do not appear to respond to existing therapies. At present certain bacterial and fungal infections can be successfully treated by antibiotics or fungicides. Such methods may result in the appearance of resistant strains.

Existing methods of disease prevention and treatment must be developed, which may be concerned with management methods, therapeutics, or, as in the case of molluscs, with water quality for hatcheries. Antibiotics are commonly used, ozonization techniques to improve water quality are being developed. It is essential that the cost does not exclude them from commercial use.

112. Coordinated Community research programmes are urgently required, therefore, in three principal areas:

- (i) the identification of disease,
- (ii) the development and improvement of disease prevention and treatment, and
- (iii) the dissemination of results to the fish farmer and inspectorates.

### Inspection and veterinary services

113. Clearly, effective disease control will not be possible without adequate inspection and specialized veterinary services.

At present the relevant services are often not primarily concerned with problems relating to fish farming. Nor is responsibility always centralized within one department.

114. The Community should seek to encourage the development of specialized services, and in particular, to ensure by means of grant aid and training schemes, that adequate numbers of qualified staff are available, that there is clear, centralized authority within each Member State, and that the Commission itself be a service with the principal task of coordinating disease control measures.

## PART SEVEN: A SURVEY OF SITES

### Limitations on sites

115. The number of sites suitable and available for fish farming are extremely limited. A number of very precise characteristics must be brought together:

- (a) a stretch of water of sufficient depth but protected from storms and wind, and with a minimum and maximum tidal range;
- (b) sufficient space for on-shore installations;
- (c) freedom to employ the water resources without infringement from industrial, commercial and leisure activities;
- (d) freedom from pollution;
- (e) in the case of salmonoid species very considerable quantities of fresh water at reasonable cost;
- (f) transport facilities and vehicular access; and
- (g) readily available source of labour.

116. All these factors are difficult to find in combination. It has been estimated, for example, that even on a coastline as long, as indented, and as free from pollution as that of Scotland, the number of suitable sites may be as few as twenty.

In the case of fish farms using heated water from power stations, the problems of pollution from associated industries may be considerable.

Fish farms must compete for a limited number of sites with a whole range of other economic activities, the implementation of which, on a particular site, may exclude the establishment of a fish farm. Such an exclusion may be in particular cases justified. But, unless there is careful planning, sites may be lost by default, even where in economic and social terms fish farms should be given priority.

### Survey of sites

117. It is imperative, therefore, that the Community finance immediately a survey of all possible sites along the coasts of the Community so as to identify opportunities for development and to ensure the proper planning in individual regions.

## Licencing and exploitation of sites

118. There may arise a second problem: that of competition between fish farming enterprises for a limited number of sites. There is the obvious temptation for a large concern which, as a result of considerable investment, has gained an advance in techniques and management, to seek to exclude competition by establishing installations, even token ones, on the known available sites.

119. This is one more reason for establishing a register of fish farms, together with a licencing scheme. The economic goals of a large company may not always coincide with the development requirements of particular regions in the Community. A licencing scheme would ensure that fish farming would develop in a manner best suited to the economic and social requirements of each region.

## PART EIGHT: MARKETING STRUCTURE

### Internal marketing problems

120. At present in a number of countries there exists no marketing structure for the developing fish farming industry.

The lack of an adequate marketing structure to ensure the orderly marketing of fish and respect for reasonable prices is aggravated by the fact that for certain species, prices paid to the fish farms depend on a limited number of purchasers. For example, salmon producers are heavily dependent on prices fixed by the smokers.

121. The situation is further complicated for marine fish farms by the fact that they are normally sited far from the centres of population. Fish being sent to market must be transported a considerable distance. Given the small size of the amounts of fish involved it may often be uneconomic for one farm to undertake the transportation involved. In many of the traditional fish farming regions concerned with oysters and mussels, producers are well organized. But in some of the newer areas and for new species no such professional organizations exist.

122. The Community should encourage the establishment of producers' organizations along the lines which exist within agriculture. Such organizations will be particularly essential in those regions where the Community should seek to develop small-scale village farms on the Norwegian model.

### External protection

123. The degree of protection from competition of imports from third countries varies considerably from species to species. For example, imports of trout are subjected to a 12 per cent customs rating while for salmon imports entry is free. Salmon fish farms face intense and increasing competition from salmon imported from Norwegian farms and there seems no reason why the protection granted to other species should not be extended to salmon. The Commission should re-examine the tariff protection afforded to species farmed within the Community, thus enabling the infant industry to develop normally.

124. It should be emphasized that the Community's developing fish farming industry faces competition from countries which have developed a wide range of subsidies to strengthen their competitive position. This may be in the form of direct grants, tax relief etc. or even disguised subsidies, as, for example, the Bill before the US Congress to underwrite insurance against loss of stock. Fish subsidies indicate clearly the need for the Community to afford sufficient protection for its own fish farming industry.

PART NINE: LEGAL AND FISCAL PROBLEMS

Wide range of obstacles to the development of fish farming

125. Fish farming is a young industry. It is at present seeking to overcome a wide range of problems concerning production techniques, feeding strategies, prevention of disease and the choice of species.

Beyond these technological problems exist a whole range of obstacles which seriously affect the economics of the industry.

Legal problems of ownership and use of the sea

126. The marine fish farmer uses the sea. This creates a number of very difficult legal problems:

- (a) The fish farmer may have no clear right to exercise jurisdiction or exclusive use of that part of the sea on which cages and other off-shore installations are situated. The right of others who wish to use that particular stretch of water, and in particular those defending navigational rights, may, for historical rather than worthwhile economic reasons, prevail. This would exclude effectively fish farming;
- (b) The inability to exercise jurisdiction may prevent the fish farmer from being able to prove a right of ownership to fish he has produced. This would be particularly pertinent in the case of sea ranching or repopulation;
- (c) Fish farmers require wild fish in order to provide a breeding stock or scientific investigation. At present there exists national and Community regulations on the taking of immature fish or seasonal restrictions. There may also exist regulations excluding the sale of fish during a particular season or of a minimum size;

Such legislation, essential for the conservation of wild stocks, has not always been drawn up with the needs of the fish farming industry in mind.

127. The Commission should:

- (a) ensure that its conservation proposals take into account the special situation of fish farming and make appropriate exemptions for farmed fish.
- (b) draw up recommendations for national governments to harmonize their own legislation on similar lines.

128. The Commission should draw up, furthermore, a Directive to be adopted by the Member States to allow for fish farmers to establish ownership to their stocks and the right to exploit the water in which they are produced. Such a Directive would allow for a free flow of capital and technology throughout the Community which is at present impeded by unnecessary and outdated legal obstacles.

129. The result of the survey of suitable fish farming sites and the licencing system, both referred to previously, would provide the basic instruments:

- (a) to ensure that fish farmers be granted the right to exclusive use of certain areas of water and to ownership of fish farmed thereon, and
- (b) to solve conflicts between different interests seeking to use certain areas of water and arising from national and international laws governing navigational rights etc.

#### National aids and taxes

130. There exists considerable differences between a number of states of the Community in the way in which fish farms are treated. For example, in some countries fish farms are classified as agricultural enterprises and are subject to low rates of tax and costs for water and electricity. In other countries fish farms are considered as industrial enterprises and so charged at correspondingly higher rates. Where it is uncertain whether fish farming comes under agricultural or industrial legislation, progress is almost impossible due to the resulting bureaucratic confusion. In order to prevent distortions in competition, the Community should seek when granting aid to ensure a greater degree of harmonization.

## PART TEN: CONCLUSIONS

131. Fish farming is a new and developing industry. It is based on a blend of elements of which Europe possesses to an almost unique degree: expertise, a skilled manpower, capital, unpolluted waters and a ready market for the produce.

132. Fish farming can make a major contribution to the economies of the peripheral maritime regions of the Community, heavily dependent, traditionally, on fishing and associated industries. Employment in these regions has been badly hit by very necessary conservation measures adopted for wild stocks; and increases in costs, such as fuel, have undermined the economic viability of a number of traditional activities, for example the scallop fisheries in Brittany.

133. There are many forms of fish farming and progress has been unequal. One clear conclusion, however, can be made: the technological breakthroughs required for the expansion of fish farming have been achieved and further major advances to bring down costs are on the horizon.

134. The major obstacles to the development of fish farming are largely man-made: lack of official encouragement and investment grants; lack of centralized responsibility; the resulting administrative complexities; insufficient veterinary facilities and research, and inadequate disease control and prevention legislation; legal problems concerning right of ownership of fish in the sea and use of water; and the lack of adequate marketing structures.

135. A Community policy on fish farming is required now. EAGGF investment aid schemes must be more closely tailored to the needs of the industry, and cover not merely aid to farms themselves but also to specialized egg hatcheries, centres engaged on improving techniques and breeding standards and vocational training.

The Commission should draw up co-ordinated research programmes to examine problems related to the identification, prevention and therapy of fish diseases.

Proposals for the harmonization of health legislation must be drawn up, and co-ordinated, specialized services established.

A survey of potential fish farm sites is required to ensure that possibilities to develop farms are not lost by default to other industrial or leisure activities.

Regional programmes should be elaborated and feasibility studies undertaken to determine whether small units associated with particular villages or farms may not be preferable in certain regions to large-scale units under the authority of large companies.

Marketing structures are required to ensure orderly sales and reasonable prices, and to overcome the problems of transport of relatively small amounts of fish from often isolated production sites.

136. The nature of the problems, which are often closely inter-related, point inevitably to the conclusion that a register of fish farms must be established, together with a licensing system. It is only by means of a register and a licensing system that it will be possible to overcome the central problem of disease, allay fears that fish farms may be a source of disease and pollution, ensure that land and water resources will be exploited in the most rational manner, and provide a solid framework for the grant of Community aid.

137. Fish farming provides a hope for a number of peripheral maritime regions faced with depopulation, and the impossibility of attracting industry to replace traditional agricultural and fishing activities. Technological development has provided the opportunity. In order to translate hope and opportunity into solid achievement, a realistic, coherent and comprehensive Community policy on fish farming is required.



MARICULTURE RESEARCH INSTITUTES WITHIN THE COMMUNITY

TOGETHER WITH RESEARCH PROJECTS BY SPECIES

BELGIUM

Instituut voor Zeewetenschappelijk Onderzoek (IZWO)  
(Institute for Marine Scientific Research)  
Prinses Elisabethlaan 69  
8401 BREDENE

- algae
- artemia
- oyster

Laboratorium voor Biologisch Onderzoek van Milieuverontreiniging,  
Rijksuniversiteit Ghent  
(State University of Ghent, Laboratory for Biological Research  
in Environmental Pollution)  
J Plateaustraat 22  
9000 GHENT

- artemia
- algae
- fabrea salina

La Station de Pêche Maritime  
OSTENDE

- shrimp
- sole

DENMARK

Danish Institute for Fishery and Marine Research  
Charlottenlund Castle  
2920 CHARLOTTENLUND

- eel

FRANCE

Institut Scientifique et Technique des Pêches Maritimes (ISTPM)  
Ministère des Transports  
BP 1049, rue de l'Ile d'Yeu  
44037 NANTES CEDEX

- |             |           |
|-------------|-----------|
| - bream     | - lobster |
| - oyster    | - shrimp  |
| - sea trout | - salmon  |
| - mussel    | - scallop |

Centre National pour l'Exploitation des Océans (CNEXO)  
Ministère de la Recherche et du Développement Industriel  
39 avenue d'Iéna  
75016 PARIS

FRANCE CONT.

Centre National pour l'Exploitation des Océans (CNEXO)

Centre Océanologique de Bretagne  
BP 337  
29273 BREST CEDEX

- |               |          |
|---------------|----------|
| - tetraselmis | - shrimp |
| - artemia     | - perch  |
| - oyster      | - sole   |
| - clam        | - turbot |
| - scallop     | - trout  |
| - algae       |          |

Equipe de Recherche Appliquée de l'Unité d'Aquaculture

- |            |          |
|------------|----------|
| - algae    | - sole   |
| - artemia  | - turbot |
| - molluscs | - bass   |

Unité régionale pour le Développement de l'Aquaculture dans  
la Région Nord  
URDA/Nord

- salmon

Base Océanologique pour la Méditerranée - Unité régionale pour  
le Développement de l'Aquaculture pour la Région Sud  
URDA/Sud

- perch
- bream

Centre Océanologique pour le Pacifique (COP)  
VAIRAO  
Ile de Tahiti  
Polynésie française

- carangidae
- oyster

Laboratoire de Pathologie des Animaux Aquatiques  
Ministère de l'Agriculture  
Direction des Services Vétérinaires  
Centre Océanologique de Bretagne  
BP 337, 29273 BREST CEDEX

- salmonid
- bass
- mussel
- oyster

Station de Biologie Marine et Lagunaire de Sète

- bass
- bream

Centre National de Recherches Zootechnique  
Institut National de la Recherche Agronomique  
Ministère de l'Agriculture  
Domaine de Vilbert  
78350 JOUY-EN-JOSAS

- bass
- turbot
- sole
- salmon

GERMANY

Biologische Anstalt Helgoland  
(Biological Station of Heligoland)  
200 HAMBURG 50  
Palmaille 9

- garfish,
- grey mullet

Institut für Ernährungsphysiologie an der Tierärztlichen  
Fakultät der Universität München  
(Institute for Nutritional Physiology in the Veterinarian  
Faculty of the University of Munich)  
8 MUNCHEN 22  
Veterinärstrasse 13

- rainbow trout
- cod

Institut für Küsten- und Binnenfischerei der Bundesforschungsanstalt  
für Fischerei  
(Institute for Coastal and Inland Water Fishery at the Federal  
Research Institute for Fishery)  
2000 HAMBURG 50  
Palmaille 9

- rainbow trout
- brown trout
- sea trout
- mussel
- sea char
- eel

Institut für Meereskunde, Fischereibiologische Abteilung an  
der Universität Kiel  
(Institute for Oceanography, Dept. of Fisheries Biology  
at the University of Kiel)  
23 KIEL  
Düsternbrooker Weg 20

- salmonid
- mussel

IRELAND

Department of Agriculture and Fisheries, Fisheries Division  
Agriculture House  
Kildare Street  
DUBLIN 2

- salmon
- crustacea
- mussel
- lobster
- oyster
- scallop

Shellfish Research Laboratory (in association with University College  
Galway)  
CARNA  
Co. Galway

- oyster
- clam
- scallop
- algae
- mussel

Electricity Supply Board (Semi-State)  
Fisheries Division  
Lower Fitzwilliam Street  
DUBLIN 2

- salmon

IRELAND CONT.

Bord Iascaigh Mhara (Semi-State)  
PO Box 275, Hume House  
Ballsbridge  
DUBLIN 4

- salmon

Salmon Research Trust of Ireland (Government and Private Industry)  
Salmon Laboratory Traenlaur  
NEWPORT  
Co. Mayo

- salmon  
- sea trout

Atlantic Fisheries Ltd. (Private)  
Rossmore  
CARRIGTHWOHILL  
Co. Cork

- oyster  
- algae

NETHERLANDS

Netherlands Institute for Fishery Investigations  
(Ministry of Agriculture and Fisheries)  
PO Box 68  
Haringkade 1  
1620 IJMUIDEN

- oyster  
- mussel  
- sole  
- turbot  
- salmon } one-year feasibility study

Mussel Experimental Station (Shellfish Dept.)  
Horntje  
TEXEL

- mussel

UNITED KINGDOM

England and Wales

Department of Biological Sciences  
The University of Aston in Birmingham  
Gosta Green  
BIRMINGHAM B4 7ET

- salmon  
- trout

Fisheries Laboratory, Ministry of Agriculture,  
Fisheries and Food  
Breakwater Road  
PORT ERIN  
Isle of Man

- turbot  
- Dover sole  
- scallop

GERMANY

Biologische Anstalt Helgoland  
(Biological Station of Heligoland)  
200 HAMBURG 50  
Palmaille 9

- garfish,
- grey mullet

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Veterinärstrasse 13

- rainbow trout
- eel

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2000 HAMBURG 50  
Palmaille 9

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Institut für Meereskunde, Fischereibiologische Abteilung an  
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Düsternbrooker Weg 20

- salmonid
- mussel

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DUBLIN 2

- salmon
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- salmon

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Ballsbridge  
DUBLIN 4

- salmon

Salmon Research Trust of Ireland (Government and Private Industry)  
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Atlantic Fisheries Ltd. (Private)  
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- algae

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- mussel

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The University of Aston in Birmingham  
Gosta Green  
BIRMINGHAM B4 7ET

- salmon  
- trout

Fisheries Laboratory, Ministry of Agriculture,  
Fisheries and Food  
Breakwater Road  
PORT ERIN  
Isle of Man

- turbot  
- Dover sole  
- scallop

UNITED KINGDOM CONT.

Fisheries Experiment Station, Ministry of Agriculture,  
Fisheries and Food  
Benarth Road  
CONWY  
Gwynedd

- prawn

Golden Sea Produce (Fitch Lovell Limited)  
1 West Smithfield  
LONDON EC1A 9LA

- salmon  
- turbot

Marine Farm Limited  
Hinkley Point  
BRIDGWATER  
Somerset TA5 1UD

- finfish  
- shellfish

Marine Harvest Limited (Unilever)  
Unilever House  
LONDON EC4P 4BQ

- salmon

Marine Science Laboratories  
MENAI BRIDGE

- shellfish

Portsmouth Polytechnic  
PORTSMOUTH

- oyster  
- sand eel

Lord Rank Research Laboratories  
WHITLEY BRIDGE

- prawn

Rank, Hovis, McDougal Limited

- eel

Seasalter Oyster Co. Limited (Associated Fisheries)  
- oyster

Shearwater Fishfarms Limited (British Oxygen Co.)  
109 Lowther Street  
CARLISLE  
Cumbria

- sole  
- turbot  
- trout  
- salmon

UNITED KINGDOM CONT.

Fisheries Laboratory, Ministry of Agriculture,  
Fisheries and Food  
Remembrance Avenue  
BURNHAM-ON-CROUCH  
Essex CMO 8HA

- scallop
- bivalve

Fisheries Laboratory, Ministry of Agriculture,  
Fisheries and Food  
LOWESTOFT  
Suffolk NR33 0HT

- shellfish

Fish Diseases Laboratory, Ministry of Agriculture,  
Fisheries and Food  
The Nothe  
WEYMOUTH  
Dorset DT4 8UB

- crustacea

Scotland

Marine Laboratory  
PO Box 101  
ABERDEEN AB9 8DB

- salmon
- trout
- flatfish

Freshwater Fisheries Laboratory  
Faskally  
PITLOCHERY  
Perthshire PH16 5LB

- salmonid
- rainbow trout
- salmon
- flatfish

Scottish Marine Biological Association  
Dunstaffnage Marine Research Laboratory  
PO Box 3  
OBAN, Argyll PA34 4AD

- rainbow trout
- salmon

Institute of Marine Biochemistry, Natural Environment  
Research Council  
St Fittick's Road  
ABERDEEN AB1 3RA

- rainbow trout
- turbot
- oyster
- mussel



UNITED KINGDOM CONT.

Unilever Research Limited  
Colworth/Welwyn Laboratory  
Greyhope Road  
ABERDEEN AB9 2JA

- salmon

Unit of Aquatic Pathobiology  
University of Stirling  
STIRLING

- shellfish

White Fish Authority  
Marine Cultivation Units (Fish and Shellfish)  
Sea Fisheries House  
10 Young Street  
EDINBURGH EH2 4QJ

Hunterston Generating Station  
WEST KILBRIDE  
Ayrshire

- flatfish

Ardtoe  
ACHARACLE  
Argyll

- Dover sole  
- turbot  
- oyster

- scallop  
- algae

Highland Trout Company Limited (Booker McConnell Company)  
SOUTH UIST  
Hebrides

- salmon

OPINION OF THE COMMITTEE ON REGIONAL POLICY, REGIONAL  
PLANNING AND TRANSPORT

Draftsman: Mr KAVANAGH

On 20 April 1978 the Committee on Regional Policy,  
Regional Planning and Transport appointed Mr KAVANAGH draftsman.

It considered the draft opinion at its meeting of 19 December 1978  
and adopted it unanimously.

Present: Lord Bruce of Donington, Chairman; Mr McDonald, Vice-Chairman;  
Mr Kavanagh, Draftsman; Mr Albers; Mr Brugger; Mr Corrie;  
Mr Fuchs; Mrs Kellett-Bowman; Mr Osborn; Mr Seefeld.

1. In one form or another fish farming - that is to say the deliberate and intensive husbandry of fish, shellfish and crustacea, has a long history both in salt and fresh waters. The report of the Committee on Agriculture is basically concerned with marine pisciculture and this Opinion will therefore concentrate on that aspect, though it should be pointed out that in many countries the main commercial applications have been in the development of fresh-water or inland fish farming.

2. For many years considerable public interest has been aroused by the possibility of "farming" the sea which was seen as a source of virtually inexhaustible riches whether derived from plankton, pelagic fish or even marine mammals. Such a point of view was supported by arguments concerning the limited traditional agricultural resources and the possibility of adding to restricted supplies of protein by the systematic and scientific exploitation of sea life.

3. More recently, however, the traditional view of the sea as a self-purifying provider of an endless stock of foodstuff has had to be modified firstly in the light of the knowledge that the sea is as liable to suffer from pollution, whether deliberate or inadvertent, as are inland waters, and secondly in the light of the fact that over fishing (not to mention climatic variations and other natural causes) was reducing certain species to the brink of extermination.

4. Awakened public and scientific awareness of the ease with which even a prolific species may be extinguished has, it must be hoped, reduced the possibility that certain types of whale or even fish formerly common such as the herring, will follow the passenger pigeon into oblivion.

5. In the light of this awareness, interest in fish farming has recently focussed on its benefits as a means of ensuring the conservation of natural stocks by providing an alternative source of food. This approach may be distinguished from efforts made earlier to improve natural fish stocks by raising fish fry in hatcheries and then releasing them into the open sea. The comparative lack of value of this type of fish farming has led to its virtual abandonment except in the case of fish such as the salmon which return after a period at sea to the rivers in which they were spawned. This is done by hatching fish artificially and releasing them after a certain time into the river into which it is intended that they should return, and then allowing the natural life cycle to take place. Considerable success has been achieved by these means (notably for example in Iceland) in increasing the number of returning fish taken in their parent rivers.

6. Though this method has commercial applications, its main value has been recreational (and hence a profitable source of tourist income), and this is true also of the long established practice of stock and re-stocking rivers and lakes, which in most of Europe cannot be termed "farming" since a nutritional role is secondary or non-existent.
7. Within the last twenty years a great deal of research and money has been invested in investigating the commercial feasibility of the intensive farming of certain species of fish - in the case of shellfish such as oysters or mussels, successful commercial cultivation is of considerable antiquity. At the moment, however, as far as fish are concerned the one species which has clearly demonstrated the value of intensive farming is the trout - in the case of the United Kingdom, for example, artificially reared trout now represent the sole commercial source of supply.
8. Though recent research has shown the feasibility of artificially rearing various species to commercial size, research and practical experience has also shown a number of practical difficulties and limitations. In the case of inland fish farming, abundant supplies of fresh water are essential - it requires some million gallons of water a day to raise an annual production of 10 tonnes of trout unless water-saving systems are used which add considerably to the cost of production.
9. For both fresh and salt water cultivation, the cost of feedstuff is high since fish require high levels of animal protein with a conversion rate of 30% or less.
10. The combination of expensive equipment and the high cost of feeding has meant that only the more expensive types of fish can currently be farmed profitably, at the moment notably salmon, trout, turbot and eels are the most attractive possibilities. United Kingdom experiments in plaice farming were abandoned not on grounds of technical feasibility but because the cost of rearing could not compete with naturally caught fish.
11. In addition to these problems, marine fish farming has to face limitations of possible locations. The first essential is unpolluted water, but such water must be of the right temperature and if fish cage farming is practiced in open water, tidal conditions must fall within certain limits and sheltered positions are necessary. If water of above normal natural temperature is required, then the siting of fish farms is only likely to be feasible in the vicinity of coastal power stations.

12. It is to some extent this limitation of suitable sites which gives marine fish farming its particular regional interest since such sites are most likely to be found in the peripheral maritime regions of the Community. The problems of such regions will be considered in detail in a forthcoming report by the Committee on Regional Policy, Regional Planning and Transport, and in that report a chapter will be devoted to examining and assessing the potential for fish farming in such regions.

13. There is no need therefore in this Opinion to make more than a few basic points in anticipation of the more detailed comments to be made in the subsequent report.

14. Reference has already been made to the first point which is that fish farming is an expensive occupation. Capital investment is estimated at around £2,000 per tonne of annual production - and will be higher if the water supply is fully pumped<sup>1</sup>.

15. Secondly, modern intensive fish farming is still in its infancy, and it requires expensive research for its development. This means in practice that only government agencies and large commercial firms have the necessary financial resources to carry out this essential task. Thus in the case of Ireland, for example, the development and promotion of fish farming techniques (notably for oysters, mussels, clams and scallops) in the Gaeltarra region is in the hands of "Beitreach Teo", a subsidiary of Gaeltarra Eireann. In the United Kingdom private research and development is being carried out by a number of firms, by the Ministry of Agriculture, Fisheries and Food and its equivalent in Scotland, the Highland and Islands Development Board, the White Fish Authority, and so on.

16. The Committee on Regional Policy, Regional Planning and Transport feel that the Commission should make a financial contribution towards this necessary research including the problems of fish diseases.

17. Another point which should be made is that marine fish farming is an entirely different technique from fishing, and those engaged in it require a different training and a different set of skills. Nonetheless it would seem certain that in the right areas it should become possible to establish cooperatives and "small holdings" and these in turn should provide employment

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<sup>1</sup> Source: "Progress in farming marine fish 1977" White Fish Authority 1977

in the processing of the farmed fish. National hatchery centres should be created, if necessary with assistance from Community resources, from which young fish stock could be purchased. It is not, however, so much the potential scale of fish farming that is important from the regional point of view - a recent U.K. estimate envisaged a total annual marine production of around 58,000 tonnes, or five percent of present U.K. consumption by weight. Since, however, fish farming is likely to be developed mainly for the more expensive species, the value of this harvest might reach as much as 20 percent of the value of the fishing fleets' catch<sup>1</sup>. What is, from the Committee's point of view most significant, is the prospect of new employment possibilities being created in areas which are already in particular need of such possibilities.

18. Reference has already been made to the national role which needs to be played in developing this industry, and it is clear that this must also be seen in the context of overall regional development and planning. Decisions must be taken as to what suitable areas are to be set aside for developing fish farming, and coordination between departments and authorities must ensure that other, incompatible, developments are not allowed to take place in such areas.

19. This raises the problem of pollution which is central to such an industry as fish farming. Here there is both a national and a Community role. Certain types of pollution may be avoided by national planning decisions, whilst others, such as the damage suffered to the Brittany shell-fish industry by successive oil tanker disasters, notably the "Amoco Cadiz", will only be resolved by concerted Community action.

20. The Community can also make an active contribution by offering financial assistance to fish farming projects. The Committee draw favourable attention to Council Regulation (EEC) No. 1952/78 on an interim common measure for restructuring the inshore fishing industry<sup>2</sup>. This regulation enables capital subsidies to be made from the Guidance Section of FEOGA to such projects amounting to a maximum of 25 percent of the total investment, rising to 50 percent in the case of Greenland, Ireland, Northern Ireland and the Mezzogiorno. This regulation is due to expire on 31 December 1978, but the Committee urge that it should be continued for subsequent years.

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<sup>1</sup> Source: "Progress in farming marine fish 1977" White Fish Authority 1977

<sup>2</sup> O.J. L 211 Vol 21, 1.8.1978, p. 30

21. In conclusion the Committee are of the opinion that marine fish farming is potentially of considerable importance for the development of certain less favoured maritime regions in the Community, and that the Community should continue to cooperate with and encourage national efforts to foster it as a commercially viable industry.

