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RECORDING SCHEMES FOR BENTHIC MACROFAUNA

by

N.A. Holme

Erratum

C.M. 1974/K:17. Shellfish and Benthos Committee.
Recording schemes for benthic macrofauna. By N.A. Holme.

In Figure 3 the boundary between sea areas S40, 19, 18, 41 and 55 lies at 49°30'N, not 49°15'N. The boundary between S16 and 17 should be between 49°30'N, 03°40'W and 50°00'N, 02°00'W.
Similarly the southern boundary of S41 is at 47°30'N and that between S55 and 56 lies between 47°30'N, 06°15'W and S. Mathieu Point.

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RECORDING SCHEMES FOR BENTHIC MACROFAUNA

by

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Summary

Data on the distribution of the more readily identifiable species of the macrofauna, particularly molluscs and echinoderms, are continually obtained during the course of benthic investigations, but the results often remain unpublished. Such data are valuable for tracing distribution patterns and for assessing population changes in the benthos. Formerly, data on the occurrence of species were incorporated into published papers or into fauna lists, but there is today a need for making readily available up-to-date records of occurrence, which include data which would not normally be published. A number of computerised recording schemes have been proposed or are in use for this and related purposes, but there is uniformity neither in the method of recording nor in the nature of the data recorded. Although a uniform system is probably unattainable, and is certainly undesirable at this stage, much could be gained by agreement on the Latin names to be ascribed to species for recording purposes. A system for computerised recording of benthic species in the English Channel is outlined, and a mapping grid based on I.C.E.S. statistical rectangles proposed.

Introduction

Much information on the distribution of benthic species is obtained in the course of investigations related to such studies as benthic production, the ecology of fish-feeding grounds, the effects of dredging or dumping of solid materials, and the effects of pollution. The data so obtained are often incidental to the main purpose of the investigation, so that records may remain unpublished or be incorporated into reports having a limited circulation.

Knowledge of the main features of the distribution of benthic species, both in space and time, is important for studies of zoogeographical distribution, on the distribution of species in relation to particular water masses, and on the effects of other environmental factors, including pollution, on marine populations. Species of the benthic macrofauna mainly have a life-span of several years, and since most are slow-moving or sedentary they may prove useful as 'monitors' of

longer term conditions in an area. Moreover their dead remains, particularly the shells of molluscs, may be valuable as indicators of former populations.

The collection of benthic samples, and their necessary sieving, sorting and identification, are time-consuming processes, often involving specialists for identification of certain taxonomic groups. However useful studies involving less ship time and manpower, can be made if every use is made of all available samples taken at sea, for whatever purpose, and if distribution patterns are based on species which can normally be identified by the experienced worker in the field. In this way the material which must be brought back to the laboratory can be drastically reduced, and the possibility of making use of records (authenticated as necessary) from a variety of sources is opened up. Such studies, perforce mainly on echinoderms and molluscs, parallel those of C.G. Joh. Petersen in which the names of the principal echinoderm and mollusc were used to define the different benthic communities.

An admitted disadvantage of using certain invertebrate groups, notably lamellibranch molluscs, for defining distribution patterns is the fact that in some species successful spatfalls occur only at intervals of a number of years, so that a single year-class may settle, grow up, and eventually die out without necessarily being replaced. This difficulty may be largely overcome by basing any conclusions on a broad spectrum of species, so that undue emphasis is not placed on the disappearance or reappearance of any single species, especially if this is known to show marked fluctuations in spatfall from year to year.

Fauna Lists

Records of occurrence have been traditionally recorded in published papers describing the species or communities of a particular area, or have been incorporated into fauna lists, which have been published either as a whole or in separate parts. Such lists, typically based on explorations in the neighbourhood of a recently established marine laboratory, tend to become in course of time merely historical records, because of a failure to update records and to chronicle fluctuations through the years of even the more characteristic species. Today we need a more dynamic approach, with records regularly brought up to date and grouped in time series, and with greater emphasis on quantitative data.

Computerised fauna recording

In recent years a number of schemes have been put forward for computerised recording of faunistic data. In marine benthos these may relate to specific grab or dredge sampling programmes; they may be more general collations of benthic records from all sources; or rely on published distribution data; or they may relate to the cataloguing of museum collections. Some schemes have been in regular use for a number of years, others are untested and liable to revision in the light of experience.

For benthos perhaps the most comprehensive scheme is that used by Roland Wigley at the National Marine Fisheries Service Biological Laboratory, Woods Hole, which has been in use for over 10 years. This involves coded sets of data for taxonomic units and for station data, which are entered on 80-column punched cards for transfer to magnetic tape for storage and retrieval. Other systems, for rather different purposes, are described by Fredj (1972) and by Swartz (1972). G. Høpner Petersen of the Zoological Museum, Copenhagen has computer programmes for compilation of benthic records from the North Sea, and he has developed a printout system using a superimposed transparent overlay, so that maps showing distributions in statistical rectangles may be readily produced from printout. Louis Cabioch at the Station Biologique at Roscoff is developing a system, in consultation with the C.N.E.X.O. Laboratory at Brest, for computer recording of his benthic stations in the English Channel.

Because of the diverse purposes for which these systems have been developed, and because of the varying nature of the data to be stored it seems unlikely that any uniform system of data recording is possible or even desirable at the present time.

In the United Kingdom recording schemes for terrestrial fauna and flora have been developed by the Biological Records Centre (BRC) at the Institute of Terrestrial Ecology, Monks Wood. Recently these have been extended to include certain marine groups - namely macro-algae, isopod Crustacea, Mollusca and Echinodermata. The latter are intended for recording distributions on the shore and in coastal waters around Britain, the data being presented in the form of distribution maps in which presence within squares of a grid system are recorded. Instructions for these schemes are given by Heath and Scott (1974).

Benthic recording in the English Channel

My own records from the Channel, and relevant records from the literature, will be stored in a system based on the marine recording schemes which were developed in conjunction with BRC. This has been modified for my own use to allow processing of data at Plymouth and the incorporation of records from phyla not at present covered by BRC schemes.

The basis for these records is a new Marine Record Card (Fig. 1), in which the original data are inserted, one card being used for each species record. The data are then transfered to 80-column punched cards, and then to magnetic storage. It is intended to retain both the original and punched cards for reference, and for security against loss or accidental erasure of the tapes. The nature of the data entered on the cards is shown in Fig. 1. Coding is similar to, but not always identical with the BRC schemes. It is very important to establish at an early stage agreed Latin names for species which are then "frozen" for recording purposes. This allows handling of data by staff unfamiliar with synonymies. Such lists have been compiled for BRC marine schemes, the Plymouth Marine Fauna names being used for other groups in my surveys. Retrieval of records will be primarily in the form of a printout giving the details entered on the cards, but when sufficient records are available these may for some purposes be produced in the form of distribution maps.

The BRC uses 10km squares of the National Grid for recording terrestrial fauna and flora in the United Kingdom, and 50km squares on the Universal Transverse Mercator projection for the Continent of Europe. For marine records there is the problem that those from the shore are usually taken from a land map bearing a kilometre grid, while offshore records are expressed in latitude and longitude. However oceanographic data is normally based on latitude/longitude positions, and it would seem logical to plot marine records on this basis. Grids for marine recording should be based on subdivisions of 10° x 10° Marsden squares, but there is no general agreement on a way of subdividing these large squares. In the Channel a grid based on a subdivision of I.C.E.S. statistical rectangles (each 1° longitude, $\frac{1}{2}$° latitude) into 100 parts, is being used, so that each rectangle is 6' x 3'. A scale devised by my colleague Dr. P.E. Gibbs, for placing a latitude/longitude position into this grid is shown in Fig. 2 (a similar scale, with minutes of longitude reversed, is used for positions W. of Greenwich). The I.C.E.S. grid gives true squares at 60°N, these becoming increasingly elongated E-W,

on a Mercator projection, farther south. However they may be plotted as true squares, with some distortion of land outlines, as in Fig. 3. A grid of true squares lends itself more readily to mechanical printout of results, and a grid of this nature is used by Høpner Petersen for the N. Sea records.

Grid plotting of results is, of course, by no means essential. Individual station positions may be plotted manually or by graph plotter. However a grid is a useful means of laying out stations when planning a programme, and later when interpreting the results.

Conclusions

A computerised system of recording is a useful adjunct to a study of distribution patterns of the more readily identifiable members of the benthic macrofauna. For groups required identification by specialists, it may be less necessary because of the smaller number of records likely to be involved. However, the system can be used for records of any species whose distribution can be readily expressed either in map form or as a line printout.

References

Fredj, G., 1972. Stockage et exploitation des données en écologie marine. Mémoires de l'Institut océanographique, Monaco, 4, 61 pp.

Heath, J. & Scott, D., 1974. Instructions for Recorders. Biological Records Centre, 28 pp. (Obtainable from the Biological Records Centre, Monks Wood Experimental Station, Abbots Ripton, Huntingdon, PE17 2LS, England).

Swartz, R.C., 1972. A preliminary design of an information system for biological collection data. Chesapeake Science, 13, S191-197.

MARINE BIOLOGICAL ASSOCIATION OF THE U.K.

MARINE RECORD CARD

Ref. B/74

Order (1–4)	Type (5–6)	Serial No. (7–10)
0078	A	00563

Genus & Species: Asterias rubens (11–24: ASTERIAS RUB)

Grid: OE4/994 (25–32: OE49940F)

Sea Area: East Channel (33–35: S14)

Latitude & Longitude: 50°13·8'N 0°26·7E (36–47: 5013 8N 0026 7E)

Station No.: Y023 (48–51)

Depth (m): 0038 (52–55)

Tide Level: - (56)

Habitat: Gravel (57–59: 144)

Date: 15 12 79 71 (60–67)

Abundance: 2/trawl (68–70: 025)

Recorder's No.: 1026 (71–74)

Stage (75):

Source: MSR (76–78)

Expert (79):

Add. Data (80):

Comments & Compiler: NAH

Figure 1. Example of card used for benthic records in the English Channel.

1-4 Class Asteroidea
5-10 Type of card, and serial number of record
11-24 Genus (first ten letters), and first three letters of species. Column 21, normally blank, is used to indicate variety.
25-32 Mapping grid. Columns 31 & 32 indicate ICES grid. 25-30 the six letter grid. Position of sample is shown by an x in Fig. 223
33-35 Sea area
36-47 Latitude and longitude, to 1/10 minute.
48-51 Station number, prefixed by a code letter.
52-55 Depth
56 Coded tide level for intertidal samples.
57-59 Habitat, coded. Offshore/Mobile epifauna/Gravel deposit
60-67 Day/month/year
68-70 Abundance. Columns 68 & 69 for numbers, column 70 for unit of measurement. In this instance 2 per trawl.
71-74 Code number of recorder
75 Stage, or may be used to indicate dead shell of a mollusc
76-78 Source of record. In this instance : small Agassiz trawl/ research vessel Sarsia
79 Identity checked by an acknowledged expert in the group.
80 Used to indicate presence of a further card with additional data

Coding for tide level, habitat and stage and distribution of sea areas from Heath & Scott (1972).

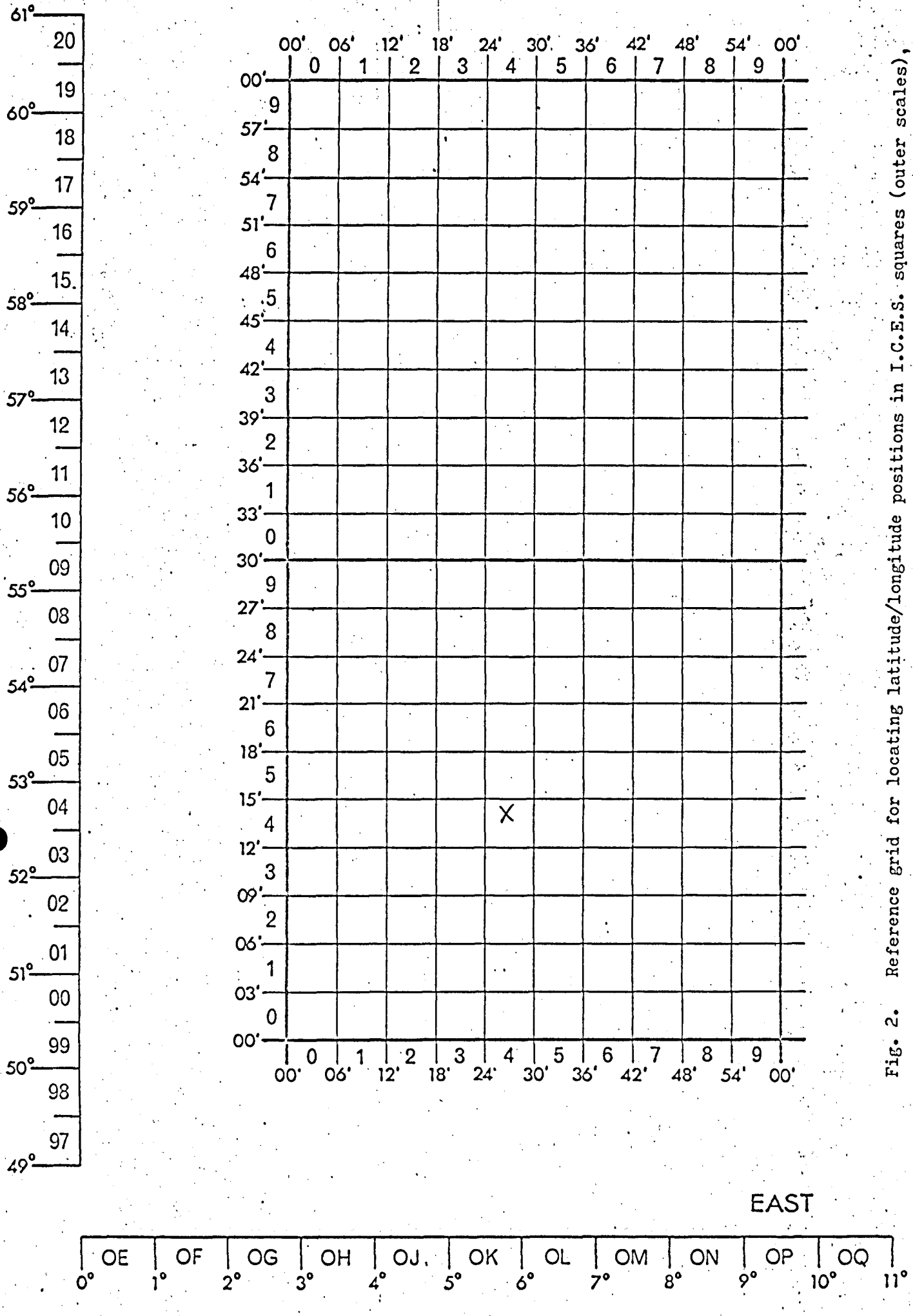

Fig. 2. Reference grid for locating latitude/longitude positions in I.C.E.S. squares (outer scales), and 1/10 x 1/10 subdivisions of these squares (inner grid).

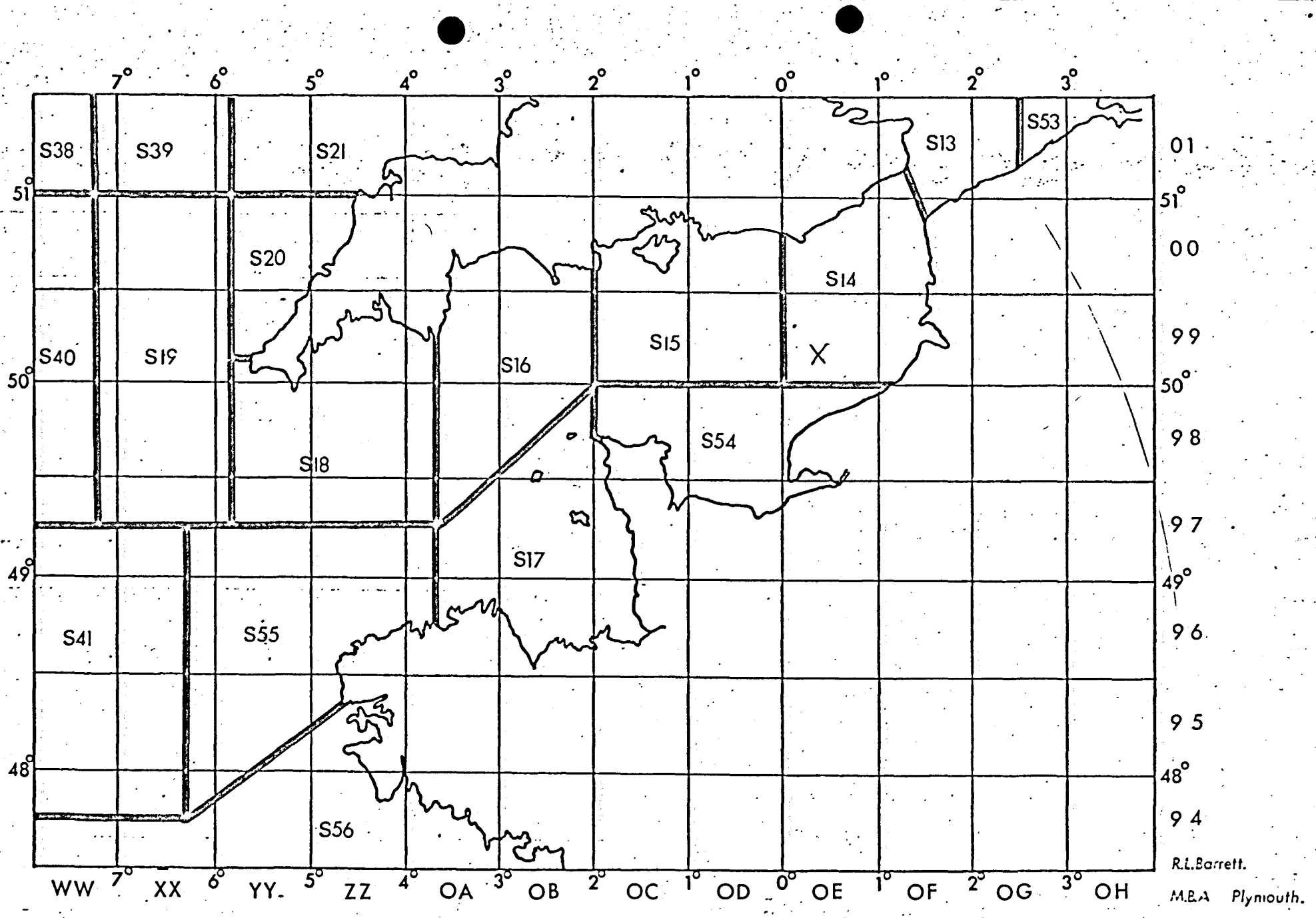

Figure 3. I.C.E.S. squares, and sea areas, in the Channel.