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Title	MEDIN data guideline for the recording of moored instrument data.
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Summary	This guideline defines the format of data and information produced from the collection of oceanographic data from moored instruments. If used correctly the data will be easily used and reused. A xls template is provided if required.
Keywords	CTD, Oceanography, Mooring, Salinity, Conductivity, Temperature, Depth, DO, turbidity, fluorescence.

Change history		
Version	Date	Change
1.0	22/12/09	First draft of document
2.0	27/05/10	Redrafted into new structure and taking in comments from the oceanographic profile guideline which it is similar.
3.0	14/07/2010	Redrafted following comments and published

1.1. Background

The Marine Environmental Data and Information Network (MEDIN) is working towards creating a framework of consistent standards covering the major types of data collection undertaken in the marine environment around the UK. The principle benefits of this suite of standards are:

- Allows contracting organisations to easily specify a format that data should be returned in that can be readily used and includes all relevant attributes
- Provides a consistent format for contractors to work to (rather than a different format for each contract)
- Data can be readily exported to Data Archiving Centres and other users
- Instills good practice amongst users

Each standard defines the data and information that must be stored with a particular data type to ensure it can be readily used and reused. As this type of information is specific for different data types, guidelines are developed for each type. This document describes one such format. Other standards can be accessed through www.oceannet.org.

This guideline has drawn heavily on the work of the ICES Working Group on Data Information Management that has produced Guidelines to describe the elements of data and metadata important to the ocean research community. These guidelines are targeted toward physical-chemical-biological data types collected on oceanographic research vessel cruises. Each guideline addresses the data and metadata requirements of a specific data type. These guideline scan be accessed at <http://www.ices.dk/datacentre/guidelines/DataTypeGuidelines/DataTypeGuidelines.asp>

This MEDIN guideline sits within the scope of the ICES guideline but differs in that it recommends structures and term lists to be used.

1.2. Scope

This guideline defines the format of data and information produced from the collection of oceanographic data from moored instruments. It covers both the raw data, methodologies used and derived summary information.

1.3. Using this data guideline

This guideline is split into sections that refers to information that can be collated at different levels. Information that is likely to be the same for all samples (e.g. ship used, datums used) is collated in the 'Project' and 'Survey' table and the instrument and processing information is held in the Data Production Tools

(Sample Methods and Processing Techniques) table. Information that is specific to each mooring deployment is collected in the 'Sample Event Table' and the raw mooring data is collected in the 'Sample Data' table. If the sampling programme is based upon return visits to a specific station and location then these details should be submitted in the 'Fixed Station Table'.

Some information stated in this guideline is common to all MEDIN guidelines and may be used in part to derive a MEDIN discovery metadata record. Where the survey is part of a ship cruise then the cruise report may hold the required information.

The tables below outline the data fields, a description and where available a term list and/or format given at the end of each field which should be used to store the data. Each field is either mandatory, conditional or optional as indicated by M, C, or O respectively. In the absence of an existing spreadsheet or database to hold the below information, it is recommended that the template available to download from the [MEDIN website](#) is used. Instructions are provided in the template.

To submit this data to a Data Archive Centre the raw data should be provided in the file type outputted from the instrument. Other tables should be provided in the .csv format.

1.4. Further information on the SeaDataNet, ICES and EPSG term lists

The available catalogues of term lists used for this MEDIN data guideline are provided primarily by SeaDataNet, the International Council for the Sea (ICES) and EPSG. If a term is not available in a recommended list then please contact MEDIN to arrange for the term to be added.

The SeaDataNet list may be viewed at http://seadatanet.maris2.nl/v_bodc_vocab/welcome.aspx . By clicking on the list any term may be searched for by using the drop-down menus or all terms viewed by clicking search. The terms may be viewed in groups of 15 or may be downloaded into an excel file.

The ICES term lists are available at <http://www.ices.dk/datacentre/reco/> Select which list you require from the 'Reference Code List' drop-down box. The results are shown for the selected list and may be downloaded into MS Excel by selecting the inverted green arrow.

There are a number of ways of describing a spatial dataset. Common horizontal coordinate reference systems include WGS84 and British National Grid. Common vertical coordinate reference systems include Highest Astronomical Tide and Ordnance Datum Newlyn (ODN). It is important that which coordinate reference system used for a data set is recorded so conversions can be carried

out between reference systems. The EPSG database of coordinate reference systems (<http://www.epsg.org/Geodetic.html>) provides a dictionary of reference systems. In brief, to find a code click on the OGP Online Registry and if you know the title (eg WGS84) then type this in the 'Name' field and click search. The name, code and further information is displayed. If you are looking for a specific type of reference system such as 'vertical' then click in the 'Type' box, hover over coordinate reference system and click on vertical and then click the search button and all recorded vertical reference systems are shown. If you want to search for a reference system in a particular part of the world (e.g. Northern Ireland Grid) then you may do so by submitting a term to the 'Area' box or fill out the lat and longs then click search. The website also provides a database of the reference systems and web services to access the information.

1.5. Relationship between MEDIN data guidelines and MEDIN discovery metadata

The MEDIN discovery metadata format is aimed at allowing the non-informed user to discover data sets and it is likely that one 'discovery' data set record will contain a large range of data types that are in turn covered by a range of data guidelines. To enable individuals to reuse data of a specific nature (e.g. benthic invertebrate data) then related information must be collected (e.g. data owner, reference systems used etc). Some of the information which is collected at the Survey Level in a data guideline is also required to create a discovery metadata record. Who creates the MEDIN discovery record for a dataset is case specific and dependant on the organisation, and the relationship it has with a Data Archive Centre. However it is intended that the information collected at the 'Survey Information' level is reused for creating a MEDIN discovery metadata record.

2.1. Project Information.

If your collection of data forms part of a wider project or time series then the below details must be recorded.

M, C, O indicate which fields are mandatory, conditional or optional.

Heading	M, C, O	Description	Recommended Term List or Format
Project name	M	The nationally/internationally accepted version of the project name	Free text; (e.g. Rapid Climate Change)
Project website	C	If a Project website exists give the address	e.g. (http://www.noc.soton.ac.uk/rapid/rapid.php)
Project start date	M	The date that the project started	Date; yyyy-mm-dd; (e.g. 2001-01-24)
Project end date	C	The date that the project is due to finish	Date; yyyy-mm-dd; (e.g. 2007-01-24)
Project code	M	Provide a code to uniquely identify the project and allow links to be made between the tables.	Free text; (e.g. RCC)

2.2. Survey Information (Data Activity).

The survey information is a uniquely identifiable programme of data collection such as a research cruise or survey event. This information is likely to be the same for all sample events (e.g. stations) and subsamples in a given data set such as a cruise. Note that in the event that these are not common to all sample events then they should be specified for each one. These fields are common throughout many other MEDIN data guidelines and only need to be given once and referenced if your data set is composed of many data types and therefore conforms to a number of MEDIN Data Guidelines. Where data collection is undertaken on research vessels the data below can often be sourced in the Cruise Summary Report.

M, C, O indicate which fields are mandatory, optional or conditional respectively.

Heading	M, C, O	Description	Recommended Term List or Format
Survey name	M	Title of the survey	Free text; (e.g. Menai Straight Benthic Survey 2004)
Survey description	M	Brief description of the purpose of the survey and other types of measurements that were made for the survey.	Free Text
Survey code	M	A unique code for the survey to allow links to be built between this and sample event data (the cruise identifier code could be used)	Free text; (e.g. JCR3022)
Responsible organisation	M	Organisation who has funded the work	Term List; European Directory of Marine Organisations (e.g. 28: Centre for Environment, Fisheries and Aquaculture Science, Lowestoft Laboratory)
Survey start date	M	The date and time that the survey started.	Date or DateTime; yyyy-mm-dd or yyyy-mm-dd hh:mm:ss (e.g. 2009-01-24 12:33:00)
Survey end date	M	The date and time that the survey ended.	Date or DateTime; yyyy-mm-dd or yyyy-mm-dd hh:mm:ss (e.g. 2009-02-16 16:33:00)
Spatial coordinate reference system	M	Describes the system of spatial referencing. I.e. the datum used to provide details of latitude and longitude.	Term List; http://www.epsg.org/Geodetic.html (e.g. WGS84 is EPSG::7030)
Position fix	M	Give the method and source of the position	Free Text; (e.g. Differential GPS taken from

method and source		fix instrument.	the ships navigation equipment.
Horizontal positional accuracy	M	How accurate the spatial positions are likely to be	Number; units = meters (e.g. 15)
Depth coordinate reference system	C	Give the reference to which the depth has been calculated e.g. Highest astronomical tide. Mandatory if seabed depths are given for each sample.	Term List http://www.epsg.org/Geodetic.html (e.g. ODN is EPSG::5701)
Vertical positional accuracy	C	How accurate the vertical resolution is. Must be provided if seabed depths are given.	Number; units = meters (e.g. 0.5)
Platform type	O	The platform type (e.g. Research Vessel) from which the sampling device was deployed.	Term list SeadataNet Platform Classes (L061) (e.g. 31)
Ship name	O	The name of the ship from which the sampling device was deployed.	Term list SHIPC at http://www.ices.dk/datacentre/reco/ (e.g. 74LG Lough Foyle)
Cruise report reference	O	Cruise report reference if applicable.	Free text; in reference format. e.g. Litt, E.J. 2009. PHiXT 4. 30 July to 2 August 2009 <i>RV Prince Madog</i> POL Coastal Observatory Liverpool Bay Cruise Report. POL Coastal Observatory, Liverpool.
Project code	M	State the code of the project given in the project table to allow links to be made between the tables.	Free text; (e.g. RCC)

2.3. Fixed Station Information.

In many cases a fixed point, transect or area is returned to on a number of occasions to form a time series. The actual sample event may not be in exactly the same location each time however due to ship movements or sampling strategy, however it is useful to record both the position which is intended to be sampled (fixed) and the actual sampling position (sample).

Therefore, the information below must be included if a fixed point, transect or area is used as the basis for replicate profiles or for repeat monitoring surveys. Actual profile coordinates should be placed in the sample event table. A fixed station may be a point, transect, or an area. If the fixed station is a transect or an area then the secondary latitude and longitude fields must be completed.

Heading	M, C, O	Description	Recommended Term List or Format
Local station identifier	M	A unique identifier for the station	Free text. e.g. Stanton Bank site 4 (point) e.g. Liverpool/Dublin transect (transect) e.g. Lagan Estuary (area)
Primary Latitude (decimal degrees)	M	The primary latitude of the fixed station given in decimal degrees. For a point this field is set to the point latitude; for a transect it is set to the latitude of the start of the transect; for an area it is set to the southern edge of the box. Units are positive north.	Decimal degrees; minimum of two and a maximum of five decimal places. e.g. 54.5837
Primary Longitude (decimal degrees)	M	The primary longitude of the sample given in decimal degrees. For a point this field is set to the point longitude; for a transect it is set to the longitude of the start of the transect; for an area it is set to the western edge of the box. Units are positive east (West is negative, East is positive).	Decimal degrees; minimum of two and a maximum of five decimal places. e.g. -5.5837
Secondary Latitude (decimal degrees)	C	The secondary latitude of the fixed station given in decimal degrees. For a point this field is not required; for a transect it is set to the latitude of the end of the transect; for an area it is set to the northern edge of the box. Units are positive north.	Decimal degrees; minimum of two and a maximum of five decimal places. e.g. 55.7393

Secondary Longitude (decimal degrees)	C	The secondary longitude of the sample given in decimal degrees. For a point this field is not required; for a transect it is set to the longitude of the end of the transect; for an area it is set to the eastern edge of the box. Units are positive east (West is negative, East is positive).	Decimal degrees; minimum of two and a maximum of five decimal places. e.g. -3.7394
Description of fixed station spatial form	M	Describe if the fixed station is a point, transect or an area.	Term list; <u>SeadataNet Geospatial Feature Type (L021)</u> (e.g. point)

2.4. Sample Event (Deployment Details). This table holds information on the location and time of mooring deployment and recovery. In some instances a number of moorings may be deployed on the same survey or cruise and therefore the information in this table will be required for each mooring deployment. Note that if it can be ascertained that the mooring has not moved during deployment that the positional information for recovery does not require completion.

Heading	M, C, O	Description	Recommended Term List or Format
Survey code	M	Give the survey code to allow links to be built between this table and survey data table.	Free text; (e.g. JCR3022)
Mooring name and/or reference number	M	A unique identifier for the mooring under consideration	e.g. Bouy 25 e.g. PS74926
Deployment Platform Type	O	The platform type (e.g. Research Vessel) from which the mooring was deployed.	Term list <u>SeadataNet Platform Classes (L061)</u> (e.g. 31)
Deployment Ship name	O	The name of the ship that deployed the mooring	Term list SHIPC at http://www.ices.dk/datacentre/reco/ (e.g. 74LG Lough Foyle)
Deployment date and time	M	The date and time of the mooring deployment.	yyyy-mm-dd or yyyy-mm-dd hh:mm:ss (e.g. 2009-01-24 13:33:00)
Deployment Latitude of sample given in original recorded format	M	The latitude of the mooring deployment given in whichever format was used to record at the time of sampling. Units are positive north.	e.g. 50°47'24"
Deployment Longitude of sample given	M	The longitude of the mooring deployment given in whichever format was used to record at the time of sampling. Units are positive east.	e.g. -4°21'53"

in original recorded format			
Deployment Latitude of sample (decimal degrees)	M	The latitude of the mooring deployment given in decimal degrees. Units are positive north.	Decimal degrees; minimum of two and a maximum of five decimal places. e.g. 54.5837
Deployment Longitude of sample (decimal degrees)	M	The longitude of the mooring deployment given in decimal degrees. Units are positive east.	Decimal degrees; minimum of two and a maximum of five decimal places. e.g. -3.476
Deployment Water Column Depth	M	The water column depth	Number; units = meters (e.g. 300)
Recovery Platform Type	O	The platform type (e.g. Research Vessel) from which the mooring was recovery.	Term list <u>SeadataNet Platform Classes (L061)</u> (e.g. 31)
Recovery Ship name	O	The name of the ship that deployed the recovery	Term list SHIPC at http://www.ices.dk/datacentre/reco/ (e.g. 74LG Lough Foyle)
Recovery date and time	M	The date and time of the mooring recovery.	yyyy-mm-dd or yyyy-mm-dd hh:mm:ss (e.g. 2009-05-12 16:12:00)

Recovery Latitude of sample given in original recorded format	M	The latitude of the mooring recovery given in whichever format was used to record at the time of sampling. Units are positive north.	e.g. 50°47'24"
Recovery Longitude of sample given in original recorded format	M	The longitude of the mooring recovery given in whichever format was used to record at the time of sampling. Units are positive east.	e.g. -4°21'53"
Recovery Latitude of sample (decimal degrees)	M	The latitude of the mooring recovery given in decimal degrees. Units are positive north.	Decimal degrees; minimum of two and a maximum of five decimal places. e.g. 54.5837
Recovery Longitude of sample (decimal degrees)	M	The longitude of the mooring recovery given in decimal degrees. Units are positive east.	Decimal degrees; minimum of two and a maximum of five decimal places. e.g. -3.476
Recovery Water Column Depth	M	The water column depth at recovery	Number; units = meters (e.g. 305)

2.5. Sample Methods, Instruments and Processing Techniques (Data Production Tools). The information in this category should be completed for each mooring. The instrument details should be provided for each instrument sensor and a clear relationship made to the sample data file headings to allow a data manager to determine which channels (or headings) within the files refer to which instrument sensors.

Heading	M, C, O	Description	Recommended Term List or Format
Survey Name	M	Title of the Survey	Free text; (e.g. Menai Straight Benthic Survey 2004)
Mooring name and/or reference number	M	A unique identifier for the mooring under consideration	e.g. Bouy 25 e.g. PS74926
Mooring Structure Description	M	Provide a brief description or diagram of the mooring structure	Free text; (e.g. The mooring was a U shaped mooring with 2 packages of instruments deployed at 35 and 75m below the surface bouy. The Anchor chain was ...etc etc
Mooring Performance	M	Performance of the mooring. Include — condition on recovery, whether dragged or damaged. Any event that might affect the data.	Free text; (e.g. There was no evidence that the mooring had been dragged for the duration of the deployment. There was significant biofouling of the instrument package at 35m depth, however less at 75m depth).
Instrument Details	M	Instrument description, reference number, manufacturer and model — provide a literature reference, web site reference or briefly describe. Include — accuracy, resolution and response range of individual sensors.	Free text; (e.g. SeaBird CTD model number 3756a, serial number BX472946HJK647, accuracy, resolution and response range of sensors can be viewed at www.seabird.com)
Instrument Sensor to Data Link	M	Provide details of which instrument sensors apply to which data file headings.	Free text; (e.g. The conductivity, temperature and depth sensors on instrument BX472946HJK647 refer to the field headings CON, TEMP, DEP respectively in the sample

			data files SB_100m_001 to SB_100m_034)
Instrument Calibration	C	If calibrations have been applied to the instrument a description should be given here including the date of the calibration.	Free text; (e.g. The CTD was returned to Seabird on the 24/03/2007 and calibrated according to their standards in the laboratory)
Instrument mounting category	M	Give details of how the instruments were mounted onto the mooring	Free text; (e.g. Instruments were fixed into the central space of a aluminum rosette...)
Water Sample Calibration Details	C	If water samples have been taken to calibrate the instrument then details of those should be given here including any field and laboratory coefficients used. These should include description of or reference to full laboratory methods and procedures, Details of any external sample analysis, including the laboratory name and accreditation level, A description of or reference to any internal or external quality assurance procedures.	Free text; (e.g. Water samples were taken after and before deployment at the instrument depths. All parameters were measured to allow an estimation of instrument accuracy and status of biofouling. Nutrients were measured by nitrate reduction following the method of Strickland (1972) at CEFAS Lowestoft laboratory which participates in the UK National Marine Chemistry Analytical QC scheme.
Data Processing Details	C	If the data has been processed then detail the steps here including, de-spiking or smoothing methods, editing and quality control methods, and an overview report. Sampling intervals and nominal intervals of the processed data.	Free text; (e.g. All instrument data was screened and despiked following expert examination. Any data that was suspect due to suspected biofouling was flagged, etc etc)

2.6. Sample Data. Moored instrument profile data typically consists of a combination of time, pressure, conductivity, temperature and other parameters measured such as turbidity. It is recommended that the raw files from the instrument are supplied as well as any additional files to which calibrations may have been applied. These data should be provided in a readable form with the header information sufficiently explained. The recommended format for moored instrument data is as a matrix with date/time as the primary channel and other parameters details as additional fields. Please ensure that there is a clear relationship between the instrument sensors calibration information, the fields (channels) for each sensor and units within the sample data files.