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**A CATALOGUE OF DEFRA HISTORICAL  
RESEARCH VESSEL DATA**

N.B. Goodwin, P.J. Dare, S.J. Belson, K.L. Gunstone,  
J.R. Ellis and S.I. Rogers

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# 1. EXECUTIVE SUMMARY

This report describes a programme to retrieve and properly archive uncatalogued Research Vessel (RV) data held at CEFAS Lowestoft, formerly the Directorate of Fisheries Research. The earliest records discovered dated back to surveys undertaken in 1904. For the period up to 1970, when reliable computer databases began, records of 2,367 surveys by 12 sea-going research vessels and eight estuarine/inshore vessels were located. A description of the type of data that were held in each of the 2,475 scientists Log Books from these surveys is included in a fully searchable Catalogue. A continuous record of research vessel activity is available, except for the periods during World Wars I and II. All data are now catalogued and stored in secure modern archiving facilities, and the CEFAS Library is the custodian of these data.

# 2. INTRODUCTION

It is widely recognised that a number of changes have taken place in the biological and physical characteristics of our seas, and that during the last century some of these changes may have been caused by human activity. In order to describe the magnitude of these changes it is important to make full use of historical datasets, including those that were compiled in the early 1900s, at the start of UK marine research. The Department for Environment, Food and Rural Affairs (DEFRA) and its predecessors have been at the forefront of marine sampling since the early part of the 20th Century. However, much of the data collected during the early biological and hydrographic investigations are uncatalogued and neglected. The cataloguing of these

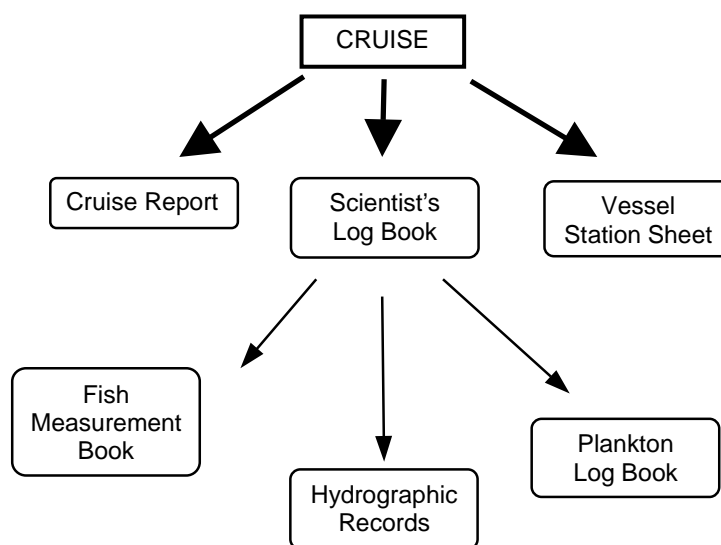
historical data is the first step towards identifying potentially useful sources of data with which to undertake further research.

This Technical Report describes the information that is now available in the RV data archive at CEFAS Lowestoft, the type of information that was discovered, and the methods that were used to summarise the data from the archive. There is also a brief description of the Microsoft Excel 'Historic RV Catalogue' that was created from this archive. This is a catalogue of information that is held in the archive, and does not contain raw data collected during any of the surveys. The final section describes how this Catalogue can be used to retrieve specific datasets, and provides examples of potentially valuable time-series data that are now available for further analysis. The Catalogue is included on a CD ROM at the back of this report.

# 3. A SUMMARY OF THE RESEARCH VESSEL ARCHIVE

## 3.1 Introduction

For much of the 20th Century, three documents have normally been available from every RV cruise, irrespective of its' duration or purpose: a Cruise Report; a Scientist's Log Book; and vessel Station Sheets (all held in CEFAS Library, Lowestoft) (Figure 1). In addition, if large numbers of fish were measured, lengths were recorded in a Fish Measurement Log Book, and plankton tows were recorded in Plankton Log Books. Hydrographic data were recorded separately and archived in bound volumes.



**Figure 1. A flow diagram showing the inter-relationships between archived documents associated with Research Vessels. All documents are archived at CEFAS Lowestoft**

In addition to these formal cruise documents, there are substantial quantities of published and ‘grey’ literature which describe the methods used during some of these surveys, and provide analyses and interpretations of results. All relevant archived material has been searched in order to provide as much information as possible for each survey. The following sections describe the main topic headings.

### 3.2 Research vessels

Since 1904, DEFRA have used 12 dedicated sea-going ships and four estuarine/inshore vessels (Table 3.1, Appendix I). These vessels have differed greatly in size and power, and undertook cruises all year round. After the Second World War, RVs were purpose built to deal with the many different types of gear and equipment used onboard. Numerous charter vessels (CVs) were also hired on either a regular or *ad hoc* basis when DEFRA vessels were unavailable or unsuitable for the cruise aims. CVs were usually fishing vessels.

Although the CEFAS Library archive contains information for both RVs and CVs, The Catalogue largely excludes information for CVs and is restricted to the RVs shown in Table 1. This is because CVs did not usually have a structured cruise programme, and also were rarely used for continuous research programmes and so were therefore unlikely to form part of a long-term series. In addition, CV scientists were not always required to provide cruise report documentation, and this made it very difficult to catalogue surveys and extract information on the data they contained.

All available data before and including 1970 has been extracted. After this time there are detailed electronic records of RV activity stored in the Fishing Survey

System at CEFAS. Only cruise reports for *RV Clione* and *RV Tellina* have been catalogued to 1980 and 1981 respectively. The folder ‘Vessel pictures’ on the attached CD ROM contains photographs of some of the RVs described in the Catalogue.

### 3.3 Cruise Reports

#### General Information

A cruise report is the main document which shows that a cruise took place, and these form an annual series for each vessel. The purpose of a cruise report is to provide a brief summary of the work performed. Cruise reports also describe any major scientific, gear or mechanical problems encountered on the cruise. Each report is written before docking by the scientist-in-charge (SIC) and initialled as factually correct by the Master and Fishing Skipper. Cruise reports are essentially a report to the Head of Research and are used for de-briefing and planning purposes. There were 1,972 RV cruises between 1904 and 1970 inclusive, and 74% of these cruises were between 1946 and 1970. No cruises took place during either World War I or II (Figure 2).

While the aims of each cruise were very varied, a large number of cruises tagged fish, sampled fish for age and length, or collected fish eggs and plankton, and made hydrographic observations (Figure 3). Many keywords were taken from these cruise reports and were used in the Catalogue.

#### Cruise Report Format

The earliest cruise reports that are still available (for the period 1920-30) were very brief, often no more than 2-3 paragraphs and not very informative. No cruise reports have been located for RV Huxley during 1905-14.

**Table 1. The numbers of cruises and Log Books available from the major DEFRA RVs used in the period to 1970**

RV	Archived Cruise Reports	No. of Cruises	Archived Log Books	No. of Log Books
<b>Sea-going Vessels</b>				
<i>Huxley</i>	1905-1909	52 <sup>1</sup>	1905-1909	57
<i>Joseph &amp; Sarah Miles</i>	1920-1922 <sup>2</sup>	50	1920-1921	35
<i>George Bligh</i>	1923-1939	288	1921-1939	364
<i>Onaway</i>	1930-1939, 1946-1960	207	1931-1939, 1950-1960	80
<i>Sir Lancelot</i>	1946-1961	303	1946-1961	509
<i>Platessa</i>	1946-1967	472	1946-1967	501
<i>Ernest Holt</i>	1949-1970	187	1949-1970	382
<i>Tellina</i>	1960-1981	274	1960-1970 <sup>3</sup>	228
<i>Clione</i>	1961-1980	353	1961-1970 <sup>3</sup>	142
<i>Corella</i>	1967-1970	62	1967-1970 <sup>3</sup>	50
<b>Estuarine Vessels</b>				
<i>Jassa</i>	Not available	unknown	1959-1970 <sup>3</sup>	4
<i>Nucella</i>	1968-1980	86	Not available	unknown

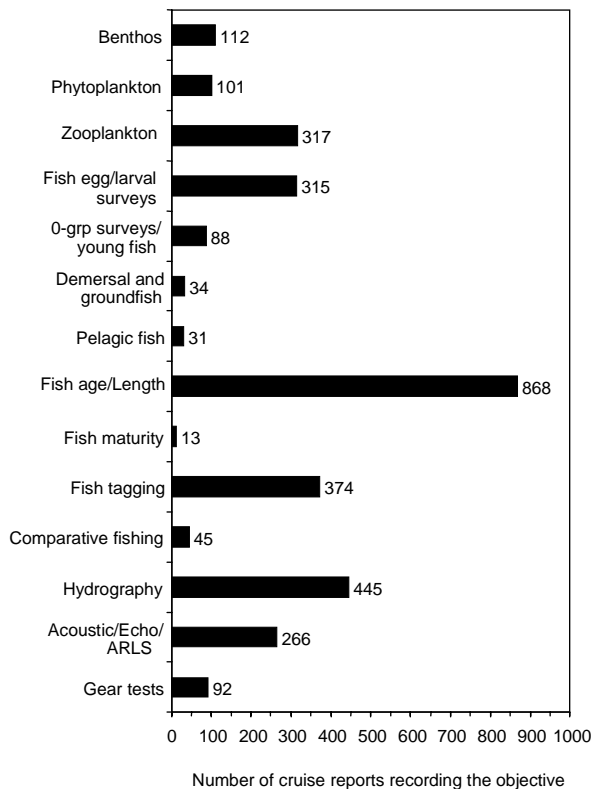
<sup>1</sup> Cruise reports missing: based on Log Book data

<sup>2</sup> JSM 1921 and 1922 listed as *George Bligh* in Log Book series

<sup>3</sup> Vessel still in service beyond 1970



**Figure 2.** The total number of RV cruise reports per year available for the period from 1904 to 1970



**Figure 3.** The number of major research objectives of RV cruises between 1904 and 1970. Most cruises had more than one objective, so the total number of cruises shown above will exceed the number of cruises in the Catalogue

Reports gradually became more formal, structured and detailed. By c.1960 the modern format (Table 2) had been introduced, together with a Cruise Programme outlining the objectives and the gear required for the cruise.

**Table 2.** A summary of the information commonly provided in Cruise Reports and Programmes

Section	Description
Ship	RV (or CV) name
Cruise No./Letter	Part of a series for each year
Scientific Staff	Scientist in charge and support staff
Dates	Departure and return to port
Sea Areas	Broad outline of the sampling area, e.g. Southern North Sea
Aims	A numbered list of scientific objectives (as programme)
Narrative	General account of sea areas worked and scientific work undertaken
Results	Success against stated aims
Author's name	Scientist in charge

#### **Cruise Report information in the Catalogue**

The 'Narrative' and 'Results' sections in each cruise report described the sea areas visited and the scientific research undertaken. Data were retrieved for inclusion in the Catalogue under four headings, (a) the cruise designation (number/letter), (b) season of cruise, (c) main work achieved, and (d) sea areas where work was performed. On many cruises, the full programme was not accomplished because of bad weather, gear faults, ship problems or other operational factors which were recorded in the narrative.

#### (a) Cruise Number/Letter

The system of numbering a cruise was sometimes inconsistent within a series, either using letters (A, B, C etc.), Roman numerals (I, II, III etc.) or conventional

(Arabic) numbering (1, 2, 3 etc.). To avoid potential confusion and to simplify data sorting in the Catalogue, we have used only conventional numerals and upper-case letters.

(b) Start Date

Most cruises were of 2-4 weeks duration and thus often spanned more than one calendar month, if only by a few days. A single month is given in the Catalogue as the nominal 'month of cruise' when 90% or more of the cruise was confined to that month. When a cruise extended over two months then they were separated in the Catalogue by a '+' (e.g. 1+2). When work was spread over 2 or more months these were delineated with a 'comma' (e.g. 3,4,5). Where there was no information available due to missing data, a '?' is used in the Catalogue.

(c) Cruise Keywords

A cruise would usually have several aims listed in the cruise report in descending order of priority. Only major projects undertaken at sea are included in the Catalogue as keywords, with the most important listed first. Minor aims were typically the collection of small amounts of data or samples for other workers in the UK, and these have not been included. A plus sign (+) joining two main projects denotes a stated or apparent linkage (e.g. nutrients + phytoplankton).

As a main topic, hydrography, usually refers to oceanographic research on major processes, but can also refer to more routine monitoring along fixed near-shore transects, or recording ancillary environmental data at plankton or fish sampling stations. Biological sampling/samples usually refers to the collection of fish lengths,

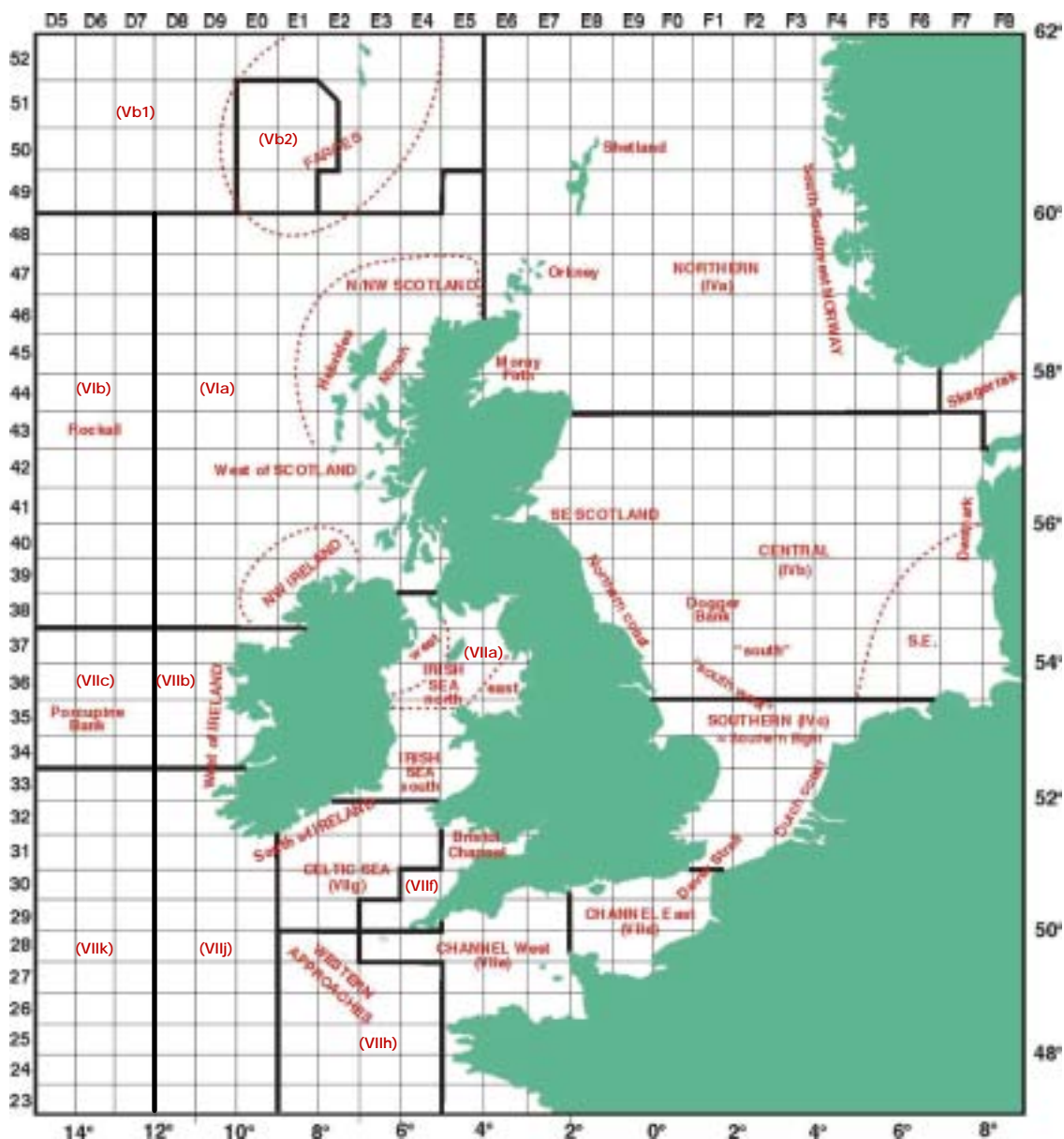


Figure 4. Some sea areas around the British Isles and adjacent waters identified in Cruise Reports. Dashed lines indicate the approximate limits of each area. ICES areas denoted by bold lines and Roman numerals



otoliths, morphological data and stomach contents data during trawling surveys. In recent decades, biological sampling has become increasingly diverse for important new research fields, e.g. genetics and stock separation, and dynamics, physiology and biochemistry of reproduction.

(d) Sea Area Description

The sea areas referred to in cruise report narratives, or programmes if the report was missing, describe the sea areas where gear and equipment were actually deployed. These were given consistent names in the Catalogue (Figure 4). In early cruise reports, sea areas were often

not described precisely, and so only an approximate indication can be given in the Catalogue. For most cruises, however, reports refer specifically to commercial fishing grounds, clearly defined coastal areas (e.g. bays and estuaries) or ICES Divisions or rectangles, and these locations are included as searchable key-words (Figure 5). Precise co-ordinates for many sampling stations are recorded in the Station Log Sheets. From 1970, computer printed track charts were usually included in cruise reports, particularly in relation to survey grids and transects. Presence or absence of track charts is indicated (Y/N) in the Catalogue.

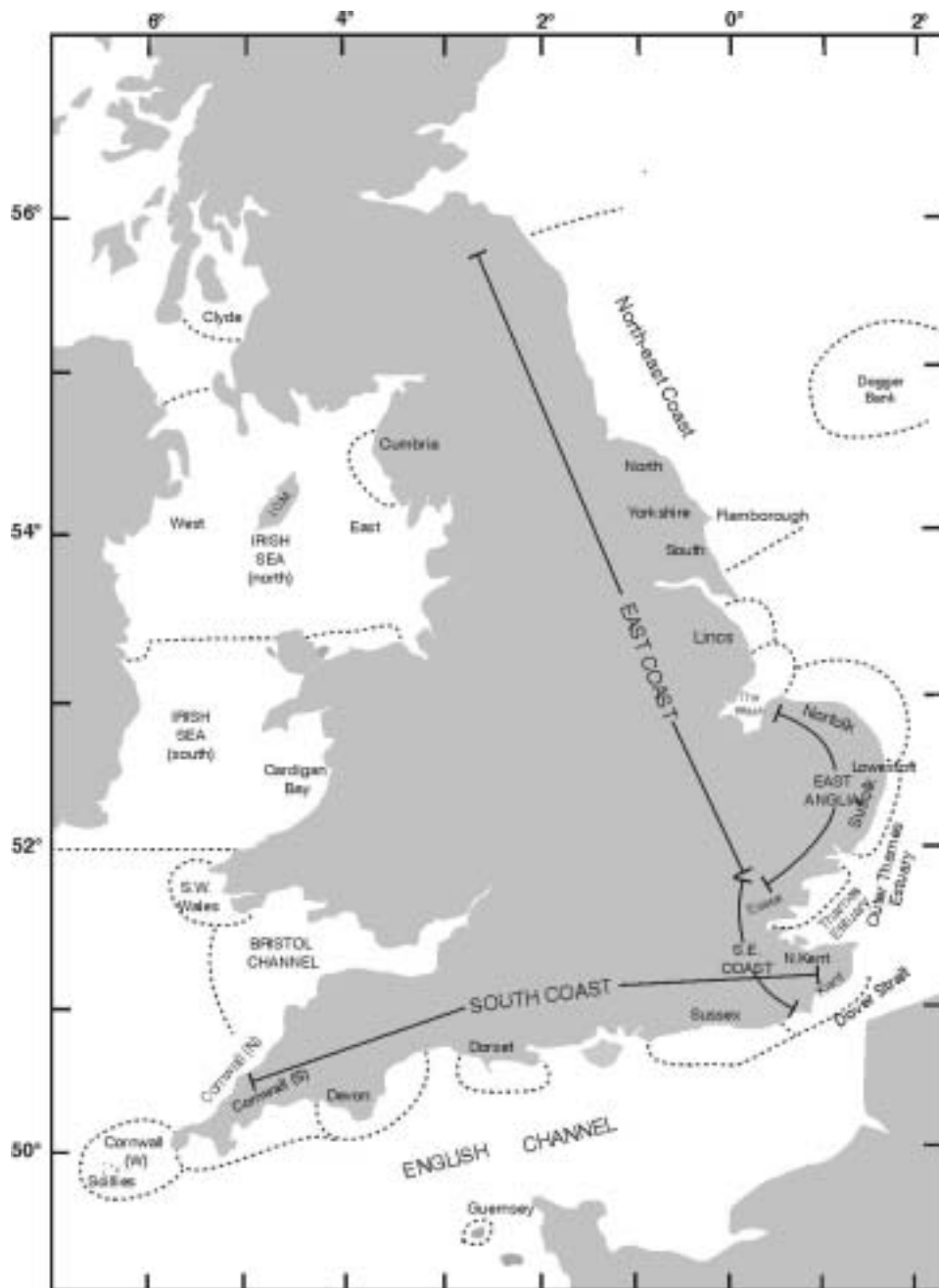
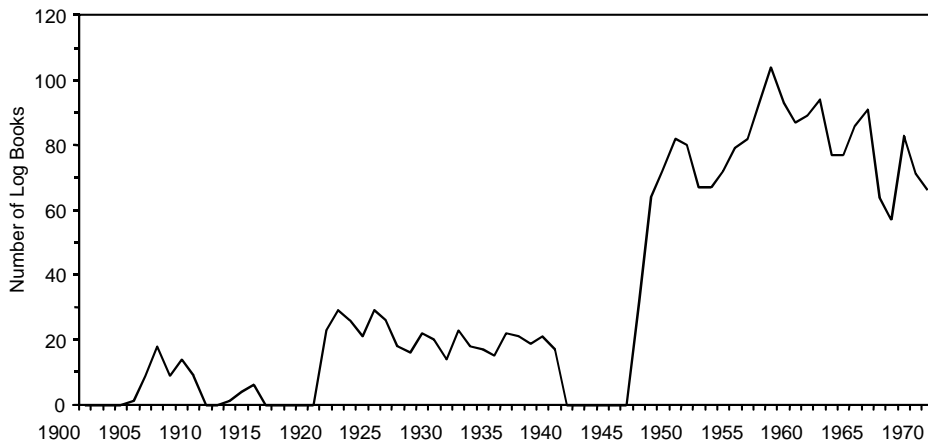


Figure 5. Inshore areas of the British Isles denoted by county names or regions (taken from Cruise Reports). Dashed lines indicate approximate limits of these coastal areas



**Figure 6.** Number of Scientist's Log Books available from Research Vessels between 1904 and 1970

### 3.4 Scientist's Log Books

#### General Information

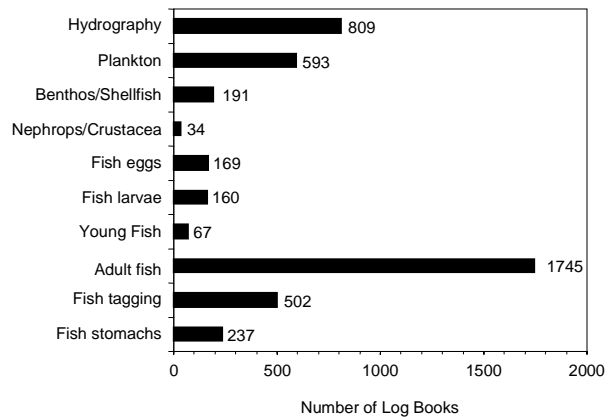
A Scientist's Log Book, also known from earlier surveys as a Naturalist's Log Book, is a basic record of all scientific activities performed by the science team during a cruise. It is the most important source of data for RV cruises. Each entry refers to a numbered sampling station, the position of which is recorded on a Station Log Sheet. A Log Book entry typically describes the type of sample(s) that were collected, and information on how the samples were collected, where from, and by whom. Some Log Books, particularly those from earlier cruises, also have a fish measuring section at the back that may contain raw data.

There were 2,475 Log Books recorded between 1904 and 1970, with the majority between 1946 and 1970 (Figure 6). No cruises took place during either World War I or II.

A very broad range of subjects has been recorded in these Scientist's Log Books. The majority record observations of fish, while smaller numbers record hydrographic observations and plankton samples (Figure 7). Log Books refer to data collected from throughout the continental shelf of NW Europe, with some research cruises to the Canary Islands, Newfoundland, southern Greenland, Bear Island, Spitzbergen and the Barents Sea. The majority of data were collected from the southern North Sea (Figure 8).

#### Format of the Scientist's Log Book

The cover of every Scientist's Log Book shows the name of the RV, the cruise number, the dates of the cruise and a unique book reference number. Inside each book is a list showing the Scientist-in-charge, the scientific support staff, and other documents which contain data relating to the cruise such as a Fish Measurement Log Book, Plankton Log Book, Station Sheets, echosounder traces, or hydrographic data. Often



**Figure 7.** The number of Scientist's Log Books which include data for 10 major research objectives, between 1904 and 1970. (Most cruises have more than one objective, so the total number of Log Books shown above will exceed the number of Log Books in the Catalogue)

there is also a list of sampling stations and the gear or equipment deployed. Log Books are occasionally written in a diary format, describing the weather, ports sailed to/from, preparations for the cruise, etc.

#### Scientist's Log Book information used in the Catalogue

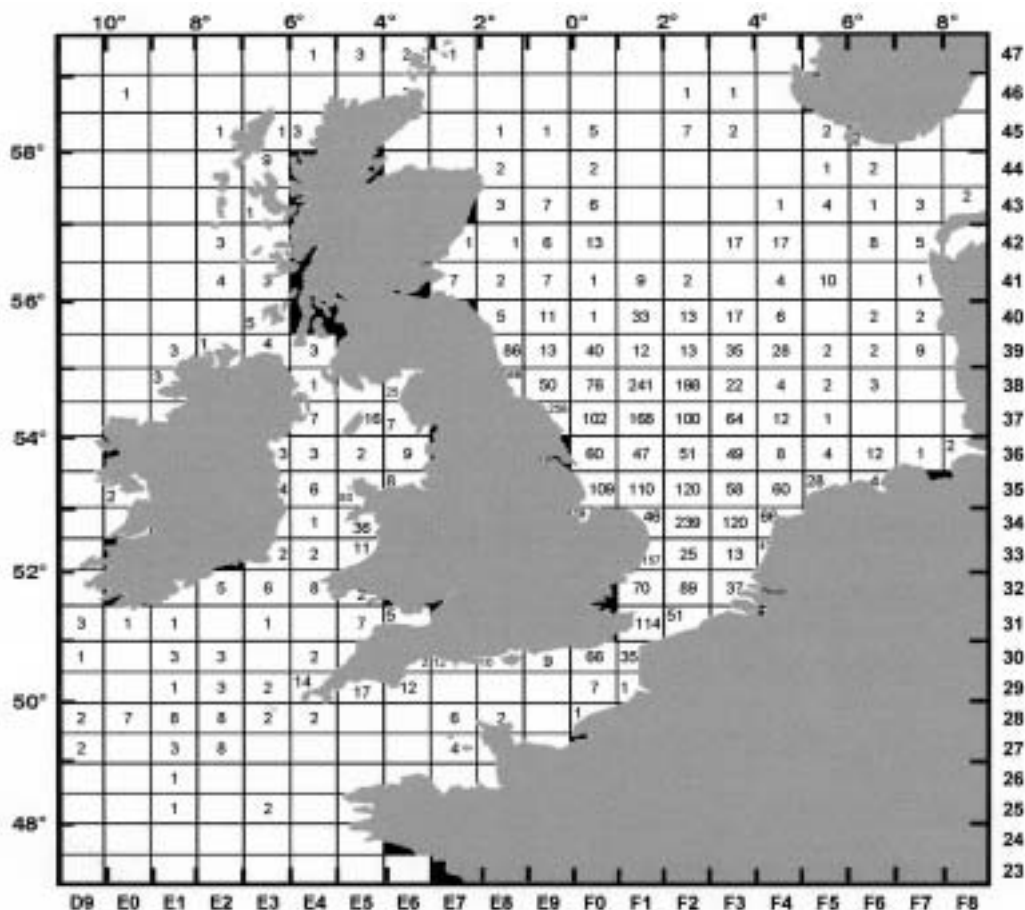
As much relevant information as possible from the Log Books has been included in the Catalogue. The following Categories of information have been retrieved.

##### Research Vessel

The name of the RV.

##### Cruise No.

Unique reference for the cruise, and part of a series for each year.



**Figure 8.** *The spatial distribution of sampling effort by RVs around the British Isles and adjacent waters. Effort is based on a surrogate measure, the total number of Scientist's Log Books recording samples or data collected in each ICES rectangle from 1904 to 1970*

#### Locality

The position of sampling stations was identified either by latitude and longitude, by a named fishing ground (e.g. Silver Pits), proximity to a light vessel (e.g. 10 miles south of Smith's Knoll LV), general sea area (e.g. southern North Sea), or coastal land reference (e.g. off Great Orme). Some Log Books, particularly on plankton cruises, contain no description of the position, however, this information can be obtained from the Station Log Sheets. Scientist's Log Books that have supporting Station Log Sheets are shown in the Catalogue. Both ICES Divisions and rectangles are shown in the Catalogue for each Log Book for which the information was available.

To simplify searches of the Catalogue, locations have been cross-referenced to the ICES division and rectangle in which they occur. The Catalogue worksheet 'Locations' provides this information within the range 47°N-64°N, and 21°W-9°E.

#### Start Date

Shown to the nearest month.

#### Gear

This describes the design and specifications of the gear used, including trawl size, mesh measurement, presence of ticklers and mesh size of cod-end covers if used. Specific details of the gear and equipment are sometimes described in the original Cruise Reports. Useful descriptions of plankton nets used are provided by Wimpenny (1966), and Davis (1927) gives an account of historic fishing gears.

#### Fish and Benthic invertebrates

The fish species listed in the Log Book often depended on the aims of the cruise and the scientist recording the data. Generally during groundfish surveys all commercially important fish were listed, counted, and/or measured. Approximate quantities of each species were usually recorded. Non-commercial fish species were often just listed as present with little or no indication of abundance.

The scientific names of several fish species have changed during the last 100 years, and a large number of common names have been used to describe the same

species. The Catalogue includes a reference list of selected marine fish species of the north-east Atlantic with their current common names, taxonomic synonyms, historical and regional names, and a summary (worksheet: Fish Names).

Length measurements were commonly recorded for target species only. It was not always clear whether the whole catch or a sample had been measured, and the units of measurement were sometimes missing. Sex and maturity stage of fish were occasionally recorded, but the index used to describe maturity is not consistent over time. When fish otoliths, scales or stomachs were described, entries usually recorded the date that samples were collected. Descriptions of fish stomach contents, when made, were listed in the Scientist's or Fish Measurement Log Books.

The size of the baskets used to measure fish quantities were not stated, and this has made it difficult to interpret and compare quantities. Furthermore, it was often unclear whether measures of abundance were an absolute count or based on a subsample.

Data on tagged fish includes tag type and number, fish length, condition, sex, mortality prior to release, and the fish release position. A separate tagged fish database exists at CEFAS Lowestoft, recording detailed fish release and recapture information.

Scientist's Log Books contained a (sometimes incomplete) list of macro-benthic species or genera caught, described by either their common or scientific names. Approximate quantities caught were recorded in a range of units such as baskets, bushels, baths or kits. Detailed benthic records were available for some cruises, but often data were included as observed additional bycatch. The RV Huxley cruises (1904-1910) all had an Invertebrate Log Book that accompanied the Scientist's Log Book, and these provided higher quality data. More recent cruises that focused upon exploitable shellfish, e.g. scallops, or specific benthos surveys, contained detailed information and the species were counted and measured.

#### Plankton

The Scientist's Log Book normally recorded that a plankton sample had been collected, and also listed the number of jars preserved, the type of net used, and time it was shot and hauled at each station. The presence and absence of eggs or larvae of certain fish species may also have been recorded. Specific species of phytoplankton were rarely mentioned as detailed analyses could be undertaken only back in the Laboratory. More information was recorded in a separate Plankton Log Book for those cruises devoted to this topic.

#### Hydrography

The hydrographic equipment that was deployed at the station was described, but raw data were not usually entered in the Scientist's Log Book. Whenever

hydrographic records were made on a cruise, the data were recorded separately and the corrected data were written up in a hydrographic log. Hydrographic Log Books are occasionally referenced, but no hard copies or microfiche records of these have been found.

#### ***Data Limitations***

The main limitation of Log Book data is the inconsistent way in which data were recorded. Scientists do not always include the same type or amount of data, and individual scientists have differed in their style of recording and notation. The hand-written information in log books can be difficult to read and so make it difficult to extract and interpret data. Any information missing from Log Books may be in other documents such as the Station Log Sheets or in published reports, so whenever possible these other sources of information should also be searched.

Generally, the Scientist's Log Book does not describe the sampling methods in detail. For example, there were no descriptions of how fishing gears or sampling equipment were handled aboard ship, deployed overboard or calibrated. Gear specifications were rarely included in Log Books, although more detail was often available in the Cruise Reports or in associated publications.

The position that gear was deployed was not routinely described in Scientist's Log Books, and 23% of Log Books listed in the Catalogue do not indicate where the cruise took place. However, station numbers were always recorded and these can be cross referenced to Station Log Sheets to give the ships precise location.

### **3.5 Station Log Sheets**

A Station Log Sheet was completed routinely by the ship's Master or Officers. These recorded the precise position of every station where equipment was deployed. During the early years, position fixing was often crude and relied on using a sextant. The advent of light vessels and light buoys aided navigation and increased the accuracy of station position fixing. A reference list of 854 fishing locations is provided in the Catalogue (see worksheet 'Locations'). In later years, the accuracy of station position fixing increased greatly with the introduction of Decca navigation, and more recently satellite navigation systems.

The Station Log Sheet also included other relevant data such as weather conditions, wind direction and force, sea state depth and tidal flow each time the gear was deployed.

### **3.6 Fish Measurement Books**

Target fish species were measured onboard the ship during fish surveys, fish tagging exercises, and otolith and stomach sampling surveys. Measurements included maximum total lengths, sex, stage of maturity, stomach

contents and condition. Fish Measurement Books also included a station number reference that was cross-referenced with the Scientist's Log Book and Station log sheet.

### 3.7 Plankton Log Books

A Plankton Log Book was occasionally used in addition to the Scientist's Log Book, and, when all the cruise aims related to plankton sampling, the Plankton Log Book sometimes replaced the Scientist's Log Book. Plankton cruises included surveys of fish eggs and larvae, and phytoplankton and zooplankton, but raw data were not provided.

Plankton Log Books provided details of every plankton tow made at a station, and these included the time and duration of a tow, the approximate tow depth, bottom depth and flowmeter measures. The Plankton Log Book also gave information about the flow meter used and the water temperature and salinity. Plankton Log Books from the 1960s and 1970s have been included in the Catalogue, but a larger MS Access Plankton Database is available within CEFAS and is maintained in the Plankton Laboratory.

### 3.8 Hydrographic Records

A wide range of hydrographic records were made during these surveys, from incidental records of water temperature and salinity to dedicated hydrographic/oceanographic cruises lasting several weeks. When notes in the Scientist's Log Books showed that temperature, salinity or Secchi disc measurements were made, these were identified in the Catalogue as routine hydrographic observations and the survey was identified in the Catalogue with the word 'Hydro' in the topic keywords field. Specific records were made of data describing sea temperature, salinity, dissolved or % oxygen saturation,  $\Sigma_t$  (*in situ* density), phosphate or silicate.

### 3.9 RV Scientists

A Scientist or Naturalist in Charge was assumed to be the Scientist whose name was listed first in the Log Book, unless it was made obvious. The initials and correct spelling of these names were checked using Lee (1992). In several Log Books no scientist's names were recorded, whilst in others the names were illegible. It is not, therefore, a complete record.

This information is valuable for cross-referencing a survey Log Book series with published information that could describe the methods used and provide analysis of the results. The Catalogue worksheet 'RV Scientists' lists all the scientists recorded as 'in charge' of research, and also the dates of all Log Books in which each scientist's name was recorded. It is possible that some entries may not relate to the same person as initials were not always recorded, and entries of a particular surname may not always relate to the same person. Further information describing the major research activities of each scientist is also described in this Catalogue worksheet.

### 3.10 Scientist's Publications and Reports

Publications in internal reports and in refereed international journals often describe the sampling methods used on surveys, such as the dimensions of the gear and the sampling regime, and also other similar surveys that were undertaken by contemporary colleagues. Raw data are also often presented in tables and maps, and calibration of hydrographic data is sometimes included. These publications are, therefore, an important source of additional information, and a number of relevant sources have been searched (Table 3). A total of 335 such documents are listed in the Catalogue.

A bibliography of relevant publications, sorted by author, is provided in the Catalogue worksheet 'RV Publications'. This is also available as an EndNote library on the attached CD in the folder 'publications'.

**Table 3. 'In-house' publications and report series that have been searched and listed in the Catalogue worksheet 'RV Publications'**

Publication	Years searched
Fisheries Investigations Series II	1914 – 1976
MAFF DFR Laboratory Leaflet	1952 – present
MAFF Fisheries Research Technical Report = Science Series Technical Report, CEFAS Lowestoft	1971 – 1996 1997 – present
Shellfish Information Leaflet	1966 – 1975
Internal Reports – Burnham Report Series	1950 – 1981
MAFF DFR Aquatic Environmental Monitoring Report*	1979 – 1995
Internal Reports – Lowestoft Report	1982 – present
Shellfish Resource Group / Team Report	1992 – present

\* Post-1995, this series became into RIFE Report series 'Radioactivity in Food and the Environment' published by Food Standards Agency/Scottish Environment Protection Agency

## 4. THE CATALOGUE - AN OPERATOR'S GUIDE

### 4.1 Introduction

This section provides a basic introduction to extracting useful data from the Catalogue. It describes how to extract and summarise records that contain specific topic and/or gear keywords, that have recorded particular fish species, or cruises which have visited specific locations. This section also explains how to produce basic maps and graphical summaries.

### 4.2 Structure of the Catalogue

The CD ROM that accompanies this report contains a Microsoft Excel Workbook called 'Historic RV Catalogue.xls'. This file contains all the important data that have been extracted from the archives available at CEFAS Lowestoft. The worksheets within this file are shown in Table 4.

**Table 4. The worksheets that are contained in the Catalogue**

Workbook Name	Worksheet name	Records
Historic RV Catalogue.xls	Cruise Reports	2,367
	Log Books	2,475
	Station Sheets	407
	Misc. CV Log Books	251
	Locations	853
	RV Scientists	139
	RV Publications	335
	Fish Names	-
	ICES Map Template	-

Within each worksheet, column headings describe the information that has been summarised in the Catalogue. Column headings used in the worksheet 'Cruise Reports' are described in Table 5, and those in the worksheet 'Log Books' are described in Table 6.

The Catalogue contains other worksheets which provide detail on specific aspects of a cruise series. The worksheet 'Station Sheets' describes the references to all sampling station details (latitude and longitude, sea conditions, etc.), their format and where they are stored. As already described, there are substantial numbers of charter vessel (CV) records which do not conform to the normal structure of the RV cruise series. Some of the most useful CV Log Books in the archive have been searched and summary details, equivalent to the information provided for RVs in 'Log Books', is given in the worksheet 'Misc. CV Log Books'.

The Worksheet 'Locations' provides positional information for the sea area descriptions used in the 'Cruise Report' and 'Log Book' worksheets. Fishing

Grounds or Land-based positional references are allocated to the appropriate ICES rectangle(s) and given a latitude and longitude.

### 4.3 Sorting and searching using Keywords

A set of common keywords has been used throughout the Catalogue to describe the gear types used, the areas visited and activities undertaken. Keywords used to describe the topic areas of Log Books are listed in Appendix III, and keywords describing the gears used to sample stations are listed in Appendix IV.

The Catalogue is designed so that the user can perform a search on any of the columns in the Catalogue worksheets. This will allow the user to answer a range of questions such as:

Where do I find information about a specific cruise ?

What Scientist's Log Books exist for the cruise I am interested in ?

Where can I find details of the survey equipment used ?

What raw data exist for specific cruise series or Log Books ?

The following section describes simple search techniques that can be used to extract summary information.

Operating commands that direct you to Microsoft Excel menus in the worksheet are highlighted in **bold** text.

### 4.4 Sorting

The Catalogue has already been sorted into ascending date order, by vessel. There are two search methods available from Excel's menu, (1) a Basic Sort, and (2) AutoFilter. The Basic Sort option is limited because it is only based on the first character of items within each column. The Basic Sort should, therefore, only be used on columns using single values such as year or date. The AutoFilter option provides a more refined search that allows the user to search for records that match certain conditions.

A Basic Sort of the dataset should be performed when all or a number of rows are selected (Figure 9, labels A and B). The entire row or rows should be highlighted by clicking on the grey row numbers, otherwise data from columns and rows will become mismatched. From the **Data** menu select **Sort** and, in the window that is displayed, the user can choose up to three columns to sort in any order (Figure 10). Column headings are selected from pull-down menus, and each column can be sorted in either ascending or descending order. The data will remain in the order that they were sorted until another sort is performed.

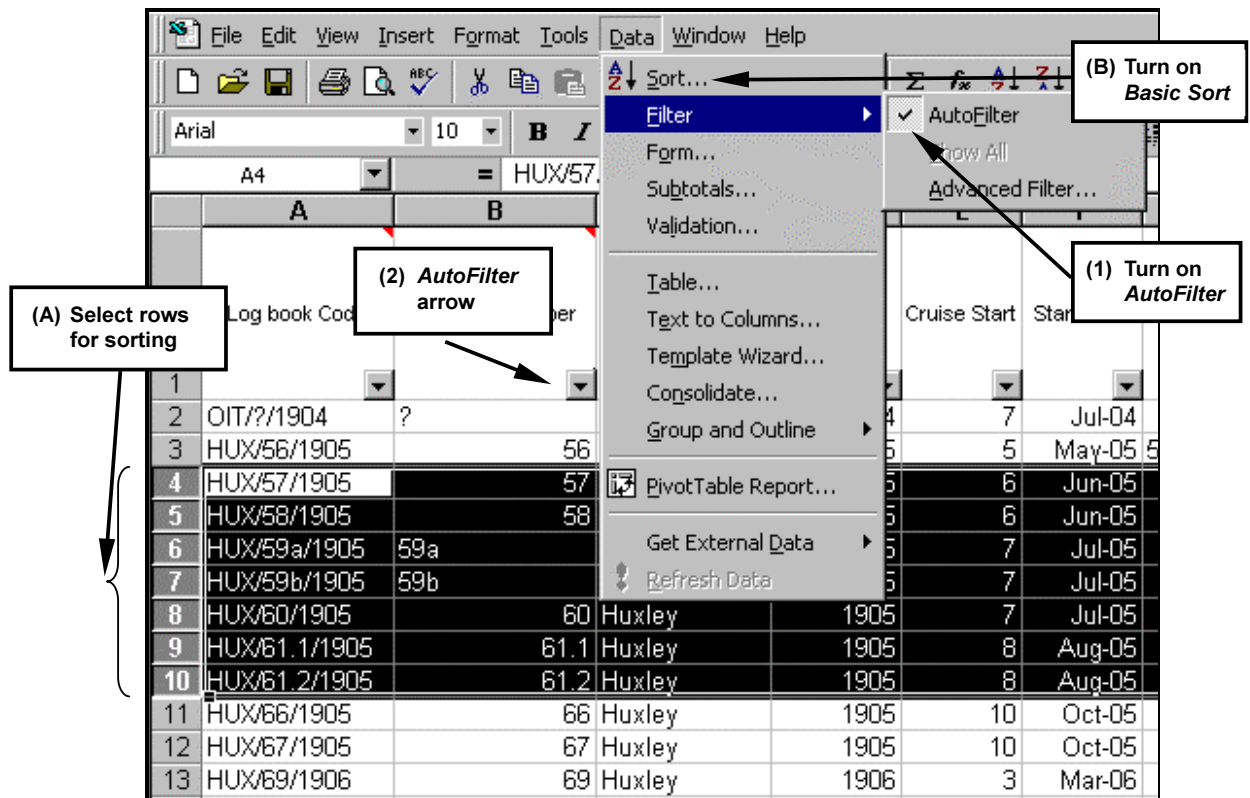
**Table 5. Further information describing the column headings used in the Historic RV Catalogue, worksheet 'Cruise Reports'. This describes the information taken from RV Cruise Reports**

Heading	Description
Cruise Code	Unique reference for each cruise, comprising vessel name, cruise series, and year.
Research Vessel	RV name.
Year	Year.
Cruise Start Month	The month in which the cruise began.
Start Date	Cruise start date as month and year.
Month (1-12)	The months (represented numerically from 1-12) during which the cruise took place. A cruise covering consecutive months is shown by '+', while ';' separates months of intermittent short trips.
Cruise No.	Cruise number for that year, used in the Cruise Code.
Document Location	Storage location of archived material, either at CEFAS Lowestoft, or the Pinbush Road store.
Document Format	Format of the data.
Author(s)	Scientist-in-charge responsible for Cruise Report, and other cruise members..
Sea Area Description	General locality of the work undertaken, from the Cruise Report.
Track Chart ?	Track chart availability (Yes/No).
Log Books ?	Log Book availability (Yes/No).
Measurement Books ?	Measurement Book availability (Yes/No).
Cruise Keywords	Keywords describing the aims of the cruise, from the Cruise Report.
Fish	Fish and shellfish keywords, from the Cruise Report. Those species grouped together at this stage are listed in Appendix II.
Echo	Echo-sounder data. '1' = collected.
Trawl	Data from trawl surveys. '1' = collected.
Seine	Data from seine surveys. '1' = collected.
Grab	Data from benthic grab survey. '1' = collected.
Behaviour	Data on fish behaviour experiments. '1' = collected.
Expts / Trials	Data from a range of experiments and gear trials. '1' = collected.
Egg	Data on fish eggs from plankton surveys. '1' = collected.
Larvae	Data on fish larvae from plankton surveys. '1' = collected.
Age / Len	Records of fish age and/or length. '1' = collected.
Sample	Biological samples collected during cruise. '1' = collected.
Otolith	Fish otoliths samples taken during cruise. '1' = collected.
Tag	Fish tagging undertaken during cruise. '1' = yes.
Plankton	Plankton sampling undertaken during cruise. '1' = yes.
Hydrography	Hydrographic records taken during cruise. '1' = yes.
Benthos	Benthic invertebrates collected during cruise. '1' = collected.
TF	Temperature/Fish distribution surveys (term used only in Arctic cod cruises by RV Ernest Holt).
Radio nucleides	Radio-nucleide data collected during cruise. '1' = yes.

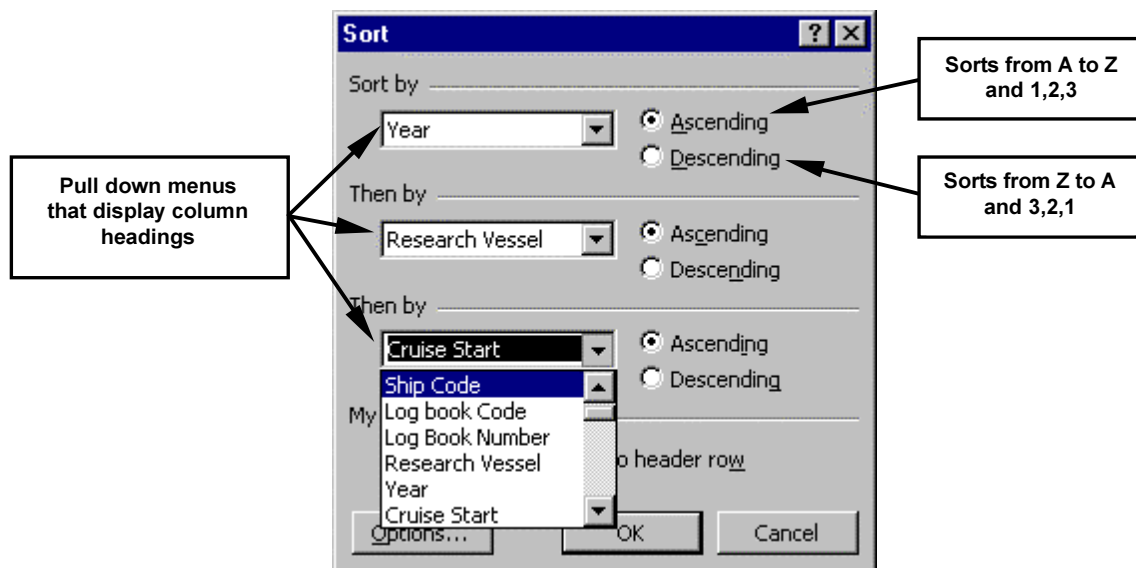
**Table 6. Further information describing the column headings used in the Historic RV Catalogue, worksheet 'Log Books'. This describes the information taken from RV Log Books**

Heading	Description
Log Book Code	Unique reference for each Log Book, comprising vessel name, cruise series and Log Book reference, and year.
Log Book Number	Log Book reference number, used in the Log Book code.
Research Vessel	RV name.
Year	Year.
Cruise Start Month	(see Table 5)
Start Date	(see Table 5)
Month (1-12)	(see Table 5)
Cruise No.	(see Table 5)
Document Status	Describes when Log Books are missing, microfiche ref, etc.
Document Location	(see Table 5)
Document Format	(see Table 5)
Scientist-in-Charge	Lead scientist (named first), and other staff.
Topic	Key words taken from the Log Books. These are listed in full in Appendix III.
Gear	Gear and sampling equipment referred to in the Log Book. These keywords are listed in full in Appendix IV.
<i>FISH AND SHELLFISH SPECIES</i>	Columns 'O' to 'BE' describe the samples of fish and shellfish recorded in Log Books, and recorded as Present only '1', Measured '2', or Measured and biological samples (i.e. stomach contents) taken '3'.
Invertebrate Log Books	Separate benthic invertebrate Log Books available (Yes/No)
Fish Measuring Books	Separate fish measuring Log Books available (Yes/No)
Plankton Books	Separate plankton Log Books available (Yes/No)
Station info	Additional station information available (Yes/No)
Hydro Data	Hydrographic data available including sea temperature '1', salinity '2', dissolved or % oxygen saturation '3', $\Sigma_t$ ( <i>in situ</i> density) '4', phosphate '5' or silicate '6'.
Sea Area Description	(see Table 5)
<i>LATITUDE AND LONGITUDE</i>	Columns 'BL' to 'BO' show the minimum and maximum latitude and longitude of sample stations within each Log Book, when sea area not described.
ICES Division	ICES Division(s) of all samples in the Log Book.
ICES Rectangle	ICES Rectangle(s) of all samples in the Log Book.





**Figure 9. Activating Excel's sorting functions, (1) Basic Sort and (2) AutoFilter.**  
 (1) **Basic Sort:** Highlight all or a range of rows to be sorted (A), then go to the Data menu and select Sort (B) and a window will appear (Figure 10)  
 (2) **AutoFilter:** Select any cell in the heading row (row 1), then activate the AutoFilter function from the Data menu, select Filter then AutoFilter (1). Each column now has an AutoFilter arrow (2). To use AutoFilter click the arrow in the required column, a scroll bar menu will appear, which is described in further detail in Section 4.4 on page 18 (Figures 11 and 12)



**Figure 10. The basic sorting function**

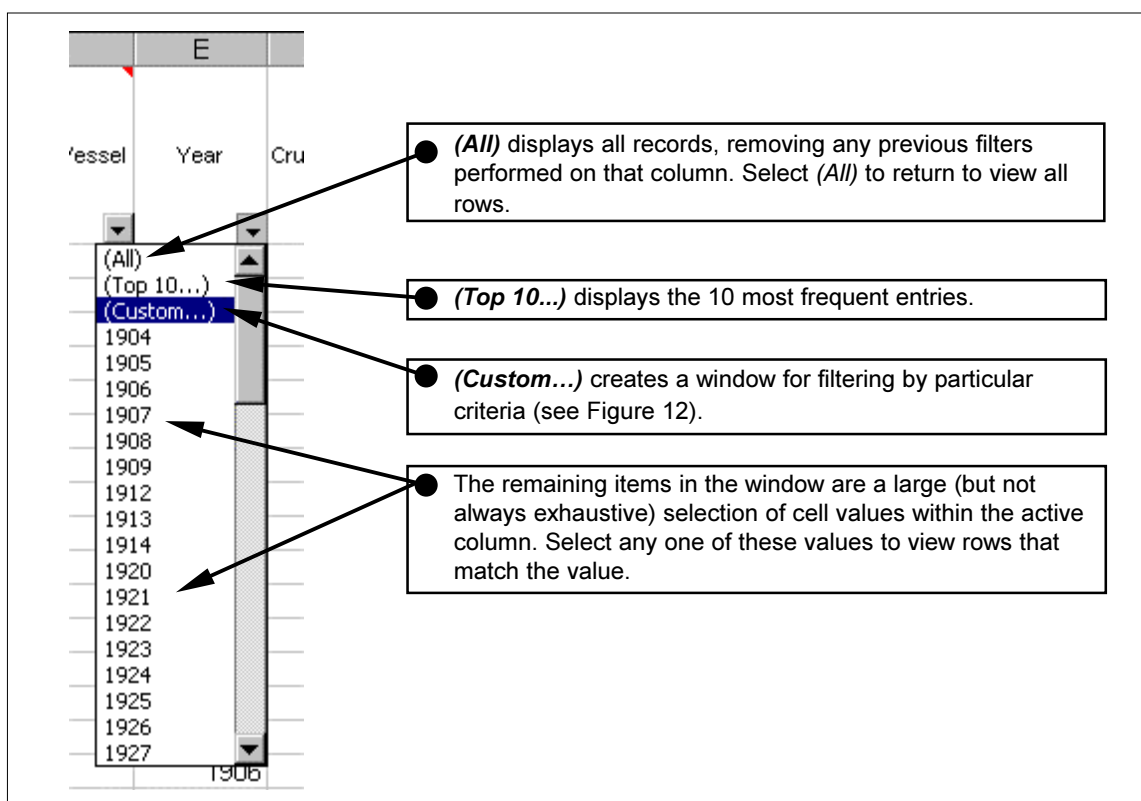
An AutoFilter provides a more refined search that allows you to find information matching specific criteria across a range of different topics. AutoFilter can be used in any Excel worksheet. The following procedure should be adopted:

- (1) Select any single cell in the first row (the column headings).
- (2) Activate the AutoFilter by selecting **Data** from the menu, then select **Filter** and then **AutoFilter** (Figure 9, label 1). Small AutoFilter arrows will appear in the bottom right-hand corner of each column heading cell (Figure 9, label 2).
- (3) Click on the AutoFilter arrow to reveal a contents list of values, topics or categories for that particular column (Figure 11), and three further options, **(All)**, **(Top 10...)** and **(Custom...)** (see below). The AutoFilter arrow is coloured blue if the column has already been sorted.
- (4) Select any single value from the pull-down menu to temporarily filter out all records that do not match it. In the example shown in Figure 11 when using the Cruise Reports worksheet of the Catalogue, selecting the year '1914' will limit the records to the six cruises undertaken in that year. The advantage of the AutoFilter is that several filters can be used on different columns at the same time, which is useful for successively refining the search.

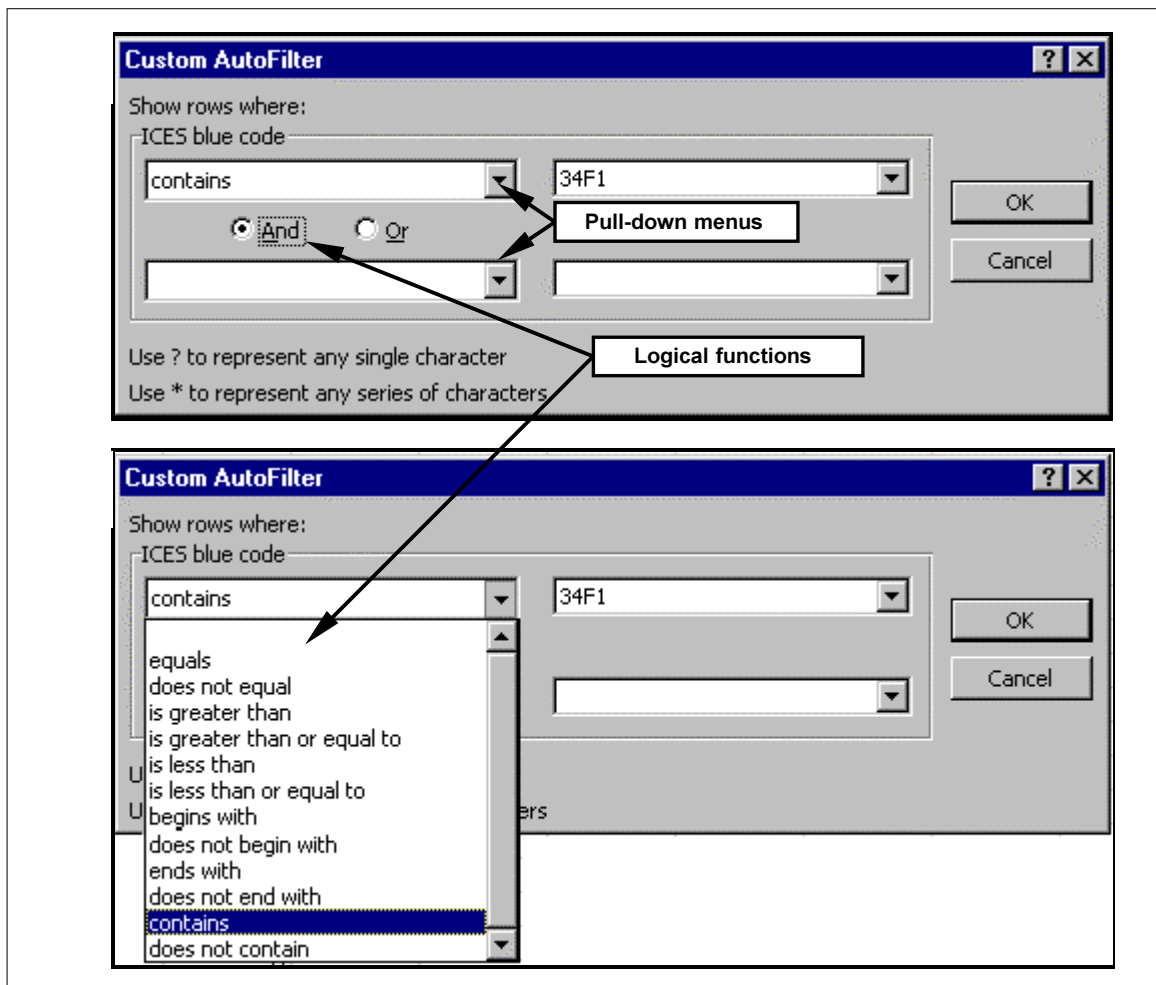
Before each new search is performed on a column, you must return to view all records. To remove an AutoFilter selection (the arrow will be coloured blue), click on the AutoFilter arrow and select **(All)**. Do this for each column used in the AutoFilter. Alternatively, select any single cell in row 1 and turn the AutoFilter function completely off by selecting **Data** from the menu, then select **Filter** and then **AutoFilter** and the tick and AutoFilter arrows will disappear.

The AutoFilter is hierarchical, so that subsequent filters will only filter from the existing records shown. Thus the user must be careful about the order in which AutoFilter criteria are selected.

- (5) A valuable facility offered by the AutoFilter arrow is the use of logical arguments with which to select data. This is accessed by selecting the **(Custom...)** option at the top of the AutoFilter contents list (Figure 11). The Custom AutoFilter box (Figure 12) contains a pull-down list of logical functions to select from. The most useful filtering function for Topic, Gear or Sea Area columns is 'contains'. The functions 'equals' and 'begins with' are also useful but will only return records where the whole or beginning of the cell contents matches your criteria. Functions such as 'is greater than', 'is greater than or equal to', etc. can be used when filtering



**Figure 11. The AutoFilter menu options. A mouse click on the AutoFilter arrow (Figure 9, label 2) will display the options in alphabetical or numerical order**



**Figure 12. Custom AutoFilter functions.** The pull-down menu of logical functions can be used to sort rows in a more refined way than a simple Basic Sort. Records of Topic, Gear and Locality include a string of words in each cell. In the above example the 'contains' function will sort rows to display those that contain a certain value/category. You can also select the And/Or function to refine the search using two criteria

years, months or species data. Two criteria can be applied at once in each column using the 'and'/'or' options, for example, 'Show rows where Year is **greater than** 1946 and is **less than** 1956'. To perform more than two searches on the same column the filtered rows must be copied to a new location. When selecting information such as place names it can be helpful to use the character '?'. For example, in the Sea Area Description column of the log book worksheet, using the function 'contains' with 'Start ?' will identify all log books which contain reference to either Start Bay or Start Point. Similarly, in the ICES Rectangle column, using the function 'contains' with '30 F?' will identify all records which originate from ICES rectangles 30F0 to 30F9 inclusive.

Always remember to remove an AutoFilter selection (the arrow will be coloured blue) before each new search is performed on a column. Click on the AutoFilter arrow and select **(All)**.

Searches performed by AutoFilter are NOT permanent, so any graph generated will change with the outcome of the latest search. To save a search, select all rows, select **Edit** from the menu, then **Copy**. In a new worksheet/workbook select **Edit** from the menu, then **Paste Special** and select **Values**.

#### 4.5 Producing a Basic Map of Log Book Visits to ICES Rectangles

The Catalogue user may have a particular spatial area of interest and want to know what information exists for it, or may need to know all areas in which a certain type of work was undertaken. This section shows how such spatial information can be presented on a map in the style of Figure 8.

Not every Log Book in the Catalogue has an ICES Rectangle reference. Of the 2,475 Log Book entries in the Catalogue, 77% include a reference to a fishing location.

Of these, 78% have been assigned an ICES Division and rectangle code that can be searched using the method below. This equals 60% of all Log Books. ICES references cover all sea areas shown in Figure 8.

As the AutoFilter works in a hierarchical manner, the filter will only search currently displayed records. It is therefore recommended that the user performs the first AutoFilter search on the category that is least likely to change at a later stage.

The majority of Log Books which result from a search of the Catalogue (see Section 4.4) will include an ICES Division or rectangle code. A map template is provided on the CD-ROM (worksheet: ICES Map Template) to enable you to plot the number of log books by ICES rectangle that have the required information.

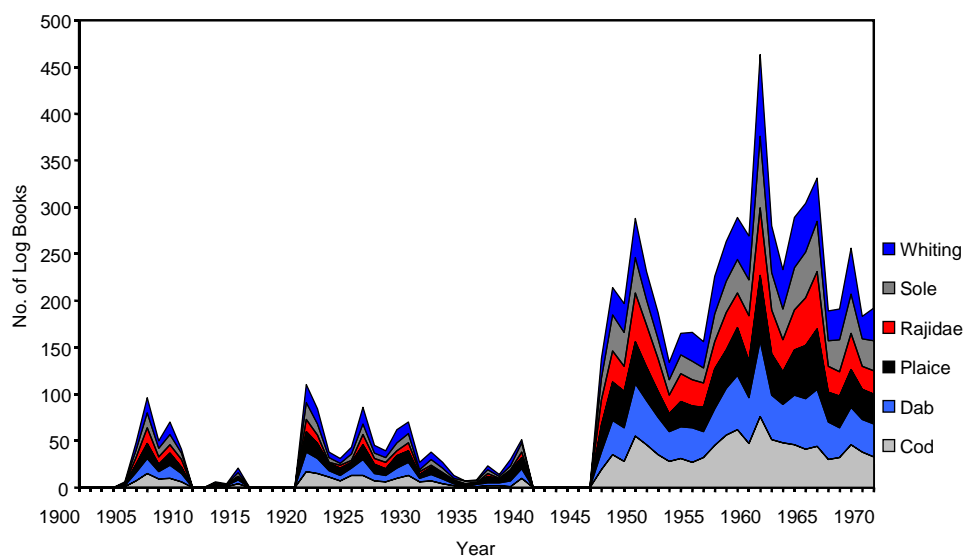
- (1) Following a search of the Catalogue worksheet 'Log Books', highlight the information in column 'ICES Rectangle' (column BQ), omitting row 1, and copy into column Y (begin at cell Y2) of the worksheet 'ICES Map Template'. Highlight the entire column Y, and convert the comma-separated text to columns by selecting **Data** from the menu, then select **Text to Columns**. A new window will appear.
- (2) Click the **Delimited** check box, then click **Next**. Select the **Delimiters, Comma** check box and make sure no others show a tick mark, then click **Finish**. Ensure that no column header text appears in column Y.
- (3) The map pictured on the left of the worksheet will update automatically and will change if the data in column Y are altered. The numbers in each cell of the figure represents the number of times each ICES Rectangle occurs between column Y and AY.

The map must be copied to another location to save it. These files are best saved as pictures, as follows:

- (1) Select the cells A2 to V30 by dragging the cursor between them. This will select the map.
- (2) Hold down the **Shift** key and select **Edit** from the menu and then select **Copy Picture**.
- (3) Release the Shift key and check the box that says '**as shown when printed**' and click OK. This copies the selected map area to the clipboard. The map can now be pasted into another document, where it will be treated as a picture. The map can be previewed by selecting **File** from the menu and then select **Print Preview**. A map pasted directly into a Word or Excel document will appear as a picture that can be resized and modified using the Picture Toolbar. Select **View** from the menu, then select **Toolbars**, then **Picture**. If you paste into another Excel worksheet make sure the gridlines are turned off before printing.

## 5. A REVIEW OF THE CATALOGUE

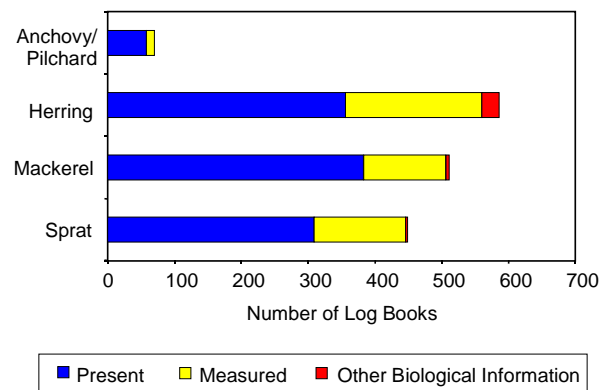
In this section we have summarised some of the information available in the Catalogue, and used example datasets which are most likely to contain data of historical interest. Potentially valuable time series datasets exist for demersal and pelagic fishes (Section 5.1), invertebrate benthos (Section 5.2), and fish eggs and larvae (Section 5.3). The quality of data under the broad heading of hydrography is described in Section 5.4.



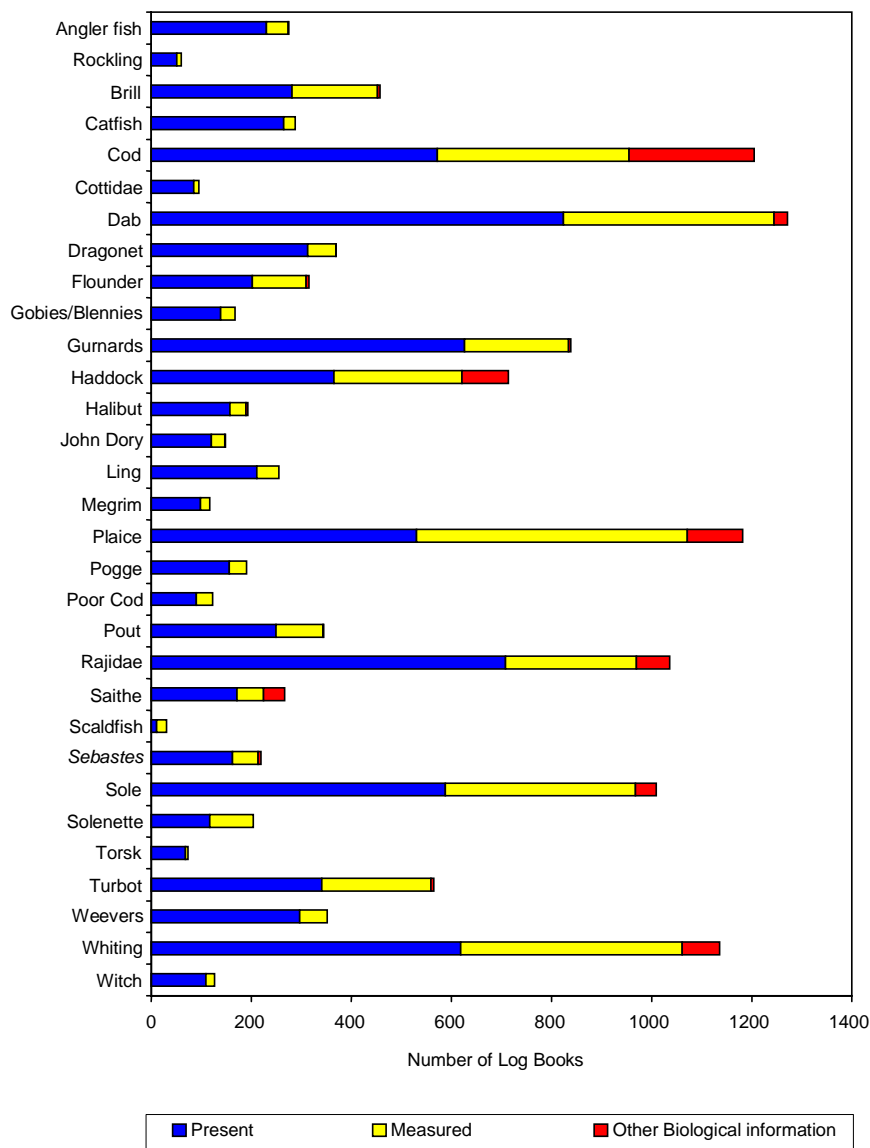
**Figure 13. The number of Scientist's Log Books that include information for the six most frequently recorded demersal fish groups/species**

## 5.1 Fishes

There has been a considerable increase in the volume of data collected for fish since the 1950s, largely due to the advent of annual fishing surveys to identify trends in relative abundance and stock status. Records are most abundant during this period for the main commercial species of interest to the UK, although sample data for the gadoids, flatfish and rays (Rajidae) are available for the entire period (1904-70) (Figure 13). Although a large number of fish species have been recorded during these surveys, the quality of the information that has been collected varies considerably. While the majority of common non-target species have been recorded as ‘present’, they are measured less frequently than commercially important species. Additional data, such as age, sex and stage of maturity, are available most frequently for commercial species, though less often from other species or species groups (Figure 14 and Figure 15).



**Figure 14.** The frequency and type of information recorded in Scientist's Log Books for pelagic fishes. For example, 350 log books recorded herring as present in catches, 200 log books recorded herring measurements, and 20 logbooks recorded herring measurements and other biological information

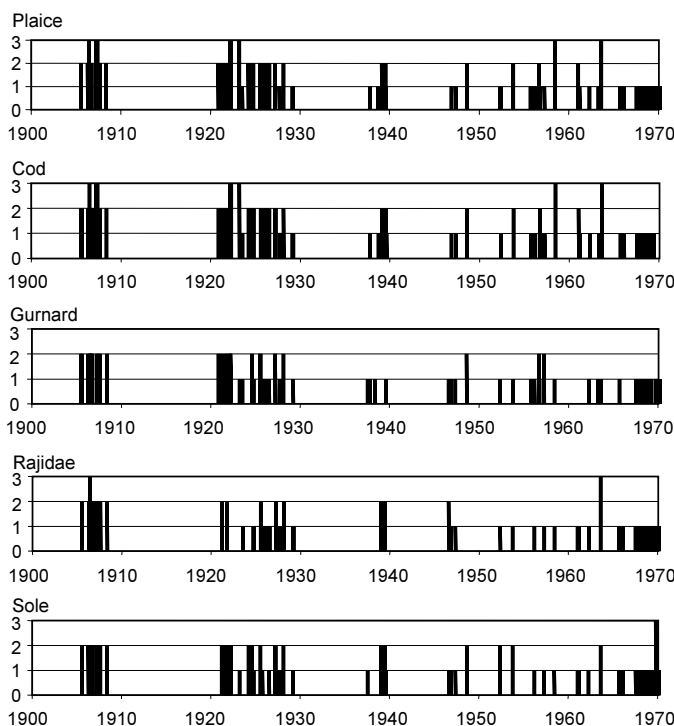


**Figure 15.** The frequency and type of information recorded in Scientist's Log Books for demersal fishes

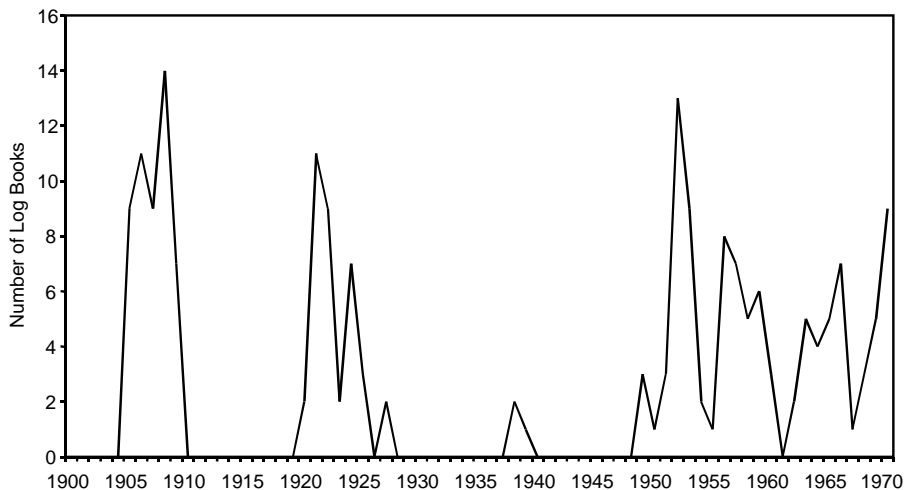
The Catalogue allows a considerable degree of flexibility when extracting these data, and it is possible to identify whether specific datasets exist, and the quality of the data. For example, using key word searches and the mapping facility of the Catalogue, it is possible to identify the number of logbooks which contain length and age information for a particular species, by ICES rectangle and year, for any part of the UK continental shelf. Good quality time-series datasets are available for a number of species for the entire period of the study, and the examples shown in Figure 16 show such information for one location, the Dogger Bank.

## 5.2 Shellfish and other benthic invertebrates

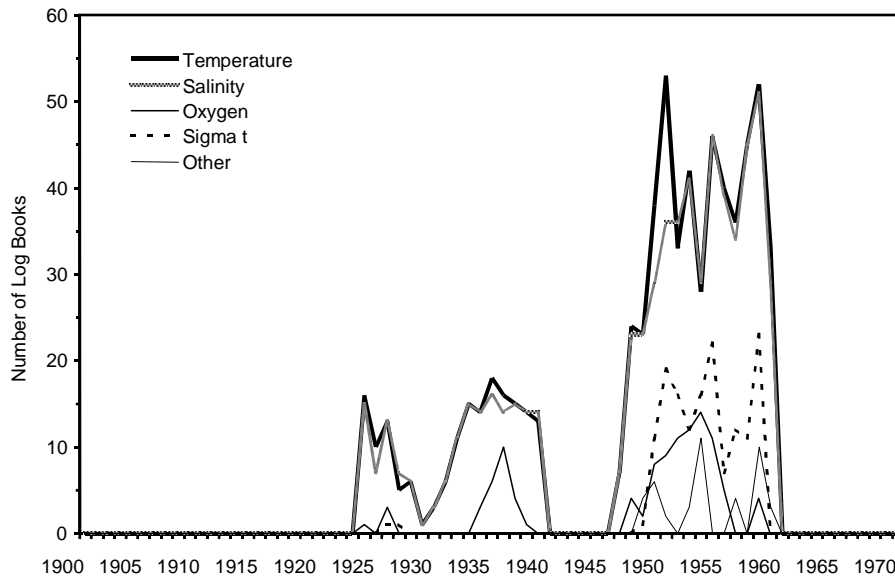
In general, few data concerning shellfish or benthic invertebrates have been recorded in Scientist's Log Books. The exception to this is the series of Invertebrate Log Books used on board the *RV Huxley* (in service 1902-1910), which provide a good record of presence/absence of invertebrates, and those that occurred in large volumes or at high abundance. Other records of benthos are available from a number of other surveys throughout the 20th Century (Figure 17), and although some of these data have already been published, there is more that can be made of these time-series records.



**Figure 16.** Summary of information available for selected demersal fish species collected from the Dogger Bank (all years). 1=present, 2=measured, 3=measured and other biological information taken



**Figure 17.** Number of Scientist's Log Books per year that recorded the collection of benthic invertebrates during research cruises (1904 to 1970)



**Figure 18.** The numbers of Log Books per year which contain hydrographic information for research cruises (1904 to 1970)

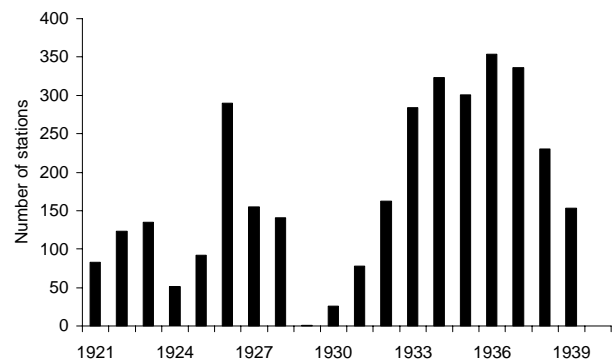
### 5.3 Plankton including fish egg and larval surveys

Historic biological data for phytoplankton, zooplankton and fish eggs and larvae have not been found as paper or computerised records for the period before 1970, even though a large number of surveys were undertaken in UK coastal North Sea waters between 1923 and 1939. Good quality plankton datasets are held at CEFAS Lowestoft in Access databases for cruises carried out in 1976 and 1982, and since 1985. The data are generally held in two tables, one holding the physical data such as environmental and positional information, and the other holding the results of the analyses of the samples themselves.

quality of the data is variable, especially for those cruises for which it was not a primary objective (Figure 18). A series of cruises by *RV George Bligh* from 1921 to 1939 collected water temperature and salinity data from 3,318 hydrographic stations (Figure 19) in the North Sea (primarily English coastal and offshore waters), the Channel and Celtic Sea. These data are not described further in this Catalogue, but can be obtained from the ICES Oceanographic Data Centre. CEFAS Lowestoft maintains an independent store of archived hard bound hydrographic records, which are also not included in this Catalogue. These records include cruise details, station numbers, latitude and longitude co-ordinates, temperature and salinity (and the depth and time that the measurement was taken).

### 5.4 Hydrographic Data

The term ‘hydrographic’ was often used to describe the study of the physical aspects of the oceans, but as the study of ocean sciences expanded the term ‘oceanography’ came into widespread use. Thus current terminology would describe the temperature and salinity observations that are common in this Catalogue as oceanographic data rather than hydrographic. The ICES Oceanographic Data Centre maintains a comprehensive archive of oceanographic data which is available to scientists ([www.ices.dk/ocean](http://www.ices.dk/ocean)). It archives primarily physical (e.g. temperature and salinity observations) and chemical (e.g. nutrients and oxygen) oceanographic data, but has recently included other data describing such aspects as chlorophyll and turbidity. Hydrographic data collected by UK RVs have only been recorded consistently since the end of World War II, but the



**Figure 19.** Number of oceanographic stations sampled by *RV George Bligh* between 1921 and 1939 in the North Sea, Channel and Celtic Sea

## 6. CONCLUSION

For the first time, there is now a comprehensive electronic method to search for the availability of data from all RV cruises undertaken on behalf of DEFRA up to 1970. Summary information from over 2,400 Log Books, representing the research undertaken during almost 2,000 RV cruises, is now available. This offers a unique insight into the work undertaken by DEFRA scientists during the period 1904 to 1970, and the addition of the Log Books to the CEFAS Library reference collection, and provision of modern archiving facilities, now provides much improved long-term security. The Catalogue has been prepared in a way which allows detailed interrogation for species, regions and time-periods, and this will enable scientists to locate a range of potentially valuable datasets.

Some potentially valuable datasets have already been identified during the course of this work. In particular, the fisheries data collected during the first 30 years of the 20th Century provide an excellent opportunity to

develop our understanding of long-term changes in the marine environment. It is clear, however, that more targeted analyses need to be undertaken.

It is important to note that RV information from 1970 to the present day is held on a central database at CEFAS Lowestoft. This holds data for the final 30 years of the 20th Century and, combined with this new Catalogue, allows us to identify all potentially valuable datasets for almost the entire 20th Century.

## 7. REFERENCES

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- LEE A.J., 1992. The Directorate of Fisheries Research: its origins and development. MAFF, London. 332pp.
- WIMPENNY R.S. 1966. The Plankton of the Sea. Faber and Faber, London. 426pp.



## APPENDIX I. Research Vessels to 1970: statistics and service

### Sea-going Research Vessels

**HUXLEY** Service: 1902-10

**Type:** Steam Ship  
**Code:** HUX  
**Notes:** Specially designed RV. First RV based in Lowestoft.  
**Events:** Inactive between 1908-9 and 1909-10 due to lack of funds.

**GEORGE BLIGH** (LO. 309) Service: 4/1921-8/39

**Type:** 138ft (326 tons gross); Lord Mersey Class. Draught was too deep for inshore work, her lifeboat was converted for this purpose.  
**Code:** GB  
**Notes:** Specially designed RV  
**Events:** 1921 Maiden voyage was to find new Plaice grounds between Scotland and Iceland.  
1930 Laid up for 5 month due to lack of funds.  
1935 Returned to full-time work.  
1935 Sent to Iceland to aid the Danish researchers.  
1939 Taken into Admiralty service during the war.

**ONAWAY** (LT. 358) Service: 1930-39; 1946-60

**Type:** 52.5 ft Scottish type drifter, with a semi-diesel engine.  
**Code:** ONA  
**Notes:**  
**Events:** 1939 Taken into Admiralty service during the war.  
1945 Lengthened by 10ft, and engine converted from a 40hp semi-diesel to a 120hp diesel. Speed increased from 5 to 9.5 knots.

**SIR LANCELOT** (LT. 263) Service: 1946-67

**Type:** Round Table class  
**Code:** SL  
**Notes:**  
**Events:** 1950? Cornwall to take underwater cine film of trawling in action.  
1951 Sent to Malta to take underwater cine film of trawling in action.

**PLATESSA** (LT. 205) Service: 1946-66

**Type:** 90ft MFV leased from the Admiralty.  
**Code:** PLA  
**Notes:**  
**Events:**

**ERNEST HOLT** (GY. 591) Service: 1949-70

**Type:** 175ft steam trawler  
**Code:** EH  
**Notes:** Specially designed RV for use in Arctic waters. Operated from Grimsby.  
**Events:**

**TELLINA** (LT. 242)                      **Service:** 1960-77

**Type:** 55ft motor vessel, with a shallow draft for inshore work.  
**Code:** TEL  
**Notes:**  
**Events:**

**CLIONE** (LT. 421)                      **Service:** 1961-88

**Type:** 55ft motor vessel, with a shallow draft for inshore work.  
**Code:** CLI  
**Notes:**  
**Events:**

**CORELLA** (LT. 767)                      **Service:** 1967-87

**Type:** 117ft stern trawler with a diesel engine.  
**Code:** COR  
**Notes:**  
**Events:**

**CIROLANA** (GY. 156)                      **Service:** 1970-present

**Type:** 235ft stern trawler with a diesel electric engine.  
**Code:** CIR  
**Notes:**  
**Events:**

## **Estuarine vessels**

**WYSTRYS**                                      **Service:** 1947-66

**Type:** 50ft oyster smack built in the 1920s.  
**Code:** WYS  
**Notes:** Based at Burnham-on-Crouch. Work confined at all times to Essex estuaries; smaller than RV Nucella, but used for much oyster work. No vessel cruise reports.  
**Events:**

**JASSA**    **Service:** 1947-59+

**Type:** 32ft launch / day boat built for the Ministry at Leigh-on-Sea.  
**Code:** JAS  
**Notes:** Based at Burnham-on-Crouch. Used for oyster cultivation work within Crouch/Roach system only. Rarely mentioned in B-o-C internal reports. No vessel cruise reports.  
**Events:**

**NUCELLA** (LT. 414)                      **Service:** 3/1968-80

**Type:** 46ft diesel engine.  
**Code:** NUC  
**Notes:** Specially designed RV by Burnham-on-Crouch oyster biologist G.D. Waugh for oyster surveys and fishing oysters within the Essex estuaries. Cruise reports present only when used out of Lowestoft.  
**Events:** Based at B-o-C until *ca.* 1979 when it was transferred to Lowestoft for general inshore work on the East-coast (Northumberland southwards).

**PEDRO** Service: unknown

**Type:** Small estuarine boat

**Code:** PED

**Notes:** Based at Conwy Lab. Used mainly for mussel studies and water quality sampling in Conwy Estuary and Menai Strait. Mentioned in only a few internal Conwy shellfish reports between 1964-1966.

**Events:**

## Leased/shared sea-going vessels

**JOSEPH & SARAH MILES** Service: 1920-22

**Type:**

**Code:** JSM

**Notes:** Commissioned from 5/1920-5/1921 to cover the RV *George Bligh* while she was being prepared for service.

**Events:**

**CLUPEA** Service: 1948-52

**Type:** 75ft motor drifter.

**Code:** CLU

**Notes:** Shared with the Scottish Home Department's Aberdeen Laboratory, working half the time from Aberdeen, half from Lowestoft.

**Events:** 1952 Moved to Aberdeen full-time.

**MV MACOMA** Service: 1948-52

**Type:** Launch/day boat

**Code:** MAC

**Notes:** Based at Burnham-on-Crouch. Used for light duties (e.g. plankton), usually within the Crouch/Roach system. Only mentioned twice in Burnham-on-Crouch internal reports (1974, 1981).

**Events:**

**NICHOLAS DEAN** Service: unknown

**Type:**

**Notes:** A trawler loaned by the Admiralty and used by Atkinson the District Fishery Officer. It is unclear whether this ship was used for research purposes.

**Events:**

**GA. REAY** Service: 1980-84

**Type:**

**Code:** GAR

**Notes:** Based in Aberdeen

**Events:**

## APPENDIX II. A list of species that are grouped within species groups in the Historic RV Catalogue: Log Books

Bearded Rockling:	All species of bearded rockling
Bream:	All species of bream
Catfish:	All species of catfish
Cod:	Cod, codling
Cottidae:	All species of Cottidae, including sea scorpion and bull rout
Dab:	Dab, long rough dab
Dragonet:	All species of dragonet
Goby/Blenny:	All species of gobies and blennies
Gurnards:	All species of gurnards
Hake:	Hake, forked hake/forkbeard
Halibut:	Halibut, mock halibut, bastard halibut, blue halibut
Ling:	Ling, blue ling
Mackerel:	Mackerel, horse mackerel/scad
Pout:	Pout, pout whiting
Rajidae:	All species of rays and skates
Sebastes:	<i>Sebastes marinus</i> and <i>Sebastes viviparus</i>
Shark/dogfish:	All species of sharks and dogfish
Sole:	Sole, lemon sole and all other species of sole
Weever:	All species of weevers
Whiting:	Whiting, blue whiting

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## APPENDIX III. A List of Keywords taken from the Log Books and used in the Catalogue under 'Topic'

### Surveys

Echo survey  
Nephrops survey  
Pilchard survey  
Plaice spawning survey  
Red Wharf Bay Survey  
Scallop survey  
Spisula survey  
Sprat survey

### Fish

Clupeoid larvae  
Fish in tanks  
Fish larvae  
Sandeels  
Young fish  
Eggs  
Larvae  
Post-larvae

### Invertebrates

Benthos  
Crustaceans  
Invertebrates  
*Macra*  
*Nephrops*  
*Tellina*

### Biological sampling

Age material  
Blood  
Fat  
Livers  
Maturity  
Muscle  
Otoliths  
Parasites  
Pituitaries  
Scales  
Stomachs

### Tagging

Acoustic tagging  
Tagging

### Gears/gear experiments

Bottom sampling  
Comparative fishing  
Gear tests  
Long lining  
Mesh measurements

### Hydrography

Current meters  
Drift indicators  
Hydro  
Moored buoys  
Photometer measurements  
Salinity  
Temperature  
Waves  
Coconut experiment

### Plankton

Chlorophyll samples  
Copepods  
Diatoms  
Plankton  
Algae

### Miscellaneous

Acoustic  
Artificial fertilisation  
C14 experiments  
Calibrating  
Diving  
Feeding experiments  
Rhodamine B measurements  
Sector scanning  
Sediment  
Video  
Vitality experiments

## APPENDIX IV. A list of gear and sampling equipment Keywords taken from Log Books and used in the Catalogue

### Trawls

Agassiz trawl  
Beam trawl  
Boothbay trawl  
Boris trawl  
Bottom trawl  
Breeches trawl  
Bridport MW trawl  
Brixham trawl  
Brixham whiting trawl  
Broden trawl  
Capelin trawl  
Capella box trawl  
Commercial trawl  
Covered trawl  
Crawler trawl  
Dutch Herring trawl  
Dutch light trawl  
Dutch small trawl  
Dutch Sole trawl  
Dutch trawl  
Engels trawl  
French trawl  
Garstang trawl  
German trawl  
Grange trawl  
Granton trawl  
Haddock trawl  
Headline trawl  
Herring trawl  
Icelandic trawl  
Isaacs-Kidd trawl  
Larsson trawl, Larson, Larsen trawl  
LT No 2 trawl (Lowestoft No 2 trawl)  
LT No 3 (otter) trawl (Lowestoft No 3 trawl)  
LT No 4 trawl (Lowestoft No 4 trawl)  
LT trawl (Lowestoft trawl)  
Mid-water trawl  
Nephrops trawl  
New Sole trawl  
No 2 Gourock trawl  
No 2 trawl  
North Sea trawl  
Otter trawl  
Pelagic trawl  
Petersen trawl  
Platessa Otter trawl  
Prawn trawl  
PYF trawl (Petersen young fish trawl)  
Roker trawl  
Sand-eel trawl  
SARO trawl  
Saunders roe trawl  
Scottish trawl  
Shrimp trawl  
Small Fish trawl

Small Sprat trawl  
Sole trawl  
Sprat trawl  
Standard trawl  
Stanford manilla trawl  
Todds trawl  
Trawl, other  
Trouser trawl  
Ulstron trawl  
VD trawl  
White Fish trawl  
Vinge trawl  
Whiting trawl  
Wollaston bow trawl  
Young fish trawl  
Young plaice trawl  
Young saithe trawl

### Seine nets

Beach seine  
Danish plaice seine  
Fly seine  
Haddock Seine  
Lance (Lance) seine  
Plaice Seine  
Purse seine  
Seine, other  
Whitebait Seine

### Nets, misc.

1m silk net  
Apstein net  
Bottom plankton sampler  
Brood nets  
Changing net  
Clarke Bumpus net  
Coarse International net  
Coarse net  
Corbin net  
Dip net  
Drift net  
Fine international net  
Fine net  
Gill nets  
GO net  
Hardy Plankton Indicator  
Hardy torpedo  
Hardys net  
Harvey net  
HCPR (Hardy Continuous Plankton Recorder)  
Heligoland larva net  
Hensen net (Hensen egg net)  
High Speed Tow net  
HL net  
Icelandic High Speed sampler  
Icelandic High Speed Tow net

International net  
Kensington stow net  
Lampara net  
Larva net  
Lucas net  
M net  
Macer Plankton sampler  
Naked net  
Nansen net  
Neuston net  
Petersen net  
Plankton indicator  
Plankton net  
Push net  
Ring net  
Shrimp net  
Spectacle net  
Sprat Drift net  
Square Stow net  
Stow net  
Stramin net  
Surface Tow net  
Sutton Shoal sampler  
Tangle net  
Tow net  
Trammel net  
Triangle Stow net  
TT net (= Tin Tow net)  
Weather ship net  
W.N. net

### **Pots and lines**

Crab pots  
Cray pots  
Feathers  
Hand lines  
Long lines  
Pots (other)  
Rod & line  
Snella lines

### **Dredges etc.**

Anchor dredge  
Baird dredge  
Conical dredge  
Detritus sledge  
Dredge, other  
Lobster larva dredge  
Naturalists dredge  
Oyster dredge  
Scallop dredge  
Sledge, other  
Triangle dredge

### **Grabs**

Baird grab  
Ekman grab  
Grab, other  
Petersen grab  
van Veen grab (VV grab)

### **Water current recorders**

Carruthers current meter  
Current crosses  
Current cone  
Current meter  
DRCM (Drift recording current meter)  
Drift bottles  
Drifters, sea-bed  
Drifters, bottom  
Drifters, indicator  
indicator Plessey current meter  
PISA current measurer Bottom current  
WSBD (Woodheads seabed drifters)

### **Others**

Armed lead  
Barrel  
Bathythermograph  
Bucket  
CCN  
Camera (Cine-camera)  
Camera (UW camera)  
Coral cutter  
Core sampler  
Coulter counter  
Divers cards  
Echo sounder  
Elliot + Garrod frame (= E+G frame)  
ER Surface sampler  
Lumby surface sampler  
Engine room surface sampler  
Surface salinity sampler  
Flow meter  
Fluorometer  
Frame  
GEK (Geomagnetic electro-kinetograph)  
Haemocytometer  
High Speed sampler  
Hydrophotometer  
JONES Caterpillar (SCADAD)  
Light meter  
Longhurst sampler  
Oxygen bottles  
Oxyteter  
Pair boat samples  
Parachute drogues  
PDR (Precision Depth Recorder)  
Petrov Hausser counter  
Photometer  
Hydrophotometer  
UW Photometer  
Pingers  
Pump (Donkey)  
Recovering frame  
Reversing Thermometer  
Ridderstad savings gear  
Scanner (Admiralty Research Laboratory)  
Secchi disc  
Sieve  
Simaca  
Sonar

T/D bomb  
Temperature-Depth recorder  
Thermistor  
Thermometer  
Towed body  
Towed electrodes  
Towed thermistors  
Turbidity meter  
Water samples  
Water Bottle (Reversing)

Water Bottle (Ekman)  
Water Bottle (Nansen)  
Water Bottle (Nansen-Petersen)  
Water Bottle (Torpedo)  
Water Bottles, misc (WB)  
Wave recorder  
Wimpenny celluloid bucket  
Wimpenny tube  
XBT (Expendable Bathythermograph)  
Yo-Yo bucket

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