



European Commission

# Fisheries research organisations and research programmes in the European Union, Iceland, Israel and Norway





European Commission  
Directorate-General for Fisheries

# **Fisheries research organisations and research programmes in the European Union, Iceland, Israel and Norway**

Coordinators:  
Jacques Fuchs (Ifremer) assisted by Pascal Le Floc'h (ENSAR))



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## FOREWORD

Almost every year since 1989, the directors of the fisheries and aquaculture research institutes of Europe have met to discuss research topics of common interest within the framework of the continuous development of the common fisheries policy. These meetings have largely contributed to better mutual understanding among European fisheries and aquaculture research institutes. Most important still, they have promoted cooperation among these institutes within the successive Community framework programmes in support of research and technological development (RTD).

The first meeting of the fisheries and aquaculture research directors (Fuengirola — Malaga, 22 to 24 May 1989) led to the publication of a review of fisheries and aquaculture research means and objectives in Europe. Ten years later, an update of this review appears quite timely and useful, to measure the progress accomplished so far, and to envisage ways to further reinforce cooperation among European fisheries and aquaculture research institutes. Furthermore, given the past enlargement of the European Union and of the European Community framework programme, this review had to be enlarged to include the 15 Member States as well as Iceland, Israel and Norway.

For each country, information about the marine resource industry context (harvesting, aquaculture, processing and of seafood consumption) is summarised. In a second part, research organisations are described, starting with the national and followed by the main research organisations. When available, their objectives and research programmes are briefly presented, as well as their involvement in scientific cooperation at national, European or international level.

In publishing this book the Fisheries Directorate-General of the European Commission aims at disseminating among — actual or potential — research partners the type of information that will promote the coordination of their research activities. It has thus adopted a catalyst rather than a directive role to facilitate the activities of its research partners, upon which rests the continuous development of the common fisheries policy.

The Fisheries Directorate-General of the European Commission wishes to thank MM. Jacques Fuchs (Ifremer) and Pascal Le Floc'h (ENSAR) for their major coordination work and to acknowledge the support of the national research institutes who remain responsible for their respective contributions.

Steffen Smidt  
*Director-General*  
*Directorate-General for Fisheries*





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## Introduction

The decision to publish a book presenting the fisheries research organisations in the European Union was taken during the sixth meeting of directors of fisheries research institutes held in Arcachon, France, in May 1995.

The report provides a description of fisheries research organisations and research programmes and a brief presentation of the sectors of fisheries, aquaculture and processing industry in each EU country. It reviews and updates a document edited by the Spanish Institute of Oceanography (IEO) in 1989 entitled '*l reunión de directores de organismos de investigación pesquera de la Comunidad Europea*'.

This publication aims to inform the scientific community, administration and private industry about research organisations and main research institutes involved in fisheries and aquaculture. It completes the European Directory of Research Centres in the Fisheries Sector, edited by the Commission in 1994, which focuses more specifically on a detailed list of all institutes involved in research in the fisheries sector.

All EU countries (except Luxembourg) plus three associated countries, Norway, Iceland and Israel, have contributed with a national presentation of their research scheme. Main research institute(s) is(are) listed first.

The document was coordinated by Ifremer, France in connection with a national focus point nominated in each country. The name and address of contributors are indicated here. Contributions were built on a unique format agreed by all participants and Ifremer provided to the Commission the support material for publication after harmonisation of the texts and validation by all contributors.

National contributions have been organised into two major parts.

The first part is devoted to a description of the fish industry including fishing, aquaculture and processing activities. Production data are given in thousand tonnes and valued in million euros. For 10 countries, exchange rates have been fixed since the 1 January 1999 (fixed exchange rate for EUR 1):

Belgium	BEF 40.3399	Spain	ESP 166.386
Austria	ATS 13.7603	Finland	FIM 5.94573
Portugal	PTE 200.482	The Netherlands	NLG 2.20371
Italy	ITL 1936.27	France	FRF 6.55957
Germany	DEM 1.95583	Ireland	IEP 0.787564

In the other cases, exchanges rates retained date from the 19 February 1999:

Exchange rates for Eur 1 (19/02/1999)	
Denmark	7.4346 DKK
Greece	322.1 GRD
Sweden	8.911 SEK
United Kingdom	0.6838 GBP
Iceland	771 ISK
Israel	1.1163 USD
Norway	8.7075 NOK

This conversion in euros makes for easier comparisons between the countries in the European Union and with associate members, such as Norway, Iceland and Israel. The disadvantage of this method is the omission of inflation and the conversion in constant prices cannot be operated with the European currency unit, euro, effective only since the beginning of this year.

**Disclaimer: Production data have been included in national reports by each contributor. They have not an official nature but these data have only an illustrative objective to make comparisons in thousand tonnes and million euros between the 17 countries. At the end of report, tables and graphs present the production structure in the fishing industry and the aquaculture industry in the European Union, Iceland, Israel and Norway.**

The second part presents the research organisation scheme in three sections. In the first section, national research organisations consist of an explanation of administrative relations between institutes involved in fishery sectors and supervisory ministerial authorities. As it is possible, information on budget and number of employees by institute is included. The main research institutes(s) is presented in a detailed manner in the second section. Generally, each country owns one main public research institute in the fishery sector (excepted Greece and Iceland where two main institutes coexist). Other research organisations are presented in the third section. Address, date of creation and status are given for each institute. Sometimes, detailed objectives and research programmes are outlined. For those institutes focused on marine resource, facilities at sea are described. An interesting point concerns scientific cooperation. This information appears according to the level of cooperation (national, bilateral European relations, European networks, Africa, America, Asia, international organisations).

A synthesis of production data in the European Union, Iceland, Israel and Norway and a list of acronyms are given at the end of the document.

## Introduction

La décision de publier un ouvrage présentant le dispositif de recherche des États membres de l'Union européenne dans le domaine des pêches a été prise lors de la sixième réunion des directeurs des instituts de recherche en halieutique qui s'est tenue à Arcachon, en France, en mai 1995. Cet annuaire décrit le dispositif de recherche halieutique des États membres et présente un bref état du secteur des pêches de l'aquaculture dans chacun d'eux. Il réactualise et précise les informations contenues dans l'ouvrage publié en 1989 par l'Institut espagnol océanographique (IEO) sous le titre «I reunión de directores de organismos de investigación pesquera de la Comunidad Europea».

L'objectif de cette publication est d'informer la communauté scientifique, les administrations et le secteur industriel de l'organisation de la recherche halieutique et de présenter les programmes des principaux instituts de recherche en Europe. Elle complète le répertoire européen des centres de recherche dans le secteur des pêches, publié en 1994 par la Commission.

Les quinze États membres (à l'exception du Luxembourg) auxquels se sont associés l'Islande, Israël et la Norvège ont participé à la rédaction de cet ouvrage.

La compilation des contributions nationales et leur mise en cohérence ont été assurées par l'Institut français de recherche pour l'exploitation de la mer (Ifremer) en concertation étroite avec un correspondant dans chacun des États concernés. Le nom et les coordonnées des contributeurs sont indiqués ci-après. Chaque contribution a été rédigée sous un format unique. Ifremer a fourni à la Commission un document final pour publication, après validation par l'ensemble des participants.

Chaque contribution nationale comprend deux principales parties.

La première partie est consacrée à une large description de l'industrie halieutique, incluant les pêches maritimes, l'aquaculture et la transformation. Des données de production, exprimées en milliers de tonnes et en millions d'euros, sont fournies. Pour dix pays membres de l'Union européenne, le taux de conversion de la monnaie nationale en euros est fixé depuis le 1<sup>er</sup> janvier 1999.

Belgique	40,3399	BEF	Italie	1 936,27	ITL
Allemagne	1,95583	DEM	Pays-Bas	2,20371	NLG
Espagne	166,386	ESP	Autriche	13,7603	ATS
France	6,55957	FRF	Portugal	200,482	PTE
Irlande	0,787564	IEP	Finlande	5,94573	FIM

Dans les autres cas, les taux de change retenus sont ceux du 19 février 1999.

Taux de change pour 1 euro (19 février 1999)		
Danemark	7,4346	DKK
Grèce	322,1	GRD
Suède	8,911	SEK
Royaume-Uni	0,6838	GBP
Islande	771	ISK
Israël	1,1163	USD
Norvège	8,7075	NOK



Cette conversion en euros permet des comparaisons immédiates des données de production en valeur entre les dix-sept pays. Par contre, les valeurs sont exprimées en prix courants et non en prix constants, l'euro n'étant effectif que depuis le début de l'année 1999.

La seconde partie décrit l'organisation de la recherche halieutique en trois sous-parties. Dans la première sous-partie, l'organisation nationale de la recherche est présentée à partir des relations administratives entre les différents instituts impliqués dans le domaine des ressources marines vivantes et leur rattachement ministériel. Des informations concernant le nombre d'employés et le budget annuel par institut sont également proposées. La deuxième sous-partie est consacrée au principal institut de recherche. Généralement, chaque pays dispose d'un principal organisme de recherche publique dans le domaine des pêches et de l'aquaculture (excepté dans le cas de la Grèce et de l'Islande où deux principaux instituts coexistent). Les autres instituts de recherche sont présentés dans la troisième sous-partie. Il est précisé, autant que possible, leur adresse, leur date de création et leur statut juridique ainsi que leurs objectifs détaillés, leurs programmes de recherche et l'existence de navires. Un point intéressant concerne la coopération scientifique. Les organismes de recherche ont précisé leurs niveaux de coopération scientifique (national, relation bilatérale en Europe, réseaux européens, Afrique, Amérique, Asie, organisations internationales).

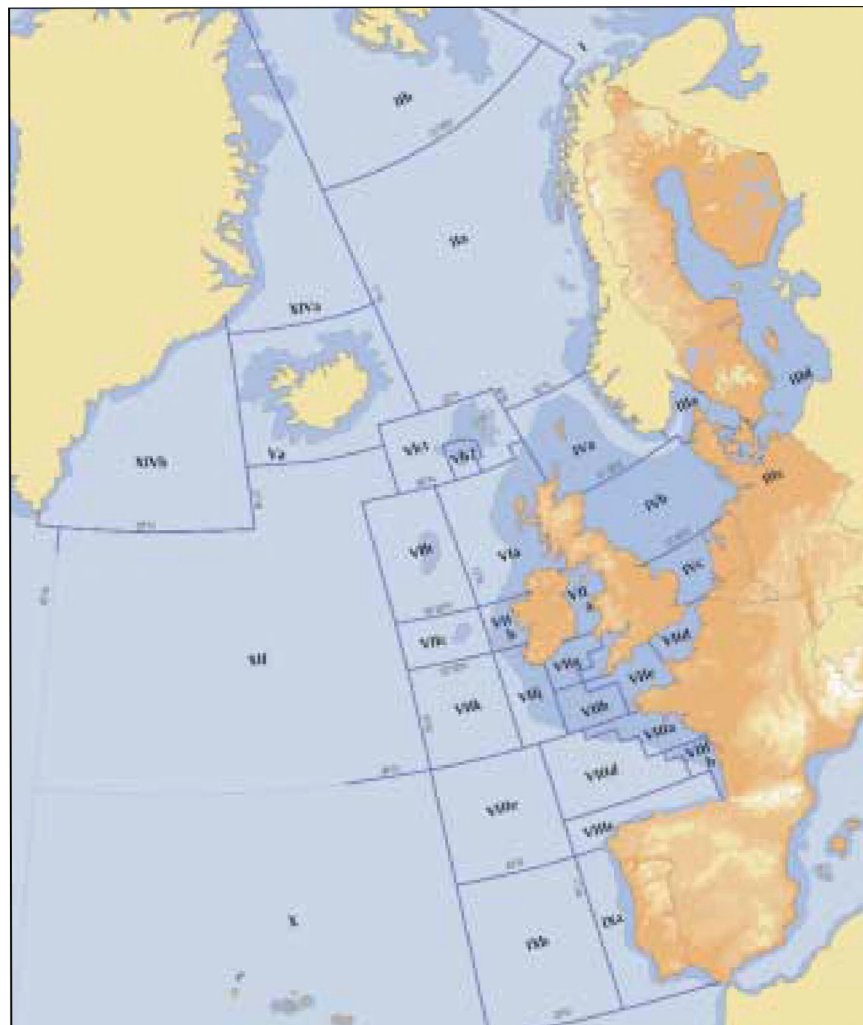
Une synthèse des données de production en Europe et dans les trois pays associés est présentée en fin d'ouvrage ainsi qu'une liste des acronymes.

**Mise en garde: des données de production ont été incluses dans les rapports nationaux sous la responsabilité de chaque contributeur. Elles n'ont pas un caractère officiel mais permettent seulement d'effectuer des comparaisons en volume (milliers de tonnes) et en valeur (millions d'euros) entre les dix-sept pays. À la fin du rapport, des tableaux et des graphiques présentent la structure de la production de l'industrie des pêches maritimes et de l'aquaculture dans l'Union européenne, en Islande, en Israël et en Norvège.**

## ICES fishing areas

This map shows the fishing areas mentioned in the following text

<b>I</b>	Barents Sea
<b>IIa</b>	Norwegian Sea
<b>IIb</b>	Spitzbergen and Bear Island
<b>IIIa</b>	Skagerrak and Kattegat
<b>IIIb</b>	Sound
<b>IIIc</b>	Belt
<b>IIId</b>	Baltic Sea
<b>IVa</b>	Northern North Sea
<b>IVb</b>	Central North Sea
<b>IVc</b>	Southern North Sea
<b>Va</b>	Iceland
<b>Vb</b>	Faroes
<b>VIa</b>	West Scotland
<b>VIa Clyde</b>	West Scotland (Clyde stock)
<b>VIb</b>	Rockall
<b>VIIa</b>	Irish Sea
<b>VIIb</b>	West Ireland
<b>VIIc</b>	Porcupine Bank
<b>VIId</b>	Eastern English Channel
<b>VIIe</b>	Western English Channel
<b>VII f</b>	Bristol Channel
<b>VIIg</b>	South-east Ireland
<b>VIIh</b>	Little Sole
<b>VIIj</b>	Great Sole
<b>VIIk</b>	West Great Sole
<b>VIIIa</b>	South Brittany
<b>VIIIb</b>	South Biscay
<b>VIIIc</b>	North and North-west Spain
<b>IIId</b>	Central Biscay
<b>IIIe</b>	West Biscay
<b>IXa</b>	Portuguese coast
<b>IXb</b>	West Portugal
<b>X</b>	Azores
<b>XII</b>	North Azores
<b>XIVa</b>	East Greenland
<b>XIVb</b>	South-East Greenland





# AUSTRIA





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

Austria, being an inland State, has no sea fisheries.

### 1.2. Aquaculture sector

Austria produces only freshwater fish in about 400 fish farms. The 1996 production consists of 2950 t for human consumption and 1150 t fingerlings with a total value of EUR 17.32 million. Production is decreasing since the last years. Main produced species of fish for consumption are rainbow trout (72 %) and common carp (17 %). The remaining 11 % consists of more than 18 species. Freshwater fishes from aquaculture and lake fishery in Austria cover 35 % of the demand, 6223.9 t of freshwater fishes were imported 1996. In all 42511.9 t products of fishes, crustaceans and molluscs were imported.

	Quantity (thousand tonnes)							
Species	1990	1991	1992	1993	1994	1995	1996	1997
Carp ponds catches	1.05	1.03	1.11	1.03	0.99	0.86	0.81	0.62
Carp ponds fingerlings	0.195	0.18	0.19	0.19	0.19	0.18	0.17	0.57
Trout farms catches	2.08	2.1	2.03	2.11	2.12	2.06	2.14	2.40
Trout farms fingerlings	0.94	1.07	1.03	0.85	0.86	0.96	0.95	0.69
<b>TOTAL</b>	<b>4.265</b>	<b>4.38</b>	<b>4.36</b>	<b>4.18</b>	<b>4.16</b>	<b>4.06</b>	<b>4.07</b>	<b>4.28</b>

	Value (million EUR)							
Species	1990	1991	1992	1993	1994	1995	1996	1997
Carp ponds (catches and fingerlings)	3.96	3.85	3.85	3.53	3.42	3.11	3.44	3.98
Trout farms (catches and fingerlings)	15.37	16.79	14.86	11.77	10.83	14.08	13.88	14.97
<b>TOTAL</b>	<b>19.33</b>	<b>20.64</b>	<b>18.71</b>	<b>15.3</b>	<b>14.25</b>	<b>17.19</b>	<b>17.32</b>	<b>18.95</b>

### 1.3. Processing industry sector

No information

### 1.4. Consumption of fishery products

Index of consumption per capita in Austria is 5.5 kg products of fishes (15 % freshwater fishes + 78 % marine fishes), crustaceans (3.5 %) and molluscs (3.5 %). Products are on market fresh (44 % alive, cooled or frozen), smoked (4 %) or canned (52 %). The inland production is totally for domestic consumption.



## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research Institutes involved in fishery sectors

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (million EUR)
<b>Main</b>	BAW-IGF	28	28	1.09	1.09
<b>Other research institutes</b>	<p>Biologische Station Illmitz</p> <p>Bundesamt für Wasserwirtschaft, Institut für Wassergüte</p> <p>Institut für Seenforschung Kärnten</p> <p>Ökologische Station Waldviertel</p> <p>Österreichische Akademie der Wissenschaften, Institut für Limnologie</p> <p>Österreichische Akademie der Wissenschaften, Biologische Station Lunz</p> <p>Universität für Bodenkultur, Institut für Hydrobiologie, Fischereiwirtschaft und Aquakultur</p> <p>Universität Graz, Institut für Zoologie</p> <p>Universität Innsbruck, Institut für Zoologie</p> <p>Universität Salzburg, Institut für Zoologie</p> <p>Universität Wien, Institut für Zoologie</p> <p>Veterinärmedizinische Universität Wien, Institut für Hydrobiologie, Fisch- und Bienenkunde</p>				

### 2.1.2. Supervisory ministerial authority(ies)

Institutes	Authority(ies)			
	Education, Research and Technology	Agriculture and Forestry	Federal State Government	Others
Bundesamt für Wasserwirtschaft, Institut für Gewässerökologie, Fischereibiologie und Seenkunde				
Biologische Station Illmitz				
Bundesamt für Wasserwirtschaft, Institut für Wassergüte				
Institut für Seenforschung Kärnten				
Ökologische Station Waldviertel				
Österreichische Akademie der Wissenschaften, Institut für Limnologie				
Österreichische Akademie der Wissenschaften, Biologische Station Lunz				
Universität für Bodenkultur, Institut für Hydrobiologie, Fischereiwirtschaft und Aquakultur				
Universität Graz, Institut für Zoologie				
Universität Innsbruck, Institut für Zoologie				
Universität Salzburg, Institut für Zoologie				
Universität Wien, Institut für Zoologie				
Veterinärmedizinische Universität Wien, Institut für Hydrobiologie, Fisch- und Bienenkunde				

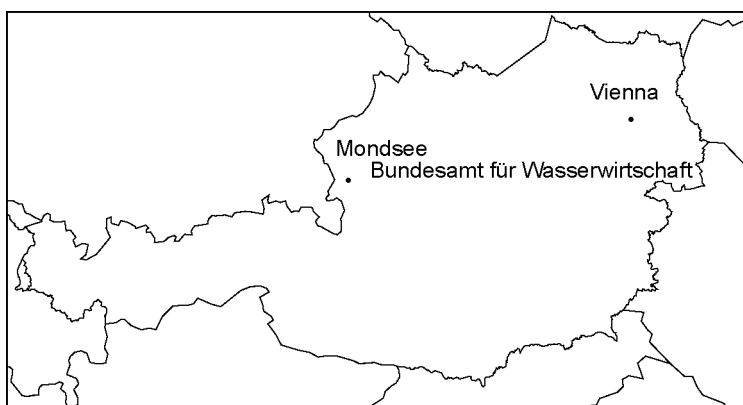
### 2.1.3. Coordination and relationship among the different research organisations and with research users

Special projects are coordinated by the Ministry of Agriculture and Forestry and/or the Ministry of Science and Transport. There is only a loose cooperation, mainly based on personal contacts of researchers.

## 2.2. Main research institute: Bundesamt für Wasserwirtschaft, Institut für Gewässerökologie, Fischereibiologie und Seenkunde

### 2.2.1. General information

<i>Address</i>	Bundesamt für Wasserwirtschaft, Institut für Gewässerökologie, Fischereibiologie und Seenkunde A-5310 Mondsee, Scharfling 18
<i>Date of creation</i>	1929
<i>Status and financial position</i>	Branch of the Ministry of Agriculture and Forestry
<i>Location</i>	



### 2.2.2. Detailed objectives and research programmes

Basic research for rearing fish.

Securing the diversity of autochthonous fish species.

Investigations on anthropogenic influences to both running waters and lakes.

Improvement of fish production.

Investigations on water quality and fish health.

School for professional fishermen.

Educational programmes for fishermen and other students (universities).

Advisory activities.

### 2.2.3. Scientific cooperation

#### National

Museum of Natural History, Vienna; Institutions of local governments; the Austrian Fisheries Association; Biologische Station Illmitz; Bundesamt für Wasserwirtschaft, Institut für Wassergüte; Institut für Seenforschung Kärnten; Ökologische Station Waldviertel; Österreichische Akademie der Wissenschaften, Institut für Limnologie; Österreichische Akademie der Wissenschaften, Biologische Station Lunz; Universität für Bodenkultur, Institut für Hydrobiologie, Fischereiwirtschaft und Aquakultur; Universität Graz, Institut für Zoologie; Universität Innsbruck, Institut für Zoologie; Universität Salzburg, Institut für Zoologie; Universität Wien, Institut für Zoologie; Veterinärmedizinische Universität Wien, Institut für Hydrobiologie, Fisch- und Bienenkunde

<b>Bilateral European relations</b>	Germany; Hungary; Czech Republic
<b>European networks</b>	Euraqua
<b>International organisations</b>	EIFAC; International Post Graduate Course on Limnology (Unesco)

### 2.3. Other research organisations

#### Name: BIOLOGISCHE STATION ILLMITZ

##### 1. General information

Address Biologische Station Illmitz  
A-7142 Illmitz

##### 2. Detailed objectives and research programmes:

Research activities: ecology, management.

#### Name: BUNDESAMT FÜR WASSERWIRTSCHAFT, INSTITUT FÜR WASSERGÜTE

##### 1. General information

Address Bundesamt für Wasserwirtschaft, Institut für Wassergüte  
Schiffmühlenstr. 120  
A-1220 Wien

##### 2. Detailed objectives and research programmes:

Research activities: water quality analysis, ecotoxycology.

#### Name: INSTITUT FÜR SEENFORSCHUNG KÄRNTEN

##### 1. General information

Address Institut für Seenforschung Kärnten  
Flatschacher Str. 70  
A-9010 Klagenfurt

##### 2. Detailed objectives and research programmes:

Research activities: ecology, rehabilitation of waters.

#### Name: ÖKOLOGISCHE STATION WALDVIERTEL

##### 1. General information

Address Ökologische Station Waldviertel  
Gebharts 33  
A-3943 Schrems

##### 2. Detailed objectives and research programmes:

Research activities: pond management, ecology.

**Name: ÖSTERREICHISCHE AKADEMIE DER WISSENSCHAFTEN, INSTITUT FÜR LIMNOLOGIE**

**1. General information**

Address Österreichische Akademie der Wissenschaften, Institut für Limnologie  
Abt. Mondsee  
Gaisberg 116  
A-5310 Mondsee

**2. Detailed objectives and research programmes:**

Research activities: ecology, stock assessment.

**Name: ÖSTERREICHISCHE AKADEMIE DER WISSENSCHAFTEN, BIOLOGISCHE STATION LUNZ**

**1. General information**

Address Österreichische Akademie der Wissenschaften, Biologische Station Lunz  
Seehof 4  
A-3293 Lunz

**2. Detailed objectives and research programmes:**

Research activities: ecology of streams.

**Name: UNIVERSITÄT FÜR BODENKULTUR, INSTITUT FÜR HYDROBIOLOGIE,  
FISCHEREIWIRTSCHAFT UND AQUAKULTUR**

**1. General information**

Address Universität für Bodenkultur, Institut für Hydrobiologie, Fischereiwirtschaft und  
Aquakultur  
Max Emanuel Str. 17  
A-1180 Wien

**2. Detailed objectives and research programmes:**

Research activities: Fundamental and applied research on freshwater biology.

**Name: UNIVERSITÄT GRAZ, INSTITUT FÜR ZOOLOGIE**

**1. General information**

Address Universität Graz, Institut für Zoologie  
Universitätsplatz 2  
A-8010 Graz

**2. Detailed objectives and research programmes:**

Research activities: ecology.

**Name: UNIVERSITÄT INNSBRUCK, INSTITUT FÜR ZOOLOGIE**

**1. General information**

Address Universität Innsbruck, Institut für Zoologie  
Abt. Ökophysiologie  
Technikerstr. 25  
A-6020 Innsbruck

**2. Detailed objectives and research programmes:**

Research activities: ecotoxicology, biochemical analysis.

**Name: UNIVERSITÄT SALZBURG, INSTITUT FÜR ZOOLOGIE**

**1. General information**

Address        Universität Salzburg, Institut für Zoologie  
                  Hellbrunner Str. 34  
                  A-5020 Salzburg

**2. Detailed objectives and research programmes:**

Research activities: Reproductonal biology of fish, ecology.

**Name: UNIVERSITÄT WIEN, INSTITUT FÜR ZOOLOGIE**

**1. General information**

Address        Universität Wien, Institut für Zoologie  
                  Abt. Limnologie  
                  Althanstr. 19  
                  A-1090 Wien

**2. Detailed objectives and research programmes:**

Research activities: ecology of fish in large rivers, metabolism of fish.

**Name: VETERINÄRMEDIZINISCHE UNIVERSITÄT WIEN, INSTITUT FÜR HYDROBIOLOGIE, FISCH- UND BIENENKUNDE**

**1. General information**

Address        Veterinärmedizinische Universität Wien, Institut für Hydrobiologie, Fisch- und  
                  Bienenkunde  
                  Josef Baumann Str. 1  
                  A-1210 Wien

**2. Detailed objectives and research programmes:**

Research activities: prophylaxis, diagnosis and treatment of fish diseases.





# BELGIUM





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in national fisheries production

In 1996 the total Belgian catch reached 27.125 thousand tonnes. In 1955 the landings amounted about three times more, viz. 73 thousand tons. A gradual decrease in the catches has been taken place since then. A gradual decrease in the number of vessels was from 440 in 1960 to 150 in 1996. However, the total power of the fleet remained rather stable: 71 146 kW in 1970 compared to 65 236 kW, in 1996.

Plaice catches are, in weight, the most important landed species (about 8 000 tonnes) followed by cod and sole (both about 5 000 tonnes). Ray and whiting are the next in the top kW 5 of the landed species. However, in value, sole is by far the leading species: about 50 % of the total value of EUR 79.3 million.

Species	Landings (1 000 tonnes)						
	1990	1991	1992	1993	1994	1995	1996
Plaice	16.9	17.1	14.1	12.2	9.9	8.8	7.3
Cod	3.8	3.0	3.6	3.7	3.1	5.0	3.8
Sole	5.0	5.4	4.3	5.0	5.4	5.2	4.9
Total	37.5	36.3	33.4	32.3	30.2	31.1	27.1

Species	Landings (million EUR)						
	1990	1991	1992	1993	1994	1995	1996
Sole	31.0	33.9	28.6	29.8	30.0	30.5	36.9
Others	57.1	60.8	49.1	46.7	44.3	44.9	42.0
Total	88.1	94.7	77.7	76.5	74.3	75.4	78.9

Fishing grounds often change during the year. Although the southern and central North Sea (IVb,c) is the main fishing ground, the Divisions VIIa, VIIf,g, VIId and VIIla have also a major importance during sole spawning time. A major part of the fleet shift during the year from one fishing ground to another. The motives for such a change depend entirely on the current catch rates on each fishing ground. Thus no regular or yearly pattern can be determined. The North sea sole catches are the most important ones and amount to about 50 % of the total sole catches. Other important by-catch species are plaice, cod, whiting, dab, turbot, lemon sole and rays. The fishery is carried out in all seasons with a peak during the second quarter (spawning season). The catches in the eastern English Channel (Division VIId) are mainly taken during the first quarter (50 %) and the fourth quarter (30 %). This Division is the second most important sole fishing ground (about 20 %) of the total landings. More than 80 vessels take part in this seasonal fishing. The principal by-catch species are plaice, red gurnard and pout. In the Celtic Sea (Division VIIf,g) the fourth quarter catches amount to about 35 % of the yearly catch. About one third of the total beam trawl fleet is involved in this temporary fishing. By-catch species are plaice, ray, cod, lemon sole and dogfish. The fishery in the Irish Sea (Division VIIa) is predominantly a second quarter fishery (52 %). At that moment about 45 vessels may shift to this fishing ground. The by-catch of this fishery consists of plaice, ray, cod and dogfish. In the Bay of Biscay (Division VIIla,b) sole catches are mainly taken in February and June. In total about 25 vessels are familiar with this fishing ground. Apart from cephalopods this fishery has a very clean sole catch.

Belgian shrimp trawlers have shrimp as the main target species but also fish for sole from March to May and for roundfish, if available, in wintertime. Shrimp landings represent only 2 % of the total Belgian landings (tonnes). All vessels operate within the 12 mile zone.

### **1.1.2. Trend in fleet**

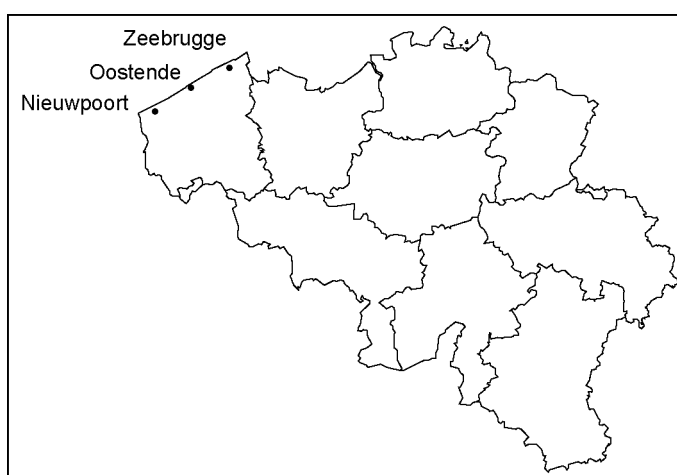
The fleet can be classified into two subgroups:

- Beam trawling for flatfish and for shrimp is the most important fishery in Belgium. With 151 vessels out of a total of 169, they account for 89 % of the landings (in tonnes).
- The Belgian otter trawl fleet consists of 18 vessels, mostly side trawlers, with engine powers between 221 and 589 kW (800 hp). Over 65 % of these vessels fish for Nephrops, which has become more important during the past years because of low roundfish stocks. 4 % of the total Belgian landings (tonnes) consist of Nephrops.

	1990	1991	1992	1993	1994	1995	1996
Fishermen							750
Number of vessels	205	201	205	182	170	166	150
Power (thousand kW)	78.38	77.06	79.7	73.89	69.85	68.75	65.22

### **1.1.3. Fishing harbours**

There are only three fishing harbours in Belgium. Zeebrugge is the most important one followed by Oostende and Nieuwpoort. Recently the landings in foreign harbours has increased considerably, but the majority of these landings were transported by lorries to Belgian auctions.



## **1.2. Aquaculture sector**

Commercial aquaculture activities in Belgium are rather restricted. Nonetheless various universities and institutes are directly or indirectly involved in aquaculture research, demonstration and training projects that can be of interest for third countries. The aquaculture production is small, but consists of various cultures in different parts of Belgium: the culture of trout, carp, tilapia, claria, European eel, seabass and seabream.

Salmon culture: About 800 tonnes (EUR 2.4 million) of rainbow trout are cultured in the southern part of Belgium; in 1980 the production was 300 tonnes and increased since then. The production takes place in some 50 units, among which 13 are producing about 15 tonnes and 2 more than 100 tonnes. About 200 people are employed. The Belgian market for trout is assessed to be 5 000 tonnes and is met by imports.

Cypriniculture: The culture of carp and related species (roach, tench, pike) of about 1 000 tonnes (EUR 2.4 million) is carried out in the north-eastern part of Belgium. A major part is exported and some parts are used for the restocking of fish ponds.

Tilapia and Claria: A total production figure of 300 tonnes for tilapia (EUR 1 million) and 100 tonnes for claria (EUR 0.25 million) is obtained yearly in an aquaculture plant close to the nuclear power station of Tihange.

European eel: The production of eel is limited to a yearly amount of 90 tonnes, although the market demand reaches 2 800 tonnes. Technical knowledge seems to be an obstacle for development.

Quantity (1 000 tonnes)	
Species	1996
Salmon culture	0.8
Cypriniculture	1
Tilapia	0.3
Claria	0.1
European eel	0.09
<b>TOTAL</b>	<b>2.29</b>

Value (million EUR)	
Species	1996
Salmon culture	2.4
Cypriniculture	2.4
Tilapia	1
Claria	0.25
European eel	1.05
<b>TOTAL</b>	<b>7.1</b>

### 1.3. Processing industry sector

About 1 240 people were employed in 1996 in the Belgian processing industry sector. Total exports in 1996 accounted for 69 646 t of fishery products. About 50 % of these exports were composed of crustaceans, cooled and fresh fish. On the other hand the total imports increased to about 185 961 t (mainly fish filets, shellfish and canned products). The number of fish processing firms in Belgium was 16 in 1996. The turnover from the leading company of 3 419 decreased to 334 for the lowest ranked firm.

### 1.4. Consumption of sea products

Consumer expenditure in fish products accounts for 7.4 % of spending on food in 1996, compared to 3.7 % in 1981. Some 70 % of expenditure on fish products is spent on fresh fish. Between 1990 and 1996, spending on fresh fish increased by 9 % in real terms, compared to a 31 % increase in the case of preserved fish, which includes frozen fish.

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
Main	DSF		40		
Other research institutes	VUB				
	UG-ARC		25		1.5
	KUL	15		1.0	
	UCL				
	FUP				
	FUL				

#### 2.1.2. Supervisory ministerial authority(ies)

Only one research unit has been established in Belgium in order to carry out research on fisheries items, viz. the Department of Sea Fishery (former name Fisheries Research Station). Occasionally some related research issues are covered by a number of university laboratories. However the latter do not have a regular long-term programme in this field.

The Department is a public research organisation depending on and supervised by the Ministry of Small Enterprises, Traders and Agriculture. The staff is composed of about 40 personnel.

Institute	Authority
Department of Sea Fishery	Ministry of Small Enterprises, Traders and Agriculture

#### 2.1.3. Coordination and relationship among the different research organisations and with research users

The Sea Fisheries Department has a long experience of exchange of results from scientific research with the Belgian fishing industry. Dissemination of reports towards the fishermen is a routine practice. Moreover the Department regularly hosts meetings with the fishing and fish-processing industry.

#### 2.1.4. Participation to European networks

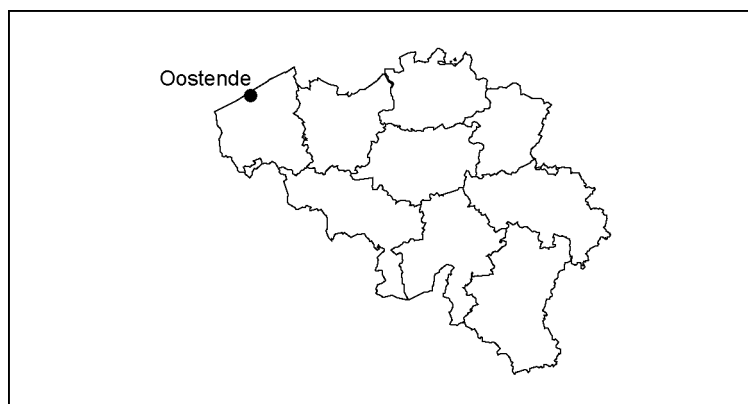
During the past 15 years the Department has been involved in a variety of project funded by the European Union (FAIR, MAST, studies). Belgium has the secretary of the European aquaculture society (EAS) which

was established on April 30 1976 as an international, non-profit association. Nowadays EAS counts members in 58 countries worldwide working in any field related to aquaculture (research, farming, education, provision of services, manufacturing, consultancy, etc.). In addition a number of European projects in the universities are currently undertaken. This is in collaboration with France (Sepia International), Italy (Padova), Spain (Tinamor, Castellon), Portugal (Timar), Greece (Cephalonian Fisheries), The Netherlands (University of Wageningen) and Sweden (Uppsala University). Since 1978 the Artemia Reference Centre (University of Ghent) has organised seven editions of the 'International Artemia Training Course' in Belgium.

## **2.2. Main research institute: Sea Fisheries Department**

### **2.2.1. General information**

<i>Address</i>	Sea Fisheries Department Ankerstraat 1 B-8400 Oostende Belgium Tel. (32-59) 32 08 05. Fax (32-59) 33 06 29 E-mail: dvz@mail.dma.be
<i>Date of creation</i>	1962
<i>Status and financial position</i>	
<i>Location</i>	



### **2.2.2. Detailed objectives and research programmes**

The department is charged with biological and technical research, including studies on the quality of fish and fish products.

#### **Research on fishery biology**

Studies in relation to fishery management: the aim of this project is to optimise the potential catches taken by the Belgian fleet. The species involved are sole, plaice, cod and whiting.

The analysis is focused on four topics:

Yearly surveys in the nursery areas along the Belgian coast started as early as 1970 and have been carried out in collaboration with the institutes of Germany, the United Kingdom and The Netherlands along the continental coast and estuaries. These long time series allows for reliable estimates of the strength of the incoming year-classes. Annual surveys are conducted on board of the research vessel *Belgica* in



order to measure the distribution and abundance of commercial flatfish species and to describe the epibenthos. Fishing stations were sampled in the western part of the southern North Sea where the majority of the Belgian fishing activity takes place. Stock assessment and the provision of TACs for sole and plaice from the North Sea, the English Channel, the Celtic Sea and the Irish Sea, cod and whiting from the North Sea remain a major aspect of the research. The length and age composition of the commercial landings are calculated. The processing of these data resulted in a series of comparable parameters on the exploitation rate and on the population. The results in combination of data from foreign countries is used to formulate an assessment of the stock and the associated fishery. Another project is targeted on the study of the biological and technical factors which affect the population dynamics and exploitation of commercial shellfish stocks, particularly Norway lobster, *Nephrops norvegicus*, and brown shrimp, *Crangon crangon*, currently exploited by the Belgian fishing fleet.

— Studies on the pollution of the sea sand extraction and dredging operations.

Ecological monitoring: the disposal areas for dredge spoils and the sand extraction sites is monitored four times a year by the *R.V. Belgica*.

Physical and chemical monitoring: besides the routine analyses of the water column, the content of carbonate, the total organic carbon and the colour (Munsell-value) were assessed. Grain distribution analyses is also performed.

— Biological monitoring.

A sampling programme for the study of epi- and macrobenthic and demersal communities is carried out on 14 sites: study of the biochemical effects of contaminants; application of genetic techniques in fish; studies on the occurrences of fish and shellfish diseases.

### **Technical fisheries research**

— Fishing gear research.

The object of this research is the study, the adjustment and the design of fishing gear from a technical, biological and economic point of view. Research is carried out in the following fields:

- a species selective shrimp beam trawl;
- twin trawls for Norway lobster;
- triple trawls;
- model tests;
- wrecks and obstacles;
- netting materials.

— Selectivity and techno-ecological effects of fishing activities.

The studies aims at an improvement of the selectivity of fishing gear with relation to the species selection, the catch composition and the length distribution of the species

— Fishing effort study.

The project investigates the relation between the fishing effort and technical vessel and gear characteristics.

### **Quality research**

The investigations are focused on the development of reliable objective quality determination methods for fishery products and the study of factors influencing the quality.

- Quality determination of fresh and frozen fish.
- Research on trace metals in fishing products.
- The study of organic contaminants in marine organisms and sediments.
- Chemical identification of fish species.

Recently the Sea Fisheries Department has installed a recirculation system of salt water with a capacity of about 80 m<sup>3</sup>. Tanks of different sizes are available. Specific studies concerning aquaculture will be undertaken in the near future in close cooperation with some universities and/or institutes. The topics of research are not yet finalised, but could go in the direction of on-growing of postlarval species.

Specific research on fish and shellfish (mussels) diseases is also carried out. These studies are considering wild stocks but the results may also be applicable to cultured stocks.

### 2.2.3. Facilities at sea

The institute has free use of a coastal vessel *Broodwinner-O29* (27 m length) and of an oceanographic research vessel *Belgica* (50 m length). The latter belongs to the Ministry of Public Health.

### 2.2.4. Scientific cooperation

<b>National</b>	Agreements and contracts with several University Departments
<b>Bilateral European relations</b>	CEFAS (UK); CEMARE (UK); Ifremer (France); ENSAR (France); CEDEM (France); DIFRES (Denmark); FRC (Ireland); RIVO (The Netherlands)
<b>International organisations</b>	International Council for the Exploration of the Sea (ICES); Scientific, Technical and Economic Committee for Fisheries (STECF-EU); Commission for Conservation of Antarctic Marine Living Resources (CCAMLR); Convention for the Protection of the Marine Environment of the North-Eastern Atlantic (OSPAR); Convention of the Prevention of Marine Pollution by Dumping of Wastes and other Matter (LDC: London Dumping Convention)

## 2.3. Other research organisations

### NAME: UNIVERSITIES

#### 1. General information

Free University of Bruxelles (VUB)  
 University of Ghent: Artemia Reference Centre (UG-ARC)  
 Catholic University Louvain (KUL)  
 University Louvain-la-Neuve (UCL)  
 Facultés Universitaires de la Paix, Namur (FUP)  
 Fondation Universitaire Luxembourgeoise — Arlon (FUL).



# DENMARK





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in national fisheries production

Denmark exploits a large number of species in Danish waters. Long-distance fishery is not very pronounced. The most important stocks are cod, plaice, and herring for human consumption; with regard to industrial fisheries, sand eel and Norway pout dominate. The stock situation is reflected in the landings. The total value of landings constituted about EUR 476 million in 1996, and about 1.848 million tonnes.

Landings (tonnes)							
Species	1990	1991	1992	1993	1994	1995	1996
Cod	157 556	143 725	108 284	89 081	126 423	121 777	130 377
Herring, sprat and mackerel	245 178	268 824	270 719	317 507	371 232	353 447	269 814
Flatfish	56 846	50 573	46 969	54 087	44 445	43 191	37 096
Eel	1 568	1 367	1 342	1 035	1 158	884	701
Other fish for human consumption	8 875	10 528	13 966	9 366	8 579	7 351	9 861
Fish for reduction purposes	1 067 398	1 328 778	1 653 291	1 315 807	1 532 480	1 707 110	1 384 401
Lobster, shrimp, prawn	9 779	10 071	12 375	10 011	11 833	15 406	15 964
<b>Total</b>	<b>1 547 200</b>	<b>1 813 866</b>	<b>2 106 679</b>	<b>1 787 954</b>	<b>2 096 150</b>	<b>2 249 126</b>	<b>1 848 214</b>

Landings (million EUR)							
Species	1990	1991	1992	1993	1994	1995	1996
Cod	232.438	231.197	164.038	109.146	150.536	137.096	135.213
Herring, sprat and mackerel	64.167	72.554	68.170	69.556	78.426	75.382	81.484
Flatfish	92.683	105.829	87.038	81.839	83.064	75.756	72.916
Eel	10.540	9.795	8.094	6.357	7.613	6.425	5.334
Other fish for human consumption	17.675	21.329	22.705	14.748	15.213	12.280	15.961
Fish for reduction purposes	77.703	102.090	133.180	95.894	111.582	124.906	114.862
Lobster, shrimp, prawn	50.229	45.555	39.731	30.262	39.662	48.377	49.863
<b>Total</b>	<b>545.436</b>	<b>587.003</b>	<b>388.451</b>	<b>407.801</b>	<b>486.097</b>	<b>480.221</b>	<b>475.634</b>

Cod is by far the most important species with 23 % of the total landing value, but the species has become less important since the end of the 1980s because of a severe decline in the cod stocks in the North Sea and in particular in the Baltic. Species such as sole and Norway lobster are important because of their very high prices. The Danish species composition has changed significantly over the past 10 years. Cod used to be very important in the mid-1980s but has now been replaced by herring. However, cod is a relatively high-valued species, while herring is a relatively low-valued species.

The large cod fishery took place in the Baltic over a period of about 10 years from 1977 to 1986. Before this period, the cod fishery in the North Sea was rather prosperous, but it never really recovered after the decline in the beginning of the 1980s.

During the following 10 years, the herring fishery was in a good condition, but it has recently declined, too. The fishery for fishmeal and fish oil is very fluctuating. The species caught are mainly short-lived species such as sand eel and Norway pout, and the fishery is very dependent on the annual recruitment to the stocks. Relatively large vessels — for Danish standards — carry out the fishery which takes place in the North Sea, the Skagerrak, and the Kattegat. The large plants that process the fish are situated in Skagen, Thyborøn, and Esbjerg. A rather substantial rationalisation has taken place over the last decade in this part of the sector.

### **1.1.2. Trend in fleet**

Small vessels dominate the Danish fleet composition. In all GRT groups below 100 GRT, the number of vessels has declined over the last decade from around 3 000 to about 2 100, while the number of larger vessels has been reduced from 317 in 1986 to 213 in 1993. The total number of full-time fishermen is estimated to have been about 7 000 in the mid-1980s but is now (1998) down to just below 5 000, i.e., about 2 000 jobs have been lost. The average crew on trawlers and seiners is three, while it is 1.5 on gill-netters. The small vessels conduct fishing for human consumption in the inner Danish waters and in the North Sea, while the large vessels mainly execute fishery for reduction purposes, although large vessels also fish for herring and mackerel for human consumption.

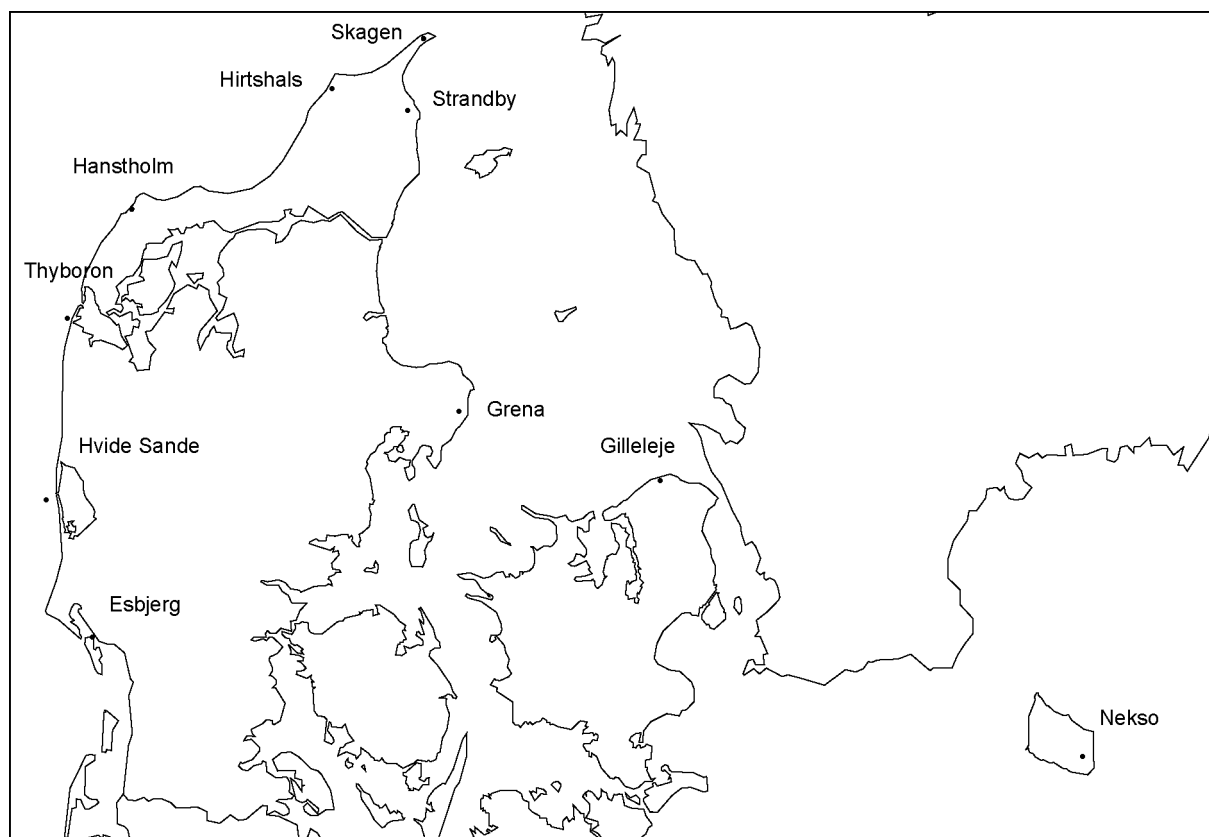
	1990	1991	1992	1993	1994	1995	1996
Fishermen <sup>(1)</sup>	7 053	6 743	6 518	6 376	5 488	5 355	5 348
Vessels <sup>(2)</sup>	2 832	2 750	3 488	3 232	3 188	5 189	4 830
Power (thousand kW) <sup>(2)</sup>	506	488	479	425	413	424	409

<sup>(1)</sup> Source: Statistics Denmark.

<sup>(2)</sup> Source: Yearbook of Fishery Statistics 1997.

Though many in number, the small vessels have only a limited share of the total fishing effort. In order to manage the fleet, EU Member States are obliged to work out multi annual guidance programmes (MAGP or MGP) where GRT and kW measure the fleet capacity. Measured with respect to fleet size, the Danish position relative to other Member States compares to the Danish share measured in catch value which shows the fleet size measured in kW. Not all Member States report GRT (GT). After a continuing reduction of the fleet, Denmark is among the members which have now achieved the goal imposed by MAGP III (multi-annual guidance programmes).

### 1.1.3. Fishing harbours



## 1.2. Aquaculture sector

Aquaculture production in Denmark comprises:

- rainbow trout in freshwater ponds
- rainbow trout in sea cages
- rainbow trout in land-based plants
- eel in land-based recycling systems
- mussels and oysters (minor and different from semi-culture mussel production).

Denmark has a long tradition for producing rainbow trout in freshwater ponds. The trout may be raised to a weight of up to 800 g, but it is mainly sold from the farms in sizes of 200–500 g. The trout is sold live for export or sold fresh, frozen or smoked. The freshwater trout farmers produce in ponds that have mostly surface water supply. The feed conversion for trout farms have decreased from 1.25 kg feed per kg produced fish in 1989 to 1.00 kg feed in 1994. Sea cage farming is a relatively new activity in Denmark. It has developed to a commercial level since the mid-1980s. In 1994, the average feed per production site was just under 200 tonnes and the average production was 165 tonnes. A mean of 141 people were employed in sea cage farming during 1994.



Quantity (thousand tonnes)							
Species	1990	1991	1992	1993	1994	1995	1996
Rainbow trout in freshwater ponds	31.5	32.3	31.7	30.7	34.9	36.2	32.4
Rainbow trout in sea cages	6.0	5.9	6.7	7.9	6.8	7.3	7.8
Rainbow trout in land-based seawater ponds	0.8	1.5	1.5	1.5	1.5	1.5	1.5
Eel farming	0.6	0.9	0.7	0.8	0.9	1.2	1.4
<b>TOTAL</b>	<b>38.9</b>	<b>40.6</b>	<b>40.6</b>	<b>40.9</b>	<b>44.1</b>	<b>46.2</b>	<b>43.1</b>

Value (million EUR)							
Species	1990	1991	1992	1993	1994	1995	1996
Rainbow trout in freshwater ponds					75.0	70.1	
Rainbow trout in sea cages					32.3	21.5	20.0
Rainbow trout in land-based seawater ponds					8.0	5.3	3.8
Eel farming	4.3	6.4	5.5	5.8	6.8	8.7	10.4
<b>TOTAL</b>					<b>122.1</b>	<b>105.6</b>	<b>34.2</b>

The development of land-based seawater ponds requires rather substantial investments in buildings and equipment. The land-based rainbow trout plants each produce at least 200 tonnes per year. For eel farming, the individual plant produces from 2 to 50 tonnes per year. The industry employs approximately 100 people (1995). A major problem for the development of the industry is the dependency of wild glass eel as production input. Small-scale experimental production of other species than rainbow trout for research purposes is carried out in Denmark. The aim is to use these species for restocking of lakes and streams, but research into restocking of salt-water species such as turbot and plaice also is carried out. The Ministry of Food, Agriculture and Fisheries has registered 2 farms as producing 3 tonnes of mussels and 20 tonnes of oysters.

### 1.3. Processing industry sector

The Danish fish processing sector is characterised by:

- Wholesale trade of fresh unprocessed fish
- Processing of fish for human consumption
  - filleting
  - canning and preservation

- smoking
- saltfish

- Fishmeal and fish oil.

The total value (not value adding) for the sector could be estimated at around EUR 2.69 million measured in wholesale prices (exports and domestic sales) in 1994. The total employment in 1994 is estimated to have been about 7 000. Since the peak period in the mid-1980s, 2 000 to 3 000 jobs have been lost. With the reduction in the number of fishermen, it is estimated that about 5 000 jobs have been lost overall in the fishing industry over the past 10 years.

The reduced performance of the processing industry is reflected in the development of the capital return. For all branches, the downward-sloping trend is clear. The return is at first glance higher for the fishmeal industry (right axis), but this is only because the return is measured before payment of the share to the fishermen who own the fishmeal plants (vertical integration), and who therefore during the year only receive payment on account.

The Danish position with respect to trade has traditionally been strong. The total imports have always been significant and it is seen that they are strongly increasing and are twice as high as the value of Danish fishermen's landings. Measured in value, close to 50 % of the imports consist of shrimp, mainly imported from Greenland. The second-most important commodity, roughly amounting to 20 %, is cod, fillets, and blocks of codfish. Finally, salmon accounts for about 15 %. Because of the imports of shrimp, Greenland supplies Denmark with about one third of the total imports. More than 40 % comes from the other Nordic countries, in particular the Faeroe Islands and Norway.

Obviously, the composition of exports is determined by the Danish catches. The imports have cod products, shrimp, lobster, and salmon as the dominant groups. Germany receives about 20 % of the Danish exports; France, Italy, and the UK follow, receiving about 12 to 15 % each of the total Danish exports.

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

The major part of Danish research and development in fishery biology, fisheries management, fishing gear technology, and fish processing is done at the Danish Institute for Fisheries Research (Difres) and at the Danish Institute for Fisheries Technology and Aquaculture (DIFTA). The National Environmental Research Institute (NERI) also performs a significant amount of fisheries-related research. Research within the area is to a smaller extent carried out at the universities, at other governmental research institutions affiliated to the Ministry of Food, Agriculture and Fisheries, at approved technological service centres as well as at private research institutions.

The fish industry is characterised by many small and medium-sized companies which have neither the potential to cover the need for research nor the ability to carry out research by themselves, although some development work takes place within a small number of private enterprises. Fisheries research is therefore mainly a public task, carried out in close collaboration with the organisations of the fish industry.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
<b>Main</b>	DIFRES	195	265	15.1	21.7 (1998)
<b>Other research institutes</b>	DIFTA	25	38		2.5 (1999)
	NERI		465		29.6 (1998)
	Odense University	16	1147	0.24	82.8 (1997)
	University of Copenhagen	32	4513	2.1	319.9 (1997)
	Aalborg University	10	1374	0.56	113.0 (1998)
	DVL	18	368	0.9	37 (1998)
	The Royal Veterinary and Agricultural University	14	1372	1.65	84.6 (1998)
	DIAFE (SJFI)	5	56		3.3 (1998)
	DIFER	7	18	0.4	0.9
	IFM	2	4	0.3	0.4 (1998)
	Aarhus Business School	3–5	443		27.4 (1998)
	Roskilde University Centre	1–2	730	0.1	44.4
	The Technical University of Denmark	2.5	2100		172.0 (1997)
	Højmark Laboratory	5–6	20	0.4	1.2

### 2.1.2. Supervisory ministerial authority(ies)

Institutes	Authorities					
	Education,	Agriculture and Forestry	Environment and energy	Approved technological services centres	Private research institutions	Others
Difres						
DIFTA						
NERI						
Odense University						
University of Copenhagen						
Aalborg University						
DVL						
The Royal Veterinary and Agricultural University						
DIAFE						
DIFER						
IFM						
MAPP						
NORS						
The Technical University of Denmark						
Højmark Laboratory						

### 2.1.3. Coordination and relationship among the different research organisations and with research users

Being by far the most important source of funding of fisheries research, the Ministry of Food, Agriculture and Fisheries, through its Science Advisory Committee and its Directorate for Development, to a large extent coordinates the research efforts.

Representatives of the fishing industry and the recreational fisheries are members of the Difres governing board. Among the smaller research institutes, the university laboratories doing basic research typically see other scientists as their main users, whereas the nature of the research products of other smaller institutions secures close cooperation with commercial customers.

#### **2.1.4. Participation to European networks**

As of July 1998, Difres participates in 43 EU-funded projects and concerted actions. About 80 % of these are funded by AIR/FAIR, about 10 % by MAST, and the remaining 10 % by various programmes (e.g., INTAS).

### **2.2. Main research institute: DANISH INSTITUTE FOR FISHERIES RESEARCH (Difres)**

#### **2.2.1. General information**

<i>Address</i>	Danish Institute for Fisheries Research Director General and Administration Jægersborgvej 64-66 2800 Lyngby. Tel. (45-33) 96 33 00. Fax (45-33) 96 33 49 E-mail: dir@dfu.min.dk
<i>Date of creation</i>	1995
<i>Status and financial position</i>	Difres is affiliated to the Ministry of Food, Agriculture and Fisheries
<b>Department of Marine and Coastal Ecology</b>	Kavalerigården 6 2920 Charlottenlund Tel. (45-33) 96 33 00. Fax (45-33) 96 34 34 E-mail: hoek@dfu.min.dk
<b>Department of Marine Fisheries</b>	Charlottenlund Slot 2920 Charlottenlund Tel. (45-33) 96 33 00. Fax (45-33) 96 33 33 E-mail: hfi@dfu.min.dk
<b>Department of Fish Biology</b>	Nordsøcentret. Postboks 101 9850 Hirtshals. Tel. (45-33) 96 32 00. Fax (45-33) 96 32 60 E-mail: fbi@dfu.min.dk
<b>Department of Inland Fisheries</b>	Vejlesøvej 39 8600 Silkeborg. Tel. (45-33) 96 31 00. Fax (45-33) 96 31 50 E-mail: ffi@dfu.min.dk
<b>Department of Seafood Research</b>	DTU, building 221 2800 Lyngby. Tel. (45-45) 88 33 22. Fax (45-45) 88 47 74 E-mail: fish@ffl.min.dk
<b>Director-general, Secretariat, and Department of Administration</b>	Jægersborgvej 64-66 2800 Lyngby. Tel. (45-33) 96 33 00. Fax (45-33) 96 33 49 E-mail: dir@dfu.min.dk

Location



### 2.2.2. Detailed objectives and research programmes

The Danish Institute for Fisheries Research (Difres) carries out research in living aquatic resources. This includes all aspects from the living resource to the final product. Difres advises the Ministry of Food, Agriculture and Fisheries, other national authorities, international commissions, the fishing industry, and recreational fisheries concerning sustainable and rational exploitation of the living aquatic resources. Difres was established in 1995 by uniting three research institutions: Danish Institute for Fisheries and Marine Research, Inland Fisheries Laboratory and Technological Laboratory, Ministry of Fisheries. Difres is managed by a governing board with representation from the fishing industry, national research councils, professional and industrial bodies, and members of the staff. The director general is responsible for the management on behalf of the governing board. The institution comprises five research departments:

- Department of Marine and Coastal Ecology
- Department of Marine Fisheries
- Department of Inland Fisheries
- Department of Fish Biology
- Department of Seafood Research.

And

- Director-General, Secretariat, and Department of Administration
- Research vessel *Dana*.

Difres has three main research areas:

Marine environment and fisheries research

- Primary and secondary production
- Advice and resources assessment

#### Freshwater research

- Freshwater fish biology
- Fish population genetics

#### Seafood research

- Microbiology and hygiene
- Process technology
- Product technology

Difres advises commissions, national authorities, and industry on:

- environmental issues (Dept. of Marine and Coastal Ecology)
- marine fisheries (Dept. of Marine Fisheries)
- recreational fisheries (Dept. of Inland Fisheries)
- handling and processing (Dept. of Seafood Research)
- aquaculture (Dept. of Fish Biology).

### **Department of Marine and Coastal Ecology**

The main research areas are:

#### — Primary and secondary production

The overall goal of this research area is to increase the understanding of the physical/chemical processes in the water column that affect energy transfer in the pelagic food web and, thus, affect the production of fish resources.

#### — Recruitment and reproduction

Research in this area is aimed at describing the influence of environmental factors (both 'natural' and 'man-made') on the recruitment of fish resources.

#### — Fish health

This area is devoted to establishing a base of knowledge concerning the frequency and distribution of pathogens in both wild and cultured fish.

### **Department of Marine Fisheries**

The research is focused on three main areas: Fisheries and ecosystem modelling, fisheries management, and management advice and resource assessment. In addition, research is carried out in the field of recruitment and reproduction; this is done in cooperation with Department of Marine and Coastal Ecology. In the field of growth and mortality, research is carried out in cooperation with the Department of Fish Biology. Most of the research involves international collaboration (EU-funded and ICES-coordinated projects). The main research areas are:

#### — Fisheries and ecosystem modelling

The research is aimed at quantifying the effects of fisheries on fish stocks, the ecosystem, and the yield by developing mathematical models, and it involves research in:

Multispecies models. An important research area has been and still is the development of population dynamic models that include biological interaction between prey and predators. Models have been developed both for the North Sea and the Baltic Sea.

Population dynamic models including forecast models for short-lived species.

Fleet models that describe the behaviour of the different fleets.

Uncertainties in stock assessment with the aim of quantifying the uncertainty in management advice.

Impact of fisheries on the ecosystem with focus on the development of ecosystem descriptors, the effect of by-catch, and possible changes in prey–predator relationships.

#### — Fisheries management

This research area includes analysis and improvement of present fisheries management regimes and development of new regimes. The research is conducted in close collaboration with economic and social science research institutes and management bodies as well as representatives for the fishing industry. In focus is the relationship between fish mortality and fishing effort and the development of management reference points.

#### — Management advice and resource assessment

This area includes assessment of fisheries resources and advising of national and international authorities on fishery-related matters and can be divided into routine data collection, stock assessment, and advice. The area accounts for nearly 60 % of the department's total budget. Examples of projects are:

Data collection includes the sampling of commercial catches and research vessel surveys. The data are used in the assessment of fish and shellfish stocks.

Assessment work is carried out in collaboration with international research institutes under ICES and involves participation in a number of ICES working groups.

Advisory work involves participation in the international fishery management committees under ICES and EU, as well as providing advice to national authorities.

### **Department of Fish Biology**

The main research areas are:

#### — Growth and mortality

The objective of the department is to conduct research in fish biology with emphasis on growth and mortality within populations of wild fish stocks. The models, which form the basis for fisheries management advice, are based on both catch and fish biology information. The relevant biological knowledge in this context includes predation, competition, variations in growth and mortality, survival of the early life history stages, migrations, and changes in geographical distribution. This biological information is provided from research in areas such as feeding biology, migration, and growth.

#### — Monitoring techniques and fishing gear technology

This area includes methodology for fish stock surveys (acoustic and trawl surveys) and fishing gear technology. The field includes the developments of stock assessment techniques (based on data collected from research vessels), advisory functions, and studies on commercial fishing gear, particularly regarding selectivity. Special techniques for measuring the size of fish stocks are used on surveys, which are key elements in fish stock assessments. The surveys include trawl surveys, acoustic surveys, and egg surveys.



Acoustic and trawl surveys are also used in specialised studies in fish biology. The department also maintains scientific equipment on the research vessel *Dana* for other departments.

### **Department of Inland Fisheries**

The main research areas are:

— Freshwater fish biology

In Danish rivers, lakes, and coastal areas there is the potential as well as a documented need for commercial and recreational fishery of salmonids. The possibilities for optimal fisheries in accordance with the carrying capacities of the different aquatic areas depend on optimal stockings. Work on freshwater fish biology is subdivided into salmonids, eels, lakes.

— Fish population genetics

This research area was started as a consequence of the large amount of fish stocked.

### **Department of Seafood Research**

The main research areas are:

— process technology

— production technology

— microbiology and hygiene.

#### **2.2.3. Facilities at sea**

*Dana* is the research vessel of the Danish Institute for Fisheries Research. *Dana* was built at the Dannebrog shipyard in Århus 1980-81 for worldwide navigation, and is equipped to carry out a wide range of investigations within different research fields. The vessel has five laboratories with extensive and wide-ranging scientific equipment for analysis and measurement plus different tools for sample collection, e.g. equipment for trawl fishing, water sampling, and sampling from the seabed.

Difres uses *Dana* for research and monitoring in projects concerning fisheries biology and oceanography. A large part of this work forms the basis of Denmark's international and national obligations to participate in giving advice concerning rational and sustainable exploitation of fish stocks.

Apart from carrying out fisheries, biological, and marine ecological investigations for Difres, estimated at 175 days per year, *Dana* is also chartered by other Danish and foreign research institutions to carry out varying research tasks.

In addition DFU operates four small research vessels:

*Havfisken* is a 20-t wooden fishing vessel with accommodation for three persons. It is equipped for fisheries research.

*Havkatten* is a 33-ft reinforced fibreglass vessel with accommodation for two persons. It is equipped for fisheries research especially in shallow waters.

*Havmusen* is a 19-ft aluminium speedboat with an outboard motor. It is able to operate in very shallow water.

*Havtasken* is a small-reinforced fibreglass boat with an outboard motor. It is used for the same type of investigations as Havmusen.

## 2.2.4. Scientific cooperation

<b>National</b>	The National Environmental Research Institute; the Danish Institute for Fisheries Technology and Aquaculture; Aalborg University; Biotechnological Institute; Danish Technological Institute; The Royal Veterinary and Agricultural University; Technical University of Denmark; The Fjord and Belt Centre; Højmark Laboratory; Institute for Fisheries Management & Coastal Community Development; Danish Institute of Agricultural Sciences; Centre for Advanced Food Studies; Centre for Market-Based Process and Product Innovation in the Food Sector; Risø National Laboratory; Roskilde University; Danish Veterinary Laboratory; Univ. of Aarhus; Univ. of Copenhagen; the Danish Veterinary and Food Administration
<b>Bilateral European relations</b>	IMR, Lysekil, Sweden; SOAEFD, Scotland; ADRIA, France; Agricultural University of Athens; National Technical University of Athens; Agrotechnological Research Institute, Holland; AtlantNIRO, Russia; Bundesforschungsanstalt für Fischerei, Germany; Centre for Environment, Fisheries and Aquaculture Science, UK; Agricultural and environmental engineering research (CEMAGREF), France; Centre de Geostatistique, France; CIRAD, France; Consejo Superior de Investigaciones Científicas, Spain; Deutsches Institut für Lebensmitteltechnik; East Anglia University; Estonian Marine Institute; FGRI, Finland; Fiskeriforskning, Norway; FRCA, Ireland; Grønlands Naturinstitut, Greenland; Havforsknings Instituttet, Norway; Hygienic Institute, Faeroe Islands; Icelandic Fisheries Laboratories; IFRD, Sweden; Ifremer, France; IMBC, Greece; Institut für Ostseefischerei, Germany; Institute of Marine Research, Norway; Instituto Português de Investigação Marítima, Portugal; Inst. del Frio, Spain; Institute for Surface Chemistry, Sweden; Instituto de Investigaciones Marinas, Spain; Instituto Español de Oceanografía; Latvian Fisheries Research Institute, Riga; Leatherhead Food Research Association, UK; Marine Laboratory, Aberdeen; National Food Biotechnology Centre, Ireland; RIVO, Holland; Rowett Research Institute, UK; Sea Fisheries Institute, Gdynia; St. Andrews University, UK; University College Cork, Ireland; Univ. di Ancona; Univ. of Aberdeen; Univ. of Athens; Univ. of Bergen; Univ. of Bristol; Univ. of Cambridge; Univ. of Humberside; Univ. of Oslo; Univ. of Stockholm; Univ. of Tromsø; Univ. of Ulster; Univ. of Warwick; Univ. of York; VESO Viken, Norway
<b>European networks</b>	European Technology Group; the West European Fish Technologists Association (Wefta); the Nordic Council; European Inland Fisheries Advisory Commission; the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (Ascobans)
<b>Asia</b>	Univ. Pertanian, Malaysia; the National Aquatic Resources Research and Development Agency, Sri Lanka
<b>America</b>	Instituto de Fomento Pesquero, Chile; Scripps Institution of Oceanography, USA
<b>Oceania</b>	Univ. of Tasmania, Australia; Univ. of New South Wales, Australia
<b>International organisations</b>	International Council for Exploration of the Sea (ICES); International Whaling Commission (IWC) Scientific Committee

## 2.3. Other research organisations

**Name:** DANISH INSTITUTE FOR FISHERIES TECHNOLOGY AND AQUACULTURE, DIFTA

### 1. General information

<i>Address</i>	Danish Institute for Fisheries Technology and Aquaculture, DIFTA Nordsøcentret, PO Box 59 DK-9850 Hirtshals. Tel. (45-98) 94 43 00 — Fax (45-98) 94 22 26 E-mail: difta@difta.dk
<i>Date of creation</i>	1990
<i>Status and financial position</i>	Self-growing R & D Institute

### 2. Detailed objectives and research programmes

#### **Fisheries Technology Department, DIFTA**

Projects within the research area are:

Codend selectivity—factors affecting the variability.

Cetasel, reduction of by-catch of small cetaceans in pelagic gear by technical means.

Rescue, research into Crangon fisheries unerring effect.

Selective flatfish trawl.

Survival of Nephrops and roundfish after escape from codends of commercial trawls.

Seldat, assessment of requirements to standardisation of selectivity data.

Evaluation of mesh size measurement techniques 'MESH'.

Development of a predictive model for selectivity of towed fishing gear.

Selectivity and fishing power of Baltic gill nets.

Improvement of technical management in Baltic cod fishery (Bacoma).

Development and tests of a low-drag human consumption trawl.

Development and tests of flexible selection grids for shrimp trawls.

Sustainable fishery.

Upgrading of fishing vessels.

Assessment of means to improve safety and working conditions on board fishing vessels.

#### **Fish Processing Department, DIFTA**

Projects within the research area are:

Protection of frozen, whole shrimp against oxidation; examination of oxidation, and development of better methods for packing and production.

Optimisation of the maturation process of spiced herring.

Elucidation of aspects on black spot development in shellfish; development of a method for determination of the enzyme polyphenol oxidase.

Examination of the use of controlled and modified atmospheres to improve quality during catch handling and packing operations of white fish.

Introduction of superchilling in the handling and processing of smoked salmon.

Development/improvement of catch handling methods for small pelagic fish for high quality food and feed products.

Development of an electronic unit for the collection of information about physical impacts to fish during catch and handling operations.

Examination of the effects of vitamin E in the feed for trout on the astaxanthine deposit and the oxidation stability of the smoked product.

Development and test of methods for the measurement of trout quality; definition of quality standards for trout.

Examination of traditional and new methods for the measurement of oxidation and resistance against oxidation in fishmeal.

Evaluation of the possibility of improving product quality, environmental aspects, and economy by the production of fishmeal by using a lactic acid fermentation step during bulk storage of raw material.

Description and assurance of the practical possibilities of recycling mainly acid brines in the herring processing industry.

Investigations on the possibilities of recycling process water from the filleting of herring.

Examination of the possibilities, including recirculation (micro filtration), of water saving and reduction of waste water outlets.

### **Aquaculture Department, DIFTA**

Projects within the research area are: Disease prevention, genetics, and nutrition in rainbow trout farming (a multidisciplinary Danish research programme); Rainbow trout—reduced quality loss at storage and smoking through regulation of feed quality; Usage of individual tagging and X-ray technology on sea bass (*Dicentrarchus labrax*); influence of pellet size; Usage of individual tagging and X-ray technology on rainbow trout (*Oncorhynchus mykiss*); influence of feeding strategies; Development of feed for 'new' aquaculture species; Influence of partial pressure of CO<sub>2</sub> on growth and feed conversion efficiency in European eel (*Anguilla anguilla*); New and improved technologies in re-circulation technology; Culturing of difficult marine species.

### **3. Scientific cooperation**

<b>National</b>	Danish Biotechnological Institute; Danish Institute for Fisheries Research; Danish Institute of Agricultural Sciences; Danish Institute of Fisheries Research, Dept. of Seafood Research; Danish Technological Institute; Danish Trout Culture Research Station; Danish Veterinary Laboratory; Technical University of Denmark; The Royal Veterinary and Agricultural University; Universities of Aalborg, Aarhus and Copenhagen
<b>Bilateral European relations</b>	Ifremer (France); Institut für Fangtechnik (Germany); University of Kiel (Germany); Institute of Marine Biology (Greece); The Norwegian research institute 'Stiftelsen Østfoldforskning' (Norway); Ipimar (Portugal); AZTI, Basque Country (Spain); Consejo Superior de Investigaciones Científicas, Instituto del Frio (Spain); Rijks Instituut voor Visserij Onderzoek (RIVO-DLO) (the Netherlands); Seafish (UK); SOAEFD Marine Laboratory (UK); University of Stirling (UK)
<b>Asia</b>	MIER (Malaysia); RIMP (Vietnam)
<b>America</b>	Fundacion Chile (Chile); IFT (Peru)
<b>International organisations</b>	ICES

**Name: NATIONAL ENVIRONMENTAL RESEARCH INSTITUTE (NERI)**

**1. General information**

**Address**

National Environmental Research Institute  
 Department of Marine Ecology and Microbiology  
 Frederiksborgvej 399  
 PO Box 358  
 DK-4000 Roskilde.  
 Tel. (45-46) 30 12 00. Fax (45-46) 30 11 14

National Environmental Research Institute  
 Department of Lakes and Estuarine Ecology and Department  
 of Streams and Riparian Areas  
 Vejlsøvej 25  
 PO Box 314  
 DK-8600 Silkeborg.  
 Tel. (45-89) 20 14 00. Fax (45-89) 20 14 14

**2. Detailed objectives and research programmes**

Department of Marine Ecology and Microbiology

Its main objectives are to conduct marine environmental research, particularly in the cycling of nutrients and organic matter in the marine environment, to monitor the quality of the marine environment, and to give advice on the quality of the marine environment to the Danish government and the Danish authorities. Research is also conducted on terrestrial microbiology and on environmental contaminants and marine ecotoxicology.

Department of Lakes and Estuarine Ecology and Department of Streams and Riparian Areas

The two departments are situated together in Silkeborg in mid-Jutland. The groups do research on streams, lakes, and estuaries. The departments aim to do multidisciplinary strategic, basic, and applied aquatic research.

**3. Facilities at sea**

Access to RV *Gunnar Thorson* on a rental basis. *Gunnar Thorson* is managed by the Ministry of Defence and is a 850 BRT vessel equipped with laboratories and sampling gear for work at open marine waters. Accommodation for 10 scientists and technicians.

**4. Scientific cooperation**

<b>National</b>	Danish Institute for Fisheries Research; University of Aarhus; University of Copenhagen; Roskilde University
<b>Bilateral European relations</b>	University of Gothenburg, Sweden; University of Oslo, Norway; Sea Fisheries Institute, Gdynia, Poland
<b>Asia</b>	Phuket Marine Biological Centre, Thailand
<b>America</b>	Université Laval, Quebec, Canada; Inst. National de Investigación Y Desarrollo Pesquero, Argentina
<b>International organisations</b>	ICES; IOC-Science and Information Centre on Harmful Algal Blooms

**Name: ODENSE UNIVERSITY, INSTITUTE OF BIOLOGY****1. General information**

Address Odense University, Institute of Biology  
 Campusvej 55  
 DK-5230 Odense M.  
 Tel. (45-66) 15 86 00. Fax (45-65) 93 04 57

**2. Detailed objectives and research programmes**

Projects are: Respiration physiology, acid-base balance, ionic transport; Reproduction and growth; Endocrine control of vitellogenesis in crustaceans and teleost fish; Endocrine control of osmoregulation and metamorphosis processes in fish; Impact of marine fish farming on the environment.

**3. Scientific cooperation**

<b>National</b>	Danish Institute for Fisheries Research (DIFRES); Univ. of Copenhagen; Aalborg University; Univ. of Aarhus
<b>Bilateral European relations</b>	Univ. of Tartu (Estonia); Univ. of Göteborg (Sweden); Univ. of Turku (Finland); Univ. of Bangor; Birmingham; Univ. of Exeter; Univ. of Manchester; Univ. of St. Andrews (UK); Univ. of Humboldt (GER)
<b>America</b>	University of California, (USA); McMaster, Victoria (CAN)
<b>Oceania</b>	Ocean Research Institute (Tokyo); Hokkaido University (JAP)

**Name: MARINE BIOLOGICAL LABORATORY (MBL), UNIVERSITY OF COPENHAGEN****1. General information**

Address Marine Biological Laboratory (MBL), University of Copenhagen  
 Strandpromenaden 5  
 DK-3000 Helsingør.  
 Tel. (45-49) 21 33 44. Fax (45-49) 26 11 65  
 E-mail: marilab@inet.uni2.dk

Date of creation 1958

Status and financial position University Department

**2. Detailed objectives and research programmes**

Its main objectives are to conduct basic research in marine biology, and to train undergraduate and graduate students. The laboratory concentrates its work within four defined research areas, but research activities cannot easily be described in terms of sharply defined projects.

The four main research areas are: marine plankton; microbial ecology; adaptation physiology; fish parasitology.

### 3. Scientific cooperation

<b>National</b>	DIFRES; University of Aarhus; NERI)
<b>Bilateral European relations</b>	MPI, Bremen, Deutschland; several University Laboratories and departments

#### Name: FRESHWATER BIOLOGICAL LABORATORY, UNIVERSITY OF COPENHAGEN

##### 1. General information

**Address** Freshwater Biological Laboratory, University of Copenhagen  
Helsingørgade 51  
DK-3400 Hillerød.  
Tel. (45-48) 26 76 00. Fax (45-48) 24 14 76  
E-mail: flabms@inet.uni-c.dk

##### 2. Detailed objectives and research programmes

The research is characterised by its broad approach within limnology and estuarine ecology. The work at the laboratory is not narrowly focused on fish and fisheries but more generally on ecology and environmental research.

Research carried out at the Freshwater Biological Laboratory can be divided into basic research, supported by the University, research councils, and the Carlsberg Foundation, and strategic research supported by the Environmental research programme and EU.

Main areas of research include:

Energetics and population dynamics of the macrozoobenthos in lakes and the recent history of eutrophication in Danish lakes as monitored by macro-fossils.

River ecology.

Nutrient turnover and plant growth in fjords and coastal areas.

Microbial ecology of lakes.

##### 3. Scientific cooperation

<b>Bilateral European relations</b>	With Norway, Spain, Sweden, Finland, UK, mostly in EU projects
<b>Asia</b>	Philippines, Vietnam
<b>America</b>	Bilateral

**Name: AALBORG UNIVERSITY, ENVIRONMENTAL ENGINEERING LABORATORY****1. General information**

*Address* Aalborg University, Department of Civil Engineering,  
Environmental Engineering Laboratory  
Sohngaardsholmsvej 57  
DK-9000 Aalborg C.  
Tel. (45-96) 35 80 80. Fax (45-96) 14 25 25

*Date of creation* 20.4.1999

*Status and financial position* University — subdivision of department

**2. Detailed objectives and research programmes**

The major aim of the research area is to model the environmental regulation of growth and mortality in wild brown-trout populations.

Examples of projects are:

Modelling sublethal effects of environmentally based oxygen depletion in salmonid fish.

Modelling nutrition and growth in fast-growing rainbow trout.

Growth of salmonids under variable environmental conditions.

**3. Scientific cooperation**

<b>National</b>	Department of Inland Fisheries in Silkeborg
<b>Bilateral European relations</b>	College of Fisheries, University of Tromsø (Norway)
<b>European networks</b>	European Centre of River Restoration

**Name: AALBORG UNIVERSITY, BIOTECHNOLOGY LABORATORY****1. General information**

*Address* Aalborg University, Dept. of Civil Engineering, The  
Biotechnology Laboratory  
Sohngårdsholmsvej 57  
DK-9000 Aalborg.  
Tel (45-96) 35 80 80. Fax (45-96) 14 25 25

*Date of creation* 01.09.1993

**2. Detailed objectives and research programmes**

The laboratory has three main research areas:

General physiology of fish growth

Quality aspects in fish farming

Disease control and Immunocompetence.



### 3. Scientific cooperation

<b>National</b>	Danish Institute for Fisheries Research; Royal Veterinarian University; University of Aarhus; Odense University; The Danish Veterinary Laboratory Aarhus
<b>Bilateral European relations</b>	Ruder Boscovic Institute, Zagreb, Croatia; Laboratoire de Physiologie Générale et Comparée; Muséum National de la Recherche Scientifique, Paris; Stockholm University, Sweden
<b>European networks</b>	AquaT-net, Dublin
<b>Asia</b>	Universitas Hasanuddin, Ujung Pandan, Indonesia; Universitas Diponegoro, Semarang., Indonesia
<b>America</b>	University of British Columbia, Canada

#### Name: THE DANISH VETERINARY LABORATORY (DVL), ÅRHUS

##### 1. General information

Address The Danish Veterinary Laboratory (DVL), Århus  
 Hangøvej 2  
 DK-8200 Århus N.  
 Tel. (45-35) 30 01 00. Fax (45-89) 37 24 70  
 E-mail: SVS@SVS.dk

##### 2. Detailed objectives and research programmes

The laboratory is the EU reference laboratory for fish diseases and OIE reference laboratory for VHS.

Examples of EU-related research projects are:

Molecular basis for fish immunity and disease resistance

Rhabdoviruses in wild marine fish in European coastal waters: characterisation and significance for aquaculture

DNA vaccination of aquaculture fish, diagnostic methods and reference panel of reagents for detection and typing of fish viruses.

##### 3. Scientific cooperation

<b>National</b>	Difres; Danish Trout Farmer Association; Veterinary Services, RUAU
<b>Bilateral European relations</b>	Marine Lab, Aberdeen, Aberdeen; Univ. Fish Disease Lab, Weymouth; National laboratories in all European countries, US and worldwide

**Name:** THE ROYAL VETERINARY AND AGRICULTURAL UNIVERSITY, THE DEPARTMENT OF DAIRY AND FOOD SCIENCE

### **1. General information**

<i>Address</i>	The Royal Veterinary and Agricultural University, The Department of Dairy and Food Science Rolighedsvej 30 DK-1958 Frederiksberg C. Tel. (45-35) 28 32 22. Fax (45-35) 28 31 90 E-mail: clm@kvl.dk
<i>Status and financial position</i>	The Department of Dairy and Food Science is conducting education and research within the field of food science at the Royal Veterinary and Agricultural University (KVL). The education and part of the research are financed by KVL. In addition research programmes are financed by external grants from the research council, EU, the industry, etc.

### **2. Detailed objectives and research programmes**

The Department of Dairy and Food Science is conducting research within the area food microbiology, food chemistry, food technology, dairy technology, plant food science, sensory and meat science.

Examples of research projects are:

#### **Oxidation of emulsion made from fish oil**

The objective is to investigate the formation of radicals in food emulsions in a wide-planned project under the management of research director Torger Børresen, Difres.

#### **Spectrometric structural analysis on-line/at-line**

New, very sensitive nitrogen-cooled CCD cameras and imaging spectrographs can be used in combination with monochromatic light and low intensity in order to give specific chemical and structural information about foods for wavelengths ranging from UV to infrared, including near infrared Raman and fluorescence. The information is used for quality control on-line and at-line. The structure analysis has been correlated to sensory and biochemical analysis in fish, meat, cheese, wheat, and pectin and used in quality control at sugar factories.

#### **Centre for critical quality attribute determination in mussel foods**

This project is designed to provide a high powered research centre between lead agencies working on the properties of meat and fish. It will be a platform on which other initiatives are built and will provide major insights into basic issues in mussel food product technology and quality attributes. Attributes such as the water holding capacity (WHC) of mussel foods are of major concern for the meat and fish industry, as they affect critical technological traits (processing, yield), important sensory characteristics (appearance, flavour, tenderness, juiciness), nutritional characteristics (water-soluble vitamins, minerals) and processing characteristics (stickiness, salt uptake). Low WHC is most undesirable, resulting in unacceptably high drip loss which may occur at many stages during processing. Industry is therefore vitally interested in factors controlling this problem.

The ability to use rapid, non-destructive and non-invasive techniques to measure WHC would provide industry with means of selection and control of product in a matter not possible at present with consequent better use of raw materials, improved yields, consistency of product characteristics and hence better financial returns. Current methods do not achieve these objects. The investigations in this project will take a novel approach on well-described materials to find solutions to these pressing problems. The use, at the highest level, of sophisticated spectroscopic techniques, such as NMR and fluorescence, with the most recent instruments and with new probes to be developed, will be coupled with the ability to analyse the complex data

obtained by application and development of the most advanced chemometric techniques in a matter not employed for this task previously.

In addition, these results will be linked with pre-mortem and immediate post-mortem energy metabolism and with detailed structural, biochemical and physical measurements on the same, or comparable, materials to provide new insights into controlling the processes of changes in mussel food quality attributes.

To do this the project brings together considerable resources, expertise and knowledge of pork muscle, fish muscle, measurement techniques and chemometrics from leading university and sectoral research institutes in the food and medical fields.

#### **Quality criteria for new fish species in conformance to consumer needs**

(Ph.D. project together with Difres)

The purpose of the project is to develop a sensory quality management system according to consumer requirements for 4–5 fish species (known/unknown) consisting a sensory and chemical/physical quality parameters. In addition sensory profiling will be linked to consumer tests. The sensory and chemical/physical analysis will form a design basis for product maintenance and quality management. Data will be analysed by multivariate data analysis to find relationships between the various measurements.

#### **Quality assurance system for fish**

(Ph.D. together with Difres)

The project aims at relating consumer relevant quality indicators to the fish production chain 'from the sea to the table'. The quality index method will be applied in consumer test, as well as for fish experts evaluations and linked to sensory tests. Finally, various chemical and physical measurements will be calibrated towards the human responses.

### **3. Scientific cooperation**

<b>National</b>	The Danish Association of Fish Meal and Fish Oil Manufactures; Danisco Ingredients; Danish Institute for Fisheries Research; Danmarks Jordbrugs Forskning, Foulum, Denmark; Technical University of Denmark; SFK-Technology A/S; Skejby NMR Centre, Denmark; United Milling Systems A/S (cereals), A. Bremner
<b>America</b>	Fary Fulcher, University of Minnesota, St. Paul, USA

**Name:** THE ROYAL VETERINARY AND AGRICULTURAL UNIVERSITY, DEPARTMENT OF VETERINARY MICROBIOLOGY

#### **1. General information**

**Address** The Royal Veterinary and Agricultural University, Department of Veterinary Microbiology  
Bülowsvej 13  
DK-1870 Frederiksberg C.  
Tel. (45-35) 28 27 60. Fax (45-35) 28 27 57

#### **2. Detailed objectives and research programmes**

The department shares facilities with the Laboratory of Fish Diseases (LFD) and the Fish Disease Laboratory (Difres). The areas of study are aquatic pathobiology, bacteriology, mycology, and parasitology. LFD is part of the University and its programme is largely basic and concentrates on the study of the classification of marine vibrio bacteria.

### 3. Scientific cooperation

<b>National</b>	The University of Copenhagen; Statens Serum Institut; Statens Veterinære Serumlaboratorium
<b>European networks</b>	Katholieke Universiteit Leuven, Belgium; Universiteit Gent, Belgium; National Veterinary and Food Research Institute, Helsinki, Finland; Institut Pasteur, Paris, France; Centre National d'Etudes Veterinaires et Alimentaires, Plouzané, France; Robert Koch Institute, Berlin, Germany; University of Iceland, Iceland; Veterinary Institute, Oslo, Norway; Heriot-Watt University, Edinburgh, Scotland; University of Aberdeen, Scotland; Marine Laboratory Aberdeen, Scotland; University of Barcelona, Spain; University Complutense, Madrid, Spain; University Vugo, Spain; University Santiago de Compostela, Spain; University Valencia, Spain; National Veterinary Institute, Uppsala, Sweden; Karolinska Institute, Stockholm, Sweden
<b>Asia</b>	Zhejiang Institute of Freshwater Fisheries, Huzhou, China; Institute of Hydrobiology, Wuhan, China
<b>America</b>	US Food and Drug Administration, USA; University of North Carolina at Charlotte, USA; Louisiana State University, USA; Universidade Santa Ursula, Rio de Janeiro, Brazil)
<b>International organisations</b>	Danish Research Council for Developing Countries (DANIDA)

#### Name: DANISH INSTITUTE OF AGRICULTURAL AND FISHERIES ECONOMICS

##### 1. General information

Address	Danish Institute of Agricultural and Fisheries Economics (SJFI) Tofttegårds Plads Gammel Køge Landevej 1-3 DK-2500 Valby. Tel. (45-36) 44 20 80. Fax (45-36) 44 11 10 E-mail: <a href="mailto:Diafe@sjfi.dk">Diafe@sjfi.dk</a>
Date of creation	1 October 1997
Status and financial position	The institute is a research institute under the Ministry of Food, Agriculture and Fisheries

##### 2. Detailed objectives and research programmes

The main objectives of the institute is to carry out research and investigations and to give advice about agriculture and fisheries economics questions from a macro- as well as a micro-economic point of view. The activities include the economic aspects of resource and environment management. The institute produces account statistics covering the primary fisheries industry. A Fisheries Economic Research Division was established in 1997. The research is mainly of a strategic and applied nature in the areas: bioeconomics on fisheries management; economic models for the fisheries sector; fisheries economics and policy.

### 3. Scientific cooperation

<b>National</b>	Department of Environment and Business (former DIFER); University of Southern Denmark; Danish Institute for Fisheries Research (Difres); and other Danish Research Institutes
<b>Bilateral European relations</b>	Institutes in relation to the European Association of Fisheries Economists (EAFE)

**Name:** SOUTH JUTLAND UNIVERSITY CENTRE, DANISH INSTITUTE OF FISHERIES ECONOMIC RESEARCH (DIFER)

#### 1. General information

**Address** South Jutland University Centre, Danish Institute of Fisheries Economic Research (DIFER)  
Niels Bohrs vej 9  
DK-6700 Esbjerg.  
Tel. (45-79) 14 11 11. Fax (45-79) 14 11 99

#### 2. Detailed objectives and research programmes

The objective of DIFER is to undertake fisheries economics research, development, and dissemination.

Four areas are specified within fisheries economics:

Fisheries biology modelling.

Production theory.

Management of exploitation of natural resources.

Regional economics (coastal zone).

Examples of ongoing projects are:

Optimality in fisheries.

Return on capital.

Resource exploitation in the Limfjorden; biological structure and functioning, modelling and socioeconomic consequences.

Concerted action: Bioeconomic modelling of the North Sea pelagic fisheries.

#### 3. Scientific cooperation

<b>Bilateral European relations</b>	EEA (EU + Iceland and Norway)
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**Name: INSTITUTE FOR FISHERIES MANAGEMENT AND COASTAL COMMUNITY DEVELOPMENT (IFM)**

**1. General information**

<i>Address</i>	Institute for Fisheries Management and Coastal Community Development (IFM) North Sea Centre, PO Box 104 DK-9850 Hirtshals. Tel. (45-98) 94 28 55. Fax (45-98) 94 42 68 E-mail: ifm@nscentre.dk
<i>Date of creation</i>	28 October 1994
<i>Status and financial position</i>	Non-profit private foundation

**2. Detailed objectives and research programmes**

The operations of the institute are based on multiannual research contracts and research cooperation with partner research institutions and authorities in Denmark and abroad, and on short-term consultancy for a range of international organisations, e.g. Danida, Norad, FAO, the World Bank, EU and UNDP.

The primary objective of IFM is to undertake research on socioeconomic and institutional aspects of fisheries management and development in coastal communities. A second objective is the delivery of advisory services to national and international public authorities, institutions, and organisations in both industrialised and developing countries. The institute is internationally orientated, but it also deals with local and national Danish problems.

IFM focus on three main research areas:

Fisheries in developing countries with a large project on co-management in Asia and Africa.

Legitimacy research and co-management in relation to management efforts in Denmark.

Integrated coastal zone management, with particular reference to developing countries.

IFM participates in EU projects, and it also has extensive contacts outside Europe, especially in Asia and Africa through the Iclarm/Danida project on co-management.

**3. Scientific cooperation**

<b>National</b>	Danish Institute for Fisheries Research (Difres); North Atlantic Regional Studies (NORS); Roskilde University; Danish Institute for Fisheries Economics Research (DIFER); South Jutland Univ. Centre; Department of Development and Planning; Aalborg Univ.; Business Studies, Aalborg Univ.; Centre for Maritime and Regional History, Esbjerg; Research Centre for Forests and Landscape; Danish Ministry of Environment and Energy; Research Centre of Bornholm
<b>Bilateral European relation</b>	Norges Fiskerihøgskole; Univ. of Tromsø; Chr. Michelsens Institutt, Bergen, Norway; School of Geography and Earth Resources; Univ. of Hull, Department of Human Geography; Univ. of Sevilla
<b>European networks</b>	European Social Science Fisheries Network (Essfin); European Association of Fisheries Economists (EAFE)
<b>Africa</b>	Instituto de Desenvolvimento da Pesca de Pequena Escala (IDPPE), Mozambique; Univ. of Cape Town; Univ. of Western Cape, South Africa; Centre of Applied Social Science (CASS), Zimbabwe.

<b>Asia</b>	Department of Natural Resources Economics, University Pertanian Malaysia
<b>America</b>	Department of Agriculture and Resources Economics, Oregon State Univ. USA
<b>International organisations</b>	ICLARM, IEPRI, Mekong River Commission

**Name: MAPP—CENTRE FOR MARKET SURVEILLANCE, RESEARCH, AND STRATEGY FOR THE FOOD SECTOR**

**1. General information**

<i>Address</i>	MAPP—Centre for Market Surveillance, Research, and Strategy for the Food Sector The Aarhus School of Business Haslegaardsvej 10 DK-8210 Aarhus V. Tel. (45-89) 48 64 87. Fax (45-86) 15 01 77
<i>Status and financial position</i>	The MAPP centre is funded by grants from the Directorate of Development for Agriculture and Fisheries at the Ministry of Food, Agriculture and Fisheries, the Danish Research Council, the Ministry of Research, and EU projects.

**2. Detailed objectives and research programmes**

The MAPP—Centre for Market Surveillance, Research, and Strategy for the Food Sector is an international research centre located at the Aarhus School of Business. The centre specialises in research on the development and marketing of food products. The objectives of the centre's research are to accumulate knowledge and to develop tools which can help Danish food manufacturers to become more market oriented.

Research at the MAPP Centre is organised in four research areas:

Surveillance and analysis of consumer behaviour.

Surveillance and analysis of distributors and competitors.

Development of competence for product innovation.

Quality function deployment.

These four research areas are conceived from the viewpoint of the food processing company, and they cover the whole food chain.

**NAME: NORTH ATLANTIC REGIONAL STUDIES PROGRAMME (NORS), ROSKILDE UNIVERSITY CENTRE, INSTITUTE OF GEOGRAPHY AND INTERNATIONAL DEVELOPMENT STUDIES**

**1. General information**

<i>Address</i>	North Atlantic Regional Studies programme (NORS), Roskilde University Centre, Institute of Geography and International Development Studies Marbjergvej 35 DK-4000 Roskilde. Tel. (45-46) 75 77 11. Fax (45-46) 75 74 01
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<i>Date of creation</i>	1980
<i>Status and financial position</i>	The North Atlantic Regional Studies programme at the Roskilde University Centre was established by means of a special grant from the Ministry of Education

## **2. Detailed objectives and research programmes**

The primary objective of NORS is to conduct research in social science, and the main focus is characterised by the following categories:

Fisheries regulations and use of resources (Denmark, EU, Greenland, Canada, and Alaska).

The market for fish and fish products (EU).

Fish dependent regions and the conditions for their development (Denmark, EU, Greenland, Canada, and Alaska).

Statistical analysis of fishing fleet, fishermen and catches (Greenland).

Consequences of the development of technologies, especially information technology, for fisheries and fisheries dependent communities.

Conditions for sustainable development in the Arctic; including fisheries and fish-processing dependent communities.

## **3. Scientific cooperation**

<b>National</b>	IFM; NERI, Dept. of Arctic Environment; Univ. of Aarhus; Greenland Statistics
<b>Bilateral European relations</b>	Univ. of Tromsø, College of Fisheries; Univ. of Hull; Univ. of Sevilla; Univ. of Patras; Univ of Brest; Akvaplan-Niva, Tromsø)
<b>European networks</b>	European Social Science Fisheries Network
<b>America</b>	Dalhousie University; Univ. of Prince Edward Island; Univ. of New Hampshire, Dartmouth College; Univ. of Alaska; Memorial University, St. Johns
<b>International organisations</b>	(FAO; ICES)

**Name:** THE TECHNICAL UNIVERSITY OF DENMARK, DEPARTMENT OF BIOTECHNOLOGY AND DEPARTMENT OF BIOCHEMISTRY AND NUTRITION

### **1. General information**

<i>Address</i>	The Technical University of Denmark, Department of Biotechnology and Department of Biochemistry and Nutrition Building 224 DK-2800 Lyngby. Tel. (45-45) 93 30 66 or 25 27 37. Fax (45-45) 88 49 22 or 88 63 07
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## **2. Detailed objectives and research programmes**

The Dept. of Biotechnology focuses its research in the following disciplines:

Metabolic engineering.

Fermentation technology.

Food and downstream technology.

Food biotechnology.

Food mycology.

Examples of research projects are:

Fish oil refining technology.

Lipid oxidation and enzymes as antioxidants.

Examples of research projects of the Department of Biochemistry and Nutrition are:

Fish oils in animal feed.

Fish oils in infant formulas.

Nutritional effects of (n-3) fatty acids from fish oil.

Mechanism of oxidation in emulsion systems with fish oil.

## **3. Scientific cooperation**

<b>National</b>	(Department of Seafood Research (Difres))
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### **Name: HØJMARK LABORATORY**

#### **1. General information**

*Address*

Højmark Laboratory  
Adelvej 11  
6940 Lem St.  
Tel. (45-97) 34 33 66. Fax (45-97) 34 34 35

*Status and financial position*

Højmark Laboratory is a privately owned company operating within the food industry, particularly within the fish industry

#### **2. Detailed objectives and research programmes**

Public and commercial research is one of the many activities of the laboratory. Other activities are laboratory analysis, consultancy, environmental management, process development, teaching, and training. The laboratory cooperates with industry, other research institutes, universities, and the educational establishment.

The main research areas are:

Fish quality and processing.

Cryoprotection.

Utilisation of fish resources.

By-products.

Examples of research projects are:

Fish mince technology, traditional and new resources.

Characterisation and stabilisation of fish protein during frozen storage.

Development and application of environmentally cleaner technology.

Quality indicators for frozen fish.

### **3. Scientific cooperation**

<b>National</b>	Department of Seafood Research (Difres); The Royal Veterinary and Agricultural University; Aalborg University
<b>International organisations</b>	Nordic Committee on Food Analysis; Eurolab



# FINLAND





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

The commercial Finnish catch in the Baltic sea fisheries in 1996 was 116 600 tonnes with a total value of EUR 25.07 million. The most important species in capture was Baltic herring, the share of which was nearly 90 % of the total catch. About three quarters of the Baltic herring catch was used for animal feed.

Landings (1 000 tonnes)							
Species	1990	1991	1992	1993	1994	1995	1996
Baltic herring	66.1	51.6	72.2	77.4	97.7	94.6	93.3
Sprat	0.2	0.1	0.9	0.2	0.5	4.1	14.3
Cod	1.7	1.7	0.5	0.2	0.5	1.9	3.1
Salmon	2.1	1.9	1.9	1.6	1.0	1.2	1.0
Whitefish	1.3	1.5	1.3	1.2	1.1	1.2	1.3
Other species	2.3	3.4	2.3	3.0	2.6	3.1	3.5
<b>Total</b>	<b>73.7</b>	<b>60.2</b>	<b>79.1</b>	<b>83.6</b>	<b>103.4</b>	<b>106.1</b>	<b>116.6</b>

Landings (million EUR)							
Species	1990	1991	1992	1993	1994	1995	1996
Baltic herring	13.31	10.31	14.60	14.65	16.19	11.93	12.90
Sprat	0.08	0.05	0.42	0.10	0.17	0.52	1.48
Cod	0.88	1.49	0.44	0.13	0.48	1.20	2.52
Salmon	6.29	6.66	6.09	5.95	4.11	2.81	2.10
Whitefish	2.73	3.39	3.11	2.98	2.79	2.20	2.67
Other species	3.17	3.19	2.77	3.19	3.21	3.03	3.40
<b>Total</b>	<b>26.46</b>	<b>25.09</b>	<b>27.43</b>	<b>27.00</b>	<b>26.95</b>	<b>21.69</b>	<b>25.07</b>

The annual catches have varied from about 60 000 tonnes to 100 000 tonnes within the last 10 years. The catch in 1996 was highest in quantity during the period. The value of the catch has decreased because of the remarked decline of fish prices in 1995 after Finland joined the EU. The fishing of Baltic herring, salmon, sprat and cod is regulated by the TAC. The variation in the catches of Baltic herring can to a large extent be explained by the changes in its demand for fur animal feed.

The total catch in inland water commercial fisheries in 1996 was 4 628 tonnes, at a value of about EUR 6.47 million. The most important species was vendace. More than one third of the vendace catch was caught by winter seine under ice. The catches in professional inland water fisheries are highly dependent on the fluctuation of the vendace populations. In the early 1990s vendace catches were at a very low level but a slight increase has taken place in the recent years.

Subsistence and recreational fishing is very common in Finland. In 1996 the total catch of non-commercial fisheries was 42 762 tonnes, at a value of EUR 65.3 million. Of the total catch in 1996, about 10 % in the sea region and 90 % in inland waters were caught by non-commercial fishermen.

### 1.1.2. Trend in fleet

In 1996 there were about 1 200 full-time and 1 800 part-time professional fishermen fishing in the sea region. The fishing fleet consisted of 1 400 vessels more than 8.0 metres long and about 2 400 smaller vessels, in total 22 520 GRT and 213 180 kW. In inland waters there were about 1 300 fishermen of whom 240 were full-time.

Before 1996 the fishing fleet register consisted of over 12 m long vessels only. There were 533 fishing vessels in 1985 and 570 in 1990.

	1990	1991	1992	1993	1994	1995	1996
Fishermen	3 046	2 884	2 739	2 765	2 375	3 000	3 000
Number vessels							3 864
Power (thousand kW)							213

### 1.1.3. Fishing harbours

In 1993, fish were landed in 67 fishing harbours along the Finnish coast and in 30 fishing harbours by the largest lakes in Finland. Landing harbours are rather small.



## 1.2. Aquaculture sector

Aquaculture in Finland consists of two main fields: food fish farming, and rearing of fish juveniles for restocking and sea ranching. The production of farmed food fish in 1996 was 17 659 tonnes, at a value of EUR 40.2 million (excluding VAT). The main species is rainbow trout. Fish fry and smolts were cultivated for further rearing and for restockings worth EUR 26.7 million (excluding VAT). In 1996 there were 331 food fish production farms, 147 fish fry farms and 349 natural food pond rearers. About 80 % of food fish is farmed in net cages in the Baltic Sea. Inland, food fish is farmed mostly in earthen ponds.

The production of food fish farming expanded about 15 % each year in the 1980s reaching a peak in 1991 (19 271 tonnes). In 1985, production was 10 074 tonnes and in 1990, 18 661 tonnes.

Quantity (1 000 tonnes)							
Species	1990	1991	1992	1993	1994	1995	1996
Rainbow trout	18.4	19.1	17.7	17.3	16.5	17.1	17.50
Other species	0.2	0.2	0.2	0.2	0.2	0.2	0.15
<b>Total</b>	<b>18.6</b>	<b>19.3</b>	<b>17.9</b>	<b>17.5</b>	<b>16.7</b>	<b>17.3</b>	<b>17.65</b>

Value (million EUR)							
Species	1990	1991	1992	1993	1994	1995	1996
Rainbow trout	59.4	64.1	62.1	62.4	61.1	47.6	39.80
Other species	0.6	0.7	0.6	0.6	0.6	0.5	0.34
<b>Total</b>	<b>60.0</b>	<b>64.7</b>	<b>62.7</b>	<b>63.0</b>	<b>61.7</b>	<b>48.1</b>	<b>40.14</b>

In many rivers and lakes the natural reproduction of some important catch species has declined because of hydropower construction in the 1940s and 1950s and water level regulation. Compensation for the loss by restockings is defined by the decisions of the water courts. Restockings are also made for fisheries management.

In 1996, a total of 1.9 million salmon smolts and 1.4 million salmon fry were restocked in the estuaries of Bothnian Bay and the Gulf of Finland as well as in the Tornionjoki, Simojoki and Kokemäenjoki Rivers. Whitefish is the most restocked. Most whitefish is restocked as small fry in inland waters. Pike-perch and sea trout were also greatly restocked.

## 1.3. Processing industry sector

From 1993-94, there were more than 200 enterprises, with a total of 1 100 employees engaged in the fish wholesale trade and/or fish processing. Most of the fish processing firms are small, with 1 to 4 workers, and a turnover of less than EUR 0.34 million. Twenty-five enterprises had a turnover of over EUR 1.68 million. The share of the nine largest firms (5 % of all enterprises) was more than half of the total amount of fish processed in 1997.

In 1997, the Finnish fish processing industry used about 39 000 tonnes of fish, of which 84 % was domestic. The most important domestic species are Baltic herring (50 %) and rainbow trout (25 %). The main processing methods were filleting and smoking.



#### **1.4. Consumption of sea products**

The consumption of fish in Finland is 14.5 kg/year per capita. The consumption figures are counted as fillet weights of domestic fish and as production weights of imported fish. Of the total consumption, 7 kg is of imported fish, 3 kg from recreational and subsistence fishery, 2.5 kg from professional fisheries and 2 kg from the production of national aquaculture. Finland imports fish for human consumption and also for animal feed. Most of the imports in 1996 were from Norway, Sweden and Denmark.

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

Fisheries research in Finland is mainly carried out at the Finnish Game and Fisheries Research Institute (FGFRI). Several universities offer higher education on fish biology, environmental ecology, stock assessment and other issues related to fisheries. University of Helsinki, Department of Limnology and Environmental Protection and University of Jyväskylä, Department of Biological and Environmental Science are the major higher level education institutes in the fisheries fields in Finland. University departments and laboratories also deal with basic as well as applied research in the fisheries field. Many private companies and consulting firms have a research department or laboratory which carries out fisheries research, offering advice to local authorities on their region's specific problems. There are several small units but only a few large ones.

Some governmental institutes, such as the Agricultural Research Centre (MTT), the National Veterinary and Food Research Institute (EELA) and the Technical Research Centre in Finland (VTT) include fish within their research projects, whereas, some other institutes carry out research closely related to fisheries. Regional environment centres and the Finnish Environment Institute (FEI) are responsible for water-quality monitoring in fresh waters and coastal areas in the Baltic Sea as well as research on eutrophication and other ecological issues. The Finnish Institute of Marine Research (FIMR) does research on marine ecosystems.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
<b>Main</b>	FGFRI	137	374	9.52	18.61
<b>Other research institutes</b>	MTT	2	919	0.11	39.04
	FEI				
	VTT	4	2500		183
	FIMR	14*	90	1.5*	7
	EELA	6	350		17.9
<b>Technical centre(s)</b>	Employment and economic development centres	57	534	2.45	21.01
	Regional environment centres				

\* Research of marine ecosystems.

#### 2.1.2. Supervisory Ministerial authority(ies)

The responsibility for managing fisheries lies with the Ministry of Agriculture and Forestry (MAF). The Department of Fisheries and Game secures the conditions for fisheries, game and reindeer husbandry in

Finland by directing the diversified use and management of natural resources. The department implements the common fisheries policy. At the local level the Employment and Economic Development Centres of the MAF are the authorities implementing the CFP.

Institutes	Authority(ies)				
	Agriculture and Forestry	Environment	Education	Transportation and Communications	Trade and Industry
FGFRI					
Agricultural Research Centre					
National Veterinary and Food Research Institute					
Technical Research Centre of Finland					
Finnish Environment Institute					
Finnish Institute of Marine Research					
Universities (in Helsinki, Joensuu, Jyväskylä, Kuopio, Lappeenranta, Oulu and Turku), Åbo Akademi					

### 2.1.3. Coordination and relationship among the different research organisations and with research users

Fish species with commercial importance are administrated by the Ministry of Agriculture and Forestry and non-commercial species are within the legislation of the Ministry of Environment. Both ministries promote sustainable development and sustainable use of natural resources; the Ministry of Agriculture and Forestry is in charge of sustainable production while the Ministry of Environment stresses production.

The main user of fisheries research results is administration, especially the Ministry of Agriculture and Forestry. The FGFRI produces information on which to base fisheries management as well as economic and social planning. The fisheries and aquaculture industries as well as recreational fishermen and their interest groups, and other organisations and fish trade and industry are important research users when developing their professional and interest activities.

### 2.1.4. Participation to European networks (concerning FGFRI)

- Mechanisms influencing long-term trends in reproductive success and recruitment of Baltic cod (CORE): Implications for fisheries management. AIR2 CT-94-1226, 1994-1997.
- Improving technical management in Baltic cod fishery (BACOMA). FAIR CT 96-1994, 1996-1999.
- International Baltic Sea Sampling Project for Commercial Fishing Fleets (IBSSP). EU Study 96-002, 1997-1999.
- International Baltic Sea Sampling Project Programme II (IBSSP II). EU Study 98/024, 1999-2001.
- Establishing a Baltic International Trawl Survey (BITS) database. EU Study 96/072, 1998-2001.

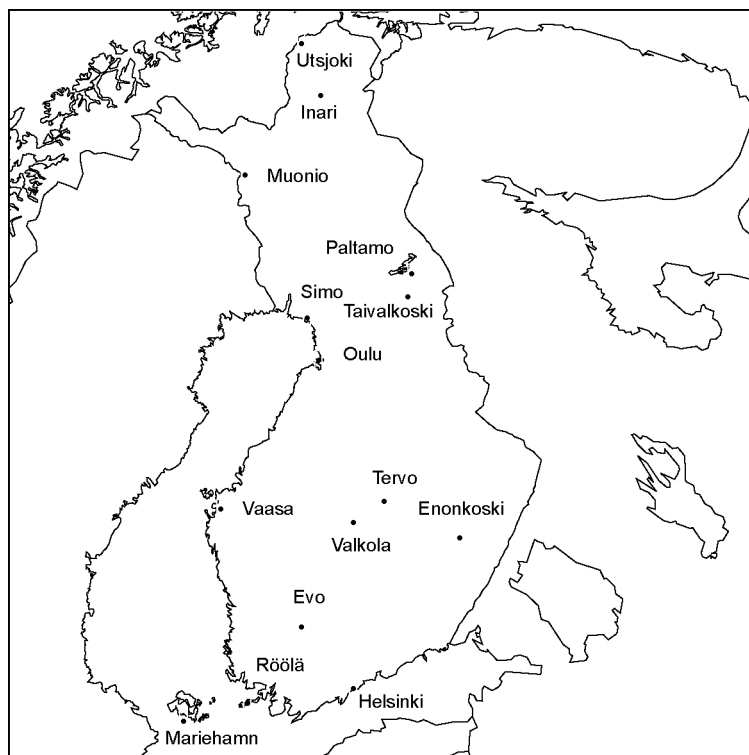
- Improvement of tagging methods for stock assessment and research in fisheries. FAIR CT.96.1394, 1996-1999.
- Hydroacoustic Assessment of Salmon in the River Tornionjoki. EU Study 96/C75, 1997-2000.
- The EC contribution to the concerted action 'European Fish Ageing Network' (EFAN). FAIR CT.96.1304, 1997-99.
- SAP- Sustainable fisheries. How can scientific basis for fish stock assessment and predictions be improved? FAIR PL97-3805, 1998-2001
- STORE — Environmental and fisheries influences on fish stock recruitment in the Baltic Sea. FAIR-PL97-3959, 1998-2001
- Surveying the paelagic fish resources and establish an acoustic database in the Baltic Sea (BALTDAT). EU Study 98/085. 1999-2001.
- Regional economic studies on employment and the level of dependency on fishing. EU associated contract. 98/S63-37476. 1998.
- Improvement of stock assessment and data collection by continuation, standardisation and design improvement of Baltic international bottom trawl surveys for fishery resource assessment (ISDBITS). EU Study 98/099. 1999-2000.
- Promotion of common methods for economic assessment of EU fisheries. FAIR CT.97.354. 1998-2001
- Environmental Impact of Aquaculture in Finland, COST 827 network. 1997-2000
- Total value of recreational fisheries in the Nordic countries. NAF. 1999-2001.

## **2.2. Main research institute: FINNISH GAME AND FISHERIES RESEARCH INSTITUTE (FGFRI)**

### **2.2.1. General information**

<i>Address</i>	Finnish Game and Fisheries Research Institute Pukinmäenaukio 4 PO Box 6 FIN-00721 Helsinki Tel. (358) 205 75 11. Fax (358) 205 751 201 Internet: <a href="http://www.rkti.fi">http://www.rkti.fi</a>
<i>Date of creation</i>	1971
<i>Status and financial position</i>	The Finnish Game and Fisheries Research Institute is a governmental institute
<b>Åland Fisheries Research Station</b>	Parkgatan 6 FIN-22100-MARIEHAMN Tel. (358) 205 75 18 60. Fax (358) 205 75 18 69
<b>Evo Fisheries Research and Aquaculture</b>	Rahtijärventie 291 FIN-16970-EVO Tel. (358) 205 75 14 20. Fax (358) 205 75 14 29
<b>Inari Fisheries Research and Aquaculture</b>	Saarikoskentie 8 FIN-99870-INARI Tel. (358) 205 75 14 60. Fax (358) 205 75 14 69
<b>Kainuu Fisheries Research and Aquaculture</b>	Manamansalontie 90 FIN-88300-PALTAMO Tel. (358) 205 75 16 40. Fax (358) 205 75 16 49

<b>Laukaa Fisheries Research and Aquaculture</b>	Vilppulantie 415 FIN-41360-VALKOLA Tel. (358) 205 75 15 10. Fax (358) 205 75 15 19
<b>Quark Fisheries Research Station</b>	Korsholmanpuistikko 16 FIN-65100-VAASA Tel. (358) 205 75 16 70. Fax (358) 205 75 16 79
<b>Muonio Fish Farm</b>	Lohirannantie 50 FIN-99300-MUONIO Tel. (358) 205 75 17 00. Fax (358) 205 75 17 09
<b>Bothnian Bay Fisheries Research Station</b>	Jenssintie 2 FIN-95200-SIMO Tel. (358) 205 75 18 10. Fax (358) 205 75 18 19
<b>Rymättylä Fisheries Research Station</b>	Aaslantie 512 FIN-21150-RÖÖLÄ Tel. (358) 205 75 17 30. Fax (358) 205 75 17 39
<b>Saimaa Fisheries Research and Aquaculture</b>	Laasalantie 9 FIN-58175-ENONKOSKI Tel. (358) 205 75 16 00. Fax (358) 205 75 16 09
<b>Taivalkoski Game and Fisheries Research</b>	Ohtaajantie 19 FIN-93400-TAIVALKOSKI Tel. (358) 205 75 15 50. Fax (358) 205 75 15 59
<b>River Tenojoki Fisheries Research Station</b>	Tuomarinniemi FIN-99980-UTSJOKI Tel. (358) 205 75 17 60. Fax (358) 205 75 17 69
<b>Tervo Fisheries Research and Aquaculture</b>	Huuhtajantie 160 FIN-72210-TERVO Tel. 358 205 751 850 — Fax 358 205 751 859
<b>Oulu Fisheries Research Station</b>	Teknologiantie 12 FIN-90570-OULU Tel. 358 205 751 870 — Fax 358 205 751 879

*Location*

### 2.2.2. Detailed objectives and research programmes

The Finnish Game and Fisheries Research Institute is a governmental institute founded in 1971. The institute is divided into five units, two of which, the Fisheries Biology and Management Research Unit and the Socioeconomic and Aquaculture Research Unit work on fisheries research. The objective of the Aquaculture Unit is to conserve endangered and declining fish stocks and safeguard their diversity. This is done through cultivation at 13 fish farms and through juvenile stockings. The game and reindeer research unit cooperates with fisheries research through marine mammals and sea bird research projects. The FGFR also compiles national fishery statistics on the professional marine and inland water fishery (catches and landings), aquaculture, recreational fishing, fish trade, fish processing, fish imports and exports, fish stockings and fish consumption.

The annual budget of the fisheries research units is approximately EUR 10.1 million. Most of the funding comes from the State budget. Research activity is based on projects. Staff at the fisheries research units totals about 110 employees, of which 70 are researchers including statisticians and those working on administrative tasks.

Fisheries biology and management research focuses on the following key areas:

Assessment of fish resources: role of fish interactions in fisheries management.

Effect of environmental loads on fish and fisheries: distribution and mitigation of damages.

Effect of physical habitat modifications on fish population: habitat enhancement and fisheries management approach.

Biological diversity: genetic diversity, species level diversity, conservation and enhancement.

Definition of fish stocking needs and monitoring the impact of stocking.

Fisheries management research: technical measures and impact analysis.

The key areas of socioeconomic and aquaculture research are:

Fish market research; fish pricing, consumer behaviour and habits, structure of the market and profitability of commercial enterprises.

Research into commercial fishing; structure of professional fishing, financial resources of fishermen and profitability of fishing.

Research into recreational fishing, evaluation of recreational fishing.

Research into aquaculture; diversifying the production of aquaculture, environmental issues, selective breeding of rainbow trout and preservation of genetic diversity using aquaculture means, crayfish production qualifications.

### **2.2.3. Scientific cooperation**

<b>National</b>	National Veterinary and Food Research Institute, Agricultural Research Centre, Finnish Environment Institute, Finnish Forest Research Institute, Finnish Marine Research Institute, Finnish Meteorological Institute, Statistic Finland, Radiation and Nuclear Safety Authority, Technical Research Centre of Finland; Universities in Helsinki, Joensuu, Jyväskylä, Kuopio, Lappeenranta, Oulu, Turku and Åbo Akademi
<b>Bilateral</b>	Finnish-Russian Frontier Water Commission, Finnish-Swedish Tornio River Commission, Finnish-Norwegian cooperation (size of salmon stocks in boundary rivers)
<b>European relations</b>	
<b>European networks</b>	EU: DG XIV, STECF, Meetings of the Directors of Fishery Research Organisations, Committees of the Research and Development Programmes, EU research projects, Scandinavian research projects
<b>International organisations</b>	ICES; International Baltic Sea Fisheries Commission (IBSFC); NASCO; Nordic Council of Ministers (NAF); FAO; the European Inland Fishery Advisory Commission (EIFAC); OECD; Eurostat; HELCOM; The International Union of Nature Conservation (IUCN); The International Species Survival Commission (ISSC)

### **2.3. Other research organisations**

**Name:** AGRICULTURAL RESEARCH CENTRE OF FINLAND (MTT) — ANIMAL PRODUCTION RESEARCH

#### **1. General information**

<i>Address</i>	Agricultural Research Centre of Finland — Animal Production Research FIN-31600 Jokioinen Tel. (358-3) 418 81. Fax (358-3) 41 8836 18 Internet: <a href="http://www.mtt.fi">http://www.mtt.fi</a>
<i>Date of creation</i>	1898
<i>Status and financial position</i>	Governmental research institute under the Department of Agriculture in the Ministry of Agriculture and Forestry

#### **2. Detailed objectives and research programmes in aquaculture research sector**

The general objective is to improve the productivity of fish farming through effective application of theory and methods of animal breeding. Research focuses on development and optimisation of breeding schemes and genetic evaluation of rainbow trout.

### 3. Scientific cooperation

<b>National</b>	FGFRI
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**Name:** NATIONAL VETERINARY AND FOOD RESEARCH INSTITUTE (EELA)

#### 1. General information

*Address*

National Veterinary and Food Research Institute  
Hämeentie 57  
PO Box 368  
Tel. (358-9) 39 31 01. Fax (358-9) 393 18 11  
Internet: <http://www.mmm.fi/hallinnonala/eela>

*Status and financial position*

Governmental research institute under the Veterinary and Food Department in the Ministry of Agriculture and Forestry

#### 2. Detailed objectives and research programmes

Research on bacteria branch: Bacterial diseases in cultured and wild fish. Antibiotic resistance of fish pathogen bacteria, antibiotic residues in farmed and wild fish, testing of vaccines (vibriosis, furunculosis). Virological branch: Virus isolations of cultured and wild fish. Parasitological branch: identification of cultured and wild fish.

### 3. Scientific cooperation

<b>National</b>	FGFRI, Universities of Oulu, Kuopio and Helsinki
<b>Bilateral European relations</b>	EU-projects, Scandinavian projects

**Name:** TECHNICAL RESEARCH CENTRE OF FINLAND (VTT) — BIOTECHNOLOGY AND FOOD RESEARCH (VTT IBEL)

#### 1. General information

*Address*

Technical Research Centre of Finland — Biotechnology and Food Research  
Biologinkuja 1  
PO Box 1500  
FIN-02044 VTT  
Tel. (358-9) 45 61. Fax (358-9) 455 21 03  
Internet: <http://www.vtt.fi>

*Status and financial position*

Governmental institute funded partly by industry

#### 2. Detailed objectives and research programmes

VTT is an impartial expert organisation that carries out technical and technoeconomic research and development work. In VTT IBEL fish is studied as food. The principal objects has been Baltic herring and farmed salmon and trout. The area of research has varied from fishing conditions to fish products with special emphasis on the quality and development of quality measurement methods.



### 3. Scientific cooperation

<b>European networks</b>	Western European Fish Technologists' Association; Nordic Network for Fish Processing
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#### Name: FINNISH ENVIRONMENT INSTITUTE (FEI)

##### 1. General information

<i>Address</i>	Finnish Environment Institute Kesäkatu 6 — PO Box 140 FIN-00260 Helsinki Tel. (358-9) 40 30 00. Fax (358-9) 40 30 01 90 Internet: <a href="http://www.vyh.fi/fei/fei.html">http://www.vyh.fi/fei/fei.html</a>
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#### Name: FINNISH INSTITUTE OF MARINE RESEARCH (FIMR)

##### 1. General information

<i>Address</i>	Finnish Institute of Marine Research PO Box 33 — FIN-00931 Helsinki Tel. (358-9) 61 39 41. Fax (358-9) 613 944 94 Internet: <a href="http://www.fmri.fi">http://www.fmri.fi</a>
<i>Date of creation</i>	1919
<i>Status and financial position</i>	National budget

##### 2. Detailed objectives and research programmes

Basic and applied research on marine ecosystems, services for sea transport.

##### 3. Facilities at sea:

R/V *Aranda*: length 59.2 m, commissioned 1989 Helsinki, crew of 12-13 persons, scientists 25 persons, maximum endurance 60 days.

##### 4. Scientific cooperation

<b>National</b>	Research institutes; universities
<b>Africa</b>	Namibia
<b>America</b>	NSF (National Science Foundation)
<b>International organisations</b>	International Council of Scientific Unions (ICSU); ICES; Scientific Committee on Oceanic Research (SCOR); Scientific Committee on Antarctic Research (SCAR); Arctic Ocean Sciences Board (AOSB); HELCOM)

**Name: UNIVERSITY OF HELSINKI***Address*

Department of Limnology and Environmental Protection  
 PO Box 27  
 FIN-00014 University of Helsinki  
 Tel. (358-9) 708 54 64. Fax (358-9) 709 52 57

Department of Biosciences Viikinkaari 9  
 PO Box 56  
 FIN 00014 University of Helsinki  
 Tel. (358-9) 70 85 92 57. Fax (358-9) 70 85 92 62

Department of Ecology and Systematics  
 Unionink. 44  
 PO Box 7  
 FIN 00014 University of Helsinki  
 Tel. (358-9) 191 86 00. Fax (358-9) 191 86 56

Department of Ecological and Environmental Sciences  
 Neopoli  
 Niemenkatu 73  
 FIN 15210 Lahti  
 Tel. (358-3) 892 11. Fax (358-3) 89 23 31

Kilpisjärvi Biological Station (in Lapland)  
 FIN-99490 Kilpisjärvi  
 Tel. (358-16) 53 77 12. Fax (358-16) 53 77 09

Lammi Biological Station (in southern Finland)  
 Pääjärventie 320  
 FIN-16900 Lammi  
 Tel. (358-3) 63 11 11. Fax (358-3) 631 11 66

Tvärminne Zoological Station (along southern coast)  
 FIN-10900 Hanko  
 Tel. (358-19) 280 11. Fax (358-19) 28 01 22

**Name: UNIVERSITY OF JYVÄSKYLÄ***Address*

Department of Biological and Environmental Science  
 PO Box 35  
 FIN-40351 Jyväskylä  
 Tel. (358-14) Fax (358-14)

Institute for Environmental Research  
 PO Box 35  
 FIN-40351 Jyväskylä  
 Tel. (358-14) 60 38 30. Fax (358-14) 60 38 31

Konnevesi Research Station (in Central Finland)  
 Sirkkamäentie 220  
 FIN-44300 Konnevesi  
 Tel. (358-45) 55 16 21. Fax (358-45) 55 16 32

**Name: UNIVERSITY OF JOENSUU***Address*

Karelian Institute — Department of Ecology  
 Building Y7 (Biology)  
 Yliopistokatu 7  
 PO Box 111 — FIN-80101 Joensuu  
 Tel. (358-13) 251 35 03. Fax (358-13) 251 34 49

Department of Biology  
Building Y7 (Biology)  
Yliopistokatu 7  
PO Box 111  
FIN-80101 Joensuu  
Tel. (358-13) 25 11 11. Fax (358-13) 251 35 90

**Name: UNIVERSITY OF KUOPIO**

*Address*

Department of Applied Zoology and Veterinary Medicine  
PO Box 1627  
FIN-70211 Kuopio  
Tel. (358-17) 16 31 22. Fax (358-17) 16 31 48  
Internet: <http://www.uku.fi>

**Name: UNIVERSITY OF TURKU**

*Address*

Department of Biology  
University of Turku  
Natural Science Building 2, 3rd floor  
FIN-20500 Turku  
Tel. (358-2) 333 55 74. Fax (358-2) 333 65 98

Archipelago Research Institute  
(in the Archipelago Sea in south-western Finland) Seili  
FIN-21660 Nauvo  
Tel. (358-26) 465 61 10. Fax (358-26) 465 61 00

University of Turku  
FIN-20500 Turku  
Tel. (358-21) 633 59 34. Fax (358-21) 633 65 92

Kevo Subarctic Research Station (in northern Lapland)  
A 777 Kevo  
FIN-99800 Ivalo  
Tel. (358-16) 67 85 05. Fax (358-67) 85 23  
or in winter time:  
FIN-20014 Turku  
Tel. (358-2) 333 59 13. Fax (358-2) 333 59 60

**Name: ÅBO AKADEMI UNIVERSITY**

*Address*

Institute of Parasitology  
Biocity  
Tykistökatu 6  
FIN-20520 Turku  
Tel. (358-2) 215 42 62. Fax (358-2) 215 47 48

Husö Biological Station (In the Åland archipelago)  
FIN-22220 Emkarby  
Åland  
Tel. (358-18) 372 21. Fax (358-18) 372 44

# FRANCE





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

In 1995, total catch was 603.4 thousand tonnes for EUR 826.6 million dispatched in the three geographic zones (north-east Atlantic, Mediterranean Sea, tropical waters).

Landings (1 000 tons)							
Species	1990	1991	1992	1993	1994	1995	1996
Saithe	46.0	33.5	16.7	30.2	29.2	29.3	26.2
Blue whiting	22.8	22.2	20.5	22.4	25.5	24.7	19.4
Hake	19.8	21.1	17.7	15.4	14.4	15.2	9.1
Cod	16.5	10.6	12.1	13.6	13.9	16.2	17.0
Anglerfish	16.4	13.8	12.1	11.2	12.5	15.6	15.6
Others	473.9	488.8	512.1	521.2	549.5	502.4	497.2
Total	595.4	590.0	591.2	614.0	645.0	603.4	584.5

After some increase over the last decade, catches have remained fairly stable for the last four years with around 600 000 tonnes. The most valuable species are tuna (15 %) then to a lesser extent saithe, blue whiting, hake, cod and anglerfish.

In terms of landings, France ranks fourth in terms of quantity and third in value among the EU member countries.

Landings (million EUR)							
Species	1990	1991	1992	1993	1994	1995	1996
Saithe	43.25	37.50	17.35	21.45	21.98	23.89	21.45
Blue whiting	31.08	32.03	25.47	23.29	22.71	23.57	21.66
Hake	82.00	92.87	78.37	62.79	44.12	47.26	37.93
Cod	40.00	28.68	28.40	27.79	25.95	27.49	29.37
Anglerfish	68.01	65.95	58.57	45.34	45.34	53.83	55.69
Others	725.27	737.12	746.67	726.75	704.90	650.54	700.60
Total	989.61	994.15	954.83	907.41	865.00	826.58	866.70

#### 1.1.2. Trend in fleet

Over the past 20 years, the number of boats has decreased by a factor 2, the overall engine power has tripled, the number of fishermen has been divided by 3 (with an annual reduction of about 5 %), and the production has been multiplied by a factor of 1.4, although it has remained rather stable since the end of the 1980s.

	1990	1991	1992	1993	1994	1995	1996
Fishermen	21 892	21 261	19 572	18 832	18 306	17 480	
Vessels number	8 654	7 393	7 139	7 021	6 837	6 593	6 475
Power (thousand kW)	1 150	1 072	1 049	1 034	1 010	990	988

The relative stability of the production, despite the reduction in the number of fishermen, corresponds to an increased productivity due to technological development in gears, deck equipment, acoustic performances and positioning of vessels.

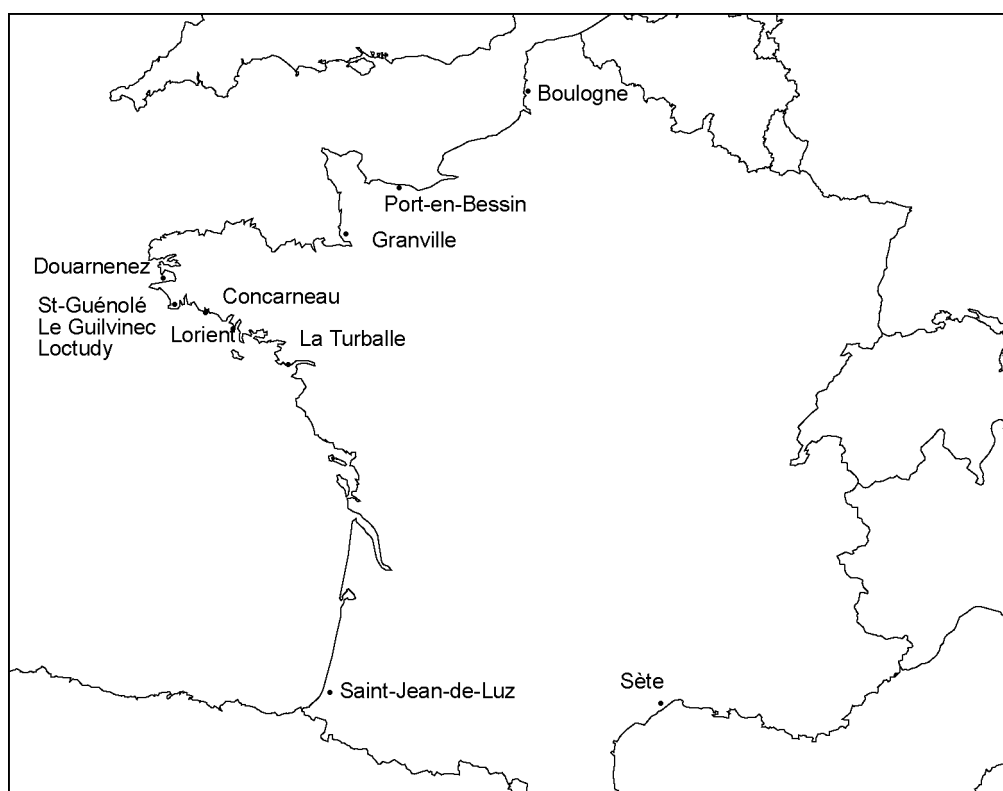
Trends of the fleet over the past 20 years are a total collapse of the long-distance fishing fleet targeting cod in the Barents Sea, the Grand Banks, the Labrador area, a decrease of the distant trawler fleet fishing in the northern North Sea, and a development of inshore fleet.

In the most recent period, the number of boats in the size category '16 to 25 meters' has decreased due to the enforcement of MAGP (Multi Annual Guidance Programme). In 1996, the fleet was made up of 73 % of boats less than 12 meters but the distant fleet still accounts for 20 % of the overall fishing power.

The overall catching capacities exceed the stock renewal potential; current regulatory systems (TACs, technical measures and MAGP) have been unable to prevent the development of this situation.

### **1.1.3. Fishing harbours**

The French marine coast is divided into 38 administrative divisions having authority in all maritime domains (fishery, trade, aquaculture, social affairs, etc.). Landings vary from 8 000 to 63 000 tonnes in the first 10 fishing harbours. The fishing harbours of South Brittany contribute to almost 40 % to the total fishing production in volume and value in 1995.



## 1.2. Aquaculture sector

The increase in aquaculture production since 1985 has made France the first producer within the European Union in terms of volume. In 1996, total production for human consumption amounted to over 285 000 tonnes for a turnover of EUR 627 million, including overseas territories production.

Species	Quantity (1 000 tonnes)						
	1990	1991	1992	1993	1994	1995	1996
Oyster	132.0	140.0	146.1	146.1	147.0	152.1	149.7
Mussel	61.8	61.9	56.2	64.4	64.2	62.0	63.4
Other molluscs	2.9	3.2	3.0	4.2	4.0	4.1	4.4
Total molluscs	196.7	205.1	205.3	214.7	215.2	218.2	217.5
Seabass-seabream	0.4	0.8	1.3	2.3	3.4	3.6	3.3
Turbot	0.04	0.1	0.2	0.4	0.6	0.7	0.8
Salmonids	1.0	1.0	1.0	0.9	1.8	1.8	1.8
Other marine fish						0.1	0.1
Total marine fish	1.4	1.9	2.5	3.6	5.8	6.2	6.0
Trout	36.9	37.9	41.4	44.7	46.9	48.5	50.0
Eels	0.8	0.8	0.8	0.8	0.8	0.2	0.2
Other freshwater fish	8.0	8.1	8.4	8.5	9.2	8.9	10.5
Total freshwater fish	45.7	46.8	50.6	54.0	56.9	57.6	60.7
Shrimps	0.9	0.9	0.9	0.8	0.9	1.0	1.2
<b>Total</b>	<b>244.7</b>	<b>254.7</b>	<b>259.3</b>	<b>273.1</b>	<b>278.8</b>	<b>283.0</b>	<b>285.4</b>

Species	Value (million EUR)						
	1990	1991	1992	1993	1994	1995	1996
Oyster			243.9	255.4	270.1	214.8	226.4
Mussel			67.4	67.1	70.3	67.8	77.3
Other molluscs			9.0	7.0	8.2	8.3	9.3
Total molluscs			320.3	329.5	348.6	290.9	313.0
Seabass-seabream			14.5	16.0	25.0	29.7	27.3
Turbot			2.3	4.0	4.9	5.3	6.3
Other marine fish (salmonids etc.)			4.6	4.7	8.1	8.5	7.5
Total marine fish			21.4	24.7	38.0	43.5	41.1
Trout			91.5	114.3	114.3	114.3	114.3
Other freshwater fish			14.0	18.6	23.6	16.8	20.0
Total freshwater fish			105.5	132.9	137.9	131.1	134.3
Shrimps			9.6	7.3	7.8	9.0	10.4
Pearl oysters	31.3	37.4	35.1	64.0	99.1	83.8	128.1
<b>Total</b>	<b>442.1</b>	<b>519.7</b>	<b>491.9</b>	<b>558.4</b>	<b>631.4</b>	<b>558.3</b>	<b>626.9</b>

Source: Ifremer/SEM



Traditional shellfish farming production has increased within the last 10 years (+ 30 %) to reach 200 000 tonnes per year; turnover doubled in nominal price between 1985 and 1996 (EUR 348 million in 1994). The number of farming industries decreased (-30 % in 10 years), especially small-scale and family-run business. Nevertheless, large firms are emerging in mussel farming as a consequence of large investments in new off-shore techniques. The adaptation of the packaging and shipping units to European sanitary regulations has also induced mergers in oyster farms.

Traditional extensive fish farming in freshwater ponds, mainly concerns carps, and is almost dedicated to stock enhancement operations. On the contrary, intensive farming of salmonids is based on rainbow trout (*Onchorynchus mykiss*) (80 % of the total production), the remaining production is for stock enhancement for recreative fisheries (Fario trout *Salmo trutta*, Atlantic salmon *Salmo salar*).

The overall production of marine finfish; seabass (*Dicentrarchus labrax*), seabream (*Sparus aurata*) and turbot (*Scophthalmus maximus*) amounts to less than 3 % of the total (41 000 tonnes in 1996). An additional turnover of EUR 9.14 million was realised in 1996 by the supply of juveniles of marine fish to ongrowers. Along with these activities for human consumption, the pearl oyster cultivation in French Polynesia produced 6 tonnes of black pearls for a turnover of EUR 128 million in 1996.

### **1.3. Processing industry sector**

The up-grading of products (number of firms, workers and turnover) steadily increased over the past few years, with France ranking leader in Europe in terms of value (20 % European market share), just before Germany (15 %) and Spain (15 %). A considerable diversification is to be noted in the canned and frozen food sectors with a shift towards cooked food (deluxe products), and the emergence of new sectors not related to the marine environment. At the present time, canning accounts for more than 35 % of the total turnover of the processing sector.

### **1.4. Consumption of sea products**

The apparent consumption of sea products, as a measure of the total supply of fish products (adding fisheries, aquaculture and imports, minus the exports), has regularly increased within the last 10 years. In order to satisfy the demand, imports have drastically increased (+ 56 % in volume and + 68 % in value since 1985) to reach about EUR 2 286.7 million in 1995. The level of exports remains very low (about EUR 762.2 millions in 1995) despite its increase over the last decade (+ 84 % in volume and + 46 % in value). Expressed in net value, total consumption of sea products reached 1.12 million tonnes, or 19 kg per capita per year. Domestic consumption represents about 70 % of the total consumption and reached 818 000 tons and EUR 5 122.3 million in 1995. Over the past 10 years, supermarkets have gained a very strong position on the retail market at the expense of fishmongers and open air markets; their market share (in volume) in the distribution of sea products is around 75 % for fish and crustaceans and 60 % for molluscs (mussels) in 1996.

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

Several national research institutes and university laboratories and marine stations are involved in fishery research. Ifremer (*Institut Français de Recherche pour l'Exploitation de la Mer*) is the main national institute in charge of the research in marine fisheries and aquaculture in France. Five other institutes involved in the fishery sector: IRD (*Institut de Recherche pour le Développement, ex-Orstom*) is devoted to conduct both academic and applied research on tropical and sub-tropical marine and continental aquatic ecosystems including fisheries and aquaculture while CIRAD (*Centre de Coopération Internationale en Recherche Agronomique pour le Développement*) is mainly involved in tropical aquaculture. INRA (*Institut National de Recherche Agronomique*) concentrates their research activities on the biology of farmed sea-water and fresh-water fish species, on the final products and on aquatic ecosystems. Cemagref (*Centre National du Machinisme Agricole, du Génie Rural et des Eaux et Forêts*) is involved in researches on continental waters (fisheries, aquaculture, post-harvest). AFSSA (*Agence Française de Sécurité Sanitaire des Aliments*) concentrates its activities in safeguarding consumer safety and animal welfare and health. RNSM (*Réseau National des Stations Marines*), CNRS (*Centre National de la Recherche Scientifique*) laboratories and several universities (Paris VI, Caen, Lille, Brest, Rennes, Perpignan, Marseille, Montpellier) conduct academic research on marine species (harvested or not). ENSAR (*Ecole Nationale Supérieure Agronomique de Rennes*) provides high education and research in biology and food-processing sciences. Technical centres (CEVA, ID.MER, CEVPM plus ADRIA) develop applied research in relation with public sector and private corporations.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
<b>Main</b>	Ifremer	447 (182 researchers)	1227 (688 researchers)	13.1 (salaries not included)	152 (salary included)
<b>Other research institutes</b>	IRD	130	2528	1.2 (salaries not included)	168
	INRA	190	8500	10.6 (salaries included)	503
	CIRAD	10	1800		
	CEMAGREF	28	1000	0.84	2.02
	ENSAR	17	183	0.06	
<b>Agency Technical centre(s)</b>	RNSM		575		46
	AFSSA	38	720		53
	CEVA	20	20	1.22	1.22
	ID.MER	15	15	0.91	0.91
	CEVPM	12	12	0.72	0.72
	ADRIA		64		6

### 2.1.2. Supervisory Ministerial authority(ies)

Institutes	Authority(ies)					
	Education, Research and Technology	Agriculture and Forestry	Equipment and transport	Health	Foreign Office	Others
Ifremer						
IRD						
INRA						
CIRAD						
AFSSA						
ENSAR						
CEMAGREF						
ADRIA						
ID.MER						
CEVPM						
CEVA						
RNSM						
Universities						

### 2.1.3. Coordination and relationship among the different research organisations and with research users

The General Secretary of the Sea is an inter-ministerial structure which coordinates the management of large-scale problems related to all marine activities including transportation, renewable and non-renewable resources exploitation. The administration in charge of the fisheries and aquaculture management is the Directorate of Sea Fisheries and Aquaculture (DPMA) in the Ministry of Agriculture and Fisheries.

The different research organisations, universities and technical centres work in close collaboration in many fields through joint research projects, joint laboratories, research marine units, etc. Most of them participate as member of the scientific committee of several organisations.

In the field of fisheries, the research institutes carried out their programmes in close relationship with:

- Several Ministries and administrative bodies (Education, Research and Technology; Agriculture and Fisheries; Equipment and Transport; Health; Foreign Affairs; Environment and Overseas Departments and Territories.
- OFIMER (*Office National Interprofessionnel des Produits de la mer et de l'Aquaculture*).
- *Conseil Supérieur de la Pêche* (CSP).
- Regional Councils.

- European Administration: DG 12 (Research), DG 14 (fisheries, FCP).
- International organisations: ICES, FAO, CIESM, Copaco, NAFO, ICCAT, GFCM, IOTC, *Commission Internationale pour la protection des eaux du lac Léman* (CIPEL).
- Firms of consultants specialised in fisheries and aquaculture (engineering, consultancy, etc.)
- Industry: fishermen organisations CNPM (*Comité National des Pêches Maritimes*) and fisheries committees at a local and regional level, CNC (*Comité national de la conchyliculture*), SFAM (*Syndicat français de l'aquaculture marine*), SYSAAF (*Syndicat des sélectionneurs avicoles et aquacoles français*), Fish food industries: interprofessionnal Confederation for Processing of Sea Products.

#### 2.1.4. Participation to European networks

Almost, all the institutes and universities are involved in EC programmes (AIR, FAIR, Biotechn, INCO, MAST, Environment and Climate, etc.).

## 2.2. Main research institute: Ifremer (*Institut Français de Recherche pour l'Exploitation de la Mer*)

### 2.2.1. General information

<i>Address</i>	Institut Français de Recherche pour l'Exploitation de la Mer 155, rue Jean-Jacques Rousseau 92138 Issy-les-moulineaux Cedex Tel. (33-1) 46 48 21 00. Fax (33-1) 46 48 22 76 Internet home page: <a href="http://www.ifremer.fr">http://www.ifremer.fr</a>
<i>Date of creation</i>	1984
<i>Status and financial position</i>	Public establishment of industrial and commercial nature
<b>Centre of Boulogne-sur-Mer</b>	150, quai Gambetta BP 699 62321 Boulogne Cedex Tel. (33-4) 21 99 56 00. Fax (33-4) 21 99 56 01
<b>Centre of Brest</b>	Technopole de Brest-Iroise BP 70 29280 Plouzane Tel. (33-2) 98 22 40 40. Fax (33-2) 98 22 45 45
<b>Centre of Nantes</b>	BP 21105 44311 Nantes Cedex 03 Tel. (33-2) 40 37 40 00. Fax (33-2) 02 40 37 40 01
<b>Centre of Toulon</b>	Zone portuaire de Brégailhon BP 330 83507 La Seyne sur mer Tel. (33-4) 94 30 48 00. Fax (33-4) 94 30 13 72
<b>Centre of Tahiti</b>	Centre Océanologique du Pacifique BP 7004 Taravao Polynésie Française Tel. 00 689 54 60 00 Fax 00 689 54 60 99

<b>Station of Port-en-Bessin</b>	Avenue du Général De Gaulle BP 32 14520 Port-en-bessin Tel. (33-2) 31 51 13 00. Fax (33-2) 31 51 13 01
<b>Station of Saint-Malo</b>	2bis rue Grout St Georges BP 46 35402 st malo Cedex Tel. (33-2) 99 40 39 51. Fax (33-2) 99 56 94 94
<b>Station of Concarneau</b>	13 rue de Kérose Le Roudouic 29900 Concarneau Tel. (33-2) 98 97 43 38. Fax (33-2) 98 50 51 02
<b>Station of Lorient</b>	8 rue François Toullec 56100 Lorient Tel. (33-2) 97 87 38 00. Fax (33-2) 97 87 38 01
<b>Station of La Trinité-sur-Mer</b>	12 rue des Résistants BP 26 56470 La trinite-sur mer Tel. (33-2) 97 30 25 79. Fax (33-2) 97 30 25 76
<b>Station of Bouin</b>	Polder des champs 85230 Beauvoir-sur-mer Tel. (33-2) 51 68 77 80. Fax (33-2) 51 49 34 12
<b>Station of La Rochelle/L'Houmeau</b>	BP 7 17137 L'houmeau Tel. (33-5) 46 50 93 50. Fax (33-5) 46 50 93 79
<b>Ifremer/CNRS CREMA</b>	BP 5 17137 L'houmeau Tel. (33-5) 46 50 94 40. Fax (33-5) 46 50 06 60
<b>Station of La Tremblade</b>	Ronce-les-Bains BP 133 17390 La tremblade Tel. (33-5) 46 36 30 07. Fax (33-5) 46 36 37 51
<b>Station of Arcachon</b>	quai du Commandant Silhouette 33120 Arcachon Tel. (33-5) 56 83 85 60. Fax (33-5) 56 83 89 80
<b>Station of Sète</b>	1 rue Jean Vilar 34200 Sete Tel. (33-4) 67 46 78 00. Fax (33-4) 67 74 70 90
<b>Station of Palavas-les-Flots</b>	Chemin de Maguelone 34250 Palavas les flots Tel. (33-4) 67 68 08 33. Fax (33-4) 67 68 28 85
<b>Joint Research Unit 219</b>	laboratoire DRIM case postale 71 2, place Eugène Bataillon 34095 Montpellier Cedex Tel. (33-4) 67 14 46 25. Fax (33-4) 67 14 46 22

**Station of Corse** Vanga di l'Oru  
Santa Maria Poggio  
20221 Cervione  
Tel. (33-4) 95 38 42 37. Fax (33-4) 95 38 54 29

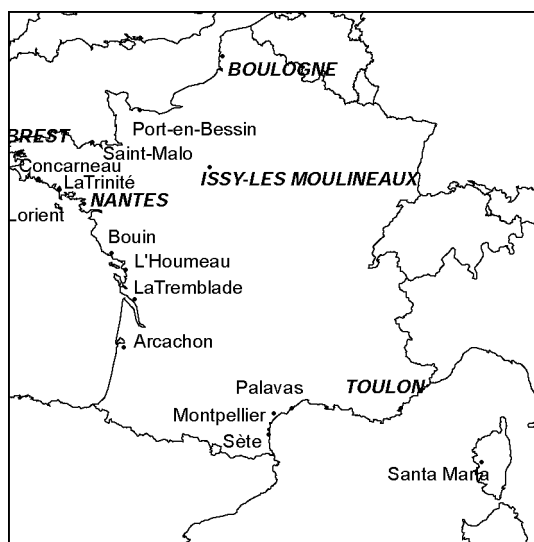
**Delegation of New Caledonia** Quai des Scientifiques  
BP 2059  
Noumea  
Nouvelle Calédonie  
Tel. 00 687 28 51 71. Fax 00 687 28 78 57

**Delegation of the West Indies** Pointe Fort  
97231 Le Robert  
Martinique  
Tel. 00 596 65 11 54. Fax 00 596 65 11 56

**Delegation of French Guyana** Domaine de Suzini  
BP 477  
97331 Cayenne  
Guyane Française  
Tel. 00 594 30 22 00. Fax 00 594 30 80 31

**Delegation of La Reunion** BP 60  
97420 Le port  
Ile de la Réunion  
Tel. 00 262 42 03 40. Fax 00 262 43 36 84

*Location* Four large centres of research (Boulogne-sur-Mer, Brest, Nantes and Toulon), 14 stations situated all over the coastlines of France, and 5 centres in overseas departments and territories.



### 2.2.2. Detailed objectives and research programmes

Ifremer has four main objectives:

- 1 — to conduct finalised research in all fields related to the exploitation of the sea;
- 2 — to monitor resources and environment;

- 3 — to provide public services and related industries with advice and expertise and serve administrations and local authorities responsible for fisheries, aquaculture, planning and environment;
- 4 — to design, build and operate large-scale equipment and facilities of national interest.

It is organised in four operational Directorates: Living resources, Environment and coastal management, Oceanic research, Engineering and information technology.

The Living Resources directorate is the main directorate of Ifremer, dealing with research on marine resources with 447 employees (33 % of staffs) and 22 % of the budget.

It's composed of three departments and one service:

- the Fishery Resources department
- the Aquaculture Resources department
- the Processing and Upgrading of Marine Products department
- the Maritime Economy Service.

- Fisheries Resources department (headquarters: Centre Ifremer in Nantes)  
143 agents distributed in 12 locations in France mainland and in the French overseas territories: 10 coastal laboratories (Boulogne-sur-Mer, Port-en-Bessin, Brest, Lorient, Nantes, L'Houmeau, Sète, Martinique, Guyane française, La Réunion) and 3 thematic laboratories, Mathematics applied to the assessment of fisheries and aquaculture resources (MAERHA), Schlerochronology of aquatic animals (LASAA), Fisheries ecology (ECOHAL).

#### *Research activities*

Ifremer has the mission to provide advice, expertise and information to the authorities in charge of fishery management at a national and European level (within the framework of the common fisheries policy). Ifremer has to draft and harmonise procedures for collecting, storing and processing fisheries and resources data and to put them within central databases, in order to establish fishery indicators. It conducts research to understand fishery ecosystems and to evaluate human effects on those ecosystems with three key aspects, variability of resources, impact of fishing on marine communities, vulnerability of sensitive ecosystems to fishing. It develops scientific tools to identify and assess living resources (underwater sonar, signal processing techniques, data processing software) and equipment and techniques helping to resolve problems confronting the fishermen (selectivity, respect of ecosystems, profitability, safety at work, quality).

- The Aquaculture Resources department (headquarters: Centre Ifremer in Nantes)  
217 agents working in 17 locations. Mollusc aquaculture: 5 coastal laboratories (Port-en-Bessin, La Trinité-sur-Mer, Bouin, La Tremblade, Palavas) and one experimental hatchery under construction (Argenton); Fish aquaculture: the Mediterranean research laboratory for fish aquaculture (Palavas); the experimental salmonid farm of Camaret (Ifremer/INRA). Tropical aquaculture is carried out in the laboratory of Tahiti (French Polynesia) (shrimp, pearl oyster, fish), in the experimental laboratory of Saint-Vincent (New Caledonia) (shrimp) and the aquaculture research laboratory of La Martinique (French West Indies) (finfish). Thematic laboratories include: invertebrates physiology (Brest), fish physiology (Brest), marine invertebrate defence and resistance (Montpellier), genetics and pathology for Molluscs (La Tremblade), fish nutrition (Brest in association with INRA), marine ecology and aquaculture (CREMA L'Houmeau).

#### *Research activities*

Work led by Ifremer is relevant to most of the domains of the production of shellfish, finfish, crustaceans, and seaweed. Molluscs represent a priority because of the economic and social importance of this industry. Ifremer's programmes aim at improving knowledge in order to achieve the following objectives:

- optimisation of shellfish farming methods and products;
- development of newly farmed species (turbot, seabass, bream and prawns) with the aim of reinforcing their competitiveness in the context of commercial competition;
- development of new techniques to favour the integration of these newly farmed species in the coastal zones (aquaculture in closed system).

Four main programmes are concerned:

- Biology of farmed species,
- Optimisation and innovation technique,
- Livestock health,
- Selection and improvement of livestock.

A particular emphasis is put on understanding and preventing diseases and on invertebrates defence mechanisms. Moreover, efforts are made to select strains of cultivated species, according to their resistance to disease.

- The 'Upgrading of Marine Products' department (headquarters: Centre Ifremer de Nantes)  
The activities of the department (67 persons) are carried out in 7 laboratories based in Nantes (5) and in Brest (2): Food processing technology (development and improvement of processing methods), Biochemistry and marine molecules (extraction and purification of substances and molecules for industrial applications), Quality and physico-chemistry of products (understanding of the evolution of quality and implementation of methods for testing the quality and conformity of products), Technical and regulatory studies (supporting the Administration and industrialists in elaborating regulations and carrying out standardisation; documentary and regulatory monitoring), Algal production and biotechnology (production of macro and micro-algae in controlled conditions), Marine micro-organisms characterisation, (characterisation of micro-organisms of biotechnological, food and environmental interests), hydrothermal micro-organisms biotechnology (production of enzymes and polysaccharides from hydrothermal bacteria).

#### *Research activities*

The objective of Ifremer is to answer the general needs of the food sector's companies and expectations of consumers in terms of quality insurance, innovation and diversification of the products. It also contributes to the development of several other sectors (agriculture, chemicals, cosmetics, medical, etc.) for new molecules or for different sources of molecules by exploiting the by-products of processes and by culture of micro-organisms (hydrothermal bacteria and micro-algae). With its research on the quality, Ifremer helps to define standards and provides authorities with technical and scientific support in establishing the national and international regulations.

The Marine Economics Service (French acronym: SEM) (headquarters: Issy-Les-Moulineaux) is part of the Living Resources Directorate, and is composed of eight agents. The main part of the work revolves around fisheries and aquaculture economics, but an increasing part of the work time is devoted to environment, coastal zone management, and the regulation of the use of marine resources.

- Sea Fisheries Technology unit (headquarters: Lorient)  
The Sea Fisheries Technology unit comprises 18 engineers, scientists and technicians who work, besides Lorient, in Brest, Boulogne, Issy-les-Moulineaux and Sète and has three missions:
  - to provide the fishermen with devices and fishing techniques which are both selective and respectful of the ecosystems, along with methods which ensure profitability, safe conditions of work, and an optimum quality of the catches;
  - to provide the fisheries technologists with reliable tools offering high performance to both assess and identify the resource;
  - to keep the profession informed and promote industrial transfer regarding the results of their works.



#### Research activities

- resource assessment and identification (acoustics);
- fishing gear selectivity (trawls: separator panels, grids, square meshes, cod-end studies, numerical simulation; gillnets);
- fishing gear impact on the environment (impact of towed gears on the seabed, ghost fishing, cetacean repellents);
- quality of products (the way the conditions in which the fishing gears are implemented act on the quality of the catches);
- information and advice to the profession and authorities;
- technological developments (hydrodynamics, acoustics): as a result of many simulations, a software (DynamiT) was developed to simulate trawl fishing operations. This software has been adapted to conduct many studies of cod-end selectivity; it will also be used to investigate the trawl impact on the seabed because it enables the calculation of the contact force on the seabed of each part of the trawl gear.

#### 2.2.3. Facilities at sea

Four research vessels: 2 inshore vessels in the Atlantic waters (*Thalia* et *Gwen Drez*), one in the Mediterranean sea, the catamaran *L'Europe*, commissioned in 1994, and the French-Spanish *Thalassa*, the most advanced fishery research vessel in Europe, commissioned in 1996.

The manned submersible *Cyana* (-3000 m) for *in situ* observations (fishes and trawls).

#### 2.2.4. Scientific cooperation

<b>National</b>	INRA; Cemagref; IRD; AFSSA; MNHN; ENITIAA; OFIMER; associated laboratory: CREMA (centre of research in marine ecology) — Ifremer/CNRS; associated laboratory: LASAA (schlerochronology of aquatic animals) — Ifremer/IRD; associated laboratory: DRIM (Defence and resistance of marine invertebrates — IFREMER/CNRS; Agreement with universities: Lille I, Côte d'Opale, Caen, Brest, Rennes I, Bretagne Sud, Nantes, La Rochelle, Bordeaux, Perpignan, Aix-Marseille II, Montpellier II, Toulon, Nice, Paris VI
<b>Bilateral European relations</b>	IEO (Spain); IBMC (Greece); ICRAM (Italy); CNR (Italy); CEFAS (UK); NERC (UK); Cemare (UK); Ipimar (Portugal); LEI-DLO (NL); DIFER (DK, South-Jutland Univ.)
<b>European networks</b>	Laboratory of genetics and pathology for Molluscs (La Tremblade), is one of the 'community reference laboratories for bivalve mollusc diseases'; Aquaflow (DG14); WEFTA (West European Fish Technologist Association); ESMB (European Society for Marine Biotechnology); EFAN (European Fish Ageing Network); Selam (Economy) is coordinated by the Institute of Mediterranean Agronomy in Zaragoza
<b>Africa</b>	Instop (Tunisia); ISPM (Morocco); CNROP (Mauritania)) Erythrea
<b>America</b>	Conicyt (Chile); MPO (Canada)
<b>Asia</b>	ASEAN — Indonesia, Philippines; NFRDA (South Korea); SOA (China); ION (Vietnam)
<b>International organisations</b>	PNDR/Globec France and Biodiversities in fishery sector; ICES; FAO; Codex Alimentarius; WEFTA; UE; CIESM; Iclarm; Copaco; ICCAT

## 2.3. Other research organisations

**Name:** INSTITUT DE RECHERCHE POUR LE DÉVELOPPEMENT (IRD)

### 1. General information

<i>Address</i>	IRD 209, rue La Fayette 75480 Paris Cedex 10 Tel. (33-1) 48 03 77 77. Fax (33-1) 48 03 08 29
<i>Date of creation</i>	1944
<i>Status and financial position</i>	State-owned public service agency under the joint authority of the French research and overseas development ministries
<b>Centre IRD de Bondy</b>	32 Avenue Henri Varagnat; 93143 Bondy Cedex Tel. 48 02 55 00. Fax 48 47 30 88
<b>Centre IRD de Montpellier</b>	911, Avenue Agropolis; BP 5045 34032 Montpellier Cedex Tel. (33-4) 67 41 61 00. Fax (33-4) 67 54 78 00
<b>Centre IRD de Brest</b>	BP 70 29280 Plouzane Tel. (33-2) 98 22 45 01. Fax (33-2) 98 22 45 14
<b>Représentation de l'IRD en Côte d'Ivoire</b>	Rue du Chevalier de Clieu; 01 BP 917 Abidjan 15 Tel. (225) 24 37 79. Fax (225) 24 65 04
<b>Représentation de l'IRD au Sénégal</b>	Route des Pères Maristes; BP 1386 DAKAR HANN Tel. (221) 832 34 76. Fax (221) 832 43 07
<b>Représentation de l'IRD de Polynésie Française</b>	Chemin de l'arahiri; PK 3,800 Arue (Polynésie Française) BP 529 Papeete; Tel. (689) 50 62 00. Fax (689) 42 95 55
<b>Représentation de l'IRD de Nouvelle Calédonie</b>	101 Promenade Roger Laroque; Anse Vata; Nouméa (Nouvelle Calédonie) BP A 5 Noumea Cedex Tel. (687) 26 10 00. Fax (687) 26 43 26
<b>Représentation de l'IRD à l'Île de La Réunion</b>	Université de la Réunion; Campus du Chaudron; Sainte-Clotilde (La Réunion); IRD/SEAS BP 172 97492 Sainte Clotilde Cedex Tel. (33-2) 62 29 56 29
<b>Représentation de l'IRD en Indonésie</b>	Wisma Anugraha; Jalan Taman Kemang 32 B; Jakarta 12730; Indonésie Tel. (62-21) 797 50 26. Fax (62-21) 797 50 77
<b>Représentation de l'IRD au Chili</b>	Calle Roman Diaz 264; Providencia; Santiago (Chili) Tel (56-2) 236 34 64. Fax (56-2) 236 34 63
<b>Représentation de l'IRD en Bolivie</b>	Avenida Iturralde No 1377; Miraflores; La Paz Tel. (591-2) 22 77 24. Fax (591-2) 22 58 46
<b>Représentation de l'IRD en Guinée</b>	Quartier Camyenne; BP 1984; Conakry (Guinée) Tel. (224) 41 36 17. Fax (224) 41 35 64
<b>Représentation de l'IRD en Guyane</b>	Route de Montabo; 97323 CAYENNE (Guyane) BP 165 97323 CAYENNE Cedex Tel. (594) 29 92 92. Fax (594) 31 98 55

## **2. Detailed objectives and research programmes**

IRD is devoted to undertake scientific and technological research in France and outside France in cooperation with scientific institutions (from the south and from the north), to understand key mechanisms related to sustainable development, and to transfer the knowledge obtained in order to contribute to the economic, social and cultural progress of developing countries. It provides findings and offers its expertise, knowledge and know-how to French, foreign and international public and private organisations. Eight major topics are considered (climatic variability; water resources; marine and coastal ecosystems and uses; agriculture and microbial biodiversity; natural risks related with earthquakes and volcanic activity and mineral resources; health; urbanism and development; social and economic features of development).

Research carried out jointly with scientific institutions in the south, are the result of scientific and technical choices defined in cooperation. IRD helps strengthening the scientific capacities of research institutions in the south and is involved in high level teaching in many French and foreign universities.

Climatic variability and its impact at regional scales:

Forecasting climatic events and their impacts at a regional scale is of major importance for the management of many activities (e.g. agriculture, fisheries, water supply, health, tourism, etc.). It is then necessary to: understand mechanisms of high frequency variability of the climate and its evolution in the long term, by studying interactions between tropical ocean and atmosphere, to define the key parameters which govern the continental hydrosystem to define climatic scenarios from natural records by modelling.

Dynamic and uses of water resources and aquatic continental ecosystems:

Sustainable exploitation of water resources and water quality assessment are of major concern for the future in most of the tropical area. In order to achieve a better use and management of aquatic ecosystems and their resources research is targeted toward the understanding of interactions between land, hydrous and biological components of the ecosystems, and to understand how they contribute to the genesis and to the evolution of the water and continental resources. Moreover the way the societies organise the diverse activities needing water question the way sustainable management should be designed.

Some research programmes aim at gathering pertinent scientific knowledge in biology, ecology and socioeconomy in order to develop aquaculture in continental and brackish waters of the tropical area.

Dynamic and uses of marine and coastal ecosystems and their living resources:

Marine ecosystems and their resources are of major importance for economy and food supply of many developing countries. In many cases they are over exploited or improperly exploited; this can affect their replacement and the viability of the related social and economic systems. The main objectives of the research programmes undertaken are to understand the mechanisms controlling the whole dynamic of the ecosystems and their uses, in order to identify proper governance schemes insuring their viability. This implies the need to assess the natural variability of ecosystems and the interactions with the different uses affecting these ecosystems: fisheries, tourism, agriculture, shipping, aquaculture, etc.

## **3. Facilities at sea**

IRD operates two polyvalent research vessels:

*R/V ALIS*: length 28.4 m, built in 1987, presently based in the Pacific Ocean at Nouméa, time at sea 14 days, crew of 12, maximum embarking capacity of 6 scientists.

*R/V ANTEA*: catamaran, length 34.9 m, built in 1995, presently based in Abidjan (Côte d'Ivoire), maximum time at sea 28 days, crew of 12, maximum embarking capacity of 11 scientists.

Within the frame of an agreement with Senegal, ORSTOM provides 4 high level crew members (captain, second captain, chief engineer, second engineer) for the Senegalese R/V *Louis Sauger*, based in Dakar.

#### 4. Scientific cooperation

<b>National</b>	Ifremer; CNRS/INSU; Cemagref; CIRAD; INRA; ANVAR; BRGM; CNES; INRIA; MNHN; Météo France; EVAAM: Etablissement de valorisation des activités aquacoles et maritimes — Tahiti; ENSA: Ecole Nationale Supérieure d'Agronomie, Rennes, Montpellier; EHESS: Ecole des Hautes Etudes en Sciences Sociales; Musée Océanographique de Monaco; CNLS/ARGOS; SHOM: Service Hydrographique et Océanographique de la Marine; ENSTB: Ecole Nationale Supérieure des Télécommunications de Bretagne; EPHE — Ecole Pratique des Hautes Etudes — Perpignan; French universities: Paris, Brest, Bordeaux, Grenoble, Lille, Lyon, Montpellier, Pau, Perpignan, Strasbourg, Toulouse, Antilles Guyane, Université Française du Pacifique
<b>European networks</b>	EFAN: European Fish Ageing Network; EURO-GOOS; Eurostat; Eurinfo
<b>International organisations</b>	International Council for the Exploration of the Sea (ICES); General Fisheries Council for the Mediterranean Fisheries (CGPM); Scientific, Technical and Economic Committee for Fisheries (STECF); Intergovernmental Oceanographic Commission (IOC) belonging to Unesco; International Commission for Conservation of Atlantic Tunas (ICCAT); International Commission for the Scientific Exploration of the Mediterranean Sea (CIESM); Management Executive Committee of WOCE (World Ocean Circulation Experiment); Intergovernmental GOOS (Global Ocean Observation System) and Euro GOOS; Permanent Service of Middle Sea Level (PSMSL); National Oceanographic Data Centre (NODC); Indian Ocean Tuna Commission (IOTC); South Pacific Commission (SPC); Inter American Tropical Tuna Commission; COPACE

**Name:** INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE (INRA)

##### 1. General information

<b>Address</b>	Institut National de la Recherche Agronomique 147, rue de l'Université 75338 Paris Cedex 07 Tel. (33-1) 42 75 90 00. Fax (33-1) 47 05 99 66
<b>Date of creation</b>	1946
<b>Status and financial position</b>	Public research institute
<b>Hydrobiology and Wildlife Department</b>	Campus de Beaulieu 35 042 Rennes Cedex Tel. (33-2) 99 28 50 30. Fax (33-2) 99 28 50 34 E-mail.: hyfs@beaulieu.rennes.inra.fr
<b>Fish Genetic</b>	INRA Domaine de Vilvert 78352 Jouy en Josas Cedex
<b>Fish Nutrition</b>	INRA PO Box 3 64310 St Pee sur Nivelle

<b>Fish Physiology</b>	INRA Campus de Beaulieu 35042 Rennes Cedex
<b>Fish Pathology</b>	Virologie et Immunologie Moléculaire INRA Domaine de Vilvert 78352 Jouy en Josas Cedex
<b>LEIMA Animal Product Technology</b>	INRA rue de la Guéraudière 44026 Nantes Cedex
<b>SRV Animal Product Technology</b>	Theix 63122 St Genes Champanelle
<b>Lake Hydrobiology</b>	INRA 75 avenue de Corzent BP 511 74203 Thonon Les Bains
<b>Aquatic Ecology I</b>	INRA 65 rue de St Brieuc 35042 Rennes Cedex
<b>Aquatic Ecology II</b>	INRA PO Box 3 64310 St Pee sur Nivelle
<b>Aquatic Ecotoxicology</b>	INRA Campus de Beaulieu 35042 Rennes Cedex

## ***2. Detailed objectives and research programmes***

Aquaculture: Acquire knowledge on biology of farmed sea-water and fresh-water fish species and on the final products; develop biotechnologies for aquaculture and processing.

Aquatic ecosystems: Acquire knowledge on ecology of wild fresh water and estuarine fish populations and their ecosystems, develop management methodologies.

- Two scientific directories: Animal & Animal Product, Environment, Forest & Agriculture.
- Three research departments: Hydrobiology & Wildlife Department, Animal Health Department, Animal Product & Technology Department.
- Ten research groups: Genetic, Nutrition, Physiology, Pathology, Product Technology, Lakes Ecology, Aquatic Ecology and Ecotoxicology.

### *Research activities*

Research aimed at improving knowledge and developing applications in three main fields:

- Aquaculture production. Both basic biology studies and implications (biotechnologies) are involved in research aiming to understand the role of genetic, nutritional and external factors in view of controlling reproduction, early development, growth, and adaptation of fish. Quality of the products (eggs, cryopreserved gametes, larvae, fish flesh) is taken as a priority of the research programmes.
- Wildlife populations. The role of various biological and ecological factors is analysed to describe, modelise and predict the evolution of fish populations. Methods of management are proposed for conservatory purposes but also for optimising commercial and game fisheries.
- Quality of aquatic ecosystems. Methods are developed to assess the quality of aquatic environment (especially lakes and salmonid rivers) and their evolution. Various components of the aquatic ecosystems are studied (physical quality of water, plankton, macrophytes, invertebrates, fish) and a specific research is focused on the effect of xenobiotics.

### 3. Scientific cooperation

<b>National</b>	Ifremer; CNRS; Cemagref; CIRAD; IRD; AFSSA; several national agronomic or veterinary high schools; several universities
<b>Bilateral European relations</b>	Institute of Marine Biotechnology of Bergen, University of Oslo (Norway); University of Wageningen, of Utrecht (the Netherlands); University of Krakov (Poland); University of Porto, University of Algarve (UCTRA, Portugal); University of Moscow (Russia); University of Murcia, University of Las Palmas, Institute of Aquaculture of Torre de la Sal (CSIC, Spain); University of Uppsala (Sweden); University of Southampton, of Aberdeen, CEFAS (UK); University of Liège, of Namur, of Louvain (Belgium); University of Kuopio (Finland); University Bayerische Julius-Maximilians Würzburg, of Berlin, Max Plank Institute (Germany); Institut of Marine Biology of Crete (Greece); University of Galway, Dublin Institute of Technology (Ireland); University of Udine, University of Pisa (Italy)
<b>European networks</b>	AIR; FAIR; Biotech; Eureka; COST; FAIP
<b>Africa</b>	Hassan II Institut (Morocco)
<b>South America</b>	University of Notre Dame, of Hawaii (USA)
<b>Asia</b>	Hebrew University, National Centre of Mariculture (Eilath; Israel); National Institute for Basic Biology (Japan); Institute of Molecular Biology (Taiwan)

**Name:** CENTRE DE COOPÉRATION INTERNATIONALE EN RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT (CIRAD)

#### 1. General information

<b>Address</b>	Centre de Coopération Internationale en Recherche Agronomique pour le Développement 42 rue Scheffer 75116 Paris France Tel. (33-1) 53 70 20 00. Fax (33-1) 47 55 15 30
<b>Date of creation</b>	1984 for CIRAD (1956 for the Aquaculture and Fisheries Section of former CTFT – Centre Technique Forestier Tropical)
<b>Status and financial position</b>	State owned scientific organisation (EPIC-Etablissement Public à caractère Industriel et Commercial)
<b>Aquaculture research unit</b>	CIRAD-EMVT/GAMET BP 5095 34033 Montpellier CEDEX 1 France Tel. (33-4) 67 04 63 00/65. Fax (33-4) 67 63 57 95 E-mail: lazard@cirad.fr

<b>Fish physiology</b> (in cooperation with INRA)	INRA/SCRIBE Campus de Beaulieu 35042 Rennes Cedex
<b>Experimental Fish Culture Research Station</b> (in cooperation with Niger)	INRAN BP 10544 Niamey Niger
<b>Department of Aquaculture</b> (in cooperation with Can Tho University)	College of Agriculture Can Tho University Can Tho City Vietnam
<b>Experimental research station</b> (in cooperation with Agifish)	Agifish Chau Doc An Giang Province Vietnam

## 2. Detailed objectives and research programmes

CIRAD's mission is to contribute to the economic development of tropical and subtropical regions through research, experiments, training and dissemination of scientific and technical information. The main objectives of CIRAD in the field of aquaculture are to contribute to the development of aquaculture in the tropical countries through cooperative programmes both on scientific research and on technical development levels. For this purpose, CIRAD carries out research programmes in its own facilities (Montpellier and Rennes) and in the countries where it is implemented, in cooperation with local research institutions. CIRAD carries out, also, development projects aiming at verifying on a larger scale and in direct connection with fish farmers the data coming from research stations and laboratories and contributes to the process of technology transfer.

CIRAD has seven departments: CIRAD-CA (annual crops), CIRAD-CP (tree crops), CIRAD-FLHOR (fruit and horticultural crops), CIRAD-EMVT (animal production and veterinary medicine), CIRAD-Forêt (forestry), CIRAD-TERA (territories, environment and people), and CIRAD-AMIS (advanced methods for innovation in science). CIRAD operates through its own research centres, national agricultural research systems, or development projects. The Aquaculture Research Unit is located in the CIRAD-EMVT Department.

### Research activities

The programmes carried out by the Aquaculture Research Unit of CIRAD are of three kinds: research, research/development and development, including training and dissemination of scientific and technical information.

- Biological and ecological basis of aquaculture

The main research projects are:

- Study of sex determination in the tilapias in order to produce monosex progenies for aquaculture purposes. This work includes all the factors involved in sex determination: genetical factors, physiological factors and environmental factors which are tested for monosex progenies production. It also includes the study of the determinism of differential growth male/female in the genus *Oreochromis*.
- Improvement of reproduction of tilapias in terms of synchronisation of spawnings and management of sexual cycles with management of broodstock.
- Reproduction in captivity of 'new species' for use of local biodiversity for aquaculture. This work is mainly developed on Mekong Catfish (*Pangasius* spp.) in Vietnam and on 'tambaqui' (*Colossoma macropomum*) of Amazone River.
- Wild populations genetics applied to broodstock management in aquaculture (mainly carried out on tilapias).



- Genetic improvement through fish hybridisation for production of hybrids for specific culture conditions (tilapia culture in brackish water).
- Study of food webs in fish culture ponds.
- Fish culture production systems
  - Optimisation of fish culture production systems in terms of fish stocking (monoculture, polyculture), manuring and inorganic fertilisation, feeding in fish ponds according to the local socioeconomic environment.
  - Development of intensive fish culture in floating cages and pens with special focus on fish species selection and fish nutrition practices and on the main culture parameters.
  - Development of brackish water aquaculture with short foodchain fishes.
- Fish culture development strategies
  - Contribution to the establishment of aquaculture development plans and policies in several tropical developing countries.
  - Conduct of aquaculture development projects including experimental and pilot level, staff training and extension to fishfarmers.

### 3. Scientific cooperation

<b>National</b>	INRA: Institut National de la Recherche Agronomique; Ifremer: Institut Français de Recherche pour l'Exploitation de la Mer; IRD (formerly Orstom): Institut de Recherche pour le Développement; Cemagref: La recherche pour l'ingénierie de l'agriculture et de l'environnement; MNHN: Muséum National d'Histoire Naturelle; INA-PG: Institut National Agronomique — Paris-Grignon; ENSAR: Ecole Nationale Supérieure Agronomique de Rennes; On the French national level, Cemagref, CIRAD, Ifremer, INRA and IRD develop a collaboration in the framework of the GIS (Groupement d'intérêt Scientifique) Pisciculture Tropicale (Tropical Fishculture)
<b>Bilateral European relations</b>	Belgium: University of Liège, University of Leuven; Germany: Bayerische Julius Maximilian University (Würzburg); Ireland: National University of Ireland (Galway); Italy: Università di Pisa (Pisa); United Kingdom: University of Swansea (Wales), University of Stirling (Scotland)
<b>Africa</b>	Cameroun: Institut de Recherche Agricole pour le Développement (Foumban); Côte d'Ivoire (Ivory Coast): Centre National de la Recherche Agronomique (Bouaké), Direction des Pêches et de l'Aquaculture (Abidjan); Niger: Institut National de la Recherche Agronomique du Niger, Direction de la Faune, de la Pêche et de la Pisciculture (Niamey)
<b>South America</b>	Brazil: Federal University of Para (Belem), State University of Minas Gerais (Belo Horizonte), Epamig — Empresa de Pesquisa Agropecuária de Minas Gerais, Agriculture Department of the State of Tocantins (Palmas)
<b>Asia</b>	Vietnam: Can Tho University (Can Tho), University of Agriculture and Forestry (UAF – Thu Duc – HoChiMinh City), AGIFISH Provincial Company (Chau Doc); Philippines: PCAMRD — Philippines Council for Aquatic and Marine Research and Development (Los Banos), BFAR — Bureau of Fisheries and Aquatic Resources (Manila)
<b>International organisations</b>	ICLARM (International Centre for Living Aquatic Resources Management (Manila, Philippines)



**Name: AGENCE FRANÇAISE DE SECURITE SANITAIRE DES ALIMENTS (AFSSA)**

**1. General information**

<i>Address</i>	AFSSA — Direction générale 23, avenue du Général De Gaulle BP 19, F-94701 Maisons-Alfort Cedex Tel. (33-1) 49 77 13 50. Fax (33-1) 49 77 90 05 E-mail: l.sanite@dg.afssa.fr
<i>Date of creation</i>	26 March 1999
<i>Status and financial position</i>	Public administrative institution with a risk assessment and research mission
<b>AFSSA Alfort</b>	Laboratoire central de recherches vétérinaires 22, rue Pierre Curie — BP 67 94703 Maisons-Alfort Cedex Tel. (33-1) 49 77 13 00. Fax (33-1) 43 68 97 62 E-mail: am.hattenberg@alfort.afssa.fr
<b>AFSSA Brest</b>	Laboratoire de Pathologie des Animaux Aquatiques BP 70, F-29280 Plouzané Tel. (33-2) 98 22 44 62. Fax (33-2) 98 05 51 65 E-mail: m.vigneulle@brest.afssa.fr
<b>AFSSA Boulogne sur mer</b>	Laboratoire d'études des produits de la pêche Gare de Marée, rue Huret Lagache, F-62200 Boulogne sur mer Tel. (33-3) 21 99 25 00. Fax (33-3) 21 30 95 47 E-mail: vabo10@calvacom.fr (soon: p.malle@boulogne.afssa.fr)
<b>AFSSA Paris</b>	Laboratoire central d'hygiène alimentaire 10, rue Pierre Curie 94704 Maisons-Alfort Cedex Tel. (33-1) 49 77 13 50. Fax (33-1) 49 77 26 95 E-mail: s.dragacci@paris.afssa.fr

**2. Detailed objectives and research programmes**

*Objectives*

AFSSA plays an essential role in safeguarding both consumer safety and animal welfare and health by carrying out applied research, epidemiological monitoring, laboratory testing and reference activities. Forty-two research and development units are gathered into 3 departments: Animal Health and Welfare; Food Hygiene, Quality and Safety; Veterinary Drugs.

*Research activities*

- AFSSA Alfort — Central Laboratory for Veterinary Research

One of the five research units of the laboratory is involved in fish pathology.

*Continental Ichthyopathology Unit*

— Objectives: The work of the laboratory focuses on freshwater fish. The unit is responsible at the national level for the epidemiological monitoring and the prevention of the two main salmonid rhabdoviruses: haemorrhagic viral septicaemia and infectious haematopoietic necrosis. It is the French national reference laboratory for these diseases.

It also develops new decentralisable diagnostic techniques (PCR, IF) and offers scientific and technical support to the French veterinary services network.

- AFSSA Boulogne sur mer — Laboratory for the Study of Seafoods

Objectives: The applied research activities consist in studying the contamination and alteration ways of seafoods. They also aim at identifying chemical and microbiological tracers of fish alter-

ation. Scientific and technical support and control consist in monitoring programmes of seafood contaminants and analyses of the chemical and microbiological quality of seafoods.

- AFSSA Brest — Laboratory for the Pathology of Aquatic Animals

The laboratory consists in two development and research units. For their experiments, the scientists have at their disposal 300 m<sup>2</sup> rooms specially equipped with temperature and flow regulated pools.

#### Fish Infectious and Parasitic Pathology Unit

— Objectives: The laboratory studies the infectious and parasitic diseases of farmed fishes, both in sea and fresh water. The applied research activities consist in characterising fish diseases and in developing means of cure and prevention. Laboratory testing consists in developing specialised diagnostic methods in virology, bacteriology and molecular biology.

#### Fish Immunology and Therapeutics Unit

— Objectives: the laboratory works on the stimulation of the immune potential of farmed fish, both in sea and fresh waters. It evaluates drugs likely to be used for fish and to be considered for a marketing authorisation.

- AFSSA Paris — Central Laboratory for Food Hygiene

#### Microbial Toxin Unit

— Objectives: The unit studies the contamination of food chains by mycotoxins (mould toxins) and phycotoxins (marine toxins from phytoplankton micro-algae) and by some bacterial toxins like staphylococcal enterotoxins. In the phycotoxin area, the unit is the French national reference laboratory for the control of marine biotoxins in seafood, especially in relation with the contamination of shellfish by diarrhetic, paralytic and amnesic toxins. The unit is in charge of official controls and confirmation in cases of food poisoning for the Ministry of Agriculture. The unit manages a national network comprising 5 routine public laboratories involved in national monitoring programmes set up by the Ministry of Agriculture. Particularly, the unit organises yearly proficiency testing and analytical training for their technicians. The unit develops new analytical methods by HPLC, CE (*capillary electrophoresis*) and also immunoassays as diagnostic tools, and regularly participates to the validation of methods through collaborative trials.

### 3. Facilities at sea

### 4. Scientific cooperation

<b>National</b>	INRA; National Veterinary Schools (Nantes); Ifremer; Universities (Brest, Rennes, Montpellier, Paris VII); CEVPM; National Museum of Natural History; ARVAM La Réunion (Association for Marine Research and valorisation); PNEAT (National Programme on Toxic Algae Blooming)
<b>Bilateral European relation</b>	European Reference Laboratory of Aarhus (Denmark); European Reference Laboratory of Vigo (Spain); Ecotoxicological laboratory RTC Cork (Ireland)
<b>European networks</b>	European Reference Laboratories Network; European Association of Fish Pathologists; European Reference Laboratory Network, CEN/TC 275 WG 5 Biotoxins)
<b>Africa</b>	Laboratory of Biochemistry, Faculty of Medicine of Sousse (Tunisia); Laboratory of Biochemistry, Faculty of Medicine and Pharmacy of Casablanca (Morocco)

<b>America</b>	Institute for Marine Biosciences (NRCC; Canada); Food Science Department of Louisiana State University (USA)
<b>International organisations</b>	International Committee for the Exploitation of the Sea (WG on Pathology of Marine Organisms)

**Name: CEMAGREF**

**1. General information**

<i>Address</i>	Cemagref (Centre National du Machinisme Agricole, du Génie Rural et des Eaux et Forêts) Parc de Tourvoie BP 121 92185 Antony Cedex Tel. (33-1) 40 96 61 21. Fax (33-1) 46 66 37 44
<i>Date of creation</i>	1981
<i>Status and financial position</i>	Public research institute
<b>Populations of migratory fishes</b>	Cemagref : Unité Ressources Aquatiques Continentales 50, avenue de Verdun – Gazinet 33612 Cestas Cedex Tel. (33-5) 57 89 08 00. Fax (33-5) 57 89 08 01
<b>Fish ways</b>	GHAAPPE Avenue du professeur Camille Soula 31000 Toulouse Tel. (33-5) 61 28 58 69. Fax (33-5) 61 28 58 97
<b>Fish resources management in ponds, lakes and reservoirs</b>	Cemagref: Unité Ressources Ichtyologiques en Plans d'Eau 361 rue Jean François Breton 34033 Montpellier Cedex 1 Tel. (33-4) 67 04 63 00. Fax (33-4) 67 63 57 95

**2. Detailed objectives and research programmes**

One research department devoted to freshwater systems management.

Two scientific directories:

- determining factors of hydrological regimes and water quality
- dynamic functioning and quality assessment of freshwater ecosystems.

*General finalities research*

The objectives are to find tools and operational methods to improve the management of freshwater environments. They focus on how hydrosystems function to identify, predict and control the impact of natural processes and human activity on the movement of water and solids within catchments and river systems, and on the dynamics of river ecosystems.

*Research topics*

Five research topics, one being devoted to the aquatic living resources: Fish resources dynamics and biological engineering.

Three research groups are working on this topic:

- Managing populations of endangered (*Acipenser sturio*) or vulnerable migratory fishes (*Anguilla anguilla*) and others aquatic living resources (*Alosa alosa*, crayfishes, etc.).

- Study and improvement of the conditions of crossing the obstacles to the migration (*Salmo salar*, *Alosa alosa*, *Anguilla anguilla*, etc.).
- Fish resources management in ponds, lakes and reservoirs (*Stizostedion lucioperca*, *Perca fluviatilis*, *Silurus glanis*, *Micropterus salmoides*, *Esox lucius*, etc.).

### 3. Facilities at sea

Heavy equipment: one experimental ship, the *Esturial*.

### 4. Scientific cooperation

<b>National</b>	INRA; CIRAD; IRD; MNHN; Ifremer; CNRS; CSP; several national agronomic high schools; Universities of Bordeaux, Toulouse, Rennes and Montpellier; ENSEIH Toulouse
<b>European networks</b>	European Aquaculture Society; Euraqua
<b>Africa</b>	INSTM, Tunisia
<b>North America</b>	Ministère de l'Environnement et de la Faune du Québec; INRS
<b>International organisations</b>	European Inland Fisheries Advisory Commission, FAO; International Council for the Exploration of the Sea (ICES)

## Name: ECOLE NATIONALE SUPÉRIEURE AGRONOMIQUE DE RENNES (ENSAR)

### 1. General information

<b>Address</b>	ENSAR-Halieuistique (Fishery Science and Aquaculture) 65, rue de Saint-Brieuc 35042 Rennes Cedex Tel. (33-2) 99 28 75 37. Fax (33-2) 99 28 75 35
<b>Date of creation</b>	1896 (1969 for the Department of Fishery Science and Aquaculture (Halieuistique))
<b>Status and financial position</b>	Public education and research institute

### 2. Detailed objectives and research programmes

Higher education and research in biological, agricultural and food-processing sciences. Undergraduate courses (125 agricultural engineering graduates per year). Long or short in-service training courses (engineering diploma). Development and consultation with companies in the food-processing sector and partners in agriculture. Teaching, research and consultation in: food processing, animal production, environment, plant production, fishery science and aquaculture, environmental economics, agricultural economics, and international economics. Most of the research at ENSAR is carried out jointly with the INRA centre in Rennes. Laboratory of fishery science and aquaculture delivers three diplomas:

- Master engineers in fisheries science and aquaculture.
- Master in marine resource economics.
- Master in marine biology and oceanography.

Main research tasks are marine resource biology, population dynamics, fishing technology, marine economics and marine products processing. International programmes are carried out in collaboration with foreign institutions.

### 3. Scientific cooperation

<b>National</b>	Ifremer; INRA; CSP; Université de Brest; OIKOS Environnement; Fish Pass; IRD; CEDEM; CEP, Université de Montpellier; CNRS; Muséum National d'Histoire Naturelle; Universités de Rennes 1; UBO
<b>Bilateral European relations</b>	LEI-DLO (The Netherlands); SFIA (UK); CEMARE (UK); DIFER (Denmark)
<b>European networks</b>	EAFE (European Association of Fisheries Economists); IIFET (International Institute of Fisheries Economics and Trade); ICES; ASCP (International Association for the Study of Common Property)

Name: ID.MER

#### 1. General information

Address	ID.MER 2, rue Bâtelière 56100 Lorient Tel. (33-2) 97 83 86 83. Fax (33-2) 97 37 11 03 Web site: <a href="http://www.idmer.com">www.idmer.com</a>
Date of creation	1987
Status and financial position	Association – Technical Centre

#### 2. Detailed objectives and research programmes

Specialised in the processing of marine products, ID.MER carries out the development of innovative products and processes, from the conception to industrial pre-series.

— Technical assistance to the fishing and seafood processing sector: Assistance and development of innovative products and processes; by-products upgrading and valuation; design and upgrading of production facilities, on board and on shore, for the compliance with EC standards; industrial pre-series allowing assessment of technical and economical parameters and safe market launching.

— Research and assistance for the implementation of clean technologies and environment management systems in the seafood processing sector.

— Creation of a nutrition competence within a network, for the promotion of nutritional advantages of seafood products.

#### 4. Scientific cooperation

<b>National</b>	ANVAR; French Agency for Development (MPEPP); French-Indian protocol (MPEDA)
<b>Bilateral European relations</b>	Ecoman (European programme FAIR CT963016)
<b>European networks</b>	TACIS technical assistance to the fishing complex of north west Russia

<b>Africa</b>	Centre for Industrial Development (Brussels — European Funds for Development)
<b>South America</b>	AL'INVEST (Mexico)
<b>Asia</b>	French – Indian protocol (creation of a technical centre for the MPEDA)
<b>International organisations</b>	ONUDI

**Name: CEVPM (CENTRE D'EXPÉRIMENTATION ET DE VALORISATION DES PRODUITS DE LA MER)**

**1. General information**

<i>Address</i>	CEVPM 15-17 rue Magenta 62200 Boulogne sur Mer Tel. (33-3) 21 83 91 31. Fax (33-3) 21 87 46 83 E-mail: cevpm@cevpm.com
<i>Date of creation</i>	1987
<i>Status and financial position</i>	Technical centre

**2. Detailed objectives and research programmes**

CEVPM is a technical centre specialised in foodstuff processing of marine products, including by-products. Thanks to its well-equipped pilot plant which complies to EC standards, the centre's engineers and technicians work with companies for the development of food products and manufacturing process. Besides, many innovative food products and several business start-ups were developed by CEVPM. The centre carries out development of marine food products from the design stage to semi-industrial-level tests runs, allowing technical and economical assessment before industrial launching. The centre is also involved in quality control of fishery products within its quality control laboratory. CEVPM tackled nutrition within collaborative work with IPL. CEVPM also sets up HACCP systems in seafood companies and provides practical training in several universities. CEVPM's action also takes place abroad.

**3. Scientific cooperation**

<b>National</b>	ACTIA (Association de Coordination Technique des Industries Agro-Alimentaires); ANVAR; AFSSA; Cevalmar; Ifremer; IPL Institut Pasteur de Lille
<b>European networks</b>	BIM; Fisheries Research Institute – University of Iceland; Norconserv; Torry Research Ltd; WEFTA (Western European Fishery Technologist Association)
<b>International organisations</b>	IIF (Institut International du Froid); ONUDI

**Name: CENTRE D'ÉTUDES ET DE VALORISATION DES ALGUES (CEVA)**

**1. General information**

<i>Address</i>	CEVA Presqu'île de Pen-Lan BP3 22610 Pleubian
<i>Date of creation</i>	1986
<i>Status and financial position</i>	Technical centre for seaweed valorisation

**2. Detailed objectives and research programmes**

CEVA, seaweed technology centre, provides services in applied research and development of products from marine plants, seaweeds or derived products.

**3. Facilities at sea**

Three small boats (6.5 m).

**4. Scientific cooperation**

<b>National</b>	Actia Network (French Network of Agro-food Technical Centres); Bretagne Innovation Network; Réseau-Bleu; CNRS; Ifremer; Inserm; ENSCR; INRA; ITERC Bordeaux; GIS Télédétection en Bretagne; Université de Marseille; INPP Marseille
<b>Bilateral European relations</b>	Université Libre de Bruxelles (Belgium); University of Portsmouth (UK); University of Las Palmas (Spain); Medical Research Council, Cambridge (UK); University of Newcastle (UK); Xunta de Galicia (Spain); VDAB (Belgium); Forpesca (Portugal); Institut Onderzoek (the Netherlands); IMC (Italy); University of Venice (Italy); University of Thessalonique (Greece); University of Hamburg (Germany); University of München (Germany); LFE (Germany); LF (Germany)
<b>European networks</b>	COST49; Marine Industrial Forum; REAL (Réseau européen de l'algue)
<b>International organisations</b>	ONUDI; ICCIDD (International Council for Control of Iodine Deficiency Disorder)

**Name: ASSOCIATION POUR LE DÉVELOPPEMENT DE LA RECHERCHE APPLIQUÉE AUX INDUSTRIES AGRO-ALIMENTAIRES (ADRIA)**

**1. General information**

<i>Address</i>	Association pour le développement de la recherche Appliquée aux industries agro-alimentaires (ADRIA) Creac'h Gwen, F-29196 Quimper Cedex Tel. (33-2) 98 10 18 18. Fax (33-2) 98 10 18 99 E-mail: xavier.drouet@adria.tm.fr
<i>Date of creation</i>	1971
<i>Status and financial position</i>	Private non-profit food research association

## 2. Detailed objectives and research programmes

The objective of ADRIA is to help the fishery industry in improving the quality and security of fish products.

The main area of research are:

- the application of antimicrobial treatments in order to reduce the initial contamination of the products;
- the use of predictive microbiology to establish links between the behaviour of specific spoilage organisms and the shelf-life — the use of modified atmosphere;
- the application of time-temperature integrators combined to predictive models, in order to be able to assess the shelf-life of fish by taking into account the fluctuation of temperature to which they were submitted — the prevention of growth of *listeria monocytogenes* in smoked salmon (predictive microbiology, effect of natural antimicrobial compounds, study of bacterial injury).

## 3. Scientific cooperation

<b>National</b>	ID.MER; INRA Villeneuve d'Ascq
<b>Bilateral European relations</b>	National Technical University of Athens (Greece); Danish Institute for Fisheries Research (Denmark); Agricultural University of Athens (Greece); Netherlands Institute for Fisheries Research (The Netherlands); Escolar Superior de Biotechnologia (Portugal)

## Name: RESEAU NATIONAL DES STATIONS MARINES (RNSM)

### 1. General information

<i>Address</i>	Réseau National des Stations Marines (RNSM)
<i>Date of creation</i>	1994
<i>Status and financial position</i>	National network (Ministry of Education and Research)
<b>Station Marine d'Arcachon</b>	CNRS — Université de Bordeaux I Centre d'Océanographie et de Biologie Marine 2, rue du Professeur Jolyet 33120 Arcachon Tel. (33-5) 56 22 39 00. Fax (33-5) 56 83 51 04
<i>Date of creation</i>	1867
<b>Station Marine de Bailleron</b>	Université de Rennes I 56860 Séné Tel. (33-2) 97 26 41 04. Fax (33-2) 97 26 40 49
<i>Date of creation</i>	1958
<b>Station Marine de Banyuls sur-Mer</b>	CNRS — INSU (OSU) — Université Paris VI Observatoire Océanologique de Banyuls 66651 Banyuls s/Mer Cedex Tel. (33-4) 68 88 73 00. Fax (33-4) 68 88 16 99
<i>Date of creation</i>	1882



<b>Station Marine de Concarneau</b>	Collège de France — Muséum National d'Histoire Naturelle Laboratoire de Biologie Marine BP 225 Place de la Croix 29182 Concarneau Tel. (33) 298 97 06 59. Fax (33) 298 97 81 24
<i>Date of creation</i>	1859
<b>Station Marine de Dinard</b>	Muséum National d'Histoire Naturelle Laboratoire Maritime Avenue Georges-V 35801 Dinard Tel. (33) 299 46 13 90. Fax (33) 299 88 29 42
<i>Date of creation</i>	1882
<b>Station Marine de L'Houmeau</b>	CNRS — Ifremer Centre de Recherches en écologie Marine et Aquaculture BP 5 17137 L'Houmeau Tel. (33) 546 50 94 40. Fax (33) 546 50 91 60
<i>Date of creation</i>	1985
<b>Station Marine de Luc-sur-Mer</b>	Université de Caen BP 49 14530 Luc s/Mer M. J. Avoine Tel. (33) 231 36 22 22. Fax (33) 231 36 22 20
<i>Date of creation</i>	1881
<b>Station Marine de Marseille</b>	CNRS — INSU (OSU) — Université de la Méditerranée (Aix-Marseille II) Rue de la batterie des lions 13007 Marseille Tel. (33) 491 04 16 00. Fax (33) 491 04 16 35
<i>Date of creation</i>	1889
	Campus de Luminy — Case 901 13288 Marseille Cedex 09 Tel. (33) 491 82 90 00
<i>Date of creation</i>	1966
<b>Station Marine de Moorea</b>	CNRS — EPHE — Université de Perpignan Centre de Recherches Insulaires et Observatoire de l'Environnement BP 1013 Mooréa Polynésie Française Tel. (33) 689 56 13 45. Fax (33) 689 56 28 15
<i>Date of creation</i>	1971
<b>Station Marine de Roscoff</b>	CNRS — INSU (OSU) — Université Paris VI Observatoire Océanologique de Roscoff BP 74 29682 Roscoff Cedex Tel. (33) 298 29 23 00. Fax (33) 298 29 23 26. E-mail: dir@sb-roscoff.fr
<i>Date of creation</i>	1872

<b>Station Marine de Sète</b>	CNRS — Université Montpellier II Station Méditerranéenne de l'Environnement Littoral 1, quai de la Daurade 34200 Sète Tel. (33) 467 46 33 70. Fax (33) 467 46 02 56
<i>Date of creation</i>	1879
<b>Station Marine de Villefranche-sur-Mer</b>	CNRS — INSU (OSU) — Université Paris VI Observatoire Océanologique de Villefranche BP 28 06234 Villefranche s/Mer Tel. (33) 493 76 38 90. Fax (33) 493 76 38 93. E-mail: dir@obs-vlfr.fr
<i>Date of creation</i>	1884
<b>Station Marine de Wimereux</b>	CNRS — INSU — Université Lille I — Université du Littoral BP 80 62930 Wimereux Tel. (33) 321 99 29 00. Fax (33) 321 99 29 01
<i>Date of creation</i>	1960

## 2. Facilities at sea

Station d'Arcachon: *Planula II* (11 m)  
 Station de Bailleron: *Sepiolo* (9.3 m)  
 Station de Banyuls-sur-Mer: *Nereis* (11.9 m) — *Rufi* (7 m)  
 Station de Concarneau: *Garvel* (8.5 m)  
 Station de Dinard: *Louis-Fage* (10.5 m)  
 Station de L'Houmeau: *Eolis* (5 m)  
 Station de Luc-sur-Mer: *Albatros* (4.6 m) — *Nausicaa* (4.4 m)  
 Station de Marseille: *Armandia* (9.4 m) — *Boston-Wheeler* (4.5 m)  
 Station de Moorea: *EPHE I, II, III, IV* (3 to 7 m)  
 Station de Roscoff: *Mysis* (11.4 m) — *Obelia* (7 m) — *Zodiac 25 HP* (5.1 m)  
 Station de Sète: *Exocet* (7.6m)  
 Station de Villefranche-sur-Mer: *Sagitta II* (8.5 m) — *Vélette II* (7 m)  
 Station de Wimereux: *Temora* (4.5 m)

## Name: UNIVERSITIES

### 1. General information

*Address* University of Caen  
 Université de Caen — Basse-Normandie  
 Esplanade de la Paix  
 14032 Caen Cedex  
 Tel. (33) 23 1 56 55 00. Fax (33) 02 31 56 56 00

University of Brest  
 Centre de Droit et d'Économie de la Mer (CEDEM)  
 UFR Droit et Sciences Économiques  
 Site V — 12, rue de Kergoat — BP 816 — 29285 Brest Cedex  
 Tel. 02 98 01 69 31 — Fax 02 98 01 69 35

Équipe de ressources halieutiques — poissons marins (ERHPM)  
Technopole Brest-Iroise — Place Nicolas Copernic  
29280 Plouzane  
Tel. 02 98 49 86 00. Fax 02 98 49 86 09

University of Nantes  
Centre d'Observation et de Recherche sur les Ressources Aquatiques et les Industries du Littoral (CORRAIL)  
Université de Nantes  
Faculté des Sciences Economiques et de Gestion de l'Université de Nantes  
Chemin de la Censive du Tertre  
BP 52231  
44322 Nantes Cedex 3  
Tel. (33) 240 14 17 17. Fax 240 14 17 00  
E-mail: [ufr@sc-eco.univ-nantes.fr](mailto:ufr@sc-eco.univ-nantes.fr)

University of Rennes  
Université de Rennes 1  
2, rue du Thabor, 35065 Rennes Cedex

University of La Rochelle  
Université de La Rochelle  
Relations Internationales — Technoforum  
23, Avenue Albert Einstein  
17071 La Rochelle Cedex 9

University of Montpellier  
Centre d'Études de projets (CEP)  
Université de Montpellier I  
Espace Richter — BP 9606  
Avenue de la Mer — 34054 Montpellier Cedex 1  
Tel. (33) 467 15 84 50. Fax (33) 4 67 15 83 64

University of Littoral (Dunkerque)  
Université du Littoral 'Côte d'Opale'  
Services Centraux  
1, place de l'Yser — BP 1022  
59375 Dunkerque Cedex 1  
Tel. (33) 328 23 73 73. Fax (33) 328 23 73 13

# GERMANY





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1 Trend in production for national fisheries

The German sea fishery fleet is grouped into high sea fisheries (long-distance fisheries) and distant trawler and coastal fisheries. Landings (comprising finfish and shellfish; product weight) of the sectors into Germany in 1997 amounted to 258.8 thousand tonnes and valued to EUR 170.5 million. Trend in production (landings) within the last 22 years: catches declined from 612.7 thousand tonnes to 258.8 thousand tonnes in 1997 (–58 %). The main commercial species (by value) are herring, cod, redfish and shellfish.

Landings (in thousand tonnes)								
Species	1990	1991	1992	1993	1994	1995	1996	1997
Herring	24.7	65.2	66.8	27.9	54.5	62.7	42.2	39.5
Cod	19.8	38.8	25.5	9.6	20.0	28.5	37.6	19.0
Mackerel	8.0	21.3	26.5	15.0	26.4	24.4	16.3	37.2
Saithe	11.6	21.7	18.0	13.5	12.4	18.4	15.2	11.9
Redfish	3.7	13.6	20.6	10.4	31.2	8.2	22.5	9.1
Others	147.8	107.2	108.1	182.1	75.1	113.5	115.8	142.1
Total	215.6	253.6	265.5	258.5	219.6	249.4	250.6	258.8

Landings (million EUR)								
Species	1990	1991	1992	1993	1994	1995	1996	1997
Herring	6.4	17.9	16.9	13.1	14.4	14.0	10.6	11.3
Cod	28.9	52.7	32.4	29.4	18.2	26.6	31.5	27.1
Mackerel	2.7	8.5	8.6	5.0	8.1	7.6	6.3	11.6
Saithe	8.3	16.7	12.0	14.8	7.1	15.8	9.1	7.6
Redfish	3.5	11.7	14.7	14.8	19.6	15.8	20.3	2.1
Others	54.3	86.7	74.2	69.1	74.6	76.5	89.3	110.8
Total	104.1	194.2	158.7	145.9	142.0	145.0	167.1	170.5

The total catch (live weight) of the sea fisheries in the NE-, NW- and Eastern Central Atlantic, North Sea and Baltic Sea (comprising finfish and shellfish) in 1997 amounted to 258.8 thousand tonnes valued EUR 170.5 million.

#### 1.1.2. Trend in fleets

The German sea fishery fleet is grouped into long-distance fisheries and cutter and coastal fisheries. Among EU member countries Germany ranks sixth in terms of quantity and sixth in value. Evolutions of the fleet over the past 20 years were a collapse of the long-range fleet fishing for cod, herring, redfish,

etc. (Barents Sea, Grand Banks, Labrador), a decrease of the distant trawler fleet fishing in the north-east Atlantic area and a development of the coastal fisheries fleets:

	1990	1991	1992	1993	1994	1995	1996
Fishermen	4 836	4 879	5 402	5 096	4 979	4 888	4 588
Vessels	1 247	1 855	2 567	2 478	2 458	2 392	2 372
Power (thousand kW)	214.7	188	184.8	175.8	172.3	169.2	168.4

Due to the inclusion of the 'Neue Bundesländer' the number of boats has increased by a factor of approximately 2, and the number of fisherman has doubled due to the same reason.

### 1.1.3. Fishing harbours

The German fishing harbours are located along the North Sea Coast and Baltic Sea Coast. The maps show the distribution of fishing harbours at the North Sea Coast and Baltic Sea Coast. The main fishing ports in Germany are: Bremerhaven, Cuxhaven, Rostock-Warnemuende, Hamburg, Sasznitz, Kiel, Husum, Buesum, Heiligenhafen, Karlshagen.



## 1.2. Aquaculture sector

The aquaculture mainly consists of the traditional carp and trout culture and blue mussel culture. The aquaculture production increased from 1985 to 1990 from 58 000 tonnes to 64.4 thousand tonnes and decreased to 1994 to 42.7 thousand tonnes. The production value was in 1994 EUR 114.7 million.

		Quantity (thousand tonnes)					
Species	1990	1991	1992	1993	1994	1995	1996
Blue mussel	20.2	30.0	50.8	24.7	4.8	17.8	38.0
Rainbow trout	22.2	21.0	23.2	23.0	22.8	22.5	22.7
Common carp	19.1	17.4	13.3	12.7	12.3	14.0	12.0
Sea trout	2.4	2.3	2.6	2.5	2.5	2.5	2.5
Silver carp	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Pacific cupped oyster	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Tench	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Bighead carp	0.02	0.02	0.02	0.04	0.01	0.01	0.01
Grass carp	0.02	0.02	0.02	0.03	0.01	0.01	0.01
(= White amur)							
Turbot	0.001	0.001	0	0	0	0	0
<b>TOTAL</b>	<b>64.7</b>	<b>71.1</b>	<b>90.3</b>	<b>63.4</b>	<b>42.9</b>	<b>57.1</b>	<b>74.5</b>

		Value (million EUR)					
Species	1990	1991	1992	1993	1994	1995	1996
Blue mussel	80.22	149.4	144.5	91.8	81.93	91.72	66.82
Rainbow trout	41.50	88.0	124.1	66.9	20.08	36.88	27.16
Common carp	5.98	43.4	49.1	2.3	2.5	6.12	11.1
Sea trout	8.69	9.4	13.8	7.3	9.06	10.17	7.43
Silver carp	0.81	0.6	0.6	0.4	0.74	0.65	0.67
Pacific cupped oyster	0.17	0.6	0.6	0.6	0.17	0.2	0.19
Tench	0.59	0.2	0.2	0.14	0.17	0.17	0.17
Bighead carp	0.06	0.06	0.06	0.07	0.03	0.03	0.03
Grass carp	0.06	0.06	0.06	0.05	0.02	0.02	0.02
(= White amur)							
Turbot	0	0	0	0	0	0	0
<b>Total</b>	<b>138.1</b>	<b>289.2</b>	<b>288.7</b>	<b>169.6</b>	<b>114.7</b>	<b>146.0</b>	<b>113.6</b>



### 1.3. Processing industry

Progression has been steady over the last few years.

	Trend in employment		
	1985	1990	1995
Number of firms (> 10 workers)	92	95	109
Number of workers	9 306	11 325	11 750

A considerable diversification in the canned and frozen food sectors can be observed with a shift towards cooked food (deluxe products), and the emergence of new sectors not related to the marine environment.

Total production of fishery products in 1995–97						
Species / products	Amount (tonnes)			Value (million EUR)		
	1995	1996	1997	1995	1996	1997
Total	433665	438124	416894	1349.8	1370.0	1275.7
Thereof:						
Fish fillets etc., fresh or chilled	26 975	25 865	15 671	103.0	96.1	65.8
Fish fillets, frozen	38 279	34 241	36 971	111.3	105.8	104.8
Salmon, smoked	6 986	6 011	5 063	92.9	74.7	58.5
Herring, smoked	3 735	3 416	2 326	10.1	9.0	7.7
Other fish, smoked	12 352	13 235	11 210	79.8	84.5	77.7
Salmon products	12 770	13 443	12 850	38.8	37.9	35.9
Herring products	86 264	86 524	69 560	223.8	225.9	205.3
Fish fillets & sticks, battered, frozen	99 721	120 258	121 626	224.7	279.5	274.9
Fish salads	18 392	20 842	32 655	70.4	76.2	104.0
Crustaceans and molluscs	8 155	7 154	5 771	62.6	55.8	47.5
Other fishery products	120036	107135	103 191	332.4	325.1	293.5

Evolution of the total consumption (in 1 000 tonnes live weight)				
	1985	1990	1995*	1996*
Total consumption	727.7	1022.5	1194.0	1185.0
*incl. new federal States: preliminary data				

During the past years the following eight fish species were of highest importance for human consumption <sup>(1)</sup>:

Market	Supply	1994 <sup>(2)</sup>	1995 <sup>(2)</sup>	1996 <sup>(3)</sup> %	96/95 share <sup>(4)</sup>	1996
Rank	Total	1.615	1.602	1.712	7	100
	landings	189	183	174	-5	10
	imports	1.426	1.419	1.538	8	90
	Fish species					
	1 Alaska pollock	218	273	305	12	18
	landings	0	0	0		
	imports	218	273	305	12	
	2 Herring	311	270	296	10	17
	landings	38	32	22	-31	
	imports	273	238	274	15	
3	Cod	119	118	144	22	8
	landings	18	21	23	10	
	imports	101	97	121	25	
4	Salmon	106	99	129	30	8
	landings	0	0	0		
	imports	106	99	129	30	
5	Tuna	97	90	109	21	6
	landings	0	0	0		
	imports	97	90	109	21	
6	Saithe	128	119	91	-24	5
	landings	9	7	7	0	
	imports	119	112	84	-25	
7	Hake	79	67	73	9	4
	landings	0	0	0		
	imports	79	67	73	9	
8	Redfish	78	66	67	2	4
	landings	14	1	2	100	
	imports	64	65	65	0	

## Notes:

(1) Total market supply: domestic landings (incl. Aquaculture) and imports.

(2) 1000 t live weight.

(3) Preliminary.

(4) In % of total market supply.

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research Institutes involved in fishery sectors

The Federal Research Centre for Fisheries (BFA Fi) is the main national institution in charge of the research in fisheries and fishery related subjects. The Alfred-Wegener-Institute for Polar and Marine Research (AWI) is more concerned with basic and applied research on marine biology and oceanography. The *Bundesamt für Seeschifffahrt und Hydrographie* (BSH) is responsible for sea water monitoring, marine cartography and security of marine transport.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
<b>Main</b>	Federal Research Centre for Fisheries	65	139		10.2 <sup>(1)</sup> (1997)
<b>Others research institutes</b>	Alfred-Wegener-Institut für Polar- und Meeresforschung	350 <sup>(2)</sup>	163		54.4 (1995)
	Bundesamt für Seeschifffahrt und Hydrographie	64	969		57.1 (1995)

(1) Including candidates for doctor degree.  
(2) Without research vessels.

### 2.1.2. Supervisory Ministerial authority(ies)

Institutes	Authority(ies)					
	Federal Government				Governments of the Federal States	
	Food, Agriculture and Forestry	Research and Technology	Transport	Environment	Universities	States centres for fisheries and veterinary control
Federal Research Centre for Fisheries	<input type="checkbox"/>					
Alfred-Wegener-Institut für Polar- und Meeresforschung		<input type="checkbox"/>				
Bundesamt für Seeschifffahrt und Hydrographie			<input type="checkbox"/>			
Institut für Wasser-Boden- und Lufthygiene des Umweltbundesamtes				<input type="checkbox"/>		
Universities (7)					<input type="checkbox"/>	
Federal State (Bundesländer) Fishery Institutes (9)						<input type="checkbox"/>

### 2.1.3. Coordination and relationship among the different research organisations and with research users

The German Scientific Commission for the Exploration of the Sea (DWK) provides a platform for the co-ordination of marine research, including fisheries research in the Federal Republic of Germany. Members of the DWK are experts in various marine fields. The membership is personal, appointed by the Ministry of Food, Agriculture and Forestry. The DWK is the national link to the ICES.

## 2.2. Main research institute: *BUNDESFORSCHUNGSANSTALT FÜR FISCHEREI (BFA Fi)*

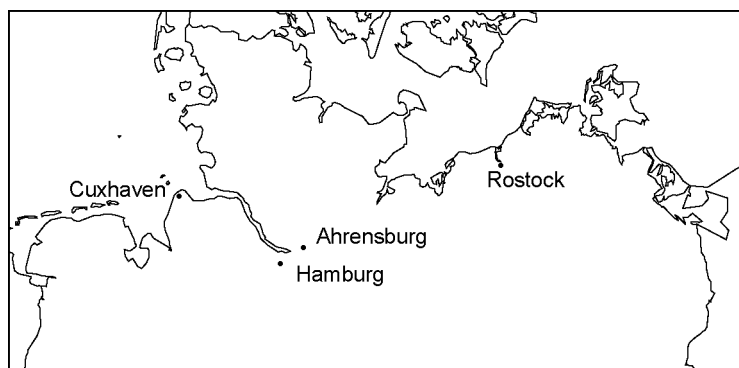
### 2.2.1. General information

#### Address

Bundesforschungsanstalt für Fischerei  
 Palmaille 9, D-22767 Hamburg,  
 Tel. (040) 38905. Fax (040) 38905-200  
 E-mail: 100565.1223@compuserve.com  
 Director: Dir.u.Prof.Dr Hans-Stephan Jenke

<i>Date of creation</i>	1948
<i>Status and financial position</i>	Applied fisheries research; Arguments for the Federal Government in national, European and international fishery politics, legislation and conventions
<b>Institut für Seefischerei</b>	Director: Dir.u.Prof.Dr habil. Gerd Hubold Tel. (040) 38905-177, -178. Fax (040) 38905-263 E-mail: ish@bfa-fisch.de
<b>Institut für Ostseefischerei</b>	Director: Dr Otto Rechlin An der Jägerbäk 2, D-18069 Rostock Tel. (049-381) 810-344, -446. Fax (049-381) 810-445 E-mail: 113322.2417@compuserve.com
<b>Institut für Fischereiökologie</b>	Director: Dir.u.Prof.Dr Hans-Stephan Jenke Wüstland 2, D-22589 Hamburg Tel. (049-40) 3190-8601, -8602. Fax (49-40) 3190-8603 E-mail: ifo@bfa-fisch.de Laboratory Ahrensburg, Wulfsdorfer Weg 204, D-22926 Ahrensburg Tel. (049-4102) 51128. Fax (049-4102) 898207 Laboratory Cuxhaven, Deichstr. 12, D-27472 Cuxhaven Tel. (049-4721) 380 34. Fax (049-47 21) 535 83 E-mail: 101322.3467@compuserve.com Head: Dr habil. Volkert Dethlefsen
<b>Institut für Fischereitechnik</b>	Director: Dir.u.Prof.Dr Otto Gabriel Tel. (049-40) 389 05-185, -186. Fax (049-40) 389 05-264 E-mail: ifh@bfa-fisch.de
<b>Institut für Biochemie und Technologie</b>	Director: (komm.) (Wiss.Dir.)Dr Hartmut Rehbein Tel. (049-040) 389 05-119, -120. Fax (049-40) 389 05-262 E-mail: ibt@bfa-fisch.de
<b>Informations- und Dokumentationsstelle incl. Libraries in Hamburg and Rostock</b>	Director: (Wiss.Dir) Dr Wulf-Peter Kirchner Tel. (049-0) 389 05-113, -140. Fax (49-40) 389 05-261 E-mail: 100565.1223@compuserve.com and iud@bfa-fisch.de

*Location*



### 2.2.2. Detailed objectives and research programmes

The Federal Research Centre for Fisheries consists of five institutes and a central information and documentation service:

#### 1. *Institute for Sea Fisheries*

Research on the stocks and biology of fish species in the North Sea and North Atlantic; short and long-term fluctuations in fish populations relevant to German fisheries; biological monitoring of marine ecosystems in the North Atlantic and Antarctic; fisheries oceanography.

#### 2. *Institute of Baltic Sea Fisheries*

Biological monitoring of fish stocks in the Baltic Sea; research on short and long-term fluctuations in fish populations relevant to commercial fishery; research on the fundamentals of stock recruitment in relation to the environment.

#### 3. *Institute of Fishery Ecology*

Investigations of the status of the marine ecosystem: Survey in terms of space and time of radioactive, inorganic- and organic-chemical contaminants in fish and nutritive animals for fish. Use of experimental and theoretical models for the description of the status, the change of and risks to the marine ecosystem. Research into the prevalence of fish diseases as well as the assessment of the ecological input of the aquaculture.

#### 4. *Institute of Fisheries Technology*

Improvement and development of fishing gear and techniques for selective catching.

#### 5. *Institute of Biochemistry and Technology*

Research on handling and processing fish after catch; storage of products; quality control of fish products.

#### 6. *Library*

The I&D Service handles and provides information for the research staff of the Federal Research Centre for Fisheries and the public: documentation, databanks, library services, press releases, editing and production of publications.

### 2.2.3. Facilities at sea

Presently 27 German research vessels are at least partly equipped for fishery research but only FRV *Walther Herwig III* and FRC *Solea* and *Clupea* are permanently working in this research field.

FRV *Walther Herwig III* (2131 GT)

FRC *Solea* (347 GT)

FRC *Clupea* (39 GT)

### 2.2.4. Scientific cooperation

<b>National</b>	DWK
<b>European networks</b>	Asfa (Aquaric Sciences and Fisheries Abstracts); Baltic Seaweb
<b>International organisations</b>	ICES; NAFO; NEAFC; IBSFC; IWC; Helcom; OSPARCOM; CCAML Codex Alimentarius; WEFTA

## 2.3. Other research organisations

### Name: ALFRED-WEGENER-INSTITUT FÜR POLAR- UND MEERESFORSCHUNG

#### 1. General information

Address Alfred-Wegener-Institut für Polar- und Meeresforschung  
Director: Prof. Dr M. Tilzer  
Columbusstr., D-27568 Bremerhaven  
Tel. (471) 4831-0. Fax (471) 4831-149

### Name: BUNDESAMT FÜR SEESCHIFFAHRT UND HYDROGRAPHIE

#### 1. General information

Address Bundesamt für Seeschifffahrt und Hydrographie  
Director: President u. Prof. Dr P. Ehlers  
Bernhard-Nocht-Str. 78, D-20359 Hamburg  
Tel. (49-40) 3190-0

### Name: INSTITUT FÜR WASSER-, BODEN- UND LUFTHYGIENE DES UMWELTBUNDESAMTES

#### 1. General information

Address Institut für Wasser-, Boden- und Lufthygiene des  
Umweltbundesamtes  
Director: Dir.u.Prof. Dr habil. H. Lange-Asschenfeldt  
Corrensplatz 1, D-14195 Berlin  
Tel. (49-30) 8308-0

### Name: UNIVERSITIES

#### 1. General information

##### Address

##### University of Kiel

##### **Institut für Meereskunde an der Christian-Albrechts-Universität Kiel**

Director: Prof. Dr D. Adelung  
Düsternbrooker Weg 20, D-24105 Kiel  
Tel. (49-431) 597-3901

##### **Universität Kiel, Institut für Polarökologie**

Director: Prof. Dr M. Spindler, Prof. Dr G. Hempel,  
Prof. Dr L. Kappen  
Wischhofstr. 1-3, Gebäude 12, D-24148 Kiel  
Tel. (49-431) 72 08 70. Fax (49-431) 7208720

##### University of Rostock

##### **Institut für Ostseeforschung Warnemünde**

Director: Prof. Dr G. Hempel  
Postfach 30 11 61, D-18112 Rostock  
Tel. (49-381) 5197-0. Fax (49-381) 5197-440

##### **Universität Rostock, Fachbereich Biologie**

Director: Prof. Dr N. Erdmann  
Wismarsche Str. 8, D-18057 Rostock  
Tel. (49-381) 498-1979. Fax (49-381) 498-1980

<b>University of Hamburg</b>	<b>Universität Hamburg, Institut für Hydrobiologie und Fischereiwissenschaft</b> Director: Prof. Dr W. Nellen Olbersweg 24, D-22767 Hamburg und Zeiseweg 9, D-22765 Hamburg Tel. (49-40) 41 23-66 00, -6601. Fax (49-40) 4123-6618  <b>Universität Hamburg, Institut für Meereskunde</b> Director: Prof. Dr J. Meincke Troplowitzstr. 7, D-22529 Hamburg Tel. (49-40) 4123-5985. Fax (49-40) 4123-4644
<b>University of München</b>	<b>Technische Universität München, Lehrgebiet Angewandte Zoologie</b> <b>Fachgebiet Fischbiologie</b> Director: Prof. Dr H. Stein D-85350 Freising-Weihenstephan Fax (49-8161) 71 37 67  <b>Universität München, Tierärztliche Fakultät, Institut für Zoologie, Fischereibiologie und Fischkrankheiten</b> Director: Prof. Dr R. Hoffmann Kaulbachstr. 37, D-80539 München Tel. (49-89) 2180-2687. Fax (49-89) 2805-175
<b>University of Dresden</b>	<b>Technische Universität Dresden, Institut für Hydrobiologie</b> Director: Prof. Drhabil. D. Uhlmann Mommsenstr. 13, D-01069 Dresden Tel. (49-351) 463-4956. Fax (49-351) 463-7108
<b>University of Hannover</b>	<b>Tierärztliche Hochschule Hannover, Fachgebiet Fischkrankheiten und Fischhaltung</b> Director: Prof. Dr W. Körting Bünteweg 17, D-30559 Hannover Tel. (49-511) 953-8889. Fax (49-511) 953-8870
<b>University of Konstanz</b>	<b>Universität Konstanz, Limnologisches Institut</b> Director: Prof. Dr B. Schink Mainaustr. 212, D-78464 Konstanz Tel. (49-7531) 88-3531. Fax (49-7531) 88-3533

#### NAME: FEDERAL STATE (BUNDESLÄNDER) FISHERY INSTITUTES

<i>Address</i>	<b>Bayerische Landesanstalt für Fischerei</b> Director: Ltd. RD Dr M. v. Lukowicz Weilheimer Str. 8, D-82319 Starnberg Tel. (49-8151) 26 92-20. Fax (49-8151) 2692-70 Mit <b>Außenstelle für Karpfenteichwirtschaft</b> , Head: LOR Dr F. Geldhauser Greiendorfer Weg 8, D-91315 Höchstadt/Aisch Tel. (49-9193) 83 72  <b>Fischereiforschungsstelle des Landes Baden-Württemberg</b> Director: Dr R. Berg Mühlesch 13, D-88085 Langenargen Tel. (07543) 9308-0. Fax (07543) 9308-20
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**Institut für Binnenfischerei e.V. Potsdam Sacrow**

Director: Prof. Dr habil. R. Knösche  
Jägerhof am Sacrower See, D-14476 Groß Glienicke  
Tel. (49-33201) 312 18. Fax (49-33201) 312 19

**Institut für Gewässerökologie und Binnenfischerei im  
Forschungsverbund Berlin e.V.**

Director: Prof. Dr C. Steinberg  
Müggelseedamm 310, D-12587 Berlin  
Tel. (49-30) 641 81-602. Fax (49-30) 641 81-600

**Landesanstalt für Ökologie, Bodenordnung und  
Forsten/Landesamt für Agrarordnung Nordrhein-Westfalen.  
Dezernate für Fischereiangelegenheiten**

Director: Dr H. Ungemach  
Heinsberger Str. 53, D-57399 Kirchhundem  
Tel. (49-2723) 779-54. Fax (49-2723) 779-77

**Landesforschungsanstalt für Landwirtschaft und Fischerei  
Mecklenburg-Vorpommern, Institut für Fischerei**

Director: Dipl-Fisch.ing. H.-J. Jennerich  
An der Jägerbäk 2, D-18069 Rostock  
Tel. (49-381) 820 55. Fax (49-381) 820 91

**Sächsische Landesanstalt für Landwirtschaft, Referat Fischerei**

Director: Dr G. Füllner  
Hauptstr. 12a, D-02699 Königswartha  
Tel. (035931) 20206. Fax (035931) 20209

**Staatlicher Fischseuchenbekämpfungsdienst Niedersachsen  
und Fischgesundheitsdienst**

Director: Dr H.-J. Schlotfeldt  
Eintrachtweg 17, D-30173 Hannover  
Tel. (49-511) 28 11 12

**Tiergesundheitsdienst Bayern e.V., Fachabteilung  
Fischgesundheitsdienst**

Director: Dr H. Dangschat  
Senator-Gerauer-Str. 23, D-85586 Grub  
Tel. (49-89) 909 10

**Name: FISHERY RELATED INSTITUTES**

*Address*

**Bayerisches Landesamt für Wasserwirtschaft, Institut für  
Wasserforschung**

(Director: Ltd. RD Dr W. Mühlhölzel)  
Kaulbachstr. 37, D-80539 München  
Tel. (49-89) 2180-1. Fax (49-89) 2800-838

**Abwasserversuchsfeld Großlappen**

(Director: Dr G. Metzner)  
Freisinger Landstr. 181, D-80939 München  
Tel. (49-89) 322-6295. Fax (49-89) 324-1374

**Versuchsanlage Wielenbach, Abt. Fischereibiologie**

(Director: Dr A. Hamm)  
Demollstr 31, D-82407 Wielenbach  
Tel. (49-881) 185-0. Fax (49-881) 41318

**Bundesanstalt für Gewässerkunde**

(Director: Dir.u.Prof. V. Wetzel)  
Kaiserin-Augusta-Anlagen 15, D-56068 Koblenz  
Tel. (49-261) 13 06-0

**Deutsches Museum für Meereskunde und Fischerei,  
Meeresmuseum und Aquarium Stralsund**

(Director: Dr S. Streicher)  
Katharinenberg 14-20, 18439 Stralsund  
Tel. (49-3831) 29 51 35. Fax (49-3881) 29 22 17

**Forschungsinstitut Senckenberg, Sektion Ichthyologie II und  
Fischökologie**

(Head: Dr A. Lelek)  
Senckenberganlage 25, D-60325 Frankfurt  
Tel. (49-69) 754 21

**GSF-Forschungszentrum für Umwelt und Gesundheit, Institut  
für Ökologische Chemie**

(Director: Prof.Dr A. Kettrup)  
Neuherberg, Postfach 11 29, D-85758 Oberschleißheim  
Tel. (49-89) 31 87 40 47. Fax (49-89) 31 87 33 71

**Landesanstalt für Umweltschutz Baden-Württemberg, Institut  
für Seenforschung**

(Director: Ltd. Biol. Dir. Dr H. Müller)  
Untere Seestr. 81, D-88085 Langenargen  
Tel. (49-7543) 304-0. Fax (49-7543) 304-40

**Max-Planck-Institut für Limnologie**

(Director: Prof. Dr W. Lampert)  
August-Thienemann-Str. 2, D-24306 Plön  
Tel. (04522) 802-1  
Mit Außenstelle **Limnologische Flußstation** (örtl. Leiter: Prof. Dr  
P. Zwick)  
Damenweg 1, D-36110 Schlitz  
Tel. (49-6642) 60 01

**Medizinal, -Lebensmittel- und Veterinäruntersuchungsamt  
Thüringen, Standort: Bad Langensalza**

(Head: Dr H.Bocklisch)  
Tennstedter Str.9, D-99947 Bad Langensalza  
Tel. (49-3603) 81 70. Fax (49-3603) 817170

**Staatliches Amt für Umweltschutz Magdeburg**

(Director: Dr K. Schmidt)  
Otto-von-Guericke-Str. 5, D-39104 Magdeburg  
Tel. (49-391) 58 10. Fax (49-391) 5811230

**Zentrum für Flachmeer-, Küsten- und Meeresumweltforschung  
e.V., Forschungszentrum Terramare**

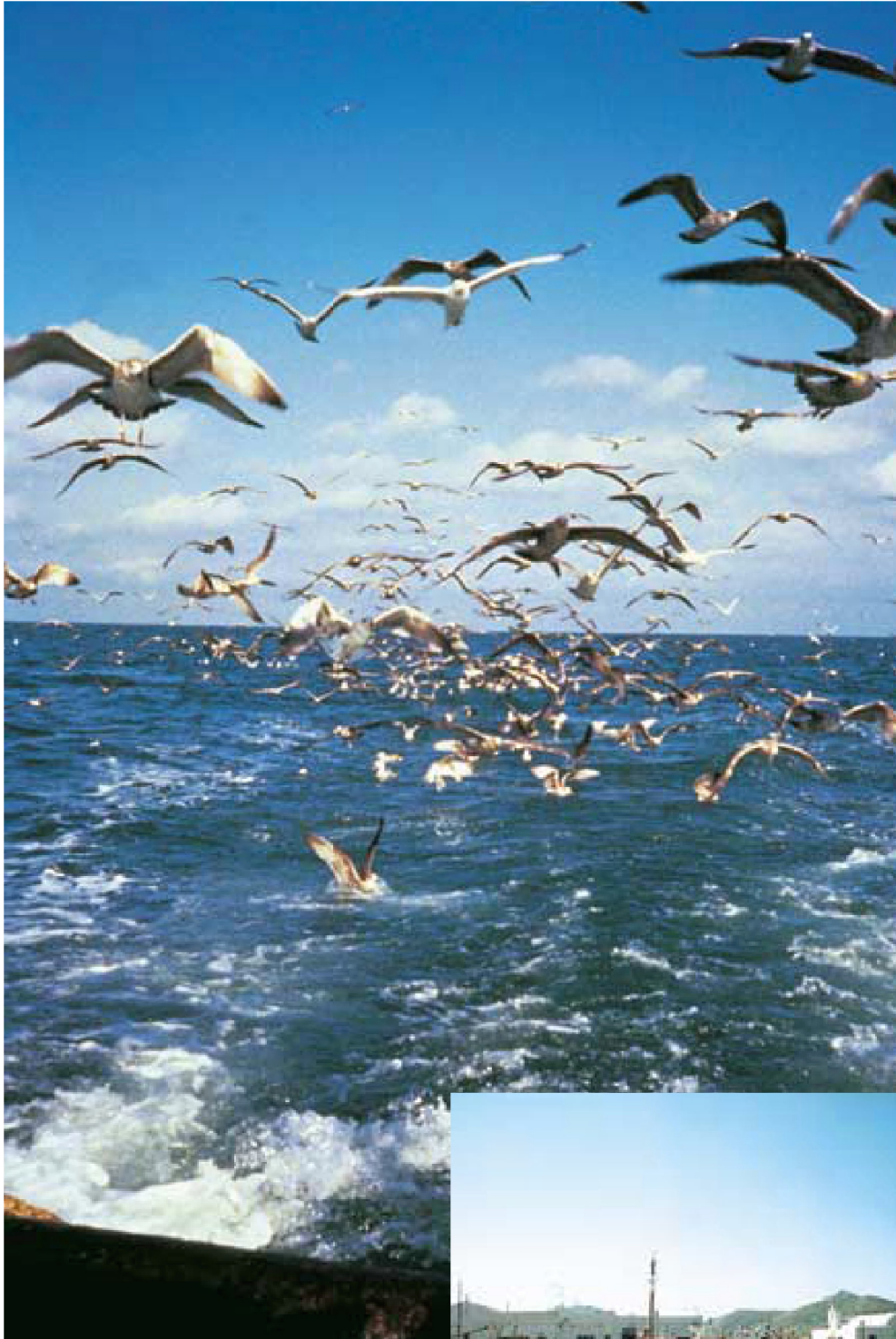
(Head: Dr G. Liebezeit)  
Schleusenstr. 1, D- 26382 Wilhelmshaven  
Tel. (49-4421) 944-0. Fax (49-4421) 944-199

**Zentrum für Marine Tropenökologie**

(Director: Prof.Dr G. Hempel)  
Fahrenheitstr. 1, D-28359 Bremen  
Tel. (49-421) 22 08-333. Fax (49-421) 2208-330



# GREECE





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

The marine fisheries production of Hellas in 1996 was 92.83 thousand tonnes.

	Landings (in thousand tonnes)						
	1990	1991	1992	1993	1994	1995	1996
Anchovy	14 377	12 386	10 217	10 925	13 302	11 294	13 132
Bogue	5 200	4 545	5 739	7 028	9 265	4 500	4 547
Hake	2 817	2 044	2 635	3 207	4 115	3 257	2 808
Horse mackerel	4 699	5 342	6 469	5 641	8 789	6 396	6 496
Mackerel	3 371	909	1 655	1 234	1 079	560	554
Pilchard	10 325	10 626	15 665	14 407	13 552	13 859	14 978
Common squid	6 628	577	893	1 249	1 027	850	741
Others	35 772	42 858	42 834	46 785	62 826	48 484	49 578
<b>Total</b>	<b>83.19</b>	<b>79.28</b>	<b>86.11</b>	<b>90.47</b>	<b>113.95</b>	<b>89.2</b>	<b>92.83</b>

	Landings (million EUR)						
	1990	1991	1992	1993	1994	1995	1996
Anchovy	16.16	14.04	10.12	13.77	15.49	13.15	15.82
Bogue	3.37	4.88	5.95	6.85	10.56	5.13	6.90
Hake	7.67	2.81	7.30	7.00	11.43	9.05	10.36
Horse mackerel	10.85	7.83	6.77	7.86	18.45	13.42	14.22
Mackerel	7.79	1.33	1.73	1.72	2.26	1.18	1.21
Pilchard	13.98	14.60	22.03	19.19	19.56	20.01	28.13
Common squid	21.90	2.08	2.90	4.05	4.11	3.40	3.29
Others	227.46	276.59	299.00	318.82	357.59	431.87	449.62
<b>Total</b>	<b>309.17</b>	<b>324.14</b>	<b>355.80</b>	<b>379.26</b>	<b>439.45</b>	<b>497.21</b>	<b>529.56</b>

#### 1.1.2. Trends in fleet

The annual trends of the Hellenic fishing fleet are based on the census data collected in 1989. This data set covers all the Hellenic fishing fleet including vessels without engine and are corrected/updated on a monthly basis.

	1991	1992	1993	1994	1995	1996
Fishermen	39413	38206	37859	39697	39397	39625
Vessels	17476	16941	16787	17602	17469	17570
Power (thousand kW)	562.5	553	533	560	550.8	562

The following conclusions may be drawn for the period 1991-96. The coastal fisheries fleet is almost stable with minor fluctuations. The open-sea fisheries fleet is almost stable with minor fluctuations. The number of overseas fishery vessels is stable while the respective engine power and tonnage of the overseas fisheries fleet has reduced by 4 and 13 % respectively. It should be noted that census database includes all fishing vessels existing today whether they are equipped with an engine or not.

### **1.1.3. Fishing harbours**

The fishing ports are located where the fisheries production is landed and stored until it is sold to wholesalers. Out of the total fisheries production about 25 to 30 % is distributed through the 10 fishing ports of the country. These fishing ports are characterised as the only authorised and registered points for the landing and distribution of fisheries production. That is why all other smaller fishing harbours are not equipped with installations for storage and handling of fisheries products. It is thus impossible to register all quantities landed and handled and as a result the official amounts listed underestimate the actual ones. There is no statistical information on the landings at the smaller fishing harbours.

There are 10 fishing ports in Hellas located in the following cities: Piraeus (Keratsini), Thessaloniki, Kavala, Patras, Chalkis, Alexandroupolis, Messologgi, Preveza, Chios, and Kalymnos. Piraeus and Thessaloniki are the largest fishing ports. Their size is identified by the volume of products that passes through as well as by the personnel employed in the fishing port. Most of the ports, with the exception of Kalymnos, were established in the late 1960s. This resulted to a growing inadequacy of their storage space and refrigeration units by modern standards. Despite this, maintenance works take place every 2 to 3 years in order to preserve the handling and storage services offered by every fishing port at a satisfactory level.



## 1.2. Aquaculture sector

Aquaculture production, since the first attempts back in 1984 has increased from 0.3-0.4 thousand tonnes to 24 thousand tonnes in 1996 and a projected value of 30 thousand tonnes in 1997. Problems such as algal blooms and disease outbreaks have not yet caused any problems to the production compared to other Mediterranean countries.

This growth is mainly associated with the production of European sea bass and gilthead seabream and minor amounts of some new marine fish species such as the striped seabream (*Puntazzo puntazzo*), the grey mullet (*Mugil cephalus*) and the red seabream (*Pagrus pagrus*). Hellas is also a major fry producer for the above species.

Species	Quantity (thousand tonnes)							
	1990	1991	1992	1993	1994	1995	1996	1997
Gilthead seabream	0.85	1.3	2.4	4.8	6.7	9.2	12.7	13.7
European sea bass	0.75	1.2	2.4	4.7	6.8	8.3	10.2	11.8
Eels	0.046	0.05	0.13	0.34	0.34	0.2	0.2	0.3
Trout-salmon	1.9	2.4	2	1.9	2	2.5	2.3	2.3
Carp	0.1	0.12	0.16	0.14	0.14	0.15	0.097	0.050
Shrimps	0	0	0	0	0	0	0.001	0.008
Molluscs	3.8	7.6	13.7	16.7	19	21	26.5	25.4
Grey mullet	-	-	-	-	-	0.05	0.05	0.04
<b>TOTAL</b>	<b>7.46</b>	<b>12.6</b>	<b>20.8</b>	<b>28.6</b>	<b>35</b>	<b>41.5</b>	<b>52.2</b>	<b>53.6</b>

Species	Value (million EUR)							
	1990	1991	1992	1993	1994	1995	1996	1997
Gilthead seabream	5.3	7.9	14.9	29.8	41.4	56.9	79.3	77.9
European sea bass	4.7	7.3	15.2	29.2	42.4	52.1	63.6	69.1
Eels	0.4	0.4	1.0	2.6	2.6	1.8	1.8	2.8
Trout-salmon	3.6	4.5	3.8	3.5	3.7	4.6	4.3	6.3
Carp	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.2
Shrimps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Molluscs	1.2	2.4	4.2	5.2	5.9	6.5	8.2	75.8
Gery mullet	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2
<b>TOTAL</b>	<b>15.1</b>	<b>22.7</b>	<b>39.3</b>	<b>70.5</b>	<b>96.3</b>	<b>122.3</b>	<b>157.4</b>	<b>232.3</b>

## 1.3. Processing industry sector

Hellas is a leader for the production and promotion of whole fresh fish products from marine fisheries and aquaculture and, therefore, the related processing industry is not thriving. In 1988, there were 44 operating processing plants while in 1995 they were reduced to 39.

The salted product industry has always been the most important for the Hellenic fisheries sector and mainly for pelagic fish such as sardine, anchovy and hake. Smoking and canning is very limited and usually applies to freshwater fisheries and aquaculture products or crustaceans. Since 1990, the produc-



tion has increased from 84 thousand tonnes to 112 thousand tonnes or 33.9 %. The 61.6 % represents the salted products, while smoked and canned products are 18 % and 20.4 % approximately.

#### **1.4. Consumption of sea products**

The Hellenic total production of wild fish has been reduced. However, the per capita consumption has increased slightly from 23.3 kg (1992) to 27.7 kg (1994) equal to an increase of 18.9 %. In this figure, however, the amount consumed from small-scale artisanal fisheries (below 19 hp power; about 11 000 vessels) is not included and therefore, the actual per capita figure is not accurately estimated. In addition, the small-scale artisanal fishery production (roughly estimated to 20-25 thousand tonnes annually) is sold in numerous uncontrolled sites or directly from the fishermen and thus, not accurately recorded. Also, sport fishery production is not recorded. The rapid growth of the aquaculture sector has caused the decrease of the imported frozen fish products by almost 7 thousand tonnes annually in 1995 since, Hellenic consumers (including tourists and foreigners) prefer fresh whole fish rather than any other processed product or by-product. At the moment, Hellas has the highest annual per capita consumption for aquaculture products (euryhaline marine fish) equal to 0.4 kg while other Mediterranean countries show less (< 0.3 kg).

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

The Ministry of Development (General Secretariat for Research and Technology) maintains two fisheries research institutions, the National Centre for Marine Research (NCMR) in Athens and the Institute of Marine Biology in Crete (IMBC). Fishery research is also being carried out by the Fisheries Research Institute (FRI) in Kavala, under the National Agricultural Research Foundation, and the Fisheries Laboratory (FIL) under the Ministry of Agriculture. In addition, marine research is being conducted by various teams in the Biologist Department of Thessaloniki, Athens, Patra and Crete Universities. Scientists in all the above institutions are grouped into functional units for particular investigations.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR; salaries not included)	Total budget (millions EUR; salaries included)
Main	NCMR	29	181	1.0	12.5
	IMBC	31	111	0.6	6.0
Other research institutes	NAGREF-FRI	23	40	0.35	1.4
	FIL	9	9	0.3	0.4

#### 2.1.2. Supervisory Ministerial authority(ies)

Institutes	Authority(ies)		
	Development	Agriculture	Education and Research
National Centre for Marine Research (NCMR)			
Institute of Marine Biology in Crete (IMBC)			
Fisheries Research Institute (FRI)			
Fisheries Laboratory (FIL)			
Universities (5)			

### 2.1.3. Coordination and relationship among the different research organisations and with research users

The organisation for the coordination of all R & D activities in Hellas is the General Secretary of Research and Technology belonging to the Ministry of Development.

## 2.2. Main research institutes

**Name:** NATIONAL CENTRE FOR MARINE RESEARCH (NCMR)

### 2.2.1. General information

*Address* National Centre for Marine Research (NCMR)  
Agios Kosmas, Hellinikon,  
GR-166 04, Athens,  
Hellas  
Tel. (30-1) 982 13 54, 982 02 14. Fax (30-1) 981 17 13, 983 30 95  
<http://www.ncmr.ariadne-t.gr>

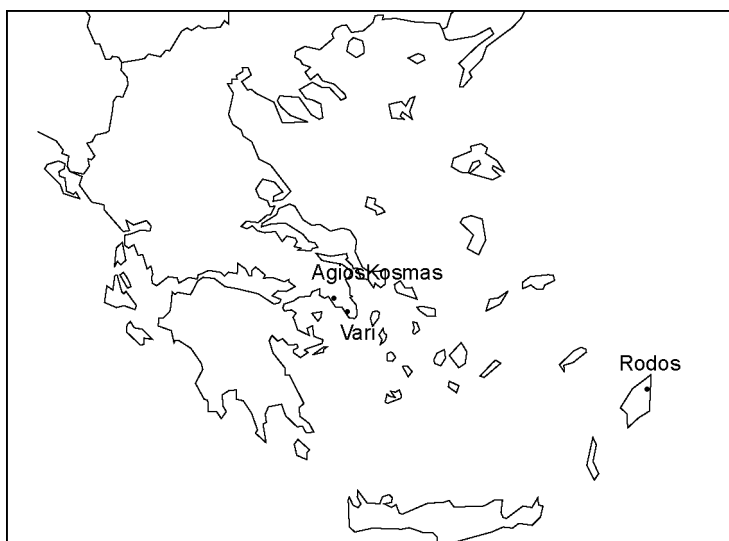
*Date of creation* 1945

*Status and financial position* The National Centre for Marine Research (NCMR) is a governmental research institution belonging to the General Secretariat of Research and Technology (Ministry of Development)

**Oceanographical Laboratories** 14 Alex. Flemming Str.,  
Flemming Building  
GR - 16672, Vari  
Hellas  
Tel. (30-1) 965 35 20, 965 35 21. Fax (30-1) 965 35 22

**Hydrobiological Station of Rodos** Ko str.,  
GR — 851 00, Rodos  
Hellas  
Tel. (30-4) 4 12 73 08, 783 20. Fax (30-4) 2 417 83 21  
E-mail: [hsr@rhs.rho.forthnet.gr](mailto:hsr@rhs.rho.forthnet.gr)

*Location*



### 2.2.2. Detailed objectives and research programmes

It was founded to promote basic research in all fields of the aquatic environment and provides comprehensive services and technical support to the public on all aspects of the marine and freshwater environments. The National Centre for Marine Research also owns and operates the Hydrobiological Station of Rhodes (HSR), located in the northern part of the island constructed during 1934-35. Since 1963 it has been operating as an aquarium-museum and research unit.

In general, the NCMR mainly focuses its studies on stock assessment and fishery biology of demersal populations with commercial importance such as hake, striped mullet, red mullet, common pandora, etc. Studies on the dynamics of ichthyoplankton, on gear selectivity, on coastal fishery, on discards and on sampling are among the objectives of the fishery research of the NCMR.

#### Research activities in fisheries

##### *(1) Biology and ecology of exploited resources in Hellenic seas:*

- contribution to the study of exploited resources;
- feeding strategy and ecology of exploited resources;
- methodological research on the determination of age and growth of exploited species;
- recruitment processes;
- distribution of populations of exploited species, biodiversity;
- international expertise.

##### *(2) Dynamics of exploited resources, fishing fleet distribution and strategy in Hellenic seas:*

- contribution to the monitoring of exploited resources;
- creation and management of scientific database;
- performance of the national fisheries management system;
- elaboration of resources diagnoses and recommendations for fisheries management.

##### *(3) Fishing gears:*

- study of gear selectivity;
- study of fishing gears used in different fishing category.

#### Research activities in aquaculture

##### *(1) Fish nutrition:*

- determination of the nutritional requirements of cultivating species, including essential fatty acids, vitamins, aminoacids and energy;
- formulation of practical diets and evaluation of feed ingredients and supplements.

##### *(2) Fish pathology:*

- application of antibiotics to the marine aquaculture, including studies on pharmacokinetics, bioavailability, development of bacterial resistance and application strategies;
- studies on the diseases of Mediterranean aquaculture species using techniques of bacteriology, histopathology, parasitology and basic immunology.

##### *(3) Interaction between aquaculture and the environment:*

- study of the interactions between the aquaculture and the environment;
- study of the effects of local human activities on aquaculture;
- zonation of coastal activities using GIS applications;
- assessment and management of coastal marine and brackish water formations (lagoons).

(4) *Aquaculture of new species:*

- study of the hermaphroditism of new species for aquaculture of the Sparidae family;
- reproduction and embryology of new species for aquaculture.

### 2.2.3. Facilities at sea

The NCMR also owns the R/V *Aegaio* vessel equipped with state-of-the-art oceanographic and fishing equipment to cover the needs of the research projects. The R/V *Aegaio* underwent major reconstruction and modernisation during 1997-98.

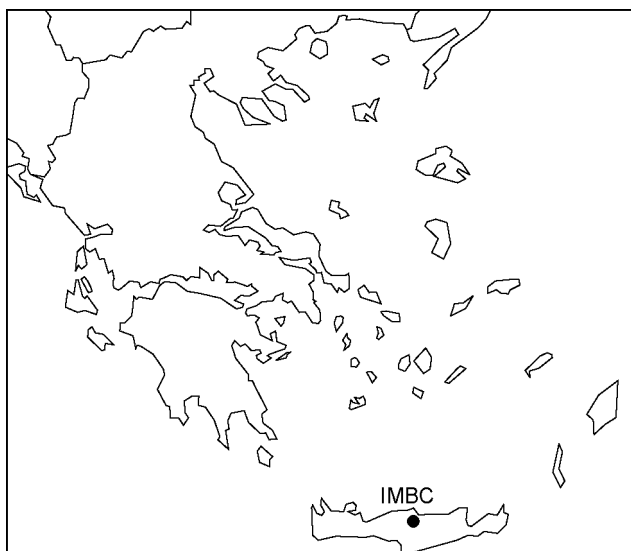
### 2.2.4. Scientific cooperation

<b>National</b>	Ministry of Agriculture, Fisheries Department; Institute of Marine Biology of Crete (IMBC); Fisheries Research Institute (FRI); University of Thessaloniki, Department of Biology; University of Patras; Hellenic Fisheries Organisations; NIREUS Consultant; DIMITRA Educational Centre)
<b>Bilateral European relations</b>	Ifremer (France); Istituto di Zoologia del Università di Genova (Italy); Instituto di Ciencias del Mar (ICM-CSIC) (Italy); Società Italiana di Biologia Marina (Italy); CNR, Istituto di Ricerca Marittima (Italy); University of Bari (Italy); University of Cagliari (Italy); ICRAM (Italy); University of Rome (La Sapienza) (Italy); Marine Laboratory of Bari (Italy); University of Southampton, Department of Oceanography (UK); University of Hull (UK); Marine Laboratory of Aberdeen (UK); Portuguese Institute of Marine Investigation (IPIMAR) (Portugal); RIVO-DLO (The Netherlands); University of Alicante (Spain); IEO (Spain); Danish Institute for Fisheries, Technology and Aquaculture (DIFTA) (Denmark)
<b>International organisations</b>	International Commission for the Scientific Exploration of the Mediterranean Sea (CIESM); General Fisheries Council for the Mediterranean (GFCM/FAO); Scientific, Technical and Economic Committee for Fisheries (STEFC); Instituto de Ciencias Marinas (ICM-CSIC)

## Name: INSTITUTE OF MARINE BIOLOGY IN CRETE (IMBC)

### 1. General information

<i>Address</i>	Institute of Marine Biology in Crete (IMBC) PO Box 2214, 710 03 Iraklion, Hellas Tel. (31-1) 81 24 20 22. Fax (31-1) 81 24 18 82 E-mail: imbc@imbc.gr <a href="http://www.imbc.gr">http://www.imbc.gr</a>
<i>Date of creation</i>	1987
<i>Status and financial position</i>	Independent research organisation supervised by the General Secretariat for Research and Technology of the Ministry of Development, founded to promote, coordinate and direct pure and applied research in selected sectors of the marine sciences

*Location***2. Detailed objectives and research programmes**

The IMBC is focusing on the appraisal of pelagic fishery resources by means of hydroacoustics, on large pelagic fish and on food chain studies. Aspects of the dynamics of demersal resources, mainly around the island of Crete, and of discards at sea are also being studied. The Institute is organised in six research departments (environment, aquaculture, oceanography, fishery, genetics, electronic applications).

Research activities in fishery

*(1) Small pelagic fish*

- estimate of abundance of small pelagic fish with emphasis on anchovy stocks;
- study of distribution and vertical migrations of sardines and anchovy in relation to environmental factors;
- investigation on anchovy spawning grounds and relation of spawning to specific environmental features of the area.

*(2) Large pelagic fish*

- collection and analysis of fisheries and biological data from commercial catches;
- monitoring of the state of large pelagic fish mainly swordfish and bluefin tuna;
- study of migratory patterns of swordfish.

*(3) Demersal fish*

- study of the dynamics and state of the stocks;
- monitoring of the state of demersal resources at the South Aegean Sea;
- estimates of commercial trawls discards.

*(4) Data processing for management of the national fisheries resources*

- establishment and operation of a network linking 24 fishery sampling stations for fishery data and related socioeconomics.

*(5) Genetics in fisheries*

- use of genetics markers for the study of breeding of fish of commercial interest;
- use of markers for species determination of immature stages of fish (including eggs);
- use of markers for phylogenetic studies of closely related fish taxa (subspecies, species, etc).

*(6) Invertebrate fisheries*

- studies on ecology of invertebrates of commercial interest for fisheries;
- studies on ecology of artificial reefs and ways to protect zones from illegal fisheries;
- studies of impact of trawling on bed grounds.

Research activities in aquaculture

*(1) Determinism and control of fish reproduction*

- study of the natural fish reproductive cycle under various environmental conditions;
- experimental induction of spawning;
- technology of non-traumatic induction of spawning in cages (or large tanks);
- studies of methods/conditions/techniques for inhibition of maturation in pre-commercial fish.

*(2) Biology and control of fish development*

- application of morphometry and image analysis for definition of criteria of quality;
- study of early development of fish;
- experimentations for better knowledge of the determinism of abnormalities and definition of accurate/easy methods for sorting of abnormal animals.

*(3) Improving hatchery technologies and larviculture*

- comparative study/analysis/evaluation of the main actual rearing techniques used for fish larviculture in the Mediterranean;
- pilot scale experiment of fry production in order to simulate real problems of production and provide medium sized populations (50 000 to 300 000 fry).

*(4) Studies of larval food chain and related technologies*

- technical and economical studies of conditions for quick and intense mass production of high quality rotifers *Brachionus plicatilis* in hatcheries;
- studies of diversity, intensity and stability of wild zooplankton cultures in extensive hatcheries or semi-extensive mesocosms;
- studies on the use of thin photobioreactors, myxotrophy and solar energy in hyperintensive automatic (computerised) marine microalgae cultures.

*(5) Fish feeding*

- definition of specific accurate larval feeding models in order to match biological demand/technological supply, and provide basis for: (1) automatisisation of live prey production/distribution in hatchery, (2) automatisisation of artificial food for weaning/nursery; (3) automatisisation of culture monitoring
- optimisation of feeding with commercial pellets;
- use of demand feeders.

*(6) Non-transmissible fish pathology*

- studies of fish pathology related to either technical (mainly feeding) or behavioural (mainly aggressiveness) origin;
- research of methods for prevention and treatment.

*(7) Genetics in aquaculture*

- use of microsatellite markers to determine parent/offspring;
- genetic manipulation for the production of hybrids all-male or all-female fish;
- selection of stocks with improved rates of growth, disease resistance, higher food utilisation.

*(8) Future orientations: aquaculture of fast growers (seriola, polyprion, tunas)*

- screening of the specific difficulties linked to the domestication/aquaculture of fast growers, including a concerted action on the subject and the study in simulation of some of the fast-growers problems making use of representative rearing segments of other species;
- creation of specific brood stocks in adequate facilities including conditions of domestication and further on-growing of wild juveniles;
- contribution to the definition of first biological basis (BBA programmes) and technico-economical basis (TEBA programmes) for aquaculture of fast growers.

**3. Facilities at sea**

The IMBC owns the R/V *Philia* which covers most of the institute's needs of research at sea. There also exists a fully equipped diving team for visual census and sampling.

**4. Scientific cooperation**

<b>National</b>	National Centre of Marine Research; University of Thessaloniki, Department of Biology; University of Patras, Department of Biology; University of Athens Department of Biology; Aquaculture Centre of Acheloos S.A; Fishery Research Institute (FRI) — Kavala; Laboratories of Fisheries Technology and applications (Ministry of Agriculture — Athens)
<b>Bilateral European relations</b>	University of Montpellier II Department of Biology and Station de l'environnement littoral de Sète (France); Ifremer Nantes/Palavas/Brest (France); INRA St Pée sur Nivelle/Rennes (France); ORSTOM (France); University of Rome, Tor vergata, Department of Biology (Italy); University of Rome La Sapienza (Italy); University of Padova (Italy); Scientifica di Palermo (Palermo, Italy); CNR Istituto di tecnologia della pesca e del pessato (Mazara del Vallo, Italy); University of Bari Department of animal production (Bari, Italy); Università degli Studi di Bari (Istituto di Zoologia e d'anatomia, Bari, Italy); University of Genova Istituto de Biologia (Italy); University of Las Palmas de Gran Canaria (Spain); Instituto Espanol de Oceanografia (IEO); Centre of Tenerife/centre of Murcia/centre of San Tander (Spain); Oceanographic Centre of Canaria (Spain); University of Malaga (Spain); University of Algarve (Portugal); Fisheries Department of Madeira (Portugal)
<b>International organisations</b>	FAO; CIESM; EU; ICCAT; General Fisheries Council for the Mediterranean (GFCM/FAO); Scientific, Technical and Economic Committee for Fisheries (STEFEC); Instituto de Ciencias Marinas (ICM-CSIC)

**2.3. Other research organisations**

**Name:** FISHERIES RESEARCH INSTITUTE (FRI)

**1. General information**

**Address**

NAGREF, Fisheries Research Institute (FRI)  
640 07 N. Peramos,  
Kavala,  
Hellas  
Tel. (30-594) 226 91, 226 92, 226 93  
Fax (30-594) 222 22



<i>Date of creation</i>	1993
<i>Status and financial position</i>	The Fisheries Research Institute (FRI) belongs to the National Agricultural Research Foundation (NAGREF), which lies under the supervision of the Hellenic Ministry of Agriculture.

## **2. Detailed objectives and research programmes**

Nagref promotes agricultural research, by undertaking research programmes throughout the country, contributes to the development of techniques and the advancement of know-how, and forwards recommendations to the Minister of Agriculture regarding solutions to agronomic problems. FRI is the only Nagref institute and the unique one in the area of northern Hellas supporting fisheries research. The main research activity of the FRI concern the determination and abundance of demersal stocks, studies on discarding, and the study of short-term predictions of fish production for pelagic and demersal species.

Research activities in fishery

### *(1) Applied fisheries biology*

- commercial species biology
- fish population dynamics
- fish-stocks management
- fisheries oceanography
- study and development of natural and artificial ecosystems.

### *(2) Fishing gear technology*

- description and recording of fishing gear in use
- design and functionality of new fishing gear
- new fishing methods.

### *(3) Fish processing*

- study of the species available for human consumption
- new technologies for processing whole fresh products
- new packaging techniques
- support to the local processing industry in North Hellas (Macedonia).

Research activities in aquaculture

### *(1) Fish farm operation*

- introduction of new technologies in fish rearing
- new aquaculture methods for improved production
- new aquaculture technologies for open-sea or recirculation systems.

### *(2) Extensive aquaculture practices*

- study on the exploitation of lagoon systems for aquaculture.

### *(3) Aquaculture and the environment*

- study on the effects of aquaculture on the environment
- study on the effects of the environment on aquaculture productivity.

## **3. Infrastructures and facilities at sea**

The FRI does not own a research vessel, but hires professional boats according to its needs. There are plans for the future purchase of a coastal research vessel. Moreover, there exists a fully equipped diving team for visual census and sampling.

#### 4. Scientific cooperation

<b>National</b>	National Centre of Marine Research; Institute of Marine Biology of Crete; University of Thessaloniki, Department of Biology; University of Thrace, Department of Civil Engineering; Hellenic Biotope/Wetland Centre; Aquaculture Centre of Acheloos S.A; Technological Educational Institution of Kavala; NAGREF, Institute of Mapping and Soil Classification
<b>Bilateral European relations</b>	University of Kiel, Institut für Meereskunde, (Germany); University of Groningen, Department of Marine Biology (The Netherlands); University of Southampton, Department of Oceanography (UK); Ifremer (France); University of Rome, Department of Biology (Italy); ICM-CSIC
<b>International organisations</b>	General Fisheries Council for the Mediterranean (GFCM/FAO); Scientific, Technical and Economic Committee for Fisheries (STEF)

#### Name: FISHERIES LABORATORY (FIL)

##### 1. General Information

<i>Address</i>	Fisheries Laboratory (FIL) Karaoli and Dimitriou 15, GR- 18531 Piraeus
<i>Date of creation</i>	1981
<i>Status and financial position</i>	Public laboratory with scientific and technical mission

##### 2. Detailed objectives and research programmes

The main objectives of the FIL concern stock assessment of the production and analytical models of most commercial demersal species in the Saronikos Gulf, as well as specific studies on the biology of these species. Identification of spawning and nursery grounds of nine (9) commercial species in the Saronikos gulf and Cyclades Islands.

##### 3. Scientific cooperation

<b>National</b>	IMBC; NCMR; FRI; Department of Biology of Athens University; University of Thessaloniki; University of Crete
<b>Africa</b>	Sea Fisheries Research Institute (South Africa)
<b>International organisations</b>	GFCM/FAO; STFS; ICES

#### Name: UNIVERSITIES

<i>Address</i>	University of Athens National and Kapodistrian University of Athens, Department of Biology, Panepistimiopolis GR- 157 01 Athens, Greece
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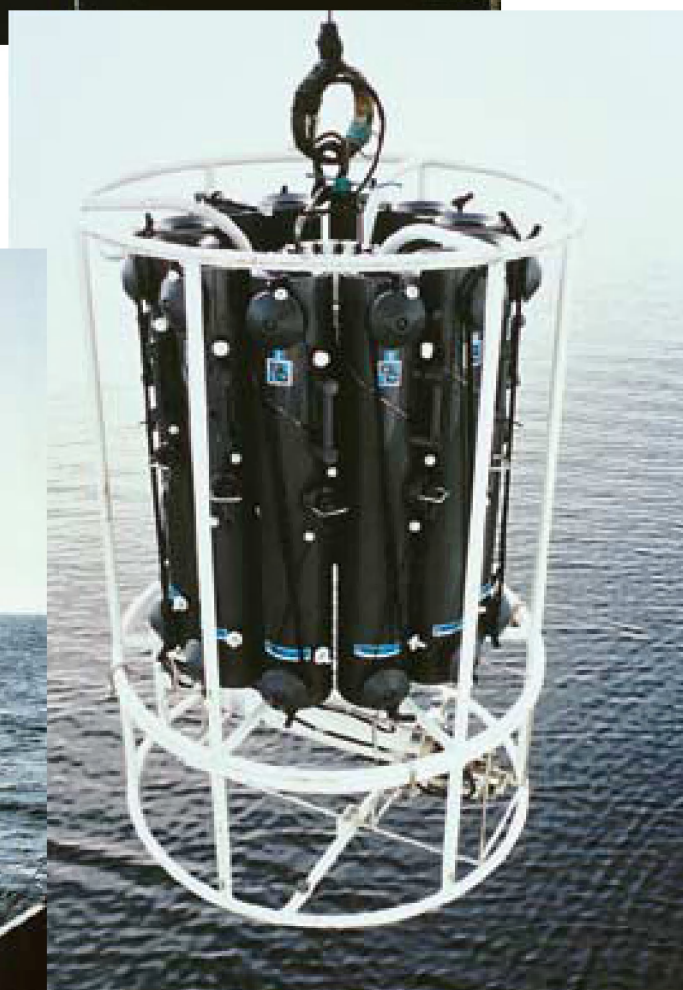
Agricultural University of Athens  
Faculty of Animal Production  
Iera Odos 75, GR- 118 55 Athens,  
Greece

University of Patras  
Department of Biology  
GR- 26110 Patras,  
Greece

Aristotle University of Thessaloniki  
Department of Zoology  
GR- 540 06 Thessaloniki,  
Greece

University of Crete  
Department of Biology  
Box 2208, Knossos Ave., GR- 741 09 Heraklion Crete,  
Greece

# ICELAND





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

Iceland exploits a number of species in Icelandic waters. Fishing in distant fishing grounds is only about 2 % of the total. The two most important species are cod and capelin. Cod represents 10 to 15 % of the quantity landed but 25 to 35 % of the value. Capelin stands for ca. 50 % of the quantity but 7 to 14.5 % of the value landed. The marine catches landed in Iceland 1996 was a *new record*, or 2 055 000 tonnes which reflects on the stock situation and the quality of the fishery management in Icelandic waters.

	Landings (in thousand tonnes)						
	1990	1991	1992	1993	1994	1995	1996
Cod	334	307	267	251	178	169	181
Haddock	66	54	46	47	58	60	56
Saithe	95	99	78	70	63	47	39
Ocean redfish	4	8	14	20	47	29	47
Redfish	91	96	94	96	95	89	69
Catfish	14	18	16	13	13	13	15
Greenland halibut	37	35	32	34	28	27	22
Plaice	11	11	10	13	12	11	11
Other demersal	22	27	28	30	27	34	33
Demersal total	<b>674</b>	<b>655</b>	<b>585</b>	<b>574</b>	<b>521</b>	<b>479</b>	<b>473</b>
Herring	90	79	123	117	130	110	100
Capelin	692	256	797	970	748	716	1179
Pelagic fishes	<b>782</b>	<b>335</b>	<b>920</b>	<b>1087</b>	<b>878</b>	<b>826</b>	<b>1 279</b>
Nephrops	2	2	2	2	2	1	1
Shrimp	30	38	47	53	73	76	68
Scallop	12	10	12	11	8	8	9
Other scallops							7
Scallops and crabs	44	50	61	70	83	85	86
Other species	2	5	2	1	8	1	1
<b>Total</b>	<b>1 502</b>	<b>1 044</b>	<b>1 569</b>	<b>1 712</b>	<b>1 551</b>	<b>1 607</b>	<b>2 055</b>

The species composition landed has changed over the last 10 years. There has been a decrease in cod fishing and saithe but increase in herring and shrimp fishing and capelin varies considerably from one year to the next. Distant water fishing has not been all that important. In 1996 24 000 tonnes were caught in the Barents Sea —mainly cod and 20 000 tonnes on the Flemish Hat – mainly shrimp. Considerable rationalisation has taken place in Icelandic fishing over the last 10 years mainly due to the quota system. The fisheries management system is based on individual transferable quotas (ITQs). All fisheries are subject to vessel catch quotes. The quota represent shares of the total allowable catch quota for each individual species (TAC). They are permanent, and fairly easily transferable.

	Landings (million EUR)						
	1990	1991	1992	1993	1994	1995	1996
Cod	275	298	248	216	179	170	175
Saithe	46	58	39	29	27	26	21
Haddock	74	65	53	47	56	52	50
Ocean redfish	2	4	9	12	24	16	35
Redfish	72	82	86	87	92	77	56
Greenl. Halib.	37	45	43	60	48	59	51
Plaice	13	13	12	14	13	12	14
Other demers.	30	37	31	32	30	34	39
<b>Demersal total</b>	<b>546</b>	<b>603</b>	<b>524</b>	<b>496</b>	<b>470</b>	<b>446</b>	<b>441</b>
Herring	11	8	10	10	12	22	25
Capelin	35	150	42	46	38	38	78
Capelin roe	1	3	1	0	5	4	0
Shrimp	42	58	63	75	90	124	135
Scallop	4	4	5	4	3	3	3
Other scall.	7	8	7	6	6	3	3
<b>Total</b>	<b>647</b>	<b>697</b>	<b>653</b>	<b>640</b>	<b>625</b>	<b>641</b>	<b>684</b>

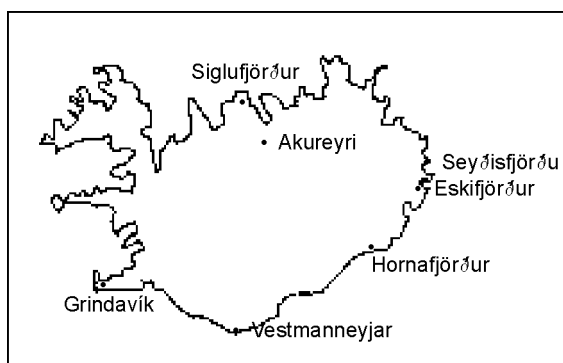
### 1.1.2. Trends in the fleet

Table shows the trends in the fishing fleet, or the number of ships, sum of the power of the main engine. Small vessels dominate the fleet composition. The number of vessels below 110 GRP has decreased about 25 % in the last 10 years from more than 700 to less than 500. The boats and trawlers remaining more or less constant though freezer trawlers have been on the increase. The fishing vessels in the table below are deck-vessels. There are more than 1 000 small non-deck boats fishing at in local waters not recorded in the table.

	1990	1991	1992	1993	1994	1995	1996
Fishermen	6 551	6 135	5 685	5 819	5 713	5 061	5 061
Vessels	9 96	993	955	943	867	825	800
Power (thousand kW)	4 20.8	420.3	426.0	424.4	419.8	415.4	432.7

### 1.1.3. Fishing harbours

Harbours where more than 100 000 tonnes were landed in 1996 are marked on the map below.



## 1.2. Aquaculture

Table shows the development of aquacultural production. As can be seen from the table there is a slight increase in land-based salmon production, where the main emphasis has been and is on making the land-based units competitive with the sea cages by increasing recirculation and controlling the temperature in the systems. There is a constant small increase in the production of arctic char.

Species	Quantity (thousand tonnes)						
	1990	1991	1992	1993	1994	1995	1996
Salmon/land based	1 739	1 195	1 413	1 489	1 577	1 847	1 966
Salmon/sea cages	977	1 490	712	859	1 011	744	806
Rainbow trout	24	65	73	221	162	379	313
Arctic char	69	217	321	340	388	471	531
Trout	20	25	5	5	24	10	0
<b>Total</b>	<b>3 109</b>	<b>3 337</b>	<b>2 784</b>	<b>3 470</b>	<b>3 728</b>	<b>3 834</b>	<b>4 344</b>

New species under development are abalone and halibut and sea bass. These will enter the commercial market in the foreseeable future.

## 1.3. Processing industry sector

Table shows the labour in fish processing in man-years and the total labour force.

	1990	1991	1992	1993	1994	1995
Fish processing	7 154	7 458	6 668	6 832	7 183	7 100
<b>Total labour force</b>	<b>124 914</b>	<b>124 840</b>	<b>123 044</b>	<b>122 055</b>	<b>122 680</b>	<b>124 500</b>

The number of enterprises in fish processing:

Processing/year	1990	1991	1992	1993	1994	1995
Freezing, salting, filleting	456	416	392	415	443	437
Herring/salting	17	3	5	4	5	5
Fish oil	7	5	4	5	6	5
Fish meal	15	18	18	20	20	21

Quantity and value of marine products:

	1990	1994	1995	1996
Net weight (1000 tonnes)	1 712	1 551	1 607	2 055
Net value (million EUR) landed	640	625	641	684
Local consumption (1000 tonnes)	24	25	25	24
Value (million EUR)	24.2	23.6	30.8	30.1
Production, total export (1000 tonnes)	649	678	638	817
Value exp. (million EUR)	980.1	1 088.8	1 091.7	1 177.7



## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

Fisheries related R & D is carried out by a number of institutions and private companies in Iceland. In 1995 around 1.6 % of GNP was devoted to R & D. Of this 9.7 % was spent on fisheries related marine research, 9.2 % was devoted to fish processing R & D and 3.2 % to aquaculture research. Thus nearly 23 % of the total national R & D budget is spent on fisheries related R & D subjects.

The two principal actors are the Marine Research Institute, responsible for marine and fish biological research, and the Icelandic Fisheries Laboratories, covering fish processing R & D. Both of these institutions report to the Ministry of Fisheries. Other important contributions come from the Agricultural Research Institute and the Institute of Freshwater Fisheries, both belonging to the Ministry of Agriculture and conducting research into aquaculture and freshwater fisheries. The University of Iceland and the University of Akureyri conduct research related to fisheries and aquaculture connected to their educational and training programmes. The Institute of Experimental Pathology of the University of Iceland is responsible for all research and health care services in fish diseases.

The Icelandic Technological Institute conducts research and offers services to the food processing and environmental sectors and reports to the Ministry of Industry.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
<b>Main</b>	The Marine Research Institute	60	160	4.0	13.2
	The Icelandic Fisheries Laboratories	32	65	2.2	3.9
	The Agricultural Research Institute	4	65	0.25	3.25
<b>Other research institutes</b>	The Institute of Freshwater Fisheries	11	13	0.7	0.9
	The Icelandic Technological Institute	15	80	1.0	4.0
	The Institute of Experimental Pathology	6	50	0.32	2.2
	The Fisheries Research Institute	4	n.a	0.15	n.a
	University of Iceland	42 <sup>(1)</sup>	n.a	2.3	n.a
	University of Akureyri including RTD cooperation <sup>(3)</sup>	10 <sup>(2)</sup>	n.a	0.5	n.a

<sup>(1)</sup> Researchers involved, not man/years.  
<sup>(2)</sup> Estimated.  
<sup>(3)</sup> Including cooperation with RTD –Institutes in Reykjavik.

### 2.1.2. Supervisory Ministerial authority(ies)

Institutes	Authority(ies)			
	Ministry of Fisheries	Ministry of Agriculture	Ministry of Industry	Ministry of Education and Research
The Marine Research Institute				
The Icelandic Fisheries Laboratories				
The Agricultural Research Institute				
The Institute of Freshwater Fisheries				
The Icelandic Technological Institute				
The Institute of Experimental Pathology				
The Fisheries Research Institute				
University of Iceland				
University of Akureyri Research Institute				

### 2.1.3. Coordination and relationship among the different research organisations and with research users

The Icelandic Research Council, which reports to the Ministry of Culture, Science and Education, carries the overall responsibility for research planning and coordination in all fields of applied R & D, including fisheries. It also finances the building of laboratory and equipment purchase for R & D and gives project financing based on annual processing of competing applications from institutions and industries. A substantial part of NRC funding goes to fisheries related projects.

The increasing interest by private industry in fisheries related R & D is mainly related to aquaculture, advanced fish processing and equipment development for product recovery and upgrading, as well as software development for various applications.

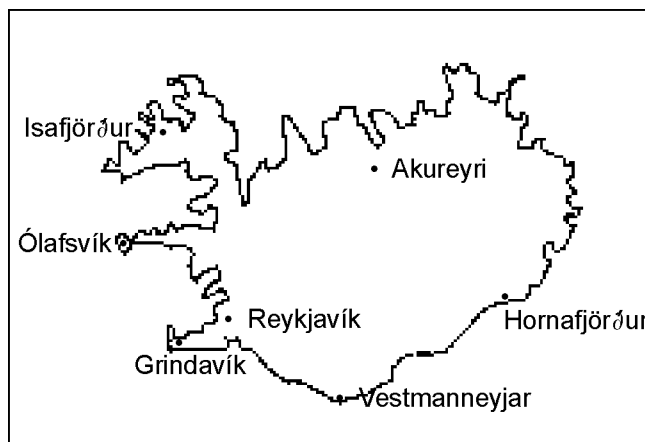
## 2.2. Main research institutes

### THE MARINE RESEARCH INSTITUTE

#### 2.2.1. General information

<i>Address</i>	The Marine Research Institute Skúlagata 4, 101 Reykjavík Tel. (354) 552 02 40. Fax (354) 562 37 90 Dir.: Jóhann Sigurjónsson E-mail:johann@hafro.is
<i>Date of creation</i>	1965
<i>Status and financial position</i>	The Marine Research Institute is a governmental institute responsible to the Ministry of Fisheries and is financed through the national budget

#### Location



### 2.2.2. Detailed objectives and research programmes

The Marine Research Institute in Reykjavík was established in 1965, when it took over the duties of the Fisheries Department of the University Research Institute dating from 1937. Institutional marine research in Iceland thus spans more than half a century.

The primary objective of the Marine Research Institute is to obtain knowledge of the sea around Iceland and its living resources. Research is carried out in most disciplines of modern oceanography, i.e. physical and chemical properties of the sea, morphology and nature of the sea floor, environmental conditions and life history of algae, zooplankton, benthos and fish. Furthermore, studies in mariculture have recently been initiated. The greatest effort is, however, put into research pertaining to the exploitation of marine resources, including analysis of stock abundance and recommendations of catch quotas, fishing gear research and study of species as yet unexploited. The institute is taking an active part in international cooperation and research in its fields. It is a member of the International Commission for Exploration of the Sea and takes part in a number of projects within the framework programmes of EU, as well as Nordic marine research, to mention but a few.

About 80 scientists, technicians and office staff are employed ashore at the Reykjavík headquarters, and in the five branch laboratories located in fishing communities in different parts of Iceland Ólafsvík, Isafjörður, Akureyri, Hornafjörður and Vestmannaeyjar. About 30 people man the ships. In addition, two of the branch laboratories run small inshore vessels.

Divisions:

*Division of Oceanography and Ecology:* Ólafur S. Ástþórsson, Head of Div.  
E-mail: oliast@hafro.is

*Division of Marine Stock and Fisheries:* Hrafnkell Eiríksson, Head of Div.  
*Department of Statistics:* Gunnar Stefánsson, Head of Dept.  
E-mail: gunnar@hafro.is

*Department of Electronics:* Sigurður Lyðsson, Head of Dept.  
*Library:* Eiríkur Þ. Einarsson, Head Librarian  
E-mail: eirikur@hafro.is.

### 2.2.3. Facilities at sea

The institute runs three research vessels, the *Bjarni Sæmundsson* (55 m), the *Árni Friðriksson* (40 m) and the *Dröfn* (25 m). The institute also runs two small vessels for in-fjord research.

#### 2.2.4. Scientific cooperation

<b>Bilateral European relations</b>	Cooperation with different Nordic organisations and research institutes
<b>European networks</b>	EU's framework programmes
<b>Africa</b>	Development programmes in Namibia and Malawi
<b>Asia</b>	P-ICES
<b>International organisations</b>	ICES; NAMCO; NEARC; NAFO; UN-University Reykjavik

### THE ICELANDIC FISHERIES LABORATORIES

#### 2.2.1. General information

<i>Address</i>	The Icelandic Fisheries Laboratories Skúlagötu 4 101 Reykjavík Tel. (354) 562 02 40. Fax (354) 562 07 40 Director Hjorleifur Einarsson E-mail: hei@rfisk.is Director of RTD Gudmundur Stefansson E-mail: gst@rfisk.is
<i>Date of creation</i>	It was founded by law in 1965 but has operated since 1934
<i>Status and financial position</i>	The Icelandic Fisheries Laboratories is an independent research institute under the Ministry of Fisheries

#### 2.2.2. Detailed objectives and research programmes

The mission of the institute is to stimulate progress in the fish industry through research and development. About half of staff time is devoted to R & D projects, including some basic research areas; fishmeal and fish feed, shelf life of fresh fish, distribution of pathogens in processing environments, ripening of salted herring, sensors for on-line measurements of fish quality, sensoric parameters of seafoods, toxic chemicals in fishery products, utilisation of fish by-products, new processing methods. The board of directors represents the Ministry of Fisheries and fish industry associations. The institute has no official quality control function. About 60 scientists, in chemistry, microbiology, food science, engineering and aquaculture science and office staff are employed at the institute in Reykjavík and in the four branch laboratories in Isafjördur, Akureyri, Neskaupstad and Vestmannaeyjar.

#### 2.2.3. Scientific cooperation

<b>Bilateral European relations</b>	Different Nordic Research institutes and organisations
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<b>European networks</b>	EU's framework programmes (WEFTA)
<b>Asia</b>	Ocean University Taiwan (Tokyo University)
<b>International organisations</b>	UN-University Reykjavik

## 2.3. Other research organisations

### Name: THE AGRICULTURAL RESEARCH INSTITUTE

#### 1. General information

<i>Address</i>	The Agricultural Research Institute Keldnaholt, 112 Reykjavík Tel. (354) 577 10 10. Fax (354) 577 10 20 Dir. Thorsteinn Tómasson E-mail: tomasson @rala.is
<i>Date of creation</i>	1965
<i>Status and financial position</i>	The Agricultural Institute is an independent institute responsible to the Ministry of Agriculture

#### 2. Detailed objectives and research programmes

The institute has been running comparative study on salmon stocks and genetic research and husbandry on salmon, arctic charr and trout. Nutrition research on salmon and arctic char is in progress.

Agricultural research including horticulture, plant disease and pests, a pasture and range utilisation, farm technology, agricultural food, ecology, input control and animal husbandry including breeding and nutrition.

### Name: THE INSTITUTE OF FRESHWATER FISHERIES

#### 1. General information

<i>Address</i>	Institute of Freshwater Fisheries Vagnhöfða 7, 112 Reykjavík Tel. (354) 567 64 00. Fax (354) 567 64 20 Dir. Sigurður Guðjónsson E-mail: siggurd@ifn.is
<i>Date of creation</i>	1946
<i>Status and financial position</i>	The institute is an independent institute responsible to the Ministry of Agriculture

#### 2. Detailed objectives and research programmes

The Institute of Freshwater Fisheries Research is concerned with activities relating to Iceland's freshwater resources as well as major research projects in the field of salmonid ecology enhancement and ranching. In addition to the headquarters in Reykjavík the institute maintains three small divisions in the rural areas of Iceland, at Borgarnes, Hólar in Hjaltadalur and Selfoss. These branches do mainly contract research, but mostly function in a consulting and development capacity, in addition to providing advice to the Director of Freshwater Fisheries.

The Institute of Fisheries and Aquaculture Research conducts much of its research on salmonids in Icelandic rivers and lakes. Some of this activity is environmental contract research, which relates hydropower development, but much research focuses on salmon ecology in fresh water and is done for individual river associations on a contract basis. Basic as well as applied ecological research which is to the benefit of all salmonid resources in Iceland, increasingly being financed through grants from various funds.

**Name: THE ICELANDIC TECHNOLOGICAL INSTITUTE**

**1. General information**

<i>Address</i>	IceTec — The Technological Institute of Iceland Keldnaholt, 112 Reykjavík Tel. (354) 587 70 00. Fax (354) 587 74 09 E-mail: info@iti.is Homepage: <a href="http://www.iti.is">http://www.iti.is</a> Dir. Hallgrímur Jónasson E-mail: hallgr@iti.is Food Technology: Dr Hannes Hafsteinsson E-mail: hannes@iti.is
<i>Date of creation</i>	1979 in the present form
<i>Status and financial position</i>	IceTec is an independent institute, operating under the Ministry of Industry

**2. Detailed objectives and research programmes**

IceTec is a polytechnical service institute with the mission of promoting the competitiveness of Icelandic companies. This goal is pursued through applied research, product development, consultation services and technology transfer. The main services IceTec offers the industry are in the field of materials technology, biotechnology, innovation and productivity, education and training, environment technology, food technology and standardisation. In recent years IceTec's non-grant income has increased considerably. Today nearly 70 % of overall revenues are privately derived. IceTec employs around 75 people, of whom more than half have a university degree. An office is operated in Akureyri in cooperation with the University of Akureyri. To maintain its competence and to be able to service a wide range of technologies IceTec maintains a wide range of cooperative networks locally as well as internationally. The Food Science Department is involved in product development, consulting and services to the food industry. The products include fish crisps, different aseptic fish products as well as pet food.

**Name: THE INSTITUTE OF EXPERIMENTAL PATHOLOGY**

**1. General information**

<i>Address</i>	University of Iceland Institute of Experimental Pathology, Dept. of Fish Disease Keldur v. Vesturlandsveg, 112 Reykjavík Director Guðmundur Georgsson. Tel. (354) 567 47 00. Fax (354) 567 39 79 Department of Fish diseases Dr Sigurður Helgason — E-mail: siggih@hi.is
<i>Date of creation</i>	1949
<i>Status and financial position</i>	Institute of Experimental Pathology is a university institute under the Ministry of Education, Sciences and Culture

## **2. Detailed objectives and research programmes**

The role of the fish disease department is research work on various aspects of fish diseases and official health control work and disease diagnosis. The following fields of research activity can be mentioned:

*Aeromonas salmonicida* subsp. *achromogenes*: Pathogenesis, virulence and vaccine development.

*Renibacter salmoninarum*: Comparative studies of diagnostic methods.

Immunology: Research on cellular and humoral immunity, incl. the production of monoclonal antibodies against IgM in salmonids and marine species.

Aquaculture: bacteriological research; immunological research; vaccine development; epidemiology of fish diseases and health care in aquaculture.

### **Name: THE FISHERIES RESEARCH INSTITUTE**

#### **1. General information**

Address	The Fisheries Research Institute Tæknigarður, Dunhagi 5, 107 Reykjavík Tel. (354) 525 47 24. Fax (354) 525 58 29 Dir. Guðrún Pétursdóttir E-mail: gudrunpe@rhi.hi.is
Date of creation	1989
Status and financial position	The Fisheries Research Institute is a university institution

#### **2. Detailed objectives and research programmes**

The Fisheries Research Institute of the University of Iceland was established in 1989. Its main objectives are:

To strengthen the research environment for fisheries-related studies at the University of Iceland and to facilitate cooperation in the field, both nationally and internationally.

To gather and generate information on fisheries-related topics, publish and distribute research results, and facilitate consultation in the field.

To coordinate a graduate programme in fisheries at the University of Iceland.

To organise courses, seminars and conference on fisheries-related topics.

### **Name: UNIVERSITY OF ICELAND — DEPARTMENT OF PHYSIOLOGY**

#### **1. General information**

Address	University of Iceland, Department of Physiology Vatnsmýrarvegur 16, 101 Reykjavík Tel. (354) 525 48 30. Fax (354) 525 48 86 Dr Logi Jónsson E-mail: logi@hi.is
Status and financial position	A university institution

#### **2. Detailed objectives and research programmes**

Research into the physiology of fish has for many years been a major part of the Physiology department.

Research tasks: Rearing of supersmolts, effect of accelerated rearing on growth, sea maturing and sexual maturity, production of spawning stock and non-fertile stock in pisciculture, measurement of saline tolerance, effect on saline concentration on the growth of salmon, gill diseases in smolts. The institute is participating in numerous international projects.

**Name: UNIVERSITY OF AKUREYRI RESEARCH INSTITUTE****1. General information**

<i>Address</i>	The University of Akureyri PO Box 224 502 Akureyri Tel. (354) 463 09 00. Fax (354) 463 09 99 Dir. Þorsteinn Gunnarsson E-mail: rektor@unak.is Faculty of Fisheries Studies: Jón Þórðarson, Dean E-mail: jon@unak.is University of Akureyri Research Institute: Gunnlaugur Sighvatsson E-mail: gulli@unak.is
<i>Date of creation</i>	1992
<i>Status and financial position</i>	The University of Akureyri is a public institution, financed and operated by the Icelandic Ministry of Education, Science and Culture.

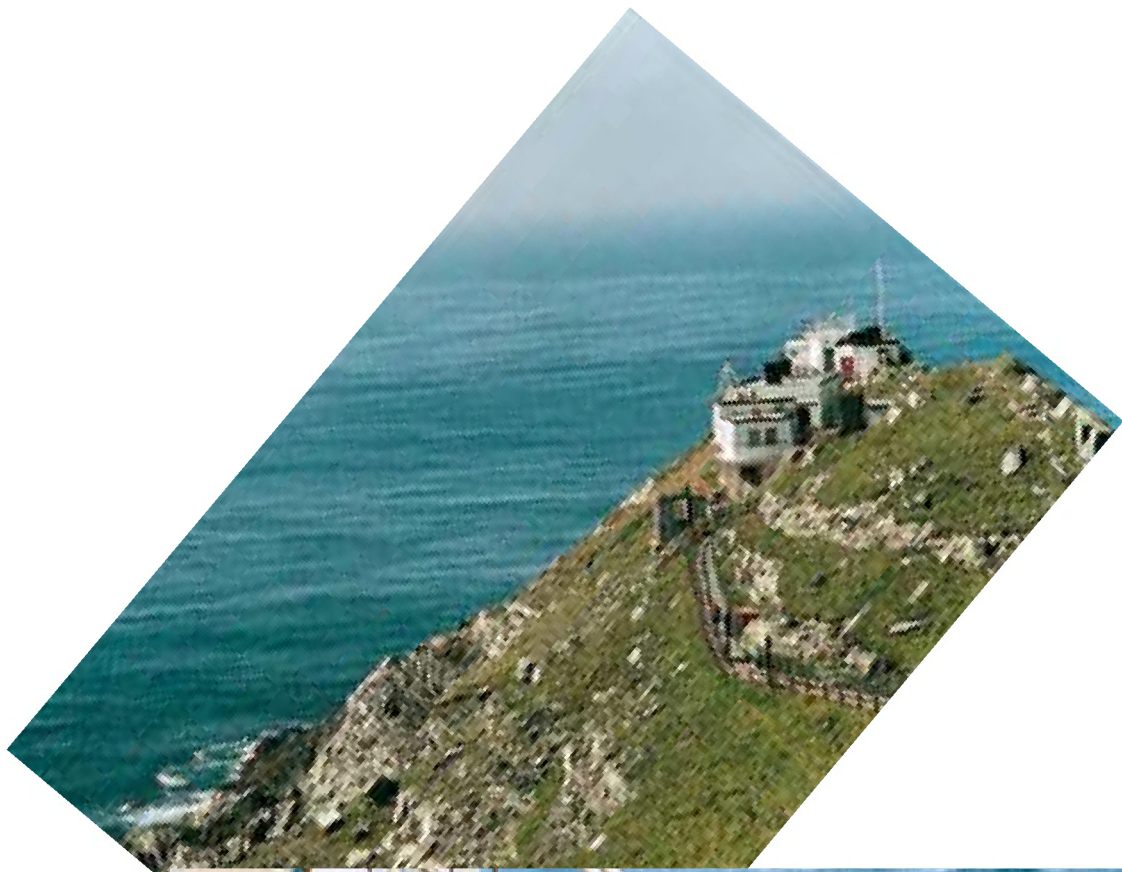
**2. Detailed objectives and research programmes**

The institute was formally established in 1992 and has from the beginning concentrated on promoting and strengthening the links between the university and industries. It manages a special technology forum where various institutes and companies engage in research and innovation projects coordinate their efforts. This forum includes the following R & D institutes: the Agricultural Research Institute, the Icelandic Fisheries Lab., the Technological Institute and the Marine Research Institute, as well as companies such as Fiskeldi Eyjafjarðar and an association of fish-processing plants.





# IRELAND





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

Species	Landings (in thousand tonnes)						
	1990	1991	1992	1993	1994	1995	1996
Total demersal	30.29	31.98	33.72	35.27	37.78	46.20	46.88
Total pelagic	178.35	201.51	226.04	219.30	225.85	305.49	256.90
Shellfish	14.31	20.90	18.04	24.19	25.30	32.32	28.50
<b>Total</b>	<b>222.95</b>	<b>254.39</b>	<b>277.81</b>	<b>278.76</b>	<b>288.92</b>	<b>384.00</b>	<b>332.29</b>

Species	Landings (million EUR)						
	1990	1991	1992	1993	1994	1995	1996
Total demersal	47.00	49.85	54.14	50.32	51.33	61.13	64.71
Total pelagic	33.91	34.87	36.86	39.59	41.72	49.96	64.01
Shellfish	32.89	32.77	31.21	31.37	39.19	42.35	39.93
<b>Total</b>	<b>113.81</b>	<b>117.50</b>	<b>122.21</b>	<b>121.28</b>	<b>132.24</b>	<b>153.44</b>	<b>168.65</b>

In Ireland, the term 'shellfish' covers crustaceans as well as molluscs. Such fisheries can be very extensive, examples being *Nephrops* (the Dublin Bay prawn) which accounts for over 20 % of the value of all wild shellfish landings, and the edible crab (*Cancer pagurus*) which is fished as far north as the Stanton Bank and the Hebrides. However, the shellfish sector of the fishing industry has a history of low capital investment, with the main exception of the north Donegal vivier crabber fleet.

Significant developments in recent years have taken place in the inshore lobster fishery (which exclusively uses pots), especially in the south east where the majority of lobster fishermen are involved in the management and enhancement of the fishery which had been in decline. More recently, lobster fishermen throughout the rest of Ireland have also applied stock enhancement measures, following the lead given by fishermen in the south east, through national and EU (PESCA) funding. Practical effort limitation measures will also be required. The industry's goal is to increase earnings by a two pronged approach:

- (a) Introduction of sound fishery management measures to increase the sustainable yield of fisheries.
- (b) Implementation of quality codes of practice for wild and farmed produce to increase product value.

#### 1.1.2. Trend in fleet

In 1996 there were 1 249 vessels in the registered fleet. This number has been decreasing in recent years. The primary reasons were licensing policy restrictions, and the fact that larger new vessels coming into the fleet tended to replace a greater number of older ones.

	1992	1993	1994	1995	1996
Number of vessels	1 445	1 459	1 446	1 385	1 249
Power (thousand kW)	196.2	195.8	200.3	197.5	190.8

The most modern segments of the registered fleet are the RSW (refrigerated sea water) pelagic and larger polyvalent vessels. Overall, the average age of the fleet in 1995 was 24 years. Only 6 % was under 10 years of age, whilst the average EU fleet had 15 % in that age category. Only 86 (6 %) of the 1 385 vessels in the 1995 fleet were 24 m in length or over, mainly in the pelagic sector, whilst 65 % of the fleet were less than 12 m in length.

In 1996, there were 7 700 people in the fleet. Most of this employment is concentrated in peripheral coastal regions where, in some areas, fishers and associated workers in such businesses as boatyards, repair yards, netmakers, chandlers, harbour staff, and specialist electronic technicians can account for 25 % of the local employment.

### **1.1.3. Fishing harbours**



## 1.2. Aquaculture sector

Species	Quantity (thousand tonnes)						
	1990	1991	1992	1993	1994	1995	1996
Finfish	7.35	10.71	11.09	13.95	13.08	13.30	15.91
Farmed salmon	6.32	9.30	9.70	12.37	11.62	11.81	14.02
Sea reared trout	0.32	0.56	0.43	0.68	0.61	0.47	0.69
Freshwater trout	0.71	0.85	0.97	0.91	0.85	1.00	1.16
Turbot <sup>(1)</sup>	0	0	3	4	3	15	30
Molluscs	19.22	16.99	15.99	16.21	15.53	14.07	19.03
Mussels	18.38	15.30	13.82	13.66	12.97	11.71	14.50
Oysters ( <i>C. gigas</i> )	0.36	1.28	1.75	2.01	1.86	2.54	4.00
Oysters ( <i>O. edulis</i> )	0.42	0.37	0.33	0.45	0.59	0.40	0.40
Clams	0.06	0.05	0.08	0.08	0.11	0.10	0.13
<b>TOTAL</b>	<b>26.57</b>	<b>27.70</b>	<b>27.08</b>	<b>30.15</b>	<b>28.61</b>	<b>27.37</b>	<b>34.93</b>

Species	Value (million EUR)						
	1990	1991	1992	1993	1994	1995	1996
Finfish	30.15	42.44	42.31	54.34	51.77	53.78	56.89
Farmed salmon	26.74	38.41	38.61	49.62	47.49	46.79	47.33
Sea reared trout	1.13	1.67	1.37	2.15	1.95	2.60	1.93
Freshwater trout	2.29	2.36	2.33	2.58	2.33	1.40	2.86
Turbot	0	0	0.02	0.03	0.02	0.10	0.21
Molluscs	7.06	7.48	9.04	9.54	9.83	8.65	13.15
Mussels	4.00	4.06	4.79	4.58	4.82	5.01	6.54
Oysters ( <i>C. gigas</i> )	0.65	1.38	3.00	3.20	2.84	2.10	4.57
Oysters ( <i>O. edulis</i> )	2.11	1.86	0.99	1.52	1.85	1.41	1.52
Clams	0.30	0.18	0.25	0.25	0.32	0.13	0.52
<b>TOTAL</b>	<b>37.21</b>	<b>49.92</b>	<b>51.35</b>	<b>63.88</b>	<b>61.60</b>	<b>62.43</b>	<b>70.05</b>

The Irish finfish farming sector has grown rapidly in the past 15 years from a production of only 601 tonnes in 1980 to 15 905 tonnes in 1996, consisting primarily of salmon, but also including rainbow trout and, more recently, small quantities of turbot.

It is estimated that the finfish aquaculture sector directly employs, in full time equivalents, approximately 530 people and generates a further 700 jobs making a total of 1 200 direct, indirect and induced jobs (Irish Salmon Growers Association — 'Salmon Farming Action Plan 1995-99'). Again, it is important to note that most of the employment created by the farmed salmon industry is in remote regions of the country where steady employment is negligible. It is a high added value industry. Many of the inputs, apart from certain plant and equipment, and an element of the feed, are sourced in Ireland.

<sup>(1)</sup> Turbot quantities are given in tonnes, not in thousand tonnes

The Irish shellfish aquaculture industry has grown substantially over the past decade and has seen a rise in capital investment more recently as the industry has upgraded in line with EU directives. With the main species such as Pacific oysters (*Crassostrea gigas*) and mussels (*Mytilus edulis*), the emphasis has changed from quantity to quality, while efforts to diversify to new species such as sea urchins, abalone and scallop continue.

### 1.3. Processing industry sector

Fish processing is labour intensive. There are currently 220 firms employing 3 400 people (full time equivalent) located mainly around the coastline.

Many of these plants are small, particularly those involved in whitefish activities for the wholesale/retail domestic market, and those involved in salmon and shellfish operations. Yet, in spite of their size, many of these plants are also engaged in export activities, and therefore generate export revenue.

External trade in fish and fish products (thousand tonnes)			
Item	1994	1995	1996
Seafood exports			
Total exports	247.58	297.09	293.04
Live, fresh, chilled	79.61	68.15	62.65
Frozen	137.30	191.94	191.05
Dried, salted, in brine, smoked	6.46	6.67	7.30
Prepared, preserved	7.93	7.85	10.38
Meal, oil, fats, waste	16.28	22.48	21.65
Seafood imports			
Total imports	66.93	66.88	56.89
Live, fresh, chilled	3.72	3.86	7.12
Frozen	12.90	14.68	5.62
Dried, salted, in brine, smoked	1.15	1.25	1.53
Prepared, preserved	9.43	10.41	11.06
Meal, oil, fats, waste	39.74	36.68	31.57

Value of external trade in fish and fish products (million EUR)			
Item	1994	1995	1996
Seafood exports			
Total exports	242.63	277.36	319.97
Live, fresh, chilled	116.1	108.99	110.72
Frozen	89.77	127.38	158.19
Dried, salted, in brine, smoked	12.42	13.82	13.79
Prepared, preserved	17.36	15.50	23.02
Meal, oil, fats, waste	6.97	11.67	14.26
Seafood imports			
Total imports	67.83	74.75	85.22
Live, fresh, chilled	10.13	11.38	16.18
Frozen	14.14	16.36	15.52
Dried, salted, in brine, smoked	2.87	3.41	4.11
Prepared, preserved	25.86	27.15	29.57
Meal, oil, fats, waste	14.83	16.46	19.84

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

Fisheries research is carried out almost exclusively by the State in Ireland, with the exception of a few universities, institutes of technology and private consultants. Work is coordinated by the Marine Institute, which was set up under the 1991 Marine Institute Act to 'undertake, coordinate, promote and assist' marine research in Ireland. It is one of three organisations responsible to the Minister for Marine and Natural Resources for research and development of the marine and fisheries sectors.

The other organisations responsible to the Minister, which engage in fisheries research, are the Irish Sea Fisheries Board (BIM) and the Central Fisheries Board (CFB). The former is responsible for the development of the sea fishing industry (including aquaculture), while the latter is responsible for freshwater and inshore marine fisheries — specialising primarily in recreational angling. Research work is also undertaken by various universities, institutes of technology, and private companies.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
Main	Marine Institute	58	96	3.93	4.32 (1996)

#### 2.1.2. Supervisory Ministerial Authority(ies)

Institutes	Authority(ies)			
	Dept. of Marine and Natural Resources	Dept. of the Arts, Heritage, Gaeltacht and the Islands	Dept. of Education and Science	Dept. of Agriculture and Food
Marine Institute				
BIM				
CFB				
SRAI				
Taighde Mara Teo				
Universities				
Institutes of Technology				
National Food Centre				



### 2.1.3. Coordination and relationship among the different research organisations and with research users

Coordination of all marine research activities is the responsibility of the Marine Institute, under the Marine Institute Act of 1991. The Marine Institute has produced a national strategy for marine RTDI entitled 'A Marine Research, Technology, Development and Innovation Strategy for Ireland — A National Team Approach.'

Cooperation is achieved through the share of facilities such as the research vessel *Celtic Voyager*, through regular coordination meetings, seminars and joint funding programmes. The Marine Institute has funded, or worked with, all of the other organisations on various projects from time to time, in order to achieve the goals laid down in the national marine RTDI strategy.

## 2.2. Main research institute: MARINE INSTITUTE

### 2.2.1. General information

<i>Address</i>	Marine Institute
<i>Date of creation</i>	1991
<i>Status and financial position</i>	The Marine Institute is a government body (semi-State organisation) responsible to the Department of the Marine and Natural Resources.
<i>Location</i>	



The Marine Institute comprises the headquarters and Marine Data Centre in the centre of Dublin, the national Fisheries Research Centre (12 km outside Dublin), the Technical Support Base in Galway, the national research vessel, '*Celtic Voyager*', and the Salmon Research Agency of Ireland at Newport.

### 2.2.2. Detailed objectives and research programmes

The main work of the Stock Assessment Section of the Marine Institute's Fisheries Research Centre at Abbotstown is to obtain sufficient knowledge about a number of commercially exploited stocks around Ireland so that they can be scientifically assessed and managed in such a way as to ensure their sustainable

exploitation. The FRC also provides advice to international groups, the Department of Marine and Natural Resources, industry and the general public on fisheries issues, and is represented on a number of national and international bodies including working groups of the International Council for the Exploration of the Sea (ICES), the Advisory Committee on Fisheries Management (ACFM of ICES) and the EU Scientific, Technical and Economic Committee on Fisheries (STECF).

This work is divided into the following areas:

- Pelagic: Monitoring stocks of mackerel, horse mackerel, blue whiting and herring, including port samples, observers at sea on commercial vessels, acoustic surveys and egg/larval surveys from the research ship *Celtic Voyager*. Acoustic techniques are also employed, along with benthos sampling equipment, to identify herring spawning grounds and to advise on possible impacts from gravel extraction or industrial pollution.
- Demersal: As with the pelagic programme, the demersal programme combines information from surveys, local sources, data logbooks, port samples and fish ageing to give a number of annual stock summaries. This work is carried out on cod, haddock, whiting, plaice, sole, monkfish, megrim and deep water species. The programme also includes annual young fish surveys, groundfish surveys, deep water surveys and inputs from the regionally based Fleet Assessment Technicians (FATs) in Killybegs, Rossaveal, Castletownbere and Howth, as well as cooperative research with university scientists into such species as skate and squid.
- Salmonid: The salmonid programme includes work on salmon and sea trout stocks, consisting of stock assessment and microtagging. This work is aimed at assessing the marine mortality, survival to coastal waters, spawning escapement and migratory patterns of wild stocks. Recent work has been focused towards the completion of the Salmon Management Task Force report for the Minister of the Marine and Natural Resources and suggesting ways in which its findings might be implemented.
- Eels: Work in this area is aimed at increasing the national catch through the devising and implementation of a national management strategy.
- Gear technology: This programme (currently in suspension) examined new and existing technologies in the fishing industry.
- Fisheries economics: Work includes bioeconomic analysis to maximise sustainable profit, collection of fish price data, costs and earnings data and the performance of cost/benefit analysis.
- Fish health: The Marine Institute maintains the national Fish Health Unit (FHU) at the FRC. The FHU is responsible for diagnostic work in freshwater and marine aquaculture, and for the health monitoring of fish and shellfish under EU Directives

The FRC also plays a key role in advising the Department of Marine and Natural Resources on the issuing of new licences for finfish farms through the Aquaculture Licence Vetting Committee, and on environmental management in general. Through its Galway office it promotes the concept of single bay management for salmon farms, which is now an essential tool in the management of farms as efficient units.

The Fisheries Research Centre is engaged in a number of shellfish programmes, including a study on the Irish sea population of *Nephrops* (known in Ireland as Dublin Bay prawns, regardless of their origin), surveys of the inshore fisheries (whelk, shrimp and bass), and studies on the aquaculture of a number of bivalve species.

*Nephrops* study — is assessing the use of a Canadian computer programme to allow for the rapid analysis of the age structure of populations, as well as employing tagging and burrow counts to assess the level of stock.

*Whelk study (Buccinum undatum)* — following an initiative from processors, via BIM, this study aims at avoiding a fisheries collapse through improved knowledge of the stocks.

*Shrimp study (Palaemon serratus)* — taking place on the south west and west coasts, with a view to improving the exploitation pattern of shrimp with mesh trials over a season in the Bantry area.

*Aquaculture studies* — on scallop (*Pecten maximus*) and oysters (*Ostrea edulis*, *Crassostrea gigas*).

### 2.2.3. Facilities at sea

The research vessel *Celtic Voyager* is a 31 m, purpose-built ship, which was delivered to the Institute in July 1997. *Celtic Voyager* has a cruising speed of 10 knots, a crew of 6 and the capacity for 8 scientists. She is a multi-purpose vessel, capable of a wide range of duties — from fisheries science to geophysical and oceanographic studies.

### 2.2.4. Scientific cooperation

<b>National</b>	The Marine Institute cooperates with all organisations engaged in fisheries RTD, through activities coordinated by the national Marine Food R & D Liaison Group — chaired by the Institute
<b>European networks</b>	European North Atlantic Margin (ENAM); European Association of Fisheries Economists (EAFE)
<b>America</b>	National Oceanic and Atmospheric Administration (USA)
<b>International organisations</b>	ICES; Unesco; International Ocean Data symposium

## 2.3. Other research organisations

**Name:** BORD IASCAIGH MHARA (BIM) — THE IRISH SEA FISHERIES BOARD

### 1. General information

<i>Address</i>	Bord Iascaigh Mhara (BIM) — the Irish Sea Fisheries Board
<i>Date of creation</i>	1952
<i>Status and financial position</i>	Government body — national development agency for the Irish sea fishing and aquaculture industries.

### 2. Detailed objectives and research programmes

BIM is divided up into four main divisions. Market Development Division assists processors in the home and export markets. Aquaculture Development Division provides technical assistance and grant aid, whilst the Marine Services Division operates Ireland's National Fisheries Training Centre and training vessel, plus ice plants in almost every port in the country. The Fleet Development Division is responsible for the development and modernisation of Ireland's fishing fleet through EU and national grant aid to achieve an efficient and sustainable exploitation of those fish resources available to Ireland.

Within the Fleet Development Division, the Marine Technology section offers advice to skipper/owners modernising their vessels or contemplating new purchases. Ensuring the safety of fishers is also a major consideration in this process, particularly in light of the findings of the recent Fishing Vessel Safety Review Group Report 1996.

The Fishing Technology section promotes the sustainable utilisation of under-fished quota and under-exploited non-quota fish and shellfish species through the evaluation of new fishing techniques (fish gear technology is a core function of BIM) and exploratory fishing trials for new species on commercial vessels, many of which have been financed by the EU. A recent diversification for the section has been the training of skippers and crews in onboard hygiene and the quality control of fish handling procedures to maximise on the value of their catch. The recent award of the IQA Hygiene Award to the Castletownbere vessel *Fiona Patricia* is a direct result of the section's input in this field. In recent years the Fishing Technology section's expertise in gear technology has been directed towards finding technical solutions to practical conservation problems through selectivity studies in real commercial conditions, financed by national and EU funds (AIR and FAIR programmes, including DG XIV Biological Studies).

Research has also been conducted into the interactions between seals and fisheries, financed by the EU Commission and work in this field is continuing. BIM was the first EU organisation to receive Commission funding for this type of work as a direct result of the European Parliament 1994 Killilea Resolution on the Interaction between Seals and Fisheries. In 1995 the Fishing Technology section was awarded funding for three significant R & D projects under the first allocation of the Marine Research Measure and is also currently responsible for a number of PESCA projects, some of which contain R & D elements.

BIM's Aquaculture Development Division is involved in promoting the commercialisation of new aquaculture species, such as arctic char, eels, turbot, halibut and ornamental fish. The aquaculture section provides support in fish health improvements, such as the development of sea lice vaccines at the National University of Ireland, Cork. It also supports feasibility studies and environmental impact assessments of new sites.

BIM manages a number of EU and nationally funded shellfish RTD projects as well as assisting third-level institutions in prioritising areas of research which are directly relevant to the commercial production of shellfish. Recent and ongoing projects include: Development of a commercial brown squid fishery in Ireland (with NUI, Cork and others); Development of a fishing gear trials database (with IT, Cork); development of a computerised system for visualising and mapping shellfisheries data in a special case study using the Donegal crab fishery (with Dublin University (Trinity College) and others); Development of integrated system of quality control in production of Pacific oysters in Bannow Bay, Wexford; microbiological safety of heat-treated, vacuum packed shellfish products (with NUI, Dublin and others); detection of viruses and bacteriophage as indicators of food safety and the development of an effective depuration system (with NUI, Dublin and others).

## **Name: THE CENTRAL FISHERIES BOARD (CFB)**

### **1. General information**

<i>Address</i>	The Central Fisheries Board (CFB)
<i>Date of creation</i>	1980
<i>Status and financial position</i>	Government body — national development agency for freshwater and sea angling fisheries resources.

### **2. Detailed objectives and research programmes**

The CFB is involved in a number of areas regarding salmon and sea trout research, including the assessment of distribution and abundance of juvenile salmon in fresh water. This involves electro-fishing surveys in salmonid rivers as part of baseline studies for the preparation of riverine physical rehabilitation programmes. The CFB has also surveyed every large salmon river in Ireland, and amassed a considerable database of information.

In addition, the CFB operates commercial salmon fisheries at Galway and Ballina, enabling them to screen for tagged fish in order to assess the survival of ranched stock compared to marked wild smolts. A downstream trap has been operated on the River Erriff Fishery since 1985, with a counter in operation since 1983.

Work is also carried out on the biology and rehabilitation of sea trout, including the assessment of sea lice infestation, and collection of rod statistics.

**Name: THE SALMON RESEARCH AGENCY OF IRELAND (SRAI)**

**1. General information**

Address	The Salmon Research Agency of Ireland (SRAI)
Date of creation	1955
Status and financial position	Government sponsored company, responsible to the Department of the Marine and Natural Resources.

**2. Detailed objectives and research programmes**

The SRAI undertakes research into wild salmon and sea trout stocks, as well as into ranching and broodstock development. The SRAI has also managed the Burrishoole Fishery on an experimental basis since the 1960s, enabling it to compile the longest set of smolt output and survival information available for any trapping site throughout the range of the Atlantic salmon. Experimental work has also been conducted on eel fisheries.

The SRAI also has its own hatchery facility and rearing facilities. The facilities of the smolt production unit offer the possibility of providing an experimental unit to assess novel or aquaculture species or new techniques to the smolt-rearing stage. The SRAI's facilities are also suited to work on impact assessment both in terms of environmental change and fish population genetics and structure.

The SRAI maintains a number of research programme relevant to the finfish aquaculture industry, including work on the growth and survival of triploid salmon, and investigations into the ecology of the fish pathogen *Aeromonas salmonicida* (Furunculosis).

**Name: TAIGHDE MARA TEO**

**1. General information**

Address	Taighde Mara Teo
Status and financial position	State body responsible to the Department of the Arts, Heritage, Gaeltacht and the Islands.

**2. Detailed objectives and research programmes**

The work of Taighde Mara Teo revolves around the dissemination of up-to-date technology to shellfish farmers in *Gaeltacht* (Gaelic speaking) areas. This involved the training of shellfish farmers, the advising of its parent body *Údarás na Gaeltachta* on prospective development plans, and R & D on lobster rearing in conjunction with the Shellfish Laboratory at Carna (see below). Work is done on both intensive farms and on extensive culture e.g. the shellfish cooperative Comharchumann Sliogeisc Chonamara.

**Name: NATIONAL UNIVERSITY OF IRELAND — GALWAY**

**1. General information**

Address	National University of Ireland — Galway
Status and financial position	University

**2. Detailed objectives and research programmes**

This university maintains the Martin Ryan Marine Science Institute (on campus in Galway) and the Shellfish Research Laboratory at Carna. Work on a wide variety of fisheries and marine related topics, including seaweed harvesting and aquaculture, is carried out at both places. Research on fish health is also conducted in the Department of Microbiology. Ongoing and recent projects include: Reduction of adverse environmental impact of demersal trawls; Genetic bases and variability of physiological traits involved in growth in *Crassostrea gigas*; Molecular basis of fish im-

munity for disease resistance; Generation of highly informative DNA markers and genetic maps of salmonid fishes; Risk assessment of antimicrobial agent use in aquaculture; Influence of competitive interactions on the abundance of the early benthic stages of the European lobster; Development of sustainable aquaculture of arctic charr; Shelf-edge advection, mortality and recruitment; Basis of sex determination and gonadal sex differentiation for sex control in aquaculture; Aquaculture of the edible red seaweed *Palmaria palmata*; Development of techniques and economic analysis; Genetic diversity in European lobster (*Homarus gammarus*); Population structure and impacts of stock enhancement; Generation of a genetic body map for Atlantic salmon; Assessment of the potential for the sustainable development of the edible periwinkle (*Littorina littorea*) industry in Ireland (with NUI — Cork and others); Strain selection of edible brown seaweed as a key dietary component of high value-shellfish; Ecology of the fish disease furunculosis in fresh waters, and its significance to wild and cultured salmonids, a validation of a new detection system (with SRAI and others); Processing systems for commercially utilised sea vegetables; Mapping and assessment of exploitable algal biomass off the west coast of Ireland.

**Name: NATIONAL UNIVERSITY OF IRELAND — COLLEGE CORK**

**1. General information**

Address National University of Ireland — College Cork

Status and financial position University

**2. Detailed objectives and research programmes**

The Aquaculture Development Centre specialises in providing high quality research in support of the aquaculture industry and maintains a shore-based facility at Bantry, Co. Cork. The Zoology Department has a noteworthy research record in a variety of marine science fields, especially in the genetics of fish and shellfish. Work on fish and seafood-processing is also undertaken at the Food Science Department. Ongoing and recent projects include: A calibration of different molecular markers for use in discrimination and management of stocks of commercially important fish species; Assessment and reduction of the by-catch of small cetaceans.

Electrode probes for rapid assay of seafood toxins; Spoilage and safety of cold-smoked fish; European fish ageing network (with Marine Institute); Cephalopod resources dynamics: patterns in environmental and genetic variation; A multidisciplinary evaluation and optimisation of the production characteristics of different strains of commercially cultured flatfish; Diagnosis of oyster herpes-like virus; Development and validation of molecular, immunological and cellular tools; Evaluation and improvement of shellfish dredge design and fishing effort in relation to technical conservation measures and environmental impact; Development of a commercial brown squid fishery in Ireland; Turbot broodstock selection and larval production; The production of scallop spat in floating ponds; Assessment of the potential for the sustainable development of the edible periwinkle (*Littorina littorea*) industry in Ireland (with NUI — Galway and others).

**Name: NATIONAL UNIVERSITY OF IRELAND — DUBLIN**

**1. General information**

Address National University of Ireland — Dublin

Status and financial position University

**2. Detailed objectives and research programmes**

Work includes remote sensing and sea temperature monitoring in relation to fish stocks, deep-water microbiology and marine botany. Work on food safety in relation to seafood has also been carried out. Ongoing and recent projects include: Microbiological safety of heat-treated, vacuum packed shellfish products (with BIM and others); Detection of viruses and bacteriophage as indicators of food safety and the development of an effective depuration system (with BIM and others).

**Name: DUBLIN UNIVERSITY (TRINITY COLLEGE)**

**1. General information**

*Address* Dublin University (Trinity College)  
*Date of creation* 1492  
*Status and financial position* University

**2. Detailed objectives and research programmes**

The Zoology Department performs research on a variety of marine and fisheries related issues including work on stocks of ray, crab and other commercial species. Ongoing and recent projects include: Application and validation of the lipofuscin method in the assessment of crustacean age; Biology and management in the control of lice on fish farms; Commercial fish and European estuaries — priorities for management and research; Development and use of cell cultures for commercially important aquatic invertebrates; Study of age structure and demography of the commercial species of ray fished in Irish waters; Development of a computerised system for visualising and mapping shellfisheries data in a special case study using the Donegal Crab Fishery.

**Name: INSTITUTE OF TECHNOLOGY — LETTERKENNY**

**1. General information**

*Address* Institute of Technology — Letterkenny  
*Status and financial position* Institute of Technology

**2. Detailed objectives and research programmes**

The institute has undertaken a number of programmes in the past, targeted at the fishing and aquaculture industries in Donegal. It is currently working on ways of developing an effective pesticide from crustacean waste.

**Name: INSTITUTE OF TECHNOLOGY — GALWAY**

**1. General information**

*Address* Institute of Technology Galway  
*Status and financial position* Institute of Technology

**2. Detailed objectives and research programmes**

Work has been carried out on the biology of commercial and non-commercial species in the Galway Bay area including lemon sole on the west coast of Ireland, mackerel distribution, and the abundance of horse mackerel larvae the west coast of Ireland and in the Celtic Sea from 1983-95. A research project is currently under way on the biology of two species of megrim on the west coast. Work has also been carried out on the biochemical analysis of carotenoid pigments used in the fish farming industry, as well as on the structural analysis of fats and oils in fish.

**Name: INSTITUTE OF TECHNOLOGY — TRALEE**

**1. General information**

*Address* Institute of Technology — Tralee  
*Status and financial position* Institute of Technology

**2. Detailed objectives and research programmes**

Work is on-going on offshore cage and mooring technology, and on intensive finfish production methods, as well as on remote net cleaning and the elimination of bacterial contamination of salmon at harvest. Research interests include exploratory fishing, coastal zone management from



a fisheries perspective, benthic invertebrate distribution and fish biology. Recent and ongoing projects include: Development of a new seaweed-based hydroseeding process for soil stabilisation and vegetation; Socioeconomic evaluation of the impact of fisheries and aquaculture in Counties Donegal, Galway, Kerry and Cork.

**Name: INSTITUTE OF TECHNOLOGY — CORK**

**1. General information**

*Address* Institute of Technology — Cork

*Status and financial position* Institute of Technology

**2. Detailed objectives and research programmes**

Work is on-going on biotoxins in relation to shellfish and human health. Project work has also been carried out in the compilation of a gear trials database, in conjunction with BIM and the Marine Institute. Recent projects include: Development of a fishing gear trials database (with BIM); Strategies for limiting the contamination of shellfish by diarrhetic toxins.

**Name: THE NATIONAL FOOD CENTRE**

**1. General information**

*Address* The National Food Centre

*Date of creation* 1959

*Status and financial position* State agency

**2. Detailed objectives and research programmes**

The National Food Centre is part of the agricultural research organisation Teagasc — a State body responsible to the Department of Agriculture. Work is ongoing on the utilisation of alternative non-commercial species (such as deepwater fish) in fillets, fish cakes and nuggets. Other work includes the effect of freeze-thawing on fresh and prepared products as well as development of super-freezing methodology. Recent projects include: Quality and safety evaluation of non-quota/under-utilised species of fish and their related products.





# ISRAEL





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

	Landings (in thousand tonnes)						
	1990	1991	1992	1993	1994	1995	1996
Total	6.2	5.6	5.4	5	4.1	4.9	5.3

	Landings (million EUR)						
	1990	1991	1992	1993	1994	1995	1996
Total	5.13	4.47	4.49	4.41	2.7	5.05	4.19

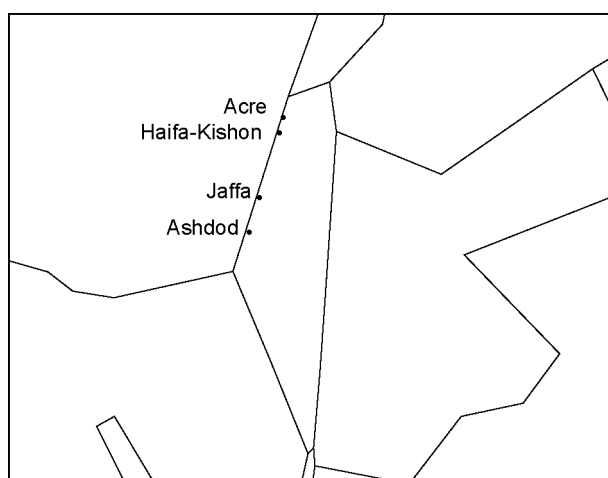
#### 1.1.2. Trend in fleet

	1990	1991	1992	1993	1994	1995	1996
Fishermen							
Vessels number	449	453	502	529	464	506	463
Power (1 000 kW)							

Due to the fact that new fishing licenses have not been issued during the past six years, the fishing fleet has gone through minor changes only.

#### 1.1.3. Fishing harbours

Regular fishing harbours, from north to south, are located in Acre, Haifa-Kishon, Jaffa and Ashdod. Apart from those there are natural semi-protected harbouring sites in Haifa-Shikmona, Dor-Habonim, Gisir al Zarka, and Ashkelon. In Eilat, the Gulf of Aqaba/Eilat fishermen are using the public marina as their home port. At present there are no real commercial fishing in the Gulf.



## 1.2. Aquaculture sector

There are about 70 active fish farms, 50 inland, 5 marine and 6-7 cold water ornamental fish. An unknown number of backyard-farms for tropical ornamental fish are spread all over the country. The total land area used by these is approximately 4 000 ha.

	Quantity (thousand tonnes)						
Species	1990	1991	1992	1993	1994	1995	1996
Silver carp	0.60	0.30	0.36	0.58	0.58	0.65	0.44
Mugilidis	0.82	0.98	0.84	0.93	0.87	1.29	1.23
Cichlids	4.97	5.93	3.34	4.41	5.79	6.24	6.40
Common carp	8.20	7.93	7.52	7.61	7.24	8.82	7.70
Trout							0.78
Salmon							0.02
Hybrid bass							0.29
Mariculture (mainly seabream)	-	-	0.07	0.15	0.23	0.45	1
<b>Total</b>	<b>14.59</b>	<b>15.14</b>	<b>12.13</b>	<b>13.68</b>	<b>14.71</b>	<b>17.45</b>	<b>17.86</b>

There are no data as to the value of the different species. However, the value of the total production is available from 1990-96 and it is given below.

	Value (million EUR)						
	1990	1991	1992	1993	1994	1995	1996
<b>Total</b>	<b>46.85</b>	<b>49.27</b>	<b>34.58</b>	<b>35.29</b>	<b>38.02</b>	<b>48.85</b>	<b>57.6</b>

The aquaculture sector is developing in spite of restrictions on inland water use. Mariculture is being developed mainly in the Red Sea but attempts are being made to install offshore cage farms along the Mediterranean coast. Few, land-based, marine fish farms, which use sea water, have been initiated recently, both along the Mediterranean coast and near the Red Sea.

Lake Kinneret (L. Tiberia) is the only lake in the country. It is restocked annually by the Department of Fisheries and Aquaculture. This restocking includes 4.5 million nursed *Sarotherodon galileus*, 50 000 silver carps (*Hypophthalmictis molitrex*), and 100 000 Mugil spp.

## 1.3. Processing industry sector

Israel's imports in 1996 amounted to 38 000 tonnes of marine fish, of which about 10 % (3 800 tonnes) are processed by the industry. Specific data on the products and the number of workers is not available.

The industry processed 2 000 tonnes of cultured fish in 1996, most of which were carps and tilapias.

## 1.4. Consumption of sea products

All the catch is consumed locally or sold in the Gaza Strip. A small portion of the mariculture production is exported and all inland aquaculture production is sold locally. Because of the massive immigra-

tion that occurred during the late 1980s and early 1990s the relevance of the accuracy of the data concerning per capita consumption in Israel is severely impaired. This population flux with different dietary habits increased the population by ~900 000 habitants (~+16.5 %) that reduced the national average from ~14 kg fish per capita to ~11. With time, nevertheless, these people are expected to adopt the local dietary habits and equal their per capita consumption to the one that existed before their arrival.

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sector

Governmental, private, and regional institutes all carry out scientific research in the field of aquaculture. The national goals are determined by the National Steering Committee for Aquaculture (NSCA), which is appointed by the Chief Scientist of the Ministry of Agriculture and Rural Development.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
<b>Main</b>	(NCM) EILAT, (IOLR)		15		2.69
<b>Other research institutes</b>	ARO		4		
	Central Lab. for Fish Health, Nir-David		3		0.39
	Ben Gurion Desert Research Institute in Sdeh Boker				
	Dor		4		0.68
	Ginossar		3		0.45
	Hebrew University, Faculty of Agriculture		2		0.45
	Jordan valley R & D unit		1		
	MIGAL		2		
	Negev R & D unit		2		
	Technion, Haifa		2		1.79
	Tel-Aviv University		2		1.79
	Bar Ilan University		1		
	The University of Beer-Sheva		1		0.9

#### 2.1.2. Coordination and relationship among the different research organisations and with research users

Private institutes sometimes coordinate their efforts with governmental institutions and sometimes don't. After consulting the NSCA, the Chief Scientist publishes the national goals that are to be attained in each sector and publishes an annual public call for scientific programmes. The NSCA selects the research programmes that are relevant to the national goals and organises them in a priority list, according to their respective contribution to the national aims. The number of research programmes that are eventually funded will then depend on the size of the budget. Research programmes that are presented to international or binational funds are judged according to their respective rules.

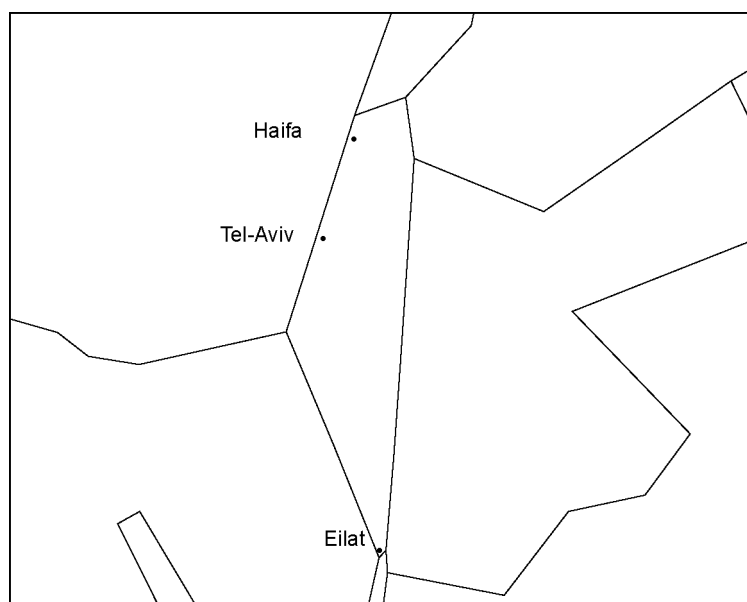
One of the main roles of the NSCA is to coordinate research programme between the various institutes thus taking advantage of their respective expertise and avoiding duplication of efforts.

## **2.2. Main research institute: NATIONAL CENTRE FOR MARICULTURE (NCM), EILAT, (IOLR)**

### **2.2.1. General information**

<i>Address</i>	National Centre for Mariculture (NCM)
<i>Date of creation</i>	1971
<i>Status and financial position</i>	Governmental
	Israel's Oceanographic & Limnological Research (IOLR) Tel. Shikmona, Haifa PO Box 8030 Tel. (972-4) 851 52 02. Fax (972-4) 851 19 11
	National Centre for Mariculture PO Box 1212 Eilat Tel. (972-7) 636 14 36. Fax (972-7) 637 57 61

#### *Location*



### **2.2.2. Detailed objectives and research programmes**

The main office governing aquaculture policy at sea is the Mariculture Division in the Department of Fisheries and Aquaculture in Tel-Aviv. The main research unit is The National Centre for Mariculture (NCM) in Eilat, which functions under Israel's Oceanographic & Limnological Research Institute, which is a not-for-profit governmental corporation, under the Ministry of National Infrastructure, within the section of the Authority for Earth Sciences. Research in mariculture covers reproduction, larval rearing and nursing of fish species, nutrition, genetics, fish diseases, diversification of cultures, integrated closed water systems. The NCM employs some 65 people of whom 15 are scientists (PhD level), 35 biological technicians (B.Sc., M.Sc. level), while the rest are maintenance personnel, administration and scientific



services like analytic chemistry, library, computer services. The budget mentioned above includes the salaries for all manpower described here; 70 % comes from governmental sources and the rest from grants and donations.

#### 2.2.4. Scientific cooperation

<b>Bilateral European relations</b>	German Israel Science Fund (Germany); German Israel Marine Sciences Cooperative Research Programme (Germany)
<b>European networks</b>	A number of projects within the 4th R & D Framework in mariculture (FAIR and Environmental Programmes)
<b>America</b>	Bi-National Agriculture Research and Development (BARD) (USA); HI-Tech Commission Israel-USA (USA); Bi-National Science Foundation (BSF) (USA)
<b>International organisations</b>	Intergovernmental Oceanographic Commission (IOC/Unesco); International Council for the Exploration of the Sea (ICES); World Aquaculture Society; European Inland Fisheries and Aquaculture Commission (EIFAC); General Fisheries Council for the Mediterranean Fisheries (GFCM); FAIR, DG XIV; European Aquaculture Society; International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) – observers; MAST (EU)

### 2.3. Other research organisations

#### Name: AGRICULTURAL RESEARCH ORGANISATION (ARO)

##### 1. General information

Address Agricultural Research Organisation (ARO)  
PO Box 6 Beit Dagan 50250

##### 2. Detailed objectives and research programmes

General research in fish nutrition, genetics, behaviour of species in culture and ornamental fish.

#### Name: CENTRAL LAB. FOR FISH HEALTH, NIR-DAVID

##### 1. General information

Address Central Lab. for Fish Health, Nir-David  
Status and financial position Supported by a budget allocated by the Dept. of Fisheries and Aquaculture as well as research funds through granting agencies

##### 2. Detailed objectives and research programmes

To assume overall responsibility of farm sanifunction of the regional laboratories. To provide diagnostic and advisory services to farms and to investigate fish disease and means to avoid and/or treat them.

#### Name: DOR

##### 1. General information

Address Dor

*Status and financial position* Supported by a budget allocated by the Department of Fisheries and Aquaculture as well as by research funds through granting agencies

## **2. Detailed objectives and research programmes**

To introduce and adapt new and exotic species to Israeli culture systems.

### **Name: GINOSSAR**

#### **1. General information**

*Address* Ginossar

*Status and financial position* Supported by a budget allocated by the Department of Fisheries and Aquaculture as well as by research funds through granting agencies

## **2. Detailed objectives and research programmes**

The aim of the Ginossar station is to develop technologies for intensive culture systems. The main objective is to develop systems with which it is possible to produce more fish with less water. The restocking of the lake is also part of the station's responsibilities.

### **Name: HEBREW UNIVERSITY, FACULTY OF AGRICULTURE**

#### **1. General information**

*Address* Hebrew University, Faculty of Agriculture

## **2. Detailed objectives and research programmes**

The main specialisation of the aquaculture scientists at the HUJI is in water purification, biofilters and intensive culture systems and fish diseases. The faculty runs an educational programme for MSc, BSc, and PhD students.

### **Name: JORDAN VALLEY R & D UNIT**

#### **1. General information**

*Address* Jordan Valley R & D unit

## **2. Detailed objectives and research programmes**

Ornamentals, closed water systems.

### **Name: MIGAL**

#### **1. General information**

*Address* MIGAL

## **2. Detailed objectives and research programmes**

Migal's general research is in fish nutrition, ornamental fish and fish reproduction. This unit also runs a regional laboratory for fish diseases.

### **Name: NEGEV R & D UNIT**

#### **1. General information**

*Address* Negev-Arava Aquaculture R & D unit

## **2. Detailed objectives and research programmes**

The Negev Arava R & D is concentrating in application of research output mainly in water purification, closed water systems, brackish and geothermal water, and diversification of species.

**Name: TECHNION, HAIFA**

### **1. General information**

Address Technion, Haifa

### **2. Detailed objectives and research programmes**

The Technion is specialising in research of pond limnology and water purification.

**Name: TEL-AVIV UNIVERSITY**

### **1. General information**

Address Tel-Aviv University

### **2. Detailed objectives and research programmes**

General research in physiology of reproduction of aquatic species.

**Name: THE BEN GURION DESERT RESEARCH INSTITUTE**

### **1. General information**

Address The Ben Gurion Desert Research Institute

### **2. Detailed objectives and research programmes**

General research focuses on the development of aquaculture in desert conditions, and on diversification of cultures.

**Name: BAR ILAN UNIVERSITY**

### **1. General information**

Address Bar Ilan University

### **2. Detailed objectives and research programmes**

Biology and reproduction of the Australian cray fish *Cherax quadricarinatus*.

**Name: THE UNIVERSITY OF BEER-SHEVA**

### **1. General information**

Address The University of Beer-Sheva

### **2. Detailed objectives and research programmes**

Biology and reproduction of the Australian cray fish *Cherax quadricarinatus*.

# ITALY





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

The Italian fishing industry is undergoing a restructuring process, which involves the modernisation of the fleet as well as the sector as a whole. Fishing services, fishermen associations, research, processing and marketing structures are all part of a greater plan which should enable the modification of the functioning of the industry in Italy. In particular, it is the organisation of the catching sector which is heavily involved in a reconversion process. To obtain this goal, smaller management units named 'Fishing Districts' have been introduced, and much more is foreseen in the period covered by the Triennial Plan (1997/99). In this way, it is believed that the various differences characterising the fishing industry in Italy can be evaluated and the necessary management flexibility can be experienced.

In Italy the introduction of fishery based on property rights is a completely new management measure which enables the introduction of mariculture investments and other activities (such as tourism with fishermen) facilitating the reconversion process from non-selective gears and reducing the fishing effort in some areas.

Landings (in thousand tonnes)							
Species	1990	1991	1992	1993	1994	1995	1996
Small pelagic	65	74	74	80	89	111	107
Swordfish and tuna	8	10	13	13	13	16	22
Clams	41	38	38	36	28	25	27
Demersal fishes, crustaceans and cephalopods	409	415	419	425	426	420	399
<b>Total</b>	<b>523</b>	<b>537</b>	<b>544</b>	<b>555</b>	<b>556</b>	<b>572</b>	<b>555</b>

Landings exceed 500 000 tonnes/year and this figure is rather consistent over time (e.g., in 1996 the total production was 555 000 tonnes). Only small variations are registered between different years, even if the contribution from various fishing areas is rapidly changing due to the different types of impact of many recently introduced management measures. The landing composition is as follows: small pelagic fishes 17 %, swordfish and tuna species 2 %, clams 17 %, demersal fishes, crustaceans and cephalopods 64 %.

Landings (million EUR)							
Species	1990	1991	1992	1993	1994	1995	1996
Small pelagic	76.4	76.1	88.3	98.7	114.8	119.1	129.9
Swordfish & tuna	52.3	70.4	74.9	80.6	78.5	95.5	111.9
Clams	61.2	61.6	60.1	45.8	42.0	40.3	30.3
Demersal fishes, crustaceans & cephalopods	1 455.7	1 502.7	1 536.2	1 511.0	1 526.1	1 538.2	1 520.2
<b>Total</b>	<b>1 645.6</b>	<b>1 710.8</b>	<b>1 759.4</b>	<b>1 736.1</b>	<b>1 761.4</b>	<b>1 793.1</b>	<b>1 792.3</b>

### 1.1.2. Trend in fleet

The fleet is undergoing reduction according to the targets foreseen in the POP III. The overall figures correspond to the targets, even if within some sectors the matching presents some small deviation. According to the 5th Triennial Plan for Fisheries in the 1993/95 period the number of boats decreased by 4.9 %, the total GRT by 5.8 % and the power by 2.9 %.

The fleet is rather old and this affects the efficiency of the fishing operations. A mixed working group (EC & Mi.P.A.) is currently performing an assessment of the real engine power of the fleet.

	1990	1991	1992	1993	1994	1995	1996
Fishermen	45 589	43 551	46 377	44 844	45 895	44 773	44 249
Number of vessels	18 492	16 651	16 723	16 788	15 785	15 965	16 780
Power (thousand kW)	1439	1505	1523	1539	1470	1494	1479

### 1.1.3. Fishing harbours

There are about 200 harbours where marine catches are landed. The main harbours are located in Sicily and in the Adriatic coast. From the economic view point the main harbours are: Chioggia, Fano, Ancona, Civitanova Marche, Pescara, Manfredonia, Molfetta, Mazara, Trapani, Anzio, Cagliari, Porto Santo Stefano, Viareggio, Savona.



## 1.2. Aquaculture sector

Development of aquaculture is one of the most important goals in the Italian fishery policy. Accordingly, private investments in aquaculture have been encouraged and an increasing share of the national subsidies are devoted to the development of aquaculture production. A continuous shift from production in concrete-built land-based basins toward off-shore cage culture systems is observed, with increasing numbers of small-scale cage culture farms being established along the coast. Total production is now around 240 000 tonnes with a 30 % increase compared to the last Triennial Plan. About 1 000 plants exist, operated by 1 500 workers. Italian aquaculture is mostly located in the north of the country, where 75 % of the farms are located.

Quantity (thousand tonnes)								
Species	1990	1991	1992	1993	1994	1995	1996	1997
Sea bass	1.0	1.5	1.8	2.4	2.9	3.6	3.8	4.6
Sea bream	0.8	0.9	1.0	1.5	1.8	3.2	3.6	3.9
Mullet	3.0	2.9	2.9	2.9	2.9	3.0	3.1	2.9
Trout	35.0	38.0	40.0	42.0	45.0	50.0	48.0	51.0
Carp	0.3	0.3	0.4	0.5	0.5	0.5	0.5	0.7
White bream	-	-	-	-	-	-	-	0.2
Sturgeon	-	-	0.35	0.4	0.4	0.5	0.5	0.5
Eel	3.7	3.6	3.3	3.1	3.0	3.0	3.0	3.1
Other fishes	0.5	0.5	0.7	2.0	2.5	1.0	1.0	1.0
Mussel <sup>(1)</sup>	110.0	101.0	116.0	120.0	126.0	132.0	130.0	130.0
Clam	16.7	27.0	26.7	24.0	40.0	60.0	40.3	40.0
Algae	5	5	5	5	5	5	5	5
<b>Total</b>	<b>176</b>	<b>180.7</b>	<b>198.25</b>	<b>203.8</b>	<b>230</b>	<b>261.8</b>	<b>238.8</b>	<b>242.9</b>

<sup>(1)</sup> including fisheries.

Value (million EUR)								
Species	1990	1991	1992	1993	1994	1995	1996	1997
Sea bass	13.42	19.36	21.38	21.63	25.55	26.02	27.47	33.3
Sea bream	9.50	10.22	9.81	12.61	15.28	21.48	24.50	26.2
Mullet	4.64	5.24	6.73	7.46	8.98	9.29	9.60	10.5
Trout	63.26	68.68	72.30	88.31	81.34	90.37	86.76	105.4
Carp	0.61	0.61	0.92	1.16	1.16	1.29	1.54	2.2
White bream	-	-	-	-	-	-	-	1.4
Sturgeon	-	-	1.62	2.06	2.06	2.58	2.58	3.1
Eel	22.93	18.59	20.45	21.47	24.78	26.33	26.33	29.6
Other fish	2.58	2.58	3.61	10.32	12.91	5.16	5.16	5.2
Mussel	56.81	41.72	53.91	61.97	65.07	68.17	67.1	67.1
Clam	28.46	46.01	41.36	37.18	82.63	103.29	83.25	83.3
Algae	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
<b>Total</b>	<b>203.71</b>	<b>214.51</b>	<b>233.59</b>	<b>265.67</b>	<b>321.26</b>	<b>336.37</b>	<b>335.79</b>	<b>368.8</b>



Among fish, trout culture has the highest performance. Sea bass and sea bream are other segments playing an important role within the Italian aquaculture sector. Production has increased from 4 000 tonnes in 1993 to 8 500 tonnes in 1997. Today about 200 intensive culture farms are in operation, while the extensive production occupies 63 485 hectares. The present production of sea bass and sea bream fry is around 61 000 000; the number of hatcheries is 27.

### **1.3. Processing industry sector**

The fish processing sector in Italy has been facing a difficult situation for some years. The main reasons for its poor performance are that the processing industry is labour intensive and Italy is not competitive with countries where labour cost is lower and secondly, the processing industry in Italy has virtually no link with the catching sector and all raw material is imported. This implies that exchange rates play an important role in the decisions of buying supplies for the industry.

During the 1992/95 period the sector shows a general decrease; the production was 144.2 thousand tonnes (10 % less than the production in 1992), the industry turnover was EUR 766.4 million registering a (-3.6 %) reduction compared to the 1992 figure. The employment has been also decreasing, from 6 500 workers in 1992 to 6 000 in 1995, while there were about 1 800 seasonal workers largely involved in the salted and filleted anchovy industry. Finally, plants are used only up to 53 % of productive capacity, as compared to 60 % in 1992.

Tuna processing is the most important segment of the Italian industry. In 1995 production has reached 83 000 tonnes with a value of EUR 390 million, about 50 % of the total industry turnover. The trend in production is decreasing, in contrast to an increase in canned product imports. The industry is buying increasingly more partly-processed product, i.e. loins, which allows to concentrate its activity on the most profitable part of the process.

Salted and filleted anchovy production also plays an important role and in 1995 represented 25 % of the total turnover. In this case the value of the production is highly dependent on the value of the raw material in different markets, which also depends on the state of stocks. In the period 1992/95 fresh anchovy prices have decreased by 44 %, which in turn entailed an equivalent decrease of the value of the salted product.

Sardines in oil have been undergoing a deep crisis for many years. Out of a total of 12 plants once in operation, only four are operating today. Production has decreased from 11 thousand tonnes in the late 1980s, to 8.5 thousand tonnes in the early 1990s to 2.1 thousand tonnes in 1995; such collapse being mainly caused by competition from non-EU countries.

Factories producing canned and frozen clams are also experiencing a long period of crisis largely due to the lack of raw material, because of the high stock exploitation levels reached in previous years. In 1995 the production reached 2.5 thousand tonnes with a turnover of EUR 20.7 million.

There are also other types of production, generally associated with other processing lines. New products (pre-cooked and smoked) show an increasing trend, although not as high as expected a few years ago. The remaining processed and non-frozen products account for EUR 67.7 million for a total of 23.5 thousand tonnes.

### **1.4. Consumption of sea products**

In 1995 total consumption amounted to 1 256 thousand tonnes, of which 503 thousand tonnes were the contribution of internal fisheries, 60 thousand tonnes consist of the landings of the ocean-going fleet and 262.7 thousand tonnes regard the aquaculture production. Total internal production is therefore 825.7

thousand, while 600 thousand tonnes is the import share. Export account for 104.2 thousand tonnes. Per capita consumption is stable around 23.07 kg; this figure has experienced a relevant increase in the previous years, partly due to a real increase in consumption, partly due to the general improvement of the statistical system.

All figures are generally stable over time, with a slight increase in national production and export during the period 1992/95, and a small reduction of imports.

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research Institutes involved in fishery sector

Fisheries research in Italy is carried out both by the public and the private sector. ICRAM (Central Institute for Marine Applied Research) is the public organisation with a nation-wide network engaging in fisheries, aquaculture and environment research.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
Other research institutes	ICRAM	23	54	0.55	6.2
	LAB. CENT. IDROBIOL.		9		0.12
	ENEA	8	5 000	0.38	
	ENEL Spa				
	DSR-CRAM	6	11		
	INEA	6	103		
	ISMEA	7			
	IREPA	12	46		
	IS.MARE-CNR		(250)	0.02	
	UNIMAR	3	(250 <sup>(1)</sup> )		
	SIBM		1 (740 <sup>(1)</sup> )	0.67	0.67
	CIBM	(11 <sup>(1)</sup> )	3 (18 <sup>(1)</sup> )	1.29	2.66
	CoNISMA	(97 <sup>(1)</sup> )	(549 <sup>(1)</sup> )		

<sup>(1)</sup> associated professors/researchers/members (1998)

#### 2.1.2. Supervisory Ministerial authority(ies)

Institutes	Authority(ies)				
	University/ Research	Environment	Agricultural Policies	Industry	Treasure
ICRAM					
LAB. CENT. IDROBIOL.					
ENEA					
ENEL spa DSR-CRAM					
INEA					

Institutes	Authority(ies)				
	University/ Research	Environment	Agricultural Policies	Industry	Treasure
ISMEA					
IREPA					
ISMARE-CNR					
CoNISMa					
UNIMAR					
SIBM					
CIBM					

### 2.1.3. Coordination and relationship among the different research organisations and with research users

The administration in charge for the fishery and aquaculture management is the Directorate-General of Fishery and Aquaculture (DG Fishery) — Ministry for agricultural policies.

	Political and administrative bodies	Industry
<b>ICRAM</b>	European Community; Directorate of Fisheries and Aquaculture, Ministry for Agricultural Policies (Italy); Regions and Local authorities; Food and Agriculture Organisation (FAO)	API (Italian Fish Farmer Trade Union); Fishery cooperatives
<b>Laboratorio Centrale di Idrobiologia</b>	Ministry for agricultural policies; Ministry of Environment; FAO	
<b>CoNISMa</b>	Calabria Region; Province of Vibo Valentia; EC	Pirelli s.p.a. and Telecom s.p.a.
<b>ENEA</b>	Directorate-General of Fishery and Aquaculture Mi.P.A., Ministry of Environment, Ministry of Industry, Tuscany Region, Egadi islands marine reserve	Private aquaculture farms
<b>ENEL</b>	Mi.P.A.; Region Lombardia and several local authorities	Private entrepreneurs; managing commercial fish farms utilising effluents from power stations
<b>INEA</b>	EC; Directorate-General of Fishery and Aquaculture, Mi.P.A.; local authorities; FAO	API

	Political and administrative bodies	Industry
<b>IREPA</b>	Ministry for Agricultural Policies, OCSE, FAO, EU, INEA, ISMEA, FIN-SIEL, ISTAT	Federpesca, Federcoopesca, Lega Pesca, UNCI, Ancit, Api
<b>ISMEA</b>	E.C.; Directorate-General of Fishery and Aquaculture, Ministry for agricultural policies; FAO; ICRAM; ISTAT	Federpesca; Federcoopesca; Lega Pesca; Unci; Ancit; Api

#### 2.1.4. Participation to European networks

##### ICRAM:

Pilot project on marine management/conservation (XIV-1/MED/91/015C); Studies on Mediterranean urban effluents, U.E.-A.R.T.M. 'MUREX, Avicenne 87' (DG XII); Analysis of trawl discards in the central and eastern Mediterranean Sea (97/0044); Cartography of Italian demersal resources (Ionian-Sicilian area), U.E. Med.91/013; Selectivity of fixed nets in the Mediterranean ('SELMED' 95/C/76/15); Spatio-temporal analysis of the fishery resources, their environment and exploitation in the Mediterranean: experimental use of the GIS. ('FIGIS' FAIRCT95-0419); North-western Mediterranean anchovy: Distribution, biology, fisheries and biomass estimation by different methods (MA.3.730); Methodology for seafood market studies in the aim of introducing new aquaculture products (MAS-MANAP, FAIR-97-3500); Impact caused by toothed dredges requantified on a pan-European scale (CFP 98/018).

## 2.2. Main research institute: **CENTRAL INSTITUTE FOR MARINE APPLIED RESEARCH (ICRAM)**

### 2.2.1. General information

<i>Address</i>	ICRAM Via Casalotti 300 00166 Rome, Tel. (39-6) 61 57 01. Fax (39-6) 61 55 05 81 President: Giuseppe Notarbartolo di Sciara (e-mail: disciara@tin.it) General Director: Attilio Rinaldi (e-mail: attiliorinaldi@tin.it) www.icram.org
<i>Date of creation</i>	1982
<i>Status and financial position</i>	A non-economic public body included in the category 'Scientific Research and Experimentation Bodies'  Struttura Tecnico Scientifica di Chioggia Viale Stazione, 5, 30015 Chioggia (Venice) Tel. (39-41) 550 06 36. Fax (39-41) 550 06 26. E-mail: otgiovani@tin.it www.provincia.venezia.it/icramci/index.htm  Struttura Tecnico Scientifica di Palermo Via A. Amari, 129, 90139 Palermo Tel. (39-91) 611 40 44. Fax (39-91) 611 40 60. E-mail: andalorf@tin.it

*Location***2.2.2. Detailed objectives and research programmes**

The mission of ICRAM is to provide scientific support to the administration in the formulation of the country's marine conservation and management policies. In particular, the following are the main fields of activity of the institute:

- to maintain the quality of the marine and coastal environment and waters;
- to conserve marine biodiversity, specifically by preserving habitats (marine protected areas) and endangered marine species;
- to promote the sustainable use of the marine environment and its resources, specifically as far as fisheries, aquaculture and tourism are concerned.

The main functions of ICRAM include: scientific advice and support, research, documentation, training, support to emergency intervention.

Research activities related to fisheries

Staff: 14 employees spread out over the locations of Rome, Chioggia and Palermo.

Activities:

- assessment of demersal and pelagic stocks;
- environmental impact of fishing technologies;
- evaluation of the effects of restrictive management policies on resources;
- socioeconomic aspects.

Research activities related to aquaculture

Staff: 7 employees in Rome.

Activities:

- production of fry: studies of their growth (including the production of gametes, embryogenesis and larvae weaning);
- environmental impact of mariculture (benthic biocenoses related to intensive fish production in floating cages).

A great deal of interest is addressed to the recovery and/or production of coastal wetlands. These areas, because of their environmental peculiarities, need considerable efforts in terms of multidisciplinary research.

Research activities related to the marine and coastal environment

Staff: 12 employees spread out over the locations of Rome, Chioggia and Palermo.

Activities:

- evaluation of the environmental impact of anthropic activities on marine coastal areas;
- xenobiotics in marine matrix (sediments, living organisms);
- biodiversity and environmental change;
- creation and management of marine protected areas;
- biogeochemical cycles in marine sediments;
- support to coastal zone management.

### 2.2.3. Facilities at sea

Partial use of the French-flagged R/V *Europa*; two inflatables as support to diving operations.

### 2.2.4. Scientific cooperation

<b>National</b>	University of Palermo; University of Bologna; University of Pisa; University of Padova; University of Ancona; University of Genova; Zoological Station of Napoli; 'Istituto zooprofilattico' of Messina; IRPEM-CNR of Ancona; Interuniversity Centre of Livorno; University of Palermo; University of Potenza; University of Udine; University and 'Politecnico' of Milano; University of Rome ('La Sapienza'); University of Roma ('Tor Vergata'); University of Perugia; IREPA; 'Istituto zooprofilattico sperimentale' of Piemonte and Liguria; AGEI; COIPA; COISPA; Bioservice; Biotecno; M.A.R.E.Cooperatives; 'Istituto zooprofilattico sperimentale' of the Venetian Regions; IRMA-CNR of Mazara; ITM-CNR MESSINA; University of Messina; Conisma; ENEA; University of Bari
<b>Bilateral European relations</b>	Instituto Español de Oceanografía (Spain); Instituto de Ciencias del mar of Barcelona (Spain); Ifremer (France); Museum National d'Histoire Naturelle of Paris (France); National Centre for Marine Research of Athens (Greece); British Antarctic Survey of Cambridge (England); Institut für Seefischerei of Hamburg (Germany); Australian Antarctic Division of Kingston (Australia); INIP (Instituto Nacional de Investigação das Pescas) (Portugal); UMBSM (UK); IMB-Crete (Greece); FRI-NAGREF Kavala (Greece)
<b>America</b>	Argentine Antarctic Institute; Universidad del Norte, Coquimbo (Chile)
<b>International organisations</b>	FAO in Rome; IOTC; CGPM-FAO; COPEMED-FAO; UNEP

## 2.3. Other research organisations

**Name:** CENTRAL LABORATORY OF HYDROBIOLOGY (LAB. CENT. IDR.)

### 1. General information

**Address** Viale del Caravaggio, 107, 00100 Roma  
Tel. (39-6) 51 60 01 78. Fax (39-6) 514 02 96

**Date of creation** 1921

**Status and financial position** Public laboratory belonging to the Ministry for agricultural policies

### 2. Detailed objectives and research programmes

Objectives:

Ecology of the aquatic environment for protection and exploitation of its resources;

Aquaculture.

Research activities:

Development of innovative models in the breeding of valuable fish species (e.g. sturgeon);

research and development of ecological models;

monitoring for management of brackish waters for aquaculture.

### 3. Facilities at sea

Inboard motorboat *Calafuria 7*

### 4. Scientific cooperation

<b>National</b>	ENEA (Casaccia), Hydraulic Department; 'La Sapienza' University, Biology Department; 'Tor Vergata' University, Environmental Biology Department; University of Siena, Palaeontology and Geology Institute; University of Trieste, Marine Biology Laboratory of Aurisina (TS), AGEI (Rome)
<b>America</b>	Universidad Magellanes Punta Arenas (Chile)

**Name:** AGENCY FOR NEW TECHNOLOGIES, ENERGY AND ENVIRONMENT (ENEA)

### 1. General Information

**Address** Agency for New Technologies, Energy and Environment (ENEA)  
Via Anguillarese, 301  
00060 S. Maria di Galeria, Roma  
Tel. (39-6) 30 48 47 16. Fax (39-6) 30 48 47 68

**Date of creation** 1991

**Status and financial position** Governmental agency

### 2. Detailed objectives and research programmes

Objectives:

In the field of aquaculture ENEA work on seawater ecosystem, new technology for farming activities, new species for aquaculture in marine waters, coastal and lagoons ecology, breeding techniques, environment impact of aquaculture activities.



Research activities:

Development of reliable methods for the cryopreservation of marine teleost; control and investigation of waste output from fish cage culture; development of reproduction techniques for yellowtail in cages; investigation of mariculture sites in Tuscany region; productive optimisation in a traditional 'Valle'; multidisciplinary programme for the development of rearing technologies in open sea.

### 3. Scientific cooperation

<b>National</b>	ICRAM; Mi.P.A.; University of Rome; University of Padua; Tuscany Region; IREPA; Spallanzani Institute; University of Genoa; CNR Messina; ENEL
<b>Bilateral European</b>	Danish North Sea Centre
<b>International organisations</b>	FAO; ICLARM

#### Name: ENVIRONMENT AND MATERIAL RESEARCH CENTRE (ENEL SPA DSR-CRAM)

##### 1. General information

<i>Address</i>	Environment and Material Research Centre (ENEL spa DSR-CRAM) Via Volta, 1 20093 Cologno Monzese (MI) Tel. (39-2) 72 24 57 93. Fax (39-2) 72 24 57 00
<i>Date of creation</i>	1970
<i>Status and financial position</i>	Stock company

##### 2. Detailed objectives and research programmes

Objectives

Optimisation of utilisation of warm water discharged by thermal power plants for aquatic organism production, both in fresh and sea water.

#### Name: NATIONAL INSTITUTE OF AGRICULTURAL ECONOMICS (INEA)

##### 1. General information

<i>Address</i>	National Institute of Agricultural Economics (INEA) Via Barberini, 36 Rome — Italy (plus 18 local units) Tel. (39-6) 474 42 63. Fax (39-6) 474 19 84
<i>Date of creation</i>	1928
<i>Status and financial position</i>	Public research institute

##### 2. Detailed objectives and research programmes

Objectives:

INEA have been established in order to collect data on agricultural and forestry economics as scientific agency of the Ministry of Agriculture and Forestry. They are organised in a large central

unit, interregional observatories and regional offices for farm accountancy in order to implement the FADN Italian part (18 000 farms) of the EU network.

In the field of fishery, INEA work on aquaculture and fishery economics through a specific Observatory (the INEA Observatory of Agricultural Economics for Lazio and Abruzzo).

The Observatory monitored 60 aquaculture plants in order to build up a management model for aquaculture plants. In the past INEA produced 'The impact of the EEC Fisheries Policy, 1980-81' for Campania, Calabria, Sicily, Abruzzo, Molise and Apulia from the EU Commission.

Research activities:

- annual survey of fishing and aquaculture markets;
- fish farming accounting.

**Name: INSTITUTE FOR THE STUDY, RESEARCH AND INFORMATION ON AGRICULTURAL AND AGRIFOOD MARKET (ISMEA)**

**1. General information**

*Address* Institute for the Study, Research and Information on Agricultural and Agrifood Market (ISMEA)  
Via Nomentana, 183 — 00161 Rome, Italy  
Tel. (39-6) 85 56 12 80. Fax (39-6) 44 25 06 32  
<http://www.ismea.it/>

*Date of creation* 1987

*Status and financial position* ISMEA is a public research institute

**2. Detailed objectives and research programmes**

Objectives:

In the field of fishery, ISMEA are joining a three-year programme concerning the 'Implementation of an information system for the fishery sector', financed by the Ministry for agricultural policies.

Research activities:

The 'Information system for the fisheries sector' has been built on along four main activities:

- economical data survey service;
- market analysis;
- spreading information;
- identification of target families for the monitoring of distribution and supply channels.

**Name: INSTITUTE FOR ECONOMIC RESEARCH IN FISHERY AND AQUACULTURE (IREPA)**

**1. General information**

*Address* Institute for Economic Research in Fishery and Aquaculture (IREPA)  
Via B. Croce 35, 84131 Salerno, Italy  
Tel. (39-89) 33 89 78. Fax (39-89) 33 08 35  
E mail: [irepa@irepa.org](mailto:irepa@irepa.org)  
Internet: <http://www.irepa.org>

*Date of creation* 1982

*Status and financial position* Mixed research organisation fully financed by contract research

## 2. Detailed objectives and research programmes

### Objectives:

IREPA is specialised in fishery and aquaculture economic research. Its main aim is to assist national and international public bodies involved in fisheries and aquaculture management. The institute participates in different theoretical and applied research programmes in collaboration with other international research institutes.

### Organisation:

IREPA is affiliated member of the following organisations and associations: EAFE — European Association of Fisheries Economist; University of Salerno — Faculty of Economics.

### Research activities:

- monitoring system for techno-economic data in the Italian fishery;
- monitoring system for aquaculture data;
- Campania regional observatory for fishing industry;
- scientific and technical observatory for the Mediterranean fisheries;
- environmental and social accounting matrix approach for fisheries in the fishing industry;
- feasibility project and technological innovations for aquaculture coastal zone management;
- models for optimal management of aquaculture farms;
- transition from quota to effort regulation;
- multispecies bioeconomic models;
- bioeconomic modelling in Mediterranean and Italian fishery;
- concerted actions in fishery economics,

## 3. Scientific cooperation

<b>National</b>	Il University of Rome 'TorVergata': Ceis; University of Naples 'Federico II'; University of Salerno (Economics and Engineering); ICRAM; Aquastudio; University of Cagliari
<b>Bilateral European relations</b>	LEI-DLO (Netherlands); SFIA (United Kingdom); Imperial College (United Kindom); CEMARE (United Kingdom); DIFER (Denmark); Ifremer (France); University of Reykjavik (Iceland); IEO (Spain); (University of Barcelona (Spain); ESRI (Ireland); Finland; National Board of Fisheries (Sweden); University of Vigo (Spain)
<b>European networks</b>	PHARE – Albania
<b>International organisations</b>	FAO – Globefish

**Name:** NATIONAL INSTITUTE FOR COORDINATION OF MARINE SCIENCE (ISMARE-CNR)

### 1. General information

<i>Address</i>	Ismare Ancona c/o Istituto Ricerche Pesca Marittima (CNR) Tel. (39-71) 20 78 81. Fax (39-71) 553 13
<i>Date of creation</i>	1996
<i>Status and financial position</i>	Public organism inside CNR, Ismare has a budget for the coordination activity of 11 different CNR coordinated institutes

## 2. Detailed objectives and research programmes

### Objectives

In the field of fishery, Ismare works on stock assessment by means of different methodologies, rationalisation of fisheries techniques (selectivity of gears), protection of coastal zone, artificial reefs, etc., together with the 'Istituto Ricerche Pesca Marittima' (IRPEM) in Ancona and the 'Istituto Risorse Marine e Ambiente' (IRMA) in Mazara del Vallo (Sicily). In the field of aquaculture Ismare works on the different aspects of mariculture both inshore and in the open sea. They also work also on marine geology, oceanography and ecology.

Recently a large research project on the climatic changes and their effects against the marine ecosystems has been approved by the Italian scientific community (CNR, University, ENEA, Stazione Zoologica in Naples, etc.). The acronym of this project, starting in 1999, is Sinapsi.

### 3. Facilities at sea

Ismare manages CNR vessels with different tonnage and power.

### 4. Scientific cooperation

<b>National</b>	CNR; University; ENEA; Stazione Zoologica in Naples
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## Name: NATIONAL INTER-UNIVERSITY ASSOCIATION FOR SEA SCIENCES (CONISMA)

### 1. General information

<i>Address</i>	Connisma c/o Institute of Environmental Sea Sciences of University of Genova Corso Rainusso, 14 — 16038 S, Margherita Ligure (Italy) Tel. (39-185) 29 24 52. Fax (39-185) 29 30 16 E-mail: <a href="mailto:conisma@unige.it">conisma@unige.it</a>
<i>Date of creation</i>	1994
<i>Status and financial position</i>	It is a non-profit organisation. At the moment it consists of 23 Italian universities (Ancona, Bari, Cagliari, Camerino, Cosenza- Univ. of Calabria, Bologna, Catania, Firenze, Genova, Lecce, Messina, Milano, Naval Institute of Napoli, Napoli-Federico II, Palermo, Parma, Roma-La Sapienza, Roma-Tor Vergata, Siena, Trento, Trieste, Urbino, Viterbo-La Tuscia)

### 2. Detailed objectives and research programmes

#### Objectives:

- to promote and coordinate all researches and other scientific and applied works in the field of marine Sciences, by encouraging cooperation not only among its member universities, but also with other universities, public and private corporations of research, local and regional authorities, productive structures;
- to promote and encourage, also through scholarships, the training of experts in the different fields of research;
- to promote the transfer of national and international research work results in this field for their application in public and private sectors;
- to promote and support national and international projects, and to carry out study and research works ordered by government administrations, public and private bodies, local and regional authorities, national and international agencies.

Conisma, because of its inner structure, has no departments with researchers, but studies and researches in the sector of fishery and aquaculture are on the way at the local units of research, one for each university member.

Research activities

'Synthese des connaissances sur les ressources du fond en mediterrannee centrale — *Syndem* (Italie et Corse)',

Analysis and researches for defining an integrated system of aquaculture — *SiMA* (Gulf of S. Eufemia, Italy),

Multi-disciplinary research programme for the development of the bluefin tuna (*Thunnus thynnus*), training of educators in the fishery sector.

### 3. Facilities at sea

Conisma permanently cooperates with Hydrographic Institute of the Navy.

### 4. Scientific cooperation

<b>National</b>	Associated Universities; CNR; ENEA; Zoological Station of Naples; Hydrographic Institute of the Navy; Iccram
<b>Bilateral European relations</b>	University of Cadiz (Spain)
<b>America</b>	Inter-university Centre for Scientific Cooperation Europe-Latin America (CICS EULA); University of Costa Rica

## Name: BIOLOGICAL TECHNICAL OBSERVATORY (UNIMAR)

### 1. General information

Address Biological Technical Observatory (Unimar)  
Via dei Gigli D'Oro, 21. 00186 Roma  
Tel. (39-6) 68 80 82 34. Fax (39-6) 68 80 82 35  
E-mail: unimar.c@agora.stm.it

Date of creation 1995

Status and financial position Association of research centres belonging to the major associations of fishery cooperatives ('Federcoopescas, Lega-Pesca, A.I.C.P. and UNCI-Pesca')

### 2. Detailed objectives and research programmes

Objective:

Census of the aquaculture and fishery enterprises.

### 3. Facilities at sea

Oceanographic research vessel.

#### 4. Scientific cooperation

<b>National</b>	ICRAM; Mi.P.A.; Ministry of Environment; Conisma; ISMARE-CNR; Ministry of Foreign Affairs; local agencies; Universities
<b>International organisations</b>	FAO; EU

#### Name: 'SOCIETÀ ITALIANA DI BIOLOGIA MARINA' (SIBM)

##### 1. General information

<i>Address</i>	Società Italiana di Biologia Marina (SIBM) Piazzale Mascagni, 1. 57127 Livorno, Italy
<i>Date of creation</i>	1969
<i>Status and financial position</i>	Association

##### 2. Detailed objectives and research programmes

To study the life of the sea and encourage scientific knowledge exchange and diffusion. At present SIBM is involved in Medits programme (demersal resources evaluation in Mediterranean by trawl survey). It is contracting partner with FAO for ASFA. It is organising several conference and meetings: the most relevant is (in cooperation with other institution) the 7th CARAH concerning artificial reefs and related habitats of worldwide importance.

#### Name: CENTRO INTERUNIVERSITARIO DI BIOLOGIA MARINA ED ECOLOGIA APPLICATA 'G. BACCI' (CIBM)

##### 1. General information

<i>Address</i>	Centro Interuniversitario di Biologia Marina ed Ecologia Applicata 'G. BACCI' (CIBM) P.le Mascagni, 1. 57127 Livorno (Italy) Tel. (39-5) 86 80 72 87. Fax (39-5) 80 91 49 E-mail: cibm@cibm.it
<i>Date of creation</i>	1967
<i>Status and financial position</i>	Research and education centre (Universities of Pisa, Firenze, Siena, Modena, Bologna, Torino and Municipality of Livorno)

##### 2. Detailed objectives and research programmes

Research activities in fisheries management (stock assessment, multi-species biological models, multi-disciplinary approach to fisheries management, environmental problems and their impact on resources), fishing techniques (selective gears, static gears); aquaculture (growth, nutrition, feed composition, disease, immunology, stress). Marine sediment quality: physical-chemical characteristics, biocenosis and bioassay for sediment toxicity.

##### 3. Facilities at sea

Rearing tanks, specialised software, equipped laboratories for oceanography, biochemistry and histology; motor boat (25 hp, 5 m), equipment for diving.

**4. Scientific cooperation**

<b>National</b>	ICRAM, ENEA, IRPeM-CNR, University of Genoa
<b>Bilateral European relations</b>	Ifremer, Universities of Perpignan and Marseille (France), IPIMAR (Portugal), IEO and CSIC (Spain), NCMR (Greece), CEFAS (UK)

# THE NETHERLANDS







## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

The former specialisation on (salted) herring changed, after the ban on North Sea herring fishing in 1977-81, into bulk fishing on other pelagic species like mackerel and horse mackerel. Real turnover is lower than in preceding decades. This fleet remained specialised on demersal species, mostly flatfish. Production decreased in the last decade and real turnover shows the same trend. Production, mostly cockles, varied much but tends to decrease in recent years (fisheries and environment management). While the market increased in the 1980s, nowadays total turnover tend to decrease also.

Landings (in thousand tonnes)				
Species	1993	1994	1995	1996
Pelagic	311.3	267.0	299.0	314.0
Demersal	97.5	101.7	98.5	77.8
Crustaceans	7.8	8.6	11.1	11.0
Shellfish	7.8	7.3	5.0	0.9
<b>Total</b>	<b>424.4</b>	<b>384.6</b>	<b>413.6</b>	<b>403.7</b>

Landings (million EUR)						
Species	1991	1992	1993	1994	1995	1996
Pelagic	82	81	89	71	80	89
Demersal	310	270	253	256	249	243
Crustaceans	20	22	23	23	32	31
Shellfish	47	69	65	65	72	55
<b>Total</b>	<b>459</b>	<b>441</b>	<b>430</b>	<b>416</b>	<b>433</b>	<b>418</b>

#### 1.1.2. Trend in fleet

Sea fisheries in the Netherlands consist of the pelagic trawler sector (big companies, integrated with processing and trade), the demersal cutter sector (family owned enterprises) and the inshore fleet (cockle fishing and various inshore fisheries). The pelagic trawler fleet developed into a small number of big trawlers, fishing in EU waters and in third countries waters. The demersal cutter fleet, fishing in the North Sea, decreased in numbers, especially the medium-sized fleet. The number of small vessels, fishing inside the 12 mile zone, increased. The increase of the vessels of over 1470 kW turned into a gradual decrease after the ban on new vessels of this class in 1988. The fleet of the inshore sector decreased recently, mostly as a result of the management of cockle fishing, limiting their fishing opportunities for environmental reasons. The development of the fleets and crew were as follows:

	1991	1992	1993	1994	1995	1996
Fishermen	2 969	2 868	2 821	2 808	2 760	2 683
Number of vessels	586	565	563	553	540	526
Power (thousand kW)	455	447	448	447	445	434

### 1.1.3. Fishing harbours



## 1.2. Aquaculture sector

Marine aquaculture in the Netherlands comprises mussel culture and oyster culture. Mussel culture takes place at the Zeeland estuaries and the Wadden Sea. Oyster culture, being on a level far below that of some decades ago (diseases and delta works), is exercised in the Zeeland estuaries.

	Quantity (thousand tonnes)					
Species	1991	1992	1993	1994	1995	1996
Mussels	41	51	72.4	105.0	84.0	92.2
Oysters			0.6	0.5	0.5	0.45
<b>Total</b>	<b>41</b>	<b>51</b>	<b>73</b>	<b>105.5</b>	<b>84.5</b>	<b>92.7</b>

Production of mussels varied widely, mostly as a result of natural causes. Production of oysters declined.

	Value (million EUR)					
Species	1991	1992	1993	1994	1995	1996
Mussels	48	39	41	42	48	57
Oysters	5	3	4	4	3	3
<b>Total</b>	<b>53</b>	<b>41</b>	<b>45</b>	<b>45</b>	<b>51</b>	<b>60</b>

### **1.3. Processing industry sector**

The fish processing sector employs about 7 000 to 8 000 people. The output value amounts to about EUR 1 361.3 million. The sector has been stable in terms of production volume and output value. The industry produces mainly for international markets. The Netherlands are next to Denmark the second largest exporter of fish products in the EU. The industry relies more and more on imported raw materials. Given the small and stable domestic market, the import and export statistics indicate the developments of the processing sector. The processing sector is rather diverse regarding the raw materials used and the type of finished products. Main activities are processing of flat fish, sales of sea-frozen pelagic fish, processing of shellfish (mussels and cockles) and processing of herring and mackerel.

### **1.4. Consumption of sea products**

Total volume of the domestic market amounts to some 150 000 tonnes with an annual wholesale value of EUR 226.9 million. A considerable part is distributed by catering outlets. About 50 % of retail sales of all fish and shellfish products is sold by supermarkets. In the fresh fish market, the share of traditional fishmongers and open air markets is relatively large still. The home consumption of fish products has been monitored since 1995.

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

RIVO-DLO and LEI-DLO are the institutes involved with all the fishing aspects in the Netherlands. Effects of fisheries and the marine ecosystem as such are addressed to a number of other institutions. RIVO-DLO, LEI-DLO, ATO-DLO, ID-DLO and RIKILT-DLO are part of the DLO organisation of the Ministry of Agriculture, Nature Management and Fisheries. A sustainable and competitive fisheries sector, linked to responsible use and management of aquatic ecosystems is the main objective of the five DLO institutes involved in fisheries and aquatic ecosystem research. The DLO Netherlands Institute for Fisheries Research (RIVO-DLO) deals with all aspects. The main points in RIVO-DLO research are sustainable fishing systems, human and animal welfare, responsible management of aquatic ecosystems, safety on board ship, satisfactory working conditions, and the quality and hygiene of the product. Fisheries economics research is performed by the DLO Agricultural Economics Research Institute (LEI-DLO) in The Hague. The Fisheries Department of LEI-DLO carries out financial and bio-economic research on behalf of the fishing sector, and analyses, evaluates and supports Dutch, as well as European Union policy. Other institutions working in the area of marine research are NIOZ, NIOO-CEMO, OVB, RIKZ, TNO lab for applied marine research. They are also under the umbrella of the Ministry of Agriculture, Nature Management and Fisheries, the Ministry of Public Works and Water Management and/or other ministries.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
Main  Other research institutes	RIVO	110 (28 researchers)	110	7.26	7.26
	LEI	16 (10 researchers)	300	1.2	17.0
	ID-DLO	4 (1 researcher)	720	0.17	54.0
	NIOZ	270 (8 researchers)	270	0.29	5.44
	LUW	40 (12 researchers)	3 000	0.55	
	NIOO-CEMO	5 (2 researchers)	100 (40 researchers)	0.14	4.3
	OVB	18 (4 researchers)	50	1.1	6.0
	RIKILT-DLO	160 (40 researchers)	160		9
	RWS-RIKZ	80 (40 researchers)			5
	ATO-DLO	6	550		25
	TNO-Laboratory for Applied Marine Research	30 (12 researchers)			2.1

### 2.1.2. Supervisory Ministerial authority(ies)

Institutes	Authority(ies)			
	Ministry of Agriculture, Nature and Fisheries	Ministry of Public Works and Water Management	Education	Other (autonomous governments)
RIVO-DLO				
LEI-DLO				
ID-DLO				
NIOZ				
LUW				
NIOO-CEMO				
OVB				
RIKILT-DLO				
RWS-RIKZ				
ATO-DLO				
TNO-Lab.				

### 2.1.3. Coordination and relationship among the different research organisations and with research users

Cooperation is achieved with national research projects that are coordinated and financed by BEON (Ministry of Public Works and Water management), DWK van LNV. Within the DLO-organisation: close cooperation with colleague institutes working in the field of fisheries and/or environment: RIVO-ID-LEI-RIKILT-ATO-IBN and also with several universities (Delft, Wageningen, Nijmegen, Amsterdam etc.).

Netherlands Ministry of Agriculture, Nature Management and Fisheries.  
 Netherlands Ministry of Public Works and Water Management.  
 European Commission, mostly DG XIV, Fisheries.  
 International organisations in the field of development cooperation.  
 Industry, like professional organisations and Dutch Fish Commodities Board.

### 2.1.4. Participation to European networks

Since 1988 an increasing number of research projects regarding the European Union as a whole or of its members has been carried out. This research covers a wide range of issues: sector analysis (Spain, Germany, Atlantic, EU), assessment of EU support policies for aquaculture, international comparison of costs and earnings of fleets or bioeconomic modelling. Many of these projects are executed in collaboration with foreign research institutes.

A major activity carried out at the request of the European Commission in 1992 was the preparation of a Synthesis Report on the regional socioeconomic role of the fisheries sector in the European Union, based

on 21 separate regional studies. Other research includes international projects within FAIR, project contracts with the Union's DG XIV Fisheries, preparation of reports for a worldwide OECD study, coordination of EU Member States' reports in this study and efforts to establish an annual 'Economic Report' on EU fisheries.

Apart from regular direct contacts with DG XIV staff, the division's officers are occupied with advising the Directorate-General of Fisheries of the European Commission. This includes the membership of the STECF (Scientific, Technical and Economic Committee on Fisheries) and of a group of four senior fisheries economists as advisors to the Economics Directorate.

## **2.2. Main research institute: NETHERLANDS INSTITUTE FOR FISHERIES RESEARCH (RIVO-DLO)**

### **2.2.1. General information**

<i>Address</i>	RIVO-DLO Netherlands Institute for Fisheries Research Haringkade 1, Postbus 68 NL-1970 AB IJmuiden Tel. (31-255) 56 46 46. Fax (31-255) 56 46 44
<i>Date of creation</i>	1888
<i>Status and financial position</i>	Fisheries Research Centre  Dependence RIVO-DLO: Korringaweg 5, P.O. Box 77 NL-4400 AB Yerseke Tel. (31-113) 57 27 81. Fax (31-113) 57 34 77

*Location*



### **2.2.2. Detailed objectives and research programmes**

Much RIVO research is aimed at advising government on matters of fisheries policy and management of coastal areas and inland water bodies and at exploring new opportunities for industry. Together with its

sister institutes throughout Europe RIVO advises the Dutch Government and the European Union on the annual TAC (total allowable catch) and national and individual fishing quotas derived from them. In recent years industry, environmental protection organisations and many others increasingly turned up as clients. The turnover of RIVO-DLO is at present in the order of EUR 6.8 million annually, about half of it obtained from assignments through the Ministry of Agriculture, Nature Management and Fisheries and the other half through open competition in the research market.

#### Research activities

The Biological Research Department supports an ecologically and economically durable fishing industry through stock assessments and studies of the interaction of fishing with marine ecology. The department operates mainly internationally, in cooperation with like institutes in other European countries, the United States and Canada. The department advises government, the EU, fishermen and fishing companies on policy matters and stock management.

The Department of Environment, Quality and Food is primarily interested in factors that determine the quality of fish and fish products. Biologists, microbiologists and chemists analyse the level and composition of fats, proteins and minerals, contamination with micro-organisms and toxic algae and diseases in natural fish populations and in cultivated fish. Methods to identify processed fish as to species and origin have been developed and are employed for certification purposes on behalf of a great variety of clients. The department is internationally recognised as a reference laboratory for the analysis of complex organic micro-contaminants (such as PCBs and pesticides), heavy metals (mercury, cadmium, lead, copper) that may be present in fish, fish products, crustaceans and shellfish, water and sediments.

The Department of Aquaculture, headquartered at Yerseke, is responsible for assessment of natural stocks of shellfish in the estuary, the Wadden Sea and along the coast, the effects of shellfish fishing on the ecology of coastal waters, the production and processing of shellfish and also the monitoring of algae producing biotoxins.

The Department of Technology has been involved in lowering of propulsion and maintenance costs of fishing vessels (reduction of towing resistance of fishing equipment, fuel efficiency, etc.). New, more selective, fishing methods are being developed in cooperation with partner institutes throughout Europe. Engineers in the department, together with shipbuilders and fishing companies developed novel vessel designs, characterised by improved effectiveness, rentability, safety and working conditions aboard. Parts of these designs have been applied to existing fishing vessels and to newly built ones. RIVO-DLO engineers co-designed and employ a remotely operated vehicle (ROV) for observation underwater. The ROV is used from research vessels to observe fishing equipment in use, to observe the behaviour of fish and other creatures, such as dolphins, both close to and in the nets. The ROV also supports other uses, such as the needs of the offshore industry. It is standard equipped with very light-sensitive video cameras and a sonar installation, whereas other measuring apparatus can be fitted to the frame as desired. The ROV is connected to the mother ship by a towing and power cable of at least 2000 m and can be set at a high speed (2-7 kts) in the tow mode and at low speed (0-2 kts) in a self propelled mode.

The technology department also investigates intensive cultivation of fish such as eel, catfish and turbot. Present research does focus on the technical and economical optimisation of recirculation systems, oxygenation, biological filtration systems and of waste treatment and disposal. The department has extensive experience with development of systems for cultivation of shrimps and of fish in the tropics and subtropics.

The fish technology group of the Technology Department is engaged in optimisation of the use, storage and processing of fish, crustaceans and shellfish. The processing of subsidiary products and their upgrading to high-quality foods receives great attention, as is treatment of waste water. It is at present the most market driven section within RIVO-DLO. Part of its income is derived from licensing of its technology.



### 2.2.3. Facilities at sea

Two seagoing research vessels and two research vessels for inshore waters.

### 2.2.4. Scientific cooperation

<b>National</b>	LEI-DLO; RIKILT-DLO; IBN-DLO; ATO-DLO; ID-DLO; University of Amsterdam; University of Wageningen; University of Delft
<b>Bilateral European relations</b>	EU-framework research programmes (I-IV)
<b>European networks</b>	WETA; WEGEMT
<b>Africa</b>	Mauretania
<b>Asia</b>	MOU-China
<b>America</b>	Network via ICES
<b>International organisations</b>	International Council for the Exploration of the Sea (ICES); Central-Eastern Committee for Atlantic Fisheries (CECAF); Scientific, Technical and Economic Committee for Fisheries (STECF); Convention for the Protection of the Marine Environment of the North-Eastern Atlantic (OSPAR); International Whale Commission (IWC); West European Fisheries Technologists Ass. (WEFTA); West European Graduate Education Marine Technology (WEGEMT); European Inland Fisheries Advisory Committee of FAO (EIFAC)

## 2.3. Other research organisations

**Name:** AGRICULTURAL ECONOMICS RESEARCH INSTITUTE — FISHERIES DIVISION (LEI-DLO)

### 1. General information

<i>Address</i>	LEI-DLO Burgermeester Patijnlaan 19 2585 Be Den Haag, The Netherlands Tel. (31-70) 330 83 30. Fax (31-70) 361 56 24 E-mail: postmaster@lei.dlo.nl
<i>Date of creation</i>	1940
<i>Status and financial position</i>	Research institute

### 2. Detailed objectives and research programmes

#### Objectives

The Fisheries Division of LEI-DLO executes economic, social and management research in the field of fisheries, aquaculture and the fisheries trade and processing sector.

#### Research activities

— Financial research: collection and analysis of costs and earnings data of Dutch fishing fleet, investment feasibility studies.

- Techno- and bioeconomics: multidisciplinary assessment of vessel and fish stock economics.
- Market research: market analysis by country and by product.
- Trade promotion: publication of market data, preparation of promotion campaigns, supervision of presentations at trade fairs.
- Sector analysis: comprehensive studies of the fishing sector and its segments.
- Fisheries policy: evaluation of economic consequences of policy measures.
- Aquaculture: assessment of the financial feasibility of new technological developments or of specific investment projects.
- European Union: studies into EU wide issues, often in cooperation with foreign partners.
- Fisheries development: missions to developing countries regarding fisheries policy, sector, investment or market analysis.

### 3. Scientific cooperation

<b>National</b>	RIVO-DLO; IBN-DLO; University of Leyden; University of Utrecht; University of Rotterdam; RIKS
<b>Bilateral European relations</b>	DIFER / Univ., of South Jutland (Denmark); Univ. of Vigo (Spain); GEM/Univ. of Barcelona (Spain); Univ. of Sevilla (Spain); Univ. of Iceland; Norwegian College of Fisheries Science (Norway); Univ. of Dundee (UK); Univ. of Montpellier (France); NTNU (Norway); Cardiff Law School (UK); Cemare/Univ. of Portsmouth (UK); Scottish Agricultural College (UK); Seafish Industry Authority (UK); Ifremer (France); IREPA (Italy); ESRI (Ireland); FGFRI (Finland); IFM (Denmark); HR Wallingford (UK); INHA (Spain); Marine Data Centre/FRC (Ireland); Nat. Inst. for Social Research (Greece); Difres (Denmark); OGS.DOGA (Italy); BFAL.ILM (Germany); BFAF.IF (Germany); Fiskeriverket (Sweden); Nautilus Consult (UK); EPB Consult. (Po); Marfish (Greece); Cofrepeche (France); Megapesca (Po)
<b>European networks</b>	EAFE
<b>International organisations</b>	European Association of Fisheries Economists (EAFE); International Institute of Fisheries Economics and Trade (IIFET)

**Name:** ID-DLO (DLO — INSTITUTE FOR ANIMAL SCIENCE AND HEALTH) — DEPARTMENT OF PATHOBIOLOGY AND EPIDEMIOLOGY — LABORATORY OF FISH DISEASES

#### 1. General information

**Address** ID-DLO  
PO Box 65  
NL — 8200 AB Lelystad  
Tel. (31-32) 23 82 38. Fax (31-32) 23 80 50

**Date of creation** 1994

**Status and financial position** Research Centre — Government department

#### 2. Detailed objectives and research programmes

##### Objectives

The section fish diseases is mainly focussing on diagnostic work as well as the development of fish virological, bacteriological and certification work.

Diagnostic of fish diseases as a support to veterinarians and fishfarmers. Certification of fish farms and fish related to import and export of live freshwater fish.

Research on fish diseases based on problems out of daily practice.

Research activities

Fisheries management.

Environmental problems and their impact on resources.

Aquaculture.

Diseases, immunology, stress, diagnostics, prophylaxis.

### 3. Facilities at sea

Research vessel.

### 4. Scientific cooperation

<b>National</b>	Wageningen Agricultural University; University of Utrecht (veterinary department)
<b>Bilateral</b>	Many research institutes working on animal and veterinary sciences
<b>European relations</b>	
<b>European networks</b>	Many research institutes working on animal and veterinary sciences

## Name: NETHERLANDS INSTITUTE FOR SEA RESEARCH (NIOZ)

### 1. General information

Address NIOZ  
PO Box 59  
NL-1790 AB Den Burg (Texel)  
Tel. (31-222) 693 00. Fax (31-222) 196 74

Status and financial position Research centre

### 2. Detailed objectives and research programmes

Objectives

Impact of fishing activities (beam trawl) on the marine ecosystem (including seabirds) and benthos specifically (*Arctica islandica*). Survival of bycatch of the commercial fisheries. Importance of the Wadden Sea for the flatfish stocks in the North Sea.

Research activities

Fisheries management; Stock assessment; Impact of fisheries on the marine ecosystem and seabird populations.

### 3. Facilities at sea

Research vessels.

**Name: AGRICULTURAL UNIVERSITY OF WAGENINGEN — FISH CULTURE AND FISHERIES****1. General information**

<i>Address</i>	LUW Postbus 338 6700 AH Wageningen The Netherlands Tel. (31-317) 48 33 07. Fax (31-317). 48 39 37 E-mail: office@alg.venv.wau.nl
<i>Date of creation</i>	1975
<i>Status and financial position</i>	Unit of University Department/Higher Education Institute

**2. Detailed objectives and research programmes***Objectives*

University training in the fields of fish culture and fisheries. Specialisation in either fish culture or fisheries is possible. Degrees offered are Ir. (Dutch engineer title), M.Sc. (Master in Sciences) and Dr (Doctor in Agricultural and Environmental Sciences; equivalent to Ph.D.).

*Research activities*

Fisheries management: Stock management; Multi-species biological models; Multi-disciplinary approach to fisheries management.

Fishing techniques: Selective gears.

Aquaculture: Nutrition and growth; Larval nutrition; Aquatic animal health; Reproduction and genetics; Aquaculture systems research.

**3. Scientific cooperation**

<b>National</b>	Environmental Technology Group (WAU-WUR); Cell Biology and Immunology Group (WAU-WUR); Animal Nutrition Group (WAU-WUR); Animal Breeding Group (WAU-WUR); Theoretical Production Ecology Group (WAU-WUR); Institute for Fisheries Research (ID-DLO; WUR); Netherlands Institute for Ecological Research (NIOO-LI); State Institute for Water Research (RIZA-RWS); University of Leiden
<b>Bilateral European relations</b>	University of Gent (Belgium); Catholic University of Leuven (Belgium); University of Bergen (Norway); University of Algarve (Portugal); University of Aberdeen (UK); University of Stirling (UK); INRA-Ifremer Unite de Nutrition de Poissons (France); Technion (Israel); Agricultural University of Debrecen (H)
<b>European networks</b>	AquaFlow (FAIR-Network — EU-DG12); AquaTNET (Socrates Thematic Network); Tempus Project INCOFit; INCO Project OrganicPOND (DG12); INCO Project Peryphyton (DG12)
<b>Africa</b>	Asmara University (Eritrea)
<b>Asia</b>	Mangalore University (India); Agricultural University (Bangladesh); AIT (Thailand); Brawijaya University, Malang (Indonesia)
<b>America</b>	Universidad Nacional (Costa Rica); CIAD-Mazatlan (Mexico); Universidad de Antioquia (Colombia)

**International organisations** ICLARM (The Philippines); IFS (Sweden)

**Name:** NETHERLANDS INSTITUTE OF ECOLOGY — CENTRE FOR ESTUARINE AND COASTAL ECOLOGY (NIOO-CEMO)

**1. General information**

*Address* NIOO-CEMO  
Korringaweg 7  
NL-4401 NT Yerseke  
Tel. (31-113) 57 73 00. Fax (31-113) 57 36 16  
E-mail: cemo@cemo.nioo.knaw.nl

*Date of creation* 1992

*Status and financial position* Research centre

**2. Detailed objectives and research programmes**

Objectives

Fundamental and applied ecological research in estuarine and coastal areas worldwide.

Research activities

Research projects: Impact of beamtrawl fisheries on benthos; Impact of shellfish fisheries on benthos.

Fisheries management: Stock assessment; Environmental problems and their impact on resources.

**3. Facilities at sea**

Research vessel.

**Name:** ORGANISATION FOR THE IMPROVEMENT OF INLAND FISHERIES (OVB)

**1. General information**

*Address* OVB  
PO Box 433  
NL — 3430 AK Nieuwegein  
Tel. (31-30) 605 84 11. Fax (31-030) 603 98 74  
E-mail: binvis@ovb.nl

*Status and financial position* Education and extension service on fisheries management

**2. Detailed objectives and research programmes**

Objectives

Practice-oriented research in fisheries management, stock assessment and welfare of fish.

Research activities

Major research projects: Restoration of salmonids in Dutch waters; Biomanipulation studies (effects of depletion of fisheries, effects of benthivorous fish, effects of 0+ cyprinids, bioregulation of 0+ cyprinids, with northern pike and pike perch); Optimisation of research fisheries; Habitat evaluation programme — application hydro acoustics in stock assessment and migration studies; Development of fisheries management plans.

Fisheries management: Stock assessment; Multi-species biological models; Environmental problems and their impact on resources; Fishing techniques; Fish migration; Welfare of fish.

Aquaculture: Early stages of reared species; Upgrading of fishery products; Improvement of techniques for handling, storing, processing, packaging fish.

### 3. Scientific cooperation

<b>National</b>	RIVO; IBN-DLO; ID-DLO; RIZA; Local water authorities; Regional water authorities
<b>Bilateral European relations</b>	International Commission Protection of the Meuse (ICBM); International Rhine Commission (IRC); Benelux Economic Union)
<b>European networks</b>	EIFAC; IFM
<b>America</b>	American Fisheries Society
<b>International organisations</b>	FAO

**Name:** STATE INSTITUTE FOR QUALITY CONTROL OF AGRICULTURAL PRODUCTS (RIKILT-DLO)

#### 1. General information

*Address* Rikilt-DLO  
PO Box 230  
NL — 6700 AE Wageningen  
Tel. (31-317) 47 54 00. — Fax (31-317) 41 77 17

*Status and financial position* Research and quality control centre

#### 2. Detailed objectives and research programmes

*Objectives*

Fundamental and applied research focused on the advancement of safe food production and food products.

*Research activities*

Fish quality control is one item in a wide range of Rikilt-DLO research topics.

The main tasks of the Institute are:

- Fundamental and applied research on food quality and safety.
- Acting as a supervising and reference laboratory for the inspection of the quality and safety of agricultural products.
- Support to the legal inspection under the responsibility of the Ministry of Agriculture, Nature Management and Fishery.

**Name: NATIONAL INSTITUTE FOR COASTAL AND MARINE MANAGEMENT (RWS-RIKZ)**

**1. General information**

*Address* RWS-RIKZ  
Kortenaerkade 1  
PO Box 20907  
NL-2500 EX Den Haag  
Tel. (31-70) 311 43 11. Fax (31-70) 311 43 21  
E-mail: library@rikz.rws.minvenw.nl

*Status and financial position* Consultancy and research centre — Government department

**2. Detailed objectives and research programmes**

*Objectives*

As part of Rijkswaterstaat (Directorate-General of Public Works and Water Management), the National Institute for Coastal and Marine Management provides advice and information on:

- the sustainable use of estuaries, coasts and seas;
- coastal flood protection.

*Research activities*

Integrated water management.

Coastal flood protection.

Fisheries management: Effects of fisheries on the ecosystem; Impact of environmental factors on resources.

**Name: AGROTECHNOLOGICAL RESEARCH INSTITUTE (ATO-DLO)**

**1. General information**

*Address* ATO-DLO  
Bornsesteeg 59  
P.O. Box 17  
NL-6700 AA Wageningen  
Tel. (31-317) 47 50 00. Fax (31-317) 47 53 47

*Date of creation* 1989

*Status and financial position* Research and development organisation

**2. Detailed objectives and research programmes**

*Research activities*

Fundamental and applied research focussed on:

- processing technology
- process development and optimisation
- production and distribution management
- storage and transportation
- packaging research
- valorisation of wastes.

### 3. Scientific cooperation

<b>National</b>	All technical Universities in the Netherlands, TNO
<b>International organisations</b>	ca. 50 foreign universities USDA; BBSRC; INRA; Makfisk; VTT; IFR; SIK; BFE

#### Name: TNO-LABORATORY FOR APPLIED MARINE RESEARCH

##### 1. General information

Address TNO  
Ambachtsweg 8a, PO Box 57  
NL-1780 AB Den Helder  
Tel. (31-223) 63 88 00. Fax (31-223) 63 88 12  
E-mail: lamp@mep.tno.nl  
Internet: www.tno.nl/er

Status and financial position Research centre

##### 2. Detailed objectives and research programmes

###### Objectives

The TNO-Laboratory for Applied Marine Research in Den Helder is part of the Netherlands Organisation for Applied Scientific Research TNO, an independent organisation. Research is directed towards solving practical problems, and is commissioned by government, industry and overseas organisations. The laboratory in Den Helder is specialised in environmental and materials research related to marine conditions.

###### Research activities

The laboratory possesses extensive facilities to study the corrosion and fouling of materials in the marine environment, and to test or develop corrosion prevention and antifouling systems.

The environmental research includes field studies; field experimentation (1-75 cubic meter mesocosms); indoor experimentation (seawater supplies) and ecological risk evaluation.

The laboratory is also involved in environmental monitoring of mariculture operations.

Fisheries management: Eco-toxicological risk analysis models; Environmental water quality problems and their impact on resources; Plankton production studies; Evaluation of ecological impacts of shellfisheries.

Aquaculture: Aquaculture/environment interaction (off-bottom mussel cultures; cod); Techniques of materials prevention from fouling and corrosion; Eco-toxicological risk assessment biocides (antibiotica).

##### 3. Facilities at sea

Research vessel.





# NORWAY





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

The total Norwegian catch, including seaweed, in 1997 reached 3.0 million tonnes. This is a 7% increase compared to the 2.8 million tonnes in 1996. Total catch of pelagic species increased by 14.4 %, while total catch of gadoid species decreased by 0.4 % from 1996 to 1997. First-hand value increased by 3.4 %, from EUR 996.4 million in 1996 to EUR 1045.2 million in 1997. The first-hand value of pelagic species increased by 10.8 % due to higher catches of species like herring, blue whiting, and capelin, as well as higher prices of herring and mackerel. The prices of the main groundfish species and shellfish were, on the other hand, reduced by approximately 10 % and 13 % respectively.

Species	Landings (1 000 tonnes)						
	1991	1992	1993	1994	1995	1996	1997
Herring, sprat	233	260	399	594	728	822	923
Mackerel	179	207	224	260	202	137	137
Capelin	576	810	530	113	27	208	158
Sand eel, blue whiting, etc.	385	411	404	486	643	620	746
Horse mackerel	53	108	128	95	95	96	46
Cod	164	219	275	374	365	358	401
Saithe	140	168	188	189	219	222	184
Haddock	25	40	44	74	80	97	106
Tusk	27	26	27	20	19	19	14
Lind, blue ling	23	22	20	19	19	19	16
Redfish	56	39	33	29	22	28	22
Greenland halibut	15	14	14	13	14	17	12
Shrimp	49	49	49	38	39	41	42
Shellfish	7	7	10	8	7	0.1	0.2
Other species	55	54	67	54	35	34	39
<b>Total</b>	<b>2 007</b>	<b>2 430</b>	<b>2 415</b>	<b>2 366</b>	<b>2 516</b>	<b>2 638</b>	<b>2 854</b>

Landings (million EUR)							
Species	1991	1992	1993	1994	1995	1996	1997
Herring, sprat	45.8	43.3	58.1	91.0	117.7	175.1	182.8
Mackerel	60.2	45.8	61.7	72.6	78.0	122.0	127.4
Capelin	34.7	48.2	33.3	7.2	1.8	13.5	13.8
Sand eel, blue whiting, etc.	26.0	28.0	25.1	34.1	47.4	43.1	64.5
Horse mackerel	4.3	8.64	10.3	8.8	11.0	4.4	8.5
Cod	185.2	214.5	226.7	319.7	321.5	288.5	326.0
Saithe	66.5	67.3	66.8	72.1	102.4	94.7	80.6
Haddock	21.9	32.4	28.9	49.4	50.5	56.5	69.7
Tusk	20.4	17.0	18.2	14.4	14.8	14.9	9.7
Lind, blue ling	27.7	24.3	21.8	23.1	23.0	21.0	16.4
Redfish	23.7	18.3	14.5	14.3	12.6	17.3	14.2
Greenland halibut	40.3	13.6	20.7	20.8	25.2	31.5	22.0
Shrimp	76.9	73.4	69.3	72.3	89.5	73.8	70.9
Shellfish	4.7	4.4	5.9	5.9	5.9	4.1	0.06
Other species	45.1	60.8	57.5	50.0	35.1	36.0	38.6
<b>Total</b>	<b>683.4</b>	<b>700.4</b>	<b>718.8</b>	<b>855.7</b>	<b>936.4</b>	<b>996.4</b>	<b>1045.2</b>

### 1.1.2. Trends in fleet

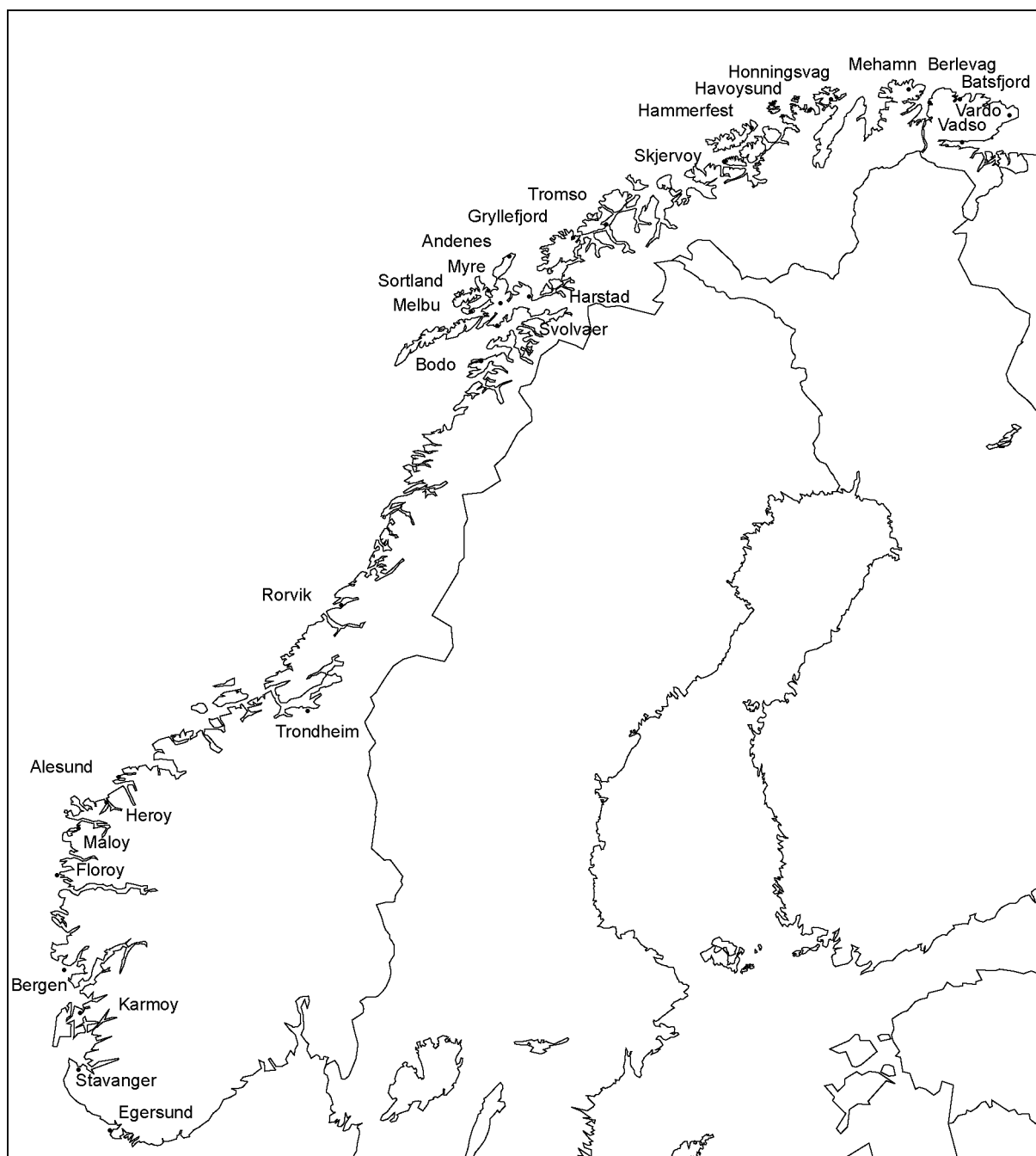
At the end of 1997 a total of 13 645 fishing vessels (8 859 covered and 5 086 open vessels) were registered in Norway. Not all registered vessels are used for fishing throughout the year.

	1990	1991	1992	1993	1994	1995	1996	1997
Fishermen <sup>(1)</sup>	20 475	20 003	19 765	19 068	16 442	17 160	17 087	16 661
Number of vessels	17 392	17 236	17 069	16 402	15 211	14 194	13 940	13 645

<sup>(1)</sup> sole or main occupation.

### 1.1.3. Fishing harbours

In Norway the expanding and maintaining of fishing ports, in order to improve conditions for the fishing industry, is a matter of public policy. The explosion in fishing ports began in the second half of the 19th century, and some 750 fishing port facilities have now been built under public administration. Of these, approximately 450 are actively operating today. The map gives an overview of 28 of the most important fishing harbours at the Norwegian coast.



## 1.2. Aquaculture sector

Aquaculture production is growing steadily, reaching a total of 366 300 tonnes in 1997. In order to contribute to stabilising the market and the prices of salmon in the European market, the Norwegian Ministry of Fisheries decided to introduce feed quotas in the salmon farming industry in 1996. As a result the growth rate in the production of salmon was reduced from approximately 30 % as in recent years to about 11 % in 1996. Production of rainbow trout increased from 23 000 tonnes to about 34 000 tonnes in the period. First hand value of the production of salmon and rainbow trout is estimated to EUR 842.7 million in 1997. This is a 12 % increase compared to 1996.

Quantity (1 000 tonnes)								
Species	1990	1991	1992	1993	1994	1995	1996	1997
Atlantic salmon	145.9		124.1	155.6	202.40	261.50	297.50	331.40
Trout	3.8		6.9	8.3	14.40	14.70	22.90	33.50
Cod					0.56	0.29	0.20	0.31
Char					0.24	0.29	0.20	0.34
Halibut					0.06	0.13	0.14	0.11
Mussels					0.54	0.39	0.18	0.50
Oysters (1 000 pieces)					1085	325	526	147
Scallops (1 000 pieces)					14	206	92	159
Other					0.22	0.31	0.29	0.16
<b>Total</b>	<b>149.7</b>		<b>131.0</b>	<b>155.9</b>	<b>218.4</b>	<b>277.6</b>	<b>231.4</b>	<b>366.3</b>

Value (million EUR)								
Species	1990	1991	1992	1993	1994	1995	1996	1997
Atlantic salmon	539.7		427.2	494.5	647.2	701.3	679.1	770.5
Trout	10.2		18.6	23.3	39.3	41.5	54.9	72.2
<b>Total</b>	<b>549.9</b>		<b>445.8</b>	<b>517.8</b>	<b>686.5</b>	<b>742.8</b>	<b>734</b>	<b>842.7</b>

### **1.3. Processing industry sector**

A characteristic feature of the Norwegian fish processing industry is the large number of small and medium-sized enterprises spread along the coast. In order to preserve its international competitiveness, the industry is continuously introducing measures to enhance efficiency. Many businesses have made considerable investments in modern equipment and facilities, quality assurance, skills upgrading and marketing. The industry has also seen increasing supplies of fish from Norwegian and international fleets and from the fish-farming industry. The potential of the industry has attracted financially strong investors usually operating outside the fishing industry. It is expected that this increased access to capital will enable the industry to preserve and develop its position as a principal supplier of top grade fish products, which are in demand in markets around the world.

### **1.4. Consumption of sea products**

Approximately 90 % of the total quantity of fish landed and farmed in Norway is exported, while 10 % is sold on the domestic market. In 1997 the total exports of fish and fish products amounted to 2 million tonnes, which represents a value of EUR 2 825 million.

## 2. Research organisation scheme

### 2.1. National research organisations

Fisheries research in Norway is conducted in both public and private sector, although publicly funded research activity constitutes by far the greater part, amounting to approximately 90 % of the total budget of fisheries research.

#### 2.1.1. Research institutes involved in fishery sectors

The main fisheries research institute in Norway is the Institute of Marine Research (IMR) in Bergen. IMR is an underlying institute of the Ministry of Fisheries and is concerned with investigations of coastal and sea environment, fish stocks and other marine organisms, as well as aquaculture industry. Other research institutes within public sector are Institute of Fisheries and Aquaculture (NIFA), Institute of Nutrition under the Directorate of Fisheries (INDF), College of Fisheries Science (NFH) and Department of Fisheries and Marine Biology (IFM) at the University of Bergen (UoB). In addition there are several independent technical-industrial institutes within fisheries sector which partly are funded by Government and partly by industry. This presentation gives an account of four of them: Akvaforsk, Sintef Fisheries and Aquaculture, Norconserv and the Norwegian Herring Oil and Meal Research Institute (SSF). All research institutes listed in the table below serve both public and private sector.

Status for 1998	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
Main	IMR	400	462	38.235	42.538
		(122 researchers)		(salary mass not included)	(salary mass included)
Other research institutes	NIFA	96 (62 researchers)	120	4.826	9.405
	INDF	44 (18 researchers)	48	2.406	3.249
	NFH	110 (90 researchers)	180	4.869	9.256
	IFM/UoB	75 (60 researchers)	85	1.653	4.670
	AKVAFORSK	63 (37 researchers)	83	2.730	5.714
	SINTEF	34	37	1.5	3.5
	NORCONSERV	28	50	1.837	2.871
	SSF	27 (14 researchers)	62	1.952	4.593



### 2.1.2. Supervisory Ministerial authorities

The main part of the fisheries research funds from public sector stems from the Ministry of Fisheries. The Ministry of Education, Research and Church Affairs also allocates funds to fisheries scientific activity undertaken at universities and colleges. Also other ministries are to some extent involved in fisheries research investments, mainly through the Research Council of Norway.

Institutes	Authorities	
	Ministry of Fisheries	Ministry of Education, Research and Church Affairs
IMR		
NIFA		
INDR		
NFH		
IFM		

IMR and INDR, being parts of the organisational structure of the Ministry of Fisheries, are directly supervised by the Ministry. NIFA, being a joint-stock company partly owned by the Ministry of Fisheries, is also to a certain extent subject to governmental supervision. NFH and IFM are wholly supervised by the Ministry of Education, Research and Church Affairs, which is the governmental body responsible for all basic research in Norway (also research related to marine sector), which for most part takes place at universities and colleges.

#### Ministry of Fisheries

Fisheries research has been priority budget item for the Government for many years, and the Ministry of Fisheries allocates a relatively large portion of its budget to R & D (approximately 30 % in 1998) compared to other ministries. A total of EUR 66 million were appropriated for fisheries research in 1998. Funding of fisheries research is granted directly to the IMR, the NIFA, and the INDR. A considerable amount of money for fisheries research purposes is channelled through the Research Council of Norway.

#### Research Council of Norway

The Research Council of Norway is a national body for research strategies. Its purpose is to aggregate general knowledge and to contribute to society's research needs through promoting basic and applied research in all important fields of both public and private sector. Research on agriculture and fisheries, and on the industries based on their products, is organised by the Bioproduction and Processing Division. The Research Council acts as an advisory body to the Ministry of Fisheries on issues concerning fisheries research.

### 2.1.3. Coordination and relationship among the different research organisations and with research users

The Ministry of Fisheries and the National Research Council, being the main public financing bodies of fisheries research, play a decisive role in the coordination of the scientific activity. Both bodies have key roles in the formulation of Norway's research policy, its implementation, as well as in the distribution of research funding to fisheries sector. The Ministry of Fisheries transfers a substantial part of the total funding channelled through the Bioproduction of Processing Division of the Research Council, whereas both bodies allocate funds to the basic budgets of research institutes. Close coordination between the two agencies in policy formulation, implementation, and funding processes is necessary to achieve the goals of fisheries research.

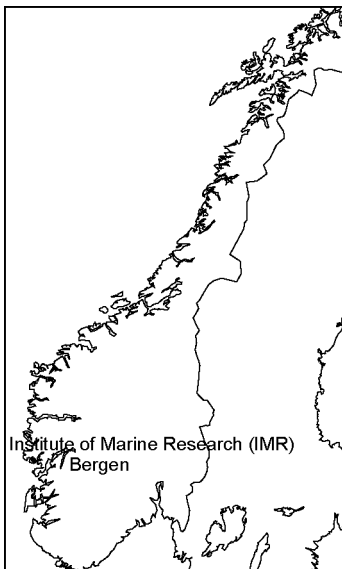
The Research Council is directly involved in the financing of research programmes and research projects. In the process of allocation of funds, directions are given regarding scientific cooperation among the research institutes. Cooperation among the research institutes is mainly achieved through collaborative projects funded by the Ministry of Fisheries, the Research Council and/or industry. Through participation in organisational meetings and committees of research users, a close relationship between research institutions and users is achieved.

#### 2.1.4. Participation to European networks

Norwegian research institutes within fisheries and aquaculture sectors are actively involved in various EU-research programmes.

## 2.2. Main research institute: **INSTITUTE OF MARINE RESEARCH (IMR)**

### 2.2.1. General information

<i>Address</i>	Institute of Marine Research Nordnesgaten 50, PO Box 1870 Nordnes, N-5024 Bergen, Norway Tel. (47) 55 23 85 00. Fax (47) 55 23 85 31 Internet home page: <a href="http://www.imr.no/">http://www.imr.no/</a>
<i>Date of creation</i>	1900
<i>Status and financial position</i>	The Institute of Marine Research in Bergen is for the most part funded directly by the Ministry of Fisheries  Austevoll Aquaculture Research Station N-5392 Storebø Tel. (47) 56 18 03 42. Fax (47) 56 18 03 98 Matre Aquaculture Research Station N-5198 Matredal Tel. (47) 56 36 60 40. Fax (47) 56 36 61 43 Flødevigen Marine Research Station N-4817 His Tel. (47) 37 05 90 00. Fax (47) 37 05 90 01
<i>Location</i>	

### 2.2.2. Detailed objectives and research programmes

The Institute of Marine Research in Bergen is chiefly concerned with investigations of coastal and sea environment, fish stocks and other marine organisms, as well as aquaculture industry. The institute is organised in three operational research centres: The Marine Environment Centre, the Marine Resource Centre, and the Aquaculture Centre. The institute has advisory functions to the Ministry of Fisheries on matters relating to the management of fisheries stocks, aquaculture, and marine environment.

#### Objectives

To explore and survey life, environment and interaction between the various living organisms in the sea and coastal areas; to generate new and up-to-date scientific knowledge on marine resources of crucial importance for fisheries and aquaculture; to develop technology and a scientific foundation for a rational and future oriented fisheries and aquaculture industry; to be an advisory body for the fisheries authorities and industry in order to promote a sustainable management of the seas and marine resources; to convey scientific results for the promotion of fisheries, aquaculture and other societal interests.

#### Research activities

Research programmes covering activities repeated every year:

- *Resource monitoring and management advice:* Through monitoring and management advice for the development of the most important species, this programme shall create the basis for a sustainable management of Norwegian marine resources.
- *Environmental monitoring and management advice:* The results from this programme shall contribute to a sustainable management of the marine environment and the living marine resources.
- *Aquaculture and management advice:* The aim of this programme is to produce material for research and keep operative lines for salmonids, halibut, king scallop and cod to maintain an updated basis for aquaculture.

#### Research programmes:

- *Resources and environment in the coastal zone:* The aim here is to bring forward knowledge about the marine environment and biological resources as a basis for a total sustainable management of the coastal zone with optimal benefits and minimum conflicts of interests.
- *Ecosystem Nordic Seas (Mare Cognitum):* The overall aim of this programme is to identify the most important factors and mechanisms that cause variability in the Nordic Seas.
- *Reproduction and recruitment:* To improve assessment methods for fish stocks by bringing forward more knowledge about the processes regulating reproduction and recruitment.
- *Population dynamics and multispecies modelling:* To explain and calculate how the physical and biological environment impact upon the development of fish stocks and the catchable marine biological production.
- *Sampling and survey design:* Covers all scientific work regarding the improvement of methods for direct monitoring of fish abundance.
- *Responsible fishing:* This programme is first and foremost directed to the harvesting of resources.
- *Young fish rearing:* The aim is to develop intensive methods for producing marine juveniles all year around and to expand this to a large-scale production.

- *Aquaculture — environment, growth and sexual maturation:* Development of sustainable and economic rational production methods for farmed fish with high quality food as a final product.
- *Biological diversity of the marine environment:* The purpose is to study the effects of marine exploitation on biological diversity in the sea.
- *Marine pollution:* The purpose is to survey environmental strain and study the effects of marine pollution on coastal and marine areas to be able to document the impacts of pollution on environmental quality and living conditions of fish.
- *Fisheries research in developing countries:* This programme shall contribute to a sustainable use of the living marine resources in the countries with which the institute cooperates.
- *Fish health and biotechnology:* The aim is among other things to work for preventing fish diseases, develop vaccines and strategies for vaccination, study viral diseases of marine species and develop methods that might solve the problems with salmon lice.

### 2.2.3. Facilities at sea

Three ocean going research vessels: *G.O. Sars*, *Michael Sars*, *Johan Hjort*.

Two smaller research vessels: *G. M. Dannevig*, *Fjordfangst*.

Management of the research vessel *Dr Fridtjof Nansen* (owned by NORAD).

### 2.2.4. Scientific cooperation

<b>National</b>	Norwegian Institute of Fisheries and Aquaculture; Directorate of Fisheries; University of Bergen; University of Tromsø; University of Oslo; Institute of Aquaculture Research; College of Veterinary Medicine; Agricultural University of Norway; SINTEF; OCEANOR; NINA; NIVA; Directorate of Natural Management; Pollution Control Authorities; Ministry of the Environment; Ministry of Fisheries; Other Ministries; Research Council of Norway
<b>Bilateral European relations</b>	MRI (Iceland); MAR LAB (UK); PINRO (Russia); University of Moscow (Russia); VNIRO (Russia); DFHU (Denmark); Grønlands fiskeriundersøkelser; University of Sterling; Queens University of Belfast; Aristotle University of Thessaloniki (Greece); Shellfish Research Laboratory, National University of Ireland; Ifremer (France); Havsfiskelaboratoriet, (Sweden); Finnish Institute of Marine Research (Finland); CEFAS (UK); IRSA (Ispra, Italy); Institute Espanol de Oceanografia (Spain); Institute of Marine Biology (Greece); University of Porto (Portugal); University of Lisbon (Portugal); Institute für Meeresforschung (Germany); Federal Research Centre for Fisheries (Germany); RIVO (The Netherlands)
<b>European networks</b>	EFAN; PARS
<b>Africa</b>	Ministry of Fisheries and Marine Resources (Windhoek, Namibia); National Marine Information and Research Centre (Swakopmund, Namibia); National Directorate of Fisheries, DNP (Mozambique); Fisheries Research Institute, IIP (Maputo, Mozambique); Department of Environmental Affairs and Tourism, (Pretoria, South Africa); Chief Directorate: Sea Fisheries (including Sea Fisheries Research Institute; Cape

	Town, South Africa); Ministry of Fisheries, Fisheries Research Institute, IIP (Angola); Nation Centre for Oceanographic and Fisheries Research, CNROP, Nouadhibou, Mauritania
<b>Asia</b>	ICLARM, (Philippines); Yellow Sea Fisheries Institute (China); East China Fisheries Research Institute (China); South China Fisheries Research Institute (China); Chinese Academy of Fisheries Science (China); Faculty of Fisheries (Japan); Korean Ocean Research & Development Institute (Korea); Fishery Survey of India (India); Fisheries Research Institute (Bangladesh); RIMP (Vietnam); Research Institute for Aquaculture No 1 (Vietnam); Research and Development Centre for Oceanology, Indonesian Institute of Science (Indonesia)
<b>America</b>	NOAA (USA); WHOI (USA); Narragasset Laboratory (USA); Northwest Atlantic Fisheries Centre (Canada); Alaska Fisheries Science Centre (USA); UNDP (USA); Instituto Nacional de la Pesca (Mexico); IFP (Chile); Peruvian Maritime Institute (Peru)
<b>Oceania</b>	CSIRO (Tasmania)
<b>International organisations</b>	CCAMLR; IWC; FAO; ICES; NEAFC; NAFO; NASCO; Nordic Council of Ministers; EEA; OSPAR; AMAP; Helcom

## 2.3. Other research organisations

**Name:** NORWEGIAN INSTITUTE OF FISHERIES AND AQUACULTURE LTD (NIFA)

### 1. General information

<i>Address</i>	Norwegian Institute of Fisheries and Aquaculture Ltd. N-9291 Tromsø, Norway Tel. (47) 77 62 90 00. Fax (47) 77 62 91 00 E-mail: fiskforsk@norut.no Internet home page: <a href="http://www.fiskforsk.norut.no/">http://www.fiskforsk.norut.no/</a>
<i>Date of creation</i>	1973
<i>Status and financial position</i>	The institute is one of five research companies within the NORUT Group Ltd

### 2. Detailed objectives and research programmes

The Norwegian Institute of Fisheries and Aquaculture (NIFA) performs research and development for the fisheries and aquaculture industry.

Objectives

- to conduct research and development for the fisheries and aquaculture industry in Norway;
- to promote and distribute knowledge to the industry and the general public;
- to advise the authorities concerning various fisheries related matters.

The institute covers all main aspects of the fisheries and aquaculture industry – 'from sea bottom to table top'. Its research profile is characterised by an interdisciplinary approach and an ability to solve applied tasks, both within specific fields and across different sectors.

NIFA is organised into five research centres:

- Economics and marketing
- Industrial processing
- Marine biotechnology
- Aquaculture
- Marine resources.

Research activities

- Centre of Economics and Marketing

Priority areas: Market trends, product development, and industrial and commercial development.

- Centre of Industrial Processing

Priority areas: Basic characteristics of marine raw materials, new production methods and products, tools for product and process supervision, and traceability, ethics and hygiene.

- Centre of Marine Biotechnology

Priority areas: Fish health, and biochemical compounds from marine raw materials.

- Centre of Aquaculture

Priority areas: Optimising of salmon farming, new aquaculture organisms and aquaculture concepts, and experimental fisheries biology.

- Centre of Marine resources

Priority areas: Research on shellfish, sea mammals, coastal resources, and flatfish.

### 3. Facilities at sea

The research vessel *Jan Mayen* (in cooperation with the University of Tromsø/College of Fisheries Science).

### 4. Scientific cooperation

<b>National</b>	IMR: Institute of Marine Research; SINTEF; MATFORSK; University of Tromsø/College of Fisheries Science; College of Veterinary Medicine; INDR: Institute of Nutrition; Norconserv; Technological Institute; Møreforskning; Norwegian Polar Institute; AKVAFORSK; Fridjof Nansen Institute; Finnmarksforskning; Nordlandsforskning
<b>Bilateral European relations</b>	PINRO: Russian fishery research institute (Murmansk); the MAPP Centre (Århus, Denmark); Murmansk Marine Biological Institute (Russia); University of Birmingham Medical School (England); Food Science and Technology Research Centre at the Robert Gordon University (Scotland); Icelandic Fisheries Laboratory (Iceland); Consejo Superior de Investigaciones Científicas, Instituto del Frio (Spain); Federal Research Centre for Fisheries (Germany); Danish Institute for Fisheries Research; Marine Research Institute, The Population Generic Laboratory (Iceland); DLO: Netherlands Institute for Fisheries Research (RIVO-DLO; Netherlands); Ifremer (Nantes, France); IPIMAR (Portugal); Rowett Research Institute (Scotland); SIK: Swedish Institute for Food and Biotechnology (Sweden)
<b>European networks</b>	EU research programmes; WEFTA
<b>America</b>	St. John's: Department of Fisheries and Oceans (Canada)
<b>International organisations</b>	ICES; IWC; NAMMC

**Name: INSTITUTE OF NUTRITION – DIRECTORATE OF FISHERIES (INDR)**

**1. General information**

<i>Address</i>	Institute of Nutrition Directorate of Fisheries PO Box 185 Sentrum, N-5804 Bergen, Norway Tel. (47) 55 23 80 00. Fax (47) 55 23 80 95
<i>Date of creation</i>	1947
<i>Status and financial position</i>	Part of the Directorate of Fisheries (executive agency of the Ministry)

**2. Detailed objectives and research programmes**

The Institute of Nutrition in Bergen advises the fisheries authorities on nutritional matters. The institute carries out research on the nutritive value of fish and other marine resources. The institute also undertakes nutritional studies of various types of farmed fish, and develops methods for analysing nutrients.

**Objectives**

- To generate knowledge for the benefit of the Norwegian fisheries and aquaculture industries, and to be an advisory body for the Ministry of Fisheries and the Directorate of Fisheries.
- To conduct fishery research in order to bring forward knowledge about marine resources as feed ingredients and as food for human consumption.
- To establish accurate and reliable methods for food and feed analysis in samples of marine origin.
- To publish scientific results nationally and internationally and to encourage sea food consumption.

**Research activities**

- Fish nutrition, feed and marine feed resources in aquaculture

Research has focused on nutritional requirements of vitamins, minerals and trace elements, as well as optimisation of the energy yielding components, to give high growth without inducing negative effects on fish health, product quality or the environment.

- Nutritional quality of sea food

Research has been focused on: interactions between salmon and halibut feed composition and fillet quality; nutritional quality of fish products (nutrients as well as unwanted chemical substances); nutritional quality of processed sea food; interactions between environment and sea food quality; seafood in human nutrition.

**3. Scientific cooperation**

<b>National</b>	AKVAFORSK; Institute of Fisheries and Aquaculture; SINTEF; University of Oslo; Nutreco; Intervet Norbio Ltd; Rieber Ltd; University of Bergen; University of Tromsø; Institute of Marine Research; Maripro A/S; Rieber & Søn A/S; Bjørge Biomarin A/S; Hordafør A/S; NorAqua Innovation AS; Norwegian College of Veterinary Medicine; National Veterinary Institute; Norwegian Food Control Authority; Austevoll fiskefôr AS
<b>Bilateral European relations</b>	Netherlands Institute of Fisheries Science in IJmuiden; Norwich Research Park Colney (UK); Nestec Ltd. Lausanne (Switzerland); Lunds University (Sweden); Wageningen (The Netherlands); Ifremer (France); ICETEC (Iceland); CSIC (Spain); The Danish Veterinary and Food Administration (Denmark); University of Padova (Italy); University of Potsdam (Germany); Netherlands Institute for Developmental Biology; University of Stirling (UK)

<b>European networks</b>	EU-FAIR; EU-COST 825
<b>Africa</b>	University of Ghana
<b>Asia</b>	National Taiwan Ocean University (Taiwan); Yellow Sea Fisheries Research Institute (China)
<b>America</b>	University of California, Davis, Dep. of Animal Science (USA); BMBB University of Minnesota (USA)
<b>International organisations</b>	Nordic Committee on Food Analysis; CEN: European Committee for Standardisation

**Name: NORWEGIAN COLLEGE OF FISHERIES SCIENCE (NFH)**

**1. General information**

<i>Address</i>	Norwegian College of Fisheries Science N-9037 Tromsø, Norway Tel. (47) 77 64 60 00. Fax (47) 77 64 60 20 E-mail: <a href="mailto:eksped@nfh.uit.no">eksped@nfh.uit.no</a> Internet home page: <a href="http://www.nfh.uit.no/">http://www.nfh.uit.no/</a>
<i>Date of creation</i>	1972
<i>Status and financial position</i>	Integrated within the structure of the University of Tromsø

**2. Detailed objectives and research programmes**

In government policy statements the Tromsø region has been highlighted for continued investment and development within fisheries science teaching and research. The college has responsibility for the teaching of a number of degree programmes ranging from economics to aquatic bio-sciences, as well as for the multidisciplinary fisheries science programme. Staff at the college are engaged in research covering many areas related to the unifying theme of fisheries science, with both natural and social sciences being strongly represented. Research of both basic and applied nature is performed, and a number of research projects cut across the boundaries of several academic disciplines. Thus, research is often conducted across interdepartmental barriers, either within the college itself, or the University of Tromsø as a whole.

Scientific activity at the college takes place within its six departments:

- Department of Marine and Freshwater Biology.
- Department of Aquatic Resources and Environmental Biology.
- Department of Marine Biochemistry.
- Department of Fishery Technology.
- Department of Economics and Management.
- Department of Social Science and Marketing.

Research activities

- Department of Marine and Freshwater Biology
  - Marine biology: Biological basis of fish production; Arctic climate and environment.
  - Freshwater biology: Inland fish resources; Anadromous salmonids; Freshwater environment.
- Department of Aquatic Resources and Environmental Biology
  - Basic: ecological, morphological, histological and physiological.



— Applied: ecosystem modelling, fisheries biology and management (stock discreteness and distributions; recruitment processes and biological capabilities to withstand exploitation; sea ranching; ecological interactions within stocks).

- Department of Marine Biochemistry

Main research areas: microbial physiology, fish health, nutritional biochemistry and feed development.

- Department of fishery Technology

Main research areas: fishing gears, optimisation of the rearing environment of aquaculture species, fish processing and product development.

- Department of Economics and Management

Main research areas: business strategy and marketing, resource economics, international economy and the environment, health and environmental economics, business economics.

- Department of Social Science and Marketing

Main research areas: resource management (regimes, measures etc.), the organisation of trade and marketing, women in the field of fisheries.

### 3. Facilities at sea

Three ongoing research vessels: *Jan Mayen*, *Johan Ruud*, *Hyas*.

### 4. Scientific cooperation

<b>National</b>	NIFA: Norwegian institute of Fishery science and Aquaculture; Norwegian Polar Institute), (Akvaplan-Niva; Norwegian Polar Institute; University of Oslo, Bergen; SINTEF; IMR: Institute of Marine Research
<b>Bilateral European networks</b>	Universidade do Algarve (Portugal); University of Stirling (Scotland)
<b>European networks</b>	University of Freiburg (Germany); University of Strathclyde (Scotland); DIFRES: Danish Fishery Research Institute, (Denmark); RUC: Roskilde University, (Denmark); IFM: Institute of Meereskunde (Germany); PML: Plymouth Marine Laboratory (Great Britain); AWI: Alfred-Wegener-Institute für Polar- und Meeresforschung (Germany); LEPM: University of Paris (France); SAFHOS: Sir Allister Hardy Foundation for Ocean Science
<b>Africa</b>	UWC: University of Western Cape (South Africa); UNAM: University of Namibia
<b>Asia</b>	Tokyo University of Fisheries (Japan)
<b>America</b>	Oregon State University (USA); University of Minnesota (USA)
<b>International organisations</b>	NORAD; ICES; U.S. GLOBEC International

**Name: DEPARTMENT OF FISHERIES AND MARINE BIOLOGY (IFM), UNIVERSITY OF BERGEN****1. General information**

<i>Address</i>	Department of Fisheries and Marine Biology (IFM) University of Bergen (UoB) P.b. 7800, Høyteknologisenteret N-5020 Bergen, Norway Tel. (47) 55 58 44 00. Fax (47) 55 58 44 50 E-mail: <a href="mailto:firstname.lastname@ifm.uib.no">firstname.lastname@ifm.uib.no</a> Internet home page: <a href="http://www.ifm.uib.no/">http://www.ifm.uib.no/</a>
<i>Date of creation</i>	1990
<i>Status and financial position</i>	The department is part of the University of Bergen

**2. Detailed objectives and research programmes****Objectives**

To conduct research and offer education in the fields of fisheries biology, marine biology, aquaculture, fish diseases and fish health, and marine ecological modelling.

IFM is organised into seven research groups:

- Aquaculture
- Benthic ecology
- Fish diseases
- Fish health
- Plankton ecology
- Resource biology
- Systems ecology

Research within the research groups:

- Aquaculture

Research activities cover studies on marine organisms under culture and new organisms for future farming; Population genetics, metamorphosis, early life history, growth, smoltification, reproduction, environmental and hormonal control.

- Benthic ecology

Research activities cover marine taxonomy, marine faunistics and floristics, marine biogeography and marine ecology on organisms associated with the sea bed.

- Fish diseases

The research concentrates on pathogenic organisms in aquaculture; virology, bacteriology, immunology and vaccine development.

- Fish health

Research activity concentrates on studies on micro- (virus, bacteria and protozoan) and macroparasites; Biology, evolution and interaction with host species; Viruses in both aquaculture and wild species populations.

- Plankton ecology

Research activities cover studies of fundamental ecological processes and mechanisms determining the development of plankton communities; Biology/ecology, systematic taxonomy, physiology, toxicology.

- Resource biology.

Research activities cover population dynamics and methods for stock assessment, ecological studies, population genetics and fish behaviour in order to obtain a greater understanding of the potential yields of fisheries resources.

- Systems ecology

Research activity covers quantitative marine ecology, biological oceanography, modelling of physical-biological processes, population dynamics of zooplankton, and evolutionary modelling of behaviour and life cycles.

### 3. Facilities at sea

The 150 foot research vessel *Håkon Mosby*.

The 60 foot research vessel *Hans Brattström* (20 knots).

Remote operated vehicle *Aglantha*.

### 4. Scientific cooperation

<b>National</b>	IMR: Institute of Marine Research; University of Tromsøe/Norwegian College of Fisheries Science; Institute of Nutrition, Directorate of Fisheries; Nutreco ARC; Skretting a.s.; Direktoratet for naturforvaltning; Fiskeriforskning (Tromsø); Akvaforsk; Intervet Norbio; Alpharma; Hydro Seafood; NTNU: Norwegian University of Technology and Natural Science; Statoil; National Veterinary Institute; Møreforskning
<b>Bilateral European relations</b>	University of Göteborg (Sweden); University College of Cork (Ireland); Catholic University of Nijmegen (Nederland); University of Stirling (Scotland); University of Aberdeen (Scotland)) University of Larn (Ireland); University of Rennes (France); Universidad de Castellon (Spain); Fiskieldi Eyafjardar (Iceland); Kaldbakk Marinbiologiske Laboratorium (Denmark); University of Island (Iceland); University of Leicester (England); University of Valencia (Spain); Duffstaffnage Marine Laboratory (England); Institute of Marine Research (Iceland); Kaldbak Marine Biological Laboratory (Faeroe Islands); Murmansk Marine Biological Institute (Russia); University of Copenhagen (Denmark); University of Hamburg (Germany); University of Kiel (Germany); Russian Academy of Science (Russia); University of Helsinki (Finland); University of Stockholm (Sweden); Ifremer (France); Institute für Meereskunde (Germany); Denmark fiskeriundersøkelser (Denmark); University of Liverpool (England); Instituto Espanol de Oceanografia (Spain); Rowett Research Institute (Scotland); Torre de la Sal (Spain); Institute of Meereskunde (Germany)
<b>European networks</b>	EU research programmes; EU-FAIR; Large Scale Facility; EU-MAST; EU-COST
<b>America</b>	St. John's: Department of Fisheries and Oceans (Canada); University of Maryland (USA); University of Galvestone (USA); Conte Anadromous Fish Research Lab (USA); Harbour Branch Oceanographic Institution (Florida, USA); Hatfield Marine Science Center (Oregon, USA); Harbour Branch Oceanographical Institution (Florida, USA); University of British Colombia (Vancouver, Canada); Department of Fisheries and Ocean, Biological station (St. Andrews, Canada)
<b>Asia</b>	Dept. of Zoology, Dhaka University (Bangladesh); Tokyo University of Fisheries (Japan); Hokkaido University (Japan); Yellow Sea Fisheries Research Institute (China)
<b>International organisations</b>	NORAD; ICES; US GLOBEC International

**Name: AKVAFORSK****1. General information**

<i>Address</i>	Akvaforsk (main office) PO Box 5010 N-1432 Ås, Norway Tel. (47) 64 94 95 00. Fax (47) 64 94 95 02 E-mail: akvaforsk@akvaforsk.nlh.no Internet home page: <a href="http://www.akvaforsk.no/">http://www.akvaforsk.no/</a>
<i>Date of creation</i>	1971
<i>Status and financial position</i>	Limited company
	Akvaforsk Sunndalsøra Research station Sunndalsøra N-6600 Sunndalsøra Tel. (47) 71 69 98 00. Fax (47) 71 69 98 01
	Akvaforsk Averøy Research station Averøy Ekkilsøy, N-6530 Bremsnes Tel. (47) 71 51 12 30. Fax (47) 71 51 15 18

**2. Detailed objectives and research programmes***Objectives*

The goal of Akvaforsk is to perform research and make knowledge available which can contribute to developing aquaculture for sustainable development nationally and internationally. The institute provides and publishes knowledge about aquaculture and aims to contribute to a strong, profitable industry that is beneficial to society. In addition, research, teaching and supervision of undergraduate and graduate students majoring in aquaculture are prioritised areas of work.

*Research activities*

The main areas of work at the institute are: Breeding and genetics; Nutrition and feeding; Preventive medicine; Environment; Product quality; Production technology; Biotechnology; Fish breeding in developing countries.

**3. Scientific cooperation**

<b>National</b>	HIDT: Institute of Food Science and Technology; NTNU: University of Science and Technology; Institute of nutrition/Directorate of Fisheries; Agricultural University of Norway; Norwegian Institute of Fisheries and Aquaculture; The Veterinary College; Norconcerv Ltd; Universities of Oslo, Bergen and Tromsø
<b>Bilateral European networks</b>	University of Stockholm (Sweden); University of Lund (Sweden)
<b>Asia</b>	Research Institute of Aquaculture No 1 (Vietnam); GIFT Foundation: Genetic Improvement of Farmed Tilapias (Philippines); CIFA: Central Institute of Freshwater Aquaculture (India)
<b>America</b>	University of Toronto (Canada); CENIACUA (Columbia)
<b>International organisations</b>	ICLARM: International Centre for Living Aquatic Resources Management (Philippines); INGA: Institute Network on Genetics in Aquaculture (Philippines)

**Name: SINTEF FISHERIES AND AQUACULTURE (SINTEF)**

**1. General information**

<i>Address</i>	Sintef Fisheries and Aquaculture N-7465 Trondheim, Norway Tel. (47) 73 59 56 50. Fax (47) 73 59 56 60 Internet home page: <a href="http://www.marintek.sintef.no/">http://www.marintek.sintef.no/</a>
<i>Date of creation</i>	1998
<i>Status and financial position</i>	Non-profit stock company, majority owned by the Sintef foundation

**2. Detailed objectives and research programmes**

Sintef Fisheries and Aquaculture is a research institute carrying out R & D within utilisation of renewable marine resources. Sustainable exploitation of marine resources is increasing in focus, calling for new and improved technologies for fisheries and aquaculture. Sintef Fisheries and Aquaculture is committed to this development. Sintef Fisheries and Aquaculture is an integral part of the SINTEF Group (the largest independent research organisation in Scandinavia) and cooperates closely with other parts of the group in order to optimise the utilisation of special laboratory facilities.

Through its integrated research and education activities, and based on close links to branch organisations and industry nationally and internationally, the institute aims to continuously develop its network and understanding of existing and future needs for research services. Within its field of work the institute cooperates closely with NTNU (the Norwegian University of Science and Technology), in order to integrate research and education of graduates and Ph.D.s.

The main fields of work of the institute are: Fisheries technology; Aquaculture technology; Seafood; Processing; Marine bioresources.

**3. Facilities at sea**

The institute has access to small research vessels belonging to NTNU.

**4. Scientific cooperation**

<b>National</b>	NTNU: The Norwegian University of Science and Technology; Sintef Energy Research, Sintef Applied Chemistry, Sintef Industrial Management, Sintef Civil and Environmental Engineering; Marintek: Norwegian Institute of Marine Technology Research; NIFA: Norwegian Institute of Fisheries and Aquaculture Research; IMR: Institute of Marine Research; Matforsk: Norwegian Food Research Institute
<b>Bilateral European relations</b>	University of Rostock (Germany); Kaliningrad State Technical University (Russia); IRPeM — Istituto Ricerche sulla Pesca Marittima (Italy); RIVO-DLO (Netherlands); Ifremer (France); University of Nantes (France)
<b>European networks</b>	WEFTA: West European Fish Technologists' Association; European network for Technology Research for Responsible Fisheries (Germany, France, Poland, Russia, Norway); TEES: The energy efficient ship (EU project — Denmark, Germany, Netherlands, UK, Norway); NorFood — Nordic project on bacalao from frozen cod (Norway, Denmark, Iceland); Nordic network on safety and working conditions in fisheries (Denmark, Sweden, Iceland, Norway)
<b>South America</b>	Various Peruvian institutions
<b>Asia</b>	Malaysian Institute of Economic Research (Malaysia); Research Institute for Aquaculture no. 1 (Vietnam); Tokyo University of Fisheries (Japan); Japan Aquatic Oil Association (Japan)

**International organisations** World Bank; Norad; Danida

**Name:** NORCONSERV

### 1. General information

*Address* Norconserv  
Postboks 327  
4001 Stavanger, Norway  
Tel. (47) 51 84 46 00. Fax (47) 51 84 46 50  
E-mail: post@norconserv.no  
Internet home page: <http://www.norconserv.no/>

*Date of creation* 1985

*Status and financial position* Independent foundation whose activities are financed by subscriptions from industry, income from contract assignments and State research funding.

### 2. Detailed objectives and research programmes

Norconserv is an independent foundation working for the food-processing industry. Key activities are research, development and training in industrial production of food with extended shelf-life. The institute is active in the value-added chain from raw material to end product and is a centre of expertise for industrial processes and production which are strategically oriented toward food technology and marine foodstuff processing. Super hygienic production and continuous cold chain distribution are important challenges within new concepts of production and trade.

The main fields of work at the institute are:

- Mechanical engineering and production systems
- Product, process and packaging
- Food analysis and hygiene
- Quality assurance and quality control
- Education and technology transfer.

### 3. Scientific cooperation

<b>National</b>	Agricultural Food Research Foundation; RF: Rogaland Research; NIFA: Norwegian Institute of Fisheries and Aquaculture; Sintef
<b>European networks</b>	VTT: VTT Technical Research Centre of Finland (Finland); SIK: Swedish Institute for Food Research (Sweden); ALMA: Universiteitsrestaurants vzw (Belgium); INRA: Station de Technologie des Produits Vegetaux (France); Technical University of Denmark; Agrotechnological Research Institute (The Netherlands); CCRA: Campden & Chorleywood Food Research Ass. (England); ESP: Escola Superior de Biotechnologia (Portugal); Aristotle University (Greece); Katholieke Universiteit Leuven (Belgium); Icelandic Fisheries Laboratories (Iceland); Danish Institute of Fisheries Research (Denmark)

**Name: NORWEGIAN HERRING OIL AND MEAL RESEARCH INSTITUTE (SSF)**

**1. General information**

<i>Address</i>	SSF Norwegian Herring Oil and Meal Research Institute Kjerreidviken 16, N-5141 Fyllingsdalen, Norway Tel. (47) 55 50 12 00. Fax (47) 55 50 12 99 E-mail: office@sildeforsk.no
<i>Date of creation</i>	1948
<i>Status and financial position</i>	Foundation  SSF- department Titlestad Solegårdsveien 71 P.B 32 Fana N-5859 Bergen, Norway Tel. (47) 55 11 21 60. Fax (47) 55 11 21 61  SSF- department Austevoll N-9293 Storebø, Norway Tel. (47) 56 18 00 32. Fax (47) 56 18 07 91

**2. Detailed objectives and research programmes**

The Norwegian Herring Oil and Meal Research Institute's (SSF) mission is to serve the Norwegian fish meal industry with research directed towards technological and product developments, quality assurance, analysis services and information service. SSF aims to contribute to industry's sound international position as manufacturer of high-quality fish meal and oil products.

Research activities

- Raw materials and processing:

Priority is given to developing refrigeration methods and other techniques for preserving raw fish, as well as quality assurance systems for shipboard handling of the catch. The institute is also highly engaged in process optimisation and product development.

- Farmed animals and fish nutrition:

The studies cover among other things growth, digestibility, feed utilisation, environmental and physiological factors.

- Development of food products based on fish oil and powder:

Research covers protection of the nutritional value of fish oil, functional proteins from pelagic fish, developing products with improved aroma, flavour and appearance for use in health foods and the food industry.

**3. Scientific cooperation**

<b>National</b>	Universities of Bergen, Oslo, Tromsø, Trondheim; IMR: Institute of Marine Research; Norconserv; Sintef
<b>European networks</b>	Eureka; FAIR
<b>Africa</b>	Council for Scientific and Industrial Research (Accra, Ghana)
<b>Asia</b>	Kasetsart University (Thailand); Mahidol University (Thailand)
<b>International organisations</b>	IFOMA: International Fishmeal and Oil Manufacturers Association



# PORTUGAL







## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

In 1996 the total catch landed in Portugal has been 234.1 thousand tonnes.

Species	Landings (in thousand tonnes)					
	1990	1991	1992	1993	1994	1995
Total			289.4			255
						234.1

#### 1.1.2. Trends in fleet

By the end of 1996 there was 11 597 fishing boats registered corresponding to a gross registered tonnage (GRT) of 120 363 tonnes and a overall engine power of 395 320 kW. From 1989 to 1996 the Portuguese fishing fleet has decreased 39 % on GRT and 21 % on engine power. The number of fishermen has decreased 10 % since 1994 passing from 31 721 to 28 458 in 1996.

	1990	1991	1992	1993	1994	1995	1996
Fishermen					31 721		28 458
Number of vessels			13 910				11 597
Power (thousand kW)			474.1				395.3

#### 1.1.3. Fishing harbours

There are more than 90 fishing communities of some significance and about 130 fishing harbours with diversified conditions and economic importance along the continental coast alone. The main fishing harbours are: in the north coast, Matosinhos; in the central coast, Figueira da Foz, Peniche and Sesimbra; in the south coast, Portimão e Olhão. Together they represent 70 % of landings of fresh and refrigerated fish. Aveiro (registration port of most long-distance fishing boats) is the most important harbour for frozen fish landings. From the economic point of view and for landed and commercialised catch, the main fishing harbours are: Matosinhos, Peniche, Sesimbra and Olhão.



## **1.2. Aquaculture sector**

Notwithstanding the existence of an old and artisanal marine aquaculture activity in Portugal, the strategic importance of a modern sector was assumed only in the middle of the 1970s. In fact, from there on, a constant and sustained support to R & D activities in this field had been assumed by the Portuguese central administration. With the adhesion of Portugal to the European Community in 1986 and the resulting possibility for funding from the EU investments in the sector led to a progressive increase in the development of marine aquaculture. The result of these investments, mainly directed to the finfish aquaculture projects, can be observed both in an initial increasing of production and also in the changes in the profile and in the structure of that production. The freshwater aquaculture (mainly rainbow trout) shows a decrease. Comparing these data, we verify that in terms of finfish production, the main species changed from eels in 1990, to seabream and seabass in 1996, species with a much higher commercial value.

Species	Quantity (thousand tonnes)						
	1990	1991	1992	1993	1994	1995	1996
Sea bream ( <i>Sparus aurata</i> )	0.1		0.34		0.4		0.5
Sea bass ( <i>Dicentrarchus labrax</i> )	0.002		0.008		0.14		0.3
Turbot ( <i>Scophthalmus maximus</i> )	-		-		0.035		0.1
Eels ( <i>Anguilla anguilla</i> )	0.266		0.6		0.98		0.021
Trout	2		1.2		1.1		1.3
Others (mulletts, breams,)	0.005		0.01		0.013		0.063
Finfish	2.4		2.2		2.7		2.3
Clams ( <i>Ruditapes decussatus</i> )	2		3		2.2		1.8
Oysters ( <i>Crassostrea angulata</i> , <i>C. gigas</i> )	0.07		0.39		1.1		0.66
Mussels ( <i>Mytilus edulis</i> )	0.001		0.061		0.136		0.136
Cockles	-		0.7		0.4		0.4
Others (crustacean, other, cuttlefish)	-		0.003		0.036		0.001
Shellfish	2.1		4.2		3.8		3
<b>Total</b>	<b>4.4</b>		<b>6.4</b>		<b>6.6</b>		<b>5.3</b>

In shellfish production, the drastic decrease of clams after 1985, is a consequence of severe epizootic, caused by *Perkinsus atlanticus* associated with the occurrence of harmful algal blooms. The shellfish production also clearly shows a diversification of the productive structure, namely an increase in the oyster and mussels productions.

### 1.3. Processing industry sector

In 1995 there were 123 open-doors in the fish and aquaculture processing industry sector. This represents an increase, which took place between 1990 and 1995, and reversed the trend which had been shown at the end of the 1980s caused by the closing down of a large number of factories. The production of dry, salted codfish has gradually increased and in 1995 reached 54.5 thousand tonnes, which represents a 30 % increase compared to 1992. Between 1992 and 1995 the canning industry's production grew to 51.4 thousand tonnes. In this year, canned sardines and canned tuna had the largest production, 23.5 thousand tonnes and 22.3 thousand tonnes respectively. Canned mackerel, with a production of 4.2 thousand tonnes in 1995, accounted for 8 % of total production. Frozen fish is the most important frozen product, and in 1995 accounted for 93 % of total frozen fish products.

### 1.4. Consumption of sea products

Production has decreased regularly with a global decrease of 30 % in the past 10 years. Imports increased by more than 140 % in the past 10 years. Exports had a slow increase and human consumption has been more or less constant in the past five years.

The Portuguese annual fish and seafood consumption per capita presents a regular high value during the last 10 years.

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

Fisheries research in Portugal is carried out by the public sector in almost exclusive manner, mainly by Ipimar (*Instituto de Investigação das Pescas e do Mar*). Also some universities have fishing research and or aquaculture centres such as the Universities of Porto, Aveiro, Coimbra, Lisboa, Faro and Açores. *The Instituto de Investigação das Pescas e do Mar* — Ipimar is the Portuguese institution responsible for ensuring scientific and technical advice for the policies followed by the administration for the fishing sector.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
Main	Ipimar				
Other research institutes	DOP				
	DRP-Madeira				
	IH				
	UA				
	IMAR				
	CEA				
	UCTRA				
	IO				
	DZA				
	ICBAS				

#### 2.1.2. Supervisory Ministerial authority(ies)

Institutes	Authority(ies)				
	Research and Technology	Agriculture and Fisheries	Education	Regional government	Navy
Ipimar					
DOP					
DRP-Madeira					
IH					
UA					

Institutes	Authority(ies)				
	Research and Technology	Agriculture and Fisheries	Education	Regional government	Navy
IMAR					
CEA					
UCTRA					
IO					
DZA					
ICBAS					

### 2.1.3. Coordination and relationship among the different research organisations and with research users

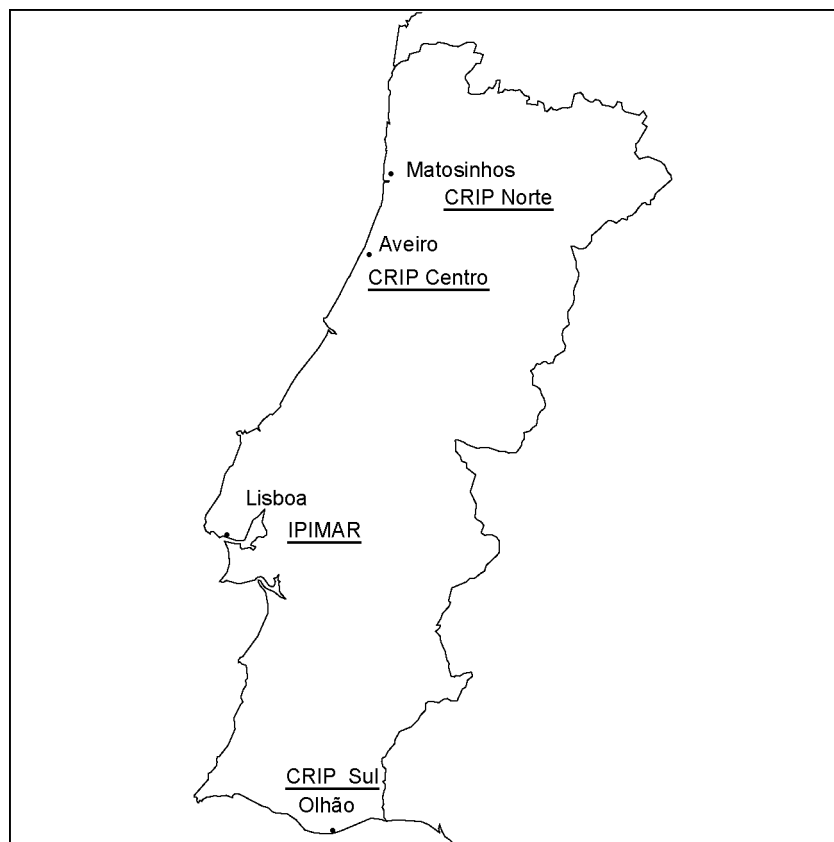
The cooperation among these organisations is achieved through joint research projects, mainly financed and coordinated by the Foundation for Science and Technology (FCT) with the support of PRAXIS XXI Programme.

## 2.2. Main research institute: *INSTITUTO DE INVESTIGAÇÃO DAS PESCAS E DO MAR (IPIMAR)*

### 2.2.1. General information

<i>Address</i>	Instituto de Investigação das Pescas e do Mar (Ipimar) Av Brasília, 1400 Lisboa Tel. (351-1) 302 70 00. Fax (351-1) 301 59 48
<b>Centro Regional de Investigação Pesqueira do Norte (CRIP Norte)</b>	Aptº 2134 4450 Matosinhos Tel. (351-2) 937 56 47. Fax (351-2) 937 56 47
<b>Centro Regional de Investigação Pesqueira do Centro (CRIP Centro)</b>	Canal das Pirâmides 3800 Aveiro Tel. (351-34) 289 08. Fax (351-34) 38 19 81
<b>Centro Regional de Investigação do Sul (CRIP Sul)</b>	Av. 5 de Outubro 8700 Olhão Tel. (351-89) 70 05 00. Fax (351-89) 70 05 35

#### Location



#### 2.2.2. Detailed objectives and research programmes

One of the most relevant responsibilities of Ipimar is to provide advice to the Portuguese Secretary of State for Fisheries and provide scientific information to other members of the government like the Ministries of Science and Environment. Ipimar activities involves R & D and others S&T activities with the general perspective of being applied to the fishing sector of the national community. In the last years the proportion of S&T activities have been increased. Ipimar structure includes a grid of regional centres and local services and support for data collecting, research projects and regional development.

#### 2.2.3. Facilities at sea

Ipimar has its main facilities in Algés, Lisbon, and also three regional centres, one in Matosinhos, the North Regional Research Centre, other in Aveiro, the Centre Regional Research Centre, another in Olhão, the South Marine Research Centre, providing, along with other small delegations, a complete continental territorial coverage. These centres are equipped to carry out research activities within the framework programme of the institute and to develop projects of regional interest.

Ipimar has two 50 m research vessels the RV *Noruega* and the RV *Capricórnio* to perform research and the monitoring of the national marine resources. They both can undertake fishing experiments as well as being used to obtain and process oceanographic data, such as temperature, salinity, nutrients, phyto- and zooplankton.

The *Mestre Costeiro* is a 27 m vessel specially assigned to fishing experiments and tests.

The *Donax*, a 15 m boat, is for carrying out studies on lagoon and shallow waters.

## 2.2.4. Scientific cooperation

<b>National</b>	Universities; homologous institutions namely the ones from the Portuguese-speaking African countries
<b>Bilateral European relations</b>	<p>Biologische Anstalt Helgoland (Germany); Freie Universität of Berlin (Germany); Institute of Food and Environment — Jena Univ (Germany); University of Hamburg (Germany); FCRF- Federal Research Centre for Fisheries (Germany); Centro Galego de Control de Calidade do Medio Mariño (Spain); Conselleria de Pesca de Galicia (Spain); Fac. de Veterinaria, Univ. Complutense de Madrid (Spain); Instituto de Investigaciones Marinas, Vigo (Spain); Instituto de Ciencias del Mar, Barcelona (Spain); U.E. Reference Laboratory for Marine Biotoxins, Vigo (Spain); Instituto Español de Oceanografía (Spain); Instituto de Investigaciones Marinas (Aquaculture/Environment; Spain); Universidad del País Vasco (Spain); AZTI-Instituto Tecnológico Pesquero y Alimentario (Spain); CMELB-Centro de Microscopia Electrónica Luis Bru (Spain); IF-Instituto del Frío (Spain); ICTP-Instituto de Ciencia y Tecnología de Polímeros (Spain); USC-Universidad de Santiago de Compostela (Spain); Universidade de Baleares (Spain); Universidade de Las Palmas de Gran Canaria (Spain); Universidade de Alicante ESGEMAR (Spain); Estudios Geológicos Marinos (Spain); CICEM (Spain); Universidade de Santiago de Compostela-Faculdade de Veterinária de Lugo (Spain); Instituto Español de Oceanografía — La Coruña (Spain); Department of Biology, University of Oslo (Norway); Department of Fisheries and Marine Biology, Univ. of Bergen (Norway); Institute of Marine Research Flodevigen Marine Research Station (Norway); MFAA — More research, Alesund (Norway); Norconserv (Norway); NIFA Norwegian Institute for Fisheries and Aquaculture, Tromsø (Norway); University of Copenhagen (Norway); Department of Marine Ecology, University of Lund (Sweden); Kristinberg Marine Research Station, Fiskebackskil (Sweden); NFA: National Food Administration (Sweden); SIK — the Swedish Food Institute for Food Research (Sweden); Laboratory of Marine Biology, Trieste (Italy); Stazione Zoologica Anton Dohrn, Napoli (Italy); IC-Instituto di la Conserva (Italy); Universidade de Genova (Italy); CNR Sicilia (Italy); CNR Ancona (Italy); National Institute for Coastal and Marine Management, Middelburg (The Netherlands); University of Utrecht (The Netherlands); Tidal Waters Division (The Netherlands); RIVO-DLO Netherlands Institute for Fisheries Research (The Netherlands); CNRS, Univ. Bordeaux I (France); CNRS-Ifremer (France); Université de Brest (France); Universidade de Liège/Laboratoire d'Océanologie (France); Universidade de Montpellier II (France); Science and Communication Centre on Harmful Algae, University of Copenhagen (Denmark); FRF-Danish Institute for Fisheries Research (Denmark); SOAFD Marine Laboratory, Aberdeen (UK); Water Research Centre (UK); CSL — Central Science Laboratory (UK); FSL-Food Science Laboratory (UK); HIFI — Humberside International Fishery Institute (UK); University of Surrey (UK); University of Southampton (UK); South Wales Sea Fisheries Committee (UK); Countryside Council for Wales (UK); Ministry of Agriculture, Fisheries and Food (UK); English Nature (UK); Seafish Industry Authority (UK); FEI-Food and Environmental Institute (Faeroe Islands); IFL-Icelandic Fishery Laboratories (Iceland); NFC—The National Food Centre (Ireland); DIT-Dublin Institute of Technology (Ireland); University of Dublin (Ireland); TRSF-Technical Research Centre of Finland (Finland)</p>
<b>Africa</b>	FRI-Food Research Institute (Ghana); IIPA-Instituto de Investigação Pesqueira de Angola (Angola); University of Namibia (Namibia)



<b>Asia</b>	Asian Natural Environmental Science Centre, Tokyo (Japan); Faculty of Agriculture, Tohoku University, Sendai (Japan); CFM-College of Fisheries Mangalore (India); UP-University of Pertanian (Malaysia)
<b>America</b>	Bedford Institute for Oceanography, Dartmouth N. Scotia (Canada); Institute for Marine Biosciences, National Research Council, Halifax (Canada); Université du Québec (Canada); Charleston Laboratory, National Marine Fisheries Service (USA); Graduate School of Oceanography, Univ. of Rhode Island (USA); Woods Hole Oceanographic Institution, Woods Hole (USA); Universidade de Costa Rica (Costa Rica)

## 2.3. Other research organisations

**Name:** DEPARTAMENTO DE OCEANOGRAPHIA E PESCAS DA UNIVERSIDADE DOS AÇORES (DOP)

### 1. General information

**Address** Departamento de Oceanografia e Pescas da Universidade dos Açores (DOP)  
Cais de Santa Cruz  
9900 Horta  
Tel. (351-92) 229 88. Fax (351-92) 226 59

**Name:** DIRECÇÃO REGIONAL DAS PESCAS DA REGIÃO AUTÓNOMA DA MADEIRA (DRP-MADEIRA)

### 1. General information

**Address** Direcção Regional das Pescas da Região Autónoma da Madeira (DRP-Madeira)  
Tel. (351-91) 331 40. Fax (351-91) 296 91

**Name:** INSTITUTO HIDROGRÁFICO (IH)

### 1. General information

**Address** Instituto Hidrográfico (IH)  
Rua das Trinas, 49  
1296 Lisboa  
Tel. (351-1) 395 51 19/24. Fax (351-1) 396 05 15

**Name:** DEPARTAMENTO DE BIOLOGIA DA UNIVERSIDADE DE AVEIRO (UA)

### 1. General information

**Address** Departamento de Biologia da Universidade de Aveiro (UA)  
Largo da Feira 28  
3800 Aveiro  
Tel. (351-34) 250 85. Fax (351-34) 286 00

**Name: INSTITUTO DO MAR (IMAR)****1. General information**

<i>Address</i>	Instituto do Mar (IMAR) Block C-2, 30 Piso Campo Grande 1700 Lisboa Tel. (351-1) 758 31 41. Fax (351-1) 759 77 16
<b>Faro (IMAR-Faro)</b>	Campus de Gambelas 8000 Faro Tel. (351-89) 81 71 66. Fax (351-89) 81 85 60
<b>Cascais (IMAR-Cascais)</b>	Forte Nossa. Senhora da Guia, Est. do Guincho 2750 Cascais Tel. (351-1) 486 92 11. Fax (351-1) 486 92 11
<b>Coimbra (IMAR-Coimbra)</b>	Largo D. Dinis 3000 Coimbra Tel. (351-39) 236 03. Fax (351-39) 358 12/ 251 44
<b>Porto (IMAR-Porto)</b>	Pr. Dos Leões 4000 Porto Tel. (351-2) 31 02 90. Fax (351-2) 200 47 77

**Name: CENTRO DE ECOLOGIA E AQUACULTURA DA UNIVERSIDADE DO ALGARVE (CEA)****1. General information**

<i>Address</i>	Centro de Ecologia e Aquacultura da Universidade do Algarve (CEA) Campus de Gambelas 8000 Faro Tel. (351-89) 297 61
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**Name: UNIDADE DE CIÊNCIAS E TECNOLOGIAS DOS RECURSOS AQUÁTICOS DA UNIVERSIDADE DO ALGARVE (UCTRA)****1. General information**

<i>Address</i>	Unidade de Ciências e Tecnologias dos Recursos Aquáticos da Universidade do Algarve (UCTRA) Campus de Gambelas 8000 Faro Tel. (351-89) 81 77 61. Fax (351-89) 81 83 53
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**Name: INSTITUTO DE OCEANOGRAFIA DA FACULDADE DE CIÊNCIAS DE LISBOA (IO)****1. General information**

<i>Address</i>	Instituto de Oceanografia da Faculdade de Ciências de Lisboa (IO) Block C-2, 30 Piso Campo Grande 1700 Lisboa Tel. (351-1) 60 80 28. Fax (351-1) 395 33 27
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**Name:** DEPARTAMENTO DE ZOOLOGIA E ANTROPOLOGIA DA FACULDADE DE CIÊNCIAS DE LISBOA (DZA)

**1. General information**

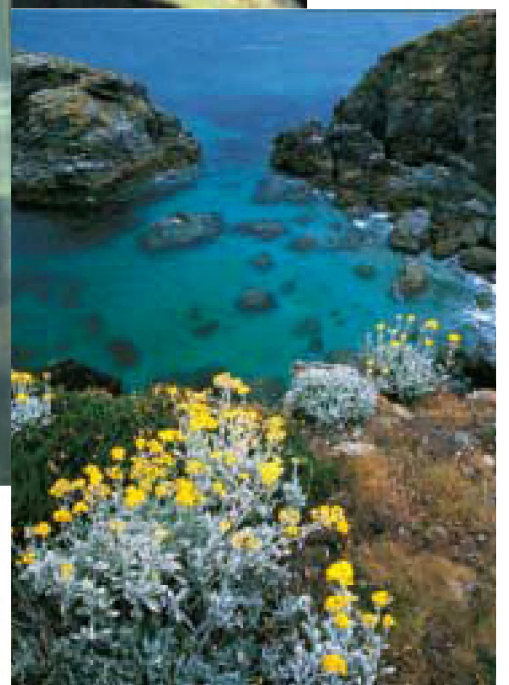
*Address* Departamento de Zoologia e Antropologia da Faculdade de Ciências de Lisboa (DZA)  
Block C-2, 30 Piso  
Campo Grande  
1700 Lisboa  
Tel. (351-1) 758 31 41. Fax (351-1) 759 77 16

**Name:** INSTITUTO DE CIÊNCIAS BIOMÉDICAS 'ABEL SALAZAR', DA UNIVERSIDADE DO PORTO (ICBAS)

**1. General information**

*Address* Instituto de Ciências Biomédicas 'Abel Salazar', da  
Universidade do Porto (ICBAS)  
Lg. Dr Abel Salazar 2  
4000 Porto  
Tel. (351-2) 31 14 47/31 03 59. Fax (351-2) 200 19 18

# SPAIN





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

In 1993 the total catch landed in Spain was 1 204.66 thousand tonnes.

Species	Landings (in thousand tonnes)			
	1992	1993	1994	1995
Hake	105.820	104.558	79.816	91.886
Anchovy	50.260	39.696	38.044	47.824
Yellowfin tuna	107.787	116.625	111.286	135.030
Squids	83.024	58.659	77.353	84.683
Albacore	20.089	19.510	20.217	21.770
Others	804.871	865.619	843.652	699.545
<b>Total</b>	<b>1 171.85</b>	<b>1 204.66</b>	<b>1 170.36</b>	<b>1 080.73</b>

Species	Landings (million EUR)			
	1992	1993	1994	1995
Hake	310.56	307.11	257.13	309.50
Anchovy	74.84	63.39	65.26	77.19
Yellowfin tuna	73.17	95.52	128.02	214.31
Squids	76.07	71.91	128.55	90.88
Albacore	45.18	45.96	45.42	58.32
Others	1 044.20	1 057.14	1 153.83	1 106.52
<b>Total</b>	<b>1 624.1</b>	<b>1 641.1</b>	<b>1 780.2</b>	<b>1 856.7</b>

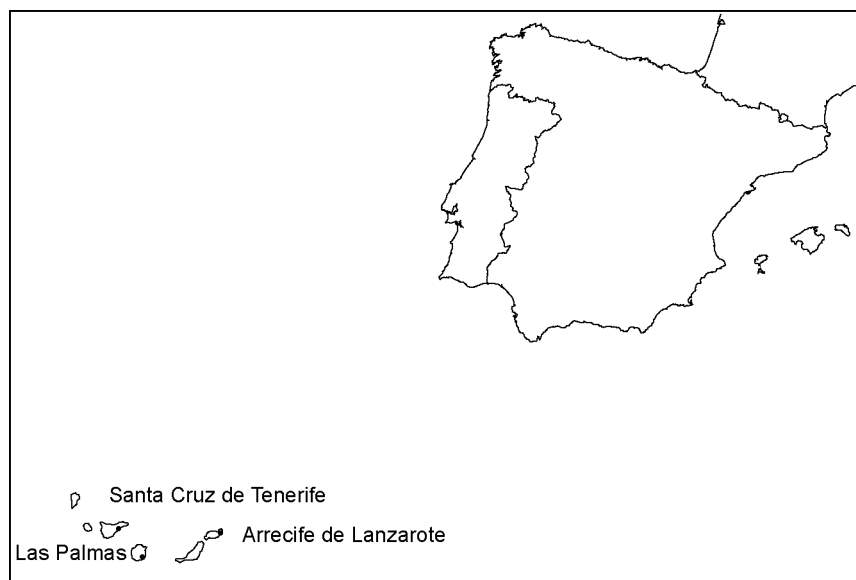
#### 1.1.2. Trend in fleet

	1992	1993	1994	1995	1996
Fishermen	81 204	79 409	79 006	74 993	72 882
Number of vessels	19 456	19 092	18 863	18 862	18 331
Power (thousand kW)	1 915	1 850	1 757	1 712	1 629

#### 1.1.3. Fishing harbours

There are about 150 harbours in Spain where marine catches are landed. The main harbours are: in the north-west coast: Pasajes, Ondárroa, Avilés, La Coruña, Ribeira and Vigo; in the south: Huelva, Cádiz and Algeciras; in Canary Islands: Santa Cruz de Tenerife, Las Palmas and Arrecife de Lanzarote; in the

Mediterranean coast: Málaga, Almería, Alicante, Castellón, Tarragona, San Carles de la Rápita and Barcelona. From the economical point of view and for landed and commercialised catch, the main five fishing harbours are: Vigo, Huelva, La Palmas, La Coruña and Algeciras.



## **1.2. Aquaculture sector**

The aquaculture production in Spain since 1985 has decreased from 266 557 to 129 271 tonnes (from 1985 to 1995), mainly due to an irregular decreasing of mussel production, because of unusual harmful algal blooms that make the mussel collection and marketing impossible. These processes were very severe in 1993 and 1995.

Nevertheless, the marine fish production has been multiplied by 150 in last 10 years (from 417 to 6 364 tonnes) and this high growth affects mainly turbot and seabream, and not only to the flesh production, but also to the hatchery production. Related to turbot, Spain is the main EU producer. The freshwater aquaculture (mainly rainbow trout) shows a regular, but very slow growth.

	Quantity (thousand tonnes)						
Species	1990	1991	1992	1993	1994	1995	1996
Turbot	0.6	0.8	1.6	1.6	1.8	2.2	2.2
Seabass	0.03	0.09	0.14	0.37	0.35	0.5	0.7
Seabream	0.6	1.1	1.7	2.0	2.1	2.7	3.8
Mullet	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Amberjack	0.02	0.03	0.02	0.003	0.006	0.001	0.001
Sole	0.01	0.01	0.01	0.01	0.01	0.03	0.02
Tuna	0.4	0.02	0.02	0.00	0.01	0.01	0.07
Eel	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Atlantic salmon	0.4	0.6	0.8	0.6	0.9	0.7	0.7
Prawn ( <i>Penaeus</i> )	0.04	0.03	0.04	0.06	0.07	0.06	0.09
Prawn (other)	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Clams	4.2	3.9	3.5	3.6	4.6	5.2	3.3
Oysters	2.8	2.2	2.7	2.7	2.3	3.1	3.7
Mussel	173.0	195.0	139.0	90.0	143.0	92.0	188.0
Rainbow trout	18.0	18.0	18.0	20.0	20.0	22.0	25.0
Tench	0.4	0.4	0.4	0.4	0.4	0.2	0.2
<b>Total</b>	<b>200.9</b>	<b>222.5</b>	<b>168.2</b>	<b>121.6</b>	<b>175.8</b>	<b>129.2</b>	<b>228.7</b>

	Value (million EUR)						
Species	1990	1991	1992	1993	1994	1995	1996
Turbot	6.10	6.99	10.12	10.10	12.48	14.03	16.29
Seabass	0.37	0.79	1.21	3.25	2.70	3.73	5.83
Seabream	5.16	8.89	12.24	13.40	12.81	19.18	24.03
Mullet	0.21	0.10	0.21	0.20	0.25	0.20	0.31
Amberjack	0.16	0.25	0.16	0.03	0.04	0.01	0.01
Sole	0.06	0.08	0.09	0.09	0.10	0.20	0.19
Tuna	1.20	0.07	0.38	0.32	—	—	3.10
Eel	0.76	0.53	0.86	1.23	1.75	1.91	1.79
Atlantic salmon	1.49	2.00	2.21	1.65	2.91	2.26	2.16
Prawn ( <i>Penaeus</i> )	0.60	0.50	0.73	0.87	1.06	1.18	1.56
Prawn (other)	—	0.14	0.20	0.26	0.20	0.24	0.29
Clams	23.54	24.19	22.34	22.44	26.89	41.29	24.18
Oysters	7.83	7.92	7.81	5.98	6.87	8.26	8.22
Mussel	52.96	100.88	52.39	29.76	45.60	36.92	52.05
Rainbow trout	36.02	36.02	33.33	35.50	36.15	39.67	43.57
Tench	1.68	1.91	1.94	1.55	0.72	0.78	0.72
<b>Total</b>	<b>138.14</b>	<b>191.25</b>	<b>146.22</b>	<b>126.63</b>	<b>150.53</b>	<b>169.86</b>	<b>184.30</b>



### **1.3. Processing industry sector**

Spain is one of the leader countries in fisheries and the EU country with the highest number of processing factories for fish canning and other marine products. In 1992 the number of firms were 509 and employed 46 000 workers and had a production value of about EUR 1 569 million. In 1992, 194 firms that belonged to canning sector (with 27 000 workers) had been reduced to 147 firms (the firms with temporary work are not included). The canning industries used to be familial owned without foreign capital and concentrated the main part of the total production. During the last years, the number of firms had been reduced and the number of jobs also had been reduced. The marine-products processing firms are multinational with important participation of foreign capital or they are big national firms; a reduced number of firms achieve the biggest part of the production. There are also fishing firms that sell in bulk and compete by reducing prices. Firms producing smoked products have a steady trade.

The canned fish, and the salted fish industries have been traditionally the more important in Spain. During the last years, the evolution in the consumption habits to more processed products has increased the importance of processed and smoked products. From 1989 to 1991, the total production in the sector has increased 15 %; fish canning increased 8 %, while marine products processing increased 17 %, and smokes 55 %. More than a half of the production value correspond to marine products processing, canned fish follow with 36 %, smokes with 5 % and salted fish 4 %. The main characteristic is the concentration of the production in a reduced number of products.

### **1.4. Consumption of sea products**

Spain is one of the EU countries with a higher index of marine products consumption per capita and per year; most of the production is for domestic consumption. In this sector, there is a high concentration in the production and consumption of a reduced number of products. Consumption habits have changed to more processed products, canned fish and ready made fish dishes.

The sales of canned products are realised mainly in supermarkets; the quality is in second place and the price is the more important factor for shopping. In smoked fish, the supply of raw material has decreased the prices and so the consumption has been increasing. The highest volume of frozen fish sales is realised in traditional shopping. The 70 % of the total market of processing marine products correspond to frozen fish in bulk. The price is the principal factor for shoppers. In the more processed products, like ready dishes, the decision factor for purchase is quality and sales have been in the traditional shopping and supermarkets.

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

Fishing research in Spain is carried out almost exclusively by the public sector, and it is in aquaculture where the private sector participates with some investigations. The *IEO (Instituto Español de Oceanografía)* is the organisation with nation-wide network taking charge specifically of fishing research and aquaculture. The *CSIC (Consejo Superior de Investigaciones Científicas)* is a public research organisation in all scientific matters with a nation-wide network of service for the scientific and technological policy of the Spanish Government. The CSIC has several centres aimed at marine and aquaculture research. Some of them are: the *ICM (Instituto de Ciencias del Mar, Barcelona)*, the *IIM (Instituto de Investigaciones Marinas, Vigo)*, the *ICMAN (Instituto de Ciencias Marinas de Andalucía, Cádiz)*, and the *IATS (Instituto de Acuicultura de Torre de la Sal, Castellón)*. The Autonomies have institutes with activities in fisheries research and aquaculture, such as *AZTI (Instituto Tecnológico Pesquero y Alimentario)* in the Basque Country with two centres, one in San Sebastián and the other one in Sukarrieta, and the *ICCM (Instituto Canario de Ciencias Marinas)* in the Canary Islands. Other centres depending on Autonomies are working specifically in aquaculture. In Galicia: *CIMA (Centro de Investigaciones Marinas)*, *Cecuma (Centro de Cultivos Marinos)* and *CEA (Centro en Experimentación de Acuicultura)*; Cataluña: *CNA (Centro Nacional de Acuicultura)*; Andalucía: (*Centros de Investigación y Cultivo de Especies Marinas (CICEM)*) 'Agua del Pino', and 'El Toruño'; Baleares: *Imedeia (Instituto Mediterráneo de Estudios Avanzados)* and *EDA (Estación de Acuicultura)*. Also some universities have fishing research and/or aquaculture equipment such as the Universities of Barcelona, Valencia, Vigo, Cádiz, Las Palmas, La Laguna, Granada, and others.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
<b>Main</b>	IEO	around 75- 120	481 (1995)	60-75 % annual budget	19.5 (1995)
<b>Other research institutes</b>	AZTI	30 (15 researchers)	82	1.95	5.1
	ICM		126 (1995)		no datum
	IIM		100 (1995)		3 (1995)
	ICMAN		32 (1994)		no datum
	IATS	57	57	0.57 (salaries not included)	0.57
	ICCM	21 (7 researchers)	40 (14 researchers)		no datum
	Imedeia	5	30	0.5	1.8
	CIMA, CEA, Ecuma		106 (1995)		1.1 (1995)
	CICEM		no datum		0.9 (1995)
	CNA		no datum		no datum
	EDA		7 (1994)		no datum

### 2.1.2. Supervisory Ministerial authority(ies)

Institutes	Authority(ies)		
	Agriculture, Fishing and Food	Education and Culture	Others (Autonomous Governments)
IEO			
ICM			
IIM			
ICMAN			
IATS			
AZTI			
ICCM			
IMEDEA			
CIMA, CEA, Cecuma			
CICEM			
CNA			
EDA			
Universities (7)			

### 2.1.3. Coordination and relationship among the different research organisations and with research users

The organisation for the coordination of all R + D activities in different organisations is the *Comisión Interministerial de Ciencia y Tecnología* (CICYT), whose National Programmes of R+D National Scheme depends.

Cooperation is achieved with the shared use of large facilities such as the *R/V Hespérides*, and with research projects that are coordinated and financed by the National Programme of Science and Marine Technology (Cytmar) managed by CICYT.

Within Recormad (European cooperation net between marine research organisations and maritime areas of the Mediterranean) a series of meetings have been celebrated to intensify the relationships between the research organisations, the Mediterranean peripheral maritime areas (Autonomous Communities) and the fishing sector. In February 1997, a meeting will be held in the Centro Oceanográfico de Baleares with participation of the mentioned entities to find the adequate diffusion process of scientific information to the sector and to the persons in charge for the Autonomous Communities in fishing matters.

### 2.1.4. Participation to European networks

During the past 10 years, the IEO has gradually increased its participation in projects financed partially by the European Union. The situation at present is as follows:

Participation in a total of 53 projects with Community financing. The distribution by programmes is:

FAIR, 8 fishing projects.

AIR, 7 projects; 3 projects are in aquaculture and the others, in fishing.

MAST, 6 projects.

In addition to this participation in the previous programmes, the IEO has 32 studies, directly financed by the Directorate-General XII of the EU, all of them in fishing area.

Finally, the IEO participates in integrated and agreed actions, also financed by the Commission.

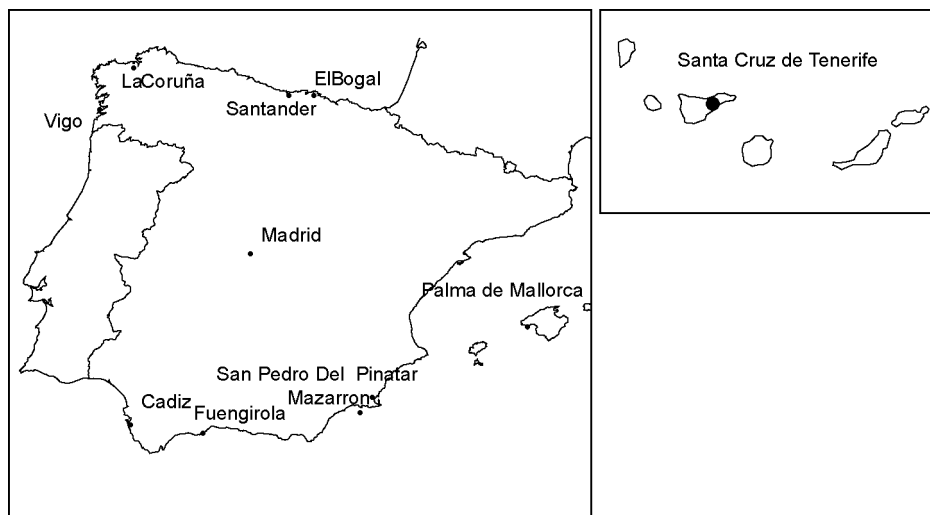
## **2.2. Main research institute: INSTITUTO ESPAÑOL DE OCEANOGRAFÍA (IEO)**

### **2.2.1. General information**

<i>Address</i>	<p>Instituto Español de Oceanografía (IEO)          Avda. del Brasil, 31. 28020 Madrid          Tel. (341) 915 97 44 43/18 64. Fax (341) 915 97 47 70  <a href="http://www.ieo.es/ieo">http://www.ieo.es/ieo</a></p> <p>Instituto Español de Oceanografía (IEO)          Corazón de María, 8          28002 Madrid          Tel. (341) 913 47 36 00. Fax (341) 914 13 55 97</p>
<i>Date of creation</i>	1914
<i>Status and financial position</i>	The Instituto Español de Oceanografía, is a public research organisation, classified as autonomous organisation because of its economic and financial management, that belongs to the General Secretary of Maritime Fishing, of the Ministry of Agriculture, Fisheries and Food
<b>Centro Oceanográfico de Santander</b>	<p>Promontorio de San Martín, s/n          Apdo. 240. 39080 Santander          Tel. (341) 942 29 10 60. Fax (341) 942 27 50 72</p>
<b>Planta Experimental de Cultivos Marinos</b>	<p>El Bocal. Barrio Bolado, s/n.          39012 Santander          Tel. (341) 942 32 15 13. Fax (341) 942 32 34 86;          (341) 942 32 26 20</p>
<b>Centro Oceanográfico de La Coruña</b>	<p>Muelle de las Ánimas, s/n          Apdo. 130. 15080 La Coruña          Tel. (341) 981 20 53 62. Fax (341) 981 22 90 77</p>
<b>Centro Oceanográfico de Vigo</b>	<p>Cabo Estay-Canido          Apdo. 1552. 36280 VIGO (Pontevedra)          Tel. (341) 986 49 21 11. Fax (341) 986 49 23 51</p>
<b>Planta Experimental de Cultivos Marinos</b>	<p>Cabo Estay-Canido          Apdo. 1552. 36280 VIGO (Pontevedra)          Tel. (341) 986 49 21 11. Fax (341) 986 49 23 51</p>

<b>Centro Oceanográfico de Canarias</b>	Carretera de San Andres, s/n Apdo. 1373. 38120 Santa Cruz de Tenerife Tel. (341) 922 54 94 00. Fax (341) 922 54 95 54
<b>Planta Experimental de Cultivos Marinos</b>	Carretera de San Andres, s/n Apdo. 1373. 38120 Santa Cruz de Tenerife Tel. (341) 922 54 94 00. Fax (341) 922 54 95 54
<b>Centro Oceanográfico de Málaga</b>	Puerto Pesquero, s/n Apdo. 285 29640 Fuengirola (Málaga) Tel. (341) 95 247 19 07. Fax (341) 95 246 38 08
<b>Centro Oceanográfico de Murcia</b>	Varadero,1 30740 San Pedro del Pinatar (Murcia) Tel. (341) 968 18 05 11. Fax (341) 968 18 44 41
<b>Planta Experimental de Cultivos Marinos</b>	Carretera de la Azohía, s/n 30860 Puerto de Mazarrón (Murcia) Tel. (341) 968 15 31 59. Fax. (341) 968 15 39 34
<b>Centro Oceanográfico de Baleares</b>	Muelle de Poniente, s/n 07015 Palma de Mallorca Tel. (341) 971 40 15 61. Fax (341) 971 40 49 45
<b>Estación de Biología Pesquera</b>	Muelle de Levante, s/n (Puerto Pesquero) Apdo. 2609 — 11106 Cádiz Tel. (341) 956 26 13 33. Fax (341) 956 26 35 56

Location



## 2.2.2. Detailed objectives and research programmes

The research is carried out in three major areas, fisheries, aquaculture and environment.

The fisheries area has the objective to improve knowledge on fishes, mollusc and crustacean stocks of interest to Spain's fishing fleet. The research is aimed at gaining greater knowledge of the biology of these species and population assessment as well as the biotic and abiotic factors which have an impact on fishing. In this way, necessary scientific data are obtained in order to make proposals to the Spanish Government regarding management decisions of renewable resources, as well as to serve as an advisor in international forums and commissions which assign the catch quotas for different countries and determine the technical regulations regarding fisheries exploitation.

### *1. Fisheries resources in the European Union*

The objectives are: To obtain fishing and biological information to evaluate annually the state of the 20 principal stocks exploited by Spanish fleet in EU waters, included Atlantic waters of Iberian Peninsula; Improvement of sampling and information net in harbours; Research of the basic biological parameters (growth in height and weight, sexual ripeness, sexes proportion, nourishment, fecundity) of the species to evaluate; Accomplishment of research campaigns for direct evaluations in Galicia and Cantabrian Sea.

### *2. Mediterranean fisheries research*

The objectives are: To fix bases to carry out a fishing research, organised in western Mediterranean, according to the fishing activity results; Research of the biology of the principal commercial species; To standardise the sea research campaigns that will provide direct information on the fisheries

### *3. Central-eastern Atlantic fisheries resources*

The objectives are: To improve knowledge of the fisheries exploited by Spain's fleet in North-western Africa; Biology of principal commercial species; Control of fishing activities results; Stocks evaluation and their evolution.

### *4. Fisheries of tuna and related species*

The objective is to know the evolution of the tuna stocks exploited by Spain's fleet: The species biology; Control of fishing activities results.

### *5. Prospecting and fisheries resources assessment in non-European waters*

The objectives are: To monitoring and research fisheries in these zones: south-western Atlantic (Patagonia shelf offshore 200 miles and Malvinas Islands area), north-west Atlantic (NAFO area), Svalbard Islands area and south-eastern Atlantic (Angola, Namibia and South Africa).

The aquaculture area is aimed at investigation of production techniques to pre-industrial scale of different species of fishes, molluscs and marine algae to promote the transfer and application of obtained results to industrial aquaculture projects as well as to diversify the production between a maximum number of profitable species.

There are the following programmes:

#### *1. Fish farming*

The lines of research are articulated in two large blocks: improvement of farming techniques of already cultured species and improvement of farming techniques of new species (diversification).

#### *2. Molluscs farming*

For the development of molluscs culture the work lines are: fattening factors of mussel in farming installation, oysters and clams seed production and development of pectinids culture techniques, and diversification of species that will be potentially cultivable.

#### *3. Algae farming*

The priority lines in this field are: the development of algae farming and production techniques in tanks and in the sea, and biological and physiological studies of cultured species.

### **2.2.3. Facilities at sea**

For its projects, the fisheries area makes use of R/V *Odón de Buen* and *Francisco de P. Navarro*, endowed with the latest navigational and positioning instruments. If requirements are more important, the IEO makes use of R/V *Cornide de Saavedra*, 66 m length, and the new Franco-Spanish research vessel *Thalassa*, commissioned in 1996. To carry out research in the Antartida the IEO uses the ocean polar R/V *Hesperides*.

#### 2.2.4. Scientific cooperation

<b>National</b>	Comisión Interministerial de Ciencia y Tecnología, (CICYT); 52 specific cooperative agreements with universities, other research institutions, companies and governmental and Autonomous Communities Institutions
<b>Bilateral European relations</b>	France; Portugal, UK; Italy; Ireland, Germany
<b>Africa</b>	Morocco; Mauritanie
<b>America</b>	Cuba; Argentine
<b>International organisations</b>	International Council for the Exploration of the Sea (ICES); Central-Eastern Committee for Atlantic Fisheries (CECAF); General Fisheries Council for the Mediterranean Fisheries (CGPM); Scientific, Technical and Economic Committee for Fisheries (STECF); Intergovernmental Oceanographic Commission (IOC) belonging to Unesco; Commission for Conservation of Antarctic Marine Living Resources (CCAMLR); International Commission for Conservation of Atlantic Tunas (ICCAT); North-Atlantic Fisheries Organisation (NAFO); International Commission for the Scientific Exploration of the Mediterranean Sea (CIESM); Convention for the Protection of the Marine Environment of the North-Eastern Atlantic (OSPAR); Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (LDC: London Dumping Convention); International Whale Commission (IWC); Subsidiary Body for Scientific, Technical and Technological Assessment (SBSTTA); Biological Diversity Convention; Management Executive Committee of WOCE (World Ocean Circulation Experiment); Intergovernmental GOOS (Global Ocean Observation System); Delegation by CICYT in EuroGOOS; Permanent Service of Middle Sea Level (PSMSL); National Oceanographic Data Centre (NODC)

#### 2.3. Other research organisations

**Name:** INSTITUTO DE CIENCIAS DEL MAR (ICM)

##### 1. General information

<i>Address</i>	Instituto de Ciencias del Mar. ICM Passeig Nacional s/n. 08039 Barcelona Tel. (341) 93 310 64 50. Fax (341) 93 319 98 42
<i>Date of creation</i>	1951
<i>Status and financial position</i>	Belonging to Consejo Superior de Investigaciones Científicas (CSIC)

##### 2. Detailed objectives and research programmes

Objectives

Oceanographic investigation in all aspects, including sea interactions with atmosphere and continents.

Oceanographic dynamic area.

Marine geology area.

Marine ecology area.

Fisheries area.

#### *Research activities*

Impact of bottom trawling on the sediment and benthic communities in the NW Mediterranean.

A bioeconomic model for Mediterranean fisheries.

Biological conditions of initial phases of anchovy in unchanging marine environment and their influence on larvae survival.

Discards of the western Mediterranean trawl fleets.

### **3. Facilities at sea**

R/V *García del Cid*, 37.2 m length.

### **4. Scientific cooperation**

<b>National</b>	Instituto Español de Oceanografía; Universitat de Girona; Universidad de Alicante
<b>Bilateral European relations</b>	Ifremer (France); Departamento di Scienze dell'ambiente e del Territorio del l'Università de Pisa (Italy); Centro Interuniversitario di Biologia Marina. Livorno (Italy); Instituto di Zoologia del l'Università di Genova (Italy); Department of Zoology, University of Aberdeen (UK); Ministry of Agriculture, Fisheries, and Food, Directorate of Fisheries Research (UK); National Agricultural Research Foundation, Fisheries. Research Centre Kavala (Greece)

## **Name: INSTITUTO DE INVESTIGACIONES MARINAS (IIM)**

### **1. General information**

<i>Address</i>	Instituto de Investigaciones Marinas (IIM) C/ Eduardo Cabello 6 36208 Vigo Tel. (341) 986 23 19 30. Fax (341) 986 29 27 62 E-mail: iim.csic.es
<i>Date of creation</i>	1951
<i>Status and financial position</i>	Belonging to Consejo Superior de Investigaciones Científicas (CSIC)
<i>Budget (million EUR)</i>	2.98
<i>Staff</i>	100

### **2. Detailed objectives and research programmes**

#### *Objectives*

To promote and develop the basic and applied investigation in marine sciences, encouraging the transfer the research results to the sector industries.

#### *Organisation*

Research departments

Ecology and marine resources



Chemistry and marine products technology  
Department of Ecology and Marine Research  
Oceanology  
Fisheries  
Aquaculture and marine organisms pathology  
Department of Chemistry and Marine Products Technology  
Processes  
Quality  
Recycled and waste assessment  
Oil biodegradation.

### **3. Facilities at sea**

R/V Mytilus. 20 m length.

## **Name: INSTITUTO DE CIENCIAS MARINAS DE ANDALUCÍA (ICMAN)**

### **1. General information**

<i>Address</i>	Instituto de Ciencias Marinas de Andalucía (ICMAN) 11510 Puerto Real. Apdo. Oficial E-Cádiz Tel. (341) 95 683 26 12. Fax (341) 95 683 47 01
<i>Status and financial position</i>	Belonging to the Consejo Superior de Investigaciones Científicas (CSIC)

### **2. Detailed objectives and research programmes**

Objectives:  
Physiology  
Reproduction  
Early stages of reared species  
Disease, immunology, stress  
Aquaculture/environment interaction  
Aquaculture structures, systems, techniques  
Pollution, effects in marine organisms  
Littoral ecosystems  
Ecological aspects of aquaculture, assessment of factors affecting larval development of seabream in culture, physiology of microalgae under culture.

### **3. Facilities at sea**

6-meters boat.

## **Name: INSTITUTO DE ACUICULTURA DE TORRE DE LA SAL (IATS)**

### **1. General information**

<i>Address</i>	Instituto de Acuicultura de Torre de la Sal (IATS) Ribera de Cabanes. E-12595 Torre de la Sal (Castellón) Tel. (341) 964 31 95 00. Fax (341) 964 31 9509
<i>Status and financial position</i>	Belonging to the Consejo Superior de Investigaciones Científicas (CSIC)

## 2. Detailed objectives and research programmes

Objectives: Aquaculture; Physiology; Reproduction; Early stages of reared species; Growth, nutrition, feed composition, live food production for aquaculture; Disease, immunology, stress; Aquaculture structures, systems, techniques.

Pathology research group; Fish physiology research group; Auxiliary species research group; Shellfish research group.

Research activities: Parasitic and infectious diseases; Reproduction and growth in sea bass and sea bream; Different biological aspects of *Artemia* and use in larviculture; Different aspects of shellfish biology and culture.

## 3. Scientific cooperation

<b>National</b>	Universitat Jaume I, Departamento de Ciencias Experimentales, Castellón; Universidad de Valencia, Facultad de Biología, Departamento de Microbiología y Ecología, Valencia; Instituto Canario de Ciencias Marinas, Facultad de Ciencias del Mar de Las Palmas de Gran Canaria; Facultad de Ciencias del Mar, Universidad de Cádiz; Departamento de Fisiología Animal, Facultad de Biología, Universidad de Barcelona; Instituto Español de Oceanografía, Laboratorio de Mazarrón, Murcia
<b>Bilateral European relations</b>	Israel Oceanographic and Limnological Research, National Centre for Mariculture, Eilat, Israel; Institute of Aquaculture, University of Stirling, (UK); Biologie Cellulaire et Reproduction, Universidad de Rennes I, (France); SEPIA, Paris (France); Department of Biology, University of Camerino (Italy); The Rowett Research Institute, Physiological Sciences Division, Molecular Neuroendocrinology Group, Aberdeen, (UK); Institute of Marine Research, Department of Aquaculture y Matre Aquaculture Research Station, Bergen (Norway); Physiological Chemistry I, Biocenter, University of Würzburg, (Germany); Laboratoire de Genetique des Poissons, INRA Jouy-en-Josas, (France); Stazione Zoologica A. Dohrn, Naples (Italy); Division of Cell Sciences, University of Southampton, (UK); Department of Animal and Plant Sciences, University of Sheffield, Sheffield (UK); Ifremer, Station Experimentale d'Aquaculture, Palavas les Flots (France); Laboratoire de Nutrition des Poissons, INRA, Saint Pee-sur-Nivelle (France); Université de Bretagne Occidentale, (France); Veterinary Medical Research Institute, Hungarian Academy of Sciences (Hungary); School of Ocean Sciences, Wales (UK); Institute of Marine Biology of Crete (Greece)
<b>Africa</b>	(Institut Agronomique et Veterinaire Hassan II. (Morocco)
<b>America</b>	Centre of Marine Biotechnology, University of Maryland Baltimore (USA); Oregon State University, Department of Microbiology (USA); University of California—Davis Section of Molecular and Cellular Biology, Ca. (USA); Universidad Austral de Chile (Chile); Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, Buenos Aires (Argentina)
<b>International organisations</b>	Other 14 groups from 8 Ibero-Latin American countries in an International CYTED Project

**Name: INSTITUTO TECNOLÓGICO PESQUERO Y ALIMENTARIO (AZTI)**

**1. General information**

<i>Address</i>	Instituto Tecnológico Pesquero y Alimentario (AZTI) Txatxarramendi Ugarte s/n. 48395 Sukarrieta (Bizkaia) Tel. (341) 94 687 07 00. Fax (341) 94 687 00 06 E-mail: info@azti.es  Instituto Tecnológico Pesquero y Alimentario (AZTI) Avda. de Satrustegui, 8. 20008 San Sebastián (Guipuzkoa) Tel. (341) 94 321 41 24. Fax (341) 943 21 21 62 E-mail: info@azti.es
<i>Date of creation</i>	1984
<i>Status and financial position</i>	Non-profit private foundation

**2. Detailed objectives and research programmes**

Fisheries Resources Department carries out research work directed at optimising a rational exploitation of fishing resources. To this end, contribute to a scientific plan to improve the management of the fishing resources by the Basque fleets in a coordinated and equitable manner. AZTI carries out this task in collaboration with other centres from the Spanish State together with other countries involved in the management of the fishing industry.

Our objectives are:

To collaborate in the management of the fishing resources of interest for the Autonomous Community of Basque Country; to advise the Basque administration and fishing sector on fishing matters; to contribute to the improvement of the competitiveness of the sector.

Research activities are:

Monitoring of fisheries obtaining updated information regarding: structure and activity of the fleets, commercial catches and their characteristics (specialised fishing statistics); Fishing biology: assessing biological parameters which describe the dynamics of the populations (migrations, stock identity, distribution, growth, reproduction, mortality); Assessment of resources: participating and promoting the following activities (evaluation of the resources state, estimation by means of directed surveys of the abundance and evolution of resources, exploration of new fisheries potential); Fishing technology in developing and transferring technology aimed at improving the efficiency of fishing activities regarding fishing gears and tackle, fishing vessels, detection and attraction methods as satellite detection, submarine sounding, behaviour of species in relation with fishing gears and tackle; Establishing the technical bases in support of responsible fishing management (impact of fishing gears, interaction of different fishing methods); Relation oceanography-fisheries (study on the relationship between environment, as upwelling, nutrient balances, chlorophyll, plankton, etc., and fisheries, as distributions, growth, mortality, etc., study on the impact of extraction activities on the ecosystem, study on teledetection applied in fisheries and the marine environment, study on the socioeconomic consequences of fish resources management).

Other departments of AZTI

Food Technology Department: aimed to improve the quality, productivity and innovation of the food products and processes, including all type of food products.

Our areas of specialisation and technological expertise are:

Quality, environment, and industrial safety; production; new products and processes; analysis and testing.

Oceanography and Marine Environment Department: aimed to provide the knowledge on coasts and marine environment to attain a sustainable development of our natural surroundings.

The specialisation and technology expertise are:

Environmental monitoring; littoral dynamics; environmental impact; relation oceanography-fisheries (ecology); Natural environment and resources management.

### 3. Facilities at sea

Oceanographic vessel.

### 4. Scientific cooperation

<b>National</b>	Instituto Español de Oceanografía; CSIC: Instituto de Ciencias del Mar; Universidad del País Vasco; Universidad Politécnica de Cataluña; Universidad de Las Palmas de Gran Canaria; Instituto Nacional de Tecnología Aeroespacial
<b>Bilateral European relations</b>	IFM (Institut Für Meereskunde; Germany); BAH — Helgoland (Biologisches Anstalt Helgoland, Univ. Kiel; Germany); Danish Institute of Fisheries and Aquaculture (Denmark); Difmar (Danish Institute; Denmark); AGLIA (Asociación Gran Litoral Atlántico, France); CG (Centre Geostatique; France); CNRS (France); Ifremer (Institute Français de Recherches de la Mer; France); ORSTOM (France); Forbairt (Ireland); FRC (Fisheries Research Centre — Dpt. of the Marine, Ireland); UCG (University College Galway; Ireland); Marine Research Institute (Iceland); ICRAM (Italy); IMR (Institut of Marine Research, Norway); IPIMAR (Instituto Português de Investigação Marítima, Portugal); I.H. (Instituto Hidrológico, Portugal); UCTRA (Univ. Algarve Dept. Aquatic Resources, Portugal); Universidad de Açores (Portugal); MAFF (UK); PML (Plymouth Marine Laboratory, UK); SAHFOS (Sir Alister Hardy Foundation for Ocean Science, UK); Seafish (Sea Fish Industry Authority, UK); SOAFD (Marine Laboratory, Aberdeen, UK); University of Aberdeen, Dept. of Zoology (UK); University of Saint Andrews (UK)
<b>European networks</b>	AIR, FAIR, Eureka, COST, innovation
<b>America</b>	Fundación La Salle (Isla Margarita, Venezuela); ITP (Instituto Técnico Pesquero, Peru); INIDEP (Argentina); CITEP (Argentina)
<b>International organisations</b>	CIEM/ICES International Council for the Exploration of the Sea; ICCAT International Commission for Conservation of Atlantic Tunas; NAFO North Atlantic Fisheries Organisation

**Name:** INSTITUTO CANARIO DE CIENCIAS MARINAS (ICCM) — CANARIAN INSTITUTE OF MARINE SCIENCES

#### 1. General information

<i>Address</i>	Instituto Canario de Ciencias Marinas PO Box 56 E-35200 Telde (Las Palmas) Spain Tel. (341) 928 132 900/4. Fax (341) 928 132 908
<i>Date of creation</i>	1977
<i>Status and financial position</i>	Public Research Institute, belonging to the Government of the Canary Islands

## 2. Detailed objectives and research programmes

### Objectives

To exercise the competences of the Autonomous Region (the Canary Islands) in oceanographic investigation.

To make and promote investigation and technological development work of interest for the Canaries in the field of Marine Sciences.

To contribute to the environmental education.

To promote the cooperation in these matters amongst the regional, national and international institutions.

### Research & Development Departments

Fisheries Biology

Marine Aquaculture

Coastal Ecology. Three programmes: Bacteriology, Phytoplankton and Phytobenthos

Oceanography

Fisheries Resources.

### Research activities

Ictiology, carcinology and biology of marine resources from the Canary Islands and other Macaronesian archipelagos; Fisheries and assessment of marine resources from the Canary Islands; Improvement of fish nutrition and feeding; Development in aquaculture techniques for new species; Studies on offshore cages prototypes; New hatchery technology; Selective breeding in aquacultured fish; Control and tracking of the repercussion of dumping of residual waters in the Canaries area; Presence of pathogens in the littoral; Isolation, determination and serotyping of bacteria; Microbiological quality of sea water; Taxonomy and ecology of phytoplankton species in the Canaries; Study of marine ecosystems of interest, proposed as protected or reservation areas; Cartography of the algae communities present in Gran Canaria; Reproductive biology and dynamics of marine macroalgae populations; The algae as bioindicators and as coloniser of artificial substrata (fouling); Fouling associated to artificial fish culture systems; Integrated system of culture of macroalgae: biofilters and diet complements for marine fishes in cages; Pharmacological potentiality and antimicrobial activity of macroalgae; Long-term temporal series studies in the eastern central Atlantic; Development of instruments and oceanographic observations methodologies; Acoustic and fishing prospection: estimations of abundance, distribution and biomass of fisheries resources; Determination of biological parameters of marine species.

## 3. Facilities at sea

R/V *Taliarte* (steel hull, 40 m length, 267 tons, 1070 HP).

R/V *Taliarte* of the Instituto Canario de Ciencias Marinas.

## 4. Scientific cooperation

### National

Spanish Institute of Oceanography; Consejo Superior de Investigaciones Científicas CSIC; University of Las Palmas de Gran Canaria; University of La Laguna; Universidad Complutense de Madrid; University of Valencia; Museum of Natural History of Santa Cruz de Tenerife; Universidad Autónoma de Barcelona; Instituto Nacional de Tecnología Aeroespacial INTA; ProAqua Nutrición SA; Alevines y Doradas ADSA)

<b>Bilateral European Relation</b>	Institute of Marine Research Bergen, University of Tronso, University of Trondheim, Norwegian College of Veterinary Medicine (Norway); Institute of Zoology University of Salzburg (Austria); University of Bremen, University of Kiel, University of Odelburg, University of Hamburg (Germany); Institute of Marine Biology of Crete (Greece); University of Azores, Directorate General of Fisheries of Madeira DSIP, Museum of Natural History of Funchal (Portugal); Hebrew University, National Centre of Mariculture Eilat (Israel); National Museum of Natural History, Leiden (Netherlands); NERC Institute of Freshwater Ecology, University of Stirling (United Kingdom); Station d'Hidrobiologie Saint Pée sur Nivele INRA (France); TEHAG Fish Centre (Hungary); Norwegian Herring Oil and Meal Industry Research Institute SSF (Norway)
<b>European Networks</b>	CANIGO; ESTOC; REGIS II-RUP)
<b>America</b>	NOAA/NESDIS/ORA (USA); British Columbia University (Canada); CIAD Acuicultura Mazatlán, CICIMAR (Mexico); CONAE (Argentina); Universidad Católica de Temuco (Chile)
<b>International Organisations</b>	International Centre for Advanced Mediterranean Agronomic Studies Zaragoza (CIHEAM); European Space Agency ESA (Italy)

**Name: INSTITUTO MEDITERRÁNEO DE ESTUDIOS AVANZADOS (IMEDEA)**

**1. General information**

<i>Address</i>	Instituto Mediterráneo de Estudios Avanzados (IMEDEA) Campus Universitario 07071 Palma de Mallorca Tel. (341) 971 17 32 82. Fax (341) 971 17 32 48 E-mail: ieabmn@ps.uib.es
<i>Date of creation</i>	1987
<i>Status and financial position</i>	Public research institute (CSIC and Universidad de las Islas Baleares)

**2. Detailed objectives and research programmes**

**Objectives**

Study and characterisation of the Mediterranean small-scale fisheries.

Fish population dynamics.

Fish biology including aspects on age, growth, physiology (neurology, sensory organs) and maturity processes.

Fish ecobiology: distribution, abundance and relationships with environmental parameters. Evolutionary adaptations and behavioural aspects.

Antarctic fish biology and distribution.

Calcified tissues: microstructure and composition. Shape analysis.

Trophic relations in fish: distribution patterns of deep-water fish in relation to the benthic boundary layer. Succession of species in pelagic ecosystems.

Composition, abundance, distribution and characteristics of the organisms in the benthic boundary layer: mysids, euphausiids, copepods, molluscs. Anatomy, population genetics of benthic molluscs by means of alloenzyme electrophoresis, RAPDS and ADN sequencing.

Research activities

Developing of the deep-water fisheries: data for their assessment and for understanding their interaction and impact on a fragile environment' (deep-sea fisheries).

Dolphin-fish biological and fishing data in the western Mediterranean.

European Fish Ageing Network (EFAN).

Reproductive aspects and optimisation of the common dentex (*Dentex dentex*) culture. Subproject 1: Study of the reproductive aspects of common dentex and nourishment aspects in its development.

Physical oceanography and productivity in the confluence Weddell-Scotia.

### 3. Facilities at sea

Does not have own vessels, but makes use of the R/V *García del Cid* (CSIC). Also makes use of the R/V *Odón de Buen* (IEO) and R/V *Hespérides* (CICYT).

### 4. Scientific cooperation

<b>National</b>	Instituto Español de Oceanografía (IEO). Centro Oceanográfico de Baleares. It is maintained as a special collaboration with this Centre, through a specific agreement CSIC-IEO; CSIC-Instituto de Ciencias del Mar (Barcelona); CSIC-Centro de Estudios Avanzados de Blanes; CSIC-Museo de Ciencias Naturales (Madrid); CSIC-Instituto de Acuicultura de Torre de la Sal; IEO-Centro Oceanográfico de Vigo; IEO-Centro Oceanográfico de Tenerife; Facultad de Ciencias del Mar, Universidad de las Palmas; Laboratori d'Ictiologia Genètica, Universitat de Girona; Universitat de les Illes Balears; Laboratori d'Enginyeria Oceanogràfica, Universitat Politècnica de Catalunya; Planta de Acuicultura d'Andrax, Govern Balear; Planta de Acuicultura Es Murtera, Gedisa; Facultad de Veterinaria, Universitat Autònoma de Barcelona; Departament de Zoologia, Universitat Autònoma de Barcelona; Facultad de Biología, Universidad de Navarra
<b>Bilateral European relations</b>	Department of Marine Sciences and Coastal Management, University of Newcastle upon Tyne (UK); Scottish Association of Marine Science (UK); British Antarctic Survey (UK); Dipartimento di Biologia Animale e Ecologia, Università di Messina (Italy); CNR-Istituto di Tecnologia della Pesca e del Pescato (Italy); CNR-Istituto di Recherche sulla Pesca Marittima (Italy); Laboratoire de Sète, Ifremer (France); Institute of Marine Research, Flødevigen (Norway); Alfred Wegener Institute (Germany)
<b>America</b>	Marine Sciences Department, University of Hawaii; NOAA Marine Fisheries Service, Hawaii (USA); Facultad de Ciencias, Universidad de la República de Uruguay (Uruguay); Instituto de Ciencias del Mar y Limnología, Mazatlan Mexico (Mexico); Instituto de Fomento Pesquero, Valparaíso (Chile)
<b>International organisations</b>	FAO; CIESM

**Names:** CENTRO DE INVESTIGACIONES MARIÑAS (CIMA)  
CENTRO DE CULTIVOS MARIÑOS (CECUMA)  
CENTRO DE EXPERIMENTACIÓN DE ACUICULTURA (CEA)

### 1. General information

Address	CIMA
	Piedras de Corón, s/n
	Playa de Borreiros Tel. (341) 986 50 01 61. Fax (341) 986 50 67 88
	CECUMA
	Muelle de Porcillán s/n
	Ribadeo (Lugo) Tel. (341) 982 12 81 00. Fax (341) 982 13 04 92
	CEA
	Punta do Couso-Aguiño
	15960 Ribeira (La Coruña) Tel. (341) 981 84 16 00. Fax (341) 981 84 15 16
Status and financial position	Depending on the Directorate-General of Fishing, Education and Research. Ministry of Fishing, Shellfish and Aquaculture. Galician Government.

### 2. Detailed objectives and research programmes

#### Objectives

To investigate the subjects at the request of the Ministry or with interest for the Directorate-General in order to give the necessary advice for the better arrangement and exploitation of the marine resources.

Research activities (mainly programmes of aquaculture)

Nourishment of fish larvae; Pathology of bivalve molluscs of commercial interest; Nourishment of molluscs larvae; Fish farming; Bivalves farming; Improvement of the bivalve production in hatchery; Improvement of the bivalve farming in natural environment; Improvement of the production of natural banks of bivalves; Studies of lamelleted Haliotis; Studies on improvement of mussel farming; Studies for the rationalisation of the commercial exploitation of barnacle; Studies on floating cages; Oceanography of estuaries; Studies on toxic dinoflagelates blooms; Primary productivity.

### 3. Facilities at sea

Making use of vessels of the Ministry of Fishing, Shellfish and Aquaculture of the Galician Government.

### 4. Scientific cooperation

<b>National</b>	Consejo Superior de Investigaciones Científicas (CSIC); Instituto Español de Oceanografía (IEO); Universidad de Santiago de Compostela; Universidad de Vigo; National Association of Canned Food Manufacturers (ANFACO); Universidad de La Coruña
<b>Bilateral European relations</b>	Ifremer (France); Facultad de Ciencias Biomédicas de la Universidad de Porto (Portugal)



**Names: CENTROS DE INVESTIGACIÓN Y CULTIVO DE ESPECIES MARINAS (CICEM)**

**1. General information**

<i>Address</i>	CICEM 'Agua del Pino' Ctra. Punta Umbría-Cartaya Apartado 104. 21071 Huelva Tel. (341) 959 39 91 04. Fax (341) 959 39 92 92  CICEM 'El Toruño' Apartado 16. 11500 Puerto de Santa María (Cádiz) Tel. (341) 956 56 23 40. Fax (341) 956 56 23 85
<i>Status and financial position</i>	Depending on the Service of Technology, Aquaculture and Fishing Education. Directorate-General of Fishing. Ministry of Agriculture and Fishing. Andalucía Government.

**2. Detailed objectives and research programmes**

*Objectives*

To promote the scientific and technical research on fishing biology and marine aquaculture in Andalucía; development of multidisciplinary specific studies on the coastal fisheries situation; contribution to the development of a statistic system of fishing information to help the investigation and fishing resources evaluation; to promote the regional coordination in fishing and marine research in Andalucía and training researchers on critical aspects of coastal fisheries and aquaculture techniques.

The Service of Technology and Aquaculture and Fisheries Education achieves the planning, programming, monitoring, scientific-technical management and administrative management. The CICEM achieves the development, execution and realisation of the projects of experimentation and technological transfer.

*Research activities*

The marine environment and its resources study of the marine pollution: artificial biotopes and resources arrangement; new fishing techniques and resources evaluation, restocking techniques and fish grazing; study of coastal ecosystems.

Marine resources and aquaculture techniques. Breeding production techniques, pathological phenomena; new methods of stress evaluation; nourishment, culture techniques and utilisation of phyto- and zooplankton micro-organisms; reproduction and development of new species; associated culture and polycultures; open sea cultures.

New techniques of integrated exploitation of resources. Techniques of culture intensification; new technologies of marine organisms culture; genetic selection, manipulation, development of techniques of tank fertilisation; interrelationship between the aquaculture and the environment.

Development and arrangement of fishing resources. Technical Improvements in exploitation; techniques of zones recovery and habitats improvement; study of the marine environment quality; application of the evaluation techniques and the marine resources planning.

Improvements of techniques in production and engineering of the facilities; renewable alternative energies; obtaining of new products and transformation.

Extension and technological transfer. Training; courses and seminars; specific technology, scholarships and specialisation; transfer techniques; spreading; publication; consulting and aquaculture extension; socioeconomy of the fishing and marine culture exploitations.

**3. Facilities at sea**

Fishing research vessel.

#### 4. Scientific cooperation

<b>National</b>	Universities; Public research organisations; Laboratories located in Andalucía)
<b>Bilateral European relations</b>	Algarve (Portugal); Poitou-Charentes (France)

#### Name: CENTRO NACIONAL DE ACUICULTURA (CNA)

##### 1. General information

*Address* Centro Nacional de Acuicultura (CNA)  
Ctra. Poble Nou, km 55.  
43540 San Carlos de la Rápita. (Tarragona)  
Tel. (341) 977 74 54 27. Fax (341) 977 74 41 38

*Status and financial position* Belonging to the Government of Cataluña

##### 2. Detailed objectives and research programmes

Waters quality control in extractive and culture zones; pathologies evaluation of farming and wild populations; technical evaluation of fattening in floating cage in open sea; technical evaluation of fattening in seashore; technical evaluation on fattening in farming and long-lines.

#### Name: ESTACIÓN DE ACUICULTURA (EDA)

##### 1. General information

*Address* Estación de Acuicultura (EDA)  
Camino del Faro.  
E-07071 Puerto Andratx. Mallorca  
Tel. (341) 971 67 23 35. Fax (341) 971 67 42 40

*Status and financial position* Belonging to the Directorate-General of Fishing and Cultures. Balearic Government.

##### 2. Detailed objectives and research programmes

*Objectives*

Aquaculture; marine resources; ichthyology.

*Research activities*

Aquaculture; early stages of reared species; disease, immunology, stress; aquaculture/environment interaction; aquaculture structures, systems, techniques.

#### Name: UNIVERSITIES

##### 1. General information

University of Barcelona  
University of Vigo  
University of Cadiz  
University of Las Palmas  
University of La Laguna  
University of Granada  
University of Valencia



# SWEDEN





## 1. The fisheries, aquaculture and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in the production of national fisheries

The Swedish total catch was in 1996 about 370 000 tonnes with a total value of about EUR 115 million. This is a new high and in the order of magnitude of the catches during the 1960s. By quantity, the most important species in Swedish fishery are herring and sprat. Of herring about half the quantity is taken in the Baltic Sea, of sprat most of in that sea.

	Landings (1 000 tonnes)						
Sea fisheries	1990	1991	1992	1993*	1994	1995	1996
Cod	57.4	46.2	22.4	18.0	31.0	33.2	41.8
Herring <sup>(1)</sup>	158.9	132.2	195.3	165.2	153.1	157.5	132.2
Pandalus	1.6	1.9	2.2	2.3	2.7	2.7	2.2
Nephrops	1.1	1.3	0.8	0.9	0.8	0.9	1.1
Eel	0.8	1.0	1.1	1.0	1.1	1.0	1.0
Saithe	0.8	1.5	3.3	5.0	5.4	2.0	1.8
Salmon	1.3	1.0	1.0	1.0	—	0.7	0.6
Sprat <sup>(1)</sup>	13.5	17.3	59.4	97.0	170.9	165.6	168.6
Haddock	1.0	1.0	2.0	1.3	1.0	1.3	1.2
Mackerel	3.6	4.3	5.0	3.6	7.5	6.3	5.4
Vendace	1.7	1.7	1.1	1.1	1.0	0.6	0.7
Blue whiting <sup>(1)</sup>	1.5	18.0	2.1	37.3	3.7	13.0	4.0
<b>Total</b>	<b>249</b>	<b>234.9</b>	<b>305.2</b>	<b>340</b>	<b>384.6</b>	<b>402.7</b>	<b>369.1</b>

<sup>(1)</sup> Total fish for human consumption and reduction purposes.

	Catches (1 000 tonnes)						
Fresh waters	1990	1991	1992	1993	1994	1995	1996
Pike-perch	0.3	0.3	0.4	0.4	0.35	0.3	0.28
Eel	0.1	0.1	0.1	0.1	0.17	0.13	0.1
Vendace	0.5	0.5	0.5	0.5	0.59	0.49	0.6
of which roe	0.03	0.03	0.03	0.03	0.04	0.03	0.04
Whitefish	0.3	0.3	0.2	0.2	0.25	0.2	0.18
Salmon and trout	0.06	0.08	0.08	0.09	0.07	0.07	0.05
Char	0.06	0.07	0.07	0.06	0.07	0.05	0.03
Pike	0.2	0.2	0.2	0.2	0.16	0.15	0.16
Perch	0.2	0.2	0.2	0.2	0.2	0.2	0.17
<b>Total</b>	<b>2.1</b>	<b>2.1</b>	<b>2.3</b>	<b>2.3</b>	<b>2.3</b>	<b>1.9</b>	<b>1.8</b>

	Value (million EUR)						
<b>Sea fisheries</b>	1990	1991	1992	1993*	1994	1995	1996
Cod	49.8	45.8	23.1	17.1	26.1	28.3	32.1
Herring <sup>(1)</sup>	13.0	15.3	15.8	12.6	13.9	14.9	17.8
Pandalus	5.3	5.5	6.8	7.2	8.4	10.5	9.7
Nephrops	7.9	8.1	4.9	4.9	4.9	4.9	6.9
Eel	3.6	4.7	4.2	4.8	6.1	6.1	5.6
Saithe	0.5	1.0	1.4	2.6	3.0	1.4	1.0
Salmon	2.7	1.9	2.0	2.1	1.9	1.3	1.3
Sprat <sup>(1)</sup>	1.5	2.2	1.6	1.4	0.6	0.9	1.2
Haddock	1.2	1.3	1.8	1.3	1.0	1.1	1.0
Mackerel	0.4	0.3	0.6	1.1	2.1	2.2	4.7
Vendace	0.2	0.3	0.3	0.3	0.2	0.1	0.1
For reduction	4.8	4.0	10.5	17.2	20.3	21.8	19.4
<b>Total</b>	<b>99.5</b>	<b>100.1</b>	<b>83.5</b>	<b>83</b>	<b>99.2</b>	<b>102.5</b>	<b>110.4</b>

\*Value calculated for fish for human consumption (fish for reduction purposes not included).

	Value (million EUR)						
<b>Freshwaters</b>	1990	1991	1992	1993	1994	1995	1996
Pike-perch	1.0	0.9	1.0	1.0	1.1	1.1	1.0
Eel	0.7	0.9	0.7	0.7	1.1	0.9	0.7
Vendace	0.7	0.7	0.7	0.7	1.1	1.0	1.5
of which roe	0.7	0.6	0.6	0.6	1.0	0.9	1.0
Whitefish	0.4	0.4	0.4	0.3	0.4	0.4	0.4
Salmon and trout	0.2	0.3	0.3	0.3	0.2	0.2	0.2
Char	0.3	0.3	0.3	0.3	0.3	0.3	0.2
Pike	0.3	0.3	0.3	0.3	0.3	0.3	0.2
Perch	0.2	0.2	0.2	0.2	0.3	0.3	0.2
<b>Total</b>	<b>3.8</b>	<b>3.8</b>	<b>4</b>	<b>3.9</b>	<b>5</b>	<b>4.7</b>	<b>4.5</b>

In 1994 and 1995 the total catch increased to about 387 000 tonnes and 404 600 tonnes, and the total value to about EUR 104.2 million and EUR 107.2 million, respectively.

### 1.1.2. Trend in the development of the fleet

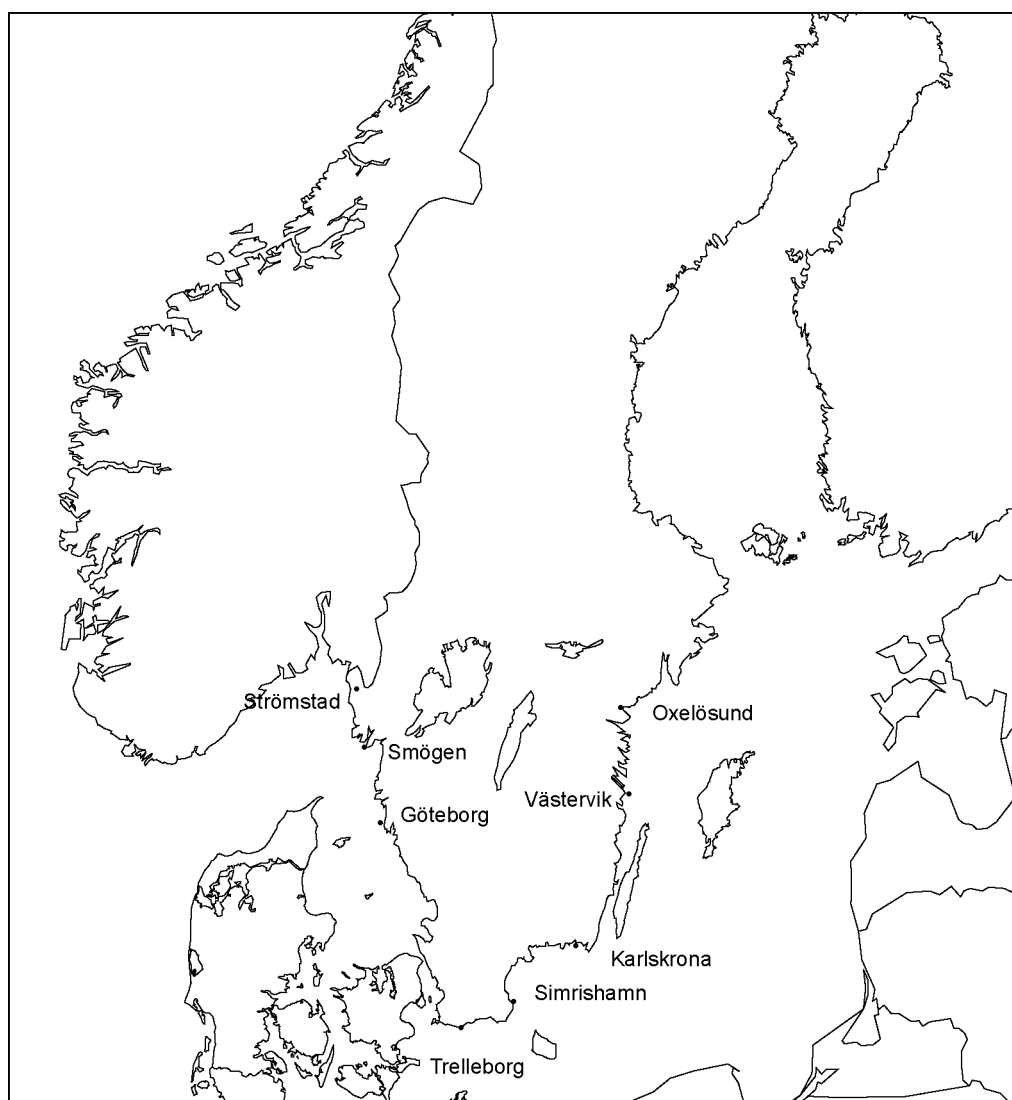
In 1996 about 2 900 professional fishermen were fishing in the sea, and additionally 300 in inland waters. In sea fisheries, about 2 400 registered fishing vessels, longer than 8 m, were operating with a total brutto tonnage of more than 50 000 grt and a power exceeding 250 000 kW.

	1990	1991	1992	1993	1994	1995	1996
Fishermen	3 473	~3 000	~3 000	~3 000	2 999	2 868	2 888
Vessels number	1 579	1 740	1 771	1 800	1 399	2 479	2 423
Power (1 000 kW)	351	379	379	368	244	267	256

Recreational fishermen can be classified into two groups, those who are *sport fishermen*, where the excitement of catching and enjoying nature are most important and only hand tackles are used, and fishermen fishing for consumption within the household where several other gear are permitted, but their size is limited and the number of gear permitted is limited. Catches from recreational fishermen are not sold. A study made in 1990 estimated the number of recreational fishermen to about 2.2 million, of whom more than 1 million fished in fresh waters exclusively, while 600 000 only fished in the sea; the balance are those fishing in both. Catches of fish by those recreational fishermen in the sea are estimated to be in the order of 10-15 000 tonnes. In freshwaters, catches taken by recreational fisheries are in the order of tens of thousands of tonnes and are much larger than those taken by professional fishermen. The annual catch of freshwater crayfish by recreational fishermen amounts to 600 tonnes, whereas by professional fishermen to only 2 tonnes.

### 1.1.3. Fishing harbours

There is a great number of landing places in Sweden. Most important are, however, on the west coast, the harbours of (from south to north) Träslövsläge, Göteborg, Ängöholmen, Smögen, Strömstad; in the Baltic (from south to north) Trelleborg, Simrishamn, Karlskrona, Nögersund, Västervik, Oxelösund. Several Danish fishing harbours are important for landing catches by Swedish fishing boats, such as the harbours of Skagen and Hanstholm. For freshwater fisheries the harbour of Spiken in Lake Vänern is most important.





## 1.2. Aquaculture sector

Production of fish in 1995 was 6 000 tonnes, in 1996 6 100 tonnes, round fresh weight, of this 5 800 tonnes rainbow trout in both years, other species were char and freshwater crayfish. In addition 1 500 and 1 800 tonnes of *Mytilus* were harvested. The total value of aquaculture fish production was in 1995 more than EUR 17 million, in 1996 more than EUR 15 million.

	Quantity (1 000 tonnes)						
Species	1990	1991	1992	1993	1994	1995	1996
Rainbow trout	7.1	5.8	5.1	4.9	5.0	5.8	5.8
Char	0.09	0.09	0.07	0.1	0.1	0.09	0.1
Eel	0.18	0.16	0.2	0.19	0.18	0.16	0.18
Total fish	8.0	6.4	5.8	5.2	5.3	6.0	6.1
Mussels	1.2	1.6	1.4	0.7	2.1	1.5	1.8
Crayfish	0.008	0.008	0.008	0.01	0.01	0.01	0.01
Total shellfish	1.2	1.6	1.4	0.7	2.1	1.5	1.8
<b>Total</b>	<b>9.2</b>	<b>8</b>	<b>7.2</b>	<b>5.9</b>	<b>7.4</b>	<b>7.6</b>	<b>7.9</b>

	Value (million EUR)						
Species	1990	1991	1992	1993	1994	1995	1996
Rainbow trout	17	13.6	11.8	12.2	14.7	14.9	12.8
Char	0.36	0.34	0.3	0.5	0.42	0.39	0.43
Eel	1.28	1.17	1.3	1.26	1.3	1.2	1.34
Other	0.47	0.48	1.51	0.39	0.77	0.7	0.81
<b>Total</b>	<b>21.2</b>	<b>16.3</b>	<b>15</b>	<b>14.4</b>	<b>17.2</b>	<b>17.2</b>	<b>15.4</b>

In 1995 there were 467 aquaculture establishments reporting the production of fish, mussels and crayfish, in 1996 the number decreased to 446. In addition there were nearly 200 establishments cultivating fry for restocking purposes. Production figures from those cultures are not included in the total production mentioned above.

Most of the establishments cultivating fish for restocking are not operating for selling their products on the open market but are producing salmon smolt for restocking as a compensation requested by law for lost salmon reproduction grounds in Baltic rivers which have been exploited for hydropower production. Thus in 1993, 2 629 000 salmon smolt (1995 about 1.8 million, 1996 about 2.2 million) and a considerable number of sea trout smolt were released for restocking the Baltic Sea. Furthermore, some 2 000 tonnes fish were produced for restocking in waters used for recreational fisheries. Another restocking programme and of a different kind is executed with imported eel larvae which are released in the Baltic.

## 1.3. Processing industry sector

In 1993 there were about 300 fish processing factories with 3 000 persons employed. Of those factories, 42 had more than 10 employees, totalling to 1 500 persons. In addition, there were in the same year about 500 factories which only partly (i.e. less to 50 %) were engaged in fish processing and therefore are not included in the official statistics. They gave jobs to about 3 500 persons working with fish. Since then there has been a strong trend to reduce the number of factories and of people employed. Most of the processing factories are located at the Skagerrak coast, in the province of Bohuslän.

There is only one factory for reduction purposes, at Ängholmen, north of Göteborg. In 1996 of the total catch of about 370 000 tonnes more than 250 000 tonnes were used for reduction into fishmeal and oil and as animal fodder. Most of the catch for reduction purposes consisted of herring, sprat, and blue whiting. Of herring and sprat catches an important part is taken in the Baltic.

There is a wide variety of products, mostly from herring cod, and sprat, and also from salmon and *Pandalus* — prawns, with well established brand names. Examples: herring is marinated and preserved in glass jars or filleted and sold in cans. Cod is filleted and deep frozen, cod roe is produced as 'caviar'. Due to shortage of cod several establishments producing fillets were closed down in 1994. Sprat is either processed into two main products: 'anchovies' and 'sardines'.

#### **1.4. Consumption of sea products**

Apparent per capita consumption of fish is rather high with about 30 kg/year and has changed very little during the past years. The real consumption is considered to be lower and fluctuated during the last years of this survey between 16 and 18 kg/year. Of total fish consumption 35 % are of fresh fish, 35 % of chilled fish, and 25 % of deep frozen fish. There is a high demand for ready made fish dishes. Consumption of fresh finfish has decreased during the last 20 years, while consumption of crustaceans and molluscs increased significantly until 1994.

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

There is one national research institute responsible for marine fisheries in Sweden, the Institute of Marine Research in Lysekil, IMR, on the west coast of Sweden, with a laboratory in Karlskrona, on the Baltic coast. There is an Institute of Coastal Research, in Öregrund, on the Baltic coast. Both belong to the National Board of Fisheries which is an administrative body, under the Ministry of Agriculture. For salmon research there is one autonomous institute, mainly funded by hydropower interests. There are a number of university marine stations, which carry out research of interest to marine production in general and to fisheries.

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
<b>Main research institute</b>	Institute of Marine Research	47	47	3.38	3.38
<b>Other research institutes</b>	Institute of Coastal Research	29	29	2.2	2.2
	Institute of Freshwater Research	36	36	2.36	2.36
	Salmon Research Institute	20	20	1.1	1.1
<b>Technical centre(s)</b>	Kristineberg Marine Research Station	See 2.3			
	Swedish Agricultural University	See 2.3			
	Stockholm University	See 2.3			
	Göteborg University	See 2.3			

### 2.1.2. Supervisory Ministerial authority(ies)

Institutes	Authority(ies)					
	Education, research and technology	Agriculture and fisheries	Equipment and transport	Health	International cooperation	Others
Institute of Marine Research						
Institute of Coastal Research						
Institute of Freshwater Research						
Swedish Salmon Research Institute						
Kristineberg Marine Research Station						
Swedish Agricultural University						
Stockholm University						
Göteborg University						

### 2.1.3. Coordination and relationship among the different research organisations and with research users

The political responsibility for managing fisheries rests with the Ministry of Agriculture and the National Board of Fisheries, (NBF) is executing this task. NBF is therefore one of the main initiators of research and also the main user of research results. NBF relies on the findings from its own institutes, but also from other national research groups. Advice on management of marine resources is given by ICES (ACFM) to the EC, to IBSFC, to NEAFC, and to others.

There is a permanent close international cooperation with research institutes of neighbouring countries, which all are cooperating within ICES. For example, there is cooperation with Estonia, Latvia and Lithuania in the fields of monitoring of coastal fisheries, fishery statistics and information. In addition, some of the activities were administrated by the Swedish Centre for Coastal Development and Management of Aquatic Resources (Swedmar) and carried out by the research institutes of the National Board of Fisheries. Earlier, advice on needs in fishery research has been provided to the Governments of Angola and of Guinea Bissau.

Furthermore, there has been a cooperation with the Fisheries Department of FAO. Guidelines on the precautionary approach to capture fisheries and species introductions have been elaborated by a group of experts in cooperation with FAO at the Institute of Marine Research in Lysekil in 1995.

End users of research results are professional fisheries and recreational fisheries, directly or through their organisations, and the fishing industry. Information is disseminated through normal scientific and administrative channels, such as reports, technical, scientific, and popular publications, and verbally, whatever is most adequate.

NBF as the central administrative authority publishes its own reports. For marine fishery science, there is a particular series of publications, otherwise results are published in international scientific forums.

Some of the other research institutes do have their own publications, which are of interest in this context.

Swedish professional fishermen do have their own organisations; a forum for ventilating their interests is the bimonthly periodical *Yrkesfiskaren* (The Professional Fisherman). Staff of IMR contribute with articles on research results and on developments in international fisheries. There are, furthermore, organisations for recreational fisheries. Marine scientists are organised in a professional body, covering all fields of marine research.

#### **2.1.4. Participation to European networks**

There is a considerable number of active organisations covering fishery research and management, being forums for scientific discussions and reaching agreements on management issues. In the following paragraph some governmental and non-governmental organisations are listed, which have fisheries as their main task or which are of more detailed interest to fisheries. A clear separation between marine and brackish water/freshwater organisations cannot be made as there are important anadromous and katadromous species and as there are species which have a wide salinity tolerance. Therefore, some bodies, such as EIFAC, are included. As Sweden is a member of the European Union since 1995, all management issues are discussed within the framework of the Commission.

Besides in ICES, the International Council for the Exploration of the Sea, Sweden is participating in the work of following governmental organisations: NEAFC (North-East Atlantic Fisheries Commission), NASCO (North Atlantic Salmon Conservation Organisation), ICCAT (International Commission for the Conservation of Atlantic Tunas), IBSFC (International Baltic Sea Fishery Commission), HELCOM (Baltic Marine Environment Protection Commission, =Helsinki Commission) IWC (International Whaling Commission), Nordic Council of Ministers—Committee on Fisheries and Aquaculture, EIFAC (European Inland Fisheries Advisory Commission). Sweden has been promoting the scientific work of non-governmental organisations, such as BMB (Baltic Marine Biologists) and CBO (Conference of Baltic Oceanographers), EFAN (European Fish Ageing Network).

### **2.2. Main research institute: INSTITUTE OF MARINE RESEARCH**

#### **2.2.1. General information**

<i>Address</i>	Institute of Marine Research (National Board of Fisheries)
<i>Date of creation</i>	1929
<i>Status and financial position</i>	Governmental, funded by the National Board of Fisheries and the Commission
<b>Institute of Marine Research National Board of Fisheries</b>	Box 4 S-453 21 Lysekil Tel. (46-523) 18 7 00. Fax (46-523) 139 77 E-mail: (name) @imr.se
<b>Baltic Research Station</b>	Utövägen 5 S-371 37 Karlskrona Tel. (46-455) 142 30. Fax (46-455) 104 84 E-mail: (name)@fiskeriverket.se

*Location*

### 2.2.2. Detailed objectives and research programmes

Fishery research in Sweden is directed by the National Board of Fisheries (NBF). Fisheries research carried out under its auspices is aiming at giving the biological basis for a better and sustainable use of fish resources, to preserve marine, brackish water and freshwater habitats of importance for fisheries and to maintain a healthy environment. Most of the research is therefore focussed on long term trends and predictions.

Research Institutes. NBF has three research institutes, Institute of Marine Research in Lysekil at the Skagerrak coast, with its branch the Baltic Research Station in Karlskrona, the Institute of Coastal Research in Öregrund, north of Stockholm, and the Institute of Freshwater Research in Drottningholm, near Stockholm.

Three research offices in Luleå, Härnösand and Jönköping investigate issues which might be harmful to fisheries, such as contaminating discharges from industries and construction work in waters. The total number of staff is 16.

NBF is the central administration and is funding most of the current research of the Institute of Marine Research in Lysekil and of the Institute of Coastal Research in Öregrund. It is also funding operational costs for the research vessels *Argos* and *Ancylus*. In addition, NBF is funding special projects in the field of fisheries development and in applied research, mainly at university institutes.

The Institute of Marine Research in Lysekil with its Baltic Research Station in Karlskrona is the centre of marine fisheries research. The results are to a large extent based on cruise data obtained from NBF's two research vessels. The total number of staff in Lysekil and on board the two research vessels is 41, in Karlskrona 6 scientists, technicians and general service staff.

Main activities: Analysis of Swedish catches of finfish and shellfish; hydroacoustic surveys of pelagic fish (herring and sprat); growth and reproduction of pelagic and demersal fish (mostly herring and Baltic cod); tagging of Baltic cod; multispecies models in the Baltic and in the Skagerrak and Kattegat; studies on Nephrops; diseases and parasites of finfish and shellfish; effects of stocking of plaice in the Kattegat;

by-catches of trawls and other gear; effects of trawls on the sea floor; selection capacity of trawls; mapping and characterisation of the sea floor; hydrodynamics and production in the Skagerrak; bioeconomic models of pelagic fisheries; the Öresunds-bridge: ecological effects.

### 2.2.3. Facilities at sea

There are two fishery research vessels, *Argos* (64 m) and *Ancylus* (19 m), the latter for coastal investigations. Furthermore, there is a remote unmanned vehicle, ROV *Sjöugglan* (together with Kristineberg Marine Research Station and others).

### 2.2.4. Scientific cooperation

<b>National</b>	Swedish Meteorological Institute/Oceanographic Laboratory; Salmon Research Institute; The Royal Academy of Science, Kristineberg Marine Research Station; Tjärnö Marine Research Station; Askö Research Station
<b>Bilateral European relations</b>	Fisheries research institutes of all countries bordering the Baltic Sea; Institute of Marine Research, Bergen and Flödevigen, Norway; DIFRES, Denmark
<b>European network</b>	EFAN (European Fish Ageing Network); Nordic Council of Ministers
<b>International organisations</b>	ICES; ICCAT; HELCOM; BMB; National partner of AFSA (Aquatic Sciences and Fisheries Abstracts)

## 2.3. Other research organisations

Introductory note. For special research projects (excluding normal research activities performed at the institutes of National Board of Fisheries) during the period 1983-92 nearly 240 projects were funded by the Swedish Council for Forestry and Agricultural Research and the National Board of Fisheries, with the percentage distribution of a total of EUR 8.82 million according to the following research themes: genetics 3.7, management 3.6, aquaculture 15.9, diseases 14.3, physiology 17.6, algal physiology 1.0, ecology 26.7, molecular biology/immunology 4.4, toxicology 2.4, environment 1.3, technique 9.3, (total 100.2 %). Most of the research was carried out at the research stations listed in this paper.

### Name: INSTITUTE OF COASTAL RESEARCH

#### 1. General information

<i>Address</i>	Institute of Coastal Research (National Board of Fisheries) Gamla Slipvägen 19 S-740 71 Öregrund Tel. (46-173) 313 05. Fax (46-173) 309 49. E-mail: (name)@kust.fiskeriverket.se
<i>Date of creation</i>	(1970) 1991
<i>Status and financial position</i>	Governmental, financed by the National Board of Fisheries and external funds

## 2. Detailed objectives and research programmes

The Institute of Coastal Research is responsible for investigations on coastal fish populations, including estimating their abundance, in response to 'natural' environmental changes. Monitoring of the effects of industries on coastal fisheries is an important part of the work of the institute. The total number of staff in Öregrund and outposted in different localities is 25 scientists, technicians and general service staff.

Main activities: Recruitment of fish, models of fish reproduction, prognosis, management issues of coastal fisheries. Fish resources: stock assessment, professional and semi-professional fisheries, development of fisheries and handling of fish, recreational fisheries. Environmental disturbances: reference areas (e.g. guidelines for coastal monitoring), investigations on recipients, environmental alerts and descriptions of consequences of environmental changes (e.g. effects of nuclear power stations, of cooling waters, of toxic substances, the Öresund bridge).

## 3. Scientific cooperation

(Mostly with countries bordering the Baltic Sea).

### Name: INSTITUTE OF FRESHWATER RESEARCH

#### 1. General information

Address	Institute of Freshwater Research (National Board of Fisheries) S-178 93 Drottningholm Tel. (46-8) 620 04 00. Fax (46-8) 759 03 38 E-mail: (name)@fiskeriverket.se
Date of creation	1933
Status and financial position	Governmental, financed by the National Board of Fisheries and external funds

#### 2. Detailed objectives and research programmes

The Institute of Freshwater Research is the centre for studies of the freshwater environment, such as counteracting the acidification of lakes, protection of fish populations and the preservation of fish resources in different aquatic systems. The total number of staff in Drottningholm is 37 scientists, technicians and general service staff. There are also two fishery research stations, in Älvkarleby and in Kälarne, for field research in fresh waters and rearing of salmon and trout.

#### 3. Scientific cooperation

National	Institute of Freshwater Research, Drottningholm
European network	EIFAC
International organisations	ICES



**Name: SWEDISH SALMON RESEARCH INSTITUTE**

**1. General information**

<i>Address</i>	Swedish Salmon Research Institute Forskarstigen S-814 94 Älvkarleby Tel. (46-26) 771 50. Fax (46-26) 771 60
<i>Date of creation</i>	1946
<i>Status and financial position</i>	Autonomous body, financed according to law by the hydropower industry and by research funds

**2. Detailed objectives and research programmes**

As a compensation for damages in rivers to natural reproduction of salmon caused by the construction of hydroelectric power stations; to carry out research on biology, reproduction, and cultivation techniques of salmonid species, particularly on *Salmo salar*.

**3. Scientific cooperation**

<b>National</b>	Institute of Freshwater Research, Drottningholm
<b>European network</b>	NASCO
<b>International organisations</b>	ICES

**Name: KRISTINEBERG MARINE RESEARCH STATION**

**1. General information**

<i>Address</i>	Kristineberg Marine Research Station (The Royal Academy of Science and Göteborg University) S-450 34 Fiskebäckskil Tel. (46-523) 185 00. Fax (46-523) 185 02 E-mail: (name)@kmf.gu.se
<i>Date of creation</i>	1877
<i>Status and financial position</i>	Since 1933 jointly governed by the Academy and the University, research funds

**2. Detailed objectives and research programmes**

Located at the Gullmarfjord on the west coast of Sweden Kristineberg offers working space for visiting scientists, marine university courses and symposia. The staff is carrying out environment monitoring programmes and studies of production of coastal waters at different trophic levels.

**3. Facilities at sea**

Two research vessels, *Arne Tiselius* (25.5 m) and *Oscar von Sydow* (12 m); ROV *Sjöugglan* (together with the Institute of Marine Research and other institutions).

**Name: ASKÖ LABORATORY****1. General information**

*Address* Askö Laboratory (Stockholm University)  
S-619 00 Trosa  
Tel. (46-156) 222 60. Fax (46-156) 221 87

*Date of creation* 1961

*Status and financial position* Stockholm University and research funds

**2. Detailed objectives and research programmes**

Marine research in the Baltic and higher education at different levels. Monitoring of long-term changes in the marine environment. Research on the food web in the Baltic and its change as a consequence to larger environmental changes.

**3. Facilities at sea**

Several smaller research vessels.

**Name: TJÄRNÖ LABORATORY****1. General information**

*Address* Tjärnö Marine Biological Laboratory  
S-452 96 Strömstad  
Tel. (46-526) 686 00. Fax (46-526) 686 07

*Date of creation* 1963

*Status and financial position* Göteborg and Stockholm University, external research funds

**2. Detailed objectives and research programmes**

Courses at different levels in marine biology; research in marine biology; monitoring of the coastal environment of the Northern Skagerrak.

**3. Facilities at sea**

Several research vessels; *Nereus* has a length of 16 m.

**Name: OTHER UNIVERSITIES STATIONS****1. General information**

Swedish Agricultural University  
The Swedish Agricultural University at Ultuna has a chair on aquaculture, located at the University of Umeå.

University of Stockholm  
The Laboratory for Aquatic Ecotoxicology and the Institute of Applied Environmental Research at Nyköping are carrying out research on fisheries and environmental issues.



# UNITED KINGDOM





## 1. The fisheries, aquaculture, and processing industry

### 1.1. Fisheries sector

#### 1.1.1. Trend in production for national fisheries

Landings (in thousand tonnes)					
Species	1992	1993	1994	1995	1996
Demersal	328.4	359.2	371.6	386	407.7
Pelagic	373.5	393.8	388.9	396.3	343.9
Shellfish	109.6	104.6	114.4	129.5	104.6
<b>Total</b>	<b>811.4</b>	<b>857.6</b>	<b>874.9</b>	<b>911.8</b>	<b>892.3</b>

Landings (million EUR)					
Species	1992	1993	1994	1995	1996
Demersal	488.88	521.2	533.49	540.22	560.84
Pelagic	74.14	82.48	85.4	94.03	131.62
Shellfish	147.26	166.13	202.1	228.72	238.37
<b>Total</b>	<b>710.15</b>	<b>769.23</b>	<b>821</b>	<b>862.97</b>	<b>930.83</b>

#### 1.1.2. Trends in fleet

	1990	1991	1992	1993	1994	1995	1996
Fishermen					20 703	19 921	19 044
Vessels number	11 189	10 862	10 979	11 108	10 297	9 174	8 073

### 1.1.3. Fishing harbours



### 1.2. Aquaculture sector

Species	Quantity (thousand tonnes)						
	1990	1991	1992	1993	1994	1995	1996
River trout	8.45	10.30	14.95	14.17	16.06	15.98	16.04
Salmon	32.45	40.69	36.30	48.79	64.17	70.32	83.46
Shellfish					6.2	7.1	10.00
<b>Total</b>					<b>86.43</b>	<b>93.4</b>	<b>109.5</b>

## 2. Research organisation scheme

### 2.1. National research organisations

#### 2.1.1. Research institutes involved in fishery sectors

Research relevant to fisheries and aquaculture is carried out in a wide variety of locations, including universities, institutes of the Natural Environment Research Council, and government agencies. The three principal institutes, described in the next sections, are part of the government departments with responsibilities for fisheries in England and Wales (MAFF), Scotland (SOAEFD) and Northern Ireland (DANI).

Status	Institutes	Employees in fisheries and aquaculture research	Total employees	Budget for fisheries and aquaculture research (million EUR)	Total budget (millions EUR)
Main research Institute	CEFAS	180	423	17.0	33.63
Other research Institutes	FRS	196	273	15.3	21.2
	ASG	20	28	2.3	2.92

#### 2.1.2. Supervisory Ministerial authority(ies)

Institutes	Authority(ies)		
	Agriculture and Fisheries (MAFF in UK and Wales)	Agriculture and Fisheries (SOAEFD in Scotland)	Agriculture and Fisheries (DANI in Northern Ireland)
CEFAS			
FRS			
ASG			

#### 2.1.3. Participation to European networks

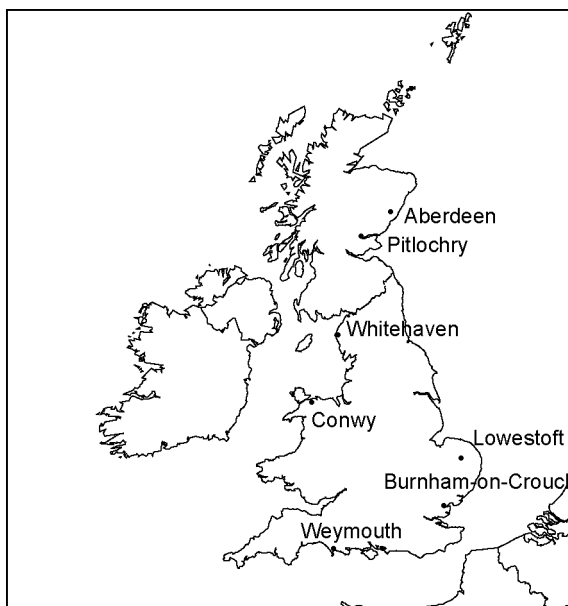
All three of the main research organisations participate widely in collaborative networks in Europe, particularly under the auspices of the EU and ICES.



## 2.2. Main research institute: CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE (CEFAS)

### 2.2.1. General information

<i>Address</i>	Centre for Environment, Fisheries and Aquaculture Science (CEFAS) Pakefield Road Lowestoft NR33 0HT Tel. (44-1502) 56 22 44. Fax (44-1502) 51 38 65 Chief Executive: Dr P. Greig-Smith
<i>Date of creation</i>	1902
<i>Status and financial position</i>	CEFAS is an Executive Agency of the Ministry of Agriculture, Fisheries and Food (MAAF)
<b>Lowestoft</b>	CEFAS Laboratory, Pakefield Road, Lowestoft, Suffolk NR33 0HT
<b>Burnham-on-Crouch</b>	CEFAS Laboratory, Remembrance Avenue, Burnham-on-Crouch, Essex CM0 8HA
<b>Weymouth</b>	CEFAS Laboratory, Fish Diseases, The Nothe, Barrack Road, Weymouth, Dorset DT4 8UB
<b>Conwy</b>	CEFAS Laboratory, Benarth Road, Conwy, Conwy LL32 8UB
<b>Whitehaven</b>	CEFAS Laboratory, West Strand, Whitehaven, Cumbria CA28 7LY
<i>Location</i>	



### 2.2.2. Detailed objectives and research programmes

CEFAS is an integrated research and consultancy centre solving problems in fisheries, aquaculture and the aquatic and terrestrial environments. Its staff provide scientific expertise of quality, depth and breadth backed up by comprehensive technical facilities and international links developed over more than 90 years. It has an active research programme which includes the development of innovative analytical methods and technologies to give leading-edge capability in the most up-to-date techniques for effective environmental monitoring and fisheries management.

CEFAS incorporates three science groups, i.e. environment, fisheries science and management and aquaculture and health.

— Environment group

Management: Chairman of the Board — Dr M. Waldock.

Teams: Regulatory assessments; Sediments and surveys; Contaminant fate; Pollution effects; Chemistry; Radioecology; Fish and shellfish quality; Physical processes; Biogeochemical processes; Radiological monitoring; Radiological assessments; Radioanalytical services; Administration.

Objectives and research programme

The environment group has over 50 years' experience in researching, monitoring and assessing the impact of potentially harmful substances or activities on the quality of the marine, coastal, estuarine and terrestrial environments.

This expertise encompasses establishing the fate and effects of a broad spectrum of contaminants, including radioactive and non-radioactive waste, organic and inorganic contaminants and micro-organisms and viruses. It also includes experience in assessing the effects of other man-made changes such as those caused by the exploitation of offshore reserves of gas, oil, sand and gravel, and the impacts of agriculture and aquaculture developments.

Research is carried out in each of the following areas: Environmental quality assessment, environmental impact and waste assessment, food safety, environmental impact of products, and environmental processes namely: oceanography, sediment dynamics and disturbances, nutrients and eutrophication, and climate change.

— Fisheries science and management group

Management: Chairman of the Board — Dr G. P. Arnold.

Teams: Marine finfish: Eastern; Marine finfish: Pelagic, Plankton (including administration); Marine finfish: Western; Marine finfish: Fisheries systems modelling; Behaviour and physiology; Shellfish; Salmon and freshwater; Electronic design unit.

Objectives and research programme

CEFAS scientists are leading participants in the International Council for the Exploration of the Sea (ICES), whose scientific working groups are the cornerstone of advice on North Atlantic fisheries assessment and management. The Centre provides scientific assessments and objective advice on managing marine and freshwater fish stocks and ecosystems via sampling programmes tailored to specific sea areas, conducting research into biological processes and developing models of complex fisheries systems.

Current field investigation programmes include studying the migration patterns of fish via tracking techniques, investigating how crustacean behaviour affects trap catches, and evaluating the biological and fisheries benefit of enhancing stocks using hatchery-reared juveniles. In the laboratory, the centre has great expertise in fish and shellfish ageing techniques and plankton recognition. Its 50-year database of fishery statistics for England and Wales, built up from both market landings and research vessel cruises, provides the basis for its multispecies and multifleet modelling work, which is linked with economic and other non-biological information.

— Aquaculture and health group

Management: Chairman of Board – Dr B. R. Howell.

Teams: Inspectorate; Pathology; Virology and molecular genetics; Microbiology; Fish cultivation; Shellfish cultivation; Support.

Objectives and research programme

The Aquaculture and Health Group provides expert advice, consultancy and research into the biology and cultivation of finfish, molluscs, crustacea, other marine invertebrates and algae, and also in the areas of the disease diagnosis of fish and shellfish and achieving regulatory approval for the use of new medicines in aquaculture respectively.

It has over 40 years' experience in broodstock, hatchery, nursery and on-growing technology research as applied to marine and freshwater species of all kinds. It also has extensive experience in isolating, cultivating and identifying a wide range of pathogens in fish and shellfish, and maintains an internationally recognised reference collection of fish bacteria and viruses. Research is carried out into the development of a variety of rapid, specific and sensitive diagnostic tests. The Group also monitors and assesses, via regular research vessel surveys, the incidence of disease in marine fish stocks and investigates possible links to contaminants in the marine environment.

### 2.2.3. Facilities at sea

CEFAS owns two research vessels which in recent years have each operated for more than 250 days a year at sea. Charter vessels are also utilised for inshore work in particular. Some details of the research vessels are:

RV *Cirolana*, 72 m length, in service since 1970.

RV *Corystes*, 53 m length, in service since 1988.

CEFAS is currently progressing procurement of a new research vessel.

## 2.3. Other research organisations

### Name: FISHERIES RESEARCH SERVICES (FRS)

#### 1. General information

<i>Address</i>	Fisheries Research Services Marine Laboratory PO Box 101 Victoria Road Aberdeen, AB11 9DB Tel. (44-1796) 87 65 44. Fax (44-1796) 29 55 11 Professor A. D. Hawkins (Chief executive)
<i>Date of creation</i>	1939
	Fisheries Research Services Freshwater Fisheries Laboratory Faskally Pitlochry Perthshire, PH16 5LB Tel. (44-1796) 47 20 60. Fax (44-1796) 47 35 23 Dr R. G. J. Shelton (Officer in charge)
<i>Date of creation</i>	1948
<i>Status and financial position</i>	FRS is an Executive Agency of the Scottish Office

#### 2. Detailed objectives and research programmes

FRS is organised into four research teams in Aberdeen and one in Pitlochry. These research teams are as follows:

— Marine Fish Resources (Aberdeen)

##### Aims

To gather regular representative biological information on all commercially important fish and shellfish species in Scottish waters by sampling at fish markets around Scotland and by undertaking extensive sampling on board commercial vessels whilst at sea; to undertake regular young fish and ground fish surveys aboard research vessels to provide fishery independent recruitment

indices and estimates of year-class strength within each stock; to use dedicated research and charter vessel surveys to carry out acoustic, egg and larval surveys to provide stock estimates of adult pelagic fish like mackerel, sprats and herring and to carry out TV and fishing surveys to provide stock estimates for shellfish; to develop and improve the methodology of fish stock assessment; to undertake research to investigate biological interactions between fish stocks and the ecosystem effects of fishing.

To integrate landings and effort data provided by the Scottish Fishery Protection Agency with survey, discard and biological data gathered by the laboratory; to provide timely assessments of the state of the fish and shellfish stocks of commercial importance to Scotland and to provide scientific advice to the UK Government and EC on fisheries management.

— Fish Capture (Aberdeen)

Aims

To provide advice to UK Government, ICES and EC on the various technical measures used to regulate the performance of fishing gears; to provide the engineering and biological knowledge required to support the development of more selective and conservation orientated fish capture methods; to improve the efficiency of the sampling methodology used for both pelagic and demersal fish stock assessment.

— Environment (Aberdeen)

Aims

To monitor the concentration of contaminants in the marine environment and to study their circulation, their eventual fate and their effects on the marine biota; to monitor the changes in water movements around the Scottish coast and to assess the resultant consequences of the productivity of the marine resources in Scottish waters; to provide advice to UK Government, ICES and EC on the present and likely future impacts of anthropogenic activities on marine resources.

— Fish Cultivation (Aberdeen)

Aims

To provide scientific support for legislation on fish and shellfish diseases including the carrying out of inspection, sampling and regulatory duties; to provide advice on fish and shellfish disease control to UK Government, ICES and EC; to undertake the diagnosis of reportable disease and to conduct a survey of fish and shellfish production on an annual basis; to carry out a programme of research into diseases of economic significance in order to provide new or better controls; to carry out research into disease interactions between farmed and wild fish.

— Freshwater Fish Resources and Environment (Pitlochry)

Aims

to provide scientific advice to government on all aspects of the Scottish fisheries for migratory and fresh water species — in particular salmon and trout; to record and quantify the effects of fishing and environmental change on the populations upon which they depend; to monitor the reported catches of salmon and sea-trout in Scotland, to assess the long-term effects of both fishing and environmental changes on the abundance and structure of salmon and trout populations and to help to formulate recommendations for stock augmentation through restocking or through environmental improvement.

Because of the multidisciplinary approach to research projects, several research teams may provide input into particular projects.

### **3. Facilities at sea**

The newly acquired RV *Scotia* — a 68 m offshore research vessel which carries out research in Scottish waters and also operates further afield — from Faeroe in the north, to the Bay of Biscay in the south. This vessel was built by Ferguson Shipbuilders of Port Glasgow and came into service at the end of March 1998.

RV *Clupea* a 32 m research vessel which works mainly in inshore areas of the North Sea and to the west of Scotland.

**Name: MARINE RESEARCH INSTITUTE: AQUATIC SCIENCES GROUP (ASG), DEPARTMENT OF AGRICULTURE, NORTHERN IRELAND**

**1. General information**

<i>Address</i>	Aquatic Sciences Group (ASG), Department of Agriculture, Northern Ireland Agricultural and Environmental Science Division Department of Agriculture, Newforge Lane Belfast, Northern Ireland, BT9 5PX Tel. (44-1232) 25 52 36. Fax (44-1232) 38 22 44 Director: Dr S. I. Heaney
<i>Date of creation</i>	1972
<i>Status and financial position</i>	State owned organisation

**2. Detailed objectives and research programmes**

ASG is an integrated research group involved with an ecosystem approach to freshwater and marine fisheries in waters of interest to Northern Ireland. Its staff consist of fisheries and environmental biologists with an emphasis on problem-solving based on sound time-series data. The group collaborates with other European fisheries and environmental laboratories in developing new technologies for environmental research and fisheries management.

Supervision of activities: ASG is part of the Agricultural and Environmental Science Division of the Department of Agriculture for Northern Ireland. The group undertakes fisheries and environmental monitoring to provide advice to government.

— Marine fisheries (Management: Programme leader — Dr R. P. Briggs)

The Marine Fisheries Programme is focused at providing a scientific basis for the conservation of Northern Ireland's marine resources and the rational management of its fisheries. Although current research is on the Irish Sea from the North Channel to Anglesey, this area may be extended in the future to take account of the migratory behaviour of some fish species, e.g. hake. Particular emphasis is on the thermally stratified western region where important cod, whiting, herring and nephrops fisheries and spawning grounds are located. The overriding issue being addressed within this research programme is to understand the current over-exploitation problem and provide advice upon which to base an ecologically and commercially viable management regime. Research interfaces with the other research programmes of ASG in order to provide a total ecosystem view of the province's marine environment and its exploitable resources.

— Freshwater fisheries (Management: Programme leader — Dr G. J. A. Kennedy)

Freshwater fisheries research is structured to cover both salmonid and coarse fisheries. The main thrust of the work on salmonids continues to be centred on the modelling of the salmon populations of the life cycle. The work is providing the scientific basis for new salmon enhancement projects being initiated on Northern Ireland rivers. Work on coarse fish is concentrated on Lough Erne, where data on population structure and recruitment are being accumulated in an area where these stocks are central to the development of the amenity value of the region.

— Biological oceanography and limnology (Management: Programme leader — Professor C. E. Gibson)

The Biological Oceanography and Limnology programme is composed of two separate elements. The oceanographic work is centred on the deployment of the research vessel *Lough Foyle* and is an intensive study of the north-west Irish Sea, with links to the Marine Fisheries and Sea Loughs programmes also carried out by ASG. The limnology programme continues a long-term study of the Lough Neagh system, supported by a 26-year data run, a study of the Erne system is being developed to investigate the influence of climate change and land use on the functioning of the lake and its fisheries.

**3. Facilities at sea**

ASG owns one 43 m research vessel which operates approximately 240 days a year at sea. It also owns a number of small boats for operating on inland waters.

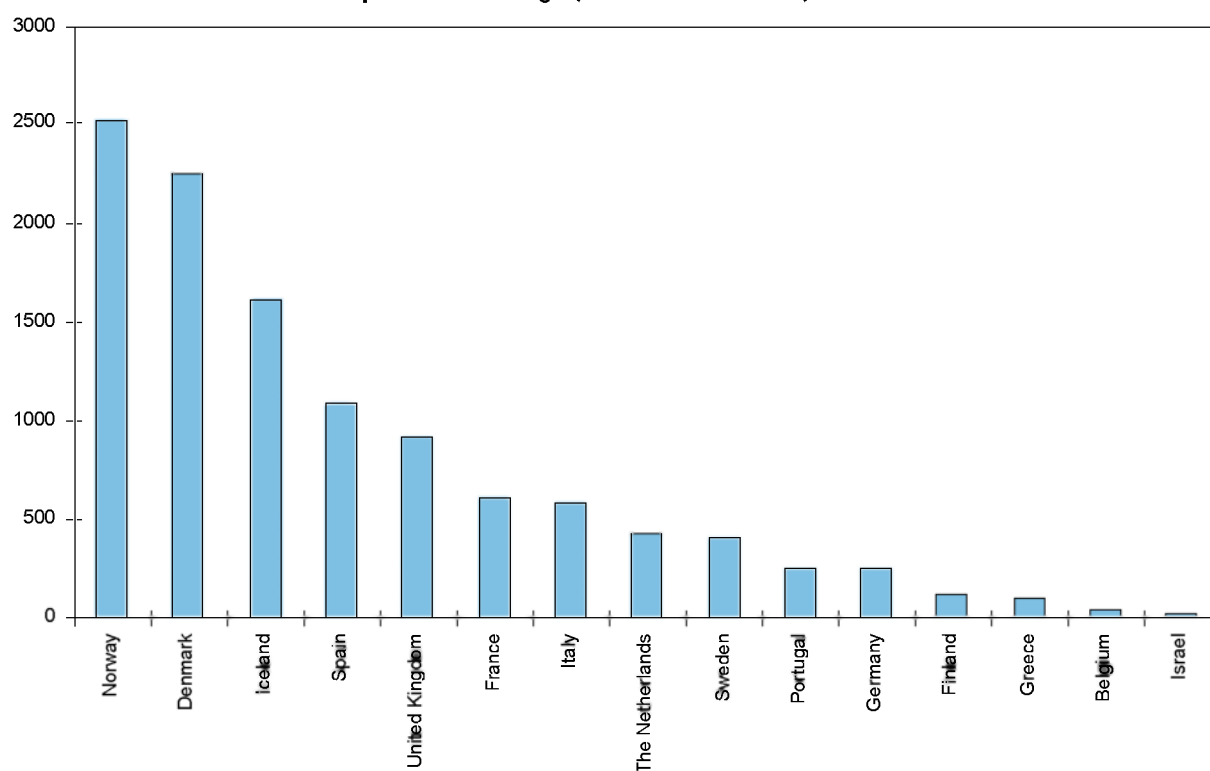
**PRODUCTION DATA  
IN THE EUROPEAN UNION,  
ICELAND, ISRAEL AND NORWAY  
SEA FISHERIES  
AND AQUACULTURE**



**Table 1 — Landings (in thousand tonnes)**

	1990	1991	1992	1993	1994	1995	1996
Belgium	37.5	36.3	33.4	32.3	30.2	31.1	27.1
Denmark	1547.2	1813.8	2106.6	1787.9	2096.1	2249.1	1848.2
Finland	73.7	60.2	79.1	83.6	103.4	106.1	116.6
France	595.4	590	591.2	614	645	603.4	584.5
Germany	215.6	253.6	265.5	258.5	219.6	249.4	250.6
Greece	83.19	79.28	86.11	90.47	113.95	89.2	92.83
Iceland	1502	1044	1569	1712	1551	1607	2055
Ireland	222.95	254.39	277.81	278.76	288.92	384	332.29
Israel	6.2	5,6	5.4	5	4.1	4.9	5.3
Italy	523	537	544	555	556	572	555
Netherlands	nd	nd	nd	424.4	384.6	413.6	403.7
Norway	nd	2007	2430	2415	2366	2516	2638
Portugal	nd	nd	289.4	nd	nd	255	234.1
Spain	nd	nd	1171.8	1204.6	1170.3	1080.7	nd
Sweden	249	234,9	305.2	340	384.6	402.7	369.1
United Kingdom	nd	nd	811.4	857.6	874.9	911.8	892.3

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**Graph 1 — Landings (in thousand tonnes) in 1995**

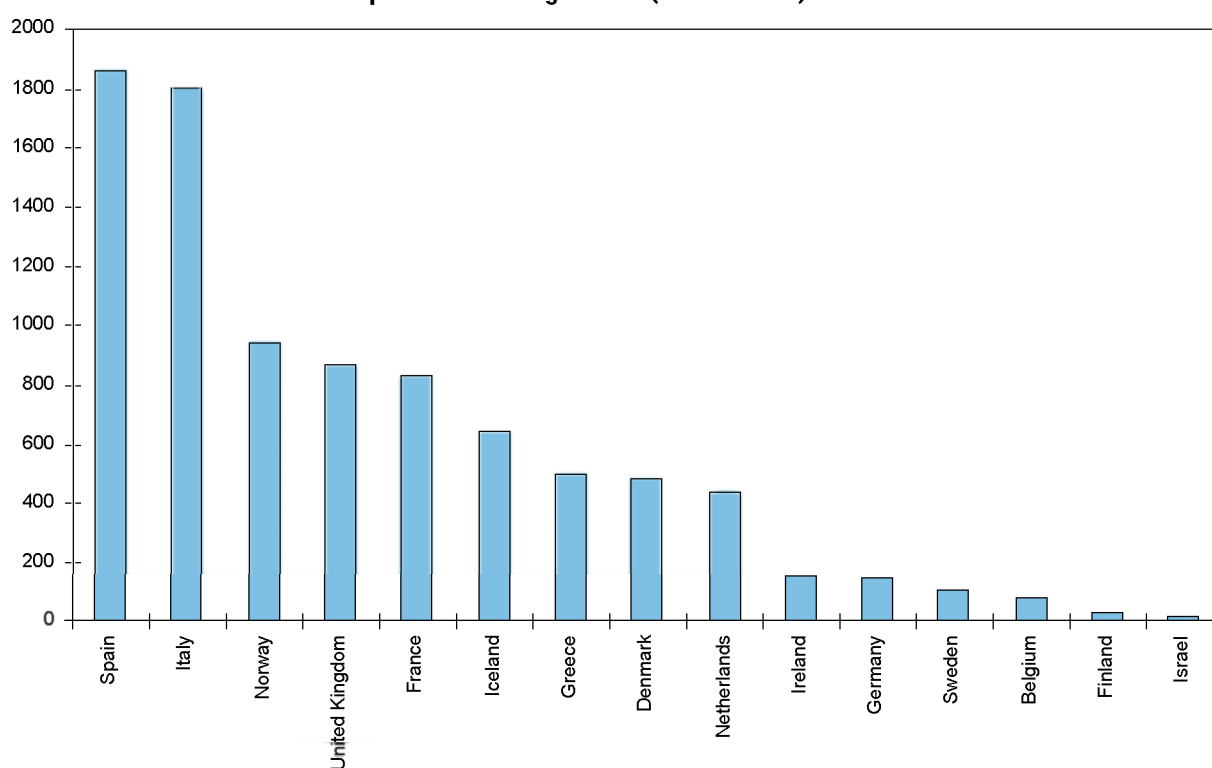


**Table 2 — Landings value (million EUR)**

	1990	1991	1992	1993	1994	1995	1996
Belgium	88.1	94.7	77.7	76.5	74.3	75.4	78.9
Denmark	545.4	587	388.41	407.8	486.09	480.22	475.63
Finland	26.46	25.09	27.43	27	26.95	21.69	25.07
France	989.61	994.15	954.83	907.41	865	826.58	866.7
Germany	104.1	194.2	158.7	145.9	142	145	167.1
Greece	309.17	324.14	355.80	379.26	439.45	497.21	529.56
Iceland	647	697	653	640	625	641	684
Ireland	113.81	117.5	122.21	121.28	132.24	153.44	168.65
Israel	5.13	4.47	4.49	4.41	2.7	5.05	4.19
Italy	1645.6	1710.8	1759.4	1736.1	1761.4	1793.1	1792.3
Netherlands	nd	459	441	430	416	433	418
Norway	nd	683.4	700.4	718.8	855.7	936.4	996.4
Portugal	nd	nd	nd	nd	nd	nd	nd
Spain	nd	nd	1624.1	1641.1	1780.2	1856.7	nd
Sweden	99.5	100.1	83.5	83	99.2	102.5	110.4
United Kingdom	nd	nd	710.15	769.23	82.1	862.97	930.83

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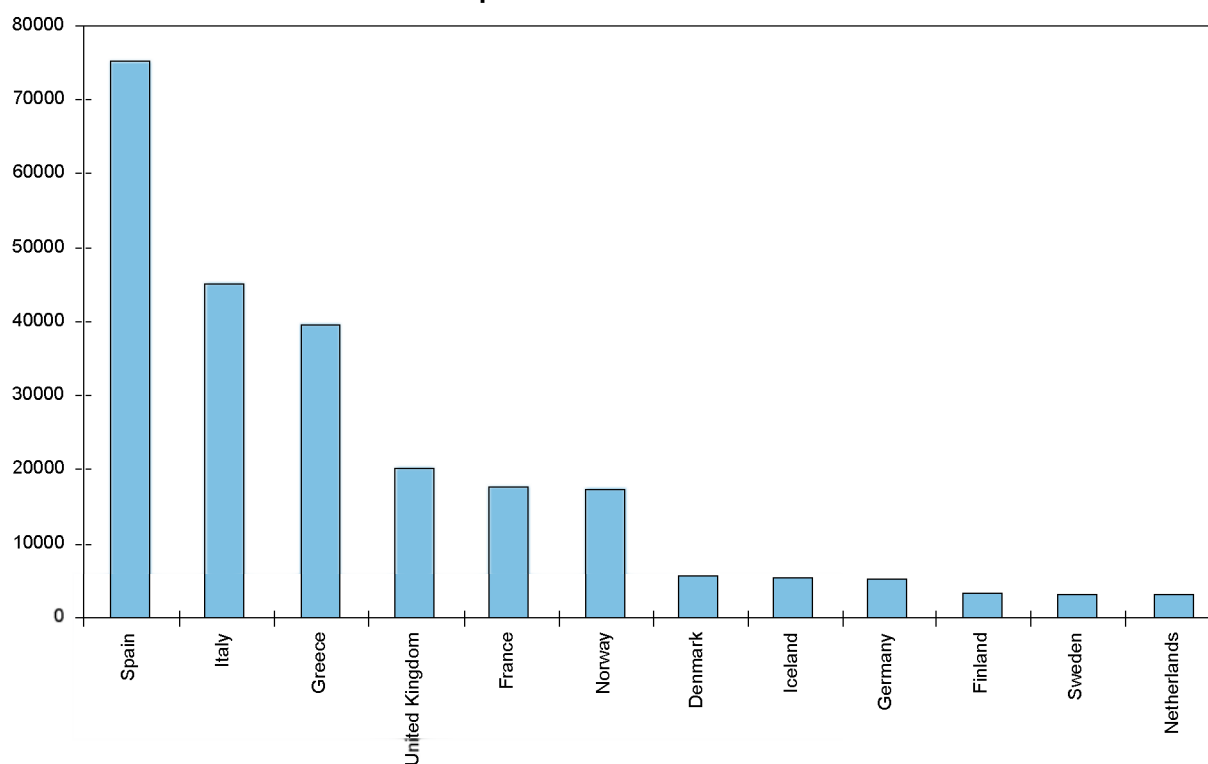
**Graph 2 — Landings value (million EUR) in 1995**



**Table 3 — Fishermen**

	1990	1991	1992	1993	1994	1995	1996
Belgium	nd	nd	nd	nd	nd	nd	750
Denmark	7 053	6 743	6 518	6 376	5 488	5 355	5 348
Finland	3 046	2 884	2 739	2 765	2 375	3 000	3 000
France	21 892	21 261	19 572	18 832	18 306	17 480	17 101
Germany	4 836	4 879	5 402	5 096	4 979	4 888	4 588
Greece	nd	39 413	38 206	37 859	39 697	39 397	39 625
Iceland	6 551	6 135	5 685	5 819	5 713	5 061	5 061
Ireland	nd	nd	nd	nd	nd	nd	7 700
Israel	nd	nd	nd	nd	nd	nd	nd
Italy	45 589	43 551	46 377	44 844	45 895	44 773	44 249
Netherlands	nd	2 969	2 868	2 821	2 808	2 760	2 683
Norway	20 475	20 003	19 765	19 068	16 442	17 160	17 087
Portugal	nd	nd	nd	nd	31 721	nd	28 458
Spain	nd	nd	81 204	79 409	79 006	74 993	72 882
Sweden	3 473	3 000	3 000	3 000	2 999	2 868	2 888
United Kingdom	nd	nd	nd	nd	20 703	19 921	19 044

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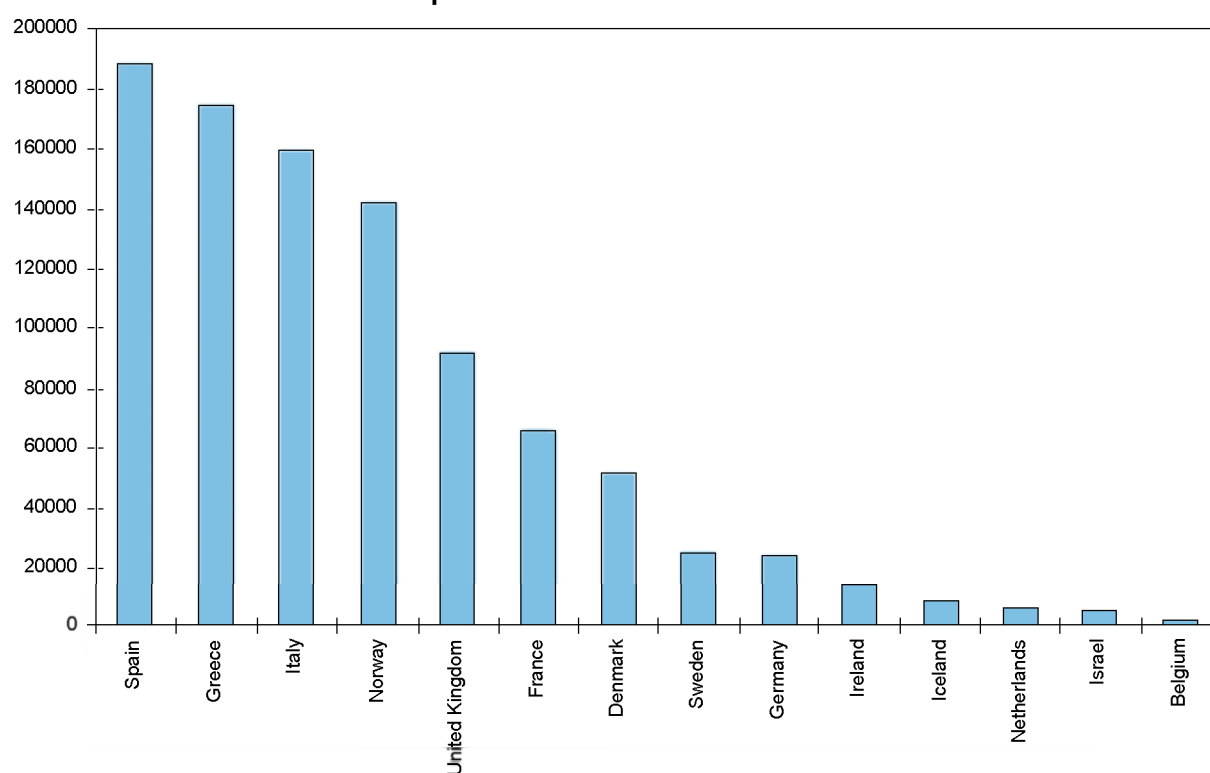
**Graph 3 — Fishermen in 1995**

**Table 4 — Number of vessels**

	1990	1991	1992	1993	1994	1995	1996
Belgium	205	201	205	182	170	166	150
Denmark	2 832	2 750	3 488	3 232	3 188	5 189	4 830
Finland	nd	nd	nd	nd	nd	nd	3 864
France	8 654	7 393	7 139	7 021	6 837	6 593	6 475
Germany	1 247	1 855	2567	2 478	2 458	2 392	2 372
Greece	nd	17 476	16 941	16 787	17 602	17 469	17 570
Iceland	996	993	955	943	867	825	800
Ireland	nd	nd	1 445	1 459	1 446	1 385	1 249
Israel	449	453	502	529	464	506	463
Italy	18 492	16 651	16 723	16 788	15 785	15 965	16 780
Netherlands	nd	586	565	563	553	540	526
Norway	17 392	17 236	17 069	16 402	15 211	14 194	13 940
Portugal	nd	nd	13 910	nd	nd	nd	11 597
Spain	nd	nd	19 456	19 092	18 863	18 862	18 331
Sweden	1 579	1 740	1 771	1 800	1 399	2 479	2 423
United Kingdom	11 189	10 862	10 979	11 108	10 297	9 174	8 073

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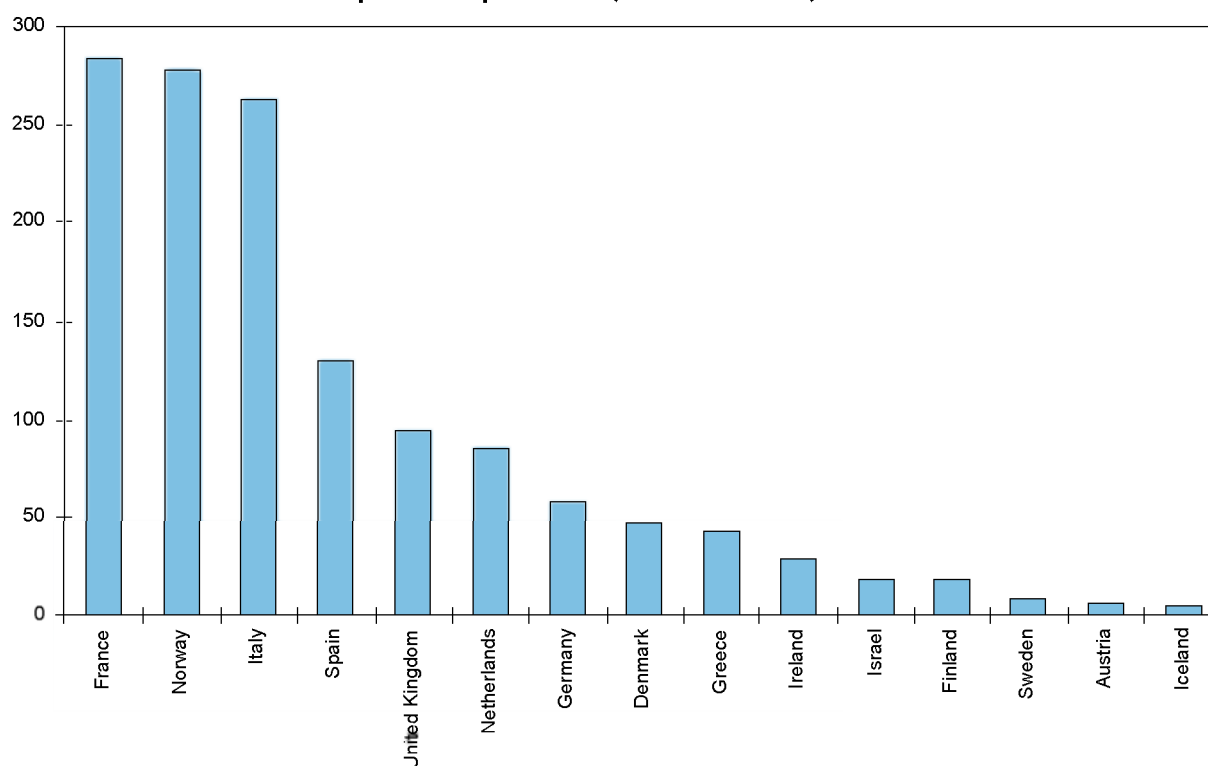
**Graph 4 — Number of vessels in 1995**



**Table 5 — Aquaculture (thousand tonnes)**

	1990	1991	1992	1993	1994	1995	1996
Austria	4.265	4.38	4.36	4.18	4.16	4.06	4.07
Belgium	nd	nd	nd	nd	nd	nd	2.29
Denmark	38.9	40.6	40.6	40.9	44.1	46.2	43.1
Finland	18.6	19.3	17.9	17.5	16.7	17.3	17.65
France	244.7	254.7	259.3	273.1	278.8	283.0	285.4
Germany	64.7	71.1	90.3	63.4	42.9	57.1	74.5
Greece	7.46	12.6	20.8	28.6	35	41.5	52.2
Iceland	3.1	3.3	2.7	3.4	3.7	3.8	4.3
Ireland	26.57	27.70	27.08	30.15	28.61	27.37	34.93
Israel	14.59	15.14	12.13	13.68	14.71	17.45	17.86
Italy	176	180.7	198.25	203.8	230	261.8	238.8
Netherlands	nd	41	51	73	105.5	84.5	92.7
Norway	149.7	nd	131	155.9	218.4	277.61	231.4
Portugal	4.4	nd	6.4	nd	6.6	nd	5.3
Spain	200.9	222.5	168.2	121.6	175.8	129.2	228.7
Sweden	9.2	8	7.2	5.9	7.4	7.6	7.9
United Kingdom	nd	nd	nd	nd	86.43	93.4	109.5

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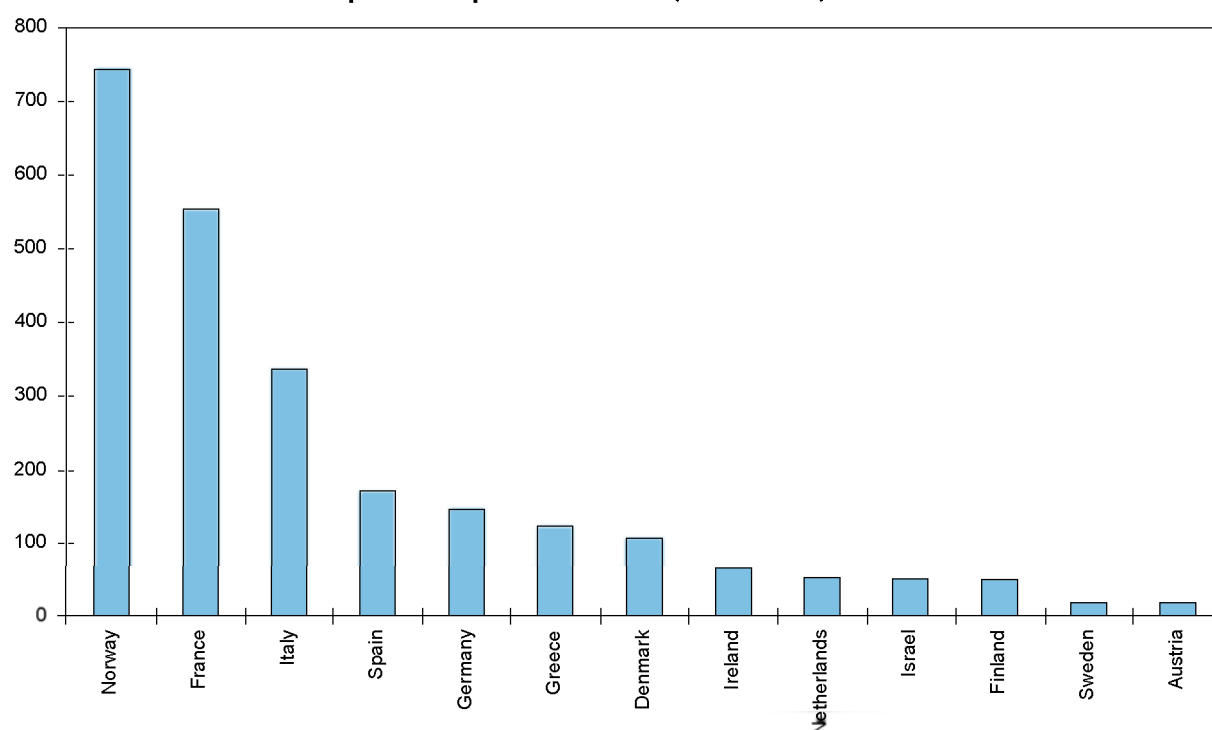
**Graph 5 — Aquaculture (thousand tonnes) in 1995**

**Table 6 — Aquaculture value (million EUR)**

	1990	1991	1992	1993	1994	1995	1996
Austria	19.33	20.64	18.71	15.3	14.25	17.19	17.32
Belgium	nd	nd	nd	nd	nd	nd	6.05
Denmark	nd	nd	nd	nd	122.1	105.6	nd
Finland	60	64.7	62.7	63	61.7	48.1	40.14
France	442.1	519.7	491.9	558.4	631.4	558.3	626.9
Germany	138.1	289.2	288.7	169.6	114.7	146	113.6
Greece	15.1	22.7	39.3	70.5	96.3	122.3	157.4
Iceland	nd	nd	nd	nd	nd	nd	nd
Ireland	37.21	49.92	51.35	63.88	61.60	62.43	70.05
Israel	46.85	49.27	34.8	35.29	38.02	48.85	57.6
Italy	203.71	214.51	233.59	265.67	321.26	336.37	335.79
Netherlands	nd	53	41	45	45	51	60
Norway	549.9	nd	445.8	517.8	686.5	742.8	734
Portugal	nd	nd	nd	nd	nd	nd	nd
Spain	138.14	191.25	146.22	126.63	150.53	169.86	184.30
Sweden	21.2	16.3	15	14.4	17.2	17.2	15.4
United Kingdom	nd	nd	nd	nd	nd	nd	nd

nd: no datum

**Graph 6 — Aquaculture value (million EUR) in 1995**



# ACRONYMS



**International organisations**

Full name	Acronym
Arctic Ocean Sciences Board	AOSB
Baltic Marine Biologists	BMB
Conference of Baltic Oceanographers	CBO
Commission for Conservation of Antarctic Marine Living resources	CCAMLR
Coalition Clean Baltic	CCB
Central-Eastern Committee for Atlantic Fisheries	CECAF
General Fisheries Council for the Mediterranean Fisheries	CGPM
International Centre for Advanced Mediterranean Agronomic Studies	CIHEAM
European Association of Fisheries Economists	EAFE
European Association of Fish Pathologists	EAFP
European Aquaculture Society	EAS
European Fish Ageing Network	EFAN
European Inland Fisheries Advisory Commission	EIFAC
European Reference Laboratories Network	ERLN
European Society for Marine Biotechnology	ESMB
Food and Agriculture Organisation	FAO
Food and Environmental Institute (Faeroe Islands)	FEI
General Fisheries Council for the Mediterranean	GFCM
Intergovernmental Global Ocean Observation System and Euro GOOS	GOOS
Baltic Marine Environment Protection Commission (=Helsinki Commission)	Helcom
Inter American Tropical Tuna Commission	IATTC
International Baltic Sea Fishery Commission	IBSFC
International Commission for the Conservation of Atlantic Tunas	ICCAT
International Council for Control of Iodine Deficiency Disorder	ICCIDD
International Council for the Exploration of the Sea	ICES
International Centre for Living Aquatic Resources Management	ICLARM
International Commission for the Scientific Exploration of the Mediterranean Sea	ICSEM
International Council of Scientific Unions	ICSU
International Institute of Fisheries Economics and Trade	IIFET
Intergovernmental Oceanographic Commission belonging to Unesco	IOC
Indian Ocean Tuna Commission	IOTC
International Whaling Commission	IWC
London Dumping Convention	LDC
North Atlantic Salmon Conservation Organisation	NASCO
North-Atlantic Fisheries Organisation	NAFO
North-Atlantic Marine Mammal Commission	NAMMCO
North-East Atlantic Fisheries Commission	NEAFC
National Oceanographic Data Centre	NODC
Convention for the Protection of the Marine Environment of the North-Eastern Atlantic	OSPAR



Permanent Service of Middle Sea Level	PSMSL
Cooperation European Net between Marine Research Organisations and Maritime Areas of the Mediterranean	Recormad
Subsidiary Body for Scientific, Technical and Technological Assessment — Biological Diversity Convention	SBSTTA
Scientific Committee on Antarctic Research	SCAR
Scientific Committee on Oceanic Research	SCOR
South Pacific Commission	SPC
Scientific, Technical and Economic Committee on Fisheries	STECF
World Aquaculture Society	WAS
West European Fish Technologists Association	WEFTA
West European Graduate Education Marine Technology	WEGEMT
Management Executive Committee of World Ocean Circulation Experiment	WOCE

### ***List of institutes in Austria***

<b>Full name</b>	<b>Acronym</b>
Biologische Station Illmitz	
Institut für Seenforschung Kärnten	
Konrad Lorenz Institut für Vergleichende Verhaltensforschung (Vienna) (Austria)	
Ökologische Station Waldviertel.	
Österreichische Akademie der Wissenschaften, Biologische Station Lunz	
Bundesamt für Wasserwirtschaft, Institut für Gewässerökologie, Fischereibiologie und Seenkunde	BAW – IGF
Bundesamt für Wasserwirtschaft, Institut für Wassergüte	BAW – IWG
Universität für Bodenkultur, Abteilung Hydrobiologie, Fischereiwirtschaft und Aquakultur	BOKU-AFH
Museum of Natural History, Vienna	NMW
Österreichische Akademie der Wissenschaften, Institut für Limnologie	ÖAW
The Austrian Fisheries Association (Österreichischer Fischereiverband)	ÖFV

### ***List of institutes in Belgium***

<b>Full name</b>	<b>Acronym</b>
Sea Fisheries Department	
Eurogenetic — Liège/Seraing	

**List of institutes in Denmark**

Full name	Acronym
<b>Højmark Laboratory</b>	
Freshwater Biological Laboratory, University of Copenhagen	
Danish Trout Culture Research Station	
Danish Biotechnological Institute	
Danish Institute of Agricultural Sciences	DIAS
Danish Institute of Fisheries Economic Research	DIFER
Danish Institute	Difmar
Danish Institute for Fisheries Research	Difres
Danish Institute for Fisheries Technology and Aquaculture	DIFTA
Danish Technological Institute	DTI
<b>The Danish Veterinary Laboratory, Århus</b>	
Danish Veterinary Laboratory	DVL
<b>Institute for Fisheries Management and Coastal Community Development</b>	IFM
<b>The Royal Veterinary and Agricultural University</b>	KVL
<b>Centre for Market Surveillance Research, and Strategy for the Food Sector</b>	MAPP
<b>Marine Biological Laboratory, University of Copenhagen</b>	MBL
National Environmental Research Institute	NERI
<b>North Atlantic Regional Studies programme Roskilde University Centre, Institute of Geography and International Development Studies</b>	NORS
Danish Institute of Agricultural and Fisheries Economics	SJFI

**List of institutes in Finland**

Full name	Acronym
Agricultural Research Centre — Animal Breeding	
National Veterinary and Food Institute	
Technical Research Centre of Finland — Biotechnology and Food Research	
Finnish Environment Institute	
Finnish Institute of Marine Research	
Technical Research Centre of Finland	
Finnish Game and Fisheries Research Institute	FGFRI

### **List of institutes in France**

<b>Full name</b>	<b>Acronym</b>
Association pour le développement de la recherche agro-alimentaire	ADRIA
Association du Grand Littoral Atlantique	AGLIA
Agence Nationale pour la Valorisation de la Recherche	ANVAR
Association for Marine Research and valorisation — Ile de la Réunion	ARVAM
Bureau de Recherches Géologiques et Minières	BRGM
Centre de Droit et d'Économie de la Mer	CEDEM
Centre National du Machinisme Agricole, du Génie Rural et des Eaux et Forêts	Cemagref
Centre d'Etudes et de projets	CEP
Centre d'études et de valorisation des algues	CEVA
Centre d'Expérimentation et de Valorisation des Produits de la Mer	CEVPM
Centre Geostatistique	CG
Centre de Coopération Internationale en Recherche Agronomique pour le Développement	CIRAD
Centre National d'Etudes Spatiales	CNES
Agence Française de Sécurité Sanitaire des Aliments	AFSSA
Centre National de la Recherche Scientifique	CNRS
Centre d'Observation et de Recherche sur les Ressources Aquatiques et les Industries du Littoral	Corrail
Centre de Recherche en Ecologie Marine et Aquaculture	CREMA
Conseil Supérieur de la Pêche	CSP
Defence and Resistance of Marine invertebrates — Ifremer/CNRS	DRIM
Ecole des Hautes Etudes en Sciences Sociales	EHESS
Ecole Nationale d'Ingénieurs des Techniques des Industries Agricoles et Alimentaires	ENITIAA
Ecole Nationale Supérieure Agronomique de Rennes	ENSAR
Ecole Nationale Supérieure des Télécommunications de Bretagne	ENSTB
Ecole Pratique des Hautes Etudes — Perpignan	EPHE
Etablissement de valorisation des activités aquacoles et maritimes — Tahiti	EVAAM
Institut Français de Recherche pour l'Exploitation de la Mer	Ifremer
Institut International du Froid	IIF
Institut National Agronomique — Paris-Grignon	INA-PG
Institut National de la Recherche Agronomique	INRA
Institut National de Recherche en Informatique et en Automatique	INRIA
Institut de Recherche pour le Développement	IRD
(schlerochronology of aquatic animals) — Ifremer/Orstom	LASAA
Muséum National d'Histoire Naturelle	MNHN
Office National Interprofessionnel des produits de la mer et de l'aquaculture	Ofimer
National Programme on Toxic Algae Blooming	PNEAT
Réseau National des Stations Marines	RNSM
Service Hydrographique et Océanographique de la Marine	SHOM

**List of institutes in Germany**

<b>Full name</b>	<b>Acronym</b>
Alfred-Wegener-Institut für Polar- und Meeresforschung	AWI
Biologische Anstalt Helgoland	BAH
Bundesforschungsanstalt für Fischerei (Federal Research Centre for Fisheries)	BFA FI
Bundesanstalt für Gewässerkunde	BfG
Bundesamt für Seeschifffahrt und Hydrographie	BSH
Deutsches Museum für Meereskunde und Fischerei, Meeresmuseum und Aquarium Stralsund	DMMF
The German Scientific Commission for the Exploration of the Sea	DWK
Federal Research Centre for Fisheries	FCRF
Fischereiforschungsstelle des Landes Baden-Württemberg	FFS
GSF-Forschungszentrum für Umwelt und Gesundheit, Institut für Ökologische Chemie	GSF
Institut für Binnenfischerei e.V. Potsdam Sacrow	IBF
Institut für Fangtechnik	IFH
Institut für Meereskunde	IFM
Institut für Gewässerökologie und Binnenfischerei im Forschungsverbund Berlin e.V.	IÖB
Landesanstalt für Umweltschutz Baden-Württemberg, Institut für Seenforschung	ISF
Institut für Seefischerei of Hamburg	ISH
Landesforschungsanstalt für Landwirtschaft und Fischerei Mecklenburg-Vorpommern, Institut für Fischerei	LFA
Bayerische Landesanstalt für Fischerei	LFi
Bayerisches Landesamt für Wasserwirtschaft, Institut für Wasserforschung	LfW u. IfW
Abwasserversuchsfeld Großlappen	LfW u. IfW
Versuchsanlage Wielenbach, Abt. Fischereibiologie	LfW u. IfW
Landesanstalt für Ökologie, Bodenordnung und Forsten / Landesamt für Agrarordnung Nordrhein-Westfalen	LÜBF
Max Plank Institute	MPI
Max-Planck-Institut für Limnologie	MPIL
Forschungsinstitut Senckenberg, Sektion Ichthyologie II und Fischökologie	MSF
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Zentrum für Marine Tropenökologie	ZMT

### ***List of institutes in Greece***

<b>Full name</b>	<b>Acronym</b>
Aquaculture Centre of Acheloos S.A	
Dimitra Educational Centre	
Hellenic Biotope/Wetland Centre	
Hellenic Fisheries Organisations	
Laboratories of Fisheries Technology and applications (Ministry of Agriculture — Athens)	
Nagref, Institute of Mapping and Soil Classification	
Nireus Consultant	
Technological Educational Institution of Kavala	
National Agricultural Research Foundation, Fisheries. Research Centre Kavala	
Fisheries Laboratory	FIL
Fisheries Research Institute	FRI
Institute of Marine Biology of Crete	IMBC
National Centre for Marine Research	NCMR

### ***List of institutes in Iceland***

<b>Full name</b>	<b>Acronym</b>
Icelandic Fishery Laboratories	IFL
Marine Research Institute	MRI

**List of institutes in Ireland**

Full name	Acronym
Bord Iascaigh Mhara (The Irish Sea Fisheries Board)	BIM
Central Fisheries Board	CFB
Dublin Institute of Technology	DIT
Fisheries Research Centre of the Marine Institute	FRC
Institute of Technology	IT
National Food Centre	NFC
National University of Ireland	NUI
Regional Fisheries Board	RFB
Regional Technical College	RTC
Salmon Research Agency of Ireland	SRAI

**List of institutes in Israel**

Full name	Acronym
Jordan Valley R & D unit	
Faculty of Agricultural Engineering, Technion, Haifa	
Agricultural Research Organisation	ARO
Ben Gurion Desert Research Institute, Ben Gurion Univ. of the Negev, Sde Boker	BGDRI
Fresh Water Fish Breeding Research Station, Dept. of Fisheries and Aquaculture, Min. of Agricultura	Dor
Intensive Fish Farming R & D Research Station, Dept. of Fisheries and Aquaculture, Min. of Agricultura	Ginossar
Israel Oceanographic and Limnological Research, Haifa	IOLR
Upper Galilee Research and Development Organisation	MIGAL
Negev Arava R & D unit	NARDU
National Centre for Mariculture, IOLR, Eilat	NCM
Central Lab. for Fish Health, Dept. of Fisheries and Aquaculture, Min. of Agricultura	Nir-David
National Steering Committee for Aquaculture	NSCA
Faculty of Agriculture, Aquaculture	REHOVOT

### **List of institutes in Italy**

<b>Full name</b>	<b>Acronym</b>
Aquastudio	
Bioservice	
Hydrographic Institute of the Navy	
Istituto Zooprofilattico of Messina	
Laboratory of Marine Biology, Trieste	
Istituto di Zoologia dell'Università di Genova	
Laboratory of Marine Biology of Bari	
Laboratory of Marine Biology and Fisheries of Fano	
Dipartimento di Scienze dell'ambiente e del Territorio dell'Università di Pisa	
Dipartimento di Biologia Animale di Ecologia. Università di Messina	
Istituto di Zoologia dell'Università di Genova	
Central Laboratory of Hydrobiology	
Acquacoltura Gestione Ittica	AGEI
Centro Interuniversitario di Biologia Marina ed Ecologia Applicata in Livorno	CIBM
Consiglio Nazionale delle Ricerche	CNR
Società Cooperativa Idrobiologia Pesca ed Acquacoltura	COIPA
Tecnologia e Ricerca S.c.a r.l., Mola di Bari	COISPA
National Inter-University Association for Sea Sciences	CoNISMa
Agency for New Technologies, Energy and Environment	ENEA
Environment and Material Research Centre	ENELspaDS
Central Institute for Marine Applied Research, ROMA	ICRAM
Struttura Tecnico-Scientifica ICRAM di Palermo (Palermo)	ICRAM-PA
Struttura Tecnico-Scientifica ICRAM di Chioggia (Venezia)	ICRAM-VE
National Institute of Agricultural Economics	INEA
Institute for Economic Research in Fishery and Aquaculture	IREPA
Istituto Risorse Marine e Ambiente — CNR	IRMA
Istituto Ricerche Pesca Marittima — CNR	IRPEM
National Institute for Co-ordination of Marine Science — CNR	ISMARE
Institute for the Study, Research and Information on Agricultural and Agrifood Market	ISMEA
Mare Acquacoltura Ricerca Ecologia, S.c.a r.l., in Cattolica	MARE
Ministero delle Risorse Agricole, Alimentari e Forestali	MiRAAF
Ministero per le Politiche Agricole	MiPA
Società Italiana di Biologia Marina	SIBM
Stazione Zoologica Anton Dohrn, Napoli	SZN
(Biological Technical Observatory)	UNIMAR

**List of institutes in The Netherlands**

Full name	Acronym
National Institute for Coastal and Marine Management, Middelburg Tidal Waters Division	
Netherlands Institute of Fisheries Science	
Agrotechnological Research Institute	ATO-DLO
Ministry of Public Works and Water management	BEON
Department of Sciences and Knowledge Dissemination	DWK van LNV
Institute for Forestry and Nature Research	IBN-DLO
Institute for Animal Science and Health	ID-DLO
Agricultural Economics Research Institute — Fisheries Division	LEI-DLO
Netherlands Institute of Ecology — Centre for Estuarine & Coastal Ecology	NIOO-CEMO
Netherlands Institute for Sea Research	NIOZ
Organisation for the Improvement of Inland Fisheries	OVB
State Institute for Quality Control of Agricultural Products	RIKILT-DLO
Netherlands Institute for Fisheries Research — Rijks Instituut voor Visserij Onderzoek	RIVO-DLO
National Institute for Coastal and Marine Management	RWS-RIKZ
The Netherlands Organisation for Applied Scientific Research	TNO
	WUR



### **List of institutes in Norway**

<b>Full name</b>	<b>Acronym</b>
Akvaplan — NIVA	
Møre Research, Alesund	
Nordland Research Institute	
Akvaforsk: Norwegian Food Research Institute	Akvaforsk
Directorate of Nature Management	DN
Finnmark Research Centre	FIFO
Department of Fisheries and Marine Biology, University of Bergen	IFM
Institute of Marine Research, Bergen	IMR
Institute of Nutrition – Directorate of Fisheries	INDF
Marine Technology Research Institute	Marintek
Norwegian Food Research Institute	Matforsk
College of Fisheries Science, University of Tromsø	NFH
Institute of Fisheries and Aquaculture, Tromsø	NIFA
Norwegian Institute for Cultural Heritage Research	NIKU
Norwegian Institute for Nature Research	NINA
Norwegian Institute for Water Research	NIVA
Institute of Fish Processing and Preservation Technology – College of Food Technology and Processing	Norconserv
Norwegian Polar Institute	NP
Norwegian University of Science and Technology	NTNU
The Norwegian School of Veterinary Science	NVH
Rogaland Research	RF
SARS International Centre for Molecular Marine Biology, University of Bergen	SARS
Fisheries and Aquaculture	Sintef
The Fridtjof Nansen Institute	SNI
Herring Oil and Meal Research Institute	SSF
National Veterinary Institute	VI

**List of institutes in Portugal**

Full name	Acronym
Centro de Ecologia e Aquacultura da Universidade do Algarve	CEA
Departamento de Oceanografia e Pescas da Universidade dos Açores	DOP
Direcção Regional das Pescas da Região Autónoma da Madeira	DRP
Departamento de Zoologia e Antropologia da Faculdade de Ciências de Lisboa	DZA
Instituto de Ciências Biomédicas 'Abel Salazar', da Universidade do Porto	ICBAS
Instituto Hidrográfico	IH
Instituto Hidrológico	IH
Instituto do Mar	IMAR
Instituto Nacional de Investigação das Pescas	INIP
Instituto de Oceanografia da Faculdade de Ciências de Lisboa	IO
Instituto de Investigação das Pescas e do Mar	IPIMAR
Departamento de Biologia da Universidade de Aveiro	UA
Unidade de Ciências e Tecnologias dos Recursos Aquáticos da Universidade do Algarve	UCTRA

### **List of institutes in Spain**

<b>Full name</b>	<b>Acronym</b>
Planta de Acuicultura Es Murtera, Gedisa	
Planta de Acuicultura d'Andraxt, Govern Balear	
Oceanographic Centre of Canaria	
Instituto Nacional de Tecnología Aeroespacial	
Instituto de Formación Náutico Pesquera de Lanzarote	
European Reference Laboratory of Vigo	
Estudios Geológicos Marinos	
Conselleria de Pescas de Galicia	
Centro Galego de Control de Calidade do Medio Mariño	
National Association of Canned Food Manufacturers	ANFACO
Instituto Tecnológico Pesquero y Alimentario	AZTI
Centro de Experimentación de Acuicultura	CEA
Centro de Cultivos Mariños	CECUMA
Centros de Investigación y Cultivo de Especies Marinas	CICEM
Comisión Interministerial de Ciencia y Tecnología	CICYT
Centro de Investigaciones Mariñas	CIMA
Centro de Microscopia Electrónica Luis Bru	CMLEB
Centro Nacional de Acuicultura	CNA
Consejo Superior de Investigaciones Científicas	CSIC
Estación de Acuicultura	EDA
Instituto de Acuicultura de Torre de la Sal	IATS
Instituto Canario de Ciencias Marinas	ICCM
Instituto de Ciencias del Mar	ICM
Instituto de Ciencias Marinas de Andalucía	ICMAN
Instituto de Ciencia y Tecnología de Polímeros	ICTP
Instituto Español de Oceanografía	IEO
Instituto del Frío	IF
Instituto de Investigaciones Marinas	IIM
Instituto Mediterráneo de Estudios Avanzados	IMEDEA

**List of institutes in Sweden**

Full name	Acronym
Swedish Agricultural University	
Swedish Environmental Protection Agency	
Swedish Salmon Research Institute	
The Royal Academy of Science	
Kristinberg Marine Research Station, Fiskebackskil	
Institute of Marine Research, Lysekil	IMR
Baltic Research Station, Karlskrona	
Institute of Coastal Research, Öregrund	
Institute of Freshwater Research, Drottningholm	
Salmon Research Institute, Älvkarleby	
Swedish Environmental Research Institute	IVL
Kristineberg Marine Research Station, Fiskebäckskil	KMF
Askö Laboratory, Trosa	
National Board of Fisheries	NBF
National Food Administration	NFA
The Swedish Food Institute for Food Research	SIK
Swedish Agricultural University, Ultuna/Umeå	SLU
Swedish Centre for Coastal development and Management of Aquatic Resources	Swedmar

**List of institutes in UK**

Full name	Acronym
Inter-Agency Committee on Marine Science and Technology	
Marine Pollution Monitoring Management Group	
UK National Monitoring Plan	
Countryside Council for Wales	
English Nature	
South Wales Sea Fisheries Committee	
Water Research Centre	
Imperial College	
British Antarctic Survey	
Scottish Association of Marine Science	
Aquatic Sciences Group, Department of Agriculture, Northern Ireland	ASG
Centre for Environment, Fisheries and Aquaculture Science	CEFAS
Centre for the Economics and Management of Aquatic Resources	Cemare
Central Science Laboratory	CSL
Department of Agriculture for Northern Ireland	DANI
Fisheries Research Services	FRS
Food Science Laboratory	FSL
Humberside International Fishery Institute	HIFI
Inter-Governmental Advisory Committee on Marine Science and Technology	IACMST
Ministry of Agriculture, Fisheries and Food	MAFF
The Natural Environment Research Council	NERC
Plymouth Marine Laboratory	PML
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Sea fish Industry Authority	SFIA
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## ABSTRACT

This report provides a description of the fisheries research organisations and research programmes and a brief presentation of the sectors of fisheries, aquaculture and processing industry in EU countries, and in three associated countries: Iceland, Israel and Norway. Its aim is to inform the scientist community, administration and private industry about research organisations and the main research Institutes involved in fisheries and aquaculture. It completes the European Directory of Research Centers in the Fisheries Sector, edited by the Commission in 1994.

This document was co-ordinated by Ifremer, France in co-operation with a national contributor in each country. Contributions were built around a single format agreed by all participants.

The first part is devoted to a description of the marine resource industry. The second part presents the research organisation; administrative organisation, research Institutes involved in the sector (address, date of creation and status, detailed objectives and research programmes, resources, scientific co-operation in Europe and abroad).

A synthesis of production data in the European Union, Iceland, Israel and Norway and a list of acronyms are given at the end of the document.

## RÉSUMÉ

Ce document décrit le dispositif de recherche halieutique des États membres auxquels se sont associés l'Islande, Israël et la Norvège et présente un bref état du secteur des pêches, de l'aquaculture et de la transformation des produits de la mer dans chacun d'eux. Son objectif est d'informer la communauté scientifique, les administrations et le secteur industriel de l'organisation de la recherche halieutique et de présenter les programmes des principaux instituts de recherche en Europe. Elle complète le répertoire européen des centres de recherche dans le secteur des pêches publié en 1994 par la Commission.

La compilation des contributions nationales et leur mise en cohérence ont été assurées par l'Ifremer en concertation étroite avec un correspondant dans chacun des États concernés. Elles ont été rédigées sous un format unique pour en faciliter la lecture.

La première partie est consacrée à une description du secteur des produits de la mer. La seconde présente l'organisation de la recherche halieutique: organisation administrative et présentation des instituts de recherche (adresse, date de création et statut juridique, objectifs détaillés, programmes de recherche et moyens, coopération européenne et internationale).

Une synthèse des données de production en Europe et dans les trois pays associés est présentée en fin d'ouvrage ainsi qu'une liste des acronymes.



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