



**JNCC Report
No. 713A**

**Mapping the flow of data from monitoring programmes into
UK Marine Strategy indicators for cetaceans
Technical notes: Dataflow descriptions & recommendations**

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Summary

Under the UK Marine Strategy (UK MS) the UK is required to determine and measure the status of the health of its seas. For this, specific indicators are used for different ecosystem components to measure and assess progress. Data used for the calculation of cetacean indicator assessments originate from a series of discrete monitoring programmes carried out by a number of organisations, none of which were specifically set-up to fulfil the requirements of the UK MS assessments. The data landscape underpinning the UK MS indicator assessments is therefore complex and the risk of duplication of effort and underutilisation of data resources great. This piece of work aims to follow and depict the flow of data from monitoring programmes to the indicator assessments, with the goal of highlighting areas where the flow of data could be streamlined, improved or, in the case of missing data links, created. We have outlined issues that could impact the efficiency and quality of the indicator assessments and made recommendations on how to address them.

This report forms part of a series of three reports describing the flow of data into each of the UK MS biodiversity indicators. Collectively these reports will provide the initial step in improving the efficiency of data flowing into indicators and achieving a more inclusive, accessible, and robust marine biodiversity evidence base.

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1 Introduction

The health of our seas is vital for our food and energy security, our economy and social well-being; over half of the UK population lives within 15 km of the sea. The seas have an integral role in regulating our climate by storing excess carbon dioxide and heat created by human activities and providing over 50% of the oxygen we need. As well as being enjoyed for recreational activities, the seas are crucial to the UK economy, providing oil and gas, maritime transport and renewable energy (Defra 2019).

To determine the state of and changes in the health of the UK's wide variety of marine ecosystems, specific indicators have been developed under the [UK Marine Strategy](#) (HM Government 2012). The UK Marine Strategy (UK MS) cetacean indicator assessments are reliant on data from monitoring programmes undertaken by a variety of organisations, including universities, research institutions, Non-Governmental Organisations (NGOs) and some of the UK statutory environmental bodies. These discrete programmes collect data to fulfil multiple purposes and were not originally designed with the aim of fulfilling the requirements of UK MS indicators. As such, many of these programmes collect data at localised scales. These datasets are pieced together to provide an overview of the health of the UK's cetaceans.

This means that currently the pathways of data feeding into the indicator assessments are not standardised or streamlined, and it is unclear whether indicator assessments capture all available data.

In 2008 the Marine Environmental Data and Information Network (MEDIN) was established, to improve access to and management of UK marine environmental data and information. MEDIN aims to achieve this primarily through a coordinated framework for managing marine data and information (see Figure 1). Ideally, general monitoring activities carried out by the statutory environmental bodies or other organisations should be registered at the UK Directory of Marine Observing Systems ([UKDMOS](#)). Specific datasets produced by monitoring activities should be made accessible and archived at one of the MEDIN Data Archive Centres where they can be assigned a persistent identifier (PID) in form of a Digital Object Identifier (DOI). Metadata describing the datasets should be published via the [MEDIN](#) Discovery Portal to ensure optimal discoverability. The datasets DOIs can then be linked to UKDMOS under the overarching monitoring survey. Dataset products (combinations of individual datasets) produced as part of the indicator assessments should be archived in the same manner (see Figure 1) but original sources of raw data from which these data products are derived can be traced back easily using PIDs. Ideally, the Marine Online Assessment Tool ([MOAT](#)) would contain metadata (information about the dataset) on the datasets collated for indicator assessments (e.g. raw data, compiled data set, data snapshot) and link them back to the data archiving centre where they have been deposited. The infrastructure behind the MEDIN framework requires further development to function optimally and consistent usage among statutory bodies and other organisations is needed.

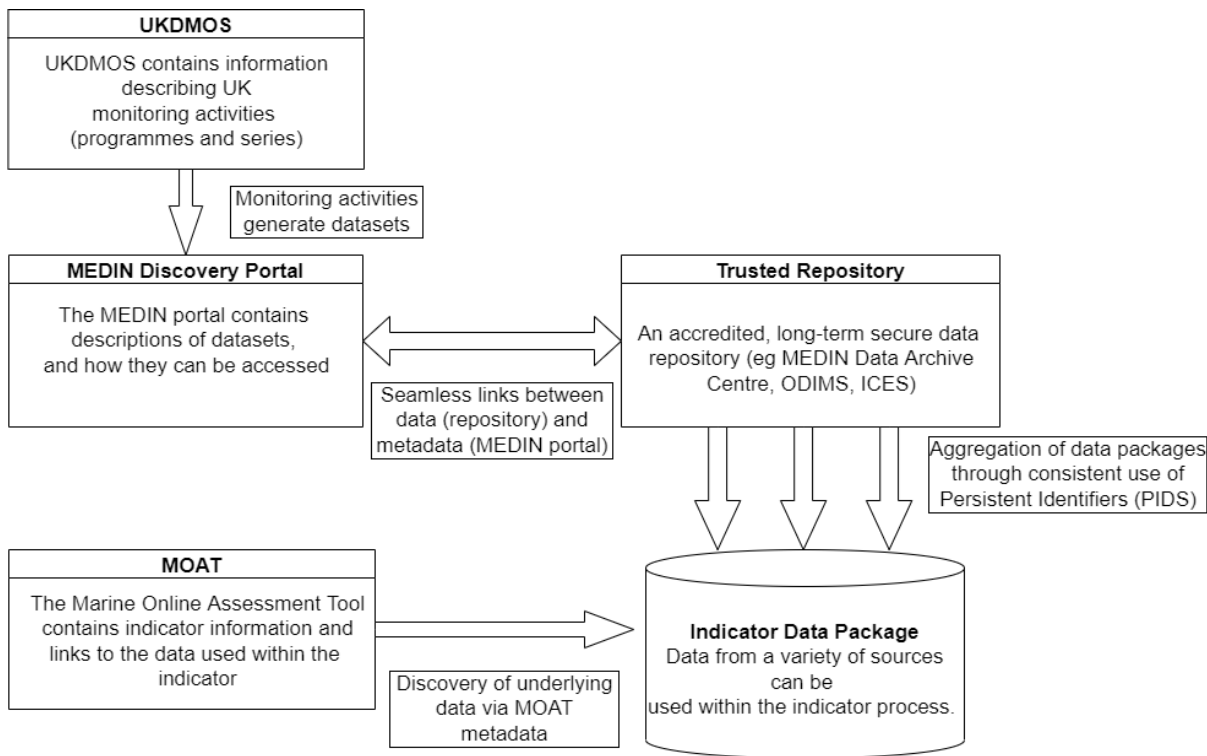


Figure 1. Idealised flow for UK monitoring programmes. It should be possible to access indicator data packages either from data collection information (UKDMOS) to datasets (MEDIN) or directly via indicator assessments (MOAT) with links maintained to support traceable and transparent reporting of assessment results.

This paper describes the pathway of data from monitoring programmes into three indicators used for UK MS assessments of cetaceans:

- Abundance and distribution of cetaceans other than coastal bottlenose dolphin
- Abundance and distribution of coastal bottlenose dolphin
- Harbour porpoise bycatch (to become 'Marine mammal bycatch')

Missing, dysfunctional, and duplicated links impacting the flow of data from collection to the indicators are identified, and key issues and recommendations highlighted. Diagrams providing graphical representation of the dataflows are provided in the accompanying Annex; these diagrams should be viewed alongside the technical notes in Section 4.

This paper forms part of a report series describing the flow of data into each of the UK MS biodiversity indicators. Collectively these papers will provide the initial step in improving the efficiency of data flowing into indicators and achieving a more inclusive, accessible, and robust marine biodiversity evidence base.

A summary of the assumptions and limitations of this report is provided in Section 5.

2 Key dataflow issues

Collecting, analysing, archiving, and publishing of cetacean monitoring data in the UK is undertaken by a variety of organisations including universities, research institutions, Non-Governmental Organisations (NGOs) and some of the UK statutory environmental bodies. This report focuses on the issues surrounding data availability and the flow of data into the cetacean indicator assessments, once data have been made accessible by organisations. However, it is acknowledged that individual organisations are facing their own internal challenges with processing and making their data publicly available. Data processing within each organisation differs depending on resources and internal data infrastructure, which can often cause a significant time-lag between the collection and publishing of data (several years in some instances). Although not directly the focus of this report these are still issues that could hamper the outcome of the indicator assessments which rely on recent, high-quality (quantitative and comparable) data.

2.1 General marine biodiversity dataflow issues

2.1.1 Discoverability of data

Many organisations are battling a backlog of data to be made available on their database and/or stores. This carries the risk that most recent data are not available for indicator assessments. Some of this backlog is caused by individual organisation's internal lack of resources and manpower, others are caused by inefficiencies and limited engagement in the UK-wide data infrastructure such as MEDIN.

2.1.2 Resource intense dissemination to UK wide databases

Data upload to UK portals and online GIS applications can be a complex process requiring several steps and specialist knowledge. These include creation and upload of metadata associated with the dataset to a metadata directory; choice of data portal (often dictated by regional policy driver); making datasets compliant with UK data standards and the specific requirements of the individual data portal and upload of the dataset. For example, the Marine Environment Monitoring and Assessment National ([MERMAN](#)) database does not always accept the newest taxonomic nomenclature conforming with the World Register of Marine Species ([WoRMS](#)). Whilst currently resource intensive, these processes are required to ensure availability and discoverability of datasets, compliant with the FAIR data principles (Findable, Accessible, Interoperable and Reusable) to provide a consistent, transparent and UK-wide coverage of data for the inclusion in the indicator assessments.

2.1.3 Inconsistencies in data sharing between organisations

Data sharing between organisations often relies on communication between individuals of the different organisations. This carries the risk that data sharing is patchy, infrequent and might be lost if individuals move roles. This could also cause confusion around permissions to share and re-use datasets for other purposes. In addition, the responsibilities for data management and the collation of data to support indicator development often sits within different teams or departments within organisations requiring ongoing cross-departmental liaison and engagement.

2.1.4 Inconsistencies in response to data calls

Contributions of data to UK assessments or data products relevant for assessments are often based on ad-hoc provision of data in response to data calls. Such calls require specific and varying data formats and are regularly responded to by individuals and rely on

availability and good will of specific personnel. This can result in data calls that are infrequently responded to and carry the risk of not utilising recent data in the indicator assessments.

2.1.5 Duplication of data upload effort

Submission of data to one UK database/portal does not automatically guarantee data are made available on other UK portals. Until recently, for example, data submitted to [Marine Recorder](#) were not routinely uploaded to and disseminated through [DASSH](#). This causes duplication of effort by some organisations. Some of the duplication will be removed by the re-development of Marine Recorder. Yet, clarifying and increasing linkages, and wider adoption of existing data standards between the different UK data portals might be a useful next step.

2.1.6 Underutilisation of available resources

Within UK statutory monitoring, global/European or even UK-based data portals are only interacted with at the end of the data publishing chain. Data deposited in these portals are from a wide range of monitoring activities (including academic) and over a greater regional scale. Thus, data that are available from portals such as [OBIS](#), [GBIF](#), and [DASSH](#) could prove very valuable for the indicator assessment. As a rule, these portals are currently not used as the start point for data acquisition for indicator assessments.

2.2 Cetacean indicator dataflow issues

The cetacean indicators rely heavily on widescale effort-related surveys such as the Small Cetacean Abundance in the North Sea (SCANS) and Cetacean Offshore Distribution and Abundance in the European Atlantic (CODA) programmes to make data products based on sightings or observational data. Effort-related data refers to observational data that have a quantification for the amount of spatial and/or temporal extent that has been surveyed during data collection and allows for the correction of factors that influence the sighting of cetaceans. Non-effort related data refers to observational data without spatial and/or temporal extent quantification. Many of these surveys are not held in publicly accessible databases but in internal databases within various organisations and made available on request. There are several areas where this report has identified inefficiencies in this process:

2.2.1 Inaccessibility of data

Data collected by the various organisations, both at a UK- and EU-level generally remains within their respective organisation and are not published openly on an accessible database. This means, that data access for the indicators relies on the response of organisations to data calls and good relationships between individuals at the different organisations to guarantee access to data.

2.2.2 Lack of Framework

At present there is no overarching framework which sets out the data protocol for surveying of cetaceans to ensure that data are collected and stored in a standardised manner by all organisations. This inhibits the utilisation of all available data in OSPAR and UK MS indicator assessments.

2.2.3 Transparency of final datasets

The publishing of the final datasets assembled for the purpose of the MS indicator assessments and the linking of the metadata to MOAT has not been realised. However, the OSPAR indicator final datasets can be accessed through [ODMIS](#) via MOAT.

3 Key recommendations

3.1 General recommendations for marine biodiversity dataflows

3.1.1 Use of a wider breadth of data

To include a greater breadth of monitoring data (outside of statutory programmes), data need to be acquired from wider sources. Currently, none of the global, European or UK-wide data portals (e.g. ODIMS, OBIS, UKDMOS, DASSH) have been used as a source of data for assessments. It is acknowledged that using downstream data aggregators does potentially increase the risk of dataset duplication without a consistent and careful use of Persistent Identifiers (PIDs). Therefore, a short project could be set-up to understand the risks of duplication of datasets and to identify ideal access points for sourcing the most complete dataset for the indicator assessments. Ideally DASSH, as the MEDIN biodiversity Data Archiving Centre (DAC) and UK node of OBIS, should provide the most complete marine biodiversity picture at the UK scale.

3.1.2 Streamline dataflow for relevant components of indicators

There should be a standardised, transparent and auditable flow of data feeding into the indicator assessments. Useable data for assessments should be identified using UKDMOS (for monitoring programmes) and the MEDIN Discovery Portal (for datasets) and ideally sourced from DASSH. To function optimally, organisations need to actively engage with UKDMOS and DASSH to support improvements to the system and interface. All UK marine biodiversity data collectors should be encouraged to upload their data and information to DASSH and UKDMOS.

3.1.3 Improve uptake of UKDMOS by statutory bodies

UKDMOS should be a first port of call to check what monitoring programmes are collecting data which could be included in the indicator assessment. Currently, UKDMOS is underutilised as a tool to search for data but also by the individual data producers for registering their monitoring programmes. It would be useful to generate greater buy-in to UKDMOS by the different statutory bodies and other monitoring organisations.

3.1.4 Improve user-friendliness of MEDIN and MEDIN DACs

Accessibility of datasets is dependent on data publication to open data portals and DACs such as DASSH. At present, the process for data ingestion by the DACs creates bottlenecks. A simplified more user-friendly interface for data ingestion and creation of metadata, as part of an update of the MEDIN network, could improve user uptake amongst the statutory bodies and other organisations.

3.1.5 Automate data-sharing processes

Currently data have to be uploaded manually to an organisation's internal database. From there, the process to make these data publicly available also requires manual interaction. It would be more cost-efficient and less resource intensive to establish better interconnection between internal and external databases, as well as between external databases which automate the process of sharing data to external databases such as DASSH.

3.1.6 Establish single point of contact

Often requests for data to be used within assessments are submitted to individuals within an organisation. This could lead to data not being made available when individuals are unavailable or move roles. Organisations could consider setting-up a single point of contact for data calls which is serviced by all members of a department rather than specific individuals. Ideally reliance on data calls will be reduced as data ingestion bottlenecks are resolved.

3.1.7 Futureproof new projects

The current problems exist because monitoring programmes were set-up prior to the existence of a data strategy. All new projects and monitoring programmes supported by public funds should require a detailed data strategy which follows the UK Marine Monitoring and Assessment Strategy (UKMMAS) Data Strategy.

3.1.8 Provide data standards and guidelines

The UK Marine Monitoring and Assessment Strategy are in the process of updating data standards and guidelines for UK monitoring. Providers of public data should be encouraged or mandated to adhere to these guidelines and standards and adopt them into their organisation.

3.1.9 Scope out data portals for useable data

For future assessment it will be useful to include a greater breadth of monitoring data. So far, none of the global, European or UK-wide data portals (e.g. ODIMS, UKDMOS, DASSH) have been used as a source of data for indicators. It is acknowledged that using downstream data aggregators does potentially increase the risk of dataset duplication without a consistent and careful use of Persistent Identifiers (PIDs). Therefore, a short project could be set-up to evaluate data held within each of the data portals outlined in Appendix 2 and determine their usefulness and relevance to the indicator assessment.

3.2 Recommendations for cetacean indicator dataflows

3.2.1 Improve access to data

Data collected by various organisations, both at a UK- and EU-level generally remain within the respective organisation and are not published openly on an accessible database. This means that data access for the indicators relies on the response of organisations to data calls and good relationships between individuals at the different organisations. Future funding for surveys such as SCANS or CODA could be tied to the stipulation of making any collected data openly accessible within a set amount of time post-collection.

3.2.2 Increase cohesion between UK monitoring surveys

Across the UK there is a tight net of different stakeholders contributing to marine mammal surveys. These include citizen science programmes, non-governmental organisation (NGO) monitoring programmes and industry datasets (e.g. ORCA, The Sea Watch Foundation, Marine Conservation Society, Whale and Dolphin Conservation (WDC)), all of which collect data that could help to improve the outcome of the indicator assessment. Yet, most of these monitoring programmes have been created in isolation and do not collect or store data in a standardised manner. The Joint Cetacean Data Programme (JCDP) is currently tackling this issue with effort-related data collected via vessel/aerial methods. Other organisations such

as WDC, [TETHYS](#) and Marine Scotland have been leading in discussions regarding land-based and acoustic data, but discussions have so far been in isolation. Bringing all these discussions into a single room could help to mitigate against multiple incomparable methods being employed.

3.2.3 Formulation of a framework across Europe

Because of the high mobility of cetaceans, a meaningful outcome of the UK MS indicator assessments relies on the coordination of surveys across different countries which have marine territories adjacent to the UK. These surveys include the Small Cetacean Abundance in the North Sea (SCANS) and Cetacean Offshore Distribution and Abundance in the European Atlantic (CODA), amongst others. Implementation of such large-scale surveys across several countries and multiple organisations is resource intensive and requires rigorous coordination. An overarching framework that ensures data are collected and stored in a standardised manner by all participating organisations could increase the robustness of the indicator outcome.

3.2.4 Support further development of the Joint Cetacean Data Programme (JCDP)

The [JCDP](#) is a data portal that has been in development over recent years to alleviate some of the problems the marine mammal monitoring community is facing. It provides a central access point for archiving and publishing of effort-related cetacean data for the North-East Atlantic, following MEDIN data standardisation guidelines. Further development of the data portal could include its ability to also hold other data formats, such as acoustic data, photo-ID and non-effort related data. The data portal is administered through ICES and has its own dedicated working group to maintain the database, to ensure data standards and to better encourage use of the data portal by all relevant partner countries. Ensuring that the JCDP becomes the universally accepted central data portal for all cetacean-related data under the MEDIN umbrella, will ensure access to high-quality data for future MS indicator assessments.

4 Technical notes on indicator dataflows

4.1 Indicator: Abundance and distribution of cetaceans other than coastal bottlenose dolphins

4.1.1 Technical summary

This [indicator](#) assesses progress towards targets for population size and species distribution of cetaceans (excluding coastal bottlenose dolphins) set out in the UK Marine Strategy Part One (HM Government 2012). The dataflow for this indicator has been represented graphically in the accompanying Annex (Figure 1).

As the majority of cetaceans have large geographic ranges, data collected at relevant spatial and temporal scales is essential to understand their abundance and distribution. A specific set of large-scale aerial and shipboard surveys provide the basis for a modelled density map and abundance estimates underpinning this indicator. These include:

- [SCANS](#) (Small Cetacean Abundance in the North Sea) (See Hammond *et al.* 2002 for a full list of partner institutions). Data are held by the University of St Andrews.
- [SCANS-II](#) (Small Cetacean Abundance in the European Atlantic and the North Sea) (See Hammond *et al.* 2013 for a full list of partner institutions). Data are held by the University of St Andrews.
- [SCANS-III](#) (Small Cetacean Abundance in European Atlantic Waters) (See Hammond *et al.* 2017 for a full list of partner institutions). Data are held by the University of St Andrews.
- [CODA](#) (Cetacean Offshore Distribution and Abundance in the European Atlantic) (See Hammond *et al.* 2009 for a full list of partner institutions).
- [NASS](#) (North Atlantic Sightings Surveys). Data are held by The North Atlantic Marine Mammal Commission.
- NILS (Norwegian Independent Line Transect Surveys). Data are held by the Norwegian Institute of Marine Research (Bøthun *et al.* 2009; Schweder *et al.* 1997; Skaug *et al.* 2004; Solvang *et al.* 2015).
- [ObSERVE](#) Programme (Aerial and acoustic surveys for cetaceans in the Republic of Ireland). Data are held by the Department of the Environment, Climate and Communications (DECC) in the Republic of Ireland.

Abundance estimates are calculated using data derived from SCANS and CODA surveys which have historically been collated and archived by the University of St Andrews within their internal SCANS/CODA databases. The OSPAR Marine Mammal Expert Group (OMMEG) combine sightings data requested from the SCANS and CODA with sightings data requested from other large-scale surveys such as NILS, NASS and ObSERVE, to generate the OSPAR assessment. After quality control (QC) and analysis of this dataset, OMMEG publish their abundance estimates for the OSPAR regions on ODIMS. From these abundance estimates, the relevant UK abundance estimates are extracted and used to underpin the UK Marine Strategy (UK MS) assessment. The indicator lead organisation for the OSPAR and UK MS assessments is agreed by OMMEG and the collective contributors and can vary between years.

To estimate distribution of cetaceans for the OSPAR and UK MS assessment, the indicator lead organisation creates a species' distribution model using the combined sightings data from OMMEG, alongside habitat features data such as seabed slope, depth, distance to coast, latitude and longitude. This model relates the density of species to the features of their habitat, to create predicted density distribution maps (also called modelled species' density maps) of the North-East Atlantic Ocean. From these modelled distributions the

indicator lead organisation extracts the relevant UK data and creates density maps to use in the UK MS assessment. It should be noted that as data collected by the NILS and NASS surveys are outside of UK seas, these data although used for OSPAR assessments, are not included in the dataset used for UK MS indicator assessments.

4.1.2 Future development

The development of the Operational Cetacean at Sea database under the [Joint Cetacean Data Programme](#) (JCDP), will streamline the process of data acquisition and provision for the abundance and distribution of cetaceans indicator, by housing all effort-related cetacean data under one platform for universal access.

The JCDP is managed by JNCC and was funded by Defra until March 2022. From March 2022 the International Council for the Exploration of the Sea (ICES) Working Group of the Joint Cetacean Data Programme ([WJGJCDP](#)) is governing the programme. ICES have also designed and built the database and associated platform which launched in June 2022. A full list of partners and contributing members involved in the JCDP is available on the [JNCC website](#).

4.1.3 Missing, duplicated and dysfunctional links

The majority of the large-scale surveys which are used for UK MS and OSPAR assessments are based on decadal intervals and therefore it is unlikely that small fluctuations in population, which could indicate recovery or decline, are captured. There is growing commitment from relevant governments to increase the frequency of this monitoring but in support of this, a coordinated approach to collating and standardising all cetacean data will be needed to address the patchiness in time, space and scale of datasets.

Several cetacean monitoring programmes have been identified that are not currently included in the indicator assessment but have the potential to do so in the future if issues around standardised data collection and accessibility could be resolved. These include:

- Photo ID Catalogues – Hebridean Whale and Dolphin Trust ([HWDT](#)), Scottish Associations for Marine Science ([SAMS](#)), University of St Andrews, University of Aberdeen Lighthouse, Whale and Dolphin Conservation ([WDC](#)), The [Sea Watch](#) Foundation.
- Data from Non-Governmental Organisations – Hebridean Whale and Dolphin Trust (HWDT), [ORCA](#), WDC, Cetacean Research and Rescue Unit ([CRRU](#)).
- Data from Institutions and government partnership projects – Collaborative Oceanography and Monitoring for Protected Areas and Species ([COMPASS](#)), Marine Protected Area Management and Monitoring ([marPAMM](#)), Passive Acoustic Monitoring Schemes, Marine Acoustics NERC Knowledge Exchange Innovation Placement, East Coast Marine Mammal Acoustic Study ([ECOMMAS](#)).
- Data from Industry such as the wet renewables sector.
- Stranding data – [UK Cetacean Strandings Investigation programme](#), Scottish Marine Animal Stranding Scheme ([SMASS](#)).
- National Recording Schemes, Societies and Citizen Science programmes – JNCC's Volunteer seabirds at sea ([VSAS](#)), [The Sea Watch Foundation Sightings Network](#) and [ShoreWatch](#).

4.2 Indicator: Abundance and distribution of coastal bottlenose dolphin

4.2.1 Technical summary

This [indicator](#) assesses progress towards the target for abundance and distribution of UK coastal bottlenose dolphins set out in the UK Marine Strategy Part One (HM Government, 2012). The dataflow for this indicator has been represented graphically in the accompanying Annex (Figure 2).

This indicator relies on monitoring data from the East of Scotland and Welsh coastal bottlenose dolphin populations.

The East of Scotland dolphin population is monitored by the University of Aberdeen Lighthouse Field Station in collaboration with the University of St Andrews and SMRU. In addition, [NatureScot](#) commissions The University of Aberdeen Lighthouse Field Station to make regular status assessments of bottlenose dolphins in the Moray Firth Special Area of Conservation (SAC). This data forms part of the monitoring of the UK's network of SPAs and SACs and is uploaded to the NBN Atlas. NatureScot commissions The University of Aberdeen Lighthouse Field Station and SMRU to combine the data on the East of Scotland bottlenose populations and calculate population estimates which are published in a NatureScot [report series](#).

Natural Resource Wales ([NRW](#)) commissions an external organisation to monitor the Coastal Wales dolphin population and calculate population estimates which are published in an NRW [report series](#). [The Sea Watch Foundation](#) was the most recently awarded organisation for the monitoring period between 2013 to 2016. The Sea Watch Foundation also carry out their own monitoring of the dolphin population through The Cardigan Bay Monitoring Project and upload this data to the UK Sea Watch Database.

JNCC uses the population estimates from the East of Scotland and Welsh coastal monitoring (extracted from the NatureScot and NRW report series) in conjunction with data requested from The Sea Watch Foundation and wide-scale UK sightings data from SCANS, CODA and ObSERVE, to provide annual UK estimates of bottlenose dolphin abundance and broad distribution ranges for the OSPAR and UK MS assessments.

4.2.2 Future development

In future, all effort-related cetacean data will be collected via the JCDP. The Sea Watch National Database will continue to hold further cetacean data such as their sighting network data, acoustics, citizen science and non-effort-related sightings data (observational data without spatial and/or temporal extent quantification).

4.2.3 Missing, duplicated and dysfunctional links

Currently, UK MS and OSPAR assessments are only possible for two of the four potential populations of the UK's coastal bottlenose dolphins, owing to a lack of data in the other two regions. Efforts to collect data are ongoing in the south-west of England by a consortium of non-profit organisations and academics. These data may be considered for future inclusion to this indicator if collected to a suitable standard and published. There is currently no suitable data available for the West Coast of Scotland population which is known for its small size and highly mobile nature.

At present sightings data from citizen science and some organisations are entered into The Sea Watch Foundation Database and data from the Wildlife Trust of South and West Wales Cardigan Bay Marine Centre and Ceredigion County Council are not included in the indicator assessment but have the potential to do so in the future if issues around standardised data collection and accessibility could be resolved.

4.3 Indicator: Harbour porpoise bycatch (to be renamed ‘Marine mammal bycatch’)

4.3.1 Technical summary

This [indicator](#) assesses the mortality of Harbour porpoise as a result of UK fishing bycatch, against targets set out in the UK Marine Strategy Part One (HM Government 2012). The dataflow for this indicator has been represented graphically in the accompanying Annex (Figure 3).

To date, the UK harbour porpoise assessment has been based on three main assessment units in the UK: the Celtic and Irish seas unit, the North Sea unit and the West Scotland unit. Within these units, bycatch is monitored by the UK Bycatch Monitoring Programme (BMP). Monitoring is predominantly conducted using dedicated observer monitoring by Sea Mammal Research Unit ([SMRU](#)), Scottish Oceans Institute and the University of St Andrews. Some monitoring is also conducted using remote electronic monitoring (REM), discard sampling and non-dedicated observer effort on commercial fishing vessels by [CEFAS](#), [Marine Scotland](#) and Agri-Food and Bioscience Institute ([AFBI](#)).

The UK Bycatch Monitoring Programme data are input into the BMP internal database. To create the UK BMP annual bycatch estimates, the BMP data undergo collation, QC, and analysis with fisheries data from the Marine Management Organisation ([MMO](#)) and [Defra](#).

The UK BMP annual estimates are disseminated to the ICES Working Group on Bycatch of Protected Species (WGBYC) and data are uploaded to the ICES Bycatch and Fisheries Database. The UK BMP annual estimates are combined with data derived from data calls from ICES WGBYC (co-ordinated by the BMP) to Cefas, Marine Scotland and AFBI on bycatch observed through routine fisheries sampling programmes (e.g. discard sampling, non-dedicated observers and REM). Bycatch counts and fishing effort data are extracted from this dataset by WGBYC and combined with cetacean abundance data from SCANS population estimates, ObSERVE data and additional data from other OSPAR parties, to calculate OPSAR region scale bycatch estimates. These bycatch estimates are submitted to the OSPAR Marine Mammal Expert Group (OMMEG) which produces the assessment for the OSPAR regions. For the UK MS indicator assessment, only the UK relevant bycatch estimates are used.

4.3.2 Future development

Harbour porpoise, short-beaked common dolphin and grey seals are the most commonly bycaught species in the North-East Atlantic. The bycatch indicator was initially focused on the bycatch of harbour porpoise due to the perceived insufficient data available on other species. For future assessments, analysis will include short-beaked common dolphin and grey seals and will be renamed ‘Marine mammal bycatch’.

To improve the amount of data flowing into this indicator there is a plan to re-develop the UK Bycatch Monitoring Programme to further strengthen capacity for estimating bycatch, particularly in under-represented fishing fleets or gear types. Technology innovations are also being explored to consider how to increase the evidence base, including validated self-

reporting and easier access to REM. In order to continue to export fisheries products to the United States (US), and to assist conservation efforts in mitigating marine mammal bycatch, the UK needs to comply with international standards for the conservation of marine mammals. As of November 2021, this means that there is now a legal requirement under fishing vessel licence conditions for fishers to report any bycatch of marine mammals to the relevant regulatory authority within 48 hrs of the end of the fishing trip.

Additionally, there is potential to integrate strandings data to include any bycatch that is not caught and uncounted, however further development is needed to be able to incorporate this data into the indicator assessment.

5 Assumptions and limitations of this paper

The dataflows described in this report are based on those used for the 2018 UK MS indicator assessments ([HM Government 2019](#)). However, where changes in the pathways have been implemented or where changes are expected for the next round of assessments, this has been described in the Future Development sections. Where possible, detail relating to specific assessment rounds has been removed from the dataflow diagrams to maximise their future applicability.

These cetacean indicators are also used for the NE Atlantic OSPAR assessments, with the outputs reworked and scaled for the UK MS assessments. The dataflows for these assessments are intertwined and therefore represented graphically as one flow diagram with both outputs. However, the focus of this report is on describing the flow into the UK MS assessments.

This report is focused on monitoring programmes conducted or commissioned by statutory bodies or external programmes which already have an established pathway into UK MS indicator assessments. There is additional cetacean monitoring ongoing throughout the UK, which is not currently included within UK MS indicator assessments. For example, monitoring conducted by citizen science, research institutes, Non-Government Organisations (NGOs) and various industries. This report lists some of the major organisations carrying out cetacean monitoring that could potentially be used in the indicator assessments in the future but focuses on improving the dataflow for already established pathways into the UK MS assessment. The mapping of external data pathways and the exploration needed to determine the compatibility of individual external datasets with the cetacean indicators, is outside the scope of this report.

This report focuses on the flow of data into the indicator assessments and not the indicator assessments themselves. Where missing links are identified, this could provide additional data for assessments. However, further exploration of data quality and compatibility would be required. The confidence, quality and coverage of data feeding into assessments is not included in the scope of this report.

This report and the accompanying dataflow diagrams (see accompanying Annex) depict the flow of monitoring datasets and not the flow of associated metadata which may follow separate pathways.

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Appendix 1: Acronym list

Acronym	Definition
AFBI	Agri-Food and Bioscience Institute
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas
BioDIG	Biodiversity Data and Information Group
BMP	Bycatch Monitoring Programme
BODC	British Oceanographic Data Centre
CEFAS	Centre for Environment, Fisheries and Aquaculture
CODA	Cetacean Offshore Distribution and Abundance in the European Atlantic
COMPASS	The Collaborative Oceanography and Monitoring for Protected Species
CRRU	Cetacean Research and Rescue Unit
DAC	Data Archiving Centre
DASSH	The Archive for Marine Species and Habitats Data
DEFRA	Department for Environment, Food and Rural Affairs
ECOMMAS	East Coast Marine Mammal Acoustic Study
GBIF	The Global Biodiversity Information Facility
HBDSEG	Healthy Biologically Diverse Evidence Group
HWDT	Hebridean Whale and Dolphin Trust
ICES	International Council for the Exploration of the Sea
JCDP	Joint Cetacean Data Programme (Operational Cetaceans at Sea Database)
JNCC	Joint Nature Conservation Committee
MarPAMM	Marine Protected Area Management and Monitoring
MCS	Marine Conservation Society
MEDIN	Marine Environmental Data and Information Network
MERMAN	Marine Environment Monitoring and Assessment National database
MMO	Marine Management Organisation
MOAT	Marine Online Assessment Tool
MPA	Marine Protected Area
NASS	North Atlantic Sightings Surveys
NBN	The National Biodiversity Network
NERC	The Natural Environment Research Council
NILS	Norwegian Independent Line Transect Surveys
OBIS	Ocean Biodiversity Information System

Acronym	Definition
ObSERVE	Aerial and Acoustic Surveys for Cetaceans programme in the Republic of Ireland
ODIMS	OSPAR Commission Data and Information Management System.
OMMEG	OSPAR Marine Mammal Expert Group
OSPAR	Oslo/Paris convention (for the Protection of the Marine Environment of the North-East Atlantic)
PAM	Passive Acoustic Monitoring
PIDS	Persistent Identifiers
QC	Quality Control
REM	Remote Electronic Monitoring
SAC	Special Area of Conservation
SAMS	Scottish Associations for Marine Science
SCANS	Small Cetacean Abundance in the North Sea
SMASS	Scottish Marine Animal Stranding Scheme
SMRU	Sea Mammal Research Unit
SNCB	Statutory Nature Conservation Body
UK MS	United Kingdom Marine Strategy
UKDMOS	UK Directory of Marine Observing Systems
UKMMAS	UK Marine Monitoring and Assessment Strategy
VSAS	Volunteer Seabirds at Sea
WDC	Whales and Dolphin Conservation
WGBYC	Working Group on Bycatch of Protected Species
WoRMS	World Register of Marine Species

Appendix 2: Summary of data portals

Table 1: Amended from (Sinclair 2022). Description of existing public database or portal that may in the future or already does receive cetacean data from key sector (public, charity, industry and academia) organisations and individual data recorders in the UK data landscape.

Scottish / UK database or portal	Description of system purpose and niche	Sector contribution
ICES Bycatch and Fisheries Database	<p>Purpose: The ICES bycatch database houses bycatch data related to the ICES regions for protected species.</p> <p>How it differs from other systems: The database provides the ability to submit and retrieve data using a programming interface for monitoring and assessment purposes.</p>	Marine species
NBN Atlas Scotland Portal	<p>Purpose: The NBN Atlas Scotland collates records from various organisations and LERCs into a national picture on a free online web portal for users to browse and download. The NBN combines multiple sources of information about species and habitats, with the ability to interrogate, combine, and analyse these data in a single location.</p> <p>How it differs from other systems: provides a Scottish picture of both marine and terrestrial species data together. It is not a data management system, but rather a discovery point for users to find datasets; it allows users to view species records together with other environmental information such as habitat information and geographical boundaries and to download and export maps and reports or summaries for your own use. The NBN is a node of GBIF and so it also provides a mechanism for disseminating species data internationally.</p>	All sectors
UK Sea Watch Foundation Database	<p>Purpose: The aim of the Sea Watch Foundation database is to provide a central archive of cetacean sightings and associated seabirds from all around the UK. Data includes sightings, species, effort, observer, geographical and platform information. The data are managed by the Sea Watch Foundation so that the data can be made available to answer questions on ecology and cetacean occurrence.</p>	Cetaceans and associated seabirds

Scottish / UK database or portal	Description of system purpose and niche	Sector contribution
	<p>How it differs from other systems: This archive is internal only, there is no external portal for viewing or accessing data. Sightings are recorded in the field and are sent to Sea Watch on paper forms or electronically.</p>	
<p>The Joint Cetacean Data Programme (JCDP) The JCDP Data Portal</p>	<p>Purpose: The purpose of the JCDP is to promote and facilitate cetacean data standardisation and maximise value through collation and universal access. An international platform, The JCDP Data Portal, provides a dashboard and the tools necessary to search, filter and download third-party cetacean effort-related survey datasets from the North-East Atlantic. ICES were contracted by JNCC on behalf of Defra to build and host this platform within the ICES Datacentre.</p> <p>The programme has also developed a data standard to guide data collection and storage to ensure high-quality data collation and facilitating access to collated datasets for bespoke analyses. Regularly updated open access data products will be made available to strengthen cetacean science and decision making.</p> <p>How it differs from other systems: Historically there has been no mechanism to facilitate access to all existing effort-related cetacean monitoring datasets in the North-East Atlantic from vessel or aerial platforms. This platform will be the first to streamline this process of accessing and utilising these data and collating them into a single resource.</p>	Cetaceans