

European Communities

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DOCUMENT 1-1445/83

## Report

drawn up on behalf of the Committee on Agriculture

on the development of aquaculture in the Community

Rapporteur: Mr G. PAPAPIETRO

PE 86.044/fin.



At its sitting of 7 February 1983, the European Parliament referred the motion for a resolution tabled by Mr Battersby and others on the development of aquaculture and mariculture in the Community (Doc. 1-1155/82) pursuant to Rule 47 of the Rules of Procedure to the Committee on Agriculture as the committee responsible and to the Committee on Regional Policy and Regional Planning for an opinion.

At its meeting of 10 February 1983, the Committee on Agriculture decided to draw up a report and appointed Mr Papapietro rapporteur.

The committee considered the draft report at its meeting of 1/2 February 1984 and at the same meeting it adopted the motion for a resolution as a whole unanimously.

The following took part in the vote: Mr Curry, chairman; Mr Früh and Mr Colleselli, vice-chairmen; Mr Papapietro, rapporteur; Mr Abens (deputizing for Mr Woltjer), Mr Battersby, Mr Dalsass, Mrs Desouches (deputizing for Mr Eyraud), Mr Gatto, Mr Gautier, Mr Goerens (deputizing for Mrs Martin), Mr Kirk, Mr Helms, Mr Hord, Mr Kaloyannis, Mr Ligios, Mr Maffre-Baugé, Mr Mertens, Mr Newton Dunn (deputizing for Mr Howell), Mr d'Ormesson, Mr Provan, Ms Quin, Mr Simmonds, Mr Stella (deputizing for Mr Clinton), Mr Sutra, Mr Vgenopoulos, Mr Vitale and Mr Wettig.

The present report was tabled on 14 February 1984.

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

The deadline for the tabling of amendments to this report appears in the draft agenda for the part-session at which it will be debated.

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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 the development of aquaculture in the Community

The European Parliament,

- having regard to the decisions of the Council of 4 October 1983,
  - having regard to the European Parliament's resolution of 11 May 1979<sup>1</sup>,
  - having regard to the motion for a resolution tabled by Mr BATTERSBY and others on the development of aquaculture and mariculture in the Community (Doc. 1-1155/82),
  - having regard to the report of the Committee on Agriculture and the opinion of the Committee on Regional Policy and Regional Planning (Doc.1-1445/83),
- A. whereas the fishery sector is passing through a serious crisis because of the increase in fishing activities and the reduction of fishing zones and depletion of fish stocks,
- B. whereas the consumption of fishery products is increasing and the Community is an importer of fishery products for human consumption,
1. Considers that, as a means of breeding fish, crustaceans, molluscs and algae, both in inland waters and in the seas, aquaculture could well count as an important economic activity with real scope for expansion;
  2. Considers that these activities could be developed in particular in the peripheral and marginal areas of the Community in which fishing and the industries related thereto are already well established and/or where agriculture is severely handicapped by natural disadvantages;

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<sup>1</sup> CORRIE Report, Doc. 116/79 ,  
OJ No C 140, 5.6.1979

3. Points out that the Community is far behind in this sector compared with countries like Japan and the United States, where the protein yield from fish farming is constantly increasing;
4. Considers that, from the environment point of view, optimum conditions are to be found in both the north and the south of the Community for the development of aquaculture;
5. Points out that aquaculture is not just confined to fish farming, but also involves the processing of products and the production of feed and the use of specific technologies and machinery, and is a potential growth sector in which there could well be an increased demand for labour, and is also a complementary activity to small scale farming;
6. Welcomes the fact that the Commission, although subjects to financial constraints, has partly accepted the recommendations made by the European Parliament in 1979 and decided to include aquaculture among the sectors whose development deserves priority;
7. Welcomes the decision of the Council of 4 October 1983 to issue a regulation on fishery structures and the development of aquaculture;
8. Considers that the time has come for the Commission, with the support of the European Parliament, to provide the incentives needed to enable the Community to give due consideration to the development of this sector, in the certain knowledge that it will benefit the economy and ease the employment situation, particularly in the peripheral maritime regions of the Community where alternative jobopportunities are scarce;
9. Considers that Community support, at least in an initial phase, should be directed towards structures, research, marketing and the centralization of certain services, but exclude species which are farmed with the help of the intervention mechanisms;
10. Considers that, in the case of certain salt-water fish farming activities in particular, aid could be more generous if an actual fall in sea fishing resources were registered;

Research aspects:

11. Points out that there is considerable scope for additional research, especially on the adaptability of the various species, reproduction, nutritional requirements and measures to combat disease;
12. Believes that the development of biogenetics could improve the various species to the extent that they become better adapted to the diversity of environmental conditions;
13. Considers that the Community must make up the considerable time it has lost in the reproduction sector and that it can go some way to achieving this by setting up a number of reproductive centres capable of replenishing breed stocks, and especially for the provision of disease free stocks, in the most cost-effective manner possible;
14. Considers that further efforts must be made to establish optimum nutritional criteria for the various species, with a view to achieving economically viable growth rates;
15. Requests that some research be directed towards measures to combat disease and reduce the mortality rate among farmed species;
16. Believes that the Commission should organize, on the basis of guidelines adopted by the European Parliament, a European conference on aquaculture, attended both by the various research centres and by individual operators, with a view to laying the foundations for coordinating the research work on which the growth of the sector depends;
17. Considers it counter-productive for responsibility for research in aquaculture to be divided between two Directorates--General within the Commission (DGs XIV and XII), although it recognizes that there is a need for both basic and applied research;
18. Urges the Commission to centralize all aspects of aquaculture research in DG XIV, which is more sensitive to the real problems involved;

Structural aspects:

19. Welcomes the fact that the Community has introduced a multiannual structural policy and that it is now possible to establish a constructive long-term policy for aquaculture;
20. Calls on the Commission to adopt criteria for the selection of aquaculture projects which will give priority to measures introduced:
  - by individual fishermen or their cooperatives, provided that the new activities undertaken by them will increase incomes in regions where an actual fall in sea-fishing resources is registered,
  - in the more backward regions, on condition that the investments supplemented by the Community result in increased employment,
  - in regions where there already exist or there are plans to build processing plants which make for efficient marketing in the interests of consumers,
  - aquaculture projects which can demonstrate the operation of a successful innovative production technique or process;
21. Calls on the Commission to extend structural aid to establishments whose activities involve the incubation of ova, the breeding of larvae, the elimination of bacteria from crustaceans and molluscs and the production of feed;

Environmental aspects:

22. Urges the Commission to propose regulations to control the impact of systematic pollution in the production zones, with a view to establishing limits consistent with fish farming activities, especially intensive fish farming;
23. Believes that the Commission should give more detailed study to the pollution caused by aquaculture, whether in inland waters or in the seas, and establish compatibility and concentration limits for aquaculture;
24. Emphasizes the ecological advantages to be derived from protected inshore fishing grounds, and takes the view in this connection that it would be useful to concentrate research not only on safeguarding the marine environment, but also and above all on resource enhancement which would in turn improve the potential economic returns;

25. Is in favour therefore of a more widespread use of artificial sea barriers (e.g., drag nets), since these help to protect certain species of fish and to replenish stocks in the areas in question;
26. Requests the Commission to consider measures to control the spread of outbreaks of parasitic and/or viral disease in fish and shellfish stocks due to transport of contaminated stock or materials;

#### Regional aspects

27. Considers that fish farming should be developed in the most suitable environment which is often to be found in the peripheral maritime regions which are amongst the most economically deprived regions of the Community;
28. Points out that aquaculture may in some cases conflict with other economic activities (tourism, industry, etc.,) and reaffirms the need for 'coastal planning' measures which establish a clear line of demarcation between industrial and tourist development zones and fishing and fish farming zones, with a view to establishing a health economic balance within the various regions concerned;
29. Calls on the Commission to finance a study to identify the areas most suited to the development of aquaculture and to confine investment aid to aquaculture in those areas;
30. Believes that the Commission, in collaboration with the local authorities concerned, should conduct a survey of the infrastructures, processing centres, employment levels, vocational training opportunities and marketing facilities of the regions judged to be most suitable, with a view to ensuring that the best use is made of investment aid, if possible, promoting additional investment in the context of the integrated programmes;
31. Calls on the budget authorities to ensure that adequate resources are allocated to aquaculture, commensurate with the degree of priority assigned to the sector;
32. Hopes that the Commission will be able to take account of the views expressed in this report and regularly report to the European Parliament and its responsible committee on progress made in the sector in question;
33. Instructs its President to forward this resolution to the Commission and the Council and to the competent Ministers of each Member State.

## EXPLANATORY STATEMENT

Introduction

This own-initiative report should be understood as the continuation - the second stage, in a sense - of an important resolution adopted by the European Parliament just before the direct elections on the basis of a comprehensive report by Mr CORRIE.

That report remains valid and will form the starting point for the present report which sets out to be both ambitious in terms of the objectives which the Community might set itself for the development of aquaculture and realistic, insofar as the objectives need to be geared to what it is possible to achieve.

As a corollary to this report, amendments were tabled to the 1984 budget, in order both to give a practical dimension to the report and encourage a greater Community effort in support of this sector which offers considerable possibilities for development.

1 - AQUACULTURE IN THE WORLD

One of the main problems in assessing the scale of aquaculture and mariculture in the world arises from the difficulty of obtaining reliable statistics. It is in the Asian countries, where the products derived from aquaculture are used extensively for direct human consumption, that the development of these activities has been most substantial. It has been estimated that fishery products account for approximately 16% of all the proteins produced and aquaculture seems set to play an increasingly important role, not least because of the expected decline in traditional fishery production.

A brief survey of the development of aquaculture and mariculture in the world seems indicated here, to enable us to measure more precisely the wide scope for expansion in this sector, which may help to overcome the world food problem.

According to the most recent estimates available (1976), world aquaculture production amounted to about 6,000,000 tonnes, disregarding the production of the millions of small, family-run farms, which are extremely common in Asia, Latin America and Africa. Nevertheless, given the prevailing uncertainty, doubts may be raised as to the actual validity of this figure. Of these 6,000,000 tonnes of production, approximately 4,000,000 - or 66% of the total - were taken up by finfish, 1,000,000 by shellfish and a further million by seaweed.

With regard to the geographical spread, as much as 84% of production originated from Asia - with 38% of Asian production concentrated in China - approximately 13% from Europe, 2% from Africa and 1% from Latin America.

Table 1: Fish reared in fresh and salt water (in tonnes) and rates of increase (%) in selected countries

	Production			Annual rate of increase		
	1970	1975	1978 (77)	70-75	75-78 (75-77)	70-79 (70-78)
China:						
Total	765 661	1 031 374	1 211 792	6.20	5.70	5.61
Fresh water	582 020	752 675	762 254	5.31	0.45	3.84
Salt water <sup>1</sup>	183 641	278 699	449 538	9.49	18.42	12.84
Japan:						
Total	597 000	845 000	1 007 000	7.73	6.07	5.95
Fresh water	48 000	72 000	90 000	8.52	7.73	7.80
Salt water <sup>2</sup>	549 000	773 000	917 000	7.70	5.92	5.80
Israel:						
Total	12 122	12 994	13 282	1.32	0.73	1.25
Hungary:						
Total	20 000	20 500	22 900 (1979)	0.5	3.12	1.81
Republic of Korea:						
Total	119 200	410 700 (1976)	(491 100)	40.75 (70-76)	19.57 (76-77)	30.16 (70-77)
Indonesia:						
Total	131 476	164 647	154 642 (1976)	5.06	-6.08	3.21 (70-76)
Fresh water	75 568	83 871	74 484 (1976)	2.87	-13.26 (75-76)	0.18 (70-76)
Salt water	55 908	78 776	80 158 (1976)	7.89	1.75 (75-76)	6.87 (70-76)
Central African Republic: Total	-	24,7	66,7	-	24,7	29,91 (75-79)

1 Seaweed production is included as wet weight  
2 Seaweed production is included as dry weight

Source: Pedini, L'Acquacoltura nel mondo, cit.

The countries were selected on the basis of their various characteristics and each one can therefore be regarded as an illustration of development in the sector. It is interesting to note that the worldwide rate of growth in aquaculture and mariculture tends to be high: an annual average of 5%, even though the nature of production and the techniques employed are extremely varied. For instance, countries such as China and Japan, which have for some time been relatively advanced in the sector, manage to maintain an annual growth rate at around 7%.

Given that the rate of growth in traditional sea fishing is now stable at between 0.5% and 1% - assuming that the forecasts prove accurate - it follows that farmed fish will account for an increasingly large proportion of human consumption.

In addition, when one takes into account the fact that mariculture began to be developed only in the early '70s, and that its expansion has so far extended to no more than 5% of the sites marked out as suitable, then aquaculture may be regarded as a sector with considerable growth potential.

Since it has been established that it costs less to produce protein from fish than from traditional stockbreeding, it can be assumed that governments will continue to support the development of this sector.

Although it would be interesting to probe more deeply into the numerous aspects of the spread of aquaculture in various developing countries, where fish and seaweed are an important element of the staple diet, it seems more appropriate for the purposes of this report to confine ourselves, in this brief survey, to the situation of the leading country in this sector: Japan.

#### The case of Japan

Japan is the country most aware of the importance of aquaculture and has subsidized the activity to an appreciable extent with public funds. This dynamism can also be explained by the important place which fishery products traditionally occupy in the Japanese diet, accounting as they do for 47% of total protein consumption (against a world average of 16%).

Nowhere does aquaculture take up a larger share of the fishing industry than in Japan - and it should not be forgotten that Japan catches by far the largest quantity of fish in the world, between 9 and 10 million tonnes per year. This share increased from 6.4% in 1970 to 8.8% in 1977 and reached 9.2% in 1979, as a result both of growth within the sector and sluggish activity in sea fishing, where growth rates in recent years have been little above zero.

It should also be pointed out that fresh and saltwater production, having been oriented chiefly towards species with a high market value, represents 17.5% of the total value of fishery production.

In addition, the Japanese have pioneered programmes for restocking both fresh and coastal maritime waters. Although the effects of such actions have not been scientifically demonstrated, fishermen believe that the efforts in this direction have helped maintain catches at an acceptable level.

The rapporteur wished to give a brief account of the importance of aquaculture in Japan because this country has applied technology to an activity in which Asian countries have, by tradition, always been in the forefront.

## 2 - COMMUNITY AQUACULTURE PRODUCTION

Why might aquaculture offer an important opportunity to the Community, an opportunity which it cannot afford to miss?

There are various possible answers to this question and this report and in a certain sense its conclusions, will be taken up with explaining them.

Before analysing the basic situation in the Community, it would be useful to summarize the principal factors which determine the need for further development in this sector.

1. The contribution of fishery products to the human diet cannot be discounted. Protein content can vary markedly from species to species, ranging from 0.3% to 20% of total weight. At world level, the protein obtained from fishery products accounts for 16% of total human protein consumption. Added to this should be the protein supplied indirectly by the fish meal (protein content: 60%) fed to poultry and other domestic animals intended for human consumption.
2. Fishery resources in general, as we have already seen, are declining, and it is reasonable to suppose that this trend will not be modified even in the medium term. It is therefore essential to make serious efforts to meet a large proportion of total needs by breeding fish in both fresh-and saltwater.
3. Unlike certain sectors in the Community, the fishery products sector is a long way from self-sufficiency. Indeed, Community imports are constantly rising: they reached 860,000 tonnes in 1982, an increase of 29% on 1976.
4. The Community is particularly suitable for aquaculture and mariculture. The coasts and inland waters of countries such as Ireland, the United Kingdom, France, Italy and Greece may be regarded as the natural sites for the development of these activities.

Moreover, these waters are located largely in peripheral and depressed regions. If the rearing of fish or crustaceans was established on a commercial basis in such areas, it could form the basis for general economic development and generate both direct and related employment.

5. The establishment of an economic activity may help encourage a more rational management of the environment in general and the sea in particular. As far as sea-water aquaculture is concerned, there will be a particular need to introduce adequate pollution controls and institute genuine 'coastal planning', as already requested by the European Parliament (motion for a resolution Doc. 1-949/82, 13.12.1982).

While these reasons and others all point to the need for an expansion of aquaculture, the impression should not be given that the Community is a novice in the sector.

- Not only is aquaculture established in the Community, but it is already in a position to make its own contribution to food production, even though the support it has achieved from the public sector does not match up to the levels of other countries or to the requirements of a vigorously growing economic activity.

Moving to the figures, most recent estimates, dating from 1980, indicate that Community production of farmed fish amounted to approximately 88,000 tonnes (see Table 2). This figure is based on estimates and, although small in comparison with a total fish production of about 4,892,747 tonnes, is by no means negligible. Indeed, when farmed shellfish are added to the finfish, the total rises to 420,000 tonnes, which means that approximately 8% of fishery products were produced from aquaculture.

In the case of fishery products intended for human consumption, the proportion of farmed fish rises to 15%. As far as the commercial aspect of aquaculture is concerned, it is not possible to give precise information at present, despite the various attempts which have been made. New elements may emerge from the visits currently taking place and, it is to be hoped, from the discussions which will arise on this point.

With regard to profitability, it can be claimed that at least half of aquaculture production is well placed to compete with the fish caught by the Community fishing fleet.

Table 2: Aquaculture production in the EEC (in tonnes)

	TROUT	EELS	CARP	SALMON	OTHERS	TOTAL
GERMANY	8,000	-	4,000	-	300	12,000
FRANCE	17,000	50	5,000	100	-	22,150
ITALY	18,000	2,200	-	-	7,700	27,900
NETHERLANDS	50	-	-	-	-	50
BELGIUM	300	-	-	-	100	400
LUXEMBOURG	12	-	-	-	2	14
UNITED KINGDOM	5,000	200	100	400	-	5,700
IRELAND	325	-	-	150	-	475
DENMARK	15,000	-	3	-	-	15,003
GREECE	2,000	-	32	-	2,230	4,262
EC 10	65,687	2,450	9,135	650	10,332	88,254

Source 1980

Table 3 : Community farmed shellfish production in 1978  
(in tonnes - live weight)

	OYSTERS	MUSSELS	TOTAL
GERMANY	1	11,760	11,761
FRANCE	95,304	50,417	145,721
ITALY	...	4,807	4,807
NETHERLANDS	1,124	118,485	119,609
BELGIUM	-	-	-
UNITED KINGDOM	450	7,200	7,650
IRELAND	756	3,018	3,774
DENMARK	-	46,756	46,756
EC 9	97,635	242,443	340,078

Source : Cross 1980

The production levels shown in Tables 2 and 3 are derived from Community averages and conceal certain important factors such as oyster production in France, which in terms of value accounts for between a quarter and a third of all marine production, and the situation in the Netherlands, where the yields from mussel culture are greater than those of any other species. In addition, it has been predicted that the quantities of salmon farmed in the Community will soon exceed the quantities netted, just as Community trout production originates almost exclusively from intensive farming. Recent forecasts on eel-farming indicate that it will be possible to replace the bulk of the 5,000 tonnes of eels presently imported by the Community with eels reared in the Community.

Like the fishing industry, aquaculture encourages the development of a wide range of related activities (for instance the manufacture of tanks, pumps and hatchery equipment), albeit on a much more limited scale. Nevertheless, it could acquire considerable economic importance in certain zones of the Community, especially in regions such as the north and west of Ireland, North-west Scotland and the Italian Mezzogiorno.

### 3 - THE MAJOR SPECIES FARMED

Without going too deeply into the more technical aspects, it seems interesting to analyze the species most commonly produced in the Community in an attempt to characterize each one in terms of yield, technical and economic factors and the nature of the market.

#### Rainbow trout

The rainbow trout is without question the species most frequently farmed. It accounts for more than 75% of Community finfish production, i.e. excluding shellfish and crustaceans. The production techniques are now well established and production itself takes place entirely in fresh water. The fish are normally marketed when they reach a weight of about 150-200 grammes; the young fish are transferred to the sea for marketing by the following summer. The main advantages of extending the production of rainbow trout to sea water lie in the relatively rapid growth and the high quality of the fish, in terms of both taste and colour.

The biggest technical problems still to be solved concern the summer spent in the sea, the reduction of deaths from disease and ways of retarding maturation.

From the economic point of view, returns on rainbow trout production are guaranteed under two conditions:

- the absence of serious diseases with high death rates and
- the absence of marketing difficulties: the abundance of the product in the late spring and the lack of a producers' organization or suitable marketing structures for frozen fish may in effect create problems with respect to market outlets. There is at present a certain amount of intra-Community trade in fresh-water trout, but the production of salt-water trout would have to be developed in order to guarantee market presence more effectively and hence, by ensuring greater regularity of supply, increase market potential.

### Salmon

Because catches of wild salmon have declined sharply since 1975, artificially reared salmon have provided an important supplement to production, due above all to the surprising results which such farming has achieved. The Norwegians, for instance, who are pioneers in this sector, now produce over 15,000 tonnes of salmon per year. Salmon rearing in the Community, has considerable potential for expansion, provided that certain technical and biological problems are solved.

The principal technical problem concerns the supply of eggs. Although there are a number of production centres, mostly in the United Kingdom<sup>1</sup> and Ireland, egg production remains concentrated, above all in the United States from where the producing countries import the eggs. In the absence of self-supply in eggs, this dependence rules out long-term development projects for this species. On the other hand, all the farming techniques have been largely mastered and, as in the case of the trout, a part of the salmon's life cycle is spent in the sea.

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The UK is self-sufficient in salmon eggs

PE 86.044/fin.

From the economic point of view, high returns on salmon rearing are possible, given the size of the market. One need only think of France, which imports 15,000 tonnes of salmon each year.

### Carp

Of all fresh-water species, the carp is held to be the one most commonly farmed. According to FAO figures for 1978, world carp production exceeded 300,000 tonnes for the year. The breeding cycle normally takes place in semi-intensive pools and is controlled by the administration of hormones.

The success of carp farming depends on the quality of the breed stock. For this reason, research should be concentrated on maintaining a breed stock with favourable characteristics such as a large increase in weight, a high food conversion rate and resistance to disease.

As far as the commercial aspect is concerned, it should not be overlooked that there are various species of carp and some are more sought after on the market than others. A further advantage of carp farming is that it can be conducted within a multi-species system (see below).

### Eels

Eels, like other species, breed in a marine environment and can be reared equally well in salt or brackish water, or in fresh water. The natural breeding cycle still forms the basis for eel farming, since attempts to transfer the cycle to an artificial environment have not progressed beyond the experimental stage. Community eel production is concentrated chiefly in Italy, which uses the traditional method of 'vallicoltura' (lagoon aquaculture). The greater part of the farming is therefore extensive or semi-extensive.

There are many possibilities from the commercial point of view, and demand from Japan is particularly strong. Ideally, eels should be marketed at a weight of about 300 grammes and the price obtained is normally sufficient to justify investment in the sector.

Anyone studying General Table No. 4, which details Community aquaculture production, cannot fail to be astonished by the large number of species farmed on a fairly small scale.

### Others

Finally, approximately 10% of farmed fish production is taken up by species which have performed well in tests, such as the sea bass, the turbot and the lobster, but which have yet to be exploited on an intensive industrial basis. The background factors outlined above also apply to these species: namely, and in particular, a decline in catches of wild fish in general and a high market value of the product, which still has considerable development potential in this field.

### Shellfish farming

The other major sector which is currently being developed intensively in the Community is shellfish farming. Its total production is much higher than that of finfish farming, and virtually all the Community countries are involved in the development of the sector, which yields good commercial results.

The production of shellfish is extremely vulnerable to the problems arising from pollution, since these species are filter feeders and therefore require a particularly pure environment.

It is difficult to determine whether shellfish farming in the broadest sense can be regarded as a growth sector, but there is nonetheless a traditional and extremely stable market for the product.

It should also be added that shellfish farming does not demand large-scale investment and the commercial value of the products guarantees high economic returns.

#### 4 - THE COMMUNITY AND AQUACULTURE

Although aquaculture is low on the list of the Community's budget priorities, it has received a degree of attention from the Commission, which has - at least since 1978 - backed its development.

However, the effectiveness of the Commission's efforts has been considerably hampered by various obstacles: firstly the limited amount of funds devoted to this sector and secondly the provisional nature of the initiatives, a result of the uncertainty surrounding Community fisheries policy.

Although the first obstacle clearly remains, it can also be argued that the introduction of a definitive fisheries policy and the need to encourage new activities to help in the development of what are now marginal areas may lead to subsequent increases in the budgetary funds devoted to the sector.

Since 1978, the Commission has, not without success, endeavoured to promote the development of aquaculture in the Community.

To summarize, albeit briefly, the stages of this process:

Aquaculture was included among the proposals relating to structural policy in the fisheries sector, submitted by the Commission in July 1980. Although the package as a whole was not adopted, owing to fundamental differences between the United Kingdom and its partners over the adoption of a European fisheries policy, it was recognized that provisional and simplified action was needed, to allow European aquaculture to move beyond the experimental stage, to which it had almost always been confined. This recognition produced a series of provisional regulations covering the restructuring of in-shore fishing and aquaculture. These regulations - four in all - covered the period up to 1983, or more precisely 25 January 1983, when the ten Community Member States reached an overall agreement on fisheries policy.

The fact that finances and support continued to be granted to aquaculture even during a transitional period when the adoption of a long-term structural policy was nowhere in sight, gives some measure of the interest and attractiveness of the sector, as well as proving that the Community has recognized its importance.

The first Council Regulation, No. 1852/78, specified appropriations of 5 million ECU for 1978, payable from the EAGGF, as a financial contribution to aquaculture development projects in regions suited for this activity. These projects were to include the construction, fitting out and modernization of aquaculture installations designed for the commercial rearing of finfish, crustaceans and shellfish in salt and brackish water. This regulation was extended in 1979 and 1980 by Council Regulations Nos. 592/79 and 1713/80, which increased the appropriations from the original 5 million to 15 million for 1979 and 20 million for 1980. If these figures are taken together with the appropriations provided for fresh-water aquaculture under various regulations on agricultural structures, notably Regulation No. 17/64, then the total appropriations allocated to aquaculture up to and including 1979 amounted to 11,000 million, distributed as shown in Table 4.

Table 4 : Appropriations for operations up to and including 1979

Member State	No. of projects	Amount contributed
Germany (FR)	3	2,627,000
Belgium	1	33,000
Denmark	1	6,000
France	5	1,314,000
Ireland	9	892,000
Italy	16	6,045,000
United Kingdom	<u>6</u>	<u>445,000</u>
TOTAL	41 =====	11,362,000 =====

The main criticism levelled at actions of this type is that they are provisional and therefore not suitable for encouraging the uniform development of the sector. This criticism is also expressed in the European Parliament report referred to above, the CORRIE report, Doc. 1-116/79, which first raised the problem of a global approach to aquaculture, moving beyond provisional measures, and then proposed a series of actions aimed at encouraging the development of the sector. For instance, the report already recognized the need to introduce programmes to encourage and coordinate research, centred in particular on the identification and prevention of diseases with high death rates.

The report also emphasized that regional planning measures to promote the establishment of marketing structures were essential, in order to provide market outlets for aquaculture production, thereby extending the benefits to consumers.

In response to Parliament's initiative, the Commission submitted in July 1980 a communication which, in addition to sea fishing, also covered aquaculture. Taking as its premise the fact that aquaculture had reached a satisfactory stage of development, especially in cases of shellfish farming and the breeding of species with a high commercial value, while there was considerable potential for expansion, mainly in regions where aquaculture had not been sufficiently developed, the Commission undertook to open up new possibilities in these regions, by proposing financial contributions to projects involving the construction, fitting up and modernization of installations designed for the rearing of finfish, crustaceans and shellfish and making provision for assistance and training centres and scientific and technical research establishments in the aquaculture sector.

The system of financing envisaged for this sector was modelled on that already established in certain agricultural regulations and therefore included multiannual guidance programmes into which the individual projects were to be incorporated. In its proposals, the Commission placed suitable emphasis on scientific research and the need to use joint Community structures for the dissemination of research findings. The proposals contained the following elements:

- a procedure for the regular exchange of scientific, economic and financial information concerning national fisheries research activities,
- procedures for the coordination of national research activity and for contacts between coordinators,
- the promotion of a series of common programmes, following the identification of the various fields in which the Member States have not yet developed any research activity or not developed it in a manner commensurate with their importance.

A third important aspect of the Commission's proposals concerned the financing of investment to launch pilot projects designed to guide and develop production within the framework of national programmes.

Although the situation remained blocked for a long time, the Council, in response to concerted pressure from the Commission, the European Parliament and public opinion in general, finally reached an overall agreement on fisheries policy on 25 January 1983. It was decided on that occasion that an appropriation of 38 million ECU would be granted over a period of three years for aid to aquaculture and the construction of artificial reefs to help boost fish stocks in the Mediterranean.

Although this agreement marked an important step forward, we are still awaiting the implementing regulations which will finally enable the measures in respect of aquaculture and artificial reefs to be established on a more permanent basis.

We can only urge the Council to apply as soon as possible the decisions already taken and hence initiate practical Community policy in this sector, by providing for EAGGF assistance over the next three years for the construction of 26 aquaculture installations and 19 artificial reefs.

This is the philosophy underlying this document which, as stated at the beginning, sets out to be realistic and is in a position to do so, given that the basic decisions have already been taken; the aim is therefore to give impetus and direction to the initiatives which may contribute to the economic development of various regions in Europe.

It is interesting to analyse the expenditure in this sector over the years, especially during the period of validity of the provisional measures (Table 5).

**Table 5: EAGGF assistance granted to aquaculture (including fresh-water aquaculture)**  
(in million ECU)

MEMBER STATE	1971 - 1977			1978 - 1982			1971 - 1982		
	No. of projects	Amount	%	No. of projects	Amount	%	No. of projects	Amount	%
Germany	3*	2.627	44.4	-	-	-	3	2.627	11.5
Belgium	-	-	-	1*	0.033	0.2	1	0.033	0.2
Denmark	-	-	-	1	0.007	0.1	1	0.007	0.03
. Greenl.	-	-	-	-	-	-	-	-	-
. Metrop.	-	-	-	1	0.007	0.1	1	0.007	0.03
Greece	-	-	-	2	0.640	3.8	2	0.640	2.8
France	5	1.314	22.2	5	2.035	12.0	10	3.349	14.7
. Overseas Depts.	6	-	-	1	0.324	1.9	1	0.324	1.4
. Metrop.	5	1.314	22.2	4	1.711	10.1	9	3.025	13.3
Ireland	4	0.251	4.2	14	2.429	14.4	18	2.680	11.7
. Irl.	4	0.251	4.2	14	2.429	14.4	18	2.680	11.7
. West Irl.	-	-	-	-	-	-	-	-	-
Italy	5	1.553	26.2	31	10.588	62.6	36	12.141	53.2
. North	3*	0.729	12.3	17	1.896	11.2	20	2.625	11.5
. South	2	0.824	13.9	14	8.692	51.4	16	9.516	41.7
Netherlands	-	-	-	1	0.043	0.2	1	0.043	0.2
United Kingdom	1	0.177	3.0	19	1.131	6.7	20	1.308	5.7
. Eng+Wales	-	-	-	3	0.077	0.4	3	0.077	0.3
. Scotland	1	0.177	3.0	14	0.391	5.3	15	1.068	4.7
. N. Irl.	-	-	-	2	0.163	1.0	2	0.163	0.7
<b>TOTAL</b>	<b>18</b>	<b>5.922</b>	<b>100.0</b>	<b>74</b>	<b>16.906</b>	<b>100.0</b>	<b>92</b>	<b>22.828</b>	<b>100.0</b>

\* in fresh water

Source: EAGGF financial reports

The table shows a marked increase in Community assistance during the second period, 1978-82, compared with the first period, 1971-77. One extremely positive factor to emerge is the large proportion of funds, something over 54%, allocated to the Italian Mezzogiorno, a peripheral and under-developed region, which often has difficulty in making good use of Community funds. Nevertheless, despite the fact that the actions to date have been conducted in the absence of a genuine long-term common fisheries policy, the situation should change, and it is in this area that Parliament's report wishes to contribute, acting as a stimulus to this change and helping to ensure that the Community is at last equipped with an instrument to promote aquaculture.

Another encouraging aspect has arisen from the inauguration of the Mediterranean programmes, which include aquaculture and for which considerable appropriations (214 m ECU) have been earmarked over the next five years, divided among the three Member States to which the integrated Mediterranean programmes apply.

Before concluding this section on the Community and aquaculture, something needs to be said on the subject of theoretical and applied research.

The development of aquaculture on an economically viable basis is highly dependent on the progress achieved by research in this sector, which is still in its infancy. It should be added that research is one of the areas in which a contribution by the Community in the fields of coordination, the dissemination of information and also, at a later stage, in European centres for the distribution of eggs and larvae, may play a decisive role in developing the sector to meet the food needs of the Community and possibly also of other countries.

It is therefore most regrettable that the Council, on 25 January 1983, postponed consideration of the Commission proposal for a Community action on the coordination and promotion of fisheries and aquaculture research, even though it recognized the value of such research in the full achievement of the objectives of the common fisheries policy.

Although it may be argued that substantial developments are likely in the years to come, the present state of aquacultural research certainly leaves something to be desired.

At present, two Directorates-General of the Commission are responsible for research: DG XIV, Fisheries, which incorporates a Scientific and Technical Committee, and DG XII, Research, Science and Education, which deals with aquaculture within the framework of the COST (scientific and technical cooperation) programme, in which non-Community countries are also involved.

This division of responsibilities is unsatisfactory; it does not seem logical to divide up a sector whose funds are already limited and, in the opinion of the draftsman, the entire research sector should be controlled and managed by the Directorate-General for Fisheries.

Furthermore, Community action is vital especially as regards the contacts which must be maintained with the national research establishments in the various countries, and it is therefore essential for it to present an efficient image to the outside world and prove its capability of making its expertise available to those active in the sector.

## 5 - THE DEVELOPMENT OF THE PRINCIPAL PRODUCTION TECHNIQUES

Aquaculture should be understood as the production of finfish, shellfish or seaweed on a commercial basis and as such may help cover the protein requirements of the population. The advantage of this economic activity is that it has not yet been exploited to saturation point, and it therefore retains a certain potential which may make a significant contribution towards meeting future food needs.

In addition, as a result of the most recent production techniques which have already been perfected and must now be applied, the development of aquaculture may become a source of ecological benefit, without entailing excessive wastage of energy. This is due to the fact that the studies on aquaculture techniques were conducted at a time marked by an acute awareness of ecological and energy problems. To prevent wastage of energy, the food chain created must arise from the shortest possible production process. The process must in addition be largely autogenous and hence allow the re-integration of unwanted by-products for the purposes of further production. Aquaculture may also become a positive ecological factor, since it enables a productive balance to be established in monitored production zones.

To give a definition of aquaculture, the activity may be considered to comprise all human actions which attempt to increase the natural productive capacity of a given site and influence the characteristics and frequency of the species offering commercial interest. In most cases, such intervention takes the form of introducing pre-selected juvenile organisms (fry) in quantities suited to the bio-genetic capacity of the chosen site.

The main activities associated with aquaculture can be subdivided into four sectors: seaweed production, shellfish farming, crustacean farming and finfish farming.

- the production of seaweed: the production of seaweed or aquatic plants is a form of aquaculture with a high energy yield. It is particularly advanced in Asia, especially Japan, and, although European biologists are in possession of all the relevant documentation, virtually non-existent in Europe, despite the fact that it has a key role to play in the

development of a modern aquaculture sector. In addition, while the potential importance of seaweed in the pharmaceutical sector and in the human diet, among other things as a source of protein, should not be underestimated, it should not be forgotten that national production of aquatic plant biomass can be instrumental to the development and establishment of finfish farming in brackish water, while in the case of sea water aquaculture it is capable of achieving notable results in terms of yield.

- shellfish farming: shellfish farming, and in particular mussel culture, is one of the most common forms of aquaculture and offers considerable scope for increasing production. The extensive sites available in Europe, the easy harvesting, the relatively low capital costs, the high yields of the various species and the existence of a ready-made market capable of absorbing large quantities of products are all factors which would seem to favour an expansion of this activity. Furthermore, as in the case of seaweed, shellfish farming is of interest as a source of feed for numerous species of finfish, because it would enable products unfit for human consumption on grounds of health, and in particular water pollution, to be used in other production processes.
  
- crustacean farming: given the present state of knowledge on the feed requirements of farmed and wild crustaceans, it can be assumed that this type of production remains particularly costly in terms of energy. In most countries, intensive crustacean farming does not figure among the activities normally undertaken, largely for economic reasons, since production costs are markedly higher than the usual market prices. The fact that the production techniques are relatively familiar and extensively used in some countries, particularly Japan, does nothing to alter this situation. Japanese farming, which has the reputation of being more efficient and the most highly perfected, can yield up to 600 grammes of crustaceans per square metre, on what are incorrectly termed extensive sites; with highly specialized installations, which have not so far progressed beyond the experimental stage, it is possible to obtain yields of 1.7 kg per square metre. Such a level of productive capacity is still low by today's standards and not encouraging from a commercial point of view. The cost-returns ratio in relation to the surface occupied, capital costs, the necessary labour, the food conversion coefficient and the

potential market price, remains unfavourable. Despite this, crustacean farming continues to be the subject of studies and research and may even acquire a role, albeit not a decisive one, in semi-extensive mixed systems, which attempt to recreate a balance by combining various species of fish which can coexist at the same time and in the same place.

- finfish farming: finfish farming is unquestionably the principal object of the efforts and hopes to increase protein production to meet human needs in the near future. The three farming methods most widely used are:
- . the extensive method in which the natural environment supplies all the feed requirements of the species farmed,
  - . the intensive method in which feed requirements are met entirely by outside sources,
  - . the semi-extensive method in which the natural resources of the environment are supplemented, especially with food from outside.

Each method has its advantages and disadvantages. The extensive method ensures maximum exploitation of natural productive capacity, with the inevitable result that yields are lower in proportion to the surface used. The intensive method on the other hand can produce extremely high yields, but without utilizing in any way the specific productive capacity of the natural environment.

Finally, the semi-extensive method offers a compromise between the two other systems.

There is an extremely lively debate going on in scientific circles as to which of these three methods should be given priority. The main feature of extensive farming is that it is based on a favourable energy balance. While it retains a certain degree of commercial viability, it requires smaller inputs of energy and capital. Conversely, the essence of intensive farming lies in its high degree of commercial viability, obtained, however, at the price of an entirely disadvantageous energy balance. The fact that in intensive finfish farming specialized in breeding carnivorous fish, between 5 and 7 kilogrammes of feed are needed to produce just one kilo of fish, albeit with a high commercial value, is sufficient to prove the point.

At the time when we, the European Parliament, are concerned with this important problem, this consideration should not be overlooked. The Commission may have a role to play here and we ourselves can, through the budget, direct a proportion of funds into intensive research on ways of using vegetable protein or trash animal protein for feed, thereby both reducing the energy costs of the intensive farming of carnivorous species with a high energy consumption, and increasing the yield of extensive farming.

An example of extensive aquaculture: artificial reefs.

Among the newest methods employed for the development of aquaculture, especially extensive sea-water aquaculture (also called mariculture), are artificial reefs, which are already used widely in the United States and Japan. At the existing centres, particularly in the United States on the coasts of California, Florida and Carolina, as well as in Japan, it has been observed that the numbers of fish and other useful organisms are increasing. Initiatives to build artificial reefs have become so commonplace that small guidebooks are now on sale: these contain the necessary information on building reefs and cover both practical methods and the various administrative and bureaucratic formalities.

Experiences in other countries more advanced than ourselves in this sector have shown that reefs have been constructed either on the initiative and with the financial backing of public bodies (the state, local authorities), in collaboration with anglers' associations, or alternatively by the fishermen's associations themselves. One interesting aspect of the situation in Japan is that coastal waters are administered in exactly the same manner as agricultural land. Any organization or cooperative of fishermen which wishes to be granted exclusive fishing rights in a given zone may submit an application to the authorities. The fishermen themselves are therefore principally responsible for construction and management in the zone bounded by the reefs; the zone thus becomes their private fishing ground and fish farm. State aid is normally granted for the initial installations. For example, the Japanese seven-year plan for 1976-1982 included expenditure of 200,000 million yen in support of the undertakings exploiting the coastal waters and for the installation of reefs.

These considerations serve to underline the relevance of certain problems of a legal and fiscal nature, which were raised in clear and precise terms in the Corrie report and demand a Community effort to ensure a uniform solution in the various countries.

There is a particular need to define the rights of ownership in respect of fish reared in the sea and define rules on the granting of licences for the exploitation of specific maritime zones, the size limits for fish offered for sale and possibly the marketing periods.

The approximation of laws in this sector would be one Community measure which, though costing nothing in budgetary terms, could have a beneficial impact on the sector. Such harmonization should also cover certain fiscal aspects, to prevent distortions to competition from arising even at the outset.

These brief remarks on the development of economic activities of this type in countries outside Europe, and especially Asia, must not give the impression that such activities are entirely absent and unknown in Europe. It is more accurate to say that in Europe, in most European countries, they are conducted on an experimental, rather than commercial, basis and are in any case not yet ripe for an economic exploitation on a par with their considerable potential.

It is important to emphasize that major research centres are devoting a certain amount of attention to these installations, especially centres with Mediterranean interests, since this maritime zone is regarded as particularly suitable for such installations; it is no coincidence, and we have already pointed this out, that the Commission has assigned an important role to aquaculture in its proposal on the integrated Mediterranean programmes.

One can quote as an example the following assessment of the problems and results which emerged from the experiments with artificial reefs conducted by the Ancona-based Istituto di Tecnologia della Pesca (institute of fisheries technology) and was submitted to the FAO General Fisheries Council for the Mediterranean:

A - The annual yield of mussel biomass was of the order of 150-200 tonnes. The average yield per surface unit was 80-100 kilogrammes per square metre. The yield of biomass from oysters was extremely high.

B - This zone has become one of the most reliable areas for small-scale fishing. The installations offer effective protection from the effects of trawling, because dragnets can easily become entangled in the artificial pyramids.

C - Species presenting considerable economic interest, such as shellfish, cephalopoda and crustaceans, were attracted to the artificial reefs, because they were able to find suitable food and shelter there.

D - At current prices, and taking account of the value of the fishing grounds, mussels etc., the cost of the reef can be recovered in as little as three years. Because the reefs, the site of the experiment, were not under surveillance, with the result that the resources which collected there were treated as common property and fished out indiscriminately by professional and amateur fishermen, it was not possible to measure these resources accurately or conduct research into management methods.

E - The researchers believe that it would be useful to expand the initiatives on an industrial scale in areas where experiments have produced good results.

F - Finally, it is vital that rules be laid down to govern all these activities and ensure that the holders of concessions for stretches of coastal water suitable for mariculture are made legally responsible for the construction, exploitation, supervision and management of artificial reefs and the re-stocking zones which these would create.

The reason for putting forward these considerations, which have the merit of being drawn from practical experience, lies not so much in the fact that mariculture could provide a solution to the food problem and many of the ills besetting European fisheries, but rather that this sector still seems to offer considerable potential, which could be exploited to good effect, given the aid and widespread employment of certain breeding methods and the related financial backing from the Community.

## Intensive aquaculture

Various technical problems hamper intensive aquaculture. The first and most important concerns the supply of fry, which is not yet fully under control. Until the scientific breeding structures are in a position to distribute larvae for rearing to the production centres at given points in the year, the intensive farming of sea bass, gilt head bream, sole and mullet will not be possible on a commercial and profitable scale.

This has led to an intensified research effort in all the sectors connected with the production of larvae: namely the physiology of reproduction, the development and nutrition of larvae, the genetic aspects and genetic manipulation. These aspects are particularly important insofar as they represent a potential field for Community action, and this could encourage the establishment of larva production centres, limited in number but highly specialized, which could supply farms throughout the Community and guarantee the regularity and quality of supplies. Viewed from this angle, Community action could assume an important role in the development of the sector.

Once this problem is solved, which is clearly proving difficult, there are two possibilities as regards production techniques:

- intensive farming in inshore tanks with pressure water circulation,
- breeding in floating or submerged pens with natural water circulation.

These possibilities differ in terms of the space occupied, the technical installations needed and the impact on the natural environment.

### - Inshore tanks with pressure water circulation:

The problems surrounding this intensive production system are fairly well known, both from the technical point of view and as regards production planning. This system may be regarded as the most traditional method of salmonoid and eel farming. The tanks form a preserve for the fish, while oxygen, feed and waste matter are carried in the water. Given that the cost of the pumping system represents only a minimal proportion of the total capital outlay, estimated at about 5%, a wider use of this farming method would be possible, especially since in this case the major pre-occupations concern not only the energy balance of production but also,

and above all, the yields obtained. Production structures of this type, though already developed in other countries, have not yet been employed in Europe.

- Multi-species farming in pools: one farming technique which has met with a degree of success in various countries (China, Hungary, Israel, India), but does not seem particularly advanced in the Community is multi-species farming. This is based on the principle of bringing together in a single farming environment several species of fish capable of utilizing different levels of the food chain. High yields can in fact be obtained by bringing together species of non-predatory fish with distinct feeding habits.

Multi-species farming lies halfway between the natural ecosystem, in which the flow of energy is split up among various elements of the system, and specialized cultivation where the flow is, on the contrary, concentrated on a single species.

Under a multi-species system, it has proved possible to double yields by comparison with specialized cultivation, without manipulating the breeding processes. The principal difficulty in the development of multi-species farming lies in the choice and numerical ratios of the different species to be bred in the pools. It might be useful to devote further study to this particular activity, which could open up an additional source of income, without entailing high energy or running costs.

- Floating pens: these are a new concept in sea-water aquaculture. We have seen how, in an extensive system of production, artificial reefs can increase the productive capacity of large stretches of water: floating pens are considered to be the equivalent of artificial reefs in an intensive system. The techniques for rearing fish in floating pens are extremely varied and certain traditions have already grown up. The development of the technology in this sector is in fact sufficiently advanced so as not to create excessive problems for the development of intensive aquaculture, provided, however, that attempts are not made to seek technical solutions in the narrowest sense to problems which, though of a technical nature, are also, and primarily, of a biological nature. One of the obstacles encountered is the low labour productivity. Because production processes in floating pens are

largely unsuitable for mechanization, labour productivity seems low. Nevertheless, this aspect need not detract from the importance of developing intensive aquaculture, especially in areas where there are large reserves of labour which can be employed, on a part-time basis, to monitor the pens or feed the fish. Indeed, this type of activity, which takes place principally in the sea, may assume an important role as a complement to traditional fishing. It should not be forgotten that certain operations which take place in the sea, such as checking artificial reefs or even more so feeding in pens, require the skills of the fishermen, whereas in the case of in-shore pools and tanks, it is the skills of the technician and the manual worker, rather than those of the fishermen, which are the most useful.

This consideration, namely the part-time employment of fishermen, becomes particularly important in the light of the general problems of the fishing industry, and especially the gradual and temporary slowing down of activity in sea fishing, necessary if only to encourage biological regeneration.

Mariculture, whether intensive or extensive, especially if managed directly by fishermen or their organizations, may prove to be an important source of additional income and a means of maintaining employment in a sector which is already suffering the effects of something rather more than a latent crisis.

Another problem associated with the development of seawater aquaculture is the health aspect: a global approach should be adopted in the breeding zones, to ensure the foolproof identification of disease in fish. This too is an activity which could in certain respects benefit from coordination at Community level, and the Community should not miss the opportunity to encourage the coordination and centralization of certain methods for the prevention of diseases affecting breed stock. The lowering of the rate of mortality at the development stage, which is still high, is essential for increasing the yields from breed stock.

To conclude this section on the methods and techniques of aquaculture production, it must be said that there is a common philosophy underlying all the modes of production. The basic aim remains an increase in the productive capacity of the aquatic environment by means of cultivation techniques such as artificial reefs or intensive aquaculture. In addition, the development of aquaculture is not only dependent on the development of certain technologies and progress in biological knowledge, it also requires improvements in other fields such as professional organization, the legal and financial aspects, marketing, conservation of the environment and the coasts. Parliament's report does not therefore intend to confine itself to the various technical aspects, but wishes to raise all the related problems, including, in the words of a previous report adopted by Parliament (the GAUTIER report on Community fisheries policy in the Mediterranean), the question of coastal planning for the rationalization of industrial activities, tourism and fisheries.

Particularly in the case of sea-water aquaculture, biologists believe that the Mediterranean offers considerable development potential, even if, as a necessary pre-condition, certain problems will have to be solved relating both to the production of fry for rearing sea bass, gilt head bream, mullet, lobsters, oysters, mussels and clams, and to the control of disease and other health and veterinary factors which, as stated above, are still the cause of high death rates among breed stock.

The conviction remains that the Community, and especially the Commission could do much more for the development of aquaculture. This does not necessarily imply a financial commitment. The action should mainly take the form of encouraging the circulation of information, the harmonization of legislative and fiscal provisions and the involvement of public bodies and fishermen who are, broadly speaking, most directly concerned by the development of aquaculture.

## 6 - AQUACULTURE AND THE ENVIRONMENT

Opinions are sharply divided as to the effects of pollution on fish farming in general. Without wishing to embark on a detailed consideration of this problem, which is an extremely complex one, it would nevertheless be useful to at least touch on the principal aspects.

The problem covers three distinct types of pollution:

- a - pollution of inland or sea waters caused by chemical substances,
- b - pollution of inland or sea waters originating from organic substances,
- c - pollution caused by aquaculture itself.

Given the lower quality of inland waters and, in many cases, their comparatively low rate of circulation, it is obvious that pollution there is a problem of greater magnitude, with a higher destructive potential, than sea water pollution.

Of all the forms of pollution, it is chemical pollution which is the most widely known, and it is in this field that the most extensive documentation is available, detailing the effects of certain substances on aquatic fauna and flora, in both fresh and salt water. In 1973, the Community, wishing to monitor and protect its waters, issued its first directives on substances; there is also a 'blacklist' which stipulates maximum permitted concentrations for a number of substances. Awareness that chemical substances are a potential source of pollution is thus fairly widespread within the Community, but there is rather more uncertainty surrounding the effects of organic substances on fauna, whether wild or reared in captivity. Indeed, some theories assert that these organic substances are entirely beneficial to the aquatic environment as a whole, since they stimulate the life-sustaining processes which take place there. The growth of seaweed, a source of feed for fish and crustaceans, provides tangible proof of this. According to other theories, the introduction of excessive quantities of organic substances is in itself a form of pollution, because it modifies the particular biological balance which has been established within the aquatic environment.

The third form of pollution is that caused by aquaculture itself, and in particular sea water aquaculture. It seems beyond reasonable doubt, and those operating in the sector acknowledge this, that a certain quantity of organic waste will be produced as a result of the intensive farming of fish in floating pens. The profession's concern, to which the draftsman wishes to give voice, is twofold. Firstly, there is the fear that the absence of suitable rules could result in excessive pollution by organic substances. Secondly, there is the fear that, in coming years, when sea water fish farming has acquired greater importance than it has at present, obstacles might be put in the way of its development, which could have a decisive bearing on its ultimate success.

In the opinion of the rapporteur one of the advantages of taking action to combat organic pollution in inland or sea waters lies in the fact that this is a relatively unexplored field, untouched by specific national laws or legal precedents. A strategic role would thus seem to fall to the Commission, which could propose a series of harmonized rules to settle the problem once and for all, and also provide both technical support and back-up for analysis and the guarantees which the economic operators need if they are to commit themselves to developing what may become an important element in Europe's future food supplies.

In conclusion, there are certain aspects of the relationship between aquaculture and the environment which need to be examined in more detail. If aquaculture is to have a beneficial impact on the environment, the following three conditions must be fulfilled:

- (a) farming must be conducted on an economically rational basis, which could be achieved by, among other things, exploiting the existing resources of the marine environment as far as possible for the purpose of obtaining feed,
- (b) the biological balance of the environment must be maintained by recycling its nitrogen and phosphorus, to avoid contaminating the water or increasing its entropy,
- (c) suitable rules must be adopted to prevent foreign and harmful chemical substances from being introduced into the food chain.

## 7 - AQUACULTURE AND RESEARCH

If aquaculture has not yet found its rightful place in the Community, this is arguably due, at least in part, to the fact that research in the sector has not progressed very far and does not guarantee a return on investment.

When he visited various aquacultural installations, the rapporteur was able to see that there are certain problems which have yet to be solved, problems of a bio-genetic nature, on the question of breeding the right species in the right places, and problems in determining which feed is most likely to ensure acceptable growth rates for breed stock. The Community is clearly not a complete novice in the field of aquacultural research, and one can even say that there are various centres throughout the Community which have already reached a certain level of development. Nevertheless, given the magnitude of the problems and the potential of the sector, it seems essential that the Community, and especially the Commission, should undertake to coordinate research, with a view to introducing a degree of specialization and harnessing efforts in a fashion most likely to yield practical results.

It is also important in this connection that contacts and relations between basic research, applied research and the relevant sector of the business community should be as close as possible. To take just one example : the eggs used by most of the breeding centres have to be imported from countries which are more advanced in this sector. On the other side, it can be seen that egg production centres are currently expanding their commercial operations at a considerable rate, so much so that techniques have been perfected for transporting the eggs from the centres, of which there are very few in Europe.

The development of aquaculture in Europe is therefore also dependent on the quality of the research effort, especially in the production of fry. The Community could not only promote an exchange of information among researchers, which is to a certain extent already taking place, but also encourage the setting up of a small number of centres which would be able to cover the requirements of all the production centres in Europe.

As a first step in this process of centralization, the Commission should modify the division of responsibilities within its own departments, to ensure greater efficiency in the efforts to promote aquaculture. It seems difficult to understand why aquaculture, in itself not a particularly vast economic sector, should come under the responsibility of two different Directorates-General, the Directorate-General for Fisheries - DG XIV - and the Directorate-General for Research, Science and Education - DG XII.

That there is still a need for basic research in the aquaculture sector is an important and indisputable fact : DG XII would therefore still have a certain responsibility in this sector (and moreover, its interest is the most tangible guarantee of this). On the other hand, it seems impossible to deny that the research findings will be applied primarily to the economic activities which will develop in the sector. It therefore seems essential, to improve the viability of aquaculture, that supervision and management of the programmes should be the responsibility of DG XIV.

Motion for a Resolution (Doc. 1-1155/82)

tabled by Mr R.C. Battersby

pursuant to Rule 47 of the Rules of Procedure

on the development of Aquaculture and Mariculture in the Community

The European Parliament,

- A. having regard to the report on aquaculture presented by the previous Parliament in 1979,
  - B. whereas considerable progress has since been made in the fields of aquaculture and mariculture research and development,
  - C. whereas these sectors have made positive use of the results of applied research, thereby materially increasing fish yields,
  - D. whereas the development of aquaculture and mariculture can contribute significantly towards reducing the balance of trade deficit in fisheries products, towards supplementing sea fishing activity, and towards guaranteeing security of supply to the processing industry,
  - E. whereas considerable opportunities exist for developing aquaculture and mariculture in all maritime states of the Community; both in the Atlantic and Mediterranean regions,
  - F. whereas such development could result in expansion in both investment and employment in the less favoured regions of the Community, as has already been achieved to a significant degree in the USA and Japan,
  - G. considering however that technical, biological, commercial, legal and fiscal problems still remain in the fields of aquaculture and mariculture in the Community, and that their solution is essential if significant further development in this economic activity is to be achieved ,
  - H. considering moreover that at the moment research in aquaculture and mariculture in the Community and the distribution of the results of such research is not fully co-ordinated,
1. Calls on the Commission to take the necessary initiatives to encourage and co-ordinate research and development activity in the fields of aquaculture and mariculture, to co-ordinate the presentation and implementation of the results of such activity, and to inform the European Parliament fully and in good time;
  2. Instructs its President to forward this Resolution to the Council and the Commission.

OPINION

(Rule 101 of the Rules of Procedure)

of the Committee on Regional Policy and Regional Planning

Draftsman: Mr M. CECOVINI

On 27 May 1983, the Committee on Regional Policy and Regional Planning appointed Mr M. CECOVINI draftsman of the opinion.

At its meeting of 1 December 1983 the committee considered the draft opinion and adopted the conclusions unanimously.

The following took part in the vote: Mr De Pasquale, chairman; Mr Costanzo, vice-chairman; Mr Cecovini, draftsman; Mr Gendebien, Mr Griffiths, Mr Hutton, Mr Kazazis, Mr Muntingh (deputizing for Mr Hume), Mr Pottering, Mr Karl Schon, Mr Travaglini, Mr Von der Vring and Mr Ziagas (deputizing for Mr Nikolaou).

The Committee on Regional Policy and Regional Planning requests the Committee on Agriculture, as committee responsible, to take the following conclusions into consideration:

1. Is convinced that the economic, technical and market conditions exist for the development of aquaculture in general and mariculture in particular, in such measure that these fish-farming techniques could increasingly help to meet the Community's protein and food self-sufficiency requirements, reduce the trade deficit in fisheries products, supplement traditional fishing activities and help to combat the depletion of stocks in certain waters and the extinction of some species;
2. Is, however, of the opinion that, although aquaculture is a quite distinct technique that tends to obviate production hazards and the risk of depleting natural resources inherent in traditional fishing, it nevertheless remains complementary to the latter, with which it and has various aspects in common, such as the nature of the products and their market; an overall view must thus be taken of the problems of both sectors;
3. Believes that, as its various products can be used for food and other purposes, aquaculture could assume an important role primarily as an economic activity that offers an alternative and/or supplementary source of earnings not only in peripheral coastal areas, which are particularly suitable for mariculture, but also in other less-favoured mountain and hill areas with appropriate water resources;
4. Stresses moreover that this production technique can create jobs that will compensate, even if only partly, for jobs lost because of:
  - the decline in traditional fishing following the imposition of catch quotas,
  - and the fact that mountain and hill farming has become less profitable;
5. Emphasizes the importance of vocational training courses geared to the complexity and variety of technical, biological, market, etc., knowledge required by aquaculturists, whose profession is quite distinct from that of traditional fishermen, and calls, for the European Social Fund and the EAGGF Guidance Section, where appropriate, to encourage and finance aquaculture and ensure that advantage is taken of the most advanced technical and scientific developments;

6. Also believes that aquaculture-related activities, ranging from major infra-structure products (such as water management schemes) to the construction of pumps and tanks, can make a considerable contribution to the economy and employment;
7. Therefore fully endorses the request, made in the document under reference, that the Community encourage this sector, and believes that considerable progress has recently been made in this direction with the adoption of Regulation (EEC) No. 2908/83 of 4 October 1983<sup>1</sup> which, in addition to providing for the restructuring, modernizing and development of some fishing fleets, actually provides as well for the development of aquaculture, for which some 34 million ECU are being allocated over a three-year period;
8. Is particularly gratified that, pursuant to this regulation:
  - (a) for the purposes of Community financing, projects for the construction, equipment or modernization of installations for raising fish, crustaceans and molluscs must form part of the 'multiannual guidance programmes' drawn up by the Member States,
  - (b) those programmes must be consistent with measures to promote the harmonious economic development of the areas concerned and also with regional development programmes,
  - (c) priority will be given to the financing of pilot projects designed to guide and develop production and, where appropriate, the retraining of fishermen,
  - (d) when examining projects, the Commission is to take account of the beneficiary's membership of a producer organization and of environmental protection requirements,
  - (e) in the less-favoured peripheral regions the aid granted by the Fund may reach 50% of the permissible cost of the project rather than the usual 25%, but in that case the beneficiary's contribution will be reduced;

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<sup>1</sup> OJ No. L 290, 22.10.1983, p. 1 et seq.

9. Nevertheless calls on the Council to adopt as soon as possible, as was indeed specifically undertaken in the resolution of 25 January 1983 <sup>1</sup>, the proposal for a regulation submitted as early as 1980 <sup>2</sup> on the coordination and promotion of fisheries research, which provides for, among other things, joint programmes of research on aquaculture and improvements in the processing and preservation of fishery products for human consumption;
10. In this connection draws attention to the fact that, if aquaculture is to be a profitable and competitive form of production, improved feeding (for farmed species) at reduced costs and the prevention and early identification of diseases and the causes of mass mortality among the species farmed are matters of fundamental importance;
11. Whilst reserving final judgment until the ad hoc report is drawn up, is gratified to note that the Commission's proposals for integrated Mediterranean programmes (IMPs) <sup>3</sup> mark a further step in the Community's encouragement of aquaculture since they allocate some 214 million ECU, about two-thirds of total expenditure on fisheries, to aquaculture in what are among the Community's least-favoured regions;
12. Notes also that the IMP proposals include the following improvements to Regulation No. 2908/83:
- (a) a broadening of the range of projects eligible for financing <sup>4</sup>,
  - (b) the encouragement of technical assistance <sup>5</sup> and the recruitment of technical assistance <sup>6</sup>,
  - (c) the encouragement of advertising and market research <sup>7</sup>,
  - (d) increases in the percentage of the Community's contribution and reductions in the scale of financial contributions made by the beneficiaries <sup>8</sup>;

<sup>1</sup> OJ No. C 28, 3.2.1983, p. 1 et seq.

<sup>2</sup> COM(80) final, 24.7.1980, p. 94 et seq.

<sup>3</sup> COM(83) 24 final; OJ No. C 251, 19.9.1983; COM(83) 641 final

<sup>4</sup> Article 19 (1) and (2): COM(83) 641 final

<sup>5</sup> Article 19 (4): COM(83) 641 final

<sup>6</sup> Article 35a: COM(83) 641 final

<sup>7</sup> Article 22: COM(83) 641 final

<sup>8</sup> Article 19 (5) and (6): COM(83) 641 final

13. Nevertheless points out that the European Regional Development Fund should also encourage aquaculture by contributing not only to immediately productive projects that receive none of the above subsidies but also to infrastructures (e.g. roads) that will reduce the isolation of the peripheral coastal regions and those more immediately connected with aquaculture such as the major water management schemes needed to improve biological conditions in lagoons;
14. Is of the opinion that Community subsidies and loans (particularly EIB loans) should preferably be granted to small and medium-sized undertakings and producers' cooperatives;
15. With a view to developing the various forms and products of aquaculture in a balanced fashion compatible with the other activities for which water is an essential element, believes that, at least at regional and inter-regional level, an inventory of water resources should be drawn up together with plans for their rational management and optimum exploitation, with identification of the resources to be reserved, depending on the potential of the various localities, for tourism, industry, fisheries or aquaculture - this being essential also with a view to combating and preventing pollution;
16. As regards mariculture in particular, recalls the idea frequently put forward by the European Parliament of 'coastal planning', which, based on the above more general concept, could for instance lead to a system of licences granted to local producers' cooperatives to encourage the optimum use of the coasts and sea-water resources;
17. To this end, believes that the Commission should act on these requests made by the European Parliament in its resolution of 19 June 1981 on the problem of coastal erosion in the European Community <sup>1</sup> and the resolution of 18 June 1982 on the European Coastal Charter <sup>2</sup>.

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<sup>1</sup> OJ No. C 172, 13.7.1981, p. 124 et seq. - Report by Mr Hume: Doc. 1-830/80

<sup>2</sup> OJ No. C 182, 19.7.1982, p. 124 et seq. - Report by Mr Harris:  
Doc. 1-302/82

18. Stresses the considerable importance, as far as the production techniques under consideration are concerned, of measures to combat and prevent pollution of water resources in general and those of the sea in particular; with regard to the latter, it is worth remembering that the biological capacity of the waters of the Mediterranean has been severely impaired by this phenomenon, as well as by traditional fishing;
19. Believes that Community intervention in this field should be geared increasingly to the gravity of the situation and that, in the immediate future, this should at least be reflected by a strengthening of the Community measures taken under the following two budget headings:
- Item 6620: Community participation in the action plan for the Mediterranean,
  - Item 6621: Protection of the marine environment (particularly against pollution caused by hydrocarbons);
20. In connection with the remarks made concerning the Mediterranean, points out the particular importance of the first of the above measures, which constitutes in essence Community support for the action programme defined in the Barcelona Convention for the protection of the Mediterranean Sea of 16 February 1976<sup>1</sup> and the protocols annexed thereto, which inter alia provides for:
- (a) integrated planning of the development and management of the resources of the Mediterranean,
  - (b) a coordinated monitoring and research programme on pollution in the Mediterranean;
21. In this connection, makes an urgent appeal to the Member States which are signatories to this framework Convention (France and Italy) to comply strictly with their financial and other obligations;

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<sup>1</sup> Ratified by the Community on 16 March 1978

22. Calls also on the Community to contribute further to the measures to combat and prevent pollution by financing, also through the Regional Fund, the establishment of purification plants for waste to be discharged into the sea, particularly in large urban conglomerations such as Athens;
23. Lastly, again in connection with the protection of the marine environment, which is clearly of direct relevance to the quality and wholesomeness of the products of aquaculture, particularly when they are intended for human consumption, stresses the need for strict application of the scientific criteria laid down at Community level for the control of the quality of water.