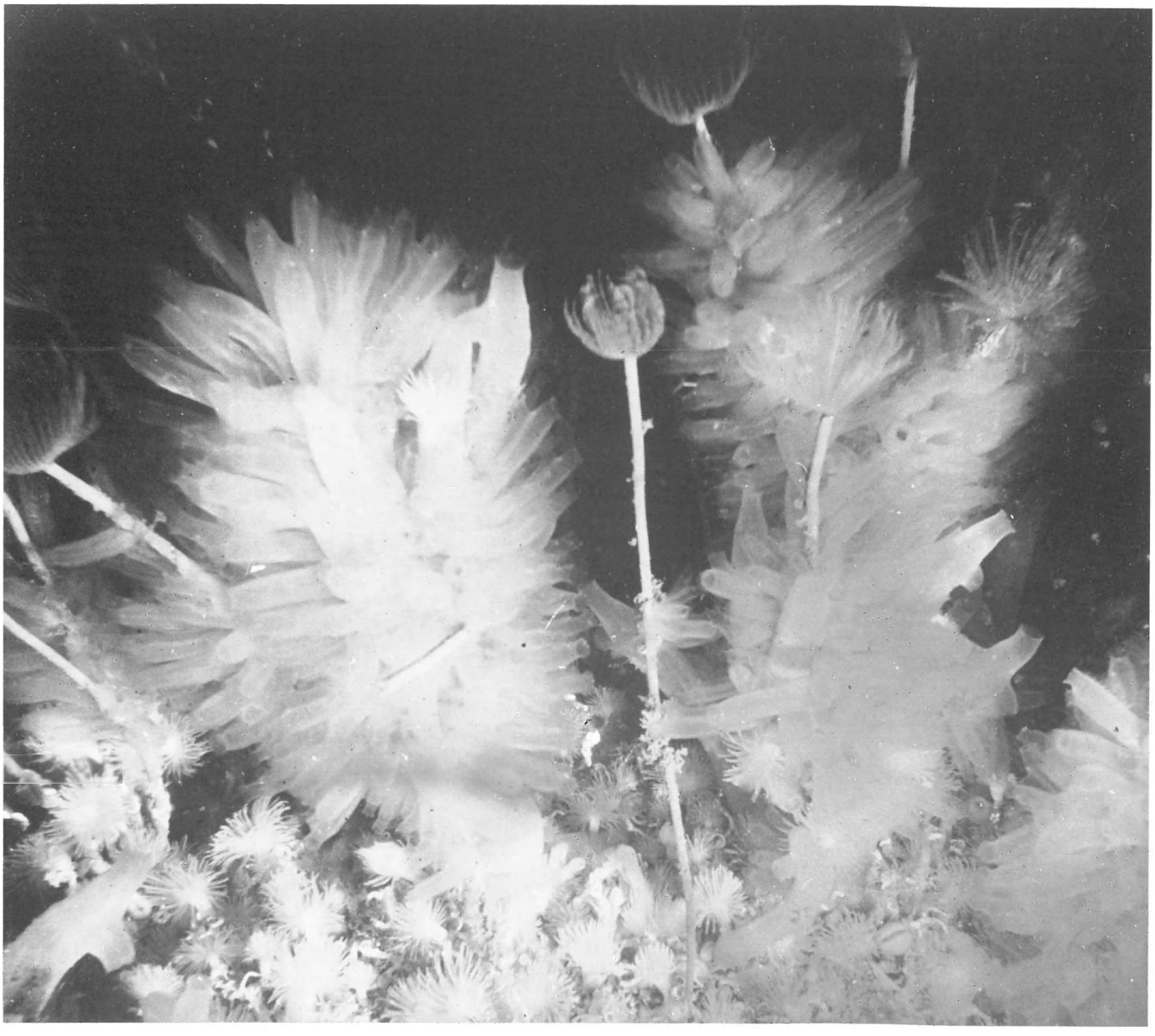
MISSION OF THE EUROPEAN COMMUNITIES

COST 47

COASTAL BENTHIC ECOLOGY

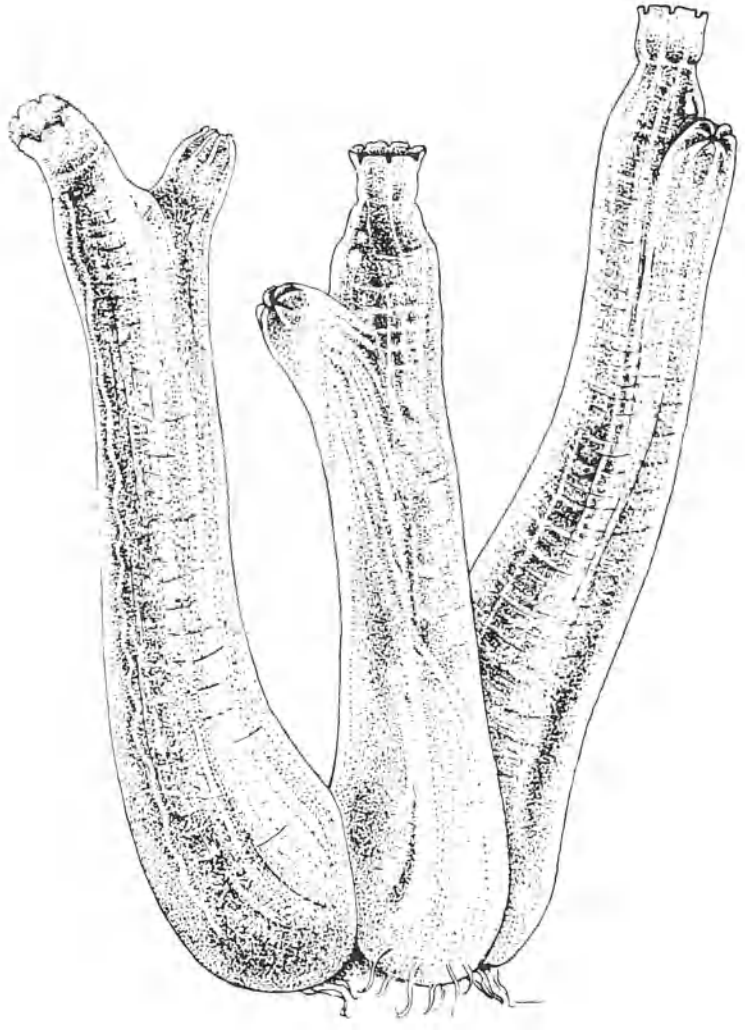
ACTIVITY REPORT: APRIL 1979 — MARCH 1983



The photograph shows aggretions of the ascidian *Ciona intestinalis* on polychaete worms tube and numerous small sea anemonae *(Protanthea simplex).* (Photograph: T. Lundälv)

Front page

Starfish is one of the rocky subtidal communities. Here: *Asterias rubens* (Photograph: T. Lundälv)



Ciona intestinalis is a widely distributed and ecologically important sea squirt species in the rocky subtidal programme.

Backpage

This large species of sponges *(Geodia baretti)* is very common in deep waters of Scandinavia (Photograph: T. Lundälv)

COST 47: COASTAL BENTHIC ECOLOGY

COMMISSION OF THE EUROPEAN COMMUNITIES

Directorate-General Science, Research and Development
Environment Research Programme

COASTAL BENTHIC ECOLOGY

(COST PROJECT 47)

ACTIVITY REPORT

of the Management Committee covering
the period April 1979 — March 1983

XII/ENU/36/83

Legal Notice

C O N T E N T S

List of maps, figures and tables

FOREWORD

Progress towards the objectives agreed in 1979 has been slow, but this is not because of scientific problems. These are to be expected; these are the challenges we accept. Indeed, apart from the longer exploratory/development phases of the subtidal sedimentary programme (caused by rather greater community variations than were known to exist) the general objectives and methods remain as set out initially, and in some cases even without modification of the original procedures. Furthermore, such new data as we have indicate clearly that the rationale and objectives are sound and realisable.

However, these new data fall, in quantity, far below what was hoped for because a number of participating states have either

a) failed to participate, as originally agreed, in the habitat programme appropriate to them, or

b) done so without providing adequate or any new financial support for the scientists concerned.

Consequently the over-all pattern is one of only slow development and of mainly part-time, even voluntary, studies on an inadequate geographical scale.

The particular significance of geographical scale to COST 47 cannot be over-emphasised. The fundamental objective of the project is to obtain data on those scales of natural, temporal variability which are attributable to fluctuations in climatic/hydrographic conditions. While such events may be local on occasion, it is hypothesised that usually they will be experienced on a broad geographical scale, and that detection of their biological effects against a background of diverse local factors will best be achieved by equally broad scale observation and study. Hence the necessity for international collaboration to give a geographical dimension that is lacking in national (and usually very local) studies. The raw material of our project, as with oceanography and meteorology, is intrinsically of an international nature, and a large amount of data from one country cannot compensate for its total absence from another. Indeed, major gaps in geographical coverage reduce the value of the work in adjacent countries, and could be a disincentive to continued participation. Tables 1-3 in this activity report indicate the short-fall of states' participation.

While part-time contributions from scientists with other duties are better than no contribution at all, it should be self-evident that the original, accepted objectives necessitate full-time studies. Ecology, both in the field and afterwards, is notoriously labour-intensive. The basic sorting and identification of benthic infauna alone is time-consuming and some participants are unable to do even this, their samples merely accumulating for future analysis. When age/size analyses and reproductive/recruitment data are required for a series of species at different times of the year

(and such data are fundamental if understanding is the aim) there can be no progress without full-time personnel.

That so many part-time contributions exist is a measure of the widespread belief in the validity of the project : but equally, the reluctance or inability to become involved in the more intensive part of each programme is fully understandable.

Yet such new data as we have are very encouraging scientifically. All we need is more. The often expressed doubts that local factors would dominate and obscure the perhaps more subtle broad-scale effects are now receding. In both the rocky programmes the opposite is proving to be the case, certainly at the major regional level, and probably on an international scale too. (See the habitat reports for details). Where intensive population studies are being carried out, as with Amphiura in Ireland, the basic patterns of reproduction and recruitment are providing the data for year by year, and eventually, geographical comparison. Where, as in the rocky littoral programme, such intensive and long-term studies have now benefited by a wider geographical comparison (i.e. U.K. and Portugal) hypotheses appear to have been substantiated and raise hopes that we are nearer to identifying the optimum conditions for successful recruitment in one or two species.

Thus one must conclude that progress over-all has been much slower than expected, almost entirely because of lack of financial support, but those more limited areas of real progress confirm that the original objectives are both valid and attainable, if the means are provided.

Please note that this report reflects the situation as at 31 January 1983.

J. LEWIS

Chairman
COST 47 Management Committee

A.1 INTRODUCTION

Following a proposal by the Irish delegation to the COST Senior Officials Committee (COST : European Co-operation in the field of Scientific and Technical Research), a concerted action on Coastal Benthic Ecology (COST 47) was established.

The legal basis is a memorandum of understanding signed by the Federal Republic of Germany, Denmark, France, Ireland, Sweden, the United Kingdom (5 April 1979), the Netherlands, Norway (22 May 1980), Spain (27 May 1980), Belgium (31 July 1980), the European Communities (27 November 1980) and Portugal (8 April 1982).

Correct assessment of the biological consequences of pollution in coastal waters demands prior and adequate understanding of the scales and causes of natural ecological variations. Such knowledge would, of course, also have applications in the areas of resource management and conservation practice. While existing data on fisheries and plankton involve long time-series and result from broadscale and/or internationally collaborative studies, ecological work on benthic (i.e. bottom-living) communities is mostly short-term and fragmented, rarely involving the same species from one locality to another. Therefore it can only deal with local events and attempt to relate them to local conditions. Yet there are enough data and sound *a priori* grounds for believing that major ecological events can result from fluctuations in broadscale climatic/hydrographic conditions and that such events may be misinterpreted, solely because broadscale investigations are lacking.

The main purpose of COST 47 is to remedy this lack of geographically broad scale data by means of a programme of international co-ordinated research, studying the same communities and using the same or intercalibrated methods over the entire distribution of those communities around the coasts of Europe. Recognizing too that the effects of climatic/hydrographic changes upon one species may have repercussions upon associated species there is also a need to ascertain the biological interactions within a community and the roles of its component species.

Thus, the aim is to establish a broad 'baseline' of knowledge comprising :

i) Data on the scales of natural variability over as long as possible to give reasonable assurance that a wide range of irregular climatic/hydrographic events have been observed.

ii) A sufficient understanding of the specific causes of biological change to permit prediction about the consequences of natural events with some degree of certainty.

iii) A sufficient understanding of community dynamics for prediction about the consequences to the whole biological community of dramatic changes in individual species as a result of natural factors or selective pollutants.

A.2 PROJECT IMPLEMENTATION

The project is divided into four distinct programmes studying selected communities in four coastal benthic habitats. (The three programmes established at the beginning of the project became four through division of the sedimentary programme into subtidal and intertidal habitats). These selected communities are widely distributed around European coasts and are regarded as being of major importance. They are identified below by their "key" or characteristic species.(For further details of key species, see Annex I)

Programme and habitat	Community	Co-ordinator
i Rocky subtidal	Ascidiacea/Porifera (sea squirts/sponges)	Dr. T. Lundälv
ii Rocky intertidal	Cirripedes/Patella/Trochidae (barnacles/limpets/topshells)	Dr. J. Lewis
iii Sedimentary subtidal	Amphiura/Abra (brittlestars/clams)	Dr. L. Cabioch
iv Sedimentary intertidal	Macoma/Polychaeta (clams/worms)	Dr. J. Beukema

The selection of these communities recognises that each is being studied intensively on a local scale in one or more countries. Thus a sound data base exists in each case upon which expanded programmes are developing.

The detailed methods of study vary greatly from one programme to another as a consequence of the different physical conditions and types of organisms involved. But the same aspects are being studied and include the following ones (among others regarded as locally desirable) :

a- Community dynamics, leading to an appreciation of the most important biological interactions and to the identification of "key" or ecologically dominant species. This involves systematic observations of natural events and the experimental manipulation of community structure.

b- The standing crop and population dynamics of these "key" species, with special emphasis upon their reproductive cycles and the intensity of recruitment from year to year. Since these latter aspects are especially responsive to slight changes of natural conditions and are also very sensitive to pollutants, special efforts are needed to develop the most accurate methods of assessing fecundity, recruitment success and juvenile establishment.

c- The appropriate range of climatic/hydrographic data, together with broad spectrum analyses of the substratum and its variation in the two sediment programmes. Although the collection of some of these data requires specific action, in some situations existing routine collections of meteorological/oceanographic data for other biological and non-biological purposes can be utilised.

A.3 PROJECT MANAGEMENT

A Management Committee for COST 47 was established. Its terms of reference and composition are outlined in Annex II and IV. The opinion of the Management Committee of COST Project 47 with regard to the extension of the programme is shown in Annex III.

B. RESULTS AND PROGRESS

B.1 GENERAL EVALUATION

The levels of participation and support between countries and programmes are highly variable. They range from fully-financed teams of several full-time scientists down to part-time data collection by individual research students.

Present participation in the different programmes is summarised in Table 1. Fuller information is provided in the habitat reports, but in order to provide a simpler, overall picture in Table 1 these various levels of participation have been divided into 3 major categories (see key to symbols).

Current or promised participation is represented in Table 2 relative to the natural potential (i.e. availability of habitats) of each country, and Table 3 summarises the potential and actual participation in each programme.

Approximately three-quarters of actual scientific participation in COST 47 is not adequately supported financially, or has no support at all. That so many individual scientists are trying to contribute under these circumstances is a measure of their belief in the potential scientific value of the project.

Furthermore, in addition to the low level of participation and its patchy geographical distribution, the long-term continuity of study is far from secure. Not only is there considerable reliance upon other sources of support but some of the specific COST funding is itself on an annual renewal basis - the most notable exceptions being the Portuguese and U.K. support of their rocky intertidal teams.

Table 1 : National participation levels in habitat programmes

	rocky subtidal	rocky intertidal	sedimentary subtidal	sedimentary intertidal
Norway	○	·	·	n/a
Sweden	●	n/a	○	n/a
Denmark	n/a	n/a	△	●
Germany	△	△	○ ●	●
Netherlands	n/a	n/a	·	○
Belgium	n/a	n/a	○	·
U.K.	·	●	○	△
Ireland	●	·	●	·
France	○ △	△	○	○
Spain	·	·	●	·
Portugal	·	●	·	·

Key to symbols

● This participation level shows either pre-existing studies which have become the core of that habitat programme or new studies developed specially for COST purposes. In all cases there is specific financial support which variously permits the employment, for example, of a part-time technical assistant, one full-time scientist, or a team of 2-4 full-time scientists.

○ These contributions come either from independent research or from studies funded for other purposes, but which have been adapted to varying extents to provide relevant COST data. These usually are senior personnel in institutes or universities, working alone or with some assistance, their data being collected mostly on a part-time basis.

△ The uncertainties indicated by a triangle in Table 1 relate to very recent promises of participation that have yet to be translated into action.

· The habitat is available; but there is no activity under COST 47.

n/a Not available. The habitat and communities are not readily available in the country concerned.

Table 2 : Potential versus active programme participation

Country	Number of habitat types readily available	Actual habitat participation	
		funded	non-funded
NORWAY	3		1
SWEDEN	2	1	1
DENMARK	2	1	
GERMANY	3	2	1 *
NETHERLANDS	2		1
BELGIUM	2		1
U.K.	4	1	1
IRELAND	4	2	
FRANCE	4		3
SPAIN	4	1	
PORTUGAL	3	1	

* There is both funded and non-funded participation in the same programme in Germany.

Table 3 : Number of countries participating in each programme

Habitat	Potential participation	Actual participation
Rocky subtidal	7	4 (+1)*
Rocky intertidal	7	2 (+2)*
Sedimentary subtidal	11	7 (+1)*
Sedimentary intertidal	9	5 (+1)*

* Numbers in brackets refer to "promised" national participation.

B.2 CO-ORDINATION AND COLLABORATION

An essential requisite for the project as a whole is co-ordination of methods and regular discussion of progress, difficulties, etc. While much of this has been attempted through correspondence, at Management Committee meetings or chance meetings at scientific conferences, organised workshops involving active personnel have been restricted for financial reasons to the following :

Date	Programme	Meeting place
September 1980	Rocky subtidal group	Sweden
November 1980	Rocky intertidal group	U.K.
June 1982	All groups	France

In May 1981, an arranged rocky subtidal group meeting in Ireland was cancelled for lack of financial support. At the Roscoff meeting (France) in June 1982, a fully co-ordinated programme and methods were agreed for each habitat. This meeting received strong backing in advance from the COST Senior Officials Committee. However, some active full-time workers (Portugal) were unable to attend for financial reasons.

As an additional method of increasing communication within and between programme members, Ireland generously offered to produce a biennial NEWSLETTER.* The format was approved during the Roscoff meeting, and the second issue has recently been published. Although primarily intended for internal circulation and discussion of methods and detailed results, etc..., this Newsletter provides a vehicle for a more general exposition of objectives and overall results which is considered useful to distribute to a wider external readership.

B.3 REPORTS ON THE HABITAT PROGRAMMES

In considering the progress summarized below it must be understood that the 4 habitats differ markedly in

i) their accessibility and ease of investigation;

ii) the diversity of their communities;

iii) the amount of initial data that was relevant to the objectives of COST 47;

iv) the level, duration and geographical distribution of the scientific effort they have received since 1979.

For example, from the beginning, the subtidal habitat was recognized as the more difficult and one in which it might not be possible to - or would take longer to - reach the scientific targets which were judged appropriate for the more accessible rocky intertidal. Accordingly the reports below

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* The work of the Editors and of the Irish National Board for Science and Technology is gratefully acknowledged.

should not be judged on a comparative basis.

The location of the laboratories currently participating in each habitat programme is indicated on the map which follows each habitat report.

(i) Rocky subtidal programme

a) Participation. The appropriate habitat and communities are present in 7 countries (Norway, Sweden, U.K., Ireland, France, Spain and Portugal). West Germany (Helgoland) is an additional possibility. Pre-COST studies had begun in Sweden 1970, in N. and S. Norway in 1976 and 1978 respectively and have since been joined by Ireland 1981 and recently (1982) by France. The total number of currently active personnel is about 8, 3 of whom are in a Swedish team, all other working mostly alone. Full COST financial support is available in Ireland. The Swedish and Norwegian contributions are part-time with short-term funding. (See map i)).

b) Objectives and methods. The communities selected are characterised by various combinations from among 13 solitary ascidians living on vertical or near vertical surfaces in sheltered or semi-sheltered waters.

The core programme called for permanent observation areas at 3 different depths at a number of sites, each to be stereophotographically monitored on a quarterly basis each year. This is a non-destructive sampling procedure. Quantitative analyses of the photographs provide data on density and percentage cover of individual species. (See figure on following page).

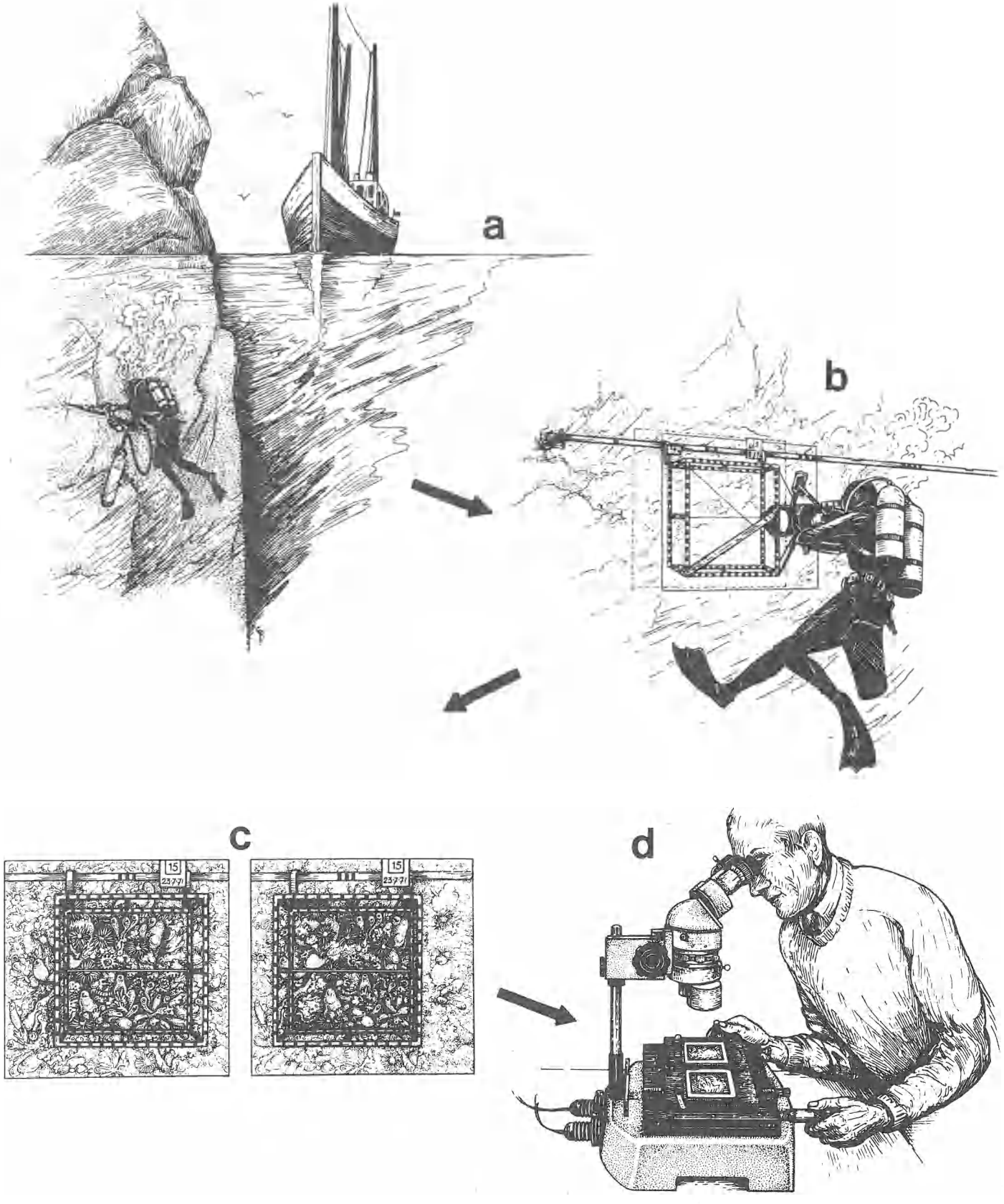
It has been agreed that this core programme should be expanded (facilities permitting) into a more intensive study comprising :

- Comparative re-colonisation experiments using natural and denuded surfaces to establish the characteristics of succession and community development under different conditions.

- Seasonal and annual variability in recruitment in relation, if possible, to climatic/hydrographic conditions, and to the possible effects of biological factors such as spatial competition and predation. Artificial settling panels will be used for various manipulations and data compared with that from the permanent observation areas.

- Functional role of "key" species and the extent to which their competitive or predatory activities determine community structure and dynamics.

c) Results. The long-running Swedish studies provide illustration of the types of data and experience in this habitat, and which are clearly needed on a broader geographical scale. Data relate to localities along 80 km of coast from sheltered fjord to wave-swept islets, and sites from 5 to 25 m depth astride the halocline.



The rocky subtidal programme is mainly based on stereo-photographic recording of permanently marked test areas followed by photogrammetric picture analysis to record biological processes. The main steps of the technique are : (a) test-area marking by underwater rockdrilling;
(b) photography;
(c)-(d) picture analysis with stereocomparator.
(Drawings by T. Lundälv)

- For species existing over the entire horizontal gradient, a very high degree of similarity has been found in long-term variation patterns between sites, with different patterns above and below the halocline. There is somewhat increased variability at the more exposed sites.

- Major changes in community structure that have occurred over the past 12 years have been clearly detectable over the entire horizontal range, even were sometimes involving different but ecologically analogous species.

- One such major community change involving sites above the halocline was the decline of dominating algae after a stable 6-7 years period and their replacement in recent years by ascidians (in shelter) and mussels (in exposure). These in turn have been subject to varying degrees of predation by increasing numbers of starfish.

- The geographical scale of such changes in Sweden encourages the view that local changes and factors do not prevent the detection of common broadscale changes, and that studies in other countries could be expected to reveal, at the least, regional events and thereby permit large-scale geographical comparison. Recent data from S. Norway also indicate common trends to those from the Swedish West coast.

- Hypotheses to explain what have clearly been major community changes on the Swedish West coast range from local or regional factors (e.g. eutrophication) to broadscale climatic influences. The eventual existence of comparable data from all northern Europe would do much to resolve such problems.

d) Recent publications. (Wholly or partly involving COST data)

. Christie, H. Natural fluctuations in a rocky subtidal community in the Oslofjord (Norway). Proc. 17th Europ. Symp. Mar. Biol.

. Gray, J.S. & Christie, H. Predicting long-term changes in marine benthic communities. Proc. 17th Europ. Symp. Mar. Biol.

. Lundälv, T. & Svane, I. Long-term surveillance of rocky subtidal communities. Indications of disturbance on the Swedish West coast. Proc. 17th Europ. Symp. Mar. Biol. (in manuscript).

. Svane, I. & Lundälv, T. 1981. Reproductive patterns and population dynamics of Ascidia mentula on the Swedish West Coast. J. exp. mar. Biol. Ecol., 50, 163-182.

. Svane, I & Lundälv, T. 1982. Population dynamics and reproductive patterns of Boltenia echinata on the Swedish West Coast. Neth. J. Sea Res.

. Svane, I. & Lundälv, T. Persistent stability in ascidian populations. Long-term population dynamics and reproductive pattern of Pyura tessellata (Forbes) in the Gullmar Fjord on the Swedish West Coast. Sarsia. (in press).

e) Personnel.

Federal Republic of Germany	:	K. Anger	Biologische Anstalt Helgoland 2192 Helgoland
France*	:	A. Castric-Fey	Laboratoire de Biologie Marine F-29110 Concarneau
Ireland	:	G. Könnecker	Zoology Department University College Galway
Norway	:	H. Christie	Institutt for Marinbiologi P.B. 1064, Blindern Oslo 3
		B. Gulliksen R. Evans	Marinbiologisk Stasjon P.B. 2550 N-9001 Tromsø
Sweden	:	T. Lundälv (Co-ordinator) I. Svane C. Larsson	Kristinebergs Marinbiologiska Station S-450 34 Fiskebäckskil

*Three further laboratories in France have indicated their future participation in this habitat programme.

Map i) Location of the laboratories participating in the rocky subtidal programme

Key to symbols : see page 7

(ii) Rocky intertidal programme

a) Participation. Of the 7 potential participants, Portugal and the U.K. are strongly involved, and make two of the most substantial COST contributions, supporting respectively 2 and 3 (4 by 1983) full-time personnel and thereby permitting intensive year-round studies. The Portuguese personnel spent a month in the U.K. in November 1980. (see map ii)).

b) Objectives and methods. Not only is this habitat very accessible and its communities well known but pre-COST U.K. studies over the previous decade provided the basis for the present programme. From consideration of

- key ecological role in the community,
- geographical distribution and likely susceptibility to climatic oscillations, plus
- comparative ease of study in the field,

a small number of mollusca and cirripedes of exposed coasts were selected for intensive study of reproductive and recruitment fluctuations and population dynamics. Methods used depend upon whether species are sessile or mobile but include :

- fixed site non-destructive monitoring of total.
- size and age analyses of field populations.
- study of gonad cycles with special reference to annual variation in fecundity, time of spawning and amount of re-ripening.
- fixed site counts or photographs of spat recruitment and subsequent survival of '0' class during next 12 months.
- use of settlement panels to obtain day-old gastropod spat for experiments on their metamorphosis, growth and survival under a range of environmental variables in the laboratory and in the field.
- replication of field observations in different geographical areas of the U.K.

The proposed methods are set out fully in the advisory discussion document together with summaries of present knowledge and of the types of geographically-varying data sought (see : COST 47, Rocky littoral, Lewis, 09/09/80).

c) Results. Most data still derive from the U.K. only, but even within these geographical limits there are detectable latitudinal differences, strongest in those species at or near their geographical limits. Some of the main results emerging (pre-COST and subsequently) are :

- recruitment is irregular or infrequent towards N. geographical limits. Thus Chthamalus, over last 100-150 km of its range has had significant recruitment once only (1975) since 1970. Gibbula umbilicalis and Monodonta, after great success in 1975 and 1976 failed in 1978, 1979 and 1980 over much of western Britain, up to 700 km from N. limits of Gibbula. Patella aspera populations show a much greater bias to young animals in the S.W. than the N.E., indicating less regular recruitment in the latter. The poor recruitment years of 1973 and 1974 in P. vulgata in N. Britain coincide with failure years 2000 km further North in N. Norway.

- recruitment failures have led to population declines of up to 56 % in Gibbula and 33 % in Monodonta. Density fluctuations in P. vulgata closely follow recruitment fluctuations and in some areas are now at a 14 year high, i.e. three times the density of 1967.

- gonads or larvae develop normally in poor or failure years in all species, so failure must arise in the larval, settling or juvenile stages. In animals transplanted beyond the northern geographical limits there is good somatic growth and gonad development, indicating that N. geographical limits are set by inability to re-populate with sufficient regularity.

- recruitment success appears to be linked with spawning early in the "reproductive period". But the "reproductive period" varies with latitude. At northern limits it is near midsummer and becomes later to the South. Our widest data are for P. vulgata : July/August in N. Norway, November/December in Portugal. This latitudinal time change suggests that there is a "weak link" in the re-populating sequences which succeeds within only a limited range of conditions.

- the experimental studies on Patella spp. breeding in the late summer/autumn on the exposed N.E. coast of England suggest that falling temperatures, experienced by spat and juveniles when spawning is late, result in slow growth and too small a size to withstand the winter. Under excessively warm conditions however (or when spawning is too early) larvae appear unable to metamorphose correctly.

- the recent participation of Portugal has now revealed comparable changes in the breeding cycles of the other limpets (P. aspera and P. depressa) and points to the probability that southern geographical limits, like northern limits, are set by failure to re-populate, not by failure of the gonad cycle.

- there is some evidence that maximum size and longevity in gastropods increase from South to North with accompanying changes in the size structure of populations.

- high settlement of Balanus occurred in 1979 in W., N.W. and N. Britain, W. Norway, N. Holland following a cold winter (why ?). The only known failure area was N.E. England, where larval release was very late (why ?) and presumably met adverse planktonic conditions.

Although there is an urgent need to fill the geographical gaps in this programme, the present pairing of Portugal and U.K. illustrates very well the mutual benefit of geographical collaboration. Because of overlapping ranges around N.W. Europe, species which dominate in Portugal and Spain are at their northern limits in U.K. and conversely those dominant in U.K. are at their southern limit in Portugal.

d) Recent publications (wholly or partly involving COST data)

- Bowman, R.S., 1981. The morphology of Patella spp. juveniles in Britain and some phylogenetic inferences. J. Mar. Biol. Ass. UK., 61, 647-666.

- Kendall, M.A. et al., 1982. Settlement patterns, density and stability in the barnacle Balanus balanoides. Neth. J. Sea Res.

- Lewis, J.R., 1982. Composition and functioning of benthic ecosystems in relation to the assessment of long-term effects of oil pollution. Phil. Trans. R. Soc. Lond. B. 297, 257-267.

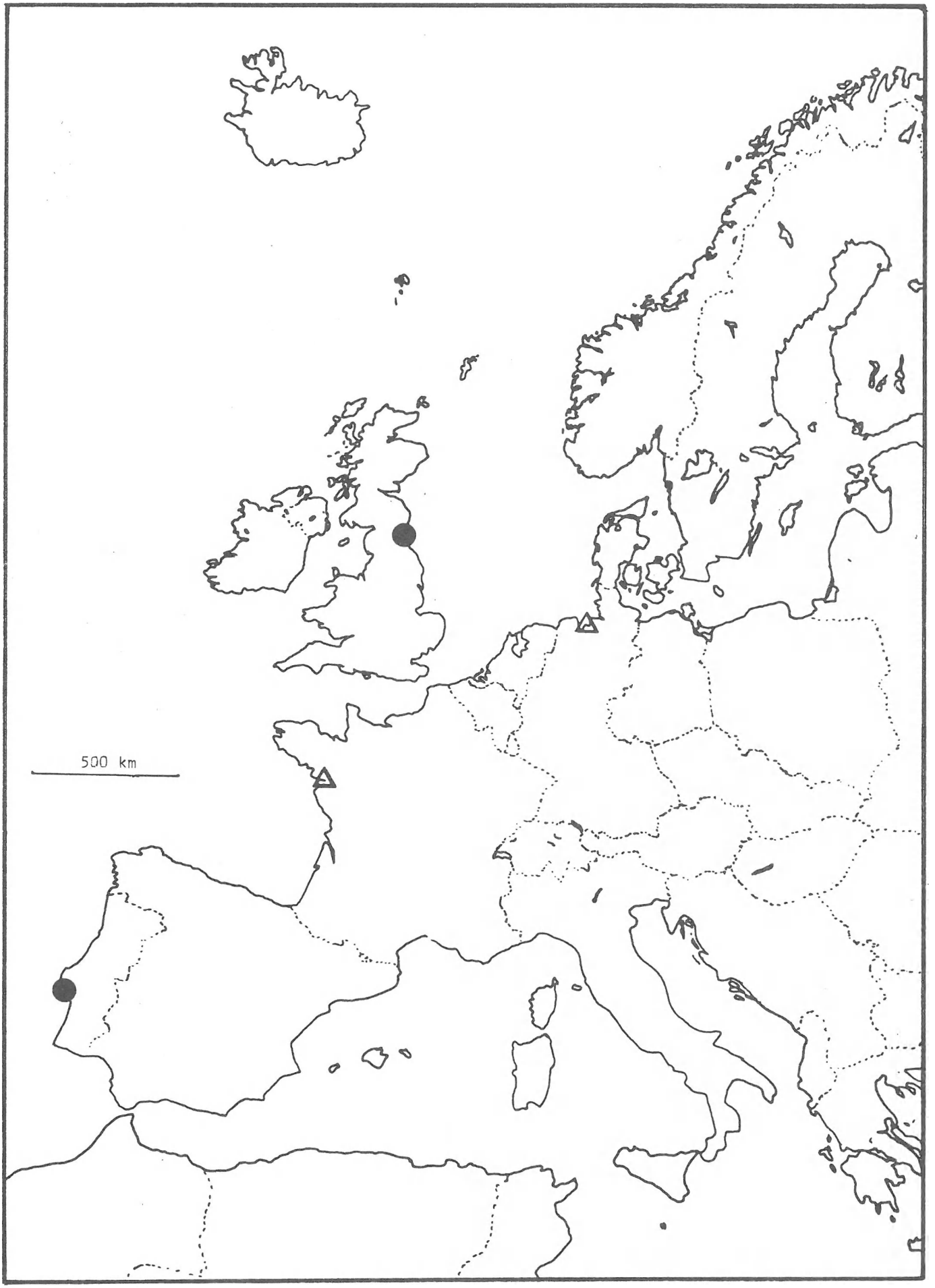
- Lewis, J.R. et al., 1982. Latitudinal variation in population dynamics, possibilities and realities in some littoral species. Neth. J. Sea Res.

- Williamson, P & M.A. Kendall, 1981. Population, age structure and growth of Monodonta lineata determined from shell rings. J. Mar. biol. Ass. U.K., 61, 1011-1026.

e) Personnel

Federal Republic of Germany	:	J. Harms K. Anger	Biologische Anstalt Helgoland 2192 Helgoland
France	:	Y. Gruet	Laboratoire de Biologie Marine 2, rue de la Houssinière 44037 Nantes
Portugal	:	Maria J. Gaudencio Miriam T. Guerra	I.N.I.P. Avenida de Brasilia 1400 Lisboa
United Kingdom	:	J.R. Lewis (co-ordinator)	University of Leeds C/O 62, Station Road Scalby Scarborough Yorkshire
		M.A. Kendall R.S. Bowman + 2 more scientists	Dove Marine Laboratory Cullercoats Tyne and Wear

Map ii) Location of the laboratories participating in the rocky intertidal programme



Key to symbols : see page 7

(iii) Sedimentary subtidal programme

a) Participation. The apparent ubiquity of this habitat/community means that all countries could take part. In practice there are now 7 active countries (plus 1 uncertain) and because of multiple participation in some countries (e.g. France,Germany) the highest number of personnel - about 20, including part-time student assistants. Direct national funding for COST 47 is available in Germany, Ireland and Spain. A high percentage of the effort is therefore part-time and with uncertain support. (See map iii))

Much of the initial co-ordination and discussion within this larger group was by post or through informal chance meetings. The Roscoff meeting in July 1982 was the first major workshop with 18 participants.

b) Objectives and methods. Initially, in recognition of the obvious diversity of sedimentary infaunas, the target communities were identified in rather general terms. Furthermore, to accommodate the possibility in some regions that there might be a continuum of overlapping distributions between the clearly intertidal Macoma community and that of subtidal Amphiura and Abra spp. no division by tidal level was made - as it was for rocky habitats.

Although there was general agreement that an "Amphiura/Abra" community existed widely, it became clear at an early stage that its character was less constant than originally expected. Accordingly, most of the first two years were occupied by further examination and comparison of the sedimentary communities available for, or currently under, investigation. Incorporated into this phase was a minimal sampling programme at specified times of the year intended to provide basic data on temporal changes in community composition.

A random sampling is undertaken by coring from a boat, several samples are collected on the same area so as to obtain a mean figure. Afterwards, the samples are treated by a Barnett fluidized sandbath. The fauna is then identified to the species level. The number of species, their abundance and their biomass is recorded. Some abiotic measurements are also done (e.g. granulometry).

These surveys confirmed that the Macoma community was the more homogeneous in its composition; and not only did this justify study in its own right, but being mainly intertidal afforded an area of separate study suitable for would-be participants lacking the boat facilities essential for the subtidal programme.

The "Amphiura/Abra" community by contrast was confirmed as an assemblage of many species with pronounced regional differences in the relative abundance of its many components. Nevertheless by the time of the Roscoff workshop it was agreed that sufficient knowledge had been gained about the structure of the communities in various areas to formulate an integrated programme of more detailed studies for those who are able to do more than continue with the slightly modified minimal survey of the dynamics of the whole community.

To this end the following 6 species were selected, on the grounds of their role as community dominants and their wide distribution, for more intensive study of their population dynamics and general biology:

Ophiuroidea	:	Acrocnida brachiata
		Amphiura chaijei
		Amphiura filiformis
Bivalvia	:	Abra alba
		Abra nitida
Polychaeta	:	Melinna palmata

Individual members of the habitat group have agreed to act as "species organisers" and the detailed methods of study and procedure were finalised at an informal meeting during the XVII European Marine Biologists Symposium at Brest in September 1982.

The extent to which this more intensive programme can now be followed is highly dependant upon a much greater level of support than most participants now have.

It is also highly desirable to extend the geographical coverage within the North Sea (Denmark, Netherlands and East coast of U.K.) and in the West and South-West of the U.K. The status of Norwegian participation requires clarification.

c) Results. Most data obtained through specific COST studies are obviously of short duration and have contributed to the evolution of the programme outlined above. Changes within this short period appear to have been primarily seasonal in character. Some studies which had started "pre-COST" suggest that in their most suitable habitats populations of the two Amphiura species selected for detailed studies are relatively stable, with individuals living for several years. In other cases major disturbances have been associated with irregular climatic conditions. Similar stability or periodic perturbations characterize some Abra-dominated communities.

Details of the annual gonad cycles have been recorded for some of the more important species, but in this area, as with population studies, it is the synchronous data of the same species on a broad geographical scale that remains the over-riding need.

In the latter context it is of special interest to note that discussions among subtidal ecologists in the U.K., provoked by the formation of COST 47, revealed that major changes had occurred around the British Isles in 1972. Each investigator, working alone, had assumed a local pollution effect until this synchrony came to light several years later. How widely around N.W. Europe were comparable events experienced at that time ?

d) Recent publications (wholly or partly involving COST data)

- Bowmer, C.T., 1982. Reproduction in Amphiura filiformis. Seasonality in gonad development. Mar. Biol., 69, 281-290.

- Josefson, A.B., 1981. Persistence and structure of two deep macrobenthic communities in the Skagerrak (Sweden) J. Exp. Mar. Biol. Ecol., 50, 63-97.

- Josefson, A.B., 1982. Regulation of population size, growth and production of a deposit-feeding bivalve. J. Exp. Mar. Biol. Ecol., 59.

- Lopez-Jamar, E., 1981. Spatial distribution of the infaunal benthic communities of the Ria des Muros, N.W. Spain. Mar. Biol., 63, 29-37.

- O'Connor, B. & Mc Grath, D., 1980. The population dynamics of Amphiura filiformis in Galway Bay, Ireland. pp. 219-222 in Proc. Eur. Coll. Ech., Brussels. Balkema, Rotterdam.

- Rachor, E., Arntz, W.E., Mantau, K.H. & Romohr, H., 1982. Seasonal and long-term population dynamics of Diastylis rathkei in Kiel Bay and the German Bight. Neth. J. sea Res.

- Rumohr, H., Arntz, W.E. Rachor, E. & Salzwedel. H., 1981. Long-term fluctuations of Abra alba in the German Bight and Kiel Bay. Symp. Balt. Mar. Biologists. Rostock.

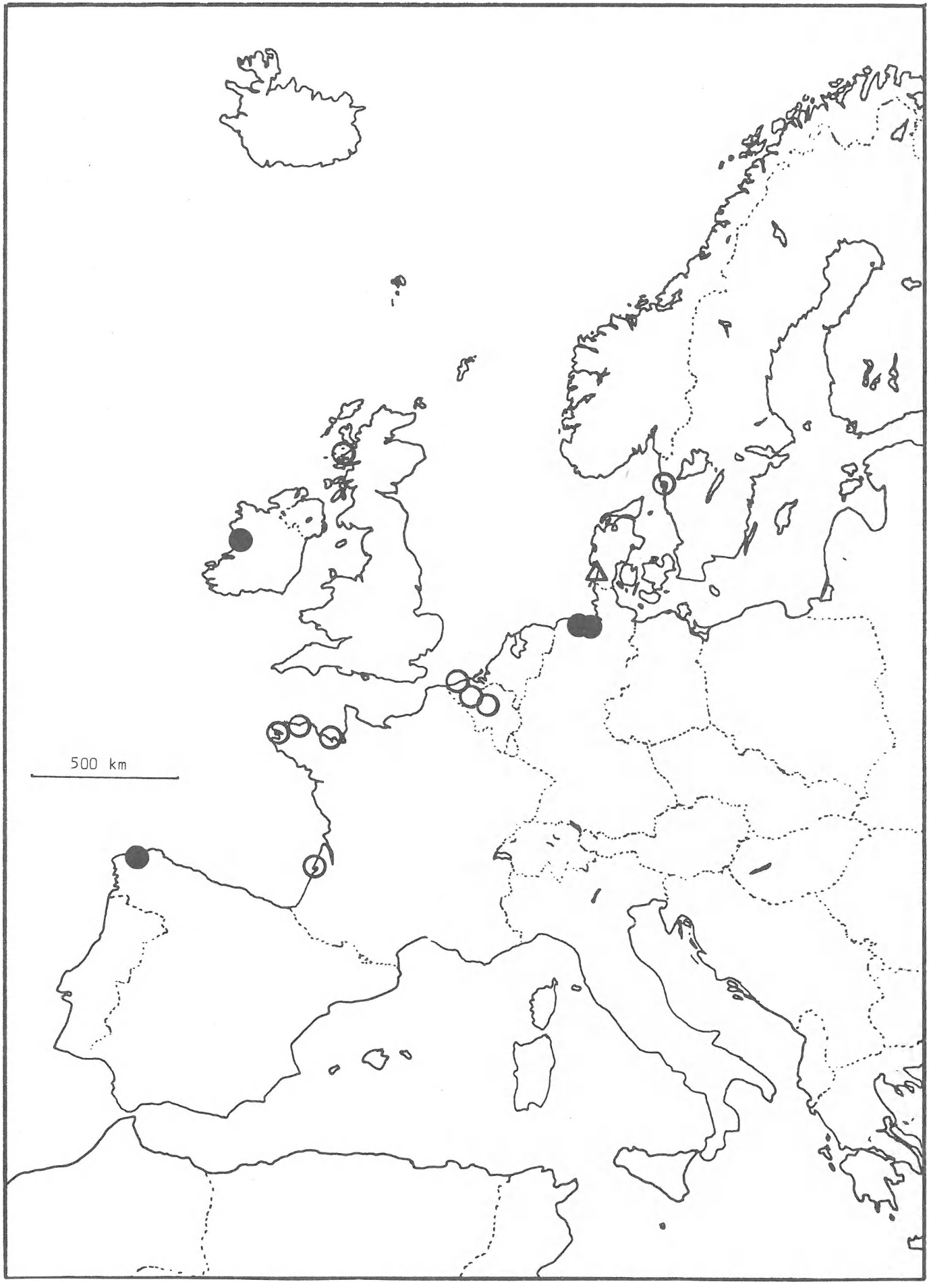
Several further papers will appear in the publications of the XVIth and XVIIth E.M.B.S., held respectively at Texel in 1981 and Brest in September 1982.

e) Personnel

Belgium	:	J. Govaere	Oceanography Section Royal Belgian Institute for Natural Sciences Vautierstraat, 29 B-1030 Brussels
		C. Heip	Zoological Institute University of Ghent B-9000 Ghent
		D. Maertens R. Redant	Fisheries Research Station Ankerstraat, 1 B-8400 Oostende
Denmark	:	Kurt Jensen	The Sea Pollution Laboratory Kavalergarden, 6 2920 Charlottenlund

Federal Republic of Germany	:	E. Rachor J.D. Dittmer	Institut für Meereskunde Am Handelshafen, 12 D-2850 Bremerhaven
		J. Dörjes + 1 techn. ass.	Institute of Marine Geology and Marine Biology Senckenberg Schleusenstrasse, 39a D-2940 Wilhelmshaven
		S.A. Gerlach H. Rumohr	Institut für Meereskunde Düsternbrooker Weg, 20 D-2300 Kiel
France	:	L. Cabioch (Co-ordinator) J.C. Dauvin F. Gentil B. Guillamont	Station Biologique 29110 Roscoff
		M.G. Glemarec M. Guillou J. Guillou C. Hily	Laboratoire d'Océanographie Biologique Université de Bretagne Occidentale 29283 Brest
		C. Retiere	Laboratoire Maritime de Dinard 35801 Dinard
		G. Bachelet	Université de Bordeaux Arcachon
Ireland	:	B. Keegan T. Bowmer B. O'Connor	Dept. of Zoology University College Galway
Spain	:	E. Lopez-Jamar	Instituto Español de Oceanografia La Coruña
Sweden	:	A. Josefson	Kristinebergs Marinbiologiska Station S-45034 Fiskebackskil
United Kingdom	:	T. Pearson	Scottish Marine Biol. Association P.O. Box nO. 3 Oban

Map iii) Location of the laboratories participating in the sedimentary subtidal programme



Key to symbols : see page 7

(iv) Sedimentary intertidal programme

a) Participation. Originally combined with the subtidal sector in a wider sedimentary programme, this habitat and its characteristic Macoma community now form a separate programme. It is the second most widely distributed habitat, but active membership has so far been restricted to Denmark, Germany, Netherlands and France. In the last two months there have been promises of minimum level participation from several parts of the U.K. These, together with several part-time, unfunded contributors in France, bring the nominal number of participants to seventeen. Special funding is only available in Denmark (full-time) and Germany (part-time). (See map iv))

b) Objectives and methods. Although work has been proceeding among the original participants, it was at the Roscoff workshop that this now discrete group formulated an agreed programme and methods.

With considerable experience to build upon, eleven species were selected for both a minimum sampling programme and for more intensive studies on recruitment and species interactions. The sampling stations chosen will be sampled over a number of years at a frequency of at least twice per year. Samples will be taken from fixed sampling stations by a corer (a site destructive method). Sufficient samples should be taken to collect at each occasion at least several tens of specimens of each of the main species. A 1 mm sieve will be used. Sorting will be done by naked eye. Emphasis will be on numbers rather than on weights and biomass. The sampling area should be described in detail. Experiments in the sampling areas are encouraged e.g. to study recruitment on bare placed, species interactions, etc...

Since most of the species have occurred in many previous studies throughout Europe and some are of commercial value, a special search is planned for old data relating to long-term trends, patterns of geographical synchrony and possible relationships with environmental conditions.

c) Results. As with most other programmes, it is too soon for data trends to have emerged specifically from COST 47. However, previous and continuing studies confirm that pronounced fluctuations in recruitment success are common in this community and have various consequences for the stability of the established populations. The Macoma community is found as far South as the frontier between France and Spain. Within the participating countries, the Northern border is in Denmark. For superficially living species hard winter conditions can severely affect the populations (Danish studies) and according to Dutch studies recruitment appears to be strongly influenced by unpredictable winter conditions too. Again, synchronous and widely distributed data are required. In this habitat, local abiotic conditions, such as suspended solids loading of the water, can be very variable and exert much influence on the fauna. The Danish studies under OCST 47 are giving special attention to this aspect.

d) Recent publications (wholly or partly involving COST 47 data)

- Beukema, J.J., 1980. Calcimass and carbonate production on the tidal flats in the Dutch Wadden Sea: the tellinid bivalve Macoma balthica. J. Neth. Sea Res., 14, 324-338.

- Beukema, J.J., 1982. Annual variation in success of reproduction of the major macrobenthic species living on the tidal flats of the Dutch Wadden Sea. J. Neth. Sea Res. 16, 37-45.

- Beukema, J.J., 1982. Calcimass and carbonate production by molluscs on the tidal flats in the Dutch Wadden Sea: II. The edible cockly, Cerastoderma edule. Neth. J. Sea Res. 15, 391-405.

- Madsen, P.B., 1982. Dynamics of the macrobenthos in the Danish Wadden Sea. Dpt. of Mar. Poll. Lab. 2. Charlottenlund.

e) Personnel

Denmark	:	P. Brinch Madsen K. Jensen	Marine Pollution Laboratory Kavalergarden, 6 DK-2920 Charlottenlund Copenhagen
		N. Kingo Jacobsen M. Pejrup St. Folving	Skalling-Laboratoriet Esbjerg and De Danske Vade-og Marskundersøgelser Tønder Geografisk Institut Haraldsgade, 68 DK--2100 Copenhagen N.B. The actual laboratories are on the West Coast.
Federal Republic of Germany	:	J. Dörjes	Institute of Marine Geology and Marine Biology "Senckenberg" Schleusenstrasse, 39A D-2940 Wilhelshaven
		H. Michaelis	Forschungsstelle für Insel- und Küstenschutz An der Mühle, 5 2982 Norderney
France	:	G. Bachelet	Institut Universitaire de Biologie Marine 2, Rue de Prof. Jolyet 33120 Arcachon
		M. Desprez	Laboratoire de Ecophysiologie Faculté des Sciences 76130 Mont-Saint-Aignan
		J.-P. Ducrotoy	Station d'Etudes en Baie de Somme 80230 St. Valery-sur-Somme
		J. Marchand	Laboratoire de Biologie Marine 2, Chemin de la Houssinière 44072 Nantes Cedex

		Ch. Retiere	Laboratoire Maritime 17, Avenue George V 35801 Dinard
		B. Sylvand	Laboratoire Maritime Rue du Docteur Charcot 14530 Luc-sur-Mer
Netherlands	:	J.J. Beukema (coordinator)	Netherlands Institute for Sea Research P.O. Box 59 1790 AB Texel
		K. Essink	Institute for Sewage and Waste-Water Treatment Groningen
		J. Coosen	Delta Instituut Hydrobiologisch Onderzoek (DIHO) Vierstraat 28 4401 EA Yerseke
United Kingdom	:	S. Atkins	Department of Zoology University of Dundee Scotland
		N.V. Jones	Department of Zoology University of Hull Hull HU6 7RX
		C. Mettam	Department of Zoology University College Cardiff Wales
		D.S. McLusky	Department of Biology University of Stirling Stirling FK9 4LA Scotland

Map iv) Location of the laboratories participating in the sedimentary intertidal programme

Key to symbols : see page 7

ANNEX I

Key species list

i) Rocky subtidal

Clavelina lepadiformis
Styela spp.
Ciona intestinalis
Corella parallelogramma
Ascidiella aspera
Ascidiella scabra
Ascidia mentula
Ascidia virginea
Phallusia mammilata
Dendrodea grossularia
Boltenia echinata
Pyura tesselata
Halocynthia spp.

ii) Rocky intertidal

Patella depressa (intermedia)
Patella vulgata
Patella aspera
Balanus balanoides
Chthamalus montagui
Chthamalus stellatus
Gibbula umbilicalis
Monodonta lineata

iii) Sedimentary subtidal

Acrocnida brachiata
Amphiura chiajei
Amphiura filiformis
Abra alba
Abra nitida
Melinna palmata

iv) Sedimentary intertidal

Macoma balthica
Arenicola marina
Cardium (Cerastoderma) edule
Nephtys hombergii
Lanice conchilega
Littorina littorea
Nereis diversicolor
Mya arenaria
Tellina tenuis
Scrobicularia plana
Mytilus edulis

ANNEX II

Extracts from the terms of reference of the COST 47 Management Committee

"The Management Committee (hereinafter referred to as "the Committee") will be set up, composed of not more than two representatives of each Signatory. Each representative may be accompanied by such experts or advisors as he may need.

The Committee will be responsible for co-ordinating the project and in particular for making the necessary arrangements for:

(a) the choice of research topics;

(b) advising on the direction that work should take;

(c) drawing up detailed plans and defining methods for the different phases of execution of the project;

(d) keeping abreast of the research being done in the territory of the Signatories and in other countries;

(e) liaising with appropriate international bodies;

(f) exchanging research results amongst the Signatories to the extent compatible with adequate safeguards fot the interests of Signatories;

(g) drawing up the annual interim reports and the final report to be submitted to the Signatories and circulated as appropriate; to this end, Signatories will require their public research establishments or research contractors to submit periodic reports and a final report, as may be deemed necessary;

(h) dealing with any problems that may arise out of the execution of the project, including, if necessary, special conditions to be attached to applications to sign this Memorandum of Understanding submitted more than six months after the date of the first signature."

ANNEX III

Opinion of the Management Committee of COST Project 47 with regard to the extension of the Programme, expressed on 2nd December 1982

The Management Committee of COST Project 47(coastal benthic ecology) took note of the intention of the Commission to propose, within the framework of the revision of the Environment Research Programme, a Community Concerted Action in this area. This programme would include, in addition to the ongoing activities, similar research in the Mediterranean and the Baltic Sea. Consequently, the status of COST Project 47 would have to be changed from COST category III to COST category II.

The Committee unanimously and strongly supports this initiative of the Commission, underlining the outstanding importance of base-line studies in coastal ecology for efficient pollution management. Furthermore, the Committee stresses the need for this type of research in improving knowledge on coastal ecosystems, in view of their importance for the utilization of marine resources.

It is essential that the research covered by COST Project 47 is carried on along the entire European coast-line. The intended extension to geographical areas so far not covered is therefore crucial. Substantial efforts should also be made to involve further non-member states of the Community in the programme.

The Committee strongly recommends that the necessary funds for the efficient coordination of the programme are made available in the future.

ANNEX IV

Composition of the Management Committee

Two meetings of the Committee have been held, on 5 December 1979 and 23 January 1981, respectively. Dr. J. Lewis (United Kingdom) was elected as Chairman of the Committee, and Prof. G. Gerlach (FRG) as Vice-Chairman. Dr. M. Lex (Commission of the European Communities) was first Secretary of the Committee. In 1982, Dr. A. Sors (Commission of the European Communities) became Secretary of the Committee.

The national COST 47 delegates are as follows:-

Belgium	: Dr. C. Heip	Lab. Morfologie en Systematiek Rijksuniversiteit Gent Ledganckstraat, 35 9000 Gent
Denmark	: Prof. N. Kingo Jacobsen	Københavns Universitet Geografisk Institut Haraldsgade, 70 2100 København
Federal Republic of Germany	: Dr. W. Bartel	Federal Ministry for Research and Technology Heinemannstr. 2 D-5300 Bonn 2
	Dr. E. Rachor	Inst. für Meeresforschung Am Handelshafen, 12 D-2850 Bremerhaven
France	: Dr. L. Cabioch	Station Biologique 29211 Roscoff
Ireland	: Dr. M. Lyes	National Board for Science and Technology Shelbourne House Shelbourne Road Dublin 4
	Dr. M. Parker	Dept. of Fisheries Fisheries Research Centre Abbotstown, Castlenock Dublin

Netherlands	:	Dr. J.J. Beukema	Netherlands Institute Sea Research P.O. Box 59 Texel
		Dr. S.J. de Groot	Rijksinstituut voor Vissersonderzoek Haringkade, 1 IJmuiden
Norway	:	Prof. J.S. Gray	University of Oslo P.O. Box 1064 Blindern Oslo, 3
Portugal	:	Cdr. J. Cabido de Ataide	INIP Av. de Brasilia, 14 Alges Praia P-1400 Lisboa
United Kingdom	:	Mr. P. Foxton	Natural Environment Research Council Polaris House North Star Avenue Swindon Wilts SN2 1EU
		Dr. J.R. Lewis	University of Leeds c/o Station Road Scalby Scarborough, Yorkshire
Spain	:	Mr. J. Corral	Instituto Espanol de Oceanografia c/Alcala, 27-4° Madrid 14
Sweden	:	Dr. T. Lundälv	Kristinenergs Marinbiologiska Station 450 34 Fiskebäckskil