BODC Project Database Structure

Introduction

A relational database is made up from tables. Each table contains one or more fields. Some of these fields, termed key fields, are contained in more than one table and provide the mechanism for linking tables, and hence the data they contain, together. If a key field occurs once in each of two tables, then a one to one relationship between the tables is established. If the key field occurs once in one table and many times in the other, then a one to many relationship exists between the tables.

The BODC Community Research Project databases are relational databases that have been built for the specific task of storing project data in a way where it may easily be found when required. The end result is an effective, if not elegant, design. Simple structures exist that match the data. These structures are extended in response to data sets supplied. However, as the databases have developed, certain patterns have been recognised in the data. In response to this, fully normalised structures (i.e. the type conventional database designers desire) have been developed. The advantage of these normalised structures is that providing the rules of their underlying data model are obeyed by the data, their scope may be expanded with no maintenance overheads. Their disadvantage is that significantly more work is required getting data in and getting data out.

We therefore have a situation in practice where simple and fully normalised structures exist side by side. Any spare resource is directed towards converting the simple structures into normalised structures, providing a clear advantage can be seen in doing the work. The structure of the database is therefore dynamic but it is supported by 'soft' documentation that can evolve in parallel.

Table Types

The database may be considered as containing five types of table. The database is built on an event-based data model. In other words, something has to happen to generate the data stored. The primary information in the database therefore has to describe what these events were, where they happened and when they happened. This information is stored in the database primary index tables. In the following table definitions, the hot links to these tables are coloured red.

The data model assumes that the events are related to the data they generate by one to many relationships. These relationships are implemented in the database by one or more secondary index tables. These tables also provide storage for metadata that are specific to a single type of event. The hot links to these tables in the table definition index are coloured green.

The third type of table is the fully normalised data table. These may be regarded as stable, long term entities within the database. Because the structures are normalised, it is not possible to obtain the sort of cross-tabulated output most users require using simple SQL queries. Consequently, data access tools are provided by BODC. The hot links to these tables in the table definition index are coloured blue.

The normalised data tables are supported by a series of code tables, such as the parameter dictionary, that together may be termed the dictionary tables. The hot links to these tables in the table definition index are coloured 'dark yellow'.

Finally, there are the simple-structured data tables. These may be effectively interrogated by simple SQL queries. However, they should be regarded as transient entities that may disappear from subsequent database releases. Obviously, if they do disappear, the data they contained will have been transferred to a fully normalised structure within the database. The hot links to these tables in the table definition index are coloured magenta (pale purple).

The Parameter Dictionary

The parameter dictionary is an essential feature of the normalised data storage tables. The identification of parameters is based on 8-byte codes. These have been designed using a hierarchical model. The first four bytes may be considered as the 'parent'. This provides information on the parameter at a low level of detail. This parent has one or more 'child' 8-byte codes. These subdivide the parent into more detailed information.

This relationship is exploited in different ways. For example, chemical parameters have a parent field identifying the basic parameter with the children identifying different measurement protocols. Thus 'CPHL' is chlorophyll-a, but CPHLHPP1 is chlorophyll-a measured by reverse-phase HPLC on an acetone extract from a GF/F filter. For biological species codes the parent specifies the genus and the children the species.

There are a large number (thousands) of parameters coded in the database. Finding out what a given code means is straightforward. A query matching on field CPMUSG of table ZUSG will provide the answer.

However, specifying the parameter code for data retrievals requires some thought. The secret lies in the use of wild cards which any database management system can incorporate into query searches. The recommended technique is to use table ZUPM to identify the parent code of the parameter you require. A wild card may then be set up to include as many of the child codes as required. One word of warning: always check the meanings of all codes covered by a wild card as there are traps for the unwary. For example, the wild card CORG% covers both CORGCAP1 ("POC") and CORGCOD1 (DOC) which should not be merged into a single data set!

Documentation Structure

This document contains two main sections. These are:

Table Definitions: A description of the fields contained in each table of the database.

Linkage Definitions: Documentation that describes how the tables of the database are linked together through their key fields.

TIP If you are looking for a particular type of data and don't know which tables you require, looking through the linkage definitions will provide a quick and easy way of finding out what you need to know.

Database Table Definitions

This section provides a field level description of all the user-accessible tables in the ODB database.

Table ADCP

This table contains the current velocity and returned signal amplitude profiles measured by shipboard Acoustic Doppler Current Profilers (ADCPs).

Table ADCPINDX

This table is the ADCP profile inventory and stores relevant metadata.

Table ARGOS

This table contains Lagrangian current data in the form of the tracks of drifting buoys or sediment traps tracked by Argos satellite or a following ship.

Table BINCTD

This table contains the CTD profile data, averaged into either 1 db (casts shallower than 100 db) or 2 db bins. BINCTD also contains the "pseudo CTD" profiles derived from SeaSoar data.

Table BOTDATA

This table contains analytical data on water and air samples. A very wide range of parameters is stored here.

Table BOTTLE

This table provides an inventory of the water and air samples, collected by a variety of methods, held in the database. Note that the name BOTTLE is more of a historical relic than a description of current usage. Vital information, particularly the depth or height from which the sample was taken, is held in the table.

Table BOTYPINDX

BOTYPINDX is a simple code table that defines the bottle type codes used in table BOTTLE.

Table C14DAT

This table contains ^{14}C uptake (primary production) data from long period (generally 24 hour) on-deck and in-situ incubations, including size-fractionated data. The table may also be used to store P:I profiles.

Table C14HDR

This table provides an inventory of the ^{14}C uptake (primary production) experiments held in the database. Vital metadata fields are included. The table also provides storage for column integrated data.

Table COREINDX

This table provides an inventory of core samples. Note that an event can generate several cores by use of multiple corers or through sub-cores.

Table COREPROF

This table contains the sample data from along-core profiles. One record is stored for each parameter measured on each sample in each profile. A wide range of parameters is stored.

Table CORESAMP

This table contains the independent variables for the core profiles stored in the database.

Table CORETOT

This table contains whole core sample data. These are either analyses undertaken on bulk core or grab samples or parameters derived from core profiles such as flux determinations. A wide range of parameters is stored.

Table CRSINDX

A number of the CRP databases contain data from more than one project. This table allows the user to identify which events were associated with which project by linking together the cruise fields from table EVENT. Metadata storage fields for each cruise are also provided.

Table CTDCAL

This table contains the calibration coefficients applied to the CTD profiles by the BODC processing system.

Table CTDINDX

This table provides an inventory of the CTD casts held in the database together with storage for CTD-specific information.

Table CTDTYP

This is a code table that supports table CTDINDX by defining the mnemonics used to identify CTD instrument types.

Table EVENT

An event is defined as any activity that results in the collection of data that are stored in the database. Table EVENT contains information on what the event was and where and when it occurred. It could therefore be considered as the most important table in the database and should certainly be involved at the start of any search for data.

Table EVENT_COMM

This is an extension of the EVENT table that carries a plain language comment field. This is only separated to make the EVENT table less cumbersome to list.

Table G_CODE

G_CODE is a simple code table that defines the gear codes used in table EVENT.

Table MOORINDX

This table provides an inventory of the data series (generally individual instruments) pertaining to each mooring event.

Table MOOR_PARAMS

This is a code table providing definitions for the parameter mnemonics used in table MOORINDX.

Table MSP

This table may contain both depth profile and time series profile data collected by the Marine Snow Profiler (a quantitative photographic system, which can be mounted on the CTD or a mooring).

Table ORGCODE

Table ORGCODE is a code table defining the data originator codes used in the database.

Table PRINDEX

This table provides an inventory of data collected by profiling instruments (except CTD) and the link between the EVENT, PRLINK and PRDATA tables. The table includes data from Profiling Radiometers, Expendable Bathythermographs (XBTs) FLY probes and Sound Velocity Probes.

Table PRLINK

This table provides a one-to-many linkage between the profile (table PRINDEX) and the individual measurements (table PRDATA). It allows ordering of the data by time.

Table PRDATA

PRDATA contains water column data obtained from various profiling instruments.

Table SSINDX

This provides an inventory of the SeaSoar profiles held in the database, including the depth range covered by each profile.

Table STINDX

This table provides an inventory of sediment trap samples stored in the database and implements the 'one-to-many' relationship between a sediment trap deployment and the individual samples. These result from either traps at multiple depths and/or traps with multiple cups. Metadata parameters are also stored.

Table SVDATA

SVDATA contains data obtained from settling velocity tube experiments. Each record contains one parameter per sample from a particular tube.

Table SVSAMP

This table provides a one-to-many linkage between the settling velocity tube (table SVTINDX) and the individual measurements (table SVDATA).

Table SVTINDX

This table provides an inventory of the Settling Velocity Tube events. Vital information, particularly the depth or height from which the sample was taken, is held in the table.

Table SVTOTAL

Table SVTOTAL contains data relating to an entire Settling Velocity experiment. The table is linked to SVTINDX.

Table TIDAL_CONS_DATA

Tidal constituents datacycles produced from harmonic analysis.

Table TIDAL_CONS_HEAD

Table TIDAL_CONS_HEAD contains the tidal constituents' header information, and is the main index to the TIDAL_CONS system.

Table TIDAL_CONS_NAME

The tidal constituents code table is primarily used as a cross-reference of Doodson number (used in table TIDAL_CONS_DATA) against constituent name.

Table TRAPDATA

Table TRAPDATA provides storage within a fully normalised schema for sediment trap analytical data and fluxes.

Table ZUCT

This table is part of the parameter dictionary. Its function is to group the 4-byte 'parent' parameter codes into categories to enable them to be interrogated more easily.

Table ZUNT

This table is part of the parameter dictionary. It is a code table that defines the codes used to represent parameter units.

Table ZUPM

This table is part of the parameter dictionary. It contains the definitions of the 4-byte 'parent' parameter codes (i.e. the first four bytes of the parameter code).

Table ZUSG

This is the main table of the parameter dictionary, containing definitions of the full 8-byte parameter codes.

Table ADCP

Field Definitions

BEN	NUMBER(6)	BODC Event Number.
BINDPTH	NUMBER(7,1)	Depth of the ADCP data bin (m).
PGOOD	NUMBER(4,1)	Percentage of good data returned for the bin.
FPGOOD	CHAR(1)	Quality control flag on PGOOD.
AMPL	NUMBER(7,3)	Amplitude of the signal returned (dB).
FAMPL	CHAR(1)	Quality control flag on AMPL.
ERRVEL	NUMBER(7,3)	Velocity error (cm/s).
FERRVEL	CHAR(1)	Quality control flag on ERRVEL.
VERT	NUMBER(7,3)	Vertical velocity (cm/s).
FVERT	CHAR(1)	Quality control flag on VERT.
RELEW	NUMBER(7,3)	Relative E-W velocity (cm/s).
FRELEW	CHAR(1)	Quality control flag on RELEW.
RELNS	NUMBER(7,3)	Relative N-S velocity (cm/s).
FRELNS	CHAR(1)	Quality control flag on RELNS.
SHPEW	NUMBER(7,3)	Ship's velocity E-W (cm/s).
FSHPEW	CHAR(1)	Quality control flag on SHPEW.
SHPNS	NUMBER(7,3)	Ship's velocity N-S (cm/s).
FSHPNS	CHAR(1)	Quality control flag on SHPNS.
ABSEW	NUMBER(7,3)	Absolute E-W velocity (cm/s).
FABSEW	CHAR(1)	Quality control flag on ABSEW.
ABSNS	NUMBER(7,3)	Absolute N-S velocity (cm/s).
FABSNS	CHAR(1)	Quality control flag on ABSNS.

Notes

The convention used for quality control flags is blank for good data points, and 'M' for suspect data points identified by BODC quality control.

If bottom track velocities are available then these will be stored as the ship's velocities with an appropriate entry in the ADCPINDX table.

Table ADCPINDX

Field Definitions

BEN	NUMBER(6)	BODC event number.
SHPFLG	CHAR(1)	Platform velocity correction method flag.
HEAD	NUMBER(8,4)	Correction factor applied to the ADCP data for differences between the ship's gyro and the ADCP heading.
HDFLG	CHAR(1)	Flag to specify whether HEAD has been applied to the data.
AMP	NUMBER(8,4)	Scaling factor applied to the ADCP velocities.
AMPFLG	CHAR(1)	Flag to specify whether AMP has been applied to the data.
TIMINT	NUMBER(4,2)	Time interval over which data were gridded (min).
BININT	NUMBER(4,1)	Depth interval over which data were gridded (m).
BINCOM	CHAR(40)	A comment on what the BINDPTH (bin depth) signifies.
VELCOM	CHAR(40)	A comment on what the ADCP velocities represent.
COM	CHAR(40)	Any other comments on the data.

Notes

The platform velocity correction method flag is set to ‘S’ if the ship’s velocity was computed from navigation or ‘B’ if it was directly measured by ADCP bottom tracking. The latter is more accurate and more reliable but is only possible in relatively shallow water. Do **not** confuse these with the data quality control flags.

The misalignment angle (HEAD) and scaling factor AMP are obtained by the ADCP calibration protocols developed by Southampton Oceanography Centre (Pollard and Read, 1989).

If it is known that the corrections HEAD and AMP have been applied then the flag fields HDFLG and AMPFLG are set to ‘ Y’. Otherwise they are set to ‘N’. If the values for HEAD and AMP are known then they are stored. Otherwise HEAD and AMP are set to 0 and 1 respectively.

The time interval is stored in decimal minutes (15 minutes 30 seconds stored as 15.5).

BINCOM contains a plain language definition of the bin depth (e.g. 'bin depth specifies the bottom of depth interval').

VELCOM contains information on the method used to determine the binned current velocities (e.g. 'velocity is averaged over the bin depth').

Reference

Pollard, R.T. and Read, J.F. (1989). A Method for Calibrating Ship-mounted Acoustic Doppler Profilers and the Limitations of Gyro Compasses. ***Journal of Atmospheric and Oceanic Technology***, 6, 859-865.

Table ARGOS

Field Definitions

BEN	NUMBER(6)	BODC Event Number.
DATIM	DATE	Date and time of position fix.
LAT	NUMBER(8,5)	Latitude of position fix (°+ve N).
LON	NUMBER(8,5)	Longitude of position fix (°+ve E).
SST	NUMBER(5,3)	Sea surface temperature (°C).
SST_F	CHAR(1)	Temperature quality control flag.
PSST	NUMBER(5,3)	Temperature at drogue depth (°C).
PSST_F	VARCHAR2(1)	Temperature quality control flag.
PPRES	NUMBER(4)	Pressure at drogue depth (dbars).
PPRES_F	VARCHAR2(1)	Pressure quality control flag.

Notes

Please refer to the data documentation to obtain the drogue depths.

The convention used for the quality control flags is:

K	Uncertain/suspect value (source of quality control unknown).
L	Uncertain/suspect value (data originator's quality control).
M	Uncertain/suspect value (BODC quality control).
O	Uncertain/suspect value (user quality control).

The flag channel is set blank for good data.

Table BINCTD

Field Definitions

BEN	NUMBER(6)	BODC event number.
PRESS	NUMBER(5,1)	Pressure (db).
TEMP	NUMBER(5,3)	Temperature (°C).
SALIN	NUMBER(5,3)	Practical salinity (PSU).
SIGMA	NUMBER(5,3)	Potential density anomaly (kg/m^3).
O2	NUMBER(4,1)	Dissolved oxygen (µM).
O2SAT	NUMBER(4,1)	Oxygen saturation (%).
CPHYL	NUMBER(4,2)	Chlorophyll (mg/m^3).
ATTEN	NUMBER(5,3)	Optical attenuance (per m).
DWIR	NUMBER(5,1)	Downwelling scalar irradiance (µE/m^2/s).
UWIR	NUMBER(4,1)	Upwelling scalar irradiance (µE/m^2/s).
POTEMP	NUMBER(5,3)	Potential temperature (°C).
POAT	NUMBER(5,3)	Potential attenuance (per m).

Notes

The pressure value signifies the midpoint of the bin. Thus, a pressure of 1.0 db signifies a bin extending from 0 db to 2 db (assuming that the cast was deeper than 100 db).

The density parameter computed is the potential density anomaly calculated at 0 db and is numerically equivalent to the parameter known as sigma-theta (computed by substituting potential temperature into the UNESCO SVAN function).

Oxygen saturation has been computed using the algorithm of Benson and Krause (1984).

UNIX users should note that CTD data are only loaded into BINCTD once BODC has full confidence in the CTD calibrations. Our normal practice is to leave this operation until near the end of the project to allow the maximum time for feedback from the user community. Prior to loading into BINCTD, the data are held uncalibrated in holding tables that are inaccessible to users through SQL. If these data are required, the **CTDLIDST** utility should be used which will retrieve the data and dynamically apply any calibrations required.

For CD-ROM database releases, all CTD data have been incorporated into BINCTD.

Reference

Benson, B.B., Krause D. (1984). The concentration and isotopic fractionation of oxygen dissolved in fresh water and sea water in equilibrium with the atmosphere. ***Limnol.Oceanogr.,*** 29, 620-632.

Table BOTDATA

Field Definitions

IBTTLE	NUMBER(6)	BODC bottle/sample identifier.
CPCODE	CHAR(8)	Parameter code.
FPVAL	NUMBER	Parameter value.
CPFLAG	CHAR(1)	Parameter quality control flag.
IORGRF	NUMBER(6)	Originator's reference.
IDOCRF	NUMBER(6)	Document reference.
CILOAD	CHAR(6)	Record creation date (yymmdd).
TSGMOD	DATE	Last modification time stamp.

Notes

The primary key is formed from the three fields, IBTTLE, CPCODE and IORGRF. In other words, the table contains one row for each parameter measurement on each water or air sample by a given data originator.

The parameter code consists of 8 bytes which describe the parameter measured in some detail. The parameter code definitions are stored in the parameter dictionary (see the table names starting with 'Z').

The parameter flag field serves two purposes. First, it identifies parameter values identified as problems during quality control procedures. Different codes are used to differentiate between originator, BODC and user quality control. Secondly, it is used to identify samples where the measured parameter was either below detection limit or saturated the measuring apparatus. In these cases the data values are set to the detection limit (zero if no detection limit was specified) or the saturation value respectively. If no flag value has been assigned (signifying good data), the CPFLAG field is blank.

The flag values which may be encountered are:

K	Uncertain/suspect value (source of quality control unknown).
L	Uncertain/suspect value (data originator's quality control).
M	Uncertain/suspect value (BODC quality control).
O	Uncertain/suspect value (user quality control)
T	Nearest value to bottle firing depth
<	Below detection limit.
>	In excess of stated value.

The 'T' flag is only found on records created for water bottle samples from CTD profile data. It means that no data were found at the bottle firing pressure. Instead, the nearest data value has been taken, providing this was within 2 db of the required pressure.

The originator's reference field allows the suppliers of individual data values to be identified. The objective when allocating these linkages is to provide a point of contact for users of the data to approach when initiating collaboration that will endure beyond the end of a project. Consequently, linkages have been assigned at the PI level and do not necessarily specify the individual who actually did the analysis.

The capability to link data to its originator only came about when the normalised structure was implemented. Linkages have been retrospectively applied to the entire data holding during restructuring which was done using cruise reports and the collective memories of BODC staff and participating scientists. If we’ve got anything wrong, please don’t bear a grudge: just let us know and we’ll fix it. Likewise, anyone who feels aggrieved for any reason about these code allocations should discuss it with us so that any problems may be quickly rectified.

Codes are used to eliminate potential problems with misspellings and the like. The codes used are documented in the table ORGCODE.

Document references have not yet been implemented so the IDOCRF field is currently always null.

Table BOTTLE

Field Definitions

BEN	NUMBER(6)	BODC event number.
IBTTLE	NUMBER(6)	A unique identifier assigned by BODC to each sample.
MINP	NUMBER(5,1)	Minimum pressure for the sample (db).
MAXP	NUMBER(5,1)	Maximum pressure for the sample (db).
DEPTH	NUMBER(5,1)	Sampling depth (m).
BOTYP	CHAR(4)	Bottle/sample type identifier.
FLAG	CHAR(1)	Problem indicator flag.

Notes

Table BOTTLE was originally conceived for the management of water bottle data. However, as the BODC databases developed, it was realised that the table could be utilised for other data types. Data currently held include pumped air and water samples, stand-alone pump (SAP) samples, bucket samples and air bottle samples.

The most important function of this table is to implement the 'one-to-many' relationship that may exist between samples and events. The table contains one row per sampling depth (multiple samples at a single depth are considered as one). Each record in EVENT can 'own' as many records as it likes in BOTTLE through the foreign key field BEN. Hence each EVENT can include many sampling depths.

The relationship between MINP, MAXP and DEPTH requires some explanation.

MINP and MAXP only have relevance to bottles on a CTD rosette. In this case, bottle 'depths' are frequently logged as pressure ranges during CTD screening and loaded into BOTTLE. Subsequently, DEPTH (the distance from the surface to the midpoint of the bottle) is derived by applying a pressure calibration to MINP and MAXP, correcting for CTD frame geometry, and applying the standard conversion from pressure to depth. In order to allow for pressure calibration drift, the minimum value is constrained at 0.5 m. The fields MINP and MAXP provide a direct linkage between BOTTLE and the CTD data which is why they are retained.

For other sample types, DEPTH is assigned a value from reports or logs and MINP and MAXP are left null. Note that air samples have negative depths to indicate height above sea level.

The BOTYP field specifies how the sample was collected, as defined in table BOTYPINDX.

The FLAG field is used to indicate known problems. The coding convention used is:

B	Filter burst (SAP samples)
L	Contamination through leakage suspected
M	No sample obtained
O	Bottles fired in incorrect order

The 'O' flag requires a little more explanation. This is used to flag stations where there was obvious confusion from the sample data set about which bottle was fired at which depth. These problems have been resolved during data load, but the flag is included to remind users that there may be problems with data from that station obtained outside the database.

Table BOTYPINDX

Field Definitions

BOTYP	CHAR(4)	Bottle type code.
DESCR	CHAR(20)	Plain Language field describing BOTYP.

Notes

For discrete water sample data this table identifies the type of water bottle used, or the sampling method.

Table C14DAT

Field Definitions

EXPREF	CHAR(12)	BODC experiment reference.
IBTTLE	NUMBER(6)	BODC bottle reference number.
DEPTH	NUMBER(4,1)	Depth (or depth equivalent) at which the sample was incubated.
LIGHT	NUMBER(4,1)	Fraction of available light illuminating the sample (%).
PPMIC	NUMBER(6,3)	Microplankton production (mg C/m^3/incubation duration).
PPNAN	NUMBER(6,3)	Nanoplankton production (mg C/m^3/ incubation duration).
PPPIC	NUMBER(6,3)	Picoplankton production (mg C/m^3/ incubation duration).
PPTOT	NUMBER(6,3)	Total production (mg C/m^3/ incubation duration).
SPPMIC	NUMBER(5,3)	Standard deviation of microplankton production (mg C/m^3/ incubation duration).
SPPNAN	NUMBER(5,3)	Standard deviation of nanoplankton production (mg C/m^3/ incubation duration).
SPPPIC	NUMBER(5,3)	Standard deviation of picoplankton production (mg C/m^3/ incubation duration).
SPPTOT	NUMBER(5,2)	Standard deviation of total production (mg C/m3/ incubation duration).
FLIGHT	NUMBER(5,1)	Light level in a PvI profile (μE/m^2/s)

Notes

The IBTTLE field provides a link to the source of the water used in the production experiment. Note that it is possible to collect water from a single source and incubate it under a variety of conditions. In such cases, the bottle reference number will be repeated on several C14DAT records.

The terms 'microplankton', 'nanoplankton' and 'picoplankton' are loose descriptions and their precise meaning may vary from one production experiment to the next. Precise definitions are held in C14HDR.

The fields DEPTH and LIGHT are provided as alternative indicators of the conditions under which the sample was incubated. For in-situ incubations, LIGHT will generally be null and DEPTH represents the actual depth of incubation. For on-deck experiments, LIGHT represents the percentage of ambient light reaching the sample: i.e. the light transmission of the incubation screen. DEPTH, where present, is computed from this using either CTD downwelling irradiance or beam attenuance data.

The field PPTOT is either the result of a non size-fractionated experiment or the summation of size fraction data. If the size fractions have been summed the standard deviation for the total field has been set to the square root of the sum of the squares of the size fraction standard deviations. As a general rule, if the size fraction columns are non-null then the total uptake values have been computed and not individually measured.

The units of uptake are per incubation duration as specified in the INCDUR field of table C14HDR. For in-situ and on-deck incubations this will normally, **but not always**, be 24 hours. In the case of light gradient incubations, where the light intensity is constant throughout the incubation, it is usual for the uptake rate to be quoted per hour. In these cases, the incubation duration has been set to 1 event though it is probable that the samples were actually incubated for longer than this.

Table C14HDR

Field Definitions

EXPREF	CHAR(12)	Experiment reference (assigned by BODC).
TYPE	CHAR(2)	Experiment type code. (OD for on deck incubations, IS for in-situ experiments, PI for PvI experiments).
BENCOL	NUMBER(6)	BODC event number of the water collection event.
BEN	NUMBER(6)	BODC event number of associated production rig deployment.
SDATE	DATE	Date and time of the start of the incubation.
INCDUR	NUMBER(3,1)	Incubation duration in hours.
COMM	CHAR(20)	Plain language comment field.
DEPINT	NUMBER(4,1)	Depth to which the integrated production was calculated.
INTMIC	NUMBER(6,2)	Integrated productivity for the microplankton fraction (mg C/m^2/day).
INTNAN	NUMBER(6,2)	Integrated productivity for the nanoplankton fraction (mg C/m^2/day).
INTPIC	NUMBER(6,2)	Integrated productivity for the picoplankton fraction (mg C/m^2/day).
INTTOT	NUMBER(6,2)	Total integrated productivity (mg C/m^2/day).
MICDEF	CHAR(8)	Microplankton definition.
NANDEF	CHAR(8)	Nanoplankton definition.
PICDEF	CHAR(8)	Picoplankton definition.

Notes

Fields BENCOL and BEN require some explanation as the presence of two BODC event numbers in a single table may at first sight seem confusing. BENCOL specifies where the water used in the production experiment came from. In some ways it is superfluous because the same information may be derived from the IBTTLE field in C14DAT. However, it is included to simplify the task of linking integrated production data held in table C14HDR to the place and time to which they relate.

BEN is a reference given to some production experiments. This invariably relates to in-situ experiments where a rig has been cast adrift from the ship. On-deck incubations have never been considered as events. The reason for this is more historical than logical: the event entries are drawn up from ship's logs and whilst a rig being deployed has often (but not always) merited a log entry, the placing of samples in an on-deck incubator has not.

Integrated production data are only included if they were computed and supplied by the data originator. They are not routinely determined by BODC.

Table COREINDX

Field Definitions

ICORE	NUMBER(6)	BODC core identifier.
BEN	NUMBER(6)	BODC event number for the coring event.
ORGREF	CHAR(16)	Identifier given to the core on the cruise.
FLAG	CHAR(1)	Flag.

Notes

It may come as something of a surprise that this table has a 'one-to-many' relationship to manage. However, the multicorer produces (ideally!) up to 12 cores from a single deployment which may be used for different purposes or for replicate analyses and hence require separate storage. Another possible 'one-to-many' relationship is the case where a series of sub-cores is taken from a box-core sample.

The flag is set to 'F' if the corer failed to return a sample or to 'S' if the corer obtained stones and no sediment. Otherwise it is left null

Table COREPROF

Field Definitions

ICSAMP	NUMBER(6)	BODC core sample reference number.
CPCODE	CHAR(8)	Parameter code.
FPVAL	NUMBER	Parameter value.
CPFLAG	CHAR(1)	Parameter quality control flag.
IORGRF	NUMBER(6)	Originator's reference.
IDOCRF	NUMBER(6)	Document reference.
CILOAD	CHAR(6)	Record creation date (yymmdd).
TSGMOD	DATE	Last modification time stamp.

Notes

The primary key is formed from the three fields, ICSAMP, CPCODE and IORGRF. In other words, the table contains one row for each parameter measurement on each core segment or profile point by a given data originator.

The parameter code consists of 8 bytes which describe the parameter measured in some detail. The parameter code definitions are stored in the parameter dictionary (see the table names starting with 'Z').

The parameter flag field serves two purposes. First, it identifies parameter values identified as problems during quality control procedures. Different codes are used to differentiate between originator, BODC and user quality control. Secondly, it is used to identify samples where the measured parameter was either below detection limit or saturated the measuring apparatus. In these cases the data values are set to the detection limit or the saturation value respectively. If no flag value has been assigned (signifying good data), the CPFLAG field is blank.

The flag values which may be encountered are:

K	Uncertain/suspect value (source of quality control unknown).
L	Uncertain/suspect value (data originator's quality control).
M	Uncertain/suspect value (BODC quality control).
O	Uncertain/suspect value (user quality control)
<	Below detection limit.
>	In excess of stated value.

The originator's reference field allows the suppliers of individual data values to be identified. The objective when allocating these linkages is to provide a point of contact for users of the data to approach when initiating collaboration that will

endure beyond the end of a project. Consequently, linkages have been assigned at the PI level and do not necessarily specify the individual who actually did the analysis.

The capability to link data to its originator only came about when the normalised structure was implemented. Linkages have been retrospectively applied to the entire data holding during restructuring which was done using cruise reports and the collective memories of BODC staff and participating scientists. If we've got anything wrong, please don't bear a grudge: just let us know and we'll fix it. Likewise, anyone who feels aggrieved for any reason about these code allocations should discuss it with us so that any problems may be quickly rectified.

Codes are used to eliminate potential problems with misspellings and the like. The codes used are documented in the table ORGCODE.

Document references have not yet been implemented so the IDOCRF field is currently always null.

Table CORESAMP

Field Definitions

ICSAMP	NUMBER(6)	BODC core sample reference number.
ICORE	NUMBER(6)	BODC core reference number.
DIST	NUMBER(7,3)	Distance from the top of the core to the mid-point of the sample (cm).
SEGLEN	NUMBER(4,2)	Thickness of the sample segment (cm).

Notes

This table provides the independent variable for core profiles. This is defined as the distance from the top of the core to the mid-point of the sample. Thus for instrumental profiles it will be the distance of the probe tip from the top of the core. For cores sectioned into slabs, it will be the distance from the middle of the slab to the top of the core. Negative values are possible and indicate samples of, or in, the water overlying the core.

The table also includes a resolution parameter, SEGLEN. This gives the slab thickness for sectioned cores. For probe profiles it is either set zero or to the size of the probe tip if known.

Table CORETOT

Field Definitions

ICORE	NUMBER(6)	BODC core reference number.
CPCODE	CHAR(8)	Parameter code.
FPVAL	NUMBER	Parameter value.
CPFLAG	CHAR(1)	Parameter quality control flag.
IORGRF	NUMBER(6)	Originator's reference.
IDOCRF	NUMBER(6)	Document reference.
CILOAD	CHAR(6)	Record creation date (yymmdd).
TSGMOD	DATE	Last modification time stamp.

Notes

The primary key is formed from the two fields, ICORE and CPCODE. In other words, the table contains one row for each parameter measurement on the whole core or grab sample.

The parameter code consists of 8 bytes which describe the parameter measured in some detail. The parameter code definitions are stored in the parameter dictionary (see the table names starting with 'Z').

The parameter flag field serves two purposes. First, it identifies parameter values identified as problems during quality control procedures. Different codes are used to differentiate between originator, BODC and user quality control. Secondly, it is used to identify samples where the measured parameter was either below detection limit or saturated the measuring apparatus. In these cases the data values are set to the detection limit or the saturation value respectively. If no flag value has been assigned (signifying good data), the CPFLAG field is blank.

The flag values which may be encountered are:

K	Uncertain/suspect value (source of quality control unknown).
L	Uncertain/suspect value (data originator's quality control).
M	Uncertain/suspect value (BODC quality control).
O	Uncertain/suspect value (user quality control)
<	Below detection limit.
>	In excess of stated value.

The originator's reference field allows the suppliers of individual data values to be identified. The objective when allocating these linkages is to provide a point of contact for users of the data to approach when initiating collaboration that will

endure beyond the end of a project. Consequently, linkages have been assigned at the PI level and do not necessarily specify the individual who actually did the analysis.

The capability to link data to its originator only came about when the normalised structure was implemented. Linkages have been retrospectively applied to the entire data holding during restructuring which was done using cruise reports and the collective memories of BODC staff and participating scientists. If we’ve got anything wrong, please don’t bear a grudge: just let us know and we’ll fix it. Likewise, anyone who feels aggrieved for any reason about these code allocations should discuss it with us so that any problems may be quickly rectified.

Codes are used to eliminate potential problems with misspellings and the like. The codes used are documented in the table ORGCODE.

Document references have not yet been implemented so the IDOCRF field is currently always null.

Table CRSINDX

Field Definitions

CRUISE	CHAR(8)	BODC cruise mnemonic,
PROJECT	CHAR(12)	Mnemonic of the project with which the cruise was associated.
PSO	CHAR(20)	Cruise chief scientist.
COUNTRY	CHAR(20)	Country responsible for organising the cruise.
TBEGNS	DATE	Date the cruise sailed.
TENDS	DATE	Date the cruise docked.
LOCATION	CHAR(80)	Plain language description of the area studied.
COMM	CHAR(60)	Plain language comment field.

Notes

This table allows events associated with a particular project to be identified as well as providing limited background information on cruises.

Table CTDCAL

Field Definitions

BEN	NUMBER(6)	BODC event number.
FPCOR	NUMBER(5,2)	Pressure correction (db).
FCSLOP	NUMBER(7,4)	Chlorophyll calibration slope.
FCIRR	NUMBER(8,7)	Chlorophyll calibration irradiance term.
FCCEPT	NUMBER(7,4)	Chlorophyll calibration intercept.
FUSLOP	NUMBER(7,4)	Upwelling irradiance calibration slope.
FUCEPT	NUMBER(7,4)	Upwelling irradiance calibration intercept.
FDSLOP	NUMBER(7,4)	Downwelling irradiance calibration slope.
FDCEPT	NUMBER(7,4)	Downwelling irradiance calibration intercept.
FBASOF	NUMBER(5,2)	Distance between the CTD pressure sensor and the base of the water bottle (m).
FTOPOF	NUMBER(5,2)	Distance between the CTD pressure sensor and the top of the water bottle (m).
FTEMOF	NUMBER(5,2)	Distance between the CTD pressure sensor and the reversing thermometer (m).
FSSLOP	NUMBER(7,5)	Salinity calibration slope.
FSCEPT	NUMBER(7,5)	Salinity calibration intercept.
FTSLOP	NUMBER(7,5)	Temperature calibration slope.
FTCEPT	NUMBER(7,5)	Temperature calibration intercept.
FOSLOP	NUMBER(6,3)	Oxygen calibration slope.
FOCEPT	NUMBER(6,3)	Oxygen calibration intercept.
FSMSLOP	NUMBER(7,5)	Total suspended matter calibration slope.
FSMCEPT	NUMBER(7,5)	Total suspended matter calibration intercept.
FOMSLOP	NUMBER(7,5)	Organic suspended matter calibration slope.
FOMCEPT	NUMBER(7,5)	Organic suspended matter calibration intercept.
FIMSLOP	NUMBER(7,5)	Inorganic suspended matter calibration slope.
FIMCEPT	NUMBER(7,5)	Inorganic suspended matter calibration intercept.

Notes

This table contains one row per CTD cast and therefore allows each CTD to have a separate calibration. However, in most cases calibrations have been set up on a cruise by cruise basis.

In the case of UK WOCE and some of the OMEX data, the CTD data are supplied to BODC fully calibrated by the data originator. In such cases, CTDINDX records are set up with dummy values which have been set up to ensure the correct functioning of the BODC **ctdlist** software. Some transformation of the data is also necessary in these cases. For example, log transforms are applied to parameters which have an exponential calibration applied by **ctdlist**.

Each calibration and its method of determination is now discussed.

Rig Geometry

The fields FBASOF, FTOPOF and FTEMOF contain the information required to compute the true water bottle depth from the CTD pressure channel. FTEMOF is used when extracting calibration temperatures.

The water bottle depth for a given CTD pressure reading (calibrated and converted to depth) is given by:

BOTTLE DEPTH = CTD DEPTH - (FBASOF + ((FTOPOF - FBASOF)/2.0))

This equation assumes bottle depth to be defined as the depth to the midpoint of the water bottle. The depth of the reversing thermometer is obtained by simply subtracting FTEMOF from the calibrated and converted CTD pressure reading.

The values used in these fields were obtained from actual measurements of the CTD rigs.

Pressure

The pressure correction, FPCOR, is a simple offset which is added to the uncalibrated CTD pressure. It is derived by consideration of data logged when the CTD was obviously out of the water.

Temperature

The temperature calibration has two components, FTSLOP and FTCEPT, which are applied to the uncalibrated temperature using the equation:

TCAL = TRAW * FTSLOP + FTCEPT

The temperature calibration is derived by comparison of the CTD temperature channel with calibrated digital reversing thermometer data for a specified cruise. A mean offset is computed after rejection of suspect reversing thermometer readings and stations where the reversing thermometers were fired on a temperature gradient.

In most cases, the accuracy of CTD resistance thermometers exceeds that of the digital reversing thermometers in common use. Consequently, the calibration coefficients are set to 1 and zero unless a problem is suspected with the CTD calibration.

Salinity

The salinity calibration is identical in form to the temperature calibration and has been derived in a similar manner using water bottle samples assayed on a bench salinometer.

Chlorophyll

The chlorophyll concentration (in mg chlorophyll *a*/m^3) may be obtained from the fluorometer voltage using the following equation:

CHLOROPHYLL = EXP (VOLTS * FCSLOP + FCIRR * DWIR + FCCEPT)

The chlorophyll calibrations were set up by multiple regression of fluorometer voltages and downwelling irradiance (at the water bottle firing depths) against the log of the associated extracted chlorophyll measurements. The calibration was done on quality controlled data.

It should be noted that, on some cruises, the FCIRR term is zero because no downwelling irradiance data were available (for example the DI183 calibration was done on samples taken from pre-dawn casts).

Oxygen

The oxygen calibration is of the form:

OXCAL = OXRAW * FOSLOP + FOCEPT

and is derived by regression of CTD channel values at the bottle firing depths against Winkler titration results. On cruises where underway oxygen data were available, the surface CTD values (averaged over the top 3m after screening) are compared with the calibrated underway oxygen values to provide additional calibration data.

Suspended Load

The suspended matter calibrations are of the form:

SUSPENDED LOAD = (ATTENUANCE - INTERCEPT) / SLOPE

The calibrations have been obtained by regression of beam attenuance against gravimetric determinations of suspended load. Organic sediment load was determined by loss on ignition of the gravimetric samples.

It should be noted that suspended matter calibrations on deep water transmissometer data are extremely rare as huge quantities of water need to be filtered to obtain the necessary gravimetric data.

Irradiance

The raw irradiance (upwelling and downwelling) data are held as voltages. These are calibrated using the equation:

IRRADIANCE = EXP (VOLTS*SLOPE + INTERCEPT)

This returns calibrated values in units of $\mu W/cm^2$. For the PML 2-pi PAR meters currently used on CTDs on the NERC ships, an empirical calibration factor (0.0375) has been determined to convert these data into $\mu E/m^2/s$. The calibration is only valid over the range -1.5V to +1V.

Table CTDINDX

Field Definitions

BEN	NUMBER(6)	BODC event number.
TBEGNC	DATE	Date/time of the start of the downcast.
TENDC	DATE	Date/time of the end of the downcast.
MAXP	NUMBER(5,1)	Maximum pressure in the downcast (db).
FMAXP	CHAR(1)	Set to 'C' if the pressure calibration held in table CTDCAL has been applied to MAXP. Otherwise left null.
EXTCO	NUMBER(5,3)	Downwelling irradiance extinction coefficient.
MLD	NUMBER(3,1)	Mixed layer depth (m).
EZD	NUMBER(4,1)	Depth to the base of the euphotic zone (m).
TYPE	CHAR(3)	Type code of the CTD used (defined in table CTDTYP)

The downcast start and end times have been derived from the CTD data time channel and may be used to regenerate that channel if required.

The fields EXTCO, MLD and EZD were set up for the BOFS programme. In practice, it has been found that providing universally acceptable algorithms for their computation is an impossible task. Consequently, current practice is to leave the fields null unless agreed values are provided by the scientific community.

Table CTDTYP

Field Definitions

TYPE	CHAR(3)	CTD type code mnemonic.
DESCR	CHAR(30)	Plain language definition of the mnemonic.

Table EVENT

Field Definitions

BEN	NUMBER(6)	BODC event number. A unique numerical identifier assigned each event.
OID	CHAR(12)	What the event was known as during the cruise (originator's identifier)
GCODE	CHAR(8)	Code used to specify the gear pertaining to the event.
TBEGNS	DATE	Event start date/time (UT).
TENDS	DATE	Event end date/time (UT).
LAT	NUMBER(7,5)	Average latitude for event (°+ve North).
LON	NUMBER(7,5)	Average longitude for deployment (°+ve East).
VARLAT	NUMBER(7,5)	Maximum deviation of latitude from mean during station.
VARLON	NUMBER(7,5)	Maximum deviation of longitude from mean during station.
WDEPTH	NUMBER(5,1)	Average bathymetric depth for the event (m).
LATS	NUMBER(7,5)	Latitude at time TBEGNS (°+ve North).
LONS	NUMBER(7,5)	Longitude at time TBEGNS (°+ve East).
LATE	NUMBER(7,5)	Latitude at time TENDS (°+ve North).
LONE	NUMBER(7,5)	Longitude at time TENDS (°+ve East).
CRUISE	CHAR(8)	Cruise mnemonic.
SITE	CHAR(12)	Fixed station name.

Notes

This table has been built from the best available information from cruise reports, log sheets and information accompanying data. Automatically logged navigation has been used to match times and positions wherever possible.

There are two types of event, point events and traverse events.

Point events may be considered as those events that effectively happen at a fixed position. Their positions are specified by the fields LAT, LON, VARLAT and VARLON with the other four position fields left null.

Traverse events, such as tows and trawls, involve the ship steaming a significant distance. In this case, the start and end positions are stored in LATS, LONS, LATE and LONE. Note that some traverse events have data entered into the point event position fields to allow them to be handled as very low-resolution points if required. Water depths are only included for point events.

Wherever possible, the fields LAT and LON are derived by averaging the data from the ship's navigation log over the event duration. VARLAT and VARLON are the maximum deviation of the data set from the mean. If VARLAT and VARLON are null then the data in LAT and LON have been take from logs or reports.

Obviously, the average of the ship's positions is not used for moorings. If VARLAT and VARLON are set then the information has been derived from the difference of the recorded positions on deployment and recovery.

The BODC event number (BEN) is a concept introduced to overcome the problem that it is impossible to guarantee that the identifiers assigned during the cruise will be unique within database incorporating many cruises. It is a very important field because it is used within the database as a 'primary key' which by definition must be unique. Data elsewhere in the database, resulting from a specified event, will either be labelled directly, or via a linkage record to its BEN.

OID, the originator's identifier, is the label that was assigned to the event during the cruise. For example, for Discovery cruises, it is based on the 'Discovery number' such as 11869#1. In a few cases, usually non-toxic samples or XBT drops, no identifier was assigned during the cruise and suitable naming schemes have been devised by BODC.

Event start and end times have been specified to bracket the event. Thus, for a CTD cast, the time span is from the instrument leaving the deck until its return. Some events are regarded as instantaneous, for example non-toxic samples. In these cases, the end times are set null. Wherever possible, cores are regarded as instantaneous events at the time when the corer reached the bottom.

The gear codes are mnemonics used to describe the data collection activity or the equipment used. The codes have been chosen to convey as much meaning as possible, but a plain language description of each code is provided in table G_CODE.

The cruise identifiers are made up from a ship code concatenated with the cruise identifier. For example, 'DI' is used for Discovery and 'CD' for Charles Darwin and a typical cruise would be labelled DI182 or CD46.

Table EVENT_COMM

Field Definitions

BEN	NUMBER(6)	The BODC event number.
COMM	CHAR(100)	Plain language comment field.

Notes

This table provides a mechanism for labelling EVENT records without encumbering EVENT listings with a large text field.

Table G_CODE

Field Definitions

GCODE	CHAR(8)	Standardised gear code.
DESCR	CHAR(60)	Plain language description of the gear described by GCODE.

Table MOORINDX

Field Definitions

BEN	NUMBER(6)	BODC event number for the mooring
ISHREF	NUMBER(8)	BODC NODB identifier for the data series.
METER_TYPE	CHAR(50)	Description of the instrument measuring the data series.
PARAM_CODES	CHAR(8)	Parameters included in the data series.
MINDEP	NUMBER(9,2)	Minimum depth sampled (m).
MAXDEP	NUMBER(9,2)	Maximum depth sampled (m).

Table MOOR_PARAMS

Field Definitions

PARAM	CHAR(8)	Parameter code.
DESCR	CHAR(50)	Parameter description.

Notes

Each character in field PARAM_CODES of table MOORINDX, is defined in this table.

Table MSP

Field Definitions

BEN	NUMBER(6)	BODC event number.
REF	VARCHAR2(6)	Originator’s reference for the MSP deployment.
FRAME	NUMBER(3)	Frame number on film.
DATIM	DATE	Date/time when the frame was exposed.
PRESS	NUMBER(5,1)	Depth of the instrument below the surface when the frame was exposed expressed in decibars for CTD compatibility.
TPA	NUMBER(6,3)	Total abundance (per l). Total of NS1-NS6 (i.e. excludes very large particles).
TPV	NUMBER(6,3)	Total particulate volume (ppm). Total of VS1-VS6 (i.e. excludes very large particles).
NS1	NUMBER(6,3)	Abundance of particles of equivalent spherical diameter of 0.6-0.98 mm (per l).
VS1	NUMBER(6,3)	Volume of particles of equivalent spherical diameter of 0.6-0.98 mm (ppm).
NS2	NUMBER(6,3)	Abundance of particles of equivalent spherical diameter of 0.98-1.56 mm (per l).
VS2	NUMBER(6,3)	Volume of particles of equivalent spherical diameter of 0.98-1.56 mm (ppm).
NS3	NUMBER(6,3)	Abundance of particles of equivalent spherical diameter of 1.56-2.48 mm (per l).
VS3	NUMBER(6,3)	Volume of particles of equivalent spherical diameter of 1.56-2.48 mm (ppm).
NS4	NUMBER(6,3)	Abundance of particles of equivalent spherical diameter of 2.48-3.94 mm (per l).
VS4	NUMBER(6,3)	Volume of particles of equivalent spherical diameter of 2.48-3.94 mm (ppm).
NS5	NUMBER(6,3)	Abundance of particles of equivalent spherical diameter of 3.94-6.25 mm (per l).
VS5	NUMBER(6,3)	Volume of particles of equivalent spherical diameter of 3.94-6.25 mm (ppm).
NS6	NUMBER(6,3)	Abundance of particles of equivalent spherical diameter of 6.25-9.93 mm (per l).
VS6	NUMBER(6,3)	Volume of particles of equivalent spherical diameter of 6.25-9.93 mm (ppm).
NS7	NUMBER(6,3)	Abundance of particles of equivalent spherical diameter of >9.93 mm (per l).
VS7	NUMBER(7,3)	Volume of particles of equivalent spherical diameter of >9.93 mm (ppm).

Notes

The fields DATIM and PRESS provide alternative independent variable channels for mooring and CTD deployments of the marine snow profiler allowing both types of deployments to reside in a single table.

Table ORGCODE

Field Definitions

IORGRF	NUMBER(6)	Originator's reference code.
CORGNM	CHAR(20)	Originator's name.
CORGO	CHAR(40)	Originator's organisation.

Table PRDATA

Field Definitions

IMREF	NUMBER(9)	BODC profile identifier.
CPCODE	CHAR(8)	Parameter code.
FPVAL	NUMBER	Parameter value.
CPFLAG	CHAR(1)	Parameter quality control flag.

Notes

The primary key is formed from the two fields, IMREF and CPCODE. In other words, the table contains one row for each parameter measurement on each SVT sample by a given data originator.

Note that the depth/pressure of a measurement is encoded into the table as a parameter.

The parameter code consists of 8 bytes, which describe the parameter measured in some detail. The parameter code definitions are stored in the parameter dictionary (see the table names starting with 'Z').

The parameter flag field serves two purposes. First, it identifies parameter values identified as suspect during quality control procedures. Different codes are used to differentiate between originator, BODC and user quality control. Secondly, it is used to identify samples where the measured parameter was either below detection limit or saturated the measuring apparatus. In these cases the data values are set to the detection limit (zero if no detection limit was specified) or the saturation value respectively. If no flag value has been assigned (signifying good data), the CPFLAG field is blank.

The flag values which may be encountered are:

K	Uncertain/suspect value (source of quality control unknown).
L	Uncertain/suspect value (data originator's quality control).
M	Uncertain/suspect value (BODC quality control).
O	Uncertain/suspect value (user quality control)
T	Nearest value to bottle firing depth
<	Below detection limit.
>	In excess of stated value.

Table PRINDEX

Field Definitions

BEN	NUMBER(6)	BODC event number.
MAXDPTH	NUMBER(5,1)	Maximum depth reached (m).
IDOCRF	NUMBER(3)	Document reference.
IORGRF	NUMBER(3)	Originator's reference.
TYPE	CHAR(3)	Instrument type code mnemonic.

Notes

The table contains metadata from various profiling instruments contained within the table PRDATA. The data from the Fly probe, Expendable Bathythermograph (XBT), sound velocity probe and profiling radiometers are included in these tables.

The instrument code, TYPE, is defined in table CTDTYP.

The originator's reference field allows the suppliers of individual data values to be identified. The objective when allocating these linkages is to provide a point of contact for users of the data to approach when initiating collaboration that will endure beyond the end of a project. Consequently, linkages have been assigned at the PI level and do not necessarily specify the individual who actually did the analysis.

The capability to link data to its originator only came about when the normalised structure was implemented. Linkages have been retrospectively applied to the entire data holding during restructuring which was done using cruise reports and the collective memories of BODC staff and participating scientists. If we’ve got anything wrong, please don’t bear a grudge: just let us know and we’ll fix it. Likewise, anyone who feels aggrieved for any reason about these code allocations should discuss it with us so that any problems may be quickly rectified.

Codes are used to eliminate potential problems with misspellings and the like. The codes used are documented in the table ORGCODE.

Document references have not yet been implemented so the IDOCRF field is currently always null.

Table PRLINK

Field Definitions

BEN	NUMBER(6)	BODC event number.
CYCLE	NUMBER(6)	Profile cycle number.
IMREF	NUMBER(9)	BODC profile identifier.

Notes

The primary key is formed from two fields, BEN and CYCLE.

The CYCLE field is the cycle number of the particular profile point, numbered consecutively from one, and may be used to sort the data in time order. This capability allows profiles including both downcasts and upcasts to be stored.

Table SSINDX

Field Definitions

BEN	NUMBER(6)	BODC event number.
BMPNTR	NUMBER(5)	Binary merge file pointer.
MINP	NUMBER(4,1)	Minimum pressure stored in the profile (db).
MAXP	NUMBER(4,1)	Maximum pressure stored in the profile (db).

Notes

The pressure range of the stored profile is given to enable cases where the water column coverage is restricted to be readily identified. The depth to which the fish was flying may also be readily ascertained.

The binary merge file pointer is the index of the record in the underway data file which is contemporaneous with the SeaSoar pseudo-CTD. This field can be used, together with the CRUISE field from the EVENT table, to forge linkages between the SeaSoar data set and the underway data set.

Table STINDX

Field Definitions

BEN	NUMBER(6)	BOFS event number.
ISAMP	NUMBER(6)	BODC sediment trap sample reference.
SAMP	CHAR(17)	Originator's sample reference.
DEPTH	NUMBER(5)	Depth below surface of sediment trap (m).
SDATE	DATE	Date of start of sample collection.
EDATE	DATE	Date of end of sample collection.
SAMPINT	NUMBER(6,3)	Sample collection time (days).

Notes

The SAMPINT field is included to allow for the trap being recovered for maintenance and then re-deployed without the removal of the current sample. Under normal circumstances, SAMPINT will be equal to the difference between SDATE and EDATE. If SAMPINT is null, then this difference may be used instead.

Table SVDATA

Field Definitions

ISVSAMP	NUMBER(6)	BODC SVT sample identifier.
CPCODE	VARCHAR2(8)	Parameter code.
FPVAL	NUMBER	Parameter value.
CPFLAG	VARCHAR2(1)	Parameter quality control flag.
IORGRF	NUMBER(6)	Originator’s reference.
IDOCRF	NUMBER(6)	Document reference.
CILOAD	VARCHAR2(6)	Record creation date (yymmdd).
TSGMOD	DATE	Last modification time stamp.

Notes

The primary key is formed from the three fields, ISVSAMP, CPCODE and IORGRF. In other words, the table contains one row for each parameter measurement on each SVT sample by a given data originator.

The parameter code consists of 8 bytes which describe the parameter measured in some detail. The parameter code definitions are stored in the parameter dictionary (see the table names starting with 'Z').

The parameter flag field serves two purposes. First, it identifies parameter values identified as suspect during quality control procedures. Different codes are used to differentiate between originator, BODC and user quality control. Secondly, it is used to identify samples where the measured parameter was either below detection limit or saturated the measuring apparatus. In these cases the data values are set to the detection limit (zero if no detection limit was specified) or the saturation value respectively. If no flag value has been assigned (signifying good data), the CPFLAG field is blank.

The flag values which may be encountered are:

K	Uncertain/suspect value (source of quality control unknown).
L	Uncertain/suspect value (data originator's quality control).
M	Uncertain/suspect value (BODC quality control).
O	Uncertain/suspect value (user quality control)
T	Nearest value to bottle firing depth
<	Below detection limit.
>	In excess of stated value.

The originator's reference field allows the suppliers of individual data values to be identified. The objective when allocating these linkages is to provide a point of contact for users of the data to approach when initiating collaboration that will endure beyond the end of a project. Consequently, linkages have been assigned at the PI level and do not necessarily specify the individual who actually did the analysis.

The capability to link data to its originator only came about when the normalised structure was implemented. Linkages have been retrospectively applied to the entire data holding during restructuring which was done using cruise reports and the collective memories of BODC staff and participating scientists. If we’ve got anything wrong, please don’t bear a grudge: just let us know and we’ll fix it. Likewise, anyone who feels aggrieved for any reason about these code allocations should discuss it with us so that any problems may be quickly rectified.

Codes are used to eliminate potential problems with misspellings and the like. The codes used are documented in the table ORGCODE.

Document references have not yet been implemented so the IDOCRF field is currently always null.

Table SVSAMP

Field Definitions

ISVT	NUMBER(6)	BODC SVT reference.
ISVSAMP	NUMBER(6)	BODC SVT sample identifier.
IELPSD	NUMBER(5,2)	Time elapsed since start of settling (minutes).
VOL	NUMBER(5,1)	Volume of sample taken (ml).
STATUS	VARCHAR2(1)	Sample status.

Notes

Each row in the table represents a single sample from a settling velocity tube experiment. ISVSAMP is the primary key.

STATUS is set to ‘R’ if the sample is supernatant liquor. Otherwise the STATUS code is ‘S’.

Table SVTINDX

Field Definitions

BEN	NUMBER(6)	BODC Event number.
ISVT	NUMBER(6)	BODC SVT reference.
DEPTH	NUMBER(5,2)	Firing depth of SVT (metres).
EXPREF	VARCHAR2(12)	Experiment reference.

Notes

SVTINDX contains a one-to-many relationship between SVT event and the number of tubes, allowing for several tubes to be fired at different depths during the same deployment.

The field EXPREF provides a mechanism to distinguish between parallel experiments on tubes fired at a common depth. Hence, experiments with different sampling frequencies can be separated.

Table SVTOTAL

Field Definitions

ISVT	NUMBER(6)	BODC SVT reference.
CPCODE	VARCHAR2(8)	Parameter dode.
FPVAL	NUMBER	Parameter value.
CPFLAG	VARCHAR2(1)	Parameter quality control flag.
IORGRF	NUMBER(6)	Originator’s reference.
IDOCRF	NUMBER(6)	Document reference.
CILOAD	VARCHAR2(6)	Record creation date (yymmdd).
TSGMOD	DATE	Last modification time stamp.

Notes

The table is designed to hold parameters derived from the total settling velocity tube experiment. The primary key is formed from the three fields, ISVT, CPCODE and IORGRF. In other words, the table contains one row for each parameter measurement on each SVT by a given data originator.

The parameter code consists of 8 bytes which describe the parameter measured in some detail. The parameter code definitions are stored in the parameter dictionary (see the table names starting with 'Z').

The parameter flag field serves two purposes. First, it identifies parameter values identified as suspect during quality control procedures. Different codes are used to differentiate between originator, BODC and user quality control. Secondly, it is used to identify samples where the measured parameter was either below detection limit or saturated the measuring apparatus. In these cases the data values are set to the detection limit (zero if no detection limit was specified) or the saturation value respectively. If no flag value has been assigned (signifying good data), the CPFLAG field is blank.

The flag values which may be encountered are:

K	Uncertain/suspect value (source of quality control unknown).
L	Uncertain/suspect value (data originator's quality control).
M	Uncertain/suspect value (BODC quality control).
O	Uncertain/suspect value (user quality control)
T	Nearest value to bottle firing depth
<	Below detection limit.
>	In excess of stated value.

The originator's reference field allows the suppliers of individual data values to be identified. The objective when allocating these linkages is to provide a point of contact for users of the data to approach when initiating collaboration that will endure beyond the end of a project. Consequently, linkages have been assigned at the PI level and do not necessarily specify the individual who actually did the analysis.

The capability to link data to its originator only came about when the normalised structure was implemented. Linkages have been retrospectively applied to the entire data holding during restructuring which was done using cruise reports and the collective memories of BODC staff and participating scientists. If we've got anything wrong, please don't bear a grudge: just let us know and we'll fix it. Likewise, anyone who feels aggrieved for any reason about these code allocations should discuss it with us so that any problems may be quickly rectified.

Codes are used to eliminate potential problems with misspellings and the like. The codes used are documented in the table ORGCODE.

Document references have not yet been implemented so the IDOCRF field is currently always null.

Table TIDAL_CONS_HEAD

Field Definitions

BEN	NUMBER(6)	BODC Event number.
ANREF	NUMBER(6)	BODC analysis reference number.
ORIG	CHAR(4)	Source of analysis.
COMM	CHAR(40)	Comment.
DEPTH	NUMBER(6,2)	Bin depth if analysis is from an ADCP (metres).

Notes

This is the main index to the TIDAL_CONS system. The analysis source (ORIG) is at present MJH1, MJH2 or MJH3 depending on whether the analysis was performed by John Howarth (MJH), Proudman Oceanographic Laboratory (using TITAN software) or obtained by MJH from another source.

Table TIDAL_CONS_DATA

Field Definitions

ANREF	NUMBER(6)	BODC analysis reference number.
ICON	NUMBER(3)	Doodson number of constituent.
ABF	CHAR(3)	Average, block or friction data (A, 1-7 or F).
NAMP	NUMBER(5,2)	North amplitude (cm/sec).
NPHASE	NUMBER(5,2)	North phase (deg).
EAMP	NUMBER(5,2)	East amplitude (cm/sec).
EPHASE	NUMBER(5,2)	East phase (deg).

Notes

This table contains the results of all the tidal analyses. Three different types of data may be present: average data, block data (the result of analysing a 29 day block of data; one or more of these blocks were used to produce an average analysis) or friction data. The type of data is described by the identifier ABF, which has the values 'A', '1'...'7', or 'F'. The numbers 1-7 refer to the number of the block in the sequence of blocks, which were averaged to produce the average data (all 7 blocks are not necessarily present).

Thus, ANREF and ABF uniquely identify an analysis.

Note: all three types of data are present for analyses produced by the TITAN software. Other analyses consist of average data only.

Table TIDAL_CONS_NAME

Field Definitions

ICON	NUMBER(3)	Doodson number of constituent.
CONS	CHAR(6)	Constituent name.
SPEED	CHAR(11)	Rotational speed of constituent (deg/hour).

Notes

This table is primarily used as a cross-reference of Doodson number (used in table TIDAL_CONS_DATA) against constituent name. The speeds used to calculate constituent values are also held in this table.

Table TRAPDATA

Field Definitions

ISAMP	NUMBER(6)	BODC trap sample identifier.
CPCODE	CHAR(8)	Parameter code.
FPVAL	NUMBER	Parameter value.
CPFLAG	CHAR(1)	Parameter quality control flag.
IORGRF	NUMBER(6)	Originator's reference.
IDOCRF	NUMBER(8)	Document reference.
CILOAD	CHAR(6)	Record creation date (yymmdd).
TSGMOD	DATE	Last modification time stamp.

Notes

The primary key is formed from the three fields, ISAMP, CPCODE and IORGRF. In other words, the table contains one row for each parameter measurement on each trap sample by a given data originator.

The parameter code consists of 8 bytes which describe the parameter measured in some detail. The parameter code definitions are stored in the parameter dictionary (see the table names starting with 'Z').

The parameter flag field serves two purposes. First, it identifies parameter values identified as problems during quality control procedures. Different codes are used to differentiate between originator, BODC and user quality control. Secondly, it is used to identify samples where the measured parameter was either below detection limit or saturated the measuring apparatus. In these cases the data values are set to the detection limit or the saturation value respectively. If no flag value has been assigned (signifying good data), the CPFLAG field is blank.

The flag values that may be encountered are:

K	Uncertain/suspect value (source of quality control unknown).
L	Uncertain/suspect value (data originator's quality control).
M	Uncertain/suspect value (BODC quality control).
O	Uncertain/suspect value (user quality control)
<	Below detection limit.
>	In excess of stated value.

The originator's reference field allows the suppliers of individual data values to be identified. The objective when allocating these linkages is to provide a point of contact for users of the data to approach when initiating collaboration that will

endure beyond the end of a project. Consequently, linkages have been assigned at the PI level and do not necessarily specify the individual who actually did the analysis.

The capability to link data to its originator only came about when the normalised structure was implemented. Linkages have been retrospectively applied to the entire data holding during restructuring which was done using cruise reports and the collective memories of BODC staff and participating scientists. If we’ve got anything wrong, please don’t bear a grudge: just let us know and we’ll fix it. Likewise, anyone who feels aggrieved for any reason about these code allocations should discuss it with us so that any problems may be quickly rectified.

Codes are used to eliminate potential problems with misspellings and the like. The codes used are documented in the table ORGCODE.

Document references have not yet been implemented so the IDOCRF field is currently always null.

Table ZUCT

Field Definitions

CCTREF	CHAR(4)	Category code.
CCTFUL	CHAR(40)	Category description in plain language.
CILOAD	CHAR(6)	Date of record creation (yymmdd).
TCTMOD	DATE	Record modification time stamp.

Notes

The category codes are designed to group parameters into logical subgroups according to general operational practices. However, there will inevitably be parameters that could be fitted into more than one category depending upon one's point of view. This should be borne in mind when searching the dictionary. Always check out all possible categories.

Table ZUNT

Field Definitions

CPUREF	CHAR(4)	Unit code.
CPUABB	CHAR(10)	Abbreviated unit description.
CPUFUL	CHAR(40)	Full unit description.
CILOAD	CHAR(6)	Date record was created (yymmdd).
TPUMOD	DATE	Last modification time stamp.

Table ZUPM

Field Definitions

CPMCAT	CHAR(4)	Category code.
CPMREF	CHAR(4)	4-byte code for the parameter name.
CPMABB	CHAR(20)	Abbreviated parameter name.
CPMFUL	CHAR(80)	Full parameter name.
CPMUNT	CHAR(4)	Parameter storage unit code.
FABSNT	NUMBER	Absent data value.
FPMINM	NUMBER	Minimum value for parameter.
FPMAXM	NUMBER	Maximum value for parameter.
CINVER	CHAR(1)	Plot inversion flag.
CILOAD	CHAR(6)	Date of record creation (yymmdd).
TPMMOD	DATE	Date and time of last modification.

Notes

Most of the fields in this table are of more interest to BODC personnel than to database users. The exceptions are CPMCAT, CPMREF, CPMFUL and CPMUNT.

The category code (CPMCAT) provides the linkage to table ZUCT and hence identifies which generalised parameter descriptions belong to which category.

CPMFUL contains the parameter description in plain language and provides the hook by which users can recognise just what is meant by a particular code.

The field CPMUNT specifies the units in which the parameter is stored in the database. This is present as a code (to prevent problems arising from differing descriptions being given to the same unit e.g. degrees, deg. and the like) which may be translated using table ZUNT.

Table ZUSG

Field Definitions

CPMREF	CHAR(4)	Parameter name code (bytes 1-4)
CSGREF	CHAR(2)	Parameter subgroup code (bytes 5-6).
CDSREF	CHAR(2)	Parameter discriminator code (bytes 7-8).
CPMUSG	CHAR(8)	Full 8-byte parameter code.
IPMBEF	NUMBER(1)	Number of digits before the decimal point.
IPMAFT	NUMBER(1)	Number of digits after the decimal point.
CSGABB	CHAR(20)	Abbreviated parameter code description.
CSGFUL	CHAR(100)	Full parameter code description.
CSGMTH	CHAR(100)	Methodology description.
ISGREF	NUMBER(8)	Narrative document reference.
CILOAD	CHAR(6)	Date record was created (yymmdd).
TSGMOD	DATE	Record modification time stamp.

Notes

The complete parameter code (CPMUSG) is constructed by concatenation of the parameter name, parameter subgroup and parameter discriminator codes.

The fields IPMBEF and IPMAFT are included to allow software to format data sensibly. Note that the data covered by the parameter codes are stored to a precision of some 16 decimal places. IPMAFT indicates how many of these have significance.

The meaning of a given code is specified in plain language by the fields CSGFUL and CSGMTH. These fields are designed to give a user-friendly reference to the full parameter code. If they don't, please let us know. All the details which make the parameter unique (including filtration details where appropriate) are included.

The ISGREF field allows a linkage point for data documentation. It is designed to allow general methodology description documents to be linked to a parameter code. This on-line documentation is not currently implemented and the field is set null.

Database Linkage Definitions

The tables in this section of the document show the linkages that exist between the database tables. The linkage chains run along the rows of the table and always start with table EVENT. The type of linkage is shown by bolding the text. A linkage from normal text to bold text is a 'one to many' relationship. Links from normal text to normal text or bold text to bold text are 'one to one' relationships.

ADCP Data

EVENT	ADCPINDX	ADCP
BEN	BEN	**BEN**

Drifting Buoy Data

EVENT	ARGOS
BEN	**BEN**

CTD Data

EVENT	CTDINDX	CTDCAL	CTDTYP	BINCTD
BEN	BEN	BEN		**BEN**
	TYPE		TYPE	

SeaSoar Data

EVENT	SSINDX	BINCTD
BEN	BEN	**BEN**

Water and Air Sample Data (Fully Normalised)

EVENT	BOTTLE	BOTDATA	BOTYPINDX	ZUSG	ORGCODE
BEN	**BEN**				
	IBTTLE	**IBTTLE**			
		IORGRF			IORGRF
		CPCODE		CPMUSG	
	BOTYP		BOTYP		

^{14}C Production Data

EVENT	BOTTLE	C14DAT	C14HDR
BEN	**BEN**		
	IBTTLE	**IBTTLE**	
		EXPREF	EXPREF
BEN			BENCOL

Benthic Profile Data (Fully Normalised)

EVENT	COREINDX	CORESAMP	COREPROF	ZUSG	ORGCODE
BEN	**BEN**				
	ICORE	**ICORE**			
		ICSAMP	**ICSAMP**		
			IORGRF		IORGRF
			CPCODE	CPMUSG	

Benthic Whole Core Data (Fully Normalised)

EVENT	COREINDX	CORETOT	ZUSG	ORGCODE
BEN	**BEN**			
	ICORE	**ICORE**		
		IORGRF		IORGRF
		CPCODE	CPMUSG	

Primary Index

CRSINDX	EVENT	EVENT_COMM	G_CODE
	BEN	BEN	
	GCODE		GCODE
CRUISE	**CRUISE**		

Marine Snow Camera

EVENT	MSP
BEN	**BEN**

Mooring

EVENT	MOORINDX	MOOR_PARAMS
BEN	**BEN** **PARAM_CODES**	 PARAM

Fully Normalised Water Column Profiles (excluding CTD)

EVENT	PRINDEX	PRLINK	PRDATA	ZUSG	ORGCODE	CTDTYP
BEN	BEN	**BEN**				
	IORGRF				IORGRF	
	TYPE					TYPE
		IMREF	**IMREF**			
			CPCODE	CPMUSG		

Settling Velocity Tube Time Series Data (Fully Normalised)

EVENT	SVTINDX	SVSAMP	SVDATA	ZUSG	ORGCODE
BEN	**BEN**				
	ISVT	**ISVT**			
		ISVSAMP	**ISVSAMP**		
			IORGRF		IORGRF
			CPCODE	CPMUSG	

Whole SVT Data (Fully Normalised)

EVENT	SVTINDX	SVTOTAL	ZUSG	ORGCODE
BEN	**BEN**			
	ISVT	**ISVT**		
		IORGRF		IORGRF
		CPCODE	CPMUSG	

Tidal Constituents Analysis

EVENT	MTSI_EVENT	TIDAL_CONS _HEAD	TIDAL_CONS _DATA	TIDAL_CONS _NAME
BEN	**BEN**			
	IMTREF	**IMTREF**		
		ANREF	**ANREF**	
			ICON	ICON

Sediment Trap Data (Fully Normalised Structure)

EVENT	STINDX	TRAPDATA	ZUSG	ORGCODE
BEN	**BEN**			
	ISAMP	**ISAMP**		
		IORGRF		IORGRF
		CPCODE	CPMUSG	

Parameter Dictionary

ZUCT	ZUPM	ZUNT	ZUSG
CCTREF	**CPMCAT**		
	CPMUNT	CPMUNT	
	CPMREF		**CPMREF**