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<b>Title</b>	<b>MEDIN data guideline for the archiving of digital photographs</b>
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<b>Summary</b>	This guideline defines good practice for archiving of digital photographs.
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1.0	17/09/09	First draft of document
2.0	30/11/09	Revised and published following comments from DASSH, CCW and BGS

## 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 organisation 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](http://www.oceannet.org).

## 1.2. Scope

This guideline covers the archiving of digital photographs regardless of the reason for which they have been taken, or from what platform they have been taken (e.g. ship, beach, underwater vehicle).

## 1.3 File Format

The recommended file format for storing digital images is the TIFF (Tagged Image File Format). TIFF is universe recommended for long-term archive and curation of digital images as it does not suffer from lossless compression like other formats such as JPEG which can cause a lack of true representation of the image which was originally captured. Many digital cameras record image properties automatically at the time of image capture in a metadata format known as the Exchangeable image file (Exif) standard. The TIFF file format supports metadata in the Exif standard. In instances when image files are provided in other formats (e.g. jpeg) we recommend that these files are converted to the TIFF format, however appreciate this may be impractical. Regardless of the approach a consistent format for image fields should be sought and compression of files should be strictly avoided.

## 1.4. Metadata

The metadata to be held with an image can be broadly split into that which will be applicable to a group of images taken using common techniques for example within one survey (**Survey Information**), spatial and temporal information relevant for each image (**Image Context Information**) and quality metadata applicable for each image (**Image Properties**).

**Survey Information.** This information is likely to be the same for all images in a given data set. Note that in the event that these are not common to all images then they should be specified for each sample. **M, O, C** indicate which fields are mandatory, optional or conditional respectively. 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.

Heading	M, O, C	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
Responsible Organisation	M	Organisation who has funded the work	Term List; <a href="#">European Directory of Marine Organisations</a> (e.g. 28: Centre for Environment, Fisheries and Aquaculture Science, Lowestoft Laboratory)
Survey Start Date	M	The date and time that the survey started.	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.	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; <a href="http://www.epsg.org/Geodetic.html">http://www.epsg.org/Geodetic.html</a> (e.g. WGS 84 is EPSG::4326)
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. You must use a properly	Term List <a href="http://www.epsg.org/Geodetic.html">http://www.epsg.org/Geodetic.html</a> (e.g. ODN is EPSG::5701)

		referenced vertical coordinate reference system.	
Vertical positional accuracy	C	How accurate the vertical resolution is. Must be provided if 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 <u>SeadataNet Platform Classes (L061)</u> (e.g. 31)
Ship name	O		Term list SHIPC at <a href="http://www.ices.dk/datacentre/reco/">http://www.ices.dk/datacentre/reco/</a> (e.g. 74LG Lough Foyle)

**Image Context Information (Station).** This table holds information on the location and time of image capture.

<b>Heading</b>	<b>M, O, C</b>	<b>Description</b>	<b>Recommended Term List or Format</b>
Image identifier	M	A unique identifier for the image under consideration. The Exif file will give a unique identifier to that camera but possibly not unique for other cameras. Therefore, a prefix should be used to ensure that it is globally unique. MEDIN recommend that a combination of the organisation name and camera ID is used.	e.g. BODC_nicon590c_00058743 e.g. CCW_canon45i_PS74926
Latitude of sample given in original recorded format	M	The latitude of the sample given in whichever format was used to record at the time of sampling. Units are positive north.	e.g. 50°47'24"
Longitude of sample given in original	M	The longitude of the sample given in whichever format was used to record at the time of sampling. Units are positive east.	e.g. -4°21'53"

recorded format			
Latitude of sample (decimal degrees)	M	The latitude of the sample given in decimal degrees. Units are positive north. 5 decimal places is recommended.	Decimal degrees; minimum of four and a maximum of seven decimal places. e.g. 54.5837
Longitude of sample (decimal degrees)	M	The longitude of the sample given in decimal degrees. Units are positive east. 5 decimal places is recommended.	Decimal degrees; minimum of four and a maximum of seven decimal places. e.g. -3.4764
Date and time	M	The date and time of sample collection.	yyyy-mm-dd or yyyy-mm-dd hh:mm:ss (e.g. 2009-01-24 13:33:00)
Depth	M	The depth that the image was taken	Number; units = meters (e.g. 15)

**Image Properties.** The image metadata fields are intended to hold information regarding the device used to record the image and the properties of the image itself. Many digital cameras record these metadata automatically at the time of image capture in a metadata format known as the Exchangeable image file (Exif) standard. If you wish to view these metadata right click on an image in windows explorer, choose the summary tab and click advanced. There is also a FireFox plug in that allows you to view these metadata easily. The Exif standard also incorporates fields for a Global Positioning System feed to provide a geo-reference to the image. The TIFF file format holds metadata in the Exif standard. The fields below give the metadata that should be stored with every image and the mandatory or optional conditions using the Exif standard. MEDIN recommend that the data below should be extracted and held in a separate table. At a minimum the information in the mandatory fields below should be present and held in the EXIF file.

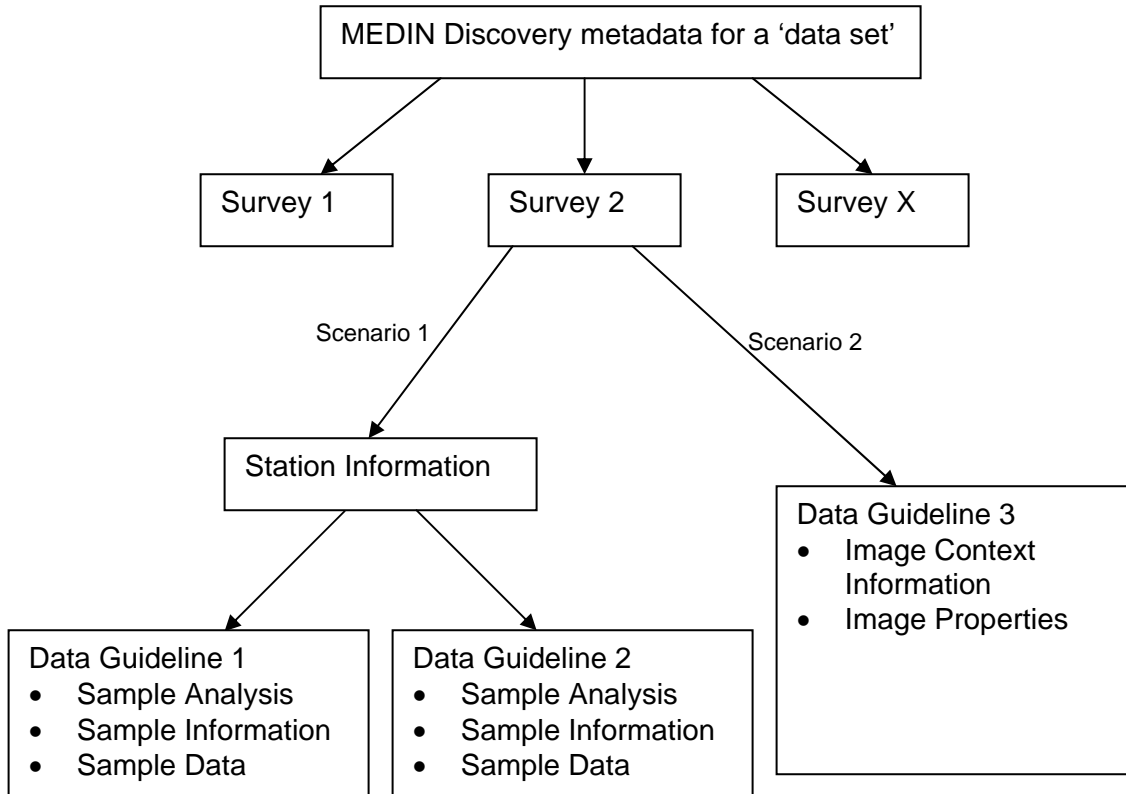
Heading	M, O, C	Description	
Identifier	M	A unique code or name used to identify the image	e.g. BODC_nicon590c_00058743
Version	O	The version of the Exif specification being used	e.g. 0220 for version 2.2
Manufacturer	O	The manufacturer of the capture device, as recorded in the Exif tags	e.g. FUJIFILM
Model	O	The model of the capture device, as recorded in the Exif tags	e.g. FinePix S3Pro
Software	O	The software version used on the capture device, as recorded in the Exif tags	e.g. FinePixViewer Ver3.1
FileSource	O	The file source of the image, as recorded in the Exif tags	e.g. 3 for a digital stills camera or 'other' for any other source of digital image.
PixelXDimension	M	The width of the image in pixels	Number; units = pixels (e.g. 2000)
PixelYDimension	M	The height of the image in pixels	Number; units = pixels (e.g. 1250)
xResolution	M	The image resolution (x-dimension - width) in pixels per field ResolutionUnit	e.g. 300
yResolution	M	The image resolution (y-dimension - height) in pixels per field ResolutionUnit	e.g. 300
ResolutionUnit	M	The units of xResolution and yResolution	e.g. DPI

<b>Heading</b>	<b>M, O, C</b>	<b>Description</b>	
ExposureTime	O	The exposure time of the image in seconds	Number; units = seconds (e.g. 0.02)
ExposureBias	O	The exposure bias (or exposure compensation) of the image, which controls the amount of light entering the camera lens	Number; units = step (e.g. 0)
ExposureProg	O	The exposure program used when taking a digital photo.	The term list is shown in Appendix 1.
fNumber	O	The f-number (focal ratio, f-ratio or relative aperture) used in capturing the image	e.g. F5.3
FocalLength	O	The actual focal length of the lens used to capture the image, given in millimetres	Number; units = mm (e.g. 78)
MeteringMode	O	The metering mode used in the capture of the image.	The term list is shown in Appendix 2.
Flash	O	The flash mode used in the capture of the image.	The term list is shown in Appendix 3. If the field is blank it indicates that a flash was not used.
ApertureValue	O	The smallest f-number of the lens used to capture the image, in the units of the Additive System of Photographic Exposure setting. This is normally, but not limited to, the range of 00.00 to 99.99.	e.g. 23.20

### 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.

A schematic of the relationship between different levels of data in a MEDIN guideline and the MEDIN discovery metadata format. Note that a 'dataset' may consist of 1 or more surveys and that if range of measurements are made at one station (scenario 1) then the station information will also be common across data guidelines.



**Appendix 1.** Term list for image metadata field 'ExposureProg'

- 1 - Manual
- 2 - Normal program
- 3 - Aperture priority
- 4 - Shutter priority
- 5 - Creative program
- 6 - Action program
- 7 - Portrait mode
- 8 - Landscape mode

**Appendix 2.** Term list for image metadata field 'MeteringMode'

- 0 – Unknown
- 1 – Average
- 2 – Center weighted average
- 3 – Spot
- 4 – Multi-spot
- 5 – Pattern
- 6 – Partial
- 255 - Other

**Appendix 3.** Term list for image metadata field 'Flash'

- 0000 = Flash did not fire
- 0001 = Flash fired
- 0005 = Strobe return light not detected
- 0007 = Strobe return light detected
- 0009 = Flash fired, compulsory flash mode
- 000D = Flash fired, compulsory flash mode, return light not detected
- 000F = Flash fired, compulsory flash mode, return light detected
- 0010 = Flash did not fire, compulsory flash mode
- 0018 = Flash did not fire, auto mode
- 0019 = Flash fired, auto mode
- 001D = Flash fired, auto mode, return light not detected
- 001F = Flash fired, auto mode, return light detected
- 0020 = No flash function
- 0041 = Flash fired, red-eye reduction mode
- 0045 = Flash fired, red-eye reduction mode, return light not detected
- 0047 = Flash fired, red-eye reduction mode, return light detected
- 0049 = Flash fired, compulsory flash mode, red-eye reduction mode
- 004D = Flash fired, compulsory flash mode, red-eye reduction mode, return light not detected

004F = Flash fired, compulsory flash mode, red-eye reduction mode, return light detected

0059 = Flash fired, auto mode, red-eye reduction mode

005D = Flash fired, auto mode, return light not detected, red-eye reduction mode

005F = Flash fired, auto mode, return light detected, red-eye reduction mode