



THE STATUS OF DATA SUPPLY TO THE ICES OCEANOGRAPHIC DATABANK: THE LAST 25 YEARS

by

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ABSTRACT

With the present interest in climate studies and global change, data collection over long time periods is becoming of increasing importance. The ICES Oceanographic Databank includes quality controlled hydrographic data from 1902 onwards and is a very valuable resource to marine scientists. Until the early 1960s most of the relevant data were submitted to ICES, but since then the position has deteriorated, although with the advent of data archaeology projects the situation has recently improved slightly. This paper looks at the status of data flow to ICES over the last 25 years, considering each member country in turn. Using the ROSCOP database maintained at ICES the number of cruises reporting hydrographic data is compared with those actually supplying the data. The status in each country is assessed and some explanations are offered. Problems areas are identified and some solutions suggested.

INTRODUCTION

The ICES Oceanographic Databank contains over half a million profiles of hydrographic data dating back to 1902. It provides a very valuable resource to marine scientists, although there are many gaps in the data holdings. Until 1960 most of the hydrographic data collected by Member Countries were forwarded to ICES and published in the Bulletin Hydrographique and later in the ICES Oceanographic Data Lists. In the 1960s the volume of data became too large to handle in this way. In addition, during the 1960s, the Intergovernmental Oceanographic Commission (IOC) encouraged the setting up of National Oceanographic Data Centres (NODCs). These Centres were to be responsible for the reformatting and quality control of data, which, in the ICES region, could then be passed on to ICES for inclusion in the Oceanographic Databank. However, in many cases this model has not worked well, because the NODCs were not equipped to handle hydrographic station data, or because funding dictated other priorities or else owing to a lack of commitment.

More recently some initiatives have resulted in an increase in the data flow. One of these is the IOC sponsored Global Oceanographic Data Archaeology and Rescue (GODAR) project, which is supported by ICES and aims to search out data which might otherwise be lost. The data could be in manuscript form or on magnetic media but not stored in any secure databank. In addition, initiatives by the Commission of the European Communities Marine Science and Technology (CEC/MAST) programme will insist that scientists complete Cruise Summary Report (ROSCOP 3rd Edition) forms and bank their data in recognised databanks at the end of the projects. These moves should also encourage data submission.

This paper examines data flow to ICES over the 25 year period 1967 to 1991 using the ICES ROSCOP database as its main tool. The ROSCOP form, a general purpose form for reporting on measurements and samples collected at sea, should be completed by the Principal Scientist at the end of a cruise and summarizes the data collected and the area visited. Normally completed forms are forwarded to one of the World Data Centres for Oceanography, to an NODC or to ICES. The present version of the ROSCOP form, the Cruise Summary Report, is the 3rd edition of these forms and came into use in January 1991.

STATUS OF DATA SUPPLY TO ICES BETWEEN 1967 AND 1991

This paper is a first attempt at quantifying the data supplied to ICES, through the use of the ROSCOP database. This approach is in some ways flawed as not all scientists submit ROSCOP forms for their cruises; however the ROSCOP database is the best available starting point and where a lack of ROSCOPs is suspected this is noted. ICES use the ROSCOP database as a tool to help search out data and to record which data are held in the ICES Oceanographic Databank, together with any relevant comments about those data. The database is available on floppy disk or by file transfer (ftp) over Internet and provides a useful way of checking which data are available from ICES. The period chosen for this investigation is the 25 years between 1967 and 1991 and it uses the database as it was in March 1993. 1991 was chosen as the cut-off point because it was felt that the ROSCOP information should be fairly complete for 1991, but would not be for 1992.

The approach used is to consider each ICES Member Country in turn and to extract the number of cruises collecting water bottle or CTD data for each year as reported on the ROSCOP form and then compare this with the number of cruises which have supplied these data to ICES. For ease of understanding this information is then presented in five year groups over the 25 year period (Table 1). The total number of cruises reported for each country over the whole period is also included, as are the totals for all countries together for each five year period.

In total, for all Member Countries, information has been supplied to ICES from 9943 cruises via ROSCOP returns; the water bottle and/or CTD data from 4502 of these cruises has been supplied to ICES (i.e. 45%). Table 1 should be considered together with the comments below which briefly describe the status and provide some explanation for each ICES Member Country. A general rating is applied to each country for both ROSCOP and data supply as follows: 70% or more - good; 40 to 55% - moderate; less than 5% - poor. All Member Countries fall into one of these three categories.

Where information is sparse and a country is a member of the European Community (EC), reference is made, where useful, to the CEC/MAST programme European Directory of Marine Environmental Data (EDMED), which is coordinated by the British Oceanographic Data Centre (BODC). EDMED is being developed as a computer searchable directory of data sets relating to the marine environment. Version 1 is due for publication late in 1993.

Belgium

Information and data supply from Belgium has fluctuated over the 25 years. Between 1967 and 1976 only 20 cruises were reported on ROSCOP and no data from these cruise have been supplied to ICES. Between 1977 and 1986, ten ROSCOPs were received and the data from all of them supplied. Note that the data from this period are from more than one cruise: each ROSCOP details the measurements carried out over a year by one ship. Between 1987 and 1991 ROSCOPs for 32 cruises were supplied and data from just over half of them were submitted. Altogether, about 10 laboratories have reported on ROSCOP. Overall 45% of the cruises reported have supplied data, but it is likely that quite a number of cruises have not been reported via ROSCOP forms. Data supply and ROSCOP reporting is moderate for Belgium.

| | 1967 - 1971 | 1972 - 1976 | 1977 - 1981 | 1982 - 1986 | 1987 - 1991 | Total |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Belgium | - (8) | - (12) | 5 (5) | 5 (5) | 18 (32) | 28 (62) |
| Canada | - (41) | 2 (30) | - (62) | 1 (52) | 1 (75) | 4 (260) |
| Denmark | 56 (67) | 52 (78) | 63 (81) | 92 (112) | 99 (110) | 362 (448) |
| Finland | 25 (25) | 28 (28) | 72 (73) | 58 (60) | 21 (21) | 204 (207) |
| France | 1 (44) | 1 (125) | 10 (172) | 4 (120) | 3 (30) | 19 (491) |
| Germany (1) | 159 (236) | 95 (215) | 138 (277) | 220 (421) | 179 (467) | 791 (1616) |
| Germany (2) | 3 (3) | 5 (36) | 13 (49) | 34 (54) | 20 (38) | 75 (180) |
| Iceland | 41 (41) | 51 (51) | 80 (80) | 57 (57) | 27 (27) | 256 (256) |
| Ireland | - (4) | - (21) | - (15) | - (-) | - (11) | - (51) |
| Netherlands | 79 (120) | 67 (124) | 34 (112) | 25 (145) | 24 (49) | 229 (550) |
| Norway | 53 (146) | 98 (169) | 181 (201) | 238 (265) | 186 (288) | 756 (1069) |
| Poland | 57 (78) | 47 (95) | 22 (68) | 30 (101) | 74 (107) | 230 (449) |
| Portugal | - (-) | - (1) | - (5) | - (5) | - (6) | - (17) |
| Russia | 65 (82) | 99 (107) | 179 (186) | 3 (19) | 7 (7) | 353 (401) |
| Spain | - (7) | - (20) | - (9) | - (3) | - (21) | - (60) |
| Sweden | 107 (109) | 131 (140) | 107 (109) | 104 (104) | 102 (102) | 551 (564) |
| U.K. | 116 (362) | 149 (337) | 134 (241) | 89 (260) | 156 (300) | 644 (1500) |
| U.S.A. | - (8) | - (943) | - (568) | - (139) | - (104) | - (1762) |
| Total | 762 (1381) | 825 (2532) | 1038 (2313) | 960 (1922) | 917 (1795) | 4502 (9943) |

Table 1. Status of Data Flow to ICES (1967 - 1991) For each 5 year period (and for the total) the figures in the first column refer to the number of ROSCOP forms received by ICES for which the data have been supplied. The figures in the second column refer to the total number of ROSCOP forms received by ICES.

Canada

Over the 25 year period 260 ROSCOP forms have been received from Canada by ICES. Usually about 10 cruises a year are reported but this varies between one (1974) and 30 (1988). ROSCOPs are filled in for only a few cruises, but ROSCOP type information is supplied to the Marine Environmental Data Service (MEDS), Ottawa, for all Canadian cruises. Data are also sent to MEDS from Canadian laboratories, but ICES has only received data from four cruises (in 1972, 1976, 1982 and 1989) over the 25 year period (this comprises about 1.5% of the cruises reported). Three of these are related to projects for which ICES is the data centre (e.g. Overflow 73 and the Greenland Sea Project). About 15 laboratories have submitted ROSCOPs, the majority of forms coming from Department of Fisheries and Oceans laboratories. Overall ROSCOP and data supply is poor for Canada.

Denmark

Over the 25 year period Denmark has supplied 448 ROSCOP forms to ICES; over recent years this has meant that about 25 forms per year are submitted and the rate of supply is fairly constant. Hydrographic data from standard sections are forwarded to ICES, which acts as the NODC for this type of data for Denmark. Overall 81% of the data reported on ROSCOP have been supplied and this figure varies only slightly over the 25 year period. Most of the data and ROSCOP forms come from 4 organisations with smaller contributions from 3 others. Data collected up to and including 1991 have been submitted, with one cruise from each of 1992 and 1993 also supplied. Data noted not to be at ICES have often been collected by light vessels and comprise surface temperature measurements only. Comparison with EDMED entries, which are thought reasonably comprehensive for Denmark, suggests that this is an accurate summary of the data collected. Data and ROSCOP submission to ICES is good for Denmark.

Finland

Data have been reported on ROSCOP from 207 cruises, all undertaken by one laboratory, the Institute of Marine Research (IMR), Helsinki, and collected primarily from one ship. Approximately 5 cruises a year were reported between 1967 and 1974. Between 1975 and 1987 approximately 15 cruises per year have been reported, with the exception of 1976 and 1983. Virtually all of the data reported on ROSCOP (i.e. 98.5%) up to and including 1987 have been sent to ICES and data have been received from one cruise in 1990. Recently all Finnish data have been sent back to IMR from ICES for comparison, which has proved a useful exercise. Data and ROSCOP submission is good for Finland.

France

ROSCOPs were sent to ICES in the past, although the supply has fluctuated over the 25 year period, with 491 ROSCOP forms sent in total. Over the five years 1987 to 1991 only 30 forms were received, all but 2 of these from 1987 and 1988. There was an active French oceanographic data centre until the mid-1980s, but then activity decreased until the Centre was reestablished in the early 1990s. ROSCOPs are sent to the data centre, who maintain their own database, this will be copied to ICES once it has been fully updated. Over the 25 year period only a small volume of French data has been received at ICES. Usually less than one cruise per year is supplied; often this is International Young Fish Survey (IYFS) data or some other ICES coordinated project. In fact, IYFS data have been supplied for 1988 to 1992 inclusive. Overall only 4% of the data reported via ROSCOP have been supplied to ICES, and, although ROSCOPs have been supplied from over 25 organisations, there may still be much information missing. EDMED is only of limited use to check this, since the French EDMED is not yet complete. ROSCOP information is moderate and data supply is poor for France.

Germany

For most of the period considered, Germany comprised the Federal German Republic (FGR) and the German Democratic Republic (GDR) and this division is used in Table 1. For the former FGR the number of ROSCOPs reported has increased from about 45 to over 90 per

year during the 25 year period. ROSCOP information has been supplied from approximately 30 organisations. Data supply was around 50%, but this has decreased to 38% for the 5 year period 1987 to 1991. Out of 102 cruises reported on ROSCOP in 1991, data from only 7 have been supplied to ICES. Overall, data from 49% of the cruises have been submitted to ICES.

With the exception of the years 1967 to 1971, the former GDR reported just under 10 cruises a year on ROSCOP and data from just less than half of these have been supplied to ICES. Data were supplied to ICES until 1990, when data collected on only one cruise (out of 11) were sent to ICES. All of the cruises reported by the former GDR, except two, are from one laboratory. The supply of ROSCOPs would appear to be reasonably complete; internal reorganisation within Germany may have temporarily halted the supply of data to ICES, but hopefully it should resume in due course. Overall data supply is moderate and ROSCOP submission is good for Germany.

Iceland

Data from 256 cruises have been reported on ROSCOP over the 25 year period and data from all of these cruises have been supplied to ICES. ICES acts as the NODC for hydrographic data for Iceland. Approximately 10 cruises per year are reported and this has remained fairly constant. One laboratory, the Marine Research Institute (MRI), Reykjavik, is responsible for all of the measurements, which are collected primarily on one of two vessels. Since 1988 no data have been reported and no ROSCOP information is available at ICES. This is because the MRI is reorganising its data storage, and, once this work is completed, data supply will resume again. ICES has recently sent all the Icelandic data back to MRI for incorporation in its new database. Overall ROSCOP information and data supply from Iceland is good.

Ireland

There has been little activity in the past, although 51 cruises have been reported on ROSCOP. These refer primarily to Coninbeg, Queen of Aran or Lough Beltra cruises. No ROSCOP information is at ICES for 1967 and 1980 to 1986. Five laboratories have completed ROSCOP forms; most of the forms are from the University of Galway. No Irish data have been supplied to ICES from the 25 year period between 1967 to 1991; but data have been supplied from one 1992 cruise. However, with the setting up of the Irish Marine Data Centre in 1993, both ROSCOPs and data will be sent to ICES in the future. Overall data supply and ROSCOP submission from Ireland is poor.

Netherlands

The Netherlands have supplied approximately 25 ROSCOPs per year to ICES over the first 20 of the 25 years under consideration; for the last five years (1987-1991) only 49 ROSCOPs have been received at ICES. The number of cruises reporting data to ICES has gradually decreased over the 25 years. Altogether, data from 42% of the cruises reported on ROSCOP have been supplied, but this has decreased from 66% data supply between 1967 and 1971 to 17% between 1981 and 1986. For the 5 year period from 1987 to 1991, although the percentage of cruises supplying data apparently increases, the actual number of cruises (24) is almost the same (25) as in the previous 5 years. There is no national oceanographic data centre in the Netherlands. Approximately 10 organisations supply ROSCOPs; four of these are major suppliers; data supply varies between them. The Rijkinstituut voor Visserijonderzoek (RIVO) has reported 81 cruises over the 25 year period and supplied data from 65% of these; the Netherlands Institute for Sea Research (NIOZ) has forwarded 159 ROSCOP forms but supplied data from only 12% of these; the Koninklijk Nederlands Meteorologisch Instituut (KNMI) has supplied 155 ROSCOP forms, 99 of which are for the vessel Cumulus (Ocean Weather Ship 'Mike' or 'Lima') - data from 70% of these cruises have been supplied, but other than this, no data have been supplied by KNMI since 1975 and no ROSCOPs have been received since 1982. Data supply overall is moderate for the Netherlands; ROSCOP submission was good, but is declining.

Norway

Norway regularly reports cruises on ROSCOP and has supplied 1069 forms over the 25 year period. The number of forms per year has increased from 30 to 55 over the 25 years. Data have been supplied from 71% of these cruises although the supply of data has been erratic in the past. Up until the mid-1970s just less than half of the data collected have been supplied to ICES, whereas 90% of the data collected between the mid-1970s and the mid-1980s have been supplied. Data supply then tails off again during 1990 and 1991. ROSCOPs and data come from about 5 laboratories, but about 85% of the forms are from the Institute of Marine Research (IMR), Bergen. Data supply to ICES has recently been discussed at IMR and will improve from 1994. Overall ROSCOP submission and data supply is good from Norway.

Poland

Over the 25 year period Poland has submitted 449 ROSCOP forms to ICES and supplied data from 51% of these. Reporting via ROSCOP has been fairly regular, with approximately 20 cruises a year. The information comes mainly from three organisations: the Polish Academy of Sciences (PAS, Sopot) who have participated in such ICES coordinated projects as the Patchiness Experiment (PEX) and the Skagerrak Experiments (SKAGEX) and who have submitted their data to ICES; the Sea Fisheries Institute (MIR), Gdynia, most of whose data have been sent to ICES and the Institute of Meteorology and Water Management (PIHM), Gdynia, some of whose data are at ICES. ROSCOPs and data have been submitted for 1990 and 1991; some data have also been received for 1992 cruises. Overall ROSCOP submission is good and data supply moderate from Poland.

Portugal

Very few ROSCOPs have been received by ICES over the 25 year period and no data have been supplied. Those ROSCOPs received have all come from the Hydrographic Institute, Lisbon. Of the 17 ROSCOPs supplied, 14 are part of one experiment and the other 3 are part of another. No forms have been supplied for the years 1967 to 1972, 1974 to 1976, 1978, 1983 and 1991. The EDMED compilation for Portugal is fairly complete and lists about 20 laboratories, institutes and universities involved in collecting marine environmental data; of these at least 8 have collections of hydrographic data. Indeed, the Hydrographic Institute has recently published an inventory of its oceanographic cruises which took place within their Economic Exclusion Zone (EEZ) between 1906 and 1986, including information on their water bottle data holdings. Data supply and ROSCOP submission for Portugal is poor.

Russia

Russia has supplied 401 ROSCOP forms to ICES over the 25 year period; the number of ROSCOPs per year increased over the first 15 years, with 186 forms received between 1977 and 1981, and then dropped dramatically with only 26 forms from the following 10 years. Over the first 15 years of the period (1967 to 1981) data from over 90% of the cruises was forwarded to ICES; since then very little data have been received (i.e. data from only 10 cruises). No ROSCOPs have been received for 1987 to 1989. Overall, 88% of the data reported on ROSCOP forms have been supplied; but the current status of both data supply and ROSCOP submission is poor.

Spain

Over the 25 year period only 60 ROSCOPs have been supplied; these have come from about 6 laboratories. No ROSCOPs have been supplied for 1967, 1969, 1981 to 1984 and 1989. Some of the more recent ROSCOPs relate to CEC/MAST funded projects. The Spanish contribution to EDMED lists about 20 different laboratories, institutes and universities; half of these have collections of hydrographic data, some of which are quite extensive. Data supply and ROSCOP submission for Spain is poor.

Sweden

ROSCOP forms have been submitted for 564 cruises over the 25 year period, at a rate of about 20 to 25 per year. Data from virtually all of the cruises have been supplied to ICES (i.e. 98%). The data supply was good, but has fallen behind recently: data submission ceases in mid-1991 apart from 1 cruise in 1992. ROSCOPs were sent up to 1988; since then ICES have created forms when data have been supplied, except in specific projects (e.g. SKAGEX), where ROSCOPs were also supplied. Data will now (from 1993) be sent annually again, or as quickly as possible for particular experiments. Data are sent from about 5 laboratories and include data collected by research ships, coastguards and icebreakers. Overall, data and ROSCOP supply for Sweden is good.

U.K.

The UK has submitted 1500 ROSCOP forms over the 25 year period and data from 43% of these have been sent to ICES. The data supply has been reasonably constant at this level with only small fluctuations over the period. ROSCOP forms are submitted from almost all cruises. Data are supplied from three main sources: the Ministry of Agriculture, Fisheries and Food (MAFF) Fisheries Laboratories, the Natural Environment Research Council (NERC) and the Scottish Office Agriculture and Fisheries Department (SOAFD) Marine Laboratory. MAFF submit their data to ICES annually, usually in March, but ICES do not receive any of the biologists' data at present. SOAFD also submit their water bottle and CTD data annually to ICES. The data from the February IYFS are sent as soon as possible. Data submission from NERC laboratories and universities (approximately 20 organisations) via BODC has been erratic over the period due to lack of funding and resources. However, the situation should improve over the next few years because BODC now has funding to acquire, quality control and bank UK hydrographic data. Once this work is underway, data will be sent to ICES regularly. In any case, data from the NERC North Sea Project (1988-1990, 38 cruises) have been sent to ICES. Overall, for the UK, ROSCOP form submission is good and data supply is moderate.

U.S.A.

ROSCOP forms from the USA are now being digitised for inclusion in the ROSCOP database and this is reflected in the figures given in Table 1. No data have been supplied, but relations with the US National Oceanographic Data Center (NODC) are good and access to their data holdings is available to ICES. Overall, data supply from the USA is poor and ROSCOP submission is moderate, but improving.

COMMENTS ON DATA SUPPLY AND SUGGESTIONS FOR IMPROVING DATA FLOW

The countries naturally fall into three groupings for supply of data to ICES. Denmark, Finland, Iceland, Norway and Sweden are good; Belgium, Germany, the Netherlands, Poland and the UK are moderate; and Canada, France, Ireland, Portugal and Spain are poor. Russia was good but data supply has almost ceased over the last 10 years and the USA was poor, but the situation is improving. For those countries where the data supply is good, the supply of ROSCOP information is usually also good. However even those countries who appear to be very good data suppliers (i.e. Finland, Iceland and Sweden) should not be complacent, as data supply has fallen behind in recent years. Of those countries who are moderate in their data supply, Germany, Poland and the UK are good for the submission of ROSCOP forms, the Netherlands was good, but has fallen behind over the last 5 years and Belgium is probably only moderate. The countries which are poor at supplying data are, in general, also poor at supplying ROSCOP information, with the exception of the USA whose NODC is digitising and passing on to ICES its ROSCOP information, and France, which is compiling its own ROSCOP database which should be passed on to ICES when it is up-to-date.

Why should some countries be better than others at supplying data to ICES? Consider those countries which have been categorised as good: Denmark and Iceland use ICES as their NODC

for hydrographic data; all five countries have only a small number of laboratories involved in data collection and are geographically and/or culturally close to ICES Headquarters in Copenhagen. Those countries in the moderate bracket often have a larger number of laboratories (e.g. 30 in Germany, over 20 in the UK). Those in the poor category are, on the whole, geographically more remote (e.g. Canada, Portugal, Spain, the USA) or do not have well developed data management programmes (e.g. Spain, Portugal, Ireland), although Ireland has just set up a data centre which should improve the situation there.

One major problem for most, if not all, Member Countries may well be the lack of awareness of which data are required (or even that data are required at all), which format they should be sent in or to whom the data should be sent (i.e. direct to ICES or via an NODC). Although this information is undoubtedly available, it may not reach the right scientists or may not be passed on as scientists move to different jobs. Lack of information may also be used as an excuse not to submit data. Thus a useful first step is to increase awareness of what is required, linked to showing the data holdings already available. The ICES Marine Data Management Working Group (MDMWG) are making this a priority, in close collaboration with the ICES Oceanography Secretary. Information will be distributed widely and will include a summary of the requirements for submitting data to ICES and a note of some of the resulting benefits. These are outlined at the end of this document.

One of the criticisms often levelled at data centres is that they resemble 'black holes' into which data sink, never to re-emerge. One way of improving this image is to advertise those data and services which are available. A PC package is being developed at ICES which allows station locations to be plotted on a map on the screen for a given year (or years) and/or area. This is an excellent way of indicating which data are available and efforts will be made by MDMWG to encourage this and to distribute it as widely as possible.

CONCLUSION

This brief survey of the status of data supply to ICES over the 25 year period from 1967 to 1991 shows that a little under half of the data reported on ROSCOP forms have been supplied to ICES, and also, that there are some sizeable gaps in the submission of ROSCOP forms. Data supply is generally good from those countries geographically close to ICES and from projects where ICES is the specified data centre or the coordinator of the project. Apart from this data submission is generally very low although more data are submitted for shelf seas than from the deep ocean. A first step to stimulate data flow to ICES is to inform scientists of the benefits of submitting their data, to ensure that information of what is required is readily available and to advertise the data already included in the ICES Oceanographic Databank and how they can be accessed. In addition, data archaeology projects, like the GODAR project, will help rescue older data, and should obviously be encouraged.

References

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Requirements for submitting data to the ICES Oceanographic Databank

- * The data required includes classical water bottle (i.e. temperature, salinity, nutrients), CTD/STD and data from undulating recorders (i.e. Batfish, Sea Rover, SeaSoar)
- * Traditionally data were supplied in ICES format either on coding forms or magnetic tape. Although ICES format is preferred (with the temperature and salinity data merged with nutrient data), other simple ASCII formats are acceptable (although these should not change from one data submission to the next). Data can also be supplied in internationally agreed formats such as the IOC's GF3 format, or ICES approved formats such as Blueprint 86. Data can be supplied on floppy disk or, for those with Internet connections, over the computer network using the ftp facility. ICES will provide help and advice on the best way to supply data.
- * Data should be transmitted via the NODC; for countries with no NODC, data can be sent directly to ICES. Data submitted to NODCs can carry a reminder that a copy of the data should be forwarded to ICES. If in doubt ICES will provide advice.
- * Scientists' wishes about the confidentiality of their data will be respected, so that access to the data by others can be restricted for a period of perhaps two to three years while papers are written. In any event, ICES will contact scientists about any requests for their data collected over the previous 10 years.
- * It is recommended that data are submitted as soon as they have been worked up. Long delays before supplying data usually results in much extra work in resolving any queries about the data.

Benefits of sending data to the ICES Oceanographic Databank

- * Keeping up-to-date a high quality regional database, with data from 1902 onwards, which is of great value for global change and climate studies, and provides more information than is available in any one country. In addition, data are available in a common format.
- * Rapid quality control of data and feedback on quality and problems
- * Long term security of data. Data not submitted may well become mislaid or lost; they may also deteriorate if kept under unsuitable conditions.