COMMISSION OF THE EUROPEAN COMMUNITIES

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# REPORT FROM THE COMMISSION

## CO-OPERATION AND CO-ORDINATION OF THE USE OF HEAVY EQUIPMENT FOR FISHERIES RESEARCH

## 1. Introduction

Fisheries research requires the collection of large amounts of data, for the implementation of the Common Fisheries Policy (CFP), but also to address more fundamental scientific questions, especially ecological ones. A great deal of information can be obtained from commercial fisheries, but there is also a need for supplementary information. This includes fishery independent information on the state of fish stocks, information on the environmental impact of fishing, information on the selectivity of fishing gear, information on non exploited species and the physical and chemical environment.

Obtaining this information often requires large scale equipment, such as research vessels equipped with laboratory facilities. This infrastructure exists in all Member states, but there are differences in their size, age, supporting facilities and level of utilization.

The aim of this document is to describe the existing facilities, namely research vessels, and to analyse the large scale equipment requirements for the purposes of the CFP. Moreover, the need of further cooperation and coordination will be considered.

A full description of the data requirements in each region of the Community and an analysis of the resources needed to meet these requirements are clearly beyond the scope of this document. However, such a study is needed so that any deficiencies can be identified and remedied.

Other equipment such a flume tanks with supporting facilities or fine isotope analysis facilities are less extended among the different Member states and its field of operation is more specific . In annex I a description of the main flume tanks operating in Europe is given together with some considerations on their utility. Concerning isotope techniques there are not for instance enough elements to establish a basis for discussion.

## 2. Research Vessels in Europe.

### 2.1. The need for research vessels

*Stock assessment*

Although a great deal of information used in fisheries research is obtained from monitoring and sampling commercial landings, there will always be a need for fisheries independent information.Diagnostics on the state of resources and their level of exploitation demand an accurate knowledge of the commercial catches , in particular their age or length composition as these are essential elements for applying the Virtual Population Analysis (VPA) technique, which is the key assessment method used by scientists. Experience has demonstrated the additional need for direct estimates of the abundance of fish stocks Fisheries management by

means of Total Allowable Catches ( TAC's) need estimates of the stock size in real time and predictions of the further development of the stock in terms of catch forecasts. The reliability of these catch forecasts depends directly on the quality of the estimates of the number of fish which will enter in the exploited phase ( pre-recruits). The independent estimates used for stock assessment are obtained from acoustic surveys, egg or larvae surveys, trawl surveys, using research vessels ( Table I ).

Fisheries management by means of Total Allowable Effort ( TAE) does not have the same data requirement since annual revisions of stock estimates are not necessary. However, proper diagnostics on the level of exploitation of resources and its further evolution are needed for adjusting, when necessary, the fishing effort.

When designing a survey to obtain these independent estimates, one of the main elements to consider is the type of vessel to be used. A choice has to be made between the use of a research or commercial vessel, the characteristics of which can influence their suitability for a particular type of survey ( Table II).

The use of research vessels makes it much easier to standardise the gear and procedures used. This is important since the abundance indices obtained from year to year must be comparable.

Another important factor is the cost of the vessel. For a research institute running costs are in general higher for a research vessel than for the periodic rent of a commercial vessel, since the latter does not have to be paid for year round.

In order to obtain a good level of accuracy a minimum level of sampling in terms of number of hauls is needed, and a proper sampling strategy which takes into consideration the distribution in space and time of the resource .

Schematically in the classical trade off between biases and variances, research vessels offer a better answer to the bias quiestion due to their standardisation facilities, while in terms of variances it can be more cost-efficient to rely on commercial vessels because of their lower costs.

*Other issues*

On board commercial vessels, facilities are generally lacking, therefore samples have to be stored and extra work in the laboratory has to be carried out after the surveys. In experiments for which requirements for laboratory facilities are limited, chartered commercial vessels may be suitable. This is the case of experiments in the field of gear technology, tagging or tests of on-board facilities for upgrading of fish products ( e.g. cold chain, packaging, conservation, etc.).

Analysing fisheries in the long term is a more difficult task, requiring an understanding of multi-species interactions, the influences of environmental factors on recruitment and survival, and so on. Special attention should be paid to the influence of the environmental factors on the distribution, abundance and migration of fish and on changes in parameters as natural mortality, growth, maturation and fecundity. Ecological research programmes involving the use of research vessels are needed to investigate these relationships. Fisheries research itself can contribute to improvements in the knowledge of the marine ecosystem. In fact the complete knowledge of the latter needs the monitoring of non commercial species, but, at the same time, there is considerable information from exploited species which play a key role among top predators in the marine food webs. One of the main difficulties when studying marine ecosystems compared with terrestrial ones, is the necessity of heavy equipment, as the marine environment is hostile.

The environmental implications of fishing will become an increasingly important consideration in the future. The institutes operating the research vessels often also have responsibilities for environmental or other research programmes apart from fisheries. The basic research needed to address these questions will clearly require a significant amount of research vessel time.

Another use of vessels which deserves mention is for gear research, for example assessing the effects of changes in mesh size or gear configurations on selectivity. This can have important conservation implications, for example by reducing discard rates. However this is an area of research which could often be carried out more efficiently using chartered commercial vessels.

## 2.2. Current availability and use of research vessels

Most of the Research Centres in the European Union have big Research Vessels ( about 60 m. long), but these vessels are not necessarily the most suited for all research tasks (Table II). Big vessels may be needed for their performance in bad weather but may be unsuitable for working in coastal areas. Vessels smaller than 30 m. may have the disadvantage of being too noisy and could so affect fish behaviour.

In the areas covered by the International Council for the Exploration of the Sea (ICES) there is already considerable International co-operation to undertake major surveys. Table III lists the most important co-operative survey programmes coordinated by ICES since 1975. There has also been considerable support for internationally coordinated surveys under the European Programmes FAR (Fisheries and Aquaculture Research), MAST ( Marine Science and Technology) and AIR (Agriculture and Agroindustry including Fisheries).

For the purposes of examining the current availability of research vessels it is convenient to consider three distinct geographic regions (Figure 1), namely:

a) North Sea, Skagerrak, Kattegat, Baltic, East English Channel

b) West English Channel, West of Scotland, Rockall, Irish Sea, West and South of Ireland, Bay of Biscay, Atlantic Coast of the Iberian Peninsula.

c) Mediterranean

These are now considered in turn. Research vessels have been allocated to regions based on the location of their home ports. However it should be noted that the activities of the research vessels are not always confined to one specific region.

*Region a : North Sea, Skagerrak, Kattegat, Baltic, East English Channel*

Catches in this region are estimated at around 3,8 million tonnes which is approximately 53% of the total Community production with a value of 2,5 billions ECU .

Although most of the research surveys in this region are undertaken using research vessels, there is also a widespread use of chartered commercial vessels. The North Sea surveys are often internationally coordinated within the framework of ICES. However a workshop convened to improve data collection for this region (Ijmuiden, the Netherlands, October 1992) concluded that a detailed investigation of the optimal ways to use existing research vessels could lead to financial savings. Despite the presence of the institutional framework of ICES and the potential support of the Baltic Fisheries Commission a major effort is still required in the Baltic area. Coordination of surveys between the different countries needs to be improved in order to ensure a real standardisation of methodology and a more satisfactory coverage of seasonality ( autumn surveys)

At present total costs for fishery data collection in this region are estimated at 12.4 million ECU; 65% of this amount ( 8.1 million ECU) is devoted to research vessels surveys.

Table IV shows the characteristics of the main research vessels operated by the institutes in the region. Most of them are well equipped and capable of undertaking a wide range of work, including trawling, acoustic surveys and oceanographic studies. The average number of days at sea per year of these vessels is 235 and their maximum trip duration varies between 10 and 50 days.

Although well equipped the United Kingdom vessels are now rather old. e.g. RV CIROLANA, RV SCOTIA and RV CLUPEA are now about 25 years old. SCOTIA is due for replacement in 1996 and CLUPEA had a major conversion in 1988.

*Region b : West English Channel, West of Scotland, Rockall, Irish Sea, West and South of Ireland, Bay of Biscay, Atlantic Coast of the Iberian Peninsula.*

Traditionally co-operation in this area has been less intense than in Region a. However there has been an increase in cooperative research projects especially after the implementation of Community programmes. In most cases these co-operative activities were restricted to bilateral ( involving two Member states) research projects focusing on stocks of common interest. This was the case of several FAR projects with the participation of the main institutes in the area, some of which have implemented bilateral co-operation agreements. Within the framework of the AIR programme more ambitious joint projects with the participation of several Member states are at present in progress with a good level of co-operation.

Table V shows the quality of the assessments of the main stocks subject to TAC in both regions a and b. For those stocks for which there is no analytical or similar assessment, TAC's can just be precautionary. By analysing this table we can observe that the quality of assessment decreases from north to south although the situation is improving with time.

Catches in region b are estimated at 2 million tonnes, which constitute 28 % of the total Community production with a value of 1,3 billion ECU. For most of these stocks TAC's are precautionary as information available is not sufficient for reliable diagnostics on their real exploitation level . It is appropriate in this region to implement a management strategy which combines the regulation of catches and effort.

There is a need to increase the number of surveys, to provide the solid database needed to fix TAC's or TAE's ( Total allowable effort) based on analytical assessments, even if in the case of recruitment estimates the need for surveys is less obvious due to the fact that fluctuations in recruitment may be smaller than in Region a. The total costs of research vessel surveys in region b is 4.8 million ECU. This figure represents 58% of the total costs of all data collection activities.

In Table VI the technical characteristics of the main research vessels operated by fisheries research institutes in Ireland, France, Portugal and Spain are shown. Those from the UK are included in Table IV. The average age of the vessels operating in region (b) is greater than that of vessels operating in region (a). The situation has recently been improved somewhat by the renewal of the Portuguese RV CAPRICORNIO. It should also be noted that some of these vessels cover both the Atlantic and the Mediterranean, and are also used to participate in co-operative research projects in other areas ( e.g. SEFOS Project, NAFO area, etc.).

*Region c : Mediterranean*

Ten per cent of the total Community catches are produced in the Mediterranean with a total value of 470 million ECU.

Although Mediterranean Member states devote to data collection 4 million ECU ( 40 % of this figure is expended in research vessel surveys) per year, sampling statistics tend to be incomplete and unreliable partly due to the practical difficulties of monitoring the widely dispersed fleets. Reliable diagnostics on the state of stocks are, consequently, one of the priorities for establishing management strategies, although there is no immediate operational

obligation of obtaining annual estimates of abundance.

Due to the difficulties on obtaining commercial data, fishery independent methods are of essential importance in this region Traditionally, surveys undertaken in the Mediterranean have tended to be fragmented and poorly coordinated. This lack of coordination can be explained by the fact that most of the stocks are not shared between countries and , therefore, the need for scientific structures for international stock assessment is less apparent. Nevertheless improved co-ordination between Mediterranean countries is desirable but the absence of adequate permanent structures for that purpose in the area is a major handicap .

The Commission is at present supporting a large programme called "An International Bottom Trawl Survey in the Mediterranean", which is being carried out during 1994. The motivation for establishing this survey was the lack of comprehensive studies of the biological status of most of the demersal stocks in the Mediterranean. The main objective of this survey is to calculate relative indices of abundance and to provide information on the geographic distribution of the various species. A good programme and coordination of these surveys is needed in the near future to establish a management system based on effort limitation. At this level appropriate databases in a common format allowing common access becomes a necessity.

Table VII shows the characteristics of the research vessels operating in the Mediterranean region. In the cases of Spain and France some of the vessels also operate in region (b).

2.3 Data storage and utilisation

One subject to be considered is the type of data avilable and their level of utilisation. So in Region (a) the existing data is underutilised for purposes other than classical stock assessment conducted by the different ICES Working Groups, despite recent efforts such as the Atlas of North Sea Fishes which is an ICES Cooperative Report based in bottom-trawl survey data for the years 1985-1987, providing important important on spatial distribution of the different species.

Although in Region (b) national databases are increasing and improving they are still partial and need to be integrated in a common format in order to ensure their availability for all Member states concerned. In the case of Region (c) there are no common databases not even within all Member states.

2.4.Overall view

The table below summarises section 2.2 by pointing out the major shortcomings in the three regions in terms of common work to be developed.

| AREA | Region a | Region b | Region c |
|---|---|---|---|
| **MANAGEMENT SYSTEM** | TAC's: Mainly Analytical Ones<br>Effort control envisaged. | TAC's: Mainly Precautionary<br>Effort control proposed | Effort control envisaged |
| **SAMPLING STRATEGY** | to be improved | to be extended | to be consolidated |
| **PLANNING OF COORDINATION** | to be improved | to be improved | to be designed |
| **LINKS BETWEEN FISHERY AND ENVIRONMENTAL DATA** | insufficient | insufficient | non-existing |
| **COMMON DATABASES** | insufficient | limited | non-existing |

3. Financial aspects

3.1. Investments.

The price of construction of a research vessel depends on a lot of different factors ( size, facilities, technical equipment, power, etc.) but it is above the means of the ordinary budget of a research institute. For example a medium size (+/- 40 m) research vessel with an operation range of 30 days ( = 6000 miles) equiped with dry and wet labs , with accomodation for 26 people ( crew and scientific staff) costs around 3,5 million ECU without considering costs of scientific and electronic equipment. In the case of a big research vessel (+/- 70 m) costs are, of course, bigger.

This investment is in many cases made by a different Ministry and budget . For that reason it is difficult for a research structure to finance such an equipment as well as to refuse it.

3.2. Running costs

After the acquisition of heavy equipment the maintenance and running costs will be deducted from the research structure budget and , in some cases, research activities are curtailed due

to budgetary constraints.

The table below shows the current costs of some of the research vessels utilised by the European research centres:

| RESEARCH VESSEL | LENGTH (m) | OPERATING COSTS ( ECU/DAY) |
|---|---|---|
| SOLEA (DE) | 35.4 | 7100 |
| BELGICA (BE) | 51 | 6250 |
| CORNIDE DE SAAVEDRA (ES) | 66.7 | 9000 |
| LOUGH BELTRA (IR) | 21 | 2000 |
| CAPRICORNIO (PT) | 46.55 | 4000 |

3.3. The Community role.

3.3.1. Investments.

There are no specific budgetary provisions which could be used to address the problem of large scale equipment for fisheries research as the existing regulations concerning structural assistance in the fisheries and aquaculture sector do not envisage such investments. However regions targeted by the structural funds could apply for funding through the Community Support Framework. To do this, Member states should schedule such provisions as a specific area of assistance when submitting their sectoral programmes to the Commission. This would open the possibility of financial support through the Regional Development Fund ( FEDER).

The Community has already given partial support for the construction of two research vessels, one in the Mediterranean under Council Regulation (EC) No. 3499/91, providing a Community Framework for studies and pilot projects relating to the conservation and management of fishery resources in the Mediterranean and the other in the Azores. In both cases the funds were provided under specific budgetary provisions.

3.3.2.Running costs.

There are no means available to the Commission which allow a direct intervention in the running costs of research vessels. Nevertheless an important number of studies and research projects are being currently supported by the Commission on a shared costs basis. This is an element of support currently given to activities aiming at ensuring appropriate data collection.

A draft proposal for a Council Decision concerning a programme to promote the training and mobility of researchers ( within IV RTD Framework Programme), states that in some cases, the additional costs related to the use of external staff of large-scale facilities can be granted on the basis of their quality, the interest shown by potential users, the cost effectiveness of Community support and the potential benefit to the Community in terms of improving the scientific and technical potential of less-favoured regions. This proposal has not yet been discussed by the Council , but, if adopted, could provide the means for a better coordinated use of existing facilities.

## 4. Conclusions

*General*

*Research surveys are of paramount importance. They are needed for many essential aspects of fisheries research.

*Due to the cost of research vessels, and to the involvement of several research vessels for most surveys a better planning and coordination at a Community scale is required. Their utilisation in space and time within the European Union can be improved in terms of cost-efficiency and quality of data collection. For that purpose availability of the equipment both geographically and periodically should be disseminated.

* Underutilisation of data must be avoided. For that reason data needs to be stored in common databases which make them available to all concerned Member states.

*Short term action*

It is recognised that fish stocks in region (a) are more intensively studied and better understood than those in regions (b) or (c). A coordination plan taking into consideration the precedent experiences coordinated by ICES and the North Sea research centres should be adopted with the aim of consolidating existing structures, to fill gaps in less studied regions and to promote the common utilisation of existing data between Member states.

*Medium term strategy*

There is a necessity to set up appropriate databases covering commercial and survey data including ecological and technical aspects. Given the common interest of Member States in the resources, it would be entirely appropriate for them to contribute to the management of these databases, whose construction and maintenance can be coordinated between Member States.

Working Groups aiming to elucidate the needs in terms of data collection, to define the best adapted sampling strategies need to be promoted. The application of such strategies could allow for the definition of a relationship between intensity of sampling and accuracy of estimates and to precise cost-efficiency relationships ensuring that the utility of the information is in accordance with the material investment.

Further to the accomplishment of above mentioned tasks , data requirements have to be translated into equipment requirements. This could constitute the basis for discussion between the Commission and Member states in order to plan the likely evolution of heavy equipment, especially vessels, for a period of 10 years. A further task can be devoted to find support mechanisms aiming at improving the present situation.

# ANNEX I

## FLUME TANKS IN EUROPE

*Introduction*

A flume tank is essentially the nautical equivalent of a wind tunnel in which a uniform flow of water passes through the working section. Flume tanks allow the effects of changing gear configurations, varying water speeds or changes in otterboard design to be studied in detail. Experiments are observed from a fixed platform above the tanks (Figure 2), and gear parameters such as loads, vertical net dimensions, wing end spread, door spread, etc., can be accurately measured with sophisticated instrumentation and video recording facilities.

*The need for flume tanks*

The experiments which can be carried out in flume tanks can improve gear design for example by increasing efficiency or selectivity. However, the present state of most stocks within the EU does not justify research on gear efficiency but mainly in gear selectivity. Improvements in gear design can bring about many conservation benefits, for example by reducing by-catch rates or by improving the exploitation pattern on the target species. This is a subject of great importance given the high discard rates and juvenile dominated age structures that are found in certain fisheries.

In spite of the undoubted didactic interest there are limitations in the utility of the flume tanks. Two main elements can be considered in fishing operations: the first one is the physical component which is well represented in simulations in flume tanks. The second is the biological component which is absent from these experiments because, for example, fish behaviour is not taken into consideration as fish can not be introduced in flume tanks.

Gear designs must ultimately be finalised on the basis of trials at sea under conditions close to those of a commercial fishery, but the initial design stage can be made more efficient if researchers have access to flume tanks . At present advances in computer simulation of gear behaviour are being achieved, which represents the behaviour of the gear under different hydrodynamic conditions. This could limit the need for flume tanks in the future.

*Current availability and use of flume tanks.*

There are currently only four operational flume tanks, on the North Sea coast (Hirtshals in Denmark, Hull in the UK and Boulogne sur Mer and Lorient in France). The technical characteristics of these tanks are shown in Table VIII.

Flume tanks are extremely expensive to maintain and must be used continually if they are to be profitable. Two of the four flume tanks belong to institutions (DIFTA and SFIA) which are involved in an important number of FAR an AIR projects. The flume tank in Lorient is managed

by the Regional Chamber of Commerce with the scientific and technical support of IFREMER. Some support is also given by several local, regional and national institutions. Their level of utilisation is rather low (about 200 hours / year in Hirtshals and 310 hours/year in Hull).

A flume tank was recently built in Vigo (Spain) by the Regional Government but , probably due to its high running costs and the low development in Spain of the research on fishing gear technology, it has never been operational and , therefore, it is not included in Table VII.

*Prospects in the use of flume tanks in Europe*

Despite the geographical imbalance in the availability of flume tanks, additional flume tanks in Europe do not seem justified given that the four currently available appear to be under-utilised. It would be more appropriate to promote the utilisation of the existing flume tanks by all Member States and to make the Spanish one available to the research institutes in southern Europe in order to establish stable teams working in gear technology research.

Furthermore considerable progress in computer simulation programmes has been made. Assuming that the accuracy in the prediction of the expected reaction of gear to hydrodynamic changes of these programmes will reach acceptable levels, the future utility of flume tanks could be questioned.

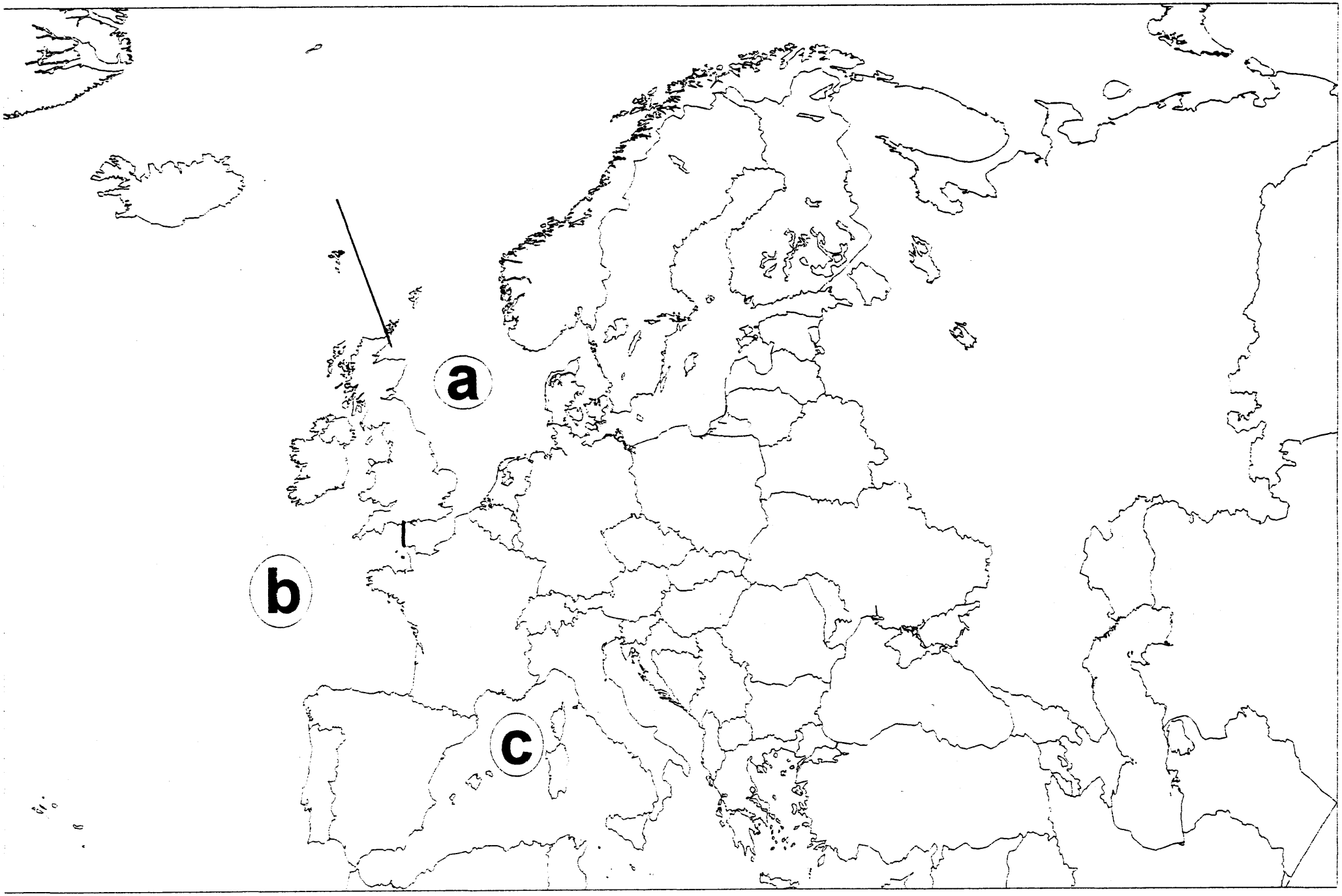


Figure 1.- The three regions of the study

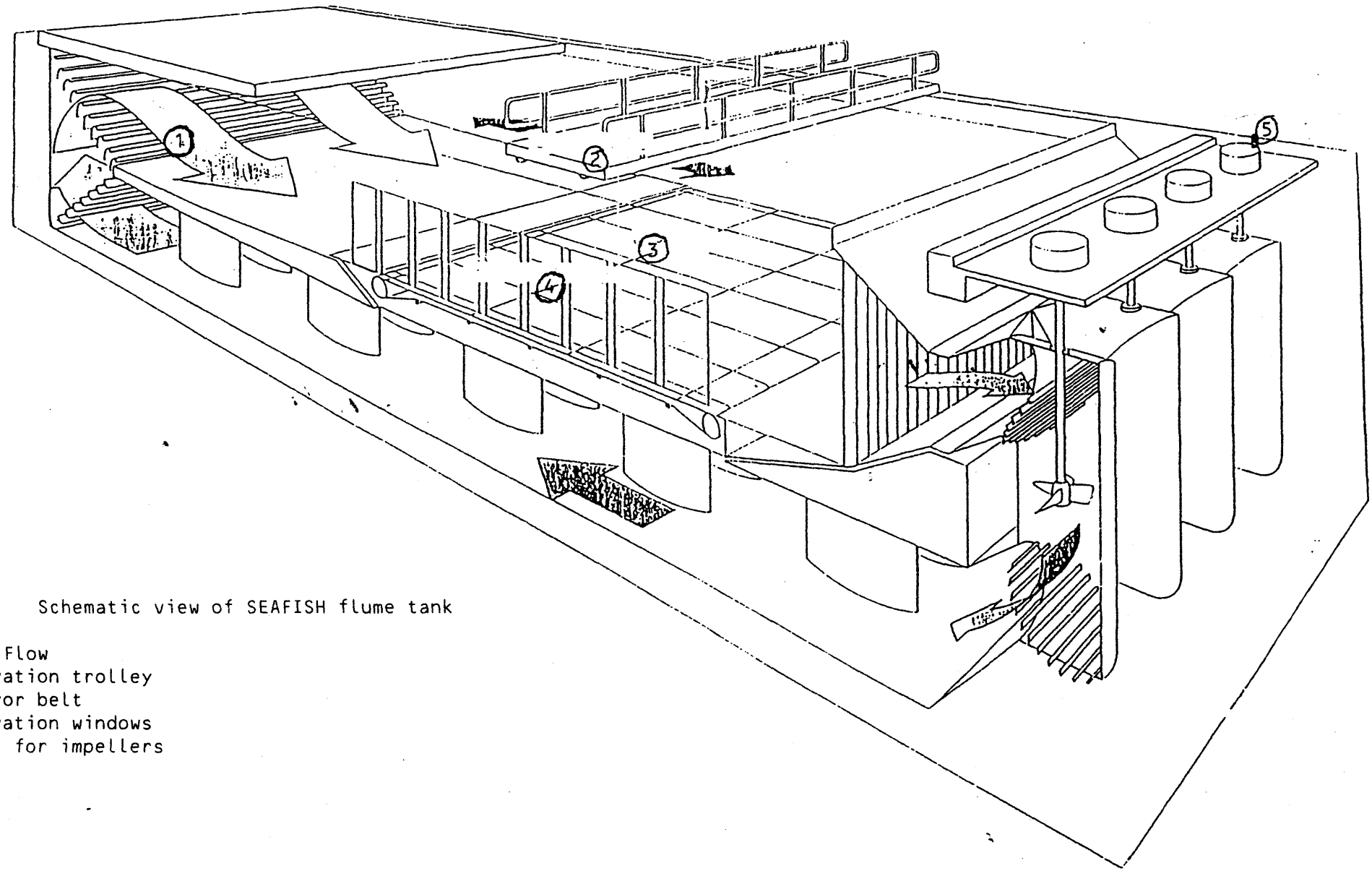


Figure 2 Schematic view of SEAFISH flume tank

1. Water Flow
2. Observation trolley
3. Conveyor belt
4. Observation windows
5. Motors for impellers

| SURVEY | TARGETED STOCKS OR FRACTIONS | WORK AT SEA | WORK AT LAB | MAIN RESULTS AND APPLICABILITY |
|---|---|---|---|---|
| PRE-RECRUITMENT | JUVENILES/DEMERSAL | SYSTEMATIC TRAWL<br>SAMPLING (length/weigth)<br>BIOLOGICAL SAMPLING | SURVEY AND HISTORIC DATA ANALYSIS<br>BIOLOGICAL PARAMETERS ( age)<br>EGGS AND LARVAE DATA | RECRUITMENT ESTIMATES FOR<br>ANALYTICAL METHODS AND<br>PREDICTIONS |
| STOCK ASSESSMENT | ADULTS/DEMERSAL | SYSTEMATIC TRAWL<br>SAMPLING (length/weigth)<br>BIOLOGICAL SAMPLING | SURVEY AND HISTORIC DATA ANALYSIS<br>BIOLOGICAL PARAMETERS (mortality, growth,reproduction....)<br>EGGS AND LARVAE DATA<br>MARKET SAMPLING<br>COMMERCIAL DATA ANALYSIS ( catch/effort) | CATCH AT AGE / LENGTH<br>ABUNDANCE ESTIMATES<br>ANALYTICAL METHODS<br>CARTOGRAPHY<br>PREDICTIONS AND SCIENTIFIC ADVICE |
| ACOUSTICS | SMALL AND MIDDLE SIZED<br>PELAGIC STOCKS | ACOUSTICS SURVEY<br>MIDWATER TRAWL<br>CATCH SAMPLING<br>QUANTIFICATION AND<br>IDENTIFICATION OF ECHOES | SURVEY AND HISTORIC DATA ANALYSIS<br>BIOLOGICAL PARAMETERS (mortality, growth,reproduction....)<br>EGGS AND LARVAE DATA<br>MARKET SAMPLING<br>COMMERCIAL DATA ANALYSIS ( catch/effort) | CATCH AT AGE / LENGTH<br>ABUNDANCE ESTIMATES<br>CARTOGRAPHY<br>ANALYTICAL METHODS<br>PREDICTIONS AND SCIENTIFIC ADVICE |
| ICHTHYO PLANKTON | SPAWNING STOCK BIOMASS | SAMPLING OF THE EGGS<br>DISTRIBUTION AREA<br>ENVIRONMENTAL PARAMETERS | SAMPLING DATA ANALYSIS<br>ENVIRONMENTAL DATA ANALYSIS<br>NUTRIENTS<br>ADULTS FECUNDITY DATA<br>HISTOLOGICAL STUDIES<br>RECRUITMENT DATA ANALYSIS ( time series) | SPAWNING AREAS/PERIODS<br>SPAWNING STOCK BIOMASS<br>RECRUITMENT/ ENVIRONMENT RELATIONSHIP<br>STOCK/RECRUITMENT RELATIONSHIP |
| ECOLOGY | ECOSYSTEMS | HYDROCLYMATIC AND<br>ENVIRONMENTAL DATA<br>COLLECTION<br>STOMACH SAMPLING<br>TAGGING | SAMPLING DATA ANALYSIS<br>ENVIRONMENTAL DATA ANALYSIS<br>NUTRIENTS<br>OTHER SURVEY DATA ANALYSIS | NATURAL MORTALITY<br>STOCKS DISTRIBUTION/ABUNDANCE RELATED TO ENVIRONMENT<br>TROPHIC RELATIONSHIPS AND MIGRATIONS<br>POLLUTION |
| UPGRADING | EXPLOITED AND/OR UNDERUTILISED RESOURCES | MACHINERY EXPERIENCES<br>FREEZE/ PROCESSING, STORAGE.,<br>TRANSPORT | TECHNICAL IMPROVEMENTS ON MACHINERY<br>SAFETY, QUALITY, MICROBIOLOGY.... | BETTER UTILISATION OF RESOURCES<br>DIVERSIFICATION OF PRODUCTS<br>QUALITY/SAFETY IMPROVEMENTS, ETC |
| FISHING TECHNOLOGY | EXPLOITED AND UNEXPLOITED FRACTIONS | GEAR SELECTIVITY EXPERIENCES<br>GEAR PERFORMANCE<br>ENVIRONMENTAL IMPACT<br>SURVIVAL AFTER ESCAPING<br>DISCARD SAMPLING | FISH BEHAVIOUR (captivity)<br>FLUME TANK STUDIES<br>COMPUTER SIMULATION<br>GEAR DESIGN<br>SELECTIVITY DATA ANALYSIS | FISHING MORTALITY/GEAR<br>DISCARDS ESTIMATES FOR STOCK ASSESSMENT PURPOSES<br>IMPROVED EXPLOITATION SCHEMES<br>RECOMMENDATIONS FOR TECHNICAL MEASURES |

Table I.- The most usual types of survey for fisheries research: objectives, type of work at sea , complementary work at the lab and expected results.

# SUITABILITY OF VESSELS

| RESEARCH REQUIREMENTS | | | RESEARCH VESSEL | COMMERCIAL VESSEL WITH OBSERVER | COMMERCIAL VESSEL |
|---|---|---|---|---|---|
| EXPLOITED STOCKS | STANDARDISED ABUNDANCE INDICES | | +++ | | |
| | PRE-RECRUITMENT DATA | | +++ | | |
| | STOMACH SAMPLING | | +++ | ++ | + |
| | DISCARDS | | + | +++ | + |
| | DIRECT ABUNDANCE | - acoustics | +++ | | |
| | | -eggs/larvae | +++ | | |
| ENVIRONMENT | HYDROCLIMATIC AND ENVIRONMENTAL ( salinity, temperature, density,...) DATA | | +++ | ++ | + |
| UNEXPLOITED STOCKS | - ABUNDANCE | | +++ | + | |
| | -DISTRIBUTION | | +++ | + | |
| OTHER EXPERIENCES AT SEA | -GEAR TECHNOLOGY | | ++ | ++ | + |
| | -TAGGING | | ++(*) | ++ | + |
| | -UPGRADING | | ++(*) | ++ | + |

Table II.- Suitability of the different types of vessel which can be used for research purposes depending on the type of survey. *[(+) low; (++)medium; (+++) high; (*) depending of specific issues ]*

TABLE III.- INTERNATIONAL COOPERATIVE SURVEYS PROGRAMMES COORDINATED BY ICES SINCE 1975

| PROGRAMME | AREA | PERIOD | MEMBER STATES INVOLVED |
|---|---|---|---|
| STOMACH SAMPLING PROJECT 1991 | NORTH SEA | 1991 | BE,DK,NL,UK |
| RECRUIT INDICES FOR SOUTHERN HAKE | ICES subareas VIII and IX | 1989/1990 | SP,PT |
| ACOUSTIC SURVEYS IN ICES SUBAREAS VIII AND IX | ICES subareas VIII and IX | continuously since 1986 | SP,PT |
| NORTH SEA AND EASTERN ENGLISH CHANNEL SOLE EGG SURVEY | NORTH SEA / ENGLISH CHANNEL | 1984/1985 | BE,GE,NL,UK |
| ACOUSTIC SURVEYS OF BLUE WHITING | NORTH SEA | continuously since 1983 | DK,GE( ex-DDR ),UK |
| HYDROACOUSTIC SURVEYS IN THE BALTIC | BALTIC SEA | continuously since 1982 | DK,GE |
| STOMACH SAMPLING PROJECT 1981 | NORTH SEA | 1981 | DK,FR,NL,UK |
| ACOUSTIC SURVEYS IN ICES SUBAREA IV AND DIVISION IIIa | ICES IV AND IIIa | continuously since 1979 | DK,UK |
| YOUNG FISH SURVEYS IN THE BALTIC | BALTIC SEA | continuously since 1978 | DK,GE |
| COD STOMACH DATA FOR THE BALTIC | BALTIC SEA | continuously since 1977 | DK,GE( ex-DDR) |
| MACKEREL/HORSE MACKEREL EGG PRODUCTION SURVEYS | NORTH SEA AND WEST OF BRITISH ISI | continuously since 1977 | GE,FR,IR,NL,SP,UK |
| BEAMTRAWL SURVEYS IN THE NORTH SEA AND ENGLISH CHANNEL | NORTH SEA / ENGLISH CHANNEL | continuously since 1976 | BE,GE,FR,NL,UK |
| INTERNATIONAL BOTTOM TRAWL SURVEY (*) | NORTH SEA | continuously since 1975 | DK,GE,FR,NL,UK |
| | | | |

(*) Up to 1991 International Young Fish Survey

TABLE IV.- TECHNICAL CHARACTERISTICS OF THE MAIN RESEARCH VESSELS OPERATING IN REGION (a)

| | NL | | DK | GE | |
|---|---|---|---|---|---|
| NAME | TRIDENS | ISIS | DANA | WALTER HERWIG III | SOLEA |
| BASED PORT | THE HAGUE/IJMUIDEN | THE HAGUE/IJMUIDEN | HIRTSHALS | BREMERHAVEN | BÜSUM |
| ORGANISATION | MINISTRY | MINISTRY | DIFMAR | BFAFI | BFAFI |
| CLASS | LR DEEPSEA | | DEEPSEA FISHING | FISHERIES R/V | FISHERIES RESEARCH CUTTER |
| LENGTH | 73.54 | 28 | 78.43 | 64.5/54.5 | 35.4 m |
| MEAN DRAUGHT | 4.6 | 2.4 | 5.93 | 5.9 m | 3.6 M |
| ENG. POWER | 1600/3200 kw | 540 kw | 2 x 2320 hp | 2900 kw | 640kw |
| TONNAGE(grt/net) | 2200m3 660 ton | 250 M3 | 2483 t | 2485 | 337.4 |
| BREADTH | 13.86 | 7.6 | 14.7 | 15.2 | 9 |
| YEAR | 1990 | 1983 | 1980 | 1993 | 1974 |
| SCIENTISTS/TECHNICIAN | 12 | 3 | 16-25 | 12 | 5 |
| CREW(n°) | 20 | 6 | 12-21 | 21 | 12 |
| WORKING AREA | NORTH SEA/ IRELAND | NORTH SEA | WORLD WIDE | WORLDWIDE | NORTH SEA/BALTIC |
| TRIP DURATION | WEEKS | <10 days | 50 DAYS | | 16 DAYS |
| DAYS AT SEA/YEAR | 200 | 200 | 200 | 304 | 272 |
| OPERATIONAL 24 H/DAY | NO | NO | YES | NO | NO |
| OPERATIVE NIGHT | YES | YES | YES | YES | YES |
| OCEANOGRAPHY | YES | NO | YES | YES | YES |
| ENVIRONMENT | YES | YES | YES | YES | YES |
| DEMERSAL RESOURCES | YES | YES | YES | YES | YES |
| PELAGIC RESOURCES | YES | YES | YES | YES | YES |
| EGGS/LARVAE | YES | YES | YES | YES | YES |
| ACOUSTICS | YES | NO | YES | YES | YES |
| FISHING GEAR | BEAMTRAWL/OTTERTRAWL | BEAMTRAWL/OTTERTRAWL | GRANTON/STAR/KALUT/FLADEN/SCOTISH | BOTTOM/PELAGIC TRAWL | BEAMTRAWL |
| OTHER | UNDERWATER CAMERA ON A VEHICLE | | GOLF/BONGO/BIONESS.... | PLANKTON NET/RMT | DREDGE |
| DRY LAB | YES | NO | YES | YES | YES |
| WET LAB | YES | YES | YES | YES | |
| COMPUTER FACILITIES | YES | | YES | YES | NO |
| OTHER | | | 14C/SPECTROPHOTOMETER/AUTOANALYSER | FISHERIES/CHEMICAL RESEARCH | |
| OPERATING COSTS/DAY | | | | 25200 ECU/DAY | 7100 ECU/DAY |
| CHARTER COSTS/DAY | | | 4000/6500 ECU/DAY | | |

TABLE IV.(cont) :TECHNICAL CHARACTERISTICS OF THE MAIN RESEARCH VESSELS IN REGION (a)

| | UK (SCOTLAND) | | UK ( ENGLAND) | | BE |
|---|---|---|---|---|---|
| NAME | SCOTIA | CLUPEA | CIROLANA | CORYSTES | BELGICA |
| BASED PORT | ABERDEEN | FRASERBURGH | | | ZEEBRUGE |
| ORGANISATION | SOAFD MARINE LAB | SOAFD MARINE LAB | MAFF- Dept Fisheries Research | MAFF- Dept Fisheries Research | MINISTRY |
| CLASS | Dept. transport VII | Dept. transport VII | DTp X Fishing Vessel | DTp X Fishing Vessel | R/V |
| LENGTH | 68.25 m/60.96 m | 32.1 m/ 27.43 m | 72.5 m | 52.5 m | 50.90/44.95 m |
| MEAN DRAUGHT( kW) | 4.6 m | 3.5 m | | | 4 / 4.35 |
| ENG. POWER | 2250 | 492 | 2500 | 2000 | 1154 |
| TONNAGE(grt/net) | 1521/376 | 176/85 | 2400/1759 | 1550/1280 | 1192/765 |
| BREADTH | 13.41 m | 7.93 m | | | 10 |
| YEAR | 1971 | 1968( large conversion 1988) | 1970 | 1988 | 1984 |
| SCIENTISTS/TECHNICIANS | 12 | 6 | 10/16 | 6/8 | 12 |
| CREW(n°) | 20 | 12 | 20 | 19 | 15 |
| WORKING AREA | NORTH ATLANTIC/NORTH SEA | NORTH SEA/ WEST SCOTLAND | NORTH ATLANTIC/NORTH SEA | NORTH ATLANTIC/NORTH SEA | NORTH SEA/IRISH SEA/ENGLISH CHANNEL |
| MAX TRIP DURATION | 22 days | 10 days | 42 days | 42 days | 21 DAYS |
| DAYS AT SEA/YEAR | 255 days | 230 days | | | 215 |
| OPERATIONAL 24 H/DAY | YES | YES | YES | YES | YES |
| OPERATIVE NIGHT | YES | YES | YES | YES | YES |
| OCEANOGRAPHY | YES | YES | YES | YES | YES |
| ENVIRONMENT | YES | YES | YES | YES | YES |
| DEMERSAL RESOURCES | YES | YES | YES | YES | YES |
| PELAGIC RESOURCES | YES | YES | YES | YES | NO |
| EGGS/LARVAE | YES | YES | YES | YES | YES |
| ACOUSTICS | YES | YES | YES | YES | NO |
| FISHING GEAR | TRAWLS | TRAWLS | | | BEAMTRAWL/OTTERTRAWL |
| OTHER | HYDRAULIC | HYDRAULIC | | | |
| DRY LAB | YES | YES | YES | YES | YES |
| WET LAB | YES | YES | YES | YES | YES |
| COMPUTER FACILITIES | YES | YES | YES | YES | YES |
| OTHER | | | | | FISHERIES/CHEMICAL RESEARCH |
| OPERATING COSTS/DAY | | | | | 6250 |
| CHARTER COSTS/DAY | | | | | 6250 |

| SPECIES | STOCK | ASSESSMENT |
|---|---|---|
| Herring | IIIa, Baltic 22 - 24 | 1 |
| Herring | IIa, IV | 1 |
| Harring | VIa North | 1 |
| Herring | VIa Clyde | 1 |
| Harring | VIa South, VIIb.c | 2 |
| Herring | VIIa (Irish Sea) | 1 |
| Herring | Celtic Sea, VIIj | 2 |
| Sprat | IIIa | 2 |
| Sprat | Baltic 22-32 | 2 |
| Sprat | IIa,IV | 2 |
| Sprat | VIId, e | 3 |
| Anchovy | VIII | 2 |
| Anchovy | IX | 3 |
| Atl.Salmon | Baltic 24-31 | 2 |
| Capelin | I,IIb | 1 |
| Cod | I,IIb | 1 |
| Cod | IIIa Skagerrak | 1 |
| Cod | IIIa Kettegat | 1 |
| Cod | Baltic 22-24 | 1 |
| Cod | IIa, IV | 1 |
| Cod | Vb, VI | 1 |
| Cod | VIIa | 1 |
| Cod | VII except VIIa | 3/2 |
| Haddock | IIIa | 3 |
| Haddock | IIa, IV | 1 |
| Haddock | Vb, VI | 1 |
| Haddock | VII, VIII | 3 |
| Saithe | IIa, III, IV | 1 |
| Saithe | Vb, VI | 1 |
| Salthe | VII,VIII | 3 |
| Pollack | Vb, VI | 3 |
| Pollack | VII | 3 |
| Pollack | VIIIa, b | 3 |
| Norway pout | IIa, IIIa, IV | 2 |
| Blue Whiting | IIa, IIIa, IV, Vb, VI, VII | 1 |
| Blue Whiting | VIII, IXa | 2 |
| Whiting | IIIa | 3 |
| Whiting | IIa, IV | 1 |
| Whiting | Vb, VI | 1 |

Table V.-Quality of the assessment for the main stocks subject to TAC's in European Atlantic waters.( From Commission's Report 1991 on the CFP)
1.Good analytical assessment
2.Medium quality information
3.little or nothing known

| SPECIES | STOCK | ASS |
|---|---|---|
| Whiting | VIIa | 1 |
| Whiting | VII except VIIa | 3/2 |
| Whiting | VIII | 3 |
| Whiting | IX | 3 |
| Hake | IIa, IIIa, IV, Vb, VI, VII, VIIIab | 2 |
| Hake | VIIIc, IXa | 2 |
| Horse Mackerel | IIa, IIIa, IV, Vb, VI, VII, VIIIab | 1/2 |
| Horse Mackerel | VIIIc, IXa | 2 |
| Mackerel | IIa, IIIa, IV, Vb, VI, VII, VIIIab | 1 |
| Mackerel | VIIIc, IXa | 3 |
| Plaice | IIIa Skagerrak | 2 |
| Plaice | IIIa Kattegat | 1 |
| Plaice | IIa, IV | 1 |
| Plaice | Vb, VI | 3 |
| Plaice | VIIa | 1 |
| Plaice | VIId, e | 1/2 |
| Plaice | VIIf, g | 1 |
| Plaice | VIIh, j,k | 3 |
| Common sole | IIIa | 2 |
| Common sole | IIa, IV | 1 |
| Common sole | VIIa | 1 |
| Common sole | VIId | 1 |
| Common sole | VIIe | 1 |
| Common sole | VIIf, g | 1 |
| Common sole | VIIh, j, k | 3 |
| Common sole | VIIIa, b | 2 |
| Common sole | VIIIc, IXa | 3 |
| Megrim | Vb, VI | 2 |
| Megrim | VII, VIIIa,b | 2 |
| Megrim | VIIIc, IXa | 2 |
| Anglerfish | Vb, VI | 2 |
| Anglerfish | VII, VIIIa,b | 2 |
| Anglerfish | VIIIc, IXa | 2 |
| Pandalus | IIIa Skagerrek | 1 |
| Nephrops | Vb, VI | 2 |
| Nephrops | VII | 2 |
| Nephrops | VIIIa,b | 2 |
| Nephrops | IXa | 2 |

Table V( cont.).-Quality of the assessment for the main stocks subject to TAC's in European Atlantic waters.( From Commission's Report 1991 on the CFP)
1.Good analytical assessment
2.Medium quality information
3.little or nothing known

TABLE VI.- TECHNICAL CHARACTERISTICS OF THE MAIN RESEARCH VESSELS IN REGION (b)

| | SP | | IR | PT | |
|---|---|---|---|---|---|
| NAME | **CORNIDE DE SAAVEDRA** | **FCO DE PAULA NAVARRO** | **LOUGH BELTRA** | **CAPRICÓRNIO** | **NORUEGA** |
| BASED PORT | VIGO | LA CORUÑA | HOWTH | LISBON | LISBON |
| ORGANISATION | SECRETARIA DE PESCA | I.E.O. | FISHERIES RESEARCH CENTRE | IPIMAR | IPIMAR |
| CLASS | RESEARCH VESSEL | RESEARCH VESSEL | RESEARCH VESSEL | DEEP-SEA FISHING VESSEL | DEEP-SEA FISHING VESSEL |
| LENGTH | 66.7 m | 30.46 m | 21.1 m | 46.55 m | 47.5 m |
| MEAN DRAUGHT | 4.3 m | 4.36 m | 3.3 m | 4.40 m | 5.18 m |
| ENG. POWER ( kw) | 1125 | 562.5 | 317.05 | 2 x 600hp | 1500 hp |
| TONNAGE(grt/net) | 1542 | 178 | 115 | 467/ 122 t | 495 t |
| BREADTH | 11.25 | 7.4 | 6.1 | 9.30 m | 10.3 m |
| YEAR | 1970 | 1983 | 1972 | 1969 ( renewed 1993) | 1978 |
| SCIENTISTS/TECHNICIANS | 15/16 | 8 | 7 | 20 | 18 |
| CREW(nº) | 27 | 10 | 5 | 18 | 14 |
| WORKING AREA | ATLANTIC/MEDITERRANEAN | ATLANTIC/MEDITERRANEAN | IRISH COASTAL WATERS | PORTUGUESE EEZ | PORTUGUESE EEZ |
| MAX TRIP DURATION | 60 days | 6 days | 7 days | 30 days | 35 days |
| DAYS AT SEA/YEAR | 212 days | 180 days | 200-240 days | 300 days | 300 days |
| OPERATIONAL 24 H/DAY | YES | YES | NO | YES | YES |
| OPERATIVE NIGHT | YES | YES | YES | YES | YES |
| | | | | | |
| OCEANOGRAPHY | YES | YES | YES | YES | YES |
| ENVIRONMENT | YES | YES | YES | YES | YES |
| DEMERSAL RESOURCES | YES | YES | NO | YES | YES |
| PELAGIC RESOURCES | YES | NO | NO | YES | YES |
| EGGS/LARVAE | YES | YES | YES | YES | YES |
| ACOUSTICS | YES | YES | YES | YES | YES |
| FISHING GEAR | BOTTOM AND PELAGIC TRAWL | BOTTOM TRAWL | | LINE,NETS ,TRAPS | LINE,NETS ,TRAPS |
| OTHER | | | | POTS | POTS |
| DRY LAB | YES | YES | YES | YES | YES |
| WET LAB | YES | YES | YES | YES | YES |
| COMPUTER FACILITIES | YES | YES | YES | YES | YES |
| OTHER | | | | | |
| OPERATING COSTS/DAY | 9000 ECU/DAY | 1300 ECU/DAY | 2000 ECU/DAY | 4000 ECU/ DAY | 4000 ECU/ DAY |
| CHARTER COSTS/DAY | 18000 ECU/DAY | 2600 ECU/DAY | 1500- 2500 ECU/DAY | 4000 ECU/ DAY | 4000 ECU/ DAY |

TABLE VI (cont).- TECHNICAL CHARACTERISTICS OF THE MAIN RESEARCH VESSELS IN REGION (b)

| | FR | | | |
|---|---|---|---|---|
| NAME | **THALASSA** | **GWEN DREZ** | **THALIA** | **NOUVELLE THALASSA*** |
| BASED PORT | BREST | BREST | BREST | BREST |
| ORGANISATION | GENAVIR | GENAVIR | GENAVIR | GENAVIR |
| CLASS | BUREAU VERITAS | BUREAU VERITAS | BUREAU VERITAS | BUREAU VERITAS |
| LENGTH | 66.7 m | 25.5 m | 24.5 m | 74.50 m |
| MEAN DRAUGHT | 4.65 m | 3.5 m | 3.5 m | 5.1 m |
| ENG. POWER ( kw) | 1384 | 441 | 2 x 265 | 2200 |
| TONNAGE(grt/net) | 1192/ 302 | 106.31 / 32 | 135.4/33.84 | |
| BREADTH | 10.4 | 7.4 | 7.4 | 14.9 |
| YEAR | 1960 | 1976 | 1978 | end 1995 expected |
| SCIENTISTS/TECHNICIANS | 18 | 5 | 6 | 25 |
| CREW(n°) | 32 | 7 | 6 | 25 |
| WORKING AREA | ATLANTIC/MEDITERRANEAN | BAY OF BISCAY/CHANNEL | BAY OF BISCAY/CHANNEL | ATLANTIC/MEDITERRANEAN |
| MAX TRIP DURATION | 30 days | 5 days | 5days | 45 days |
| DAYS AT SEA/YEAR | 152 days | 189 days | 250 days | 250/300 days |
| OPERATIONAL 24 H/DAY | NO | NO | NO | NO |
| OPERATIVE NIGHT | YES | YES | YES | YES |
| OCEANOGRAPHY | NO | NO | YES | YES |
| ENVIRONMENT | YES | YES | YES | YES |
| DEMERSAL RESOURCES | YES | YES | YES | YES |
| PELAGIC RESOURCES | YES | YES | NO | YES |
| EGGS/LARVAE | YES | YES | YES | YES |
| ACOUSTICS | YES | YES | YES | YES |
| FISHING GEAR | BOTTOM AND PELAGIC TRAWL | BOTTOM AND PELAGIC TRAWL | BOTTOM AND PELAGIC TRAW | BOTTOM AND PELAGIC TRAW |
| OTHER | | | | |
| DRY LAB | YES | YES | NO | YES |
| WET LAB | YES | YES | YES | YES |
| COMPUTER FACILITIES | YES | YES | YES | YES |
| OTHER | | | | NETWORK |
| OPERATING COSTS/DAY | | | | |
| CHARTER COSTS/DAY | 11247 ECU/DAY | 2584 ECU/DAY | 2280 ECU/DAY | |

(*) Forescast

TABLE VII.- TECHNICAL CHARACTERISTICS OF THE MAIN RESEARCH VESSELS IN REGION (c)

| | GR | | SP | FR* | IT | | |
|---|---|---|---|---|---|---|---|
| NAME | AEGAIO | PHILIA | ODON DE BUEN | EUROPE | + H100 A1 | S. LO BIANCO | TECNOPESCA II |
| BASED PORT | PIRAEUS | IRAKLION | PALMA DE MALLORCA | SETE | NAPLES | ANCONA | ANCONA |
| ORGANISATION | N.C.M.R. | I.M.B.C. | I.E.O. | GENAVIR | SO.PRO.MAR. SpA | C.N.R. | C.N.R. |
| CLASS | + H100 A1 | + H100 A1 | RESEARCH VESSEL | BUREAU VERITAS | RESEARCH VESSEL | + H100 A1 | + H100 A1 |
| LENGTH | 51.11 m/ 45.55 m | 26.2 m | 24 m | 29.6 m/24.3 m | 31.56 m | 30.7/ 25 m | 16.25 m /13.50 m |
| MEAN DRAUGHT | 3.22 m | 2.6 m | 2.7 m | 3.45 m | 3.65 m | 3 m | 0.80 m |
| ENG. POWER ( kw) | 2 x 700 | 330 | 378.7 | 2 x 346 | 1000 | 660 hp | 2 x 170 |
| TONNAGE(grt/net) | 597/179 | 200/140 | 64 | 259.69/ 55.82 | 199 | 129.84 | 24.5 |
| BREADTH | 9.6 m | 7.15 | 6 m | 10.6 m | 7 m | 6.9 m | 4.7 m |
| YEAR | 1985 | 1986 | 1973 | 1993 | 1986 | 1967 | 1989 |
| SCIENTISTS/TECHNICIANS | 16 | 8 | 4/3 | 8 | 10 | 8 | 6 |
| CREW(n°) | 22 | 7 | 5 | 8 | 7 | 6 | 2 |
| WORKING AREA | MEDITERRANEAN | AEGEAN/IONIAN SEA | MEDITERRANEAN | MEDITERRANEAN | MEDITERRANEAN | MEDITERRANEAN | MEDITERRANEAN |
| TRIP DURATION | 15 days | | 4 days | 7 days | 10 days | 10 days | 2 days |
| DAYS AT SEA/YEAR | 180 days | 220 | 180 days | 200-300 days | 200 days | 200 days | 180 days |
| OPERATIONAL 24 H/DAY | | YES | NO | YES | YES | YES | YES |
| OPERATIVE NIGHT | | YES | YES | YES | YES | YES | |
| OCEANOGRAPHY | YES | YES | YES | YES | YES | YES | YES |
| ENVIRONMENT | YES | YES | YES | YES | YES | YES | YES |
| DEMERSAL RESOURCES | YES | YES | YES | YES | YES | YES | NO |
| PELAGIC RESOURCES | YES | YES | YES | YES | YES | YES | YES |
| EGGS/LARVAE | YES | YES | YES | YES | YES | YES | YES |
| ACOUSTICS | YES | YES | YES | YES | YES | YES | NO |
| FISHING GEAR | | BOTTOM/PELAGIC TRAWL | BOTTOM/PELAGIC TRAWL | BOTTOM/PELAGIC TRAWL | BOTTOM/PELAGIC TRAWL | BOTTOM/PELAGIC TRAWL | STATIC |
| OTHER | | | | | | | |
| DRY LAB | YES | YES | YES | YES | YES | YES | NO |
| WET LAB | YES | YES | YES | YES | YES | YES | YES |
| COMPUTER FACILITIES | YES | YES | YES | YES | YES | YES | YES |
| OTHER | | | | | | | |
| OPERATING COSTS/DAY | | 2000 ECU/DAY | 1000 ECU/DAY | | 1350 ECU/DAY | | 200 ECU/DAY |
| CHARTER COSTS/DAY | | 2700 ECU/DAY | 2000 ECU/DAY | 3496 ECU/DAY | 2800-3000 ECU/DAY | | 300 ECU/DAY |

TABLE VIII.- TECHNICAL CHARACTERISTICS OF THR FLUME TANKS OPERATING IN MEMBER STATES

| | | DIFTA (DK) | SEAFISH ( UK) | IFREMER LORIENT | IFREMER BOULOGNE |
|---|---|---|---|---|---|
| **DIMENSIONS** | Overall ( L x H x W ) | 30 x 6 x 8 m | 31 x 5 x 5 m | 24.5 x 3.3 x 7.5 m | 34 x 5 x 9 m |
| | Measuring section | 21.3, 2.7 and 8 m. | 11 x 2.5 x 5 m | 12 x 1.5 x 2.6 m | 18 x 2 x 4 m |
| | Volume of water | 1200 m3 | 700 m3 | 150 m3 | 700 m3 |
| | Windows | 20 m x 3 m | 11 x 1.5 m | 4.51 x 1.2 m | 9 x 2 m |
| **VELOCITY** | Water speed max | 1 m/s | 1.2 m/s | 1.10 m/s | 2 m/s |
| | Max simulated towing speed ( scale 1:5 ) | 4.3 knots | 5.2 knots | 4.8 knots | 8.7 knots |
| | Max simulated towing speed (scale 1:20 ) | 8.6 knots | 10.4 knots | 9.6 knots | 17.4 knots |
| **EQUIPMENT** | Measuring | object measuring/ resistance and drag | Warp loads, water speed, coordinates in vertical plane | yes | Laser tomography |
| | Lights | 18*400 W | 12 fixed overhead, 4 movable overhead | yes | 2 x 3000 W |
| | Video | movable cameras for horizontal and vertical views | 3 x CCD, 2 x portable cameras, VHS, S-VHS and U-Matic forma | yes | VHS, Hi 8 |
| | Other | metal workshop/material testing lab/ computer center | Observation trolley | - | Observation trolley |
| **ACTIVITIES** | Testing Fishing Gear | yes | yes | yes | yes |
| | Training and courses | yes | yes | yes | yes |
| | Research projects | yes | yes | yes | yes |
| **COST OF HIRING ECU/DAY** | | 3600 | 1600 | 750 | 2000 |

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