Marine Environmental Data and Information Network (MEDIN)

Data Archive Centre (DAC) Network Annual Report for 2021-22

'Measure once, use many times'

Executive summary

This report represents the continuing efforts of the distributed network of Marine Environmental Data and Information Network (MEDIN) Data Archive Centres (DAC) to underpin the MEDIN's overall aim of facilitating access to UK marine data. While the majority of the report's content is derived from the portal it is also important to reflect on the achievements against the DAC Work Stream (WS1).

All WS1 activities were maintained during the past year, despite the continued impact of COVID on operations of many of the DACs. There has been continued development of the common Application Programming Interface (API) and work has begun on understanding the use of Persistent Identifiers (PIDs) to support a DAC-wide approach to provenance. The coordination of multi-disciplinary data submissions through a single point of contact and triage system to notify all relevant DACs is now being introduced.

The uptake of the CoreTrustSeal accreditation scheme, which provides a globally-recognised framework for the accreditation of data repositories, fully aligned with the MEDIN DAC accreditation process, is continuing to increase. As existing MEDIN accreditation expires, the DACs are preparing submissions to CoreTrustSeal.

We continue to encourage direct access to data and some DACs are continuing to increase both the number, and proportion, of datasets within "2-clicks". The figures are somewhat distorted due to the wide range of granularity used for MEDIN records. The single largest number of records are from a single DAC, which does not provide 2-click access. However, their data *are* directly accessible online and significant improvements have been made across all the DACs in terms of discoverability and accessibility of data holdings. The DACs continue to provide the foundational infrastructure for the delivery of Findable, Accessible, Interoperable, Reusable (FAIR), open access to UK marine data and in the promotion of best practice in marine data management.

Summary highlights

MEDIN coordinates an operational network of seven linked marine Data Archive Centres (DACs) covering bathymetry; fish and shellfish, fisheries, aquaculture and related samples; the historic environment; marine geology and geophysics; marine species and habitats; marine meteorology; and water column oceanography. The DACs continue to archive data from MEDIN partners and third-party organisations to agreed individual programmes.

This is the third DAC annual report falling within the 5-year period of the current MEDIN Business Plan. DAC metrics are now applied more consistently across the DAC network, being pulled directly from the MEDIN Portal, where possible.

The 2021-21 DAC annual reports show that:

- Almost 3.5 million 'requests' for data were made to MEDIN DACs during the reporting year.
- 67% of the datasets described in the MEDIN portal are available from the MEDIN DACs. That is 11,527 datasets managed, quality controlled and distributed by MEDIN's coordinated network of DACs.
- More than 95% of the datasets available from MEDIN DACs are accessible online (an increase of 1,254 since 2021) and 37% are downloadable within 2 clicks of finding them on the MEDIN portal.

4 Introduction

MEDIN has established an operational network of linked marine Data Archive Centres (DACs) to provide secure long-term storage for, and access to, marine data. This network provides the capability for users

to upload and retrieve data. Organisations archiving data at a MEDIN DAC have free access to their data, and DACs manage third-party access to these data according to the data provider's specification.

The required capabilities of DACs within the MEDIN framework are:

- To ensure the secure, long-term curation of key marine data sets, according to best practice and to relevant national and international standards.
- To make available clear, searchable information on their data holdings by the generation and publication of metadata on the MEDIN portal.
- To form the first point of call for expertise in the management of marine data.

In addition MEDIN will, on request from the data provider, publish metadata records to data.gov.uk and hence the INSPIRE geoportal.

In order to maintain its status as a MEDIN Data Archive Centre, each DAC is required to provide a short annual report so that Sponsors can assess how well the DAC framework is operating.

The MEDIN Sponsors' Board has emphasised the following requirements:

- Provide a statement on funding and sustainability.
- Include Key Performance Indicators (KPIs), specifically measures of use (numbers of enquiries, numbers of downloads).
- Further information on dissemination – how is access to data currently served and how do the DACs see their interaction with the MEDIN portal.

This document provides a report on the current status of DACs in terms of metadata records in the MEDIN Portal where the DAC is custodian of the data, requests from users for data, and financial outlook. This is a summary of information from the individual DAC reports, which are available on request to enquiries@medin.org.uk

5 DAC Listing

There are currently seven DACs in the MEDIN DAC network, as listed in

Table 1. More details of each DAC are available through links on the DAC web pages of the MEDIN website at https://www.medin.org.uk/data-archive-centres. These pages include information on the data types held and top-level guidelines on how to submit data to, and access data from, each DAC.

Table 1: MEDIN Data Archive Centres

Name	Coverage	Contact Information	MEDIN Status
British Oceanographic Data Centre (BODC)	Water Column Oceanography data	enquiries@bodc.ac.uk 0782 512 0946	Accredited 2009; Re-accredited 2017; Application for CTS expected 2022; operational.
British Geological Survey (BGS)	Marine Geology and Geophysics data	medin@bgs.ac.uk	Accredited 2009; Re-accredited 2017; CTS accreditation 2018; Reaccredited March 2022; operational.
The Archive for Marine Species and Habitats Data (DASSH)	Marine Species and Habitats data	Dassh.enquiries@mba.ac.uk 01752 633291	Accredited 2009; Re-accredited 2017; CTS submission 2021; resubmission pending; operational.
Met Office	Marine Meteorology data	enquiries@metoffice.gov.uk	Accredited Dec 2011; Re-accredited 2018; operational.
United Kingdom Hydrographic Office (UKHO)	Bathymetry data	CustomerServices@ukho.gov.uk	Accredited 2009; Re-accredited 2017; operational.
FishDAC Cefas Marine Scotland Science (MSS) DASSH	Fisheries data - Fish and Shellfish, Aquaculture and related samples and environmental data	Cefas: data.manager@cefas.co.uk	Accredited 2012; Re-accredited 2018; operational.
		Marine Scotland Science: jens.rasmussen@gov.scot	Accredited 2012; Re-accredited 2018; operational.
Historic Environment DAC Archaeology Data Service (ADS) Historic Environment Scotland (HES) Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW)	Marine Historic Environment fieldwork derived data	Archaeology Data Service: help@archaeologydataservice.ac.uk	Accredited 2013; Re-accredited 2018; CTS accreditation 2020 operational;
		Historic Environment Scotland: peter.mckeague@hes.scot Hannah.smith@hes.scot	Accredited May 2014; Re-accreditation due 2019; operational.
		Royal Commission on the Ancient and Historical Monuments of Wales General: Gareth.edwards@rcahmw.gov.uk Maritime: julian.whitewright@rcahmw.gov.uk	Accredited June 2016; Considering CTS Application operational.

6 DAC Performance

Each year, MEDIN asks the DACs to report on their performance using a standard set of metrics.

The metrics are now pulled directly from the MEDIN Portal where possible. They therefore show the number of metadata records in the portal where a DAC is the custodian of the data. This is not always directly representative of the number of data sets held at a DAC because of some variability in the granularity of metadata records. This is the third year of reporting using metrics from the MEDIN Portal.

The key metrics are as follows:

- Total number of metadata records present in the MEDIN Portal where each DAC holds the data. For some cases, particularly the Historical Environment DAC, there are records available in the portal where the DAC is the data holder but did not provide the MEDIN record. In these cases, there has been some previous duplication of records that were removed this year, leading to an apparent reduction in records for these DACs.
- Number of new or updated records in the MEDIN Portal in reporting year where each DAC holds the data. Note: the metrics were run in May 2022, not 31 March, and hence some additional records added in April and early May will be recorded within this year.
- Number of records where DAC holds the data, with:
    - A URL leading to online access to data
    - A URL allowing direct access to data (i.e. within 2 clicks)
    - A URL containing a Digital Object Identifier
- Number of records in the MEDIN Portal for Marine Science Coordination Committee (MSCC) partners with data archived in a MEDIN DAC.
- Number of requests for data for each DAC (using figures supplied by DACs as it is not possible to obtain this from the MEDIN portal).

3.1 DAC Metrics

The metrics for 2019-20 to 2021-22 are shown in Table 2.

Table 2: Annual metrics for the MEDIN DACs

Year	BGS	BODC	DASSH	UKHO	Met Office	Cefas	MSS	ADS	HES	RCAHMW
Total number of metadata records where DAC is custodian[1]										
2019-20	857	1107	710	4736	7	2058	282	74	47	26
2020-21	857	1107	723	4736	7	2096	308	263	47	26
2021-22	857	1143	724	6050	7	2108	334	265	26	13
New/updated records in reporting year										
2019-20	22	45	496	0	1	536	54	74	25	13
2020-21	693	2	152	0	2	421	54	189	7	1
2021-22	1	1029	118	4600	3	1637	42	259	2	0
Records with online access to data										
2019-20	855	1056	631	4736	2	1914	240	74	17	0
2020-21	855	1056	635	4736	2	1958	254	153	17	0
2021-22	855	1082	382	6049	2	2108	278	155	9	0

[1] These do not include records where the DAC may have compiled the metadata but are not custodians of the data.

Year	BGS	BODC	DASSH	UKHO	Met Office	Cefas	MSS	ADS	HES	RCAHMW
Records with 2 clicks to data										
2019-20	694	997	165	0	1	1914	57	73	12	0
2020-21	694	997	124	0	1	1958	64	150	12	0
2021-22	694	1013	178	0	1	2108	69	152	6	0
Records with DOI										
2019-20	0	54	1	0	0	101	49	73	12	0
2020-21	0	54	9	0	0	115	56	150	12	0
2021-22	0	80	15	0	0	115	61	152	6	0
Total number of records for data from MSCC organisations										
2019-20	151	80	15	34	5	2058	213	0	0	0
2020-21	151	80	22	34	5	2096	225	0	0	0
2021-22	151	80	22	23	5	2108	244	0	0	0
New records in reporting year for data from MSCC organisations										
2019-20	0	4	9	0	0	536	21	0	0	0
2020-21	12	2	9	0	2	421	18	0	0	0
2021-22	0	59	4	20	1	1639	20	0	0	0
Data download requests										
2021-22	2,920,975	540,380	19,889	9,027	Unknown	3,541	39,332	17,284	2[2]	619,043

[1] With an additional 413,190 online serviced metadata requests, which includes key information download

Please note that it is not advisable to compare absolute values between DACs, as the granularity of the metadata records varies significantly between (and even within) DACs. For instance, all the data held in the Met Office MEDIN DAC for marine meteorology data are held within 7 data sets, which are augmented each year with that year's new data and their associated metadata records updated accordingly.

Figure 1: Number of metadata records in the MEDIN portal per DAC.

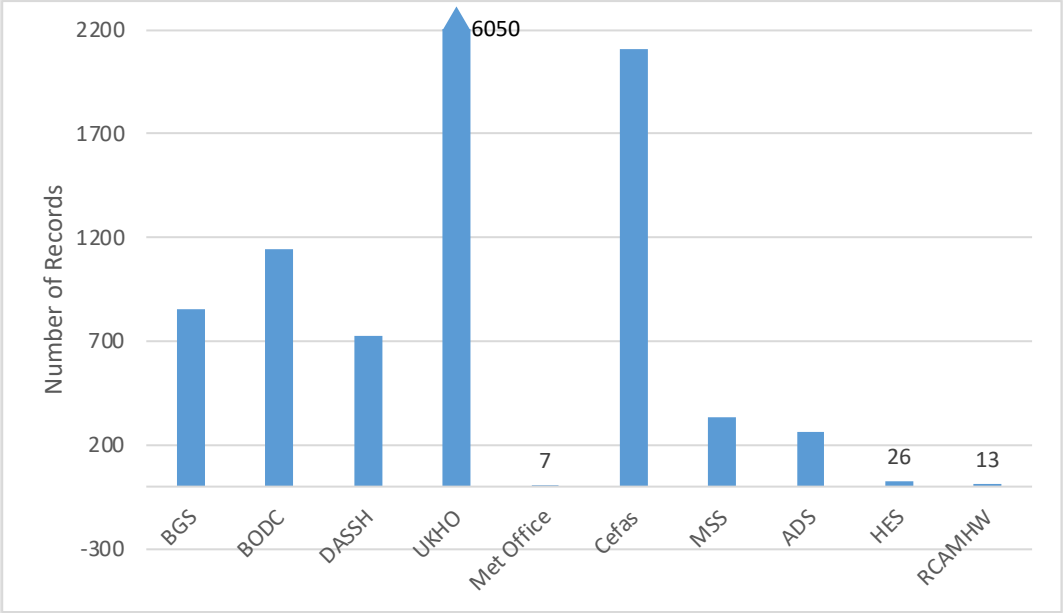


Figure 1 shows that the UKHO remains the DAC with the most metadata records in the MEDIN Portal, accounting for more than 50% of the total. However, as noted earlier, the difference in metadata granularity between DACs means a direct comparison between DACs is not appropriate. Four of the DACs have updated or increased their metadata records in the MEDIN portal by over 70% in the past year (Figure 2). Some of this will relate to new datasets, or new data being added to existing datasets such as time series, and some to improving the quality of existing metadata. Note that any updates to existing metadata records count as changes in this metric. During the year, BODC upgraded their workflow to allow generation of new MEDIN records, and in the process updated records to the latest version, giving a very high number of new and replaced records.

Figure 2: Percentage of metadata records in the MEDIN portal per DAC that are new, or were updated during 2021-22.

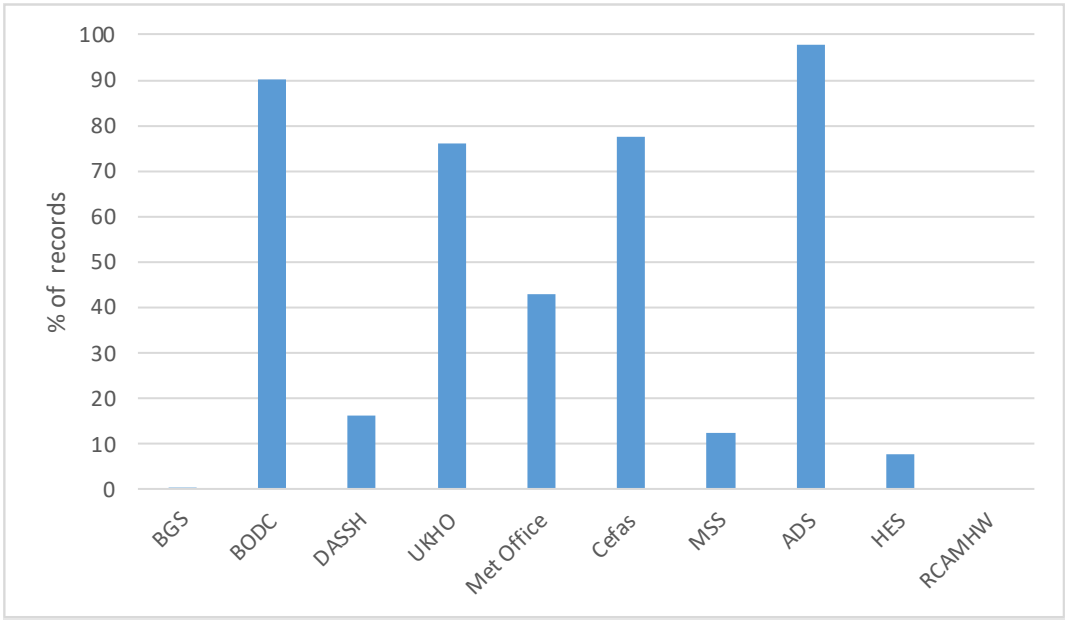


Figure 3 shows that five MEDIN DACs have a Uniform Resource Locator (URL) leading to some form of online access to data (not necessarily 2-click access) for over 80% of the metadata records for data they hold . In total this represents more than 95% of all metadata records in the portal. One way to provide direct access to data is by using a Digital Object Identifier (DOI) and the use of DOIs has increased again this year, although the proportion of records with a DOI has remained stable.

Figure 3: Percentage of metadata records per DAC in the MEDIN Portal with online access to data.

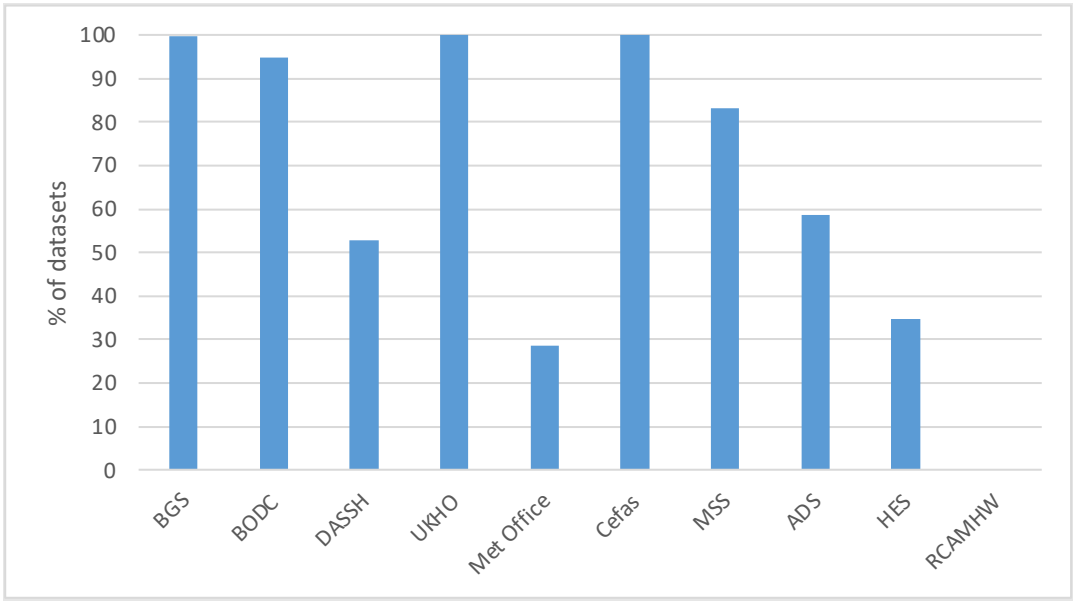
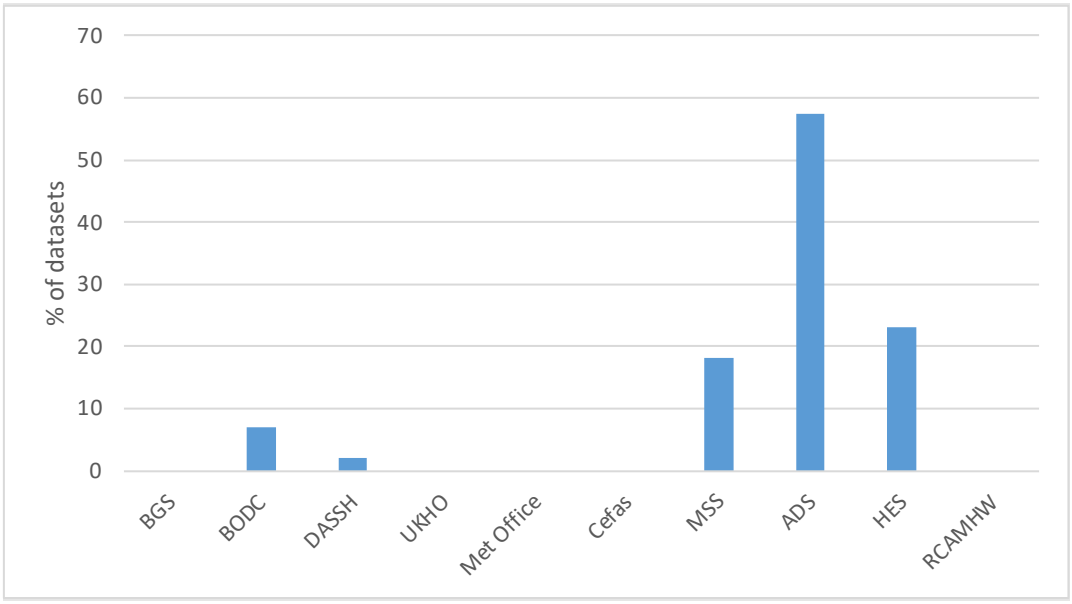
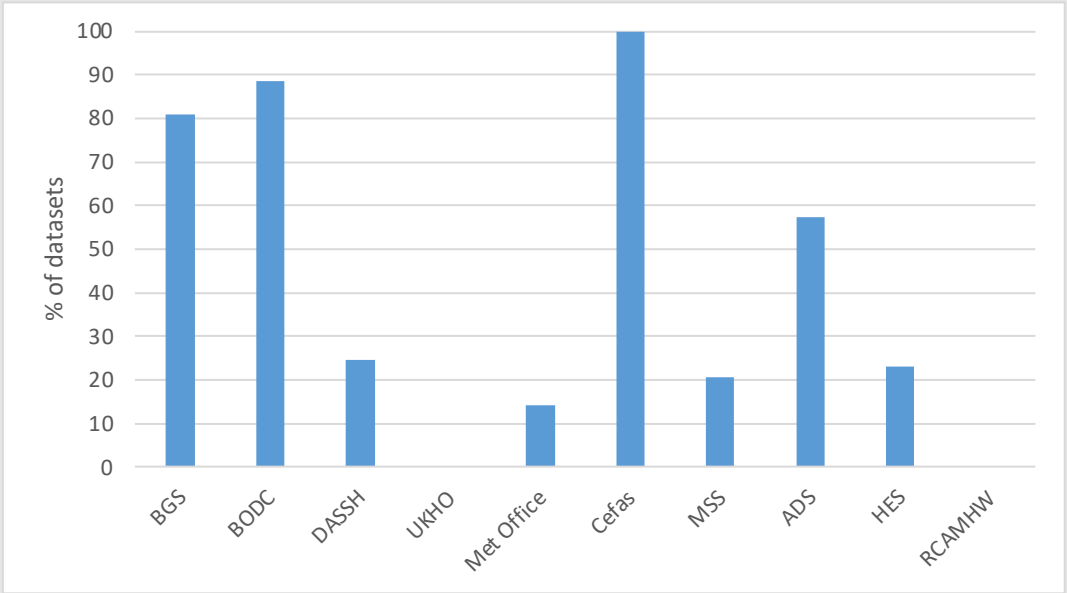


Figure 4: Percentage of metadata records per DAC in the MEDIN Portal with a Digital Object Identifier (DOI).



MEDIN continues to promote direct access to data, ideally within 2 clicks. The DACs are continuing to increase the number of metadata records providing data with '2-click' direct access, although the proportion of records remains similar to 2021 as new records are not all associated with 2-click download options. Three of the MEDIN DACs now provide direct access to data (within 2 clicks) from over 80% of their metadata records in the portal (Figure 5).

Figure 5: Percentage of metadata records per DAC in MEDIN Portal that offer 2-clicks to data.



The breakdown of country of origin for metadata records in the MEDIN portal where the DACs are custodian is shown in Figure 6.

Figure 7 shows the percentage of records at each DAC where data originate from organisations involved with the Marine Science Coordination Committee (MSCC). MEDIN is a partnership initiative of the MSCC and MEDIN reports progress to MSCC. The number of MSCC organisations archiving data at MEDIN DACs varies across the DACs, as the data from each MSCC organisation is more relevant to some DACs than others.

Figure 6: Percentage of metadata records per DAC in the MEDIN Portal by country of origin.

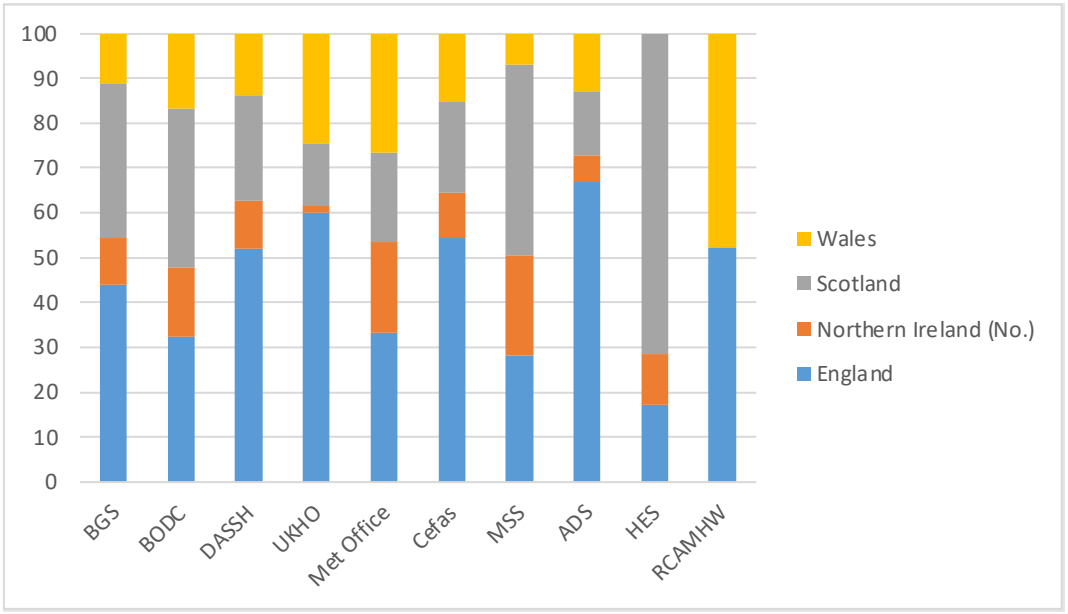
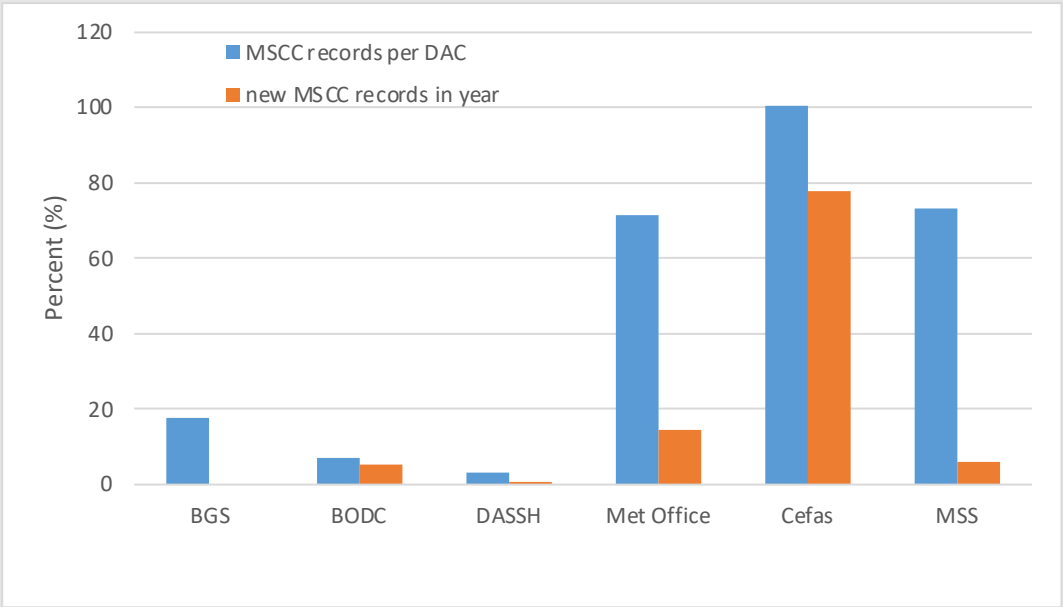


Figure 7: Percentage of metadata records per DAC in the MEDIN Portal where data is archived in a DAC, and the percentage of new records, where data was collected by MSCC organisations (unlisted DACs have no MSCC data).



3.2 New datasets

The MEDIN DACs continue to archive major new datasets. Table 3 summarises new datasets archived by each DAC during the financial year (FY) 2021-22.

Table 3: Summary of new datasets archived at MEDIN DACs during 2021-22.

Met Office	UKHO
There are 7 datasets on the MEDIN portal, which together describe most in-situ marine meteorological observations collected by the Met Office. The Met Office differs from other DACs in that it doesn't add new data sets, instead it adds new observations to its existing data sets. The amount of data in the database increases daily. The Met Office is actively involved in international collaboration with WMO partners, with members of the DAC involved in WMO task teams. One of the goals of the collaboration effort is to increase the quantity of data and data suppliers to the WMO, which in turn would feed into the Met Office's datasets.	260 new surveys were added in the reporting year, including 47 Hydrographic Instruction surveys. These included contributions from the following new organisations: • London Gateway • Aspect Land and Hydrographic Surveys • Unmanned Survey Solutions • CalMac Ferries Limited • RJ McLeod Limited Orkney Islands Council Marine Services

DASSH	BODC
New datasets archived during 2021-22 include: ○ 2015 - 2018 Marine Biological Association of the United Kingdom (MBA) Western English Channel standard-haul demersal fish survey data: This dataset is the first to be published of a significant long historic time series, which we are working with the MBA Sepia team to get standardised and published. ○ 2002 - Ongoing Marclim time series surveys: The long-term Marclim master -dataset was archived within DASSH and is currently undergoing standardisation/QA to be published. This is a significant dataset with long-term trends captured over nearly 20 years, and many organisations and individuals have contributed.	During 2021/22, BODC received 180 accessions of data from 53 organisations in 12 countries, as follows: 2 accessions from NERC laboratories (not including collaborative centres & NOC) 40 accessions from UK universities 1 accession from a UK Government funded laboratory 6 accessions from commercial organisations 87 accessions from charitable organisations (including NOC centres) 44 accessions from overseas laboratories The data comprise physical, chemical, biological and geophysical observations in a variety of forms including profiles, time series and discrete samples. Data sets are prepared using MEDIN guidelines and are loaded into the NODB (either the BODC Series or the BODC Samples database) after re-formatting, usage metadata compilation, quality control (automatic tests and visual inspection), documentation and audit. During 2021 - 2022, an additional 63 datasets were added to the PDL (Published Data Library) and received a DOI. The PDL had 766 active downloads from 449 published datasets One new organisation was added as data depositor.
RCAHMW (Historic Environment DAC)	**ADS (Historic Environment DAC)**
No new maritime archives added during 2021/22. A major survey was undertaken by MSDS Marine, on behalf of the CHERISH Project, of the Bronze Bell designated wreck site in Cardigan Bay. The resulting dataset and archive were deposited with the RCAHMW during 2022/23 and will feature in the report for that year, in due course. No new organisations depositing 'maritime' data in 2021/22. This is likely to change in 2022/23 due to digital recording measures being mandated through the marine planning system following consultation with RCAHMW.	Project Reporting Data for the Queen Elizabeth Class Capital Dredge Project, Portsmouth 2015-2017 https://doi.org/10.5284/1086864 Wessex Archaeology was commissioned by Boskalis Westminster Limited, dredging contractor for the Defence Infrastructure Organisation, to operate an archaeological protocol for the reporting of archaeological discoveries and undertake the associated quayside archaeological monitoring of recovered finds, as part of the Queen Elizabeth Class Capital Dredge Project at Her Majesty's Naval Base Portsmouth. Over 1000 objects were recovered and subsequently recorded as part of the capital dredge works. The earliest datable finds comprise projectiles from the 16th century and ordnance from the 17th century. The remains of an early 19th century buoy is considered highly significant. Most finds are dated to the 20th century, with the Second World War period and late 20th century well represented. Aviation material is also represented in the assemblage comprising an aircraft engine. The Royal Navy presence in Portsmouth is represented by a variety of finds issued by the Navy, some marked with the broad arrow.
HES (Historic Environment DAC)	**BGS**
HES have reported no new datasets or contributors this year	New datasets archived during 2020-21 include: Further Civil Hydrography Programme backscatter and sample data have been received from UKHO

Marine Scotland Science (FishDAC)	Cefas (FishDAC)
Over the past year, MSS have been operating in a strictly business as usual mode, meaning they are continuing to archive data from fisheries independent surveys and fisheries statistics for Scotland.	The following highlighted datasets represent time series that may be used for multiple scientific purposes. Lynam et al, Cefas (2022). **Occurrences of sensitive fish species in scientific trawl surveys of the Northeast Atlantic 1983-2020.** Cefas, UK. V1. doi: https://doi.org/10.14466/CefasDataHub.128 Dye et al, Cefas (2022). **Salinity and Temperature data from the Angmagssalik Array in the Denmark Strait Overflow - 1998 to 2015.** Cefas, UK. V1. doi: https://doi.org/10.14466/CefasDataHub.127 Cooper et al, Cefas (2022). **Biotope (macrofaunal assemblage) map and associated confidence layer based on grab and core data from 1976 to 2020**. Cefas, UK. V1. doi: https://doi.org/10.14466/CefasDataHub.125 Rogers et al, Cefas (2021). **Database of critical oxygen level (Pcrit) in freshwater and marine fishes.** 1974 - 2015. Cefas, UK. V1. doi: https://doi.org/10.14466/CefasDataHub.121

7 Highlights

In addition to providing metrics, the DAC reports also detail highlights from the previous year, which together show levels of activity and examples of usefulness of the DAC network and also indicate how nationally and internationally integrated the DAC system is. A number of new developments and initiatives took place during 2021-22, enhancing the capability of the MEDIN DACs to the benefit of MEDIN's users.

4.1 New developments and capabilities:

Marine Species and Habitats DAC (DASSH): The EDR API is being developed with MEDIN funding, in collaboration with other MEDIN DACs (**Cefas** & **BGS**). This pilot will assist the MEDIN marine data community in selecting a potential API standard to meet the needs of data providers and requestors.

DASSH are also developing a new discovery metadata online editor and maestro, the metadata tool editor.

A new DOI tool is in development, including the seamless integration of the DataCite API for DOI minting.

Bathymetry DAC (UKHO): The Seabed Mapping Service is continually improved to make the best possible experience for users. This year UKHO have added improved filtering and search facilities, improved metadata and the WMS layer to provide context and improve the user journey, with fewer clicks required to download data.
All data sets now have MEDIN 3.1 Discovery Metadata available from the UKHO web-accessible folder (WAF) (https://medinexport-data.ukho.gov.uk/), as well as through the MEDIN portal. The data platform, the Seabed Mapping Service and the WAF all ensure users now get consistent metadata and the UKHO has appropriate technology to ensure ongoing compliance to standards.

Fisheries DAC (MSS and Cefas)

MSS: During this reporting period MSS have been operating in a strictly business as usual mode and no significant developments have been undertaken. They maintain the archival of ongoing survey data and provide access through the Marine Scotland Open Data portal.

Cefas: The Cefas Data Hub, which includes the Cefas Data Portal, was significantly updated and upgraded during the year. Major highlights include:

- Migration of all infrastructure to the MS Azure Cloud

- Improvements to search capabilities and performance
- Redevelopment of the Cefas Data Portal to improve external user experience and upgrades to both digital security and accessibility
- Updates to all metadata from MEDIN 2.7 to MEDIN 3.1.1 discovery metadata standard
- Development of a pilot implementation of the OGC ENV API standard to a selection of datasets

Historical Environment DAC (ADS, RCAHMW and HES)

There has been ongoing collaboration between the federated heritage DACs through the UNPATH project, notably in the development of a shared ontology and enhanced vocabularies that better describe marine heritage e.g. adopting common craft-type thesaurus and the need to map UKHO IDs to NMR IDs. The advent of the UnPath'd Waters project has ignited regular discussion on a roughly monthly basis between those responsible for the maritime elements of the respective national monument records in Scotland, England, Wales and Northern Ireland.

ADS: Work is nearly complete on building a new ADS website that meets modern W3C Accessibility Guidelines. A staging version is currently being reviewed, prior to release over Summer 2022. The new website includes a new search mechanism with much improved spatial searching.

The ADS is playing a significant role in UNPATH, leading the work on aggregation of marine data from all UK state heritage agencies, academic partners and commercial archaeological contractors. The UNPATH data will be available in a customised portal based on the current ARIADNE project and will also be exported/provided to the MEDIN metadata portal.
In addition, for datasets without a designated national repository, ADS will provide long-term hosting and archiving - including such exciting sites as the wreck of the Mary Rose.

RCAHMW: RCAHMW now have a maritime office in post (from June 2021), after an absence of nearly two years. They are now engaged in the process of updating the maritime records with the NMRW.

This work is also taking place under the aegis of the UnPath'd waters project (commenced November 2021), which should see greater interaction between site data held within the NMRW and that held in wider collections, e.g. bathymetry data held by Bangor University of ship surveys held by the Lloyds Register Heritage and Education Centre.

HES: HES produced a training video explaining how to use our online marine resources in Canmore. The video will be uploaded onto the HES YouTube channel during 2022 or 2023.
Enhancements were made to the overall Canmore website, including zoomify for online images and bound volumes views that will aid accessing the marine data

Water Column Oceanography DAC (BODC): Highlights of the developments for 2021-22.

- General Bathymetric Chart of the Oceans (GEBCO) 2021 global release with an enhanced selection of all 15-arc versions of the grid as well as generation of images for data subsets
- GEOTRACES IDP 2022 – Citeable and traceable data product for the GEOTRACES community
- BODC NERC Vocabulary Service: A suite of improvements have been made using stakeholder feedback: to improve UI/UX, increase speed, improve submission workflow and allow bulk uploads, along with the development of "smart mappings"
- BODC have continued the real-time delivery of data through ERDDAP via the project Cream-T, supporting near-real time delivery of data for live warning systems
- Fix BODC flow to MEDIN and update the metadata to meet version 3.1.1

- Argo developments including development of Argo DMQC package in Python, expansion of vocabularies for Argo community, supporting the Argo community and global ocean monitoring
- Submission and proof of concept for data flow to meet UN SDG 14.3.1 data flow for ocean acidification data held at BODC

Marine Geology and Geophysics DAC (BGS): Ongoing improvements/additions to the Offshore GeoIndex

- BGS OGC APIs
- Initial work for MEDIN OGC API project (though the main part of this will be during FY22/23)
- Some work done on metadata system
- BGS marine gravity and magnetic data released under OGL (previously licenced)
- BGS Factor Maps to be release under OGL (previously under Letter of Undertaking)

Marine Meteorology DAC (Met Office): Due to the continuing coronavirus situation, major projects have been delayed due to different working conditions and restrictions on physical engineering works. As restrictions have eased work has resumed on projects such as upgrading physical observing equipment on voluntary observing ships. These upgrades resulted in an increased volume of observations available.

A major development in the last year has been the launch of SurfaceNet, the new Met Office observation processing suite. After extensive testing and development the project is now progressing to the operational phase and most of the automatic shipborne observations are now processed through SurfaceNet. This is expected to lead to improvements in quality control and to improve data timeliness.

The Met Office has also launched a new metadata handling suite called OSMM, which has greatly improved the link between metadata storage and applying metadata to QC processes.

7.2 New funding streams

Some of the MEDIN DACs received new funding streams during 2020-2021. In particular the **Historic Environment DAC** were successful in the Historic England-led UKRI Toward a National Collection (TaNC) Discovery Programme bid: *Unpath: To unpath'd waters, undream'd shores*. HES will be working on the maritime craft terminologies with colleagues in national heritage agencies, from Historic England, RCAHMW, Northern Ireland and the Isle of Man, as well as with the National Maritime Museum and Lloyds Register Foundation, to develop a consistent approach to indexing maritime craft in national datasets. We will also be working on improving data standards more generally and encouraging archive deposition of primary data.
Additional funding streams for the **Historic Environment DAC include:**

- **ADS:** Within the 12 months, the ADS has received funding for infrastructure development via the UKRI. HS2 has confirmed additional funding until 2030 to secure the digital archives generated by archaeological works in advance of construction of the High Speed 2 (HS2) infrastructure programme.
- **HES:** The Historic Scotland Foundation approved the funding for The Heritage Hub, which will overhaul and rationalise the existing websites to present all HES information in one place in a n easy to use way. Work on the development will commence in Spring 2022.

Other DACs have also secured additional funding. For example **Marine Species and Habitats DAC (DASSH)** has a range of project-based funding including a JNCC subcontract to carry out a portion of the mNCEA project work - where DASSH used specific expertise to extract, process and compare metadata holdings between specific [missing word???]. The **Water Column Oceanography DAC (BODC)** has secured EU funding from the European Union Horizons 2020 Blue Cloud and the European Commission (EC) European Open Science Cloud (EOSC) EOSC Futures project, underpinned by UKRI in case of the UK not becoming a full partner in Horizons Europe. A new Oceanids2 funding stream for glider data processing development is currently under review.

4.3 International meetings

Many of the DACs have a strong presence internationally, reflected in the broad spectrum of international meetings attended. Most international meetings have been held virtually during this period. A few examples from this reporting year include:

A variety of EMODnet meetings (e.g. Biology, Chemistry, Geology, Ingestion, Partners meetings and a Citizen Science Workshop) involving **Marine Species and Habitats DAC (DASSH)**, **Fisheries DAC (Cefas**), **Water Column Oceanography DAC (BODC)**, **Marine Geology and Geophysics DAC (BGS).**

The **Marine Species and Habitats DAC (DASSH)**, have been involved in a range of biodiversity working and meetings, including OBIS Vocabulary and QC Working Groups and Steering Group; Joint OBIS/GBIF Workshop; EuropaBON Stakeholder Workshop; Marine Biodiversity Observation Network (MBON) Community Event; EMBRC eInfrastructure Working Group; EMBRC/Data Terra Collaborative Meeting; Future of our Seas - EU workshop on MSFD and the future of monitoring; MarineLife2030 Co-Design Stakeholder Engagement Meeting - 04/02. DASSH have also attended a series of workshops on regional marine data including UK/Russia Marine Stations Workshop; White Sea Benthic Data workshop and Black Sea Connect Workshop - 02/02.

The **Fisheries DAC (MSS and Cefas)** and **BODC** have been involved in International Council for the Exploration of the Sea (ICES) meetings, including **MSS** in the ICES TAF Governance, Spatial Fisheries Data Governance and Data and Information Groups, **Cefas** in the Assessment Working Groups, Data Governance, technical advisory and many others, with **BODC** in the Data Information Group.

Cefas also attended various UK-EU fisheries Negotiation meetings, HELCOM meetings and OSPAR-sponsored meetings.

DASSH, Cefas and **BODC** attended the United Nations Educational, Scientific and Cultural Organisation (UNESCO) Intergovernmental Oceanographic Commission (IOC) International Oceanographic Data and Information Exchange (IODE) International Data Conference. They also attended and presented at the International Conference on Marine Data and Information Systems (IMDIS).

The Historic Environment DAC has also been involved in international meetings. For example, the **RCAHMW** Maritime Officer attended the International Symposium on Boat and Ship Archaeology, **HES** attended the Nautical Archaeological Society Conference (virtually) and **ADS** attended the European Association of Archaeologists (EAA) meeting and the Cultural Heritage and New Technologies (CHNT) meeting.

Marine Meteorology DAC (Met Office) attended the EUMETNET Data Management Workshop virtual meeting with UK and international colleagues, as well as giving a presentation on Met Office QC processes and developments.

The Water Column DAC (BODC) have attended and presented at several international science meetings in their data sessions, including the American Geophysical Union (AGU) and the European Geophysical Union (EGU). They have also participated in international project meetings for GEOTRACES, GLOSS, GEBCO and Argo, and working groups for EU ODANext – Sensor-to-client, Copernicus INSTAC (in situ thematic centres) and the OBIS Vocabulary Infrastructure Project.

4.4 Data Access and Sharing

Data from most of the MEDIN DACs are made available under open licences such as the UK Open Government Licence (OGL) for data. Most data from MSS, NERC (e.g. BGS and BODC), Met Office and Cefas are made available under this licence. UKHO data are made available under the UKHO Bathymetry Data Licence, which allows users (with caveats) to copy, publish, distribute and transmit the information; adapt it or exploit it commercially, for example, by combining it with other Information or by including it in their own product or application. For data centres accepting data from non-government or Research Council sources, there may be additional constraints applied to the license agreements.

DASSH licensing is assigned in consultation with the data provider. All data are made "as open as possible, as closed as necessary". DASSH promote CC-BY or OGL as the preferred license but in some cases, data are deposited under CC-BY-NC.

The DACs' data access mechanisms are described below, along with improvements made during the reporting year:

Bathymetry DAC (UKHO): Data sets are accessible from the UKHO via the Seabed Mapping Service at https://seabed.admiralty.co.uk, which provides a geospatial viewer and search query, supported by complete MEDIN 3.1 metadata records completed this year. The MEDIN 3.1 metadata is also available from the UKHO web-accessible folder – https://medinexport-data.ukho.gov.uk/

The UKHO 100m Web Map Service (WMS) is a simple HTTP interface for requesting georeferenced map images of the seabed around the UK derived from over 5,000 open bathymetric data sets, which have been conflated into a single 100m resolution gridded surface.

The data are licenced under OGL and are also made available through third-party portals such as data.gov.uk, EMODnet and the International Hydrographic Office (IHO) Data Centre for Digital Bathymetry (DCDB). Data sets can also be requested from the UKHO via Customer Services.

Marine Species and Habitats DAC (DASSH): Data sets are ingested into DBOSSH, the internal DASSH database, converted to Darwin core format and then published on the IPT (Integrated Publishing Toolkit) for EMODnet (European Marine Observation and Data Network) and EurOBIS/OBIS (Europe/ Ocean Biodiversity Information System) to download and publish/collate. Data sets are also shared regularly with NBN (National Biodiversity Network). On a DASSH level, individual species records are made available on the DASSH Mapper (https://www.dassh.ac.uk/data/search-data, this URL will change with the new MBA website launch), and whole datasets are made available through MEDIN Discovery Metadata published on the MEDIN portal, where a download link to the geoserver hosting the dataset will be provided in the resource locator. Over the last year, there have been some incremental improvements to the database including new fields, as well as new search fields on the DASSH mapper (e.g. biotope).

Fisheries DAC (Cefas and MSS): MSS: For repeated annual surveys coordinated internationally through ICES working groups, the data are submitted to the ICES Database for Trawl Surveys (DATRAS), while metadata is sent to MEDIN with direct links to the DATRAS system. For nationally coordinated surveys or other datasets, data are uploaded to the Marine Scotland Open Data portal (https://data.marine.gov.scot) and made available with a DOI. Metadata containing the DOI are submitted to MEDIN.

Cefas: Metadata and datasets are made available via the Cefas Data Portal, with no registration or sign-in required. All data can be downloaded from the website in csv or shapefile format, additional spatial data is available via WMS/WFS direct feeds. Public APIs are available to access all metadata and data.

Following Cefas Data Management Policy, data are made openly available on the Cefas Data Portal by default, except where there is a good reason to restrict e.g. commercially sensitive or personal data.

All *metadata* is automatically exported to MEDIN and data.gov.uk via Web Accessible Folders (WAFs) and all metadata that include a DOI are also served to the Defra Shared Services Platform. Such third-party data portals direct external users directly to the Cefas Data Portal to access the data. Selected biodiversity timeseries data sets are published on the Cefas Data Portal and distributed by DASSH to the EurOBIS/OBIS data systems, which are in turn made accessible via the GBIF and EMODnet data portals.

Historical Environment DAC (ADS, HES and RCAHMW):

ADS: Data sets are available for download directly from the ADS website. Data sets are normally grouped by collections that reflect the project carried out by the originator, such as a survey or monitoring project. Each collection has a DOI. 155 grey literature reports are disseminated as individual records within an application known as the ADS Library. Each report has its own DOI.

Among other improvements, all archive and grey literature metadata are now in the new ARIADNE data portal https://ariadne-portal-staging.d4science.org/

HES: Public access is provided through the online portal (Canmore) and map-based search (PastMap). Users may select and download up to 1,000 records in .csv or .kml formats under an Open Government Licence.

HES Public Services are the principal point of contact for bespoke data requests and downloads. They do not distinguish between terrestrial and marine data requests. Seven marine data requests were forwarded to the Data Management team.

HES spatial datasets and services: Historic Marine Protected Areas, Scheduled Monuments (for Inter-tidal and wrecks), Listed Buildings (for Coastal built heritage) and Canmore – National Record of the Historic Environment, are available to download and access as view and download services from the HES spatial downloads page and through the Scottish Government metadata portal. Records are harvested to data.gov.uk but, following Brexit, no longer appear on the INSPIRE Geoportal. Data are also provided through Marine Scotland's National Marine Plan Interactive Portal and through SEWeb. A copy of the Canmore record is provided periodically to the Archaeology Data Service for uploading onto ArchSearch and for onward use in the ARIADNEplus portal.

RCAHMW: Data are mainly accessed via the dedicated Coflein online database, which is OGC compliant and holds 8,299 site records, and through Historic Wales, the collaborative historic environment portal for Wales. The Coflein data access system is published using ArcGIS Online with compliant metadata standards. The full maritime dataset is available on the Welsh Government's . Data downloads are available on request to the RCAHMW enquiry service and archives can be accessed in a public reading room. Geo-Portal. Data downloads are available on request from the RCAHMW enquiry service and archives can be accessed in a public reading room.

Water Column Oceanography DAC (BODC): The BODC National Oceanographic Database (NODB) delivery system (https://www.bodc.ac.uk/data/online_delivery/nodb/) now gives access to 137,500 data series, a 1% increase in the number of series available online last year. Data are available in a fashion that allow users to search across cruises, time, location, originator, parameter etc. Services offer users the choice of a one-click download (for publicly accessible data) or 'online shopping' with a basket and checkout mechanism. Data are available in various data formats under secure access control methodologies, which includes user request tracking of auto-downloads.

The BODC tally sits at 267 data collection aggregations and 835 cruise collection aggregations. Where appropriate, these discovery metadata records carry a URL within the online resource metadata that leads directly to the data. The URLs are of two types:

- If a dataset has an associated DOI, the URL resolves to a landing page within the BODC Published Data Library that incorporates a one-click download service.

- For non-DOI datasets, a URL resolves to a pre-filtered search result set in the BODC online web user interface (UI) specific to the data or cruise collection. The UI incorporates a one-click download service.

BODC have made further improvements to access arrangements through continued development of ERDDAP instances, sensor web enablement schema and Google's schema.org. All metadata records in the PDL have been published with schema.org. These improvements are ongoing pieces of work within BODC, who will continue to provide improvements to DOI/PID services.

Data are made available through a number of international third-party portals including: SeaDataNet CDI; SeaDataCloud; EMODNET Chemistry via SeaDataNet; ICES; Marine Scotland Science (MSS) and CEFAS (MERMAN data assessment level cleaned data); GEBCO; ARGO GDAC; Everyone's Glider Observatory (EGO); Global Sea Level Observing System (GLOSS); Global Ocean Acidification Observing Network (GOA-ON).

Marine Geology and Geophysics DAC (BGS): Data are made available through several portals:

- The Offshore GeoIndex – https://www.bgs.ac.uk/GeoIndex/offshore.htm (also available as a Web Map Service)
- SEA Data Portal - https://www.bgs.ac.uk/data/sea/home.html
- BGS Deposited Data Search - https://www.bgs.ac.uk/services/ngdc/accessions/index.html?

Additional services provide access to the DAC holdings:

- Geological maps created from data are incorporated into EMODnet map products and made available through the EMODnet Geology Portal.
- Web Map Services are used in various portals (e.g. BGS Offshore map products).

Marine Meteorology DAC (Met Office) Data sets are requested through email/telephone enquiry. The request may be passed to their Data Provisioning team, who then provide a quote for the extraction of the data and information requested. Additionally, there are data available on the Met Office public website for moored platform data for the previous 24 hours. Moored platform data for the previous 24 hours are also available, either in full or in part, on the Cefas WaveNet webpage and the National Data Buoy Centre portal run by the US National Oceanic and Atmospheric Administration (NOAA), as well as other weather websites such as Windy.com. Furthermore, Voluntary Observing Ship data and shipborne automatic marine observations are available through ICOADS. Data is also available through the Centre for Environmental Data Analysis (CEDA).

Data are also shared in real time through the World Meteorological Organisation (WMO) Global Telecommunications System and development is ongoing to make metadata access through OceanOps much more efficient.

4.5 Data Standards and data quality

Use of MEDIN guidelines by depositors using the MEDIN DACs is variable across the DACs. DASSH and ADS promote the MEDIN guideline formats with their depositors to standardise the data being submitted.

Some DACs, such as Cefas and MSS only receive data from staff in their own organisations. The MEDIN metadata standard is followed but the use of the guidelines is not widespread.

BODC and BGS receive data from a wide range of originators and in many formats and it is not known whether the MEDIN guidelines are used by their depositors. DACs such as UKHO, RCAMHW, Met Office and HES promote the use of specific standards relevant to their communities.

8 DAC Sustainability and Funding

An important aspect of the DAC network is the assurance of long-term sustainability and continuity of service provision. The MEDIN DAC network achieves this by requiring that the core capability of each DAC is underwritten by an organisation or group of organisations (usually the host organisation) that itself has a business requirement to manage data of a particular theme. This approach forms the backbone of the funding/cost model for the MEDIN DACs (see box below). Current status of the individual DACs is as follows:

Funding for the **Bathymetry (UKHO)** and **Marine Meteorology (Met Office)** DAC activities has been incorporated into operational plans and is considered part of business as usual. Funding for the Bathymetry DAC is built into future plans at UKHO and investment is increased each year to ensure continued and increased availability of bathymetry data.

Species and Habitats DAC (DASSH) funding situation is relatively stable, with continuing support from Defra, the Scottish Government and MEDIN for the operation of core DAC functions. DASSH are working with Defra to streamline and improve the mechanism for DASSH funding This is augmented by funding secured from EMODnet Biology (DG-MARE) until 2023. Additional small project funding is sought each year to complement the overall DASSH work plan.

Funding for the **Water Column Oceanography (BODC)** and **Marine Geology and Geophysics (BGS)** DACs appears secure in the short term with no reductions (although this is not inflation-proofed). These two data centres are approaching the end of the current NERC Data Centre National Capability evaluation and commissioning process 5-year funding cycle (2018-2023). NERC remains committed to data management for the medium and long term. The commissioning process for the next five years of funding for the Environmental Data Service (EDS) is now underway within NERC.

FishDAC: Cefas operates under a yearly funding cycle and funding is approved to support data management activities in FY21/22. For **MSS**, the funding situation is stable, with Marine Scotland funding a full-time data management post with responsibility for the MEDIN DAC function. However, the post is also involved in numerous other projects, so time for DAC functions is limited.

Historic Environment DAC: The ADS is hosted by the University of York, Department of Archaeology, as a Cost Centre. The ADS' long-term business plan is under constant review and is monitored by the ADS Management Committee. The ADS 5-year plan currently runs to July 2026. This was reviewed by the Management Committee, on which MEDIN is represented. The plan covers aims and objectives for the coming period as well as an assessment of the external environment in which the ADS operates. This report is compiled in conjunction with a Risk Register. Both documents are made available to the MEDIN representative on the ADS Management Committee.

The other two components of the Historic Environment DAC (Historic Environment Scotland and RCAHMW) are funded through the Scottish and Welsh Governments respectively, which are committed to ensuring that they are properly resourced in the current, short term and medium-long term. Historic Environment Scotland receives additional revenue from its Commercial and Tourism arm. The impact of the Coronavirus pandemic has had a significant impact on income from HES Properties in Care. This is likely to impact the wider organisation over the next couple of years.

MEDIN DAC Cost Model

The DAC cost model proposed and adopted in November 2010 identifies four aspects of the DAC function: Core Capability, MEDIN Coordination, Additional Archiving, and Data retrieval / distribution, as described below:

Core DAC Capability
"Core" DAC capability includes infrastructure costs and some routine data archiving. It is expected that core DAC funding is provided by organisations with a strategic interest in a national DAC capability for specific data types. MEDIN acts to provide an overview and to consider whether funding of this core capability is secure or at risk.
Funded by the organisation hosting the DAC, or in the case of DASSH by a consortium of organisations.

MEDIN co-ordination
MEDIN acts to ensure common standards and service provision across the MEDIN DAC network. The cost of MEDIN coordination activities is shared between MEDIN Sponsorship funds and the DACs themselves.
Funded by MEDIN Sponsor funds and DACs through in-kind effort

Additional Archive Costs
In the general case, the costs of archiving newly collected data should be funded by the data providers, in the form of one-off fees to the DACs in return for the services provided. This data archiving cost is not currently included in the overall budget of many monitoring and research programmes.
Funded by data suppliers

Data retrieval / distribution
MEDIN DACs will provide data access to the original data provider at no cost and will manage third party access to data sets according to terms agreed with the data provider. If no constraints are required by the owner, data will be made available to third parties at no cost, beyond any necessary to cover costs of retrieval / provision.
No cost