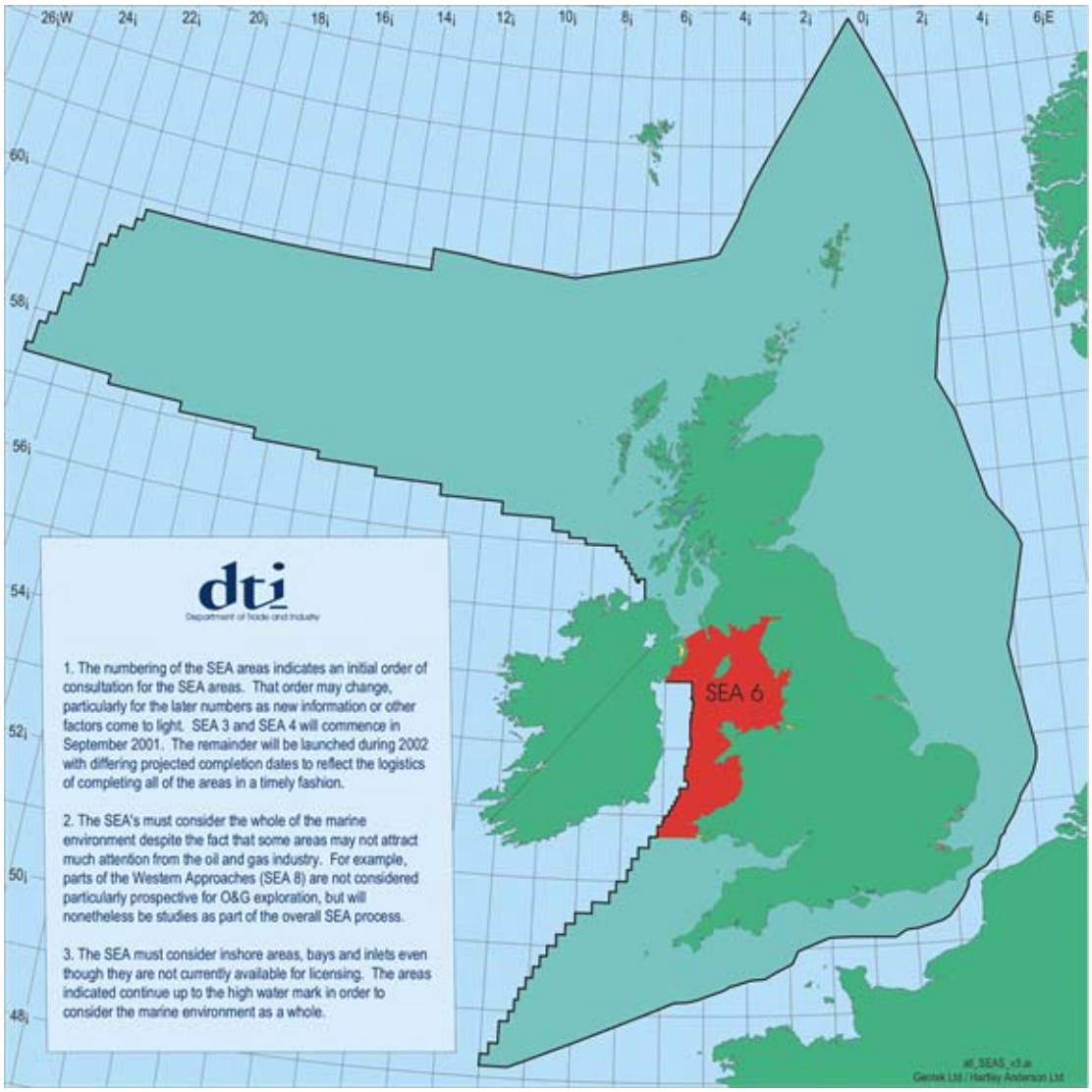
Metadata report for DTI area 6 Irish Sea (approx. 51.8°N – 54°N, 6°W – 3°W)

Plankton



1 Introduction

1.1 This report, prepared on behalf of the DTI as part of the Strategic Environment Assessment (area 6), aims to provide a comprehensive overview of all parties engaged in activities involving plankton research in the study area (approx. 51.8°N – 54°N, 6°W – 3°W, see above map). A number of organisations are interested in the study of the plankton community, as it can provide useful information as regards to the local environment, as well as an indication of much larger ecosystem changes. A comprehensive list of such organisations, and a point of contact, is given under Section 2. Section 3 details the actual datasets of plankton information that are available for SEA 6. Section 4 lists pertinent references appertaining to plankton research in the SEA 6 area.

1.2 Plankton can be divided into phytoplankton and zooplankton, representing plants and animals generally. The majority of the plankton occurs in the top 20m of the sea, known as the photic zone (the layer that light penetrates to allow photosynthesis). The pycnocline is a zone of marked density gradient between stratified upper layers and mixed lower waters, which form in summer months in the northern North Sea. Denser concentrations of plankton may accumulate in the pycnocline; this may enter up at the surface, forming a 'front'. The vertical position of the pycnocline can vary throughout the year (Richardson et al., 1998).

1.3 The phytoplankton community can be divided into larger entities such as diatoms and dinoflagellates, and the smaller flagellates. The latter are often referred to as pico or nano plankton because of their small size, but can at times make up a large proportion of the phytoplankton community. Diatoms are characterised by having a siliceous test, comprising 2 valves, and being autotrophic (produce energy by photosynthesis). Dinoflagellates differ in having 2 flagella and a rigid test. They are usually heterotrophic (consume substances), but can also photosynthesize under certain conditions.

1.4 In the plankton community a 'bloom' of phytoplankton occurs every spring, often followed by a smaller peak in the autumn. Phytoplankton (diatom) blooms are normally initiated by the establishment of a thermal stratification in spring, as a result of increased light and temperature. Dinoflagellate communities are associated with post spring bloom conditions, when surface waters are limited by the amount of phosphorus and nitrogen left after the initial diatom bloom (Williams and Lindley 1980). The factors that initiate the spring bloom are vertical mixing and stratification of the water column, along with the length of photoperiod. During the winter months, in periods of low light, phytoplankton growth is inhibited. In this period, the nitrogen, phosphorus and silicate and ammonia nutrients increase in concentrations, as little or no primary production is taking place to utilise them. When the water becomes stratified in the spring, advantageous diatom species increase rapidly in abundance, hence the term 'bloom'. As the spring progresses to summer, surface waters warm and a more permanent thermocline develops. Colder, nutrient-rich waters sink away from the photic zone; primary production slows and tends to be largely confined to deeper layers in the pycnocline. Silicate (essential for diatom growth, being incorporated into their 'test') eventually becomes limited and other groups, such as flagellates, bloom, followed later by the dinoflagellates. The resulting phytoplankton community is one that can cope with reduced nutrient levels. With the onset of autumn, and the increase in wind strength, the sea becomes mixed once again. This secondary bloom is limited in size by the amount of phosphorus and nitrogen left after the initial diatom bloom. As the light levels diminish in the latter part of the year, primary production once again decreases. The water then becomes mixed and this aids the distribution of nutrients throughout the water column.

1.5 The most common group of organisms in the zooplankton community are the copepods (small, insect-like crustaceans which range from 0.5mm to 6mm). These are known to reach large concentrations, and they form the main food source for higher trophic levels.

1.6 By using a long term dataset of plankton, broad scale processes can be identified, such as anthropogenic impacts and responses to hydro-climatic variation. As plankton represent the first level on the trophic chain, there importance as primary producers should not be underestimated. Similarly, in this position it has been hypothesised that the plankton community will respond first to climate change.

1.7. Acknowledgements for this report must be given to the staff at the Marine Biological Library in Plymouth, as well as Polly Hadziabdic at BODC.

2. Contacts for data and organisations involved with plankton research in SEA 6

2.1

CENTRE-NAME: Free University of Brussels, Laboratory for Ecotoxicology and Polar Ecology

ADDRESS: Pleinlaan 2
1050 Brussels
Belgium

DESCRIPTION:
The activities are in two main research areas: (1) Monitoring of stable pollutants (PCBs, organochlorine pesticides, heavy metals) at the different trophic levels of marine ecosystems (phytoplankton, zooplankton, benthos, fish, birds and mammals) with special interest for background concentrations (levels in Arctic and Antarctic areas); (2) At sea study of the distribution of marine birds and mammals: seasonal variations of distributions, linkage with hydrographical regimes, estimations of population sizes and densities. Estimations of food demands and energy fluxes through higher trophic levels of the marine ecosystems.

CONTACT-NAME: Prof. C. Joiris

PHONE: +32 2 629 34 14

FAX: +32 2 629 34 38

EMAIL: cjoiris@vub.ac.be

2.2

CENTRE-NAME: ICES Secretariat, International Council for the Exploration of the Sea

ADDRESS: Palaegade 2-4,
1261 Copenhagen K
Denmark

CENTRE-WEBSITE: www.ices.dk

DESCRIPTION:
ICES is the oldest international marine science organization. It was formed in 1902 to promote the scientific understanding of the mechanisms inducing variability in North Atlantic commercial fish stocks, including their ecological interactions. Its member countries, of which there are currently 19, are located around the North Atlantic and its adjacent seas, particularly the North Sea and the Baltic Sea. Although its original remit concerned the scientific aspects of fisheries, the current remit of ICES has matured into providing member countries and various North Atlantic Regulatory Commissions with scientific and management advice concerning fisheries and environmental quality. To meet this end ICES addresses a wide range of issues from fundamental marine science questions to technical questions relating to fish capture via approximately 100 Working and Study groups, who provide the basic material for consideration by its advisory committees.

To support its advisory role, ICES has sought to promote and support marine science programmes by means of stimulating member governments to participate in collaborative programmes. In particular the main thrust of the activities of the ICES Secretariat is to provide professional support and publication facilities for use by scientists working to meet ICES' objectives. In former days, ICES concerned itself with the publication of raw scientific data as well as the prominent research findings of the day, and this has evolved into the scientific management of a number of data banks concerned with fish catches, fisheries biological data, oceanographic data, and data on marine contaminants. ICES promotes the collection of data of the highest accuracy by means of, for example, co-ordinating intercalibration exercises, and providing advice on quality assurance procedures.

The oceanographic data activities of the Secretariat are concerned primarily with oceanographic profile data. These data are provided by member countries. ICES endeavours to work closely with existing National Data Centres, and provides advice and products to fisheries scientists on the use of oceanographic data. Data are not necessarily freely available. Details of restrictions will be provided on request. ICES also maintains a computerised inventory of cruise summary reports, which also doubles as a catalogue of its data holdings. Currently this inventory contains detailed information about 13,000 marine scientific cruises and programmes that have been conducted since 1967 when this inventory system was introduced.

ICES member countries are Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Netherlands, Norway, Russia, Spain, Sweden, Poland, Portugal, UK, and USA.

CONTACT-NAME: General Secretary

PHONE: +45 33 154225
FAX: +45 33 939215
EMAIL: ocean@ices.dk

2.3

CENTRE-NAME: CNRS / STATION BIOLOGIQUE DE ROSCOFF

ADDRESS: Place Georges Teissier,

BP 74, 29682,

ROSCOFF,

FRANCE

CENTRE-WEBSITE: http://www.cnrs.fr/index.html

DESCRIPTION:
La station a ete fondee en 1872. Elle heberge 55 laboratoires de recherche en biochimie, electrophysiologie, biologie moleculaire et oceanographie ansi que des aquariums. Enseignement universitaire annuel et ecoles d'ete. Navire PLUTEUS II

CONTACT-NAME: VAULOT Daniel

PHONE: +33(0)2 98 29 23 34

FAX:

EMAIL: vaulot@iznogoud.sb-roscoff.fr

CONTACT-NAME: MORIN Pascal

PHONE: +33(0)2 98 29 23 17

FAX:

EMAIL: pmorin@iznogoud.sb-roscoff.fr

2.4

CENTRE-NAME: MarLIN Marine Life Information Network

CENTRE-HOST: Marine Biological Association of the UK, Plymouth

VISIT-ADDRESS: MarLIN
MBA
The laboratory,
Citadel Hill
Plymouth
PL1 2PB
United Kingdom

CENTRE-WEBSITE: www.marlin.ac.uk/

DESCRIPTION:
MarLIN is an initiative of the marine Biological Association of the UK in collaboration with major holders and users of marine biological data and information. It provides a structure for linking available data on marine life around Britain and Ireland.

CONTACT-NAME: Dr. Keith Hiscock

PHONE: +44 (0)1752 633336

FAX: +44 (0)1752 633102

EMAIL: marlin@mba.ac.uk

2.5

CENTRE-NAME: Royal Holloway, University of London, School of Biological Sciences

ADDRESS: School of Biological Sciences,
Royal Holloway,
University of London,
Egham,
Surrey,
TW20 0EX,
United Kingdom

CENTRE-WEBSITE: www1.rhbnc.ac.uk/biological-sciences/

DESCRIPTION:
The School of Biological Sciences carries out academic and contract research, including marine ecology, phyto- and zooplankton, fish stocks, toxicology and diseases and parasites.

CONTACT-NAME: Prof. J.D. Dodge

PHONE: +44 1784 443774

FAX: +44 1784 471739

EMAIL: j.dodge@rhbnc.ac.uk

2.6

CENTRE-NAME: Sir Alister Hardy Foundation for Ocean Science (SAHFOS)

VISIT-ADDRESS: The Laboratory,
Citadel Hill,
Plymouth
PL1 2PB,
United Kingdom

CENTRE-WEBSITE: www.npm.ac.uk/sahfos/sahfos.html

DESCRIPTION:

The Foundation was established to study spatial patterns in the abundance of marine plankton. It is responsible for the Continuous Plankton Recorder Survey, inaugurated in 1931. A major remit is to maintain the integrity of a unique planktonic database. Area of operation includes the North Atlantic, particularly European Shelf Seas, and recently the North Pacific. Sister surveys operate in Australia, Finland and North West America.

CONTACT-NAME: Darren Stevens

PHONE: +44 1752 633271

FAX: +44 1752 670637

EMAIL: dpst@wpo.nerc.ac.uk

2.7

CENTRE-NAME: Plymouth Marine Laboratory (PML**)**

ADDRESS: Plymouth Marine Laboratory,
Prospect Place,
The Hoe,
Plymouth,
PL1 3DH,
Devon,
United Kingdom

CENTRE-WEBSITE: www1.npm.ac.uk/

DESCRIPTION:
The Plymouth Marine Laboratory (PML) was formed in 1988 through the merger of the former Institute for Marine Environmental Research and the Marine Biological Association. Research interests include the role of the oceans in the global carbon cycle; physical, chemical and biological processes in seas and estuaries; plant and animal communities; cell biology and response of marine organisms to pollutants. Facilities include a major library.

CONTACT-NAME: Prof. Nick Owens.

PHONE: +44 1752 222772

FAX: +44 1752 670637

EMAIL:

2.8

CENTRE-NAME: British Oceanographic Data Centre (BODC)

ADDRESS: Proudman Oceanographic Laboratory,
Bidston Observatory,
Bidston Hill,
PRENTON,
Merseyside,
CH43 7RA,
United Kingdom

CENTRE-WEBSITE: www.bodc.ac.uk

DESCRIPTION:

BODC operates on behalf of the Marine Science and Technology Board of the UK's Natural Environment Research Council and acts as the UK's focal point for international oceanographic data exchange. It participates within the Intergovernmental Oceanographic Commission (IOC)'s network of national oceanographic data centres (NODCs) and was a founding partner of the European Sea-Search network.

BODC maintains a national oceanographic database, and provides a data service to research scientists, industry, and local and central government, and to major oceanographic programmes. In particular, it provides active data management support to NERC's Thematic Projects, including the AUTOSUB, LOIS and PRIME projects and the UK components of JGOFS and WOCE. It is the WOCE Data Assembly Centre for sea level data and, on behalf of the IOC and IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), is responsible for developing the GEBCO Digital Atlas. BODC also acts as the data centre for a number of EC/MAST projects including OMEX, INDIA and PROVESS.

BODC exchanges data freely with other NODCs on a bilateral basis, but reserves the right to charge other users the marginal costs involved in making data available e.g. costs of copying, materials and postage. These charges may be waived for reasonable requests in support of bona-fide scientific research. Some data held by BODC are of restricted availability, awaiting final clearance by the scientists involved in their original collection.

CONTACT-NAME: BODC Enquiries Officer

PHONE: +44 (0) 151 653 1510

FAX: +44 (0) 151 652 3950

EMAIL: enquiries@bodc.ac.uk

2.9

CENTRE-NAME: Southampton Oceanography Centre

ADDRESS: Southampton Oceanography Centre,
University of Southampton,
Waterfront Campus,
European Way,
Southampton.
SO14 3ZH

CENTRE-WEBSITE: www.soc.soton.ac.uk/

DESCRIPTION:
The Southampton Oceanography Centre comprises both the NERC oceanographic research institute and the Department of Oceanography at Southampton University. It is a multidisciplinary department covering all the major fields of oceanography. Research work is conducted through a variety of organisations. Data are retained in a variety of forms and individual members of staff of the Department should be contacted for particular data. Details of the Department are available from the Departmental Secretary. Degrees of B.Sc., M.Sc. and Ph.D. are awarded in Oceanography.

CONTACT-NAME: Head of Department

PHONE: +44 1703 595000

FAX: +44 1703 593059

EMAIL:

2.10

CENTRE-NAME: FRS, Marine Laboratory, Aberdeen

ADDRESS: Fisheries Research Services,
Marine Laboratory,
PO Box 101,
Victoria Road,
Aberdeen,
AB11 9DB,
United Kingdom

CENTRE-WEBSITE: www.marlab.ac.uk/

DESCRIPTION:

The Marine Laboratory, Aberdeen is one of two constituent parts of Fisheries Research Services (FRS) which is an executive agency of the Scottish Office (SO). The programme of the Laboratory is authorised by a committee chaired by the SO Fisheries Secretary. Research on freshwater and migratory species (principally Atlantic salmon and sea trout) is carried out by the other constituent part of FRS, the Freshwater Fisheries Laboratory, Faskally, Perthshire.

Within the United Kingdom, fisheries research and development are integrated by a Customer Group, composed of representatives of FRS, the Centre for Environment, Fisheries and Aquaculture (CEFAS) and the Department of Agriculture Northern Ireland (DANI). A UK Co-ordinator of Fisheries Research and Development ensures that liaison is maintained between FRS, CEFAS and DANI.

The main thrust of the Laboratory's scientific programme is in support of the fisheries management responsibilities of the Scottish Office Agriculture, Environment and Fisheries Department (SOAEFD). The objective is to monitor the state of the main fish and shellfish stocks, and effort is aimed at conserving and managing the fish and shellfish resources to support an efficient, market-orientated fishing industry. Thus, the largest part of the research programme is directed at investigation of the main fish stocks exploited by Scottish fishermen. Attention is also paid to investigating the various technical measures adopted to promote the conservation of fish stocks. The Laboratory maintains a strong interest in the events and processes taking place in the oceanic and coastal waters around Scotland, ranging from broad interactions between water movements and fisheries to the more local effects on fish nursery grounds. The Laboratory supports The Scottish Office in its environmental interests, conducting research aimed at monitoring and protecting the quality of the seas around Scotland and their fisheries from the adverse effects of environmental change. There is a need for information and advice on the circulation of waters around Scotland and the consequent dispersion of particular contaminants arising from man's activities. The Laboratory also has an interest in the field of fish farming. Here, some of the important roles are the statutory inspection of fish and shellfish farms and the prevention of the spread of fish diseases within the Much of the marine environmental data collected by the Laboratory is submitted to national (BODC) and international (ICES) organisations for inclusion in appropriate data bases. Other data appear in a variety of publications, ranging from internal reports and working papers to refereed papers in the scientific literature.

In general, any requests for data by bone fide researchers are generally granted with

possibly only a small charge for materials and time involved in putting together the data in a form to suit the enquirer. Requests for data from commercial organisations or from research institutes using the data for commercial gain shall be charged at rates laid down by FRS to recover costs of extracting and supplying the data.

Each year, FRS publishes its Annual Review describing the scientific activities of the Marine Laboratory, Aberdeen. A separate Annual describing the scientific activities of the Freshwater Fisheries Laboratory is Marine Laboratory, also produced. Copies of Working Papers describing particular aspects of the, work of the Laboratory are also freely available.

CONTACT-TITLE: Director

PHONE: +44 1224 876544

FAX: +44 1224 295511

2.11

CENTRE-NAME: Natural History Museum, London (NHM)

ADDRESS: The Natural History Museum,
Department of Zoology,
Cromwell Road,
London,
SW7 5BD,
United Kingdom

CENTRE-WEBSITE: www.nhm.ac.uk/zoology/index.html

DESCRIPTION:

The Natural History Museum in London, formerly known as the British Museum (Natural History), is internationally recognised as one of the world's foremost institutions for systematics - the study and classification of animals, plants and minerals. The Museum employs about 300 scientific staff in its five scientific departments - botany, entomology, mineralogy, palaeontology and zoology. In addition there is a separate department of library services.

The Museum's scientific collections of more then 68 million items are the largest and most comprehensive in existence. They are a major reference resource for mankind's endeavour in researching the flora and fauna of our planet. They are unique in their global coverage, richness of species represented, historical importance and their wealth of type and other reference specimens. The quality and orderliness of these collections is extremely high as they receive continual curation and benefit from regular enhancement by researchers - both Museum staff and visitors - who are internationally acknowledged authorities in their fields.

The Museum's library of over one million volumes is the world's most complete collection of published works about natural history. It has a comprehensive range of modern periodicals and books, and an unequalled collection of historical materials.

CONTACT-NAME: Keeper of Zoology

PHONE: +44 20 7942 5275

FAX: +44 20 7942 5054

EMAIL: psr@nhm.ac.uk

2.12

CENTRE-NAME: Centre for Environment, Fisheries and Aquaculture Science

ADDRESS: CEFAS, Lowestoft Laboratory,
Pakefield Road,
Lowestoft,
Suffolk,
NR33 OHT
United Kingdom

CENTRE-WEBSITE: www.cefas.co.uk/

DESCRIPTION:
CEFAS is a scientific research and monitoring centre for fisheries management and environmental protection. It provides contract research, consultancy, advice and training in fisheries science and management, marine environmental protection, aquaculture and fish and shellfish disease and hygiene to a variety of public and private sector clients around the world.

CEFAS is an agency of the UK government's Ministry for Agriculture Fisheries and Food (MAFF).

There are two broad aims for this research. Firstly, the assessment of the state of the stocks of fish and shellfish to provide a sound scientific basis for management policies at national and international level which will maintain the supply of fish and promote the efficiency of the industry; and secondly, the protection of the aquatic environment and especially its fish and shellfish resources, as well as man as a consumer of marine food, from the adverse effects of pollutants introduced through man's industrial and other activities.

There are Fisheries Laboratories at Lowestoft, Burnham-on-Crouch, Whitehaven and Weymouth. All enquiries should be directed to the Contracts Office, CEFAS, Lowestoft Laboratory, Pakefield Road, Lowestoft, Suffolk NR33 0HT, United Kingdom (Tel: +44 1502 562244; Fax: +44 1502 513865 (FAO Contracts Officer), Telex: 995543 (FAO Contracts Officer)).

At Burnham-on-Crouch research is concentrated on the protection of the aquatic environment from the disposal of non-radioactive waste and also the effects of other man-made changes such as offshore oil and marine gravel exploitation.

CONTACT-NAME: Contracts Office, CEFAS, Lowestoft

PHONE: +44 1621 562244

FAX: +44 1621 513865

2.13

CENTRE-NAME: Netherlands Institute for Sea Research (NIOZ)

ADDRESS: Nederlands Instituut voor Onderzoek der Zee (NIOZ) Data Management Group

Landsdiep 4
P.O. Box 59
1790 AB Den Burg/Texel
Netherlands

CENTRE-WEBSITE: www.nioz.nl/en/facilities/dmg/meta

DESCRIPTION:
The Netherlands Institute for Sea Research (NIOZ), on the Frisian island Texel, is supervised and financed by the Netherlands Organisation for Scientific Research (NWO). NIOZ is devoted to fundamental marine research and offers research opportunities for visiting scientists from The Netherlands and abroad. Various applied and fundamental research projects are carried out, mainly for governmental bodies but also for the industry.

NIOZ is organised in 7 working groups:

HYDROGRAPHICAL
1) physical oceanography
2) chemical oceanography and marine pollution
3) marine geology and geochemistry
BIOLOGICAL
4) coastal systems
5) benthic systems
6) pelagic systems
APPLIED SCIENTIFIC RESEARCH
7) BEWON

CONTACT-NAME: T.F. de Bruin

PHONE: +31 (0)222-369479

FAX: +31 (0)222-319674

EMAIL: bruin@nioz.nl

3. Metadata report

3.1

DATASET-NAME: Distribution of armoured planktonic dinoflagellates in the North East Atlantic and coastline (benthic) dinoflagellates around UK (1970-)

CENTRE-NAME: Royal Holloway, University of London, School of Biological Sciences

TIME-PERIOD: from approximately 1970 onwards

GEOGRAPHIC-COVERAGE: North East Atlantic, including the North Sea

PARAMETERS: planktonic dinoflagellates; benthic dinoflagellates around the coasts of UK

SUMMARY:

Over the past 20 years data have been accumulated on the distribution of armoured dinoflagellates in the area of the North East Atlantic bounded by latitude 20deg N and 70deg N, longitude 5deg E and 25deg W, and benthic dinoflagellates around the coasts of UK. Over 2500 samples, collected by a range of oceanographic techniques, have been examined. To date 250 species have been identified and their distributions plotted using a 5 degree grid.

STORAGE-MEDIUM: Unknown

AVAILABILITY: Contact Prof. J.D. Dodge for further details

3.2

DATASET-NAME: IOS Deacon Laboratory Biological Database of the North East Atlantic (1969-)

CENTRE-NAME: Southampton Oceanography Centre

TIME-PERIOD: from 1969 onwards

GEOGRAPHIC-COVERAGE: Eastern North Atlantic Ocean, Western Mediterranean, Arabian Sea/Persian Gulf, off Bermuda, Weddell Sea

PARAMETERS: macroplankton, micronekton, benthic fish, amphipods, cephalopods, ctenophores, medusae, pteropods, heteropods

INSTRUMENTS: rectangular midwater trawl (1 and 8 metre), benthic nets

SUMMARY:

The Biology Group at IOS Deacon Laboratory has been engaged in a series of comprehensive mid-water sampling programmes in the North Atlantic between the equator and 60deg N and from offshore Europe and Africa mainly to 33deg W for many years.

Between 1969 and 1974 the sampler used was the opening/closing Rectangular Midwater Trawl (1+8), but in 1974 this was superseded by the multiple version (1+8m) Using both systems a macroplankton and a micronekton sample are collected simultaneously in an RMT1 and RMT8 net respectively, fished in tandem. At many stations a series of horizontal hauls were taken systematically in discrete depth strata 50-200m in thickness, so the whole water column was sampled. In the upper 900-1000m usually both day and night samples were collected; below these depths samples were taken irrespective of the light regime.

A relational database is used for storage and retrieval of the biological data relating to the vertical and geographic distribution of open ocean species of macroplankton and micronekton. Data on the vertical distribution and maturity stages of the following taxonomic groups are included in the database: Decapoda, Ostracoda, Chaetognatha, Mysidacea, Fish, Siphonophora, Euphausiacea, amphipoda, cephalopoda, ctenophora, medusae, pteropoda, heteropoda. The total number of records entered into the database is 81523 and the number of specimens identified is over 4.5 million.

REFERENCE: Hargreaves, P.M. 1990 North East Atlantic data held in the biological database
of the Institute of Oceanographic Sciences Deacon Laboratory, U.K.
Arquipelago. Life and Earth Sciences 8:55-61 Angra do Heroismo. Domanski, P.
1981 BIOS database for marine biological data. Journal of Plankton Research
3:3.

STORAGE-MEDIUM: Data on disk (Oracle RDBMS)

AVAILABILITY: These data may be made available to bona fide members of the scientific community at negotiable cost. Further enquiries should be addressed to the Biology Group at IOSDL, Wormley, Surrey, UK.

3.3

DATASET-NAME: Control Volume Experiment (CONVEX) North Atlantic (1991-)

CENTRE-NAME: Southampton Oceanography Centre

TIME-PERIOD: from 01 August 1991 onwards

GEOGRAPHIC-COVERAGE: North Atlantic (UK to Cape Farewell, Greenland)

PROJECT: World Ocean Circulation Experiment (WOCE), CONVEX

PARAMETERS: temperature, salinity, transmittance, dissolved oxygen, nitrate, silicate, oxygen-16/oxygen-18 ratio, CFCs, plankton, meteorological measurements, current profiles, bathymetry

INSTRUMENTS: thermosalinograph, XBT, CTD, transmissometer, rosette

sampler, nets, multimet recorder, Simrad echo-sounder, shipborne ADCP, drifting buoys

SUMMARY:
This data set was collected on RRS Charles Darwin cruise 62 (CONVEX 91) as a contribution to WOCE core Project 3. The data set comprises high quality CTD, nutrient, dissolved oxygen, and CFC data between the UK and Cape Farewell, Greenland. These data were collected to investigate the distribution of water masses and to derive full depth circulation. Two approximately meridional sections were completed with linking sections on 20deg W and 30deg W. Two drifting buoys were deployed during the cruise.

STORAGE-MEDIUM: Magnetic disk

AVAILABILITY: Contact Dr. W.J. Gould for details; data may be restricted to WOCE scientists

3.4
DATASET-NAME: UK coastal seawater quality survey (1980-1982)

CENTRE-NAME: Centre for Environment, Fisheries and Aquaculture Science

TIME-PERIOD: from 1980 to 1982

GEOGRAPHIC-COVERAGE: 9 sites (Walton-on-the-Naze, Reculver, Whitstable, Beaulieu, Milford Haven, Inland Sea and Tal-y-foel (Anglesey), Conwy, Connel) on the UK coastline

PARAMETERS: Temperature, salinity, phytoplankton, pH, nutrients (silicate, nitrate, nitrite, orthophosphate, inorganic and organic carbon), Vibrios and total bacteria

SUMMARY:
Seawater was collected at high tide on a weekly basis from March to October inclusive. Temperature was taken at the time of collection using a thermometer. Sea water subsamples (0.1 ml) were spread over nutrient agar and TCBS medium immediately after collection for the assessment of total bacteria and Vibrio spp respectively. Salinity was measured by refractometer and pH with a pH meter. Nutrients were measured by colorimetric methods using an automatic analyzer.

Phytoplankton identification and enumeration were carried out using a binocular microscope

DATA-WEBSITE: www.cefas.co.uk/

STORAGE-MEDIUM: Magnetic disk

AVAILABILITY: Report - data available on application. Contact the Contracts Office, CEFAS, Lowestoft.

3.5

DATASET-NAME: *Phaeocystis* data set (1969-)

CENTRE-NAME: Centre for Environment, Fisheries and Aquaculture Science

TIME-PERIOD: from 1969 onwards

GEOGRAPHIC-COVERAGE: CEFAS, Conwy Laboratory sea water intake, North Wales coast

PARAMETERS: *Phaeocystis* colonies per ml

SUMMARY:

Phaeocystis globosa blooms annually in Liverpool Bay and water samples are examined regularly during the bloom period, usually May and June. A record is kept of the duration and progress of the bloom, as colonies per ml. Associated biological events, e.g. fish kills, are noted.

DATA-WEBSITE: www.cefas.co.uk/

STORAGE-MEDIUM: Notebook and floppy disk

AVAILABILITY: Contact the Contracts Office, CEFAS, Lowestoft

3.6

DATASET-NAME: Irish Sea Nephrops Larvae Surveys (1982 and 1985)

CENTRE-NAME: Centre for Environment, Fisheries and Aquaculture Science

TIME-PERIOD: April to June 1982 and April to June 1985

GEOGRAPHIC-COVERAGE: Mainly western Irish Sea with some limited coverage east of the Isle of Man

PARAMETERS: Plankton, nutrients, temperature, salinity

SUMMARY:

1982: Five surveys of 60-80 samples were carried out to estimate the spawning stock biomass of the western Irish Sea Nephrops. Plankton samples were sorted and all fish eggs and larvae were identified to species level where possible. Nephrops (*Nephrops norvegicus*) larvae were also sorted and staged into 4 developmental stages. Seasonal production estimates and mortality rates have been calculated for Nephrops. Temperature and salinity 'V' shape profiles are available at each sampling position. Surface salinity values are available from bottle samples and nutrient data (nitrate, nitrite, phosphate and silicate) are available from each sampling position.

1985: Four surveys of 70-90 stations were carried out to estimate the spawning stock biomass of Western Irish Sea Nephrops. The analysis was as described for 1982. Environmental parameters were also as described above for 1982.

REFERENCE: J.H. Nichols, D.B. Bennett, D.J. Symonds and R. Grainger. Estimation of the

stock size of adult *Nephrops norvegicus* (L.) from larvae surveys in the
Western Irish Sea in 1982. Journal of Natural History. 1987, 21, 1433-1450.

B.M. Thompson, J.H. Nichols and J.P. Hillis. Estimation of the stock size of adult
Nephrops from larvae surveys in the Irish Sea in 1985. ICES. CM 1986/K:5
(mimeo).

J.H. Nichols et al. Spring plankton surveys of the Irish Sea in 1982, 1985, 1987,
1988 and 1989: hydrography and the distribution of fish eggs and larvae.
Fisheries Research Technical Report No. 95.

DATA-WEBSITE: www.cefas.co.uk/

STORAGE-MEDIUM: paper

AVAILABILITY: Contact the Contracts Office, CEFAS, Lowestoft

3.7

DATASET-NAME: Abundance and distribution of Nephrops larvae in the North Sea (1982, 1985) and Irish Sea (1987)

CENTRE-NAME: Centre for Environment, Fisheries and Aquaculture Science

TIME-PERIOD: 1982, 1985 and 1987

GEOGRAPHIC-COVERAGE: North Sea (1982 and 1985) and Irish Sea (1987)

PROJECT: To study the abundance and distribution of Nephrops larvae for stock assessment purposes

PARAMETERS: Numbers of Nephrops larvae per metre squared of sea surface by larval stage and by cruise station position

INSTRUMENTS: Research vessel plankton cruises using a high speed tow net. Analysis by laboratory staff

SUMMARY:

The data set has been compiled from various research vessel plankton cruises carried out in the North Sea (1982 and 1985) and the Irish Sea (1987) during the Nephrops hatching period. Cruises included Clione 6 and 7/82, Clione 5 and 6/85, and Clione 9 and 10/87.

DATA-WEBSITE: www.cefas.co.uk/

STORAGE-MEDIUM: Ingres database (plankton suite)

AVAILABILITY: Contact the Contracts Office, CEFAS, Lowestoft

3.8

DATASET-NAME: Estimation of fish biomass in the Irish Sea by means of egg production 1995

CENTRE-NAME: Centre for Environment, Fisheries and Aquaculture Science

TIME-PERIOD: Feb-June 1995

GEOGRAPHIC-COVERAGE: Irish Sea and Cardigan Bay. Grids of plankton stations up to 10 nautical miles apart.

PROJECT: EU Air Project AIR3 2263 - Concerted Action on Fishery Independent Assessment of Irish Sea Fish Stocks

PARAMETERS: plankton, temperature, salinity

INSTRUMENTS: Lowestoft version Gulf 3 plankton sampler with CTD

SUMMARY:

A series of 11 plankton surveys aimed at providing an independent assessment of the size of the spawning stocks of cod, plaice and sole in the Irish Sea.

3 other labs participated : dept of the marine, Dublin; DANI, Belfast; Port Erin Marine Lab, Isle of Man.

4 grids were sampled by CEFAS - 5 sets of samples were analysed. Each grid consisted of 90-106 samples; fish eggs, fish larvae and Nephrops larvae were sorted and identified. Cod plaice sole eggs were staged, as were nephrops larvae.

REFERENCE: EU AIR Project AIR3 2263

STORAGE-MEDIUM: magnetic disk

AVAILABILITY: See contracts Officer CEFAS

3.9

DATASET-NAME: NHM foraminifera collection from the oceans and seas adjoining Europe (1850-)

CENTRE-NAME: Natural History Museum, London (NHM)

TIME-PERIOD: from 1850 onwards

GEOGRAPHIC-COVERAGE: oceans and seas adjoining Europe; very extensive coverage

PROJECT: taxonomic research

PARAMETERS: plankton and benthos

SUMMARY:
The Palaeontology Department of the Natural History Museum holds one of the finest and largest collections in the world of recent as well as fossil foraminifera. These are both wet and dry preserved specimens and include historically important collections such as the 'Challenger', Terra Nova', 'Discovery' and other cruises of international importance. The Department holds extensive collections from European coastal regions and seas.

The foraminifera collection comprises material obtained by individuals and by cruises from the north east Atlantic, the Arctic Ocean, the North Sea, the Baltic, the Irish Sea, the west Irish coast, the English Channel and Western Approaches, the Mediterranean and the Black Sea. The Brady collection contains not only the famous Challenger collection, but also much material from European coasts obtained in exchange from Scandinavia and the Mediterranean. We hold material from the 'Porcupine' cruises, and much material in the Heron- Allen and Earland collection from European shores (e.g. Clare Island Survey). Other famous collections include the Parker and Jones' collection (North Atlantic and Grecian Archipelago) and the Williamson collection of British foraminifera.

Data are stored in a series of hand-written registers (species, geographical and donor indices). This is to be computerised in the near future. Active research is being undertaken on the more important historical collections (e.g. Heron-Allen and Earland, Parker and Jones' collections).

REFERENCE: Reference to the Heron-Allen and Earland collections published in the Journal
of Micropalaeontology (Vol. 8, pt. 2, pp 149-156) and the Parker (and Jones)
collections in the Bulletin of the British Museum (Nat. Hist.), (Geol.) (Vol. 48, pt.2, pp 45-78).

STORAGE-MEDIUM: Hand-written registers and indices. Computerization is being undertaken. Wet and dry preserved specimens.

AVAILABILITY: The collections are available for scientific study within the Museum and in some situations, for loan to institutions. The Heron-Allen Library houses one of the finest collections of books on foraminifera in the world.

3.10

DATASET-NAME: MLA Zooplankton Data (1986-)

CENTRE-NAME: FRS, Marine Laboratory, Aberdeen

TIME-PERIOD: from 1986 onwards

GEOGRAPHIC-COVERAGE: Scottish coastal waters, central and northern North Sea, Rockall, north east Atlantic

PROJECT: Various internal projects, national and international programmes

PARAMETERS: Species composition, biomass concentration, dry weight, feeding and growth rates, length/weight data, and other derived parameters

INSTRUMENTS: Dutch Gulf III, ARIES, 1m nets, optical plankton counter, OCEAN sampler, single and multiple METHOT nets, LOCH EWE net, and water bottle samplers

SUMMARY:
These data have been collected over a period of many years using a wide range of sampling gears. The ARIES sampler is a multiple net sampler which can be fitted with a variety of environmental sensors as well as a multiple water bottle sampler. It was designed and developed within the Laboratory. The OCEAN sampler was also designed and developed by the Laboratory and is a modified version of the traditional Gulf III high speed sampler. It is fitted with four nets, is acoustically controlled and can be fitted with an environmental sensor package if required. The LOCH EWE net is again an internally designed system and consisted of two concentric nets of different mesh sizes, one to trap zooplankton and the other for phytoplankton. These sampling gears have been operated in different modes - vertical hauls, oblique and double-oblique tows, at multiple depths on the one tow, and at a single fixed depth. The choice of sampling strategy was dependent on the scientific requirements of the programme.

Since many of the samples which have been collected were for a specific research project, a full analysis to stage and species level has not been done in many instances. This is particularly true of the samples collected during ICES Herring Larvae surveys. Here, the herring larvae are extracted from the sample for further study but the rest of the sample is not analyzed. In other instances, only selected samples from a particular cruise or survey may have been analyzed in detail. The other samples were not analyzed in detail but were dried to produce dry weight data.

In the present database, data only goes back as far as 1986. There is the potential to include data back as far as the mid-60s but this is heavily dependent on the availability of manpower resources. At present, the data are arranged by cruise but, as the integrated database grows and extra features are added, better search and query facilities will be available.

Almost the entire data set was collected by research vessels operated by or on behalf of the Marine Laboratory, Aberdeen. The exception is the data set collected on the ICES Herring Larval surveys. The Laboratory acts as the international co-ordinator for the collation of these data and is also responsible for archiving the entire data set.

REFERENCE: There is as yet no specific reference to these data nor to the database itself. The use of such zooplankton data is described in papers by the data originators which appear as internal reports and working papers and in refereed papers in the scientific literature.

DATA-WEBSITE: www.marlab.ac.uk/

STORAGE-MEDIUM: Magnetic tape, optical disk, floppy disk, manuscript

AVAILABILITY: This data set is currently being assimilated into an integrated computerised relational database. Until such time as this has been accomplished with the necessary examination and validation of all data prior to its inclusion in the database, these data are not generally available.

CONTACT: Steve Hay (S.Hay@marlab.ac.uk)

3.11

DATASET-NAME: ACSOE/MAGE (Atmospheric Chemistry Studies in the Oceanic Environment/Marine Aerosol and Gas Exchange) marine data set (1996-1998)

CENTRE-NAME: British Oceanographic Data Centre (BODC)

TIME-PERIOD: 1996-1998

GEOGRAPHIC-COVERAGE: Eastern Atlantic, North-Eastern Atlantic and Northern North Sea

PROJECT: UK NERC Thematic Research Programme Atmospheric Chemistry Studies in the Oceanic Environment (ACSOE)

PARAMETERS: CTD profiles and Seasoar transects (temperature, salinity, fluorescence, underwater PAR, attenuance, optical backscattering), current speed and direction, biomass measurements (chlorophyll and accessory pigments, particulate organic nitrogen, size-fractionation, micro- and nanophytoplankton abundance, microzooplankton abundance, bacterial diversity, bacterial abundance, seabirds and cetacean counts), suspended particulate matter, biological productivity and nutrient/gas cycling (size-fractionated carbon uptake, DOC production, PI 14C curves, size-fractionated ammonium and nitrate uptake, ammonium remineralisation, microzooplankton grazing, DMSlyase activity, DMS speciation and cycling), dissolved gases (SF6 tracer, DMS, DMSP, methyl bromide, nitrous oxide and methane, non-methane hydrocarbons, volatile selenium, pCO2, carbon monoxide, methyl halides, oxygen), dissolved nutrients (nitrate, nitrite, silicate, phosphate and iron) and Bacillus globigii tracer.

INSTRUMENTS: CTD with fluorometer, underwater PAR sensor, transmissometer and nephelometer; XBT; SeaSoar with CTD and fluorometer; drifting buoys; underway ship's navigational, meteorological and hydrographic instruments; underway shipborne ADCP; CTD-rosette water samplers.

SUMMARY:
ACSOE was a 5-year UK NERC Thematic Research Programme investigating the chemistry of the lower atmosphere (0 - 12 km) over the oceans. The study aimed to bring about a clearer understanding of natural processes in the remote marine atmosphere, and how these processes are affected by atmospheric pollution originating from the continents. The marine component was only a small part of ACSOE which focused mainly on atmospheric processes through two of its three consortia: Oxidising Capacity of the Oceanic Atmosphere (OXICOA) and Aerosol Characterisation Experiment (ACE). The third consortia, Marine Aerosol and Gas Exchange (MAGE) was the only component of the ACSOE Project which included measurements in the marine environment. This consortium focused on the study of aspects of air-sea exchange relevant to atmospheric chemistry and aerosol production. It consisted of four cruises: the Eastern Atlantic Experiments EAE96 and EAE97 in June-July 1996 and in May 1997, the ASGAMAGE North Sea experiment in the Southern North Sea in October-November 1996, and the North Atlantic Experiment NAE in the North Eastern Atlantic in June-July 1998.

ACSOE data management was a shared responsibility between the British Atmospheric Data Centre (BADC) and the British Oceanographic Data Centre (BODC). BODC handled the management of ship data as well as all other data collected in the water column during the ACSOE/MAGE cruises. BODC assisted in the onboard collection and subsequent working up of ship data, and assembled all marine data in BODC's relational database carrying out quality control and data processing as required. These data will be published on CD-ROM as the ACSOE/MAGE marine data set.

DATA-WEBSITE: www.bodc.ac.uk

STORAGE-MEDIUM: BODC data storage system (Oracle RDBMS, optical and magnetic disk). The data will be available on CD-ROM.

AVAILABILITY: Unrestricted

CONTACT: BODC Enquiries Officer

3.12
DATASET-NAME: PML Irish Sea Project Data Set (1987-1991**)**

CENTRE-NAME: Plymouth Marine Laboratory (PML)

TIME-PERIOD: from 1987 to 1991

GEOGRAPHIC-COVERAGE: Irish Sea

PARAMETERS: phytoplankton, zooplankton, fish larvae, fish eggs, primary production, particle characterisation, salinity, temperature, chlorophyll

INSTRUMENTS: CTD, fluorometer, plankton nets, Undulating Oceanographic Recorder, Longhurst Hardy Plankton Recorder, Coulter counter, CHN analyser

SUMMARY:
The project was initiated in March 1987, as a collaborative study between the Fisheries Laboratory, Lowestoft and the NERC Institute for Marine Environmental Research (which became the Plymouth Marine Laboratory in 1988). The scientific problem studied concerned the differences that occur in fish yields per unit area between the Irish and North Seas; the Irish Sea has consistently yielded a lower catch per unit area than the North Sea. The aim was to study the productivity of both phytoplankton and zooplankton, in relation to the survival of fish larvae, and to investigate how differences in ecosystem structure might influence the availability of food and successful recruitment of fish, and to determine if these were critical factors which might explain the differences between these two seas.

REFERENCE: Coombes, S.H. et al. J mar.biol.Assoc.UK, 72: 821-834

STORAGE-MEDIUM: 1 optical disk

AVAILABILITY: by special arrangement

3.13

DATASET-NAME: Zooplankton and optical plankton counter database for the North and South Atlantic

CENTRE-NAME: Plymouth Marine Laboratory (PML)

TIME-PERIOD: 1994 onwards

GEOGRAPHIC-COVERAGE: North and South Atlantic

PROJECT: Atlantic Meridional Transect, Plankton Reactivity in the Marine Environment plus various others

PARAMETERS: Zooplankton abundance

INSTRUMENTS: Microscopy and optical plankton counter, zooplankton nets

SUMMARY:
A database has been established covering optical plankton counter and more traditional methods of establishing mesozooplankton abundance. This covers both North and South Atlantic - cruises include those undertaken as part of the PRIME, AMT and other projects.

REFERENCE: Not yet published

STORAGE-MEDIUM: database

AVAILABILITY: Contact Chris Gallienne, PML

3.14

DATASET-NAME: The North Atlantic Continuous Plankton Recorder Survey Data Set (1931-)

CENTRE-NAME: Sir Alister Hardy Foundation for Ocean Science (SAHFOS)

TIME-PERIOD: from 1931 onwards

GEOGRAPHIC- North Atlantic (35deg N to 60deg N, 71deg W to 11deg E). The area east of about 15deg W has been sampled from the late 1930s whereas the area west of this line has been sampled only for the period 1961 to 1984, although sampling restarted in 1991 on a transect from Iceland to Newfoundland.

PARAMETERS: phytoplankton, zooplankton

SUMMARY:

The Continuous Plankton Recorder is a piece of apparatus towed by vessels for sampling plankton near the sea surface. The CPR now used is very little different from that described by Hardy (1939). The CPRs are towed by ships-of-opportunity at a depth of 10m and are deployed as far as possible, at monthly intervals over a standard set of routes.

Water enters through an aperture in the nose cone and is slowed to one thirtieth of its original speed before being filtered through a slowly moving band of bolting silk. The plankton is retained on the filtering silk and held in position by a second band of silk to form a 'sandwich' which is wound onto a spool in a tank containing a preservative (formalin). The silk is cut into lengths representing 10 nautical miles of tow, and the lengths of silk are then subjected to a standard routine analysis. Each 10 mile length of tow is regarded as a sample taken at its centre point and, for the purposes of constructing an atlas, allocated to a standard 1 degree latitude by 2 degree longitude rectangle.

The current catalogue of CPR records lists a total of 391 taxa identified to varying taxonomic levels. For each taxon the mean number per sample in each rectangle is calculated for each month, and the monthly means are averaged over a chosen period of years to give a mean value for each rectangle. Phytoplankton counts only are available for the years from 1958 onwards; before this only presence/absence is available. Data for the most abundant of the zooplankton taxa are available for the years from 1946, and data for all are available from 1958. For the pre-war years, when the survey was being developed, only a few taxa are as yet available. Some effort is being expended in an attempt to extract more data from the notebooks of the period. Data handling procedures in the CPR survey have evolved alongside the development of the laboratory computer, with the data archive and retrieval systems being elaborated as computer systems became more sophisticated. Since the Survey was established over 70 years ago, over 180,000 samples have been analyzed and the data entered into the data archive.

REFERENCE: Hardy, A.C. 1939 Ecological investigations with the Continuous Plankton Recorder: object, plan and methods. Hull. Bull. mar. Ecol., 1,1-47.

DATA-WEBSITE: www.npm.ac.uk/sahfos/sahfos.html

STORAGE-MEDIUM: IBM compatible PC. CPR database (including access programs and some processed data) extends to approximately 64Mbytes. Samples stored in formalin.

AVAILABILITY: Contact the Sir Alister Hardy Foundation for details of access to the data set.

CONTACT: Darren Stevens

3.15

DATASET-NAME: Marine Species Biology and Sensitivity Key Information

CENTRE-NAME: MarLIN Marine Life Information Network

TIME-PERIOD: present

GEOGRAPHIC-COVERAGE: Britain and Ireland

PARAMETERS: general biology, habitat preferences, distribution, taxonomy, reproduction, natural heritage importance

INSTRUMENTS: not known

SUMMARY: As part of the MarLIN programme a web-based database of key information on marine species and biotopes is being produced.

REFERENCE: Hiscock K Jackson A and Lear D 1999 Assessing seabed species and ecosystem sensitivities. Existing approaches and development. Report to the DETR (MarLIN report no 1)

DATA-WEBSITE: www.marlin.ac.uk/

STORAGE-MEDIUM: web site

AVAILABILITY: See web site

CONTACT: Keith Hiscock MarLIN

3.16

DATASET-NAME: Marine Species Record Collections

CENTRE-NAME: MarLIN Marine Life Information Network

TIME-PERIOD: present

GEOGRAPHIC-COVERAGE: UK and Ireland

PROJECT:

PARAMETERS: List of collections

INSTRUMENTS: not known

SUMMARY: The list of marine species record collections has been compiled mainly from the results of a questionnaire circulated at the Marine Species Recording workshop held at the University of Newcastle-upon-Tyne on 29-30th January 1998.

REFERENCE: Foster-Smith 1998. Marine Species Recording Workshop held at the University of Newcastle-upon-Tyne 29-30th Jan 1998

DATA-WEBSITE: www.marlin.ac.uk/

STORAGE-MEDIUM: web site

AVAILABILITY: see web site

CONTACT: Keith Hiscock MarLIN

3.17

DATASET-NAME: German physical, chemical and biological oceanographic data collected in JGOFS North Atlantic Bloom Experiment (1989)

CENTRE-NAME: German Oceanographic Datacentre (NODC)

TIME-PERIOD: 1989

GEOGRAPHIC-COVERAGE: NE Atlantic

PROJECT: Joint Global Ocean Flux Study (JGOFS) - North Atlantic Bloom Experiment (NABE)

PARAMETERS: temperature, salinity, oxygen, NO3, NO2, NH4, SIO3, particulate organic carbon, particulate organic nitrogen, particulate PO4, particulate SIO3, chlorophyll-a, carbon nitrogen ratio, primary production

INSTRUMENTS: Thermometer, Salinometer, Bathythermograph, Titrations and Electrochemical Determination, Autoanalizer, GC-Mass

Spectrometry, weight and extraction

SUMMARY: This will, upon completion, be the North Atlantic Bloom Experiment (NABE) contribution of Germany. So far only data collected by CTD and Rosette have been included. It is expected that net haul data, sediment trap data, sediment data, and underway data will be available in the near future.

REFERENCE: JGOFS reports

DATA-WEBSITE: www.bsh.de/Meereskunde/DOD/972.htm

STORAGE-MEDIUM: Magnetic tape

AVAILABILITY: The data set is available on request to the German Oceanographic Datacentre.

SUPPLY-DETAILS: E-mail, ftp or disk

CONTACT: dod@bsh.d400.de

3.18

DATASET-NAME: Bulletin Hydrographique - Physical, chemical and biological oceanographic data in the North Atlantic, North Sea and Baltic (1902-1956)

CENTRE-NAME: ICES Secretariat, International Council for the Exploration of the Sea

TIME-PERIOD: from 1902 to 1956

GEOGRAPHIC-COVERAGE: North Atlantic, North Sea and Baltic

PROJECT: Fisheries Oceanography

PARAMETERS: physical, chemical and biological oceanography

SUMMARY: The observations published by ICES in the Bulletin Hydrographique were collected during ICES co-ordinated projects and routine programmes. The observations included (a) listings of surface temperature and salinity along 18 or so ship routes across the Atlantic, North Sea and Baltic and at light vessels (approximately 500,000 observations), (b) observations from classical hydro-chemical stations (approximately 200,000 stations), and (c) observations acquired from plankton hauls, principally in the North Sea (several thousand stations).

The listings are accompanied by detailed documentation of the instrumentation used, and other logistical matters of relevance to understanding the underlying accuracy of the data. Until 1936 most of the observations were published quarterly, with separate listings for each ship or route. Subsequently observations were published in geosorted

form.

This publication is available in most marine libraries of ICES member countries, as well as in the ICES Secretariat. The observations contained therein include the majority collected in the North Atlantic area during the first half of the 20th century. Most of the other data are published in other ICES publications (e.g. Rapports Atlantique)

All of these data are available in digital form from the ICES database, however some of the metadata is available only through these publications.

REFERENCE: ICES Bulletin Hydrographique

STORAGE-MEDIUM: Manuscript

AVAILABILITY: On application to marine libraries in ICES member countries

3.19

DATASET-NAME: Organochlorines and heavy metals in marine life of North Sea, NE Atlantic, Arctic polar seas and Antarctica (1975 onwards)

CENTRE-NAME: Free University of Brussels, Laboratory for Ecotoxicology and Polar Ecology

TIME-PERIOD: from 1975 onwards

GEOGRAPHIC-COVERAGE: North Sea and NE Atlantic (1970 - 1985); Greenland and Norwegian Seas (from 1978 onwards), Barents Sea (from 1991 onwards); Antarctica (from 1989 onwards)

PARAMETERS: organochlorines (PCBs and pesticides) and heavy metals (total and organic Hg) in phytoplankton, krill, fish, seabirds and marine mammals. In collaboration, pathology of birds and mammals; other heavy metals, metallothioneins, Se.

SUMMARY: Monitoring of stable pollutants (PCBs, organochlorine pesticides, heavy metals) in the different trophic levels of various marine ecosystems. Interpretation at the ecosystem level (transfer and accumulation mechanisms, fluxes) and the individual level: detoxification, excretion, lethality, mortality).

REFERENCE: A list of publications and reports is available from C. Joiris

STORAGE-MEDIUM: Apple MacIntosh: excel, statview MS Word

AVAILABILITY: by arrangement; contact C. Joiris or L. Holsbeek

3.20

DATASET-NAME: Ecology of seabirds and marine mammals in North Sea, NE Atlantic, Arctic polar seas and Antarctica (1970 onwards)

CENTRE-NAME: Free University of Brussels, Laboratory for Ecotoxicology and Polar Ecology

TIME-PERIOD: from 1970 onwards

GEOGRAPHIC-COVERAGE: North Sea and NE Atlantic (1970-1985); Greenland and Norwegian Seas (from 1978 onwards), Barents Sea (from 1991 onwards); Antarctica (from 1989 onwards)

PARAMETERS: birds and mammals counts, density, link with other ecological factors (in collaboration: phytoplankton, zooplankton, pelagic and demersal fish)

SUMMARY: At sea study of the distribution of marine birds and mammals: seasonal variations of distributions, linkage with hydrographical regimes, estimations of population sizes and densities. Estimations of food demands and energy fluxes through higher trophic levels of the marine ecosystems.

REFERENCE: A list of publications and reports is available from C. Joiris

STORAGE-MEDIUM: Apple Macintosh excel, statview, MSWord

AVAILABILITY: by arrangement; contact C. Joiris or L. Holsbeek

3.21

DATASET-NAME: Abundance of Photosynthetic picoplankton measured by epifluorescence, microscopy and flow cytometry

CENTRE-NAME: CNRS / STATION BIOLOGIQUE DE ROSCOFF

TIME-PERIOD: 1987 a present

GEOGRAPHIC-COVERAGE: Roscoff, Sargasso Sea, East Atlantic, Pacific, East China Sea, Mediterranean Sea

PARAMETERS: Abundance (cell ml-1), Light scatter, Chl fluorescence

INSTRUMENTS: Flow cytometer

SUMMARY: Abondance de Picoplancton photosynthetique mesuree par epifluorescence, microscopie et flux cytometrique, for each of the following groups:
- *Prochlorococcus*
- *Synechococcus*
- *Picoeucaryotes*

Data are obtained by flowcytometry.

REFERENCE: Flow cytometric determination of phytoplankton DNA in

cultures and natural populations. Marine Ecology, Progress series, 1991, No 71, pp. 75-84., BOUCHER N., VAULOT F., PARTENSKY F.,

Wintertime presence of prochlorophytes in surface waters of the North-western Mediterranean Sea. Limnology and Oceanography, 1990, 35: 1156-1164., D. VAULOT, PARTENSKY F., NEVEUX J., MANTOURA RFC., LLEWELLYN C.,

Wintertime presence of prochlorophytes in surface waters of the North-Western Mediterranean Sea. Limnology and Oceanography. 1990, 35:1156-1164., VAULOT D., PARTENSKY F., NEVEUX J., MANTOURA R.F.C., LLEWELLYN C.,

STORAGE-MEDIUM: Size of dataset 1MO, storage Disquettes

AVAILABILITY: jusqu'a publication

CONTACT: The author of the description is usually one of the contact points

3.22

DATASET-NAME: Deep Chlorophyll Maximum in the North Atlantic Ocean (1996)

CENTRE-NAME: Netherlands Institute for Sea Research (NIOZ)

TIME-PERIOD: From 22-06-1996 to 31-08-1996

GEOGRAPHIC-COVERAGE: North Atlantic Ocean

PROJECT: Deep Chlorophyll Maximum

PARAMETERS: oxygen, chlorophyll, DOC, nutrients, POC, T, S

INSTRUMENTS: CTD, bottle samples, multinet, vertical net, optical instruments,

SUMMARY: The inverse gradients of light and nutrients (nitrogen) with depth have resulted in a unique phytoplankton distribution and primary production in oligotrophic stratified (tropical) oceans. These gradients can only partly explain why a Deep Chlorophyll Maximum (DCM) is found here world-wide at depths of 80 or 150 m. The microbial composition of this layer is remarkably constant in spite of the high activity of the photosynthetic, microbial and heterotrophic components which indicate a highly dynamic system.

The phytoplankton composition is dominated by picoplankton (< 2 micron in diameter) and consists of a mixture of prokaryotic (*Synechococcus* and *Prochlorococcus*) and various (unknown) eukaryotic species of which various subpopulations dominate at different depths. By modelling the production processes and trophic interaction the contribution of the DCM to the sedimentation of particulate carbon will be studied.

The expedition on board Hr. Ms. Tydeman focuses on the factors which prevent (major) fluctuations in structures and organisation of microbial populations present

near the Deep Chlorophyll Maximum.

REFERENCE: publications, reports

DATA-WEBSITE: www.nioz.nl/projects/dcm

STORAGE-MEDIUM: Disk, CD-ROM

AVAILABILITY: Freely

CONTACT: Data Manager

4. Useful references

Abdul-Rachid, M. K. (1990). Studies of aliphatic amines and other volatile organic compounds in the marine environment, Liverpool University**:** 346.

Abdul-Rashid, M. K., J. P. Riley, et al. (1991). Determination of volatile amines in sediment and water samples. *Analytica Chimica Acta*. **252:** 223-226.

Alvarez-Cadena, J. (1993). Proceedings of the II International Workshop of Chaetognatha, Palma, 1-6 September, 1992 Life cycle, abundance, gonadic stages and size frequency distribution of the Chaetognath *Sagitta elegans* Verrill in the north-eastern Irish Sea. I. Moreno. Palma, Universitat de les Illes Balears**:** 99-105.

Alvarez-Cadena, J. N. (1993). Feeding of the chaetognath *Sagitta elegans* Verrill. *Estuarine, Coastal and Shelf Science*. **36:** 195-206.

Alvarez-Cadena, J. N. (1993). Life cycle, abundance, gonadic stages and size frequency distribution of the chaetognath *Sagitta elegans* Verrill in the north-eastern Irish Sea. *Estuarine, Coastal and Shelf Science*. **37:** 15-25.

Aprahamian, M. W. (1989). The diet of juvenile and adult twaite shad *Alosa fallax* fallax (Lacepede)from the rivers Severn and Wye (Britain). *Hydrobiologia*. **179:** 173-182.

Armstrong, M. J., M. Dickey-Collas, et al. (1999). The distribution of anchovy *Engraulis encrasicolus* in the northern Irish Sea from 1991 to 1999. *Journal of the Marine Biological Association of the United Kingdom*. **79:** 955-956.

Back, S., J. C. Collins, et al. (1992). Comparative ecophysiology of Baltic and Atlantic *Fucus vesiculosus*. *Marine Ecology Progress Series*. **84:** 71-82.

Back, S., J. C. Collins, et al. (1993). Comparative reproductive biology of the Gulf of Finland and the Irish Sea *Fucus vesiculosus L*. *Sarsia*. **78:** 265-272.

Ballantine, D. and F. M. Smith (1973). Observations on blooms of the dinoflagellate *Gyrodinium aureolum* Hulbert in the river Conway and its occurrence along the north Wales coast. *British Phycological Bulletin*. **8:** 233-238.

Bayliss, R. (1994). The Duddon Estuary - a partnership for progress. Technical report, Duddon Estuary Partnership**:** 145.

Beardall, J., G. E. Fogg, et al. (1978). Phytoplankton distributions in the western Irish Sea and Liverpool Bay, and their relation to hydrological factors : a progress report. *Biologia Contemporanea*. **5:** 163-175.

Beaumont, A. R., A. K. M. Abdul-Matin, et al. (1993). Early development, survival and growth in pure and hybrid larvae of *Mytilus edulis* and *M. galloprovincialis*. *Journal of Molluscan Studies*. **59:** 120-123.

Best, M. A. and J. P. Thorpe (1994). An analysis of potential food sources available to intertidal bryozoans in Britain. Biology and palaeobiology of bryozoans. P. J. Hayward, J. S. Ryland and P. D. Taylor. Fredensborg, Olsen and Olsen**:** 1-7.

Blight, S. P. (1996). Microbial metabolism and temperature: comparative studies in the Southern Ocean and a temperate coastal ecosystem. Bangor, University of Wales.

Blight, S. P., T. L. Bentley, et al. (1995). Phasing of autotrophic and heterotrophic plankton metabolism in a temperate coastal ecosystem. *Marine Ecology Progress Series*. **128:** 61-75.

Bot, P. V. M. and F. Colijn (1995). Second annual progress report. August 1994-July 1995

Trends in chlorophyll in the Irish Sea (Isle of Man)and two stations in the Dutch coastal zone: consequences for primary production, NOWESP**:** 171-176.

Bot, P. V. M. and F. Colijn (1996). A method for estimating primary production from chlorophyll concentrations with results showing trends in the Irish Sea and the Dutch coastal zone. *ICES Journal of Marine Science*. **53:** 945-950.

Bowman, J. J., K. J. Clabby, et al. (1996). Water quality in Ireland 1991-1994. Ardcaven, Wexford, Environmental Protection Agency**:** xv,[231]+ separate map.

Brawley, S. H. (1992). Fertilization in natural populations of the dioecious brown alga *Fucus ceranoides* and the importance of the polyspermy block. *Marine Biology*. **113:** 145-157.

Briggs, R. P., M. J. Armstrong, et al. (2002). The application of fecundity estimates to determine the spawning stock biomass of Irish Sea *Nephrops norvegicus* (L.)using the annual larval production method. *ICES Journal of Marine Science*. **59:** 109-119.

Burrows, E. M. (1975). Phytoplankton studies in Liverpool Bay. *Natural Environment Research Council Publications, Series* C**:** 44-45.

Cancino, J. M., R. N. Hughes, et al. (1991). Environmental cues and the phasing of larval release in the bryozoan *Celleporella hyalina* (L.).
Proceedings of the Royal Society of London, Series B. **246:** 39-45.

Centre for Environmental, F. and S. Aquaculture (2001). Nutrient input to the sea and the impact on the marine ecosystem (JoNuS II). Lowestoft, Centre for Environmental Fisheries and Aquaculture Science (CEFAS)**:** 179.

Claustre, H., S. A. Poulet, et al. (1992). Relationship between the qualitative nature of particles and copepod faeces in the Irish Sea. *Marine Chemistry*. **40:** 231-248.

Claustre, H., S. A. Poulet, et al. (1990). A biochemical investigation of *Phaeocystis* sp. bloom in the Irish Sea. *Journal of the Marine Biological Association of the United Kingdom*. **70:** 197-207.

Conlan, K., K. N. White, et al. (1992). The hydrography and ecology of a re-developed brackish-water dock. *Estuarine, Coastal and Shelf Science*. **35:** 435-452.

Conway, D. V. P., S. H. Coombs, et al. (1997). Vertical distribution of fish eggs and larvae in the Irish Sea and southern North Sea. *ICES Journal of Marine Science*. **54:** 136-147.

Coombs, S. H., D. B. Robins, et al. (1994). Suspended particulates in the Irish Sea and feeding conditions for fish larvae. *Marine Biology*. **118:** 7-15.

Cutts, N. and K. Hemingway (1996). The Solway Firth: broad scale habitat mapping. *Scottish Natural Heritage Research, Survey and Monitoring Report***:** xi,100 + maps.

Darby, C. D. and J. A. Durance (1989). Use of the North Sea water parcel following model (NORSWAP)to investigate the relationship of larval source to recruitment for scallop (*Pecten maximus*)stocks of England and Wales. *ICES Council Meeting Papers*. **C.M.1989/K:28:** 19.

Davison, D. M. (1996). An estimation of the total number of marine species that occur in Scottish coastal waters. *Scottish Natural Heritage Review***:** 32.

Dempsey, C. H. (1989). Appendix: the ichthyoplankton of the Mersey estuary
The Mersey Barrage. The Proceedings of the Mersey Barrage Symposium, March 4th 1989, Chester Zoo. B. Jones and B. Norgain. Chester, North of England Zoological Society**:** 88-91.

Dempsey, C. H. and S. I. Rogers (1989). Ichthyoplankton entrainment at Wylfa Power Station, Anglesey and implications for a further siting proposal. *Research Report. Central Electricity Generating Board*. **ESTD/L/0015/R89:** 12.

Devi, J. S. (1980). Phytoplankton of Malpegue Bay, Prince Edward Island, Canada, and the Welsh Dee estuary, U.K, Salford University**:** 576.

Dickey-Collas, M., R. P. Briggs, et al. (2000). Production of *Nephrops norvegicus* larvae in the Irish Sea. *Marine Biology*. **137:** 973-981.

Dickey-Collas, M., J. Brown, et al. (1997). Does the western Irish Sea gyre influence the distribution of pelagic juvenile fish. *Journal of Fish Biology*. **51:** 206-229.

Dickey-Collas, M., R. D. M. Nash, et al. (2001). The location of spawning of Irish Sea herring (*Clupea harengus*). *Journal of the Marine Biological Association of the United Kingdom*. **81:** 713-714.

Dong, L. F., D. B. Nedwell, et al. (2000). Environmental limitations of phytoplankton in estuaries. Final Report. Colchester, University of Essex**:** 51 + appendix.

Ellis, T. and R. D. M. Nash (1997). Predation by sprat and herring on pelagic fish eggs in a plaice spawning area in the Irish Sea. *Journal of Fish Biology*. **50:** 1195-1202.

Ellis, T. and R. D. M. Nash (1997). Spawning of plaice *Pleuronectes platessa* L. around the Isle of Man, Irish Sea. *ICES Journal of Marine Science*. **54:** 84-92.

Evans, D. (1987). Morecambe Bay : an assessment of present ecological knowledge Phytoplankton. N. A. Robinson and A. W. Pringle, University of Lancaster Centre for North West Regional Studies**:** 213-224.

Field Studies Council Research, U. (1993). Caernarfon and Cardigan Bays: an environmental appraisal. London, Hamilton Oil Company Ltd**:** 71.

Fielding, N. J. (1997). Fish and benthos communities in regenerated dock systems on Merseyside, Liverpool University**:** 425.

Fish, J. D. and S. Fish (1977). The veliger larva of *Hydrobia ulvae* with observations on the veliger of *Littorina littorea* (Mollusca: Prosobranchia). *Journal of Zoology*. **182:** 495-503.

Floodgate, G. D., G. E. Fogg, et al. (1981). Microbiological and zooplankton activity at a front in Liverpool Bay. *Nature*. **290:** 133-136.

Fogg, G. E. and O. Calvario-Martinez (1989). Effects of bottle size in determinations of primary productivity by phytoplankton. *Hydrobiologia*. **173:** 89-94.

Foster, P., J. Beardall, et al. (1985). The effects of wind, phytoplankton and density discontinuities upon ammonia distributions in Liverpool Bay. *Estuarine, Coastal and Shelf Science*. **20:** 463-475.

Foster, P., D. Voltolina, et al. (1982). A seasonal study of the distribution of surface state variables in Liverpool Bay. IV. The spring bloom. *Journal of Experimental Marine Biology and Ecology*. **62:** 93-115.

Foster, P., D. Voltolina, et al. (1984). Seasonal study of the distribution of surface state variables in Liverpool Bay. VI. Autumn. *Journal of Experimental Marine Biology and Ecology*. **77:** 69-79.

Fox, C. J., M. Dickey-Collas, et al. (1997). Spring plankton surveys of the Irish Sea in 1995: the distribution of fish eggs and larvae. *Science Series Technical Report***:** 106.

Geffen, A. J. (1995). Growth and otolith microstructure of cod (*Gadus morhua* L.)larvae. *Journal of Plankton Research*. **17:** 783-800.

Gowen, R. J. and S. P. Bloomfield (1996). Chlorophyll standing crop and phytoplankton production in the western Irish Sea during 1992 and 1993. *Journal of Plankton Research*. **18:** 1735-1751.

Gowen, R. J., G. M. Cullough, et al. (1998). Copepod abundance in the western Irish Sea: relationship to physical regime, phytoplankton production and standing stock. Journal of Plankton Research. **20:** 315-320.

Gowen, R. J., M. Dickey-Collas, et al. (1997). The occurrence of *Calanus finmarchicus* (Gunnerus)and *Calanus helgolandicus* (Claus)in the western Irish Sea. *Journal of Plankton Research*. **19:** 1175-1182.

Gowen, R. J., D. K. Mills, et al. (2000). Production and its fate in two coastal regions of the Irish Sea: the influence of anthropogenic nutrients. *Marine Ecology Progress Series*. **208:** 51-64.

Gray, A. J. (1992). Saltmarshes: morphodynamics, conservation and engineering significance Saltmarsh plant ecology: zonation and succession revisited. J. R. L. Allen and K. Pye, Cambridge University Press**:** 63-79.

Graziano, C. (1988). Some observations on the plankton of the north Irish Sea, Liverpool University**:** 187.

Graziano, C. (1989). On the ecology of tintinnids (Ciliophora: Oligotrichida)in the North Irish Sea. *Estuarine, Coastal and Shelf Science*. **29:** 233-245.

Harker, G. E. (1997). A comparison between optical properties measured in the field and the laboratory, and the development of an optical model. Bangor, University of Wales.

Harker, G. E. L. (1998). Applied optics and optoelectronics 1998 Measurements and modelling of diffuse attenuation. K. T. V. Grattan, Institute of Physics Publishing**:** 239-244.

Hawkins, S. J., J. R. Allen, et al. (1999). Restoration of temperate marine and coastal ecosystems: nudging nature. *Aquatic Conservation: Marine and Freshwater Ecosystems*. **9:** 23-46.

Haywood, M. G. (1976). The determination of arsenic in the marine environment. Liverpool, University of Liverpool Department of Oceanography**:** 192.

Helm, M. M., D. L. Holland, et al. (1991). Fatty acid composition of early non-feeding larvae of the European flat oyster, *Ostrea edulis*. *Journal of the Marine Biological Association of the United Kingdom*. **71:** 691-705.

Henderson, P. A. (1989). Assessment of the effect of the proposed Mersey Barrage on phytoplankton. *Research Reports. Central Electricity Generating Board*. **RD/L/3439/R88**.

Hill, A. S. and S. J. Hawkins (1990). An investigation of methods for sampling microbial films on rocky shores. *Journal of the Marine Biological Association of the United Kingdom*. **70:** 77-88.

Hough, A. R. and E. Naylor (1991). Field studies on retention of the planktonic copepod *Eurytemora affinis* in a mixed estuary. *Marine Ecology Progress Series*. **76:** 115-122.

Hughes, R. G. and I. M. Horsfall (1990). Differences in the swimming behaviour of the amphipod *Corophium volutator* from different populations. *Journal of the Marine Biological Association of the United Kingdom*. **70:** 143-148.

Johannesson, K. (1992). Genetic variability and large scale differentiation in two species of littorinid gastropods with planktotrophic development, *Littorina littorea* (L.)and *Melarhaphe* (Littorina)*neritoide*s (L.)(Prosobranchia: Littorinacea), with notes on a mass occurrence of *M. neritoides* in Sweden. *Biological Journal of the Linnean Society*. **47:** 285-299.

Johnson, M. P. (2000). Physical control of plankton population abundance and dynamics in intertidal rock pools. *Hydrobiologia*. **440:** 145-152.

Johnstone, J., A. Scott, et al. (1924). The marine plankton, with special reference to investigations made at Port Erin, Isle of Man during 1907-1914. A handbook for students and amateur workers. London**:** 194.

Jones, B. and B. Norgain (1989). The Mersey Barrage. The Proceedings of the Mersey Barrage Symposium, March 4th 1989, Chester Zoo. Chester, North of England Zoological Society**:** 142.

Jones, K. (1991). Estuaries and coasts: spatial and temporal intercomparisons. ECSA19 Symposium, University of Caen, France

A comparison of the distribution of heterotrophic nitrogen-fixing bacteria in coastal waters of Morecambe Bay, UK, the Ligurian Sea, France, the Bay of Naples, Italy, and the Pacific Ocean, Hawaii, USA. M. Elliott and J. P. Ducrotoy. Fredensborg, Olsen and Olsen**:** 111-116.

Jones, P. G. W. and S. M. Haq (1963). The distribution of *Phaeocystis* in the eastern Irish Sea. *Journal du Conseil Permanent International pour l'Exploration de la Mer*. **28:** 8-20.

Kain, J. M. and M. J. Bates (1993). The reproductive phenology of *Delesseria sanguinea* and *Odonthalia dentata* off the Isle of Man. *European Journal of Phycology*. **28:** 173-182.

Kelley, D. F. (1990). Young bass in the Dwyryd/Glaslyn, Mawddach and Dyfi estuaries. Trebetherick, D.F. Kelley**:** [4].

Kelly, K. S., M. J. Costello, et al. (1997). An indexed bibliography of Irish marine literature from 1839-1997. Dublin, Environmental Sciences Unit Trinity College**:** 243.

Kelly-Gerreyn, B. A., A. C. Gall, et al. (2001). JoNuS-SONUS biogeochemical modelling in UK estuaries and in the North and Irish Seas. Final Report. Southampton, Southampton Oceanography Centre**:** 189.

Kenchington, R. A. (1970). An investigation of the detritus in Menai Straits plankton samples. *Journal of the Marine Biological Association of the United Kingdom*. **50:** 489-498.

Kennington, K., J. R. Allen, et al. (1997). The distribution of phytoplankton and nutrients in the North East Irish Sea during 1996. Almondsbury, Bristol, Environment Agency**:** [124].

Kennington, K., J. R. Allen, et al. (1999). Phytoplankton and nutrient dynamics in the north-east Irish Sea. *Hydrobiologia*. **393:** 57-67.

Khan, M. A. (1970). The distribution of planktonic species and hydrographical factors in the eastern Irish Sea during 1968, University of Liverpool**:** 95.

Khan, M. A. and D. I. Williamson (1970). Seasonal changes in the distribution of Chaetognatha and other plankton in the eastern Irish Sea. *Journal of Experimental Marine Biology and Ecology*. **5:** 285-303.

Kinney, E. S. A., C. E. Gibson, et al. (1997). Planktonic diatoms in the north-west Irish Sea: A study by automatic sampler. *Biology and Environment. Proceedings of the Royal Irish Academy, Section B*. **97B:** 197-202.

Kumlu, M. and D. A. Jones (1997). Digestive protease activity in planktonic crustaceans feeding at different trophic levels. *Journal of the Marine Biological Association of the United Kingdom*. **77:** 159-165.

Lefevre, D., T. L. Bentley, et al. (1994). The temperature response of gross and net community production and respiration in time-varying assemblages of temperate marine micro-plankton. *Journal of Experimental Marine Biology and Ecology*. **184:** 201-215.

Lindley, J. A., H. Call, et al. (1999). Resting cysts and eggs of marine plankton in Irish Sea sediments: a pilot study, Plymouth Marine Laboratory**:** 99.

Lindley, J. A., P. Donkin, et al. (1997). The effect of sediment contamination on the viability of zooplankton eggs, Plymouth Marine Laboratory**:** 177.

Lindley, J. A., C. L. George, et al. (1998). Viability of calanoid copepod eggs from intertidal sediments: a comparison of three estuaries. *Marine Ecology Progress Series*. **162:** 183-190.

Lucey, J., J. J. Bowman, et al. (1999). Water quality in Ireland 1995-1997. Johnstown, County Wexford**:** 122 + appendices + 2 maps.

Marasigan, A. N. (1986). Studies on the coarse scale distribution of the phytoplankton in the Irish Sea, and some aspects of the biology of two pennate diatoms isolated from Port Erin Bay, University of Liverpool**:** 212.

Mills, D. K., R. J. Gowen, et al. (1997). Observation and simulation of the spring bloom in the north-western Irish Sea. *Journal of Plankton Research*. **19:** 63-77.

Mitchelson-Jacob, E. G. and E. S. Menhinick (2000). Review of the North Wales Coastal Water Quality Survey Data. *CCW Contract Science Report*. **(394)**.

Montagnes, D. J. S., A. J. Pouton, et al. (1999). Mesoscale, finescale and microscale distribution of micro- and nanoplankton in the Irish Sea, with emphasis on ciliates and their prey. *Marine Biology*. **134:** 167-179.

Morris, A. W. (1971). Trace metal variations in sea water of the Menai Straits caused by a bloom of *phaeocystis. Nature*. **233:** 427-428.

Morris, A. W. (1972). Trace metal variations in sea water of the Menai Straits caused by a bloom of *Phaeocystis. Nature*. **233:** 427-428.

Morrison, J. R. (1998). Variability of natural fluorescence and its applicability to phytoplankton biomass and photosynthesis prediction: in situ evidence of quenching mechanisms. Bangor, University of Wales.

Nagaraj, M. (1993). Combined effects of temperature and salinity on the zoeal development of the green crab, *Carcinus maenas* (Linnaeus, 1758)(Decapoda: Portunidae). *Scientia Marina*. **57:** 1-8.

Nash, R. D. M. and A. J. Geffen (1999). Variability in Stage I egg production and settlement of plaice *Pleuronectes platessa* on the west side of the Isle of Man, Irish Sea. *Marine Ecology Progress Series*. **189:** 241-250.

Nash, R. D. M. and A. J. Geffen (2000). The influence of nursery ground processes in the determination of year-class strength in juvenile plaice *Pleuronectes platessa* L. in Port Erin Bay, Irish Sea. *Journal of Sea Research*. **44:** 101-110.

Nash, R. D. M., R. S. Santos, et al. (1994). Diel variability in catch rate of juvenile flatfish on two small nursery grounds (Port Erin Bay, Isle of Man and Porto Pim Bay, Faial, Azores). *Journal of Fish Biology*. **44:** 35-45.

Natural Environment Research, C. (1975). Liverpool Bay. An assessment of present knowledge compiled by members of the Liverpool Bay study group. *Natural Environment Research Council Publications, Series* C**:** iv,72.

Nicholas, K. R. (1995). Secondary production of coastal plankton communities in the western Irish Sea, Liverpool University.

Nicholas, K. R. and R. D. M. Nash (1999). Rare records of Euchaeta species (Crustacea:Copepoda)in the Irish Sea. *Journal of the Marine Biological Association of the United Kingdom*. **79:** 367-368.

Owrid, G. M. A. and J. S. Ryland (1991). Sexual reproduction in *Alcyonidium hirsutum* (Bryozoa: Ctenostomata). *Bulletin - Societe des Sciences Naturelles Ouest de la France*. **Mem. HS 1:** 317-326.

Parke, M. W., I. Manton, et al. (1955). Studies on marine flagellates. II. Three new species of *Chrysochromulina*. *Journal of the Marine Biological Association of the United Kingdom*. **34:** 579-609.

Parr, W., S. J. Clarke, et al. (1998). Turbidity in English and Welsh tidal waters, English Nature**:** 116.

Perkins, E. J. and O. J. Abbott (1977). Third Annual Report to the Cumbria Sea-Fisheries Committee. Solway Firth Survey - 1st April 1976 to 31st March 1977. *Consultants Report Cumberland Sea Fisheries Committee*. **1975-1977:** C.S.F.C./AR 76-77, 11.

Pierce, E. L. and J. H. Orton (1939). *Sagitta* as an indicator of water movements in the Irish Sea. *Nature*. **144:** 784.

Powell, M. I. and K. N. White (1990). Heavy metal accumulation by barnacles and its implications for their use as biological monitors. *Marine Environmental Research*. **30:** 91-118.

Reid, P. C. (1999). Development of towed phytoplankton sampling systems for time series monitoring in the Irish Sea. Plymouth, Sir Alister Hardy Foundation for Ocean Science**:** 50 + appendices + CDROM.

Riemann, B., F. Thingstad, et al. (1995). Marine sciences and technologies. Second MAST days and EUROMAR market. Volume 1

Microbiological Element Cycling in Coastal Environments MEICE. M. Weydert, E. Lipiatou, R. Goniet al. Luxembourg, Office for Official Publications of the European Communities**:** 245-255.

Rio-Portilla, M. A. d. and A. R. Beaumont (2000). Larval growth, juvenile size and heterozygosity in laboratory reared mussels, *Mytilus edulis. Journal of Experimental Marine Biology and Ecology*. **254:** 1-17.

Rodrigues, R. M. N. V. and P. J. l. B. Williams (2001). Heterotrophic bacterial utilization of nitrogenous and nonnitrogenous substrates, determined from ammonia and oxygen fluxes. *Limnology and Oceanography*. **46:** 1675-1683.

Rogers, S. I. and S. J. Lockwood (1990). Observations on coastal fish fauna during a spring bloom of *Phaeocystis pouchetii* in the eastern Irish Sea. *Journal of the Marine Biological Association of the United Kingdom*. **70:** 249-253.

Scott, A. (1905). On the tow-nettings collected in the Irish Sea. *Proceedings and Transactions of the Liverpool Biological Society*. **19:** 196-215.

Scott, A. (1906). Report on the tow-nettings. *Proceedings and Transactions of the Liverpool Biological Society*. **20:** 164-201.

Scott, A. (1907). Report on the tow-nettings. *Proceedings and Transactions of the Liverpool Biological Society*. **21:** 137-190.

Seed, R. and R. N. Hughes (1992). Reproductive strategies of epialgal bryozoans. *Invertebrate Reproduction and Development*. **22:** 291-300.

Sharples, E. J. (1969). A preliminary survey of the plankton of the River Mersey with special reference to phytoplankton, University of Liverpool.

Sharples, E. J. (1972). The use of phytoplankton for indication of the effect of waste disposal on water quality in Liverpool Bay. Liverpool, University of Liverpool**:** 164.

Skinner, T. G. (1995). The seasonal occurrence of some prominent zooplankton species in Rough Firth. I. Scyphomedusae. *Glasgow Naturalist*. **22:** 471-477.

Skinner, T. G. (1995). The seasonal occurrence of some prominent zooplankton species in Rough Firth. II. Chaetognatha. *Glasgow Naturalist*. **22:** 479-484.

Skinner, T. G. (1996). The seasonal occurrence of some prominent zooplankton species in Rough Firth. III. Decapod larvae. *Glasgow Naturalist*. **23:** 51-56.

Smith, G. C. and G. D. Floodgate (1991). Bioindicators and environmental management Bacterial bioindicators: biomass determinations of methanogenic bacteria. D. W. Jeffrey and B. Madden. London, Academic Press**:** 277-294.

Topliss, B. J. (1977). A study of optical irradiance in coastal waters, University of Wales.

Topliss, B. J. (1982). Optical monitoring of coastal waters: photic depth estimates. *Marine Environmental Research*. **7:** 295-308.

Trimmer, M., R. J. Gowen, et al. (1999). The spring bloom and its impact on benthic mineralisation rates in western Irish Sea sediments. *Marine Ecology Progress Series*. **185:** 37-46.

Turley, C. M. (1986). Urea uptake by phytoplankton at different fronts and associated stratified and mixed waters on the European shelf. *British Phycological Journal*. **21:** 225-238.

Tytler, P. and J. Ireland (2000). The influence of salinity and temperature change on the functioning of the urinary bladder in the early larval stages of the Atlantic herring *Clupea harengus L. Journal of Experimental Biology*. **203:** 415-422.

University of Liverpool, P. E. M. L. (1998). The distribution of phytoplankton and nutrients in the North East Irish Sea during 1997. Bristol, Environment Agency**:** 115.

Veer, H. W. v. d., L. Pihl, et al. (1990). Recruitment mechanisms in North Sea plaice *Pleuronectes platessa. Marine Ecology Progress Series*. **64:** 1-12.

Voltolina, D. (1980). The phytoplankton of Liverpool Bay. Its taxonomy and quantitative distribution. Menai Bridge, Gwynedd (UK), University College of North Wales.

Weber, L. I., R. G. Hartnoll, et al. (2000). Genetic divergence and larval dispersal in two spider crabs (Crustacea: Decapoda). *Hydrobiologia*. **420:** 211-219.

Wiencke, C., J. Gorham, et al. (1992). Incomplete turgor adjustment in *Cladophora rupestris* under fluctuating salinity regimes. *Estuarine, Coastal and Shelf Science*. **34:** 413-427.

Wildgust, M. A., P. Donald, et al. (2000). Assimilation of 210Po by the mussel *Mytilus edulis* from the alga *Isochrysis galbana*. *Marine Biology*. **136:** 49-53.

Wilkinson, S. B., W. Zheng, et al. (1996). Water quality improvements in Liverpool Docks: the role of filter feeders in algal and nutrient dynamics. *Marine Ecology, Naples*. **17:** 197-211.

Williams, P. J. B. (2000). The changing ocean carbon cycle Net production, gross production and respiration: what are the interconnections and what controls what? R. B. Hanson, H. W. Ducklow and J. G. Field, Cambridge University Press**:** 37-60.

Williamson, D. I. (1952). Distribution of plankton in the Irish Sea in 1949 and 1950. *Proceedings and Transactions of the Liverpool Biological Society*. **58:** 1-46.

Williamson, D. I. (1956). The plankton in the Irish Sea, 1951 and 1952. *Bulletin of Marine Ecology*. **4:** 87-114.

Williamson, D. I. (1956). Planktonic evidence for irregular flow through the Irish Sea and north Channel in the autumn of 1954. *Journal of the Marine Biological Association of the United Kingdom*. **35:** 461-466.

Williamson, D. I. (1975). The zooplankton of Liverpool Bay. *Natural Environment Research Council Publications, Series* C**:** 46-48.

Wilson, J. G. (1987). The Dublin Bay ecosystem Managing Dublin Bay. M. Brunton, F. J. Convery and A. Johnson. Dublin, University College Resource and Environmental Policy Centre**:** 21-26.

Wilson, J. G. (1989). Dublin Bay environmental studies 1985-87 Lough Beltra - 1987. Proceedings of the 4th Annual Lough Beltra Workshop, Dublin, 23rd March 1988. G. Sullivan and M. Gillooly. Dublin, Fisheries Research Centre**:** 104-112.

Wilson, J. G. and A. Parkes (1998). Network analysis of the energy flow through the Dublin Bay ecosystem. *Biology and Environment*. **98B:** 179-196.

Wood, V. and R. Seed (1992). Reproduction and growth of *Alcyonidium hirsutum* (Fleming)and *Flustrellidra hispida* (Fabricius)(Bryozoa: Ctenostomata)within a *Fucus serratus* L. community. *Cahiers de Biologie Marine*. **33:** 347-363.

Woodhead, D. (1998). The impact of radioactive discharges on native British wild-life and the implications for environmental protection. Almondsbury, Bristol, Environment Agency**:** 80.

Wurthmann, I. S. (1977). A study of the phytoplankton ecology of rivers in the Morecambe Bay catchment area and an assessment of the productivity of the waters

using a bioassay technique. (A contribution to the Morecambe Bay Feasibility Study.), University of Lancaster**:** 112.

Zeng, C. and E. Naylor (1996). Endogenous tidal rhythms of vertical migration in field collected zoea-1 larvae of the shore crab *Carcinus maenas*: implications for ebb tide offshore dispersal. *Marine Ecology Progress Series*. **132:** 71-82.

Zeng, C. and E. Naylor (1996). Heritability of circatidal vertical migration rhythms in zoea larvae of the crab *Carcinus maenas* (L.). *Journal of Experimental Marine Biology and Ecology*. **202:** 239-257.

Zeng, C. and E. Naylor (1996). Occurrence in coastal waters and endogenous tidal swimming rhythms of late megalopae of the shore crab *Carcinus maenas*: implications for onshore recruitment. *Marine Ecology Progress Series*. **136:** 69-79.