| **Version:** 2.0 December 2024 |
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| Essential Ocean Variable Specification Sheet | |  |
| --- | --- | --- |
| **Seagrass cover and composition** | |  |
|  | **EOV Specification Sheet curated by:** | |
| Global Ocean Observing System (2024). Essential Ocean Variable Specification Sheet:  Seagrass cover and composition. GOOS Reference No; DOI: [to be assigned] |

| Background and justification |  |  |
| --- | --- | --- |
| **Why is seagrass cover and composition an Essential Ocean Variable (EOV)?**  Seagrass cover and composition is recognized as an Essential Ocean Variable (EOV) because it provides vital insights into ocean health, biodiversity, and climate resilience. These ecosystems are important habitats and play a key role in supporting marine biodiversity, sustaining fisheries, stabilising coastlines, and filtering pollutants, delivering critical benefits to coastal communities around the world (Nordlund et al 2016). Moreover, their noteworthy capacity for "blue carbon" sequestration and storage significantly contributes to climate change mitigation efforts (UNEP, 2020). Monitoring and assessing seagrass cover and composition allow for tracking environmental quality and ecosystem dynamics at global to local scales (Duffy et al. 2019). These insights inform conservation strategies, promote sustainable fisheries, and guide policy development aimed at fostering resilient coastal ecosystems.  Seagrass can be assessed and monitored using several methods, such as in-water surveys, remote sensing, and citizen science, which together enable reliable data collection on its cover, composition, and extent. This should be supported by standardized data collection protocols in combination with standardised data handling. Moreover, regular monitoring is crucial for detecting changes over time. These efforts enhance our ability to model and manage seagrass ecosystems and the associated benefits that support society.  **Integration with Global Observation Frameworks**  **The Global Climate Observing System (GCOS) developed the Essential Climate Variable (ECV) framework to define necessary observations for monitoring Earth's climate (Bojinski et al., 2014). Some EOVs, including ocean physics, biogeochemistry, and biology/ecosystems variables (GCOS, 2022a; GCOS, 2022b), are also ECVs.**  **The Essential Biodiversity Variables (EBVs) defined and curated by the Group on Earth Observations Biodiversity Observation Network (GEO BON) complement the GOOS biological and ecosystem (BioEco) EOVs (Muller-Karger et al., 2018; Bax et al., 2019). The EOVs are measured (primary observations), while EBVs are not measured, they are derived from direct measurements of BioEco EOVs and other observations. Furthermore, the EBVs take the form of time series of BioEco EOVs and other observations, or model results, at a location or over an area. Thus, EOVs may be seen as the building blocks for GEO BON EBVs. The EOVs can be used to synthesise the EBVs as time series of BioEco EOV sub-variables at one location, or as time series of gridded, mapped, or modelled EOVs (Jetz et al., 2019).** |  | **The GOOS Biology and Ecosystems Panel collaborates with the Physics and Climate and Biogeochemistry Panels to advance EOVs, advocating for the need for biological observations, information management, and applications. GOOS, MBON, GEO BON, and OBIS work together to standardise guidelines and data management for EOVs, EBVs, and ECVs.**  **Current observing networks and coordination**  **Diverse networks and communities are collecting observations of biology and ecosystems EOVs at different scales and in different regions. An initial baseline survey conducted in 2019/20 identified 203 active, long-term (>5 years) observing programs systematically sampling marine life. These programs spanned about 7% of the ocean surface area, mostly concentrated in coastal regions of the United States, Canada, Europe, and Australia (Satterthwaite et al 2021). This information can be found in the GOOS BioEco Metadata Portal, which is continually updated. To consult the latest information, please visit:** [**https://bioeco.goosocean.org**](https://bioeco.goosocean.org/) | |
| Contributes to (please click on the symbol for more information):  EBV: [A group of icons with text  Description automatically generatedA group of icons with text  Description automatically generatedA group of icons with text  Description automatically generatedA group of icons with text  Description automatically generatedA group of icons with text  Description automatically generated](https://geobon.org/ebvs/what-are-ebvs/) ECV:  SDG:[A blue square with white text and a fish and waves  Description automatically generated](https://sdgs.un.org/goals/goal14) CBD:  Other: | |

| **1. EOV information** |
| --- |

| **ESSENTIAL OCEAN VARIABLE (EOV)** | Seagrass cover and composition |
| --- | --- |
| **DEFINITION** | * + The areal extent, cover, and species composition of the submerged plants that form the foundation of seagrass habitats and ecosystems |
| **EOV SUB-VARIABLES -**  key measurements that are used to estimate the EOV | * + Seagrass percent cover   + Seagrass species composition   Seagrass areal extent |
|
| **SUPPORTING VARIABLES -** other measurements that are useful to provide scale or context to the sub-variables of the EOV | Environmental: water depth, water clarity, water temperature, salinity, sediment characteristics (grain size distribution, bulk density, organic carbon content), nutrient concentrations (NO3, PO4, etc.), pH, dissolved oxygen concentration, land runoff, fishing pressure, coastal development, tourism pressure, surrounding habitats |
| EOV related: seagrass shoot length, seagrass canopy height, seagrass shoot density, seagrass (above- and/or below-ground) biomass, epiphytic algae cover and/or biomass, seagrass productivity, seagrass elemental nutrient content, seagrass ash rate and seagrass dry weight |
| **DERIVED PRODUCTS -** outputs calculated from the EOV and sub-variables, often in combination with the supporting variables | Global and regional seagrass distribution, seagrass diversity metrics, ecosystem resilience (representing ecosystem state, recovery capacity), carbon storage/sequestration, essential habitat for species of conservation Interest, fish, etc |

| **2. Phenomena to observe - what we want to observe with this EOV** This section presents examples of priority phenomena for GOOS that can be (partly) characterised by this EOV’s sub-variables. This list is not exhaustive but serves to provide general suggestions on how observation efforts can structure their planning and implementation.  The GOOS application area(s) the phenomena are relevant for are depicted as follows: Climate , ocean health , operational services | | | | |
| --- | --- | --- | --- | --- |
| **PHENOMENA TO OBSERVE** | | **Habitat status and trends** | Carbon stock and sequestration trends (estimated) | Changes in species composition |
| PHENOMENA  EXTENT | HORIZONTAL | local, regional, global | local, regional, global | local, regional, global |
| VERTICAL | 0 – 100 m | 0 – 100 m | 0 – 100 m |
| TEMPORAL | Seasonal to decadal | Decadal | Weeks to year |
| RESOLUTION TO OBSERVE PHENOMENA | HORIZONTAL | 10 - 1000 m | 10 - 1000 m | 10 - 1000 m |
| VERTICAL | NA | NA | NA |
| TEMPORAL | Seasonal to annual | Seasonal to decadal | Seasonal to decadal |
| SIGNAL TO CAPTURE | | >25% change in cover and/or species lost or gained and/or >20% change areal extent | >20% change areal extent  and/or  >25% change in cover and/or species lost or gained. | species lost or gained |
| SUB-VARIABLES NEEDED TO MEASURE | | percent cover, species composition, areal extent | areal extent, percent cover, species composition | species composition, percent cover, areal extent |
| SUPPORTING VARIABLES NEEDED | | Water clarity | Carbon and emission factors from [IPCC](https://www.ipcc-nggip.iges.or.jp/public/wetlands/pdf/Wetlands_separate_files/WS_Chp4_Coastal_Wetlands.pdf) (literature-based numbers), Sediment characteristics (esp organic carbon), Carbon sequestration rates from the literature (ref in prep) |  |

| **3. GOOS Observing Specifications or Requirements** This section outlines ideal measurements for an optimal observing system for this Essential Ocean Variable (EOV). It offers guidance on creating a long-term system to observe key phenomena related to the EOV. These values are not mandatory, and no single system is expected to meet these specifications. Instead, the combined efforts of various observing systems should aim to meet these goals. Observations at different scales are also valuable contributions to global ocean observation if shared openly. | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EOV | Seagrass cover and composition | | | | | | | | | |
|  | |  | | | | | | | | |
| PHENOMENA | Habitat status and trends, carbon stock and sequestration trends (estimated), changes in species composition | | | | | | | | | |
| **EOV SUB-VARIABLE** | Seagrass percent cover | | | | | **DEFINITION** | | The percent of substrate covered by seagrass plants, measured in a defined sample area (%) | | |
|  | **Resolution** | | | | **Timeliness** | **Uncertainty**  **Measurement** | **Stability** | **Sampling approach** | **References** | |
| **Spatial Horizontal** | | **Spatial Vertical** | **Temporal** |
| **IDEAL** | <1 m | | NA | Seasonal |  | <10% cover |  | In situ measurements in defined areas (e.g. quadrats)  estimate the cover of seagrass in total and/or by species, to the nearest % possible (minimum: in Braun-Blanquet categories of seagrass total) | Braun-Blanquet cover categories  Fourqurean et al. 2001  Point counts  Protocol Cover and density  Kenworthy, W.J., et al. 1993. | |
| **DESIRABLE** | < 1 m | | NA | Annual |  | 10-20% cover |  |
| **MINIMUM** | < 5 m | | NA | Decadal |  | 10-40% cover |  |

| **EOV SUB-VARIABLE** | Seagrass species composition | | | | **DEFINITION** | | Seagrass species present | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Resolution** | | | **Timeliness** | **Uncertainty**  **Measurement** | **Stability** | **Sampling approach** | **References** |
| **Spatial Horizontal** | **Spatial Vertical** | **Temporal** |
| **IDEAL** | <1m | NA | Seasonal |  | ID to species level |  | Record the presence of a seagrass species and the location.  Minimum: closest possible functional/morphological categories) |  |
| **DESIRABLE** | <1m | NA | Annual |  |  |  |  |
| **MINIMUM** | <5m | NA | 5 year |  | Functional/ morphological categories |  | Kilminster et al., 2015 |

| **EOV SUB-VARIABLE** | Seagrass areal extent | | | | **DEFINITION** | | The horizontal spatial extent of seagrass | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Resolution** | | | **Timeliness** | **Uncertainty**  **Measurement** | **Stability** | **Sampling approach** | **References** |
| **Spatial Horizontal** | **Spatial Vertical** | **Temporal** |
| **IDEAL** | <1\*1m  (pixel size) |  | Seasonal, and after extreme events.  Sample during the same month |  | 5% |  | Ideal and desirable: Acquire imagery and apply image classification techniques.  Minimum: Create polygons of seagrass meadows using GPS-enabled devices (i.e. smartphone, handheld GPS unit) by walking, swimming or using a boat. |  |
| **DESIRABLE** | <10\*10m  (pixel size) |  | Annual, and after extreme events.  Sample during the same season. |  | 10% |  |  |
| **MINIMUM** | <30\*30m  (pixel size) |  | Decadal |  | +/- 5m radius |  |  |

| **4. Observing approach, platforms and technologies This table provides examples of approaches and technologies used to collect this EOV to help observe priority phenomena** | | | |
| --- | --- | --- | --- |
| **APPROACH / PLATFORM** | **Fixed Point: diver survey or other** | **Fixed Point: diver survey or other** | **Remote sensing: satellite** |
| **EOV SUB-VARIABLE(S) MEASURED** | percent cover, species composition | species composition | areal extent |
| **TECHNIQUE / SENSOR TYPE** | Quadrat based surveys, incl. drop camera, photoquadrat | Point observation | Satellite observations |
| **SUGGESTED METHODS AND BEST PRACTICES** | Kenworthy, W.J., et al. 1993,  species composition - SeagrassSpotter.org, Althaus et al., 2015; Kilminster et al., 2015, den Hartog 1970,  Pixel classification - Roelfsema et al 2014, 2010  Calibration standards - Foden, 2007 |  | Dierssen et al 2021 |
| **SUPPORTING VARIABLES MEASURED** | water depth |  | surrounding habitats |

| **APPROACH / PLATFORM** | **Remote sensing: other** | **Fixed-point: other** | **Fixed Point: other** |
| --- | --- | --- | --- |
| **EOV SUB-VARIABLE(S) MEASURED** | areal extent | areal extent, percent cover, species composition | areal extent |
| **TECHNIQUE / SENSOR TYPE** | aircraft or aerial drone (cameras with optical sensors, RGB, multi-spectral or hyperspectral, bathymetry lidar) | Remotely operated vehicle (camera), including video transects | GPS-enabled devices for seagrass polygon |
| **RECOMMENDED METHODS AND BEST PRACTICES** | [UNEP 2020](https://www.unep.org/resources/report/out-blue-value-seagrasses-environment-and-people) | Roelfsema et al 2015a |  |
| **SUPPORTING VARIABLES MEASURED** | surrounding habitats | surrounding habitats | surrounding habitats |

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| **APPROACH / PLATFORM** | **Remote sensing: acoustics** | **Ship based: other**  **Fixed point: other** |  |
| --- | --- | --- | --- |
| **EOV SUB-VARIABLE(S) MEASURED** | areal extent | species composition |  |
| **TECHNIQUE / SENSOR TYPE** | vessel mounted (sidescan sonars, single- and/or multibeam) | eDNA |  |
| **RECOMMENDED METHODS AND BEST PRACTICES** |  |  |  |
| **SUPPORTING VARIABLES MEASURED** | water depth |  |  |

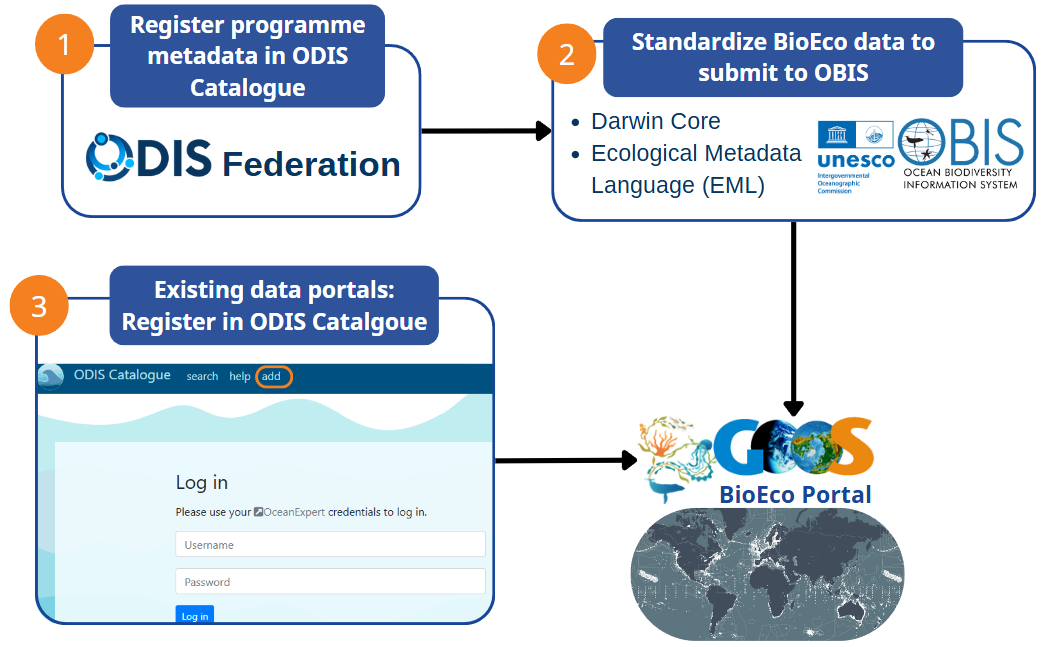


All EOV data and information is valuable, thus effective data management practices are essential to ensure it remains accessible and (re)usable for future generations. This section explains how you can contribute data to global ocean observing and ensure your data and information is accessible, interoperable and sustained.

**Please follow these practices carefully, as BioEco EOV data FAIRness relies on compliance with the guidelines below.[[1]](#footnote-0)**

BioEco EOV data is successfully managed if it is discoverable in the [**GOOS BioEco Portal**](https://bioeco.goosocean.org/)**.** The BioEco Portal is the central point of access and coordination of BioEco EOV observing programmes. The recommendations below are aligned with the [IOC Strategic Plan for Ocean Data and Information Management](https://oceanexpert.org/document/31325) (2023–2029), the [UN Ocean Decade’s original Implementation Plan](https://unesdoc.unesco.org/ark:/48223/pf0000377082), its subsequent [Data and Information Strategy](https://unesdoc.unesco.org/ark:/48223/pf0000385542), as well as the latter’s upcoming Implementation Plan.

Two main IOC-UNESCO digital systems help ensure global data compatibility: the [Ocean Data and Information System (ODIS)](https://odis.org)[[2]](#footnote-1) and the [Ocean Biodiversity Information System (OBIS)](https://obis.org/)[[3]](#footnote-2). Compatibility with ODIS and OBIS ensures compatibility with a broader IOC-UNESCO digital ecosystem, further ensuring that EOV data will be visible to the global community and FAIR.



*Figure 1. The high-level flow for EOV (meta)data. 1) New BioEco EOV monitoring programmes register programme metadata with the ODIS Catalogue. 2) BioEco (meta)data is standardised to Darwin Core and EML, then published in OBIS. 3) Existing EOV programmes and data portals must also register in the ODIS Catalogue. Finally, the BioEco Portal will harvest EOV observing programme metadata from ODIS and dataset metadata from OBIS to monitor the status and implementation of the BioEco Observing system.*

# 1. Become discoverable

Before data flow is initiated, you must ensure that key metadata about the source of the EOV data (i.e. the programme) is up to date, verifiable, and FAIR within the IOC-UNESCO digital ecosystem. To do this:

1. To enhance data provenance, register yourself, and your organisation if not done yet, in IOC’s **Ocean Expert system (OE)**. Account approval may take 1-2 business days. OE accounts are email based and thus can only be managed by the person it describes, or through an organisational email for organisations. OE allows linking identifiers like ORCID or ROR, which can be included in EOV metadata for ensuring data traceability in the GOOS BioEco Portal. OE entries also connect with ODIS for broader discoverability.
2. Register your programme in the **ODIS Catalogue of Sources**. For guidance consult the [ODIS Book](https://book.odis.org/gettingStarted.html), contact [info@odis.org](mailto:info@odis.org), or post an issue on the [ODIS GitHub repository](https://github.com/iodepo/odis-arch).

# 2. Prepare Programme Metadata

When preparing programme metadata to flow to the BioEco Portal, it is important to provide as much information as possible. Providing comprehensive metadata will enable users to discover, assess, understand, and attribute your data for their particular needs. Note that this metadata is not about an *individual* dataset, but rather about the **source** of the data, e.g. a project, monitoring program, organisation, etc. Metadata for individual datasets are submitted to the repository hosting them e.g. OBIS.

See for ODIS documentation on which [programme metadata](https://book.odis.org/thematics/projects/index.html) should be documented, and documentation for [EOV-dataset metadata](https://book.odis.org/thematics/variables/index.html). Tools are being developed to streamline this process and help you generate metadata files in the desired format (i.e. JSON-LD).

# 3. Publish EOV data

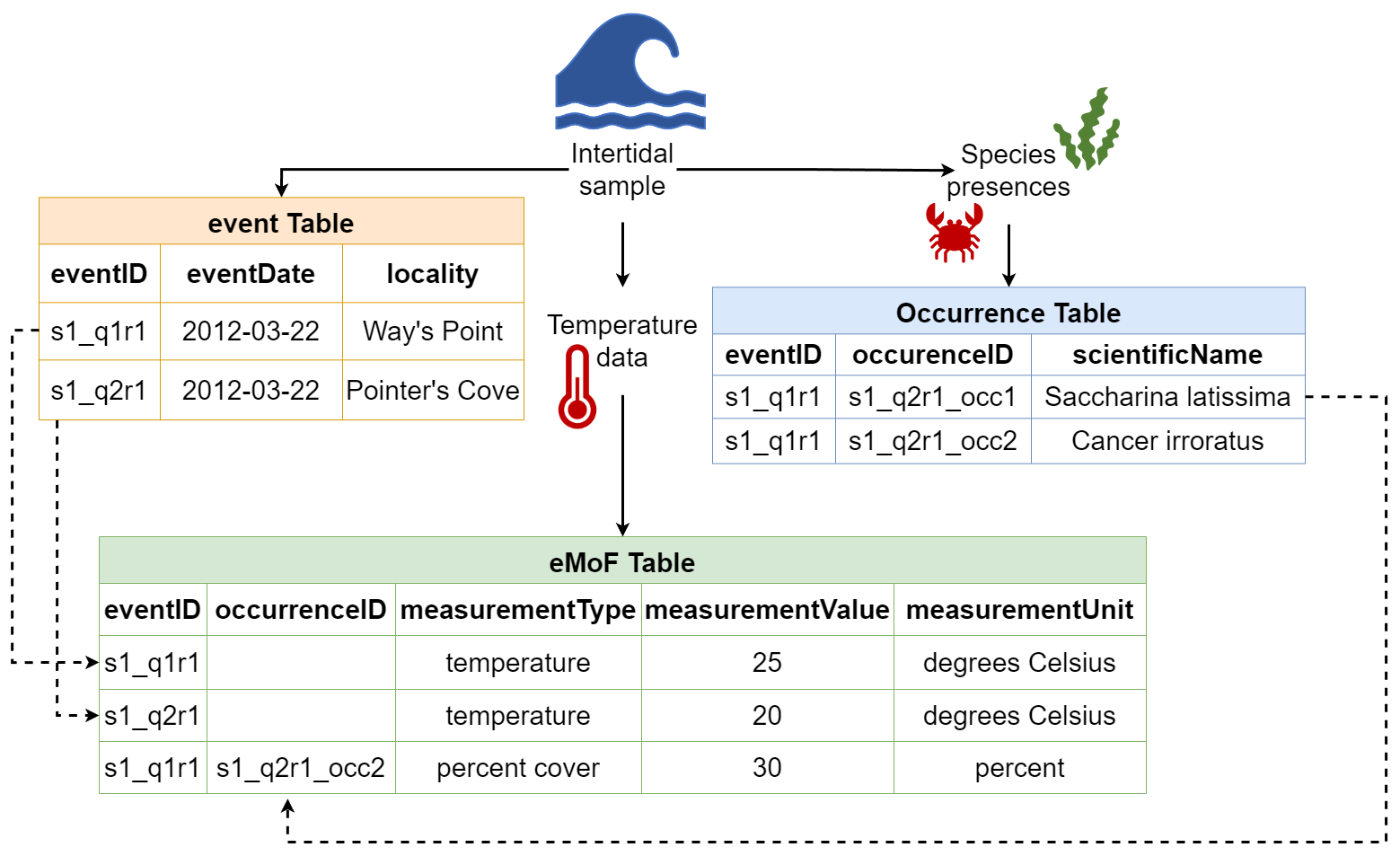
We encourage adherence to the “Publish once harvest many times” principle. Where data will be published depends on the data type, but it’s crucial to use a repository that can interoperate with the data systems used by GOOS, IODE, and other IOC entities.

## 3a. Publish BioEco Data to Ocean Biodiversity Information System (OBIS)

OBIS is the recommended repository for all BioEco datasets, including data derived from field samples, acoustic surveys, and DNA sequencing. OBIS data must follow **Darwin Core** (<https://dwc.tdwg.org/>), while dataset metadata should align with **Ecological Metadata Language** (<https://manual.obis.org/eml.html>). Associated raw image or DNA sequence data can be deposited in an appropriate repository (e.g. [NCBI](https://www.ncbi.nlm.nih.gov/), [EcoTaxa](https://ecotaxa.obs-vlfr.fr/), image hosting platforms, regional or national repositories, etc.), with links provided in the Darwin Core-aligned dataset. The OBIS Manual (<https://manual.obis.org/>) provides comprehensive guidance on how to align to these standards. Once published, OBIS datasets can also be harvested by other data systems like [GBIF](https://www.gbif.org).

To publish BioEco EOV data from systems like NCEI or ERDDAP to OBIS, consider becoming an OBIS node or [collaborate with one](https://obis.org/contact/). The OBIS Secretariat can help guide you through [the process of becoming a Node](https://manual.obis.org/nodes.html#tor-of-obis-nodes), or connect you with an appropriate OBIS node.

**Darwin Core Overview:** Darwin Core requires your dataset to be organised into different tables, (e.g.: ***Event***: Sampling events, including location, ***Occurrence***: Biological observations, ***ExtendedMeasurementOrFacts***: Any biotic/abiotic measurements, sampling facts, or relevant information, ***DNADerivedData***: DNA information). Column names must use Darwin Core terms (<https://dwc.tdwg.org/terms/>). The OBIS Manual, OBIS Nodes, or the OBIS helpdesk ([helpdesk@obis.org](mailto:helpdesk@obis.org)) can assist with formatting and publishing. See Figure 2 for a simplified example of how Darwin Core tables can relate to each other.



*Figure 2. A simplified example of the Darwin Core structure, demonstrating how data in an Event, Occurrence, and extendedMeasurementOrFact (eMoF) tables can be linked. Note the example does not show all required fields.*

## 3b. Connect existing data portals with Ocean Data and Information System (ODIS)

If you host your own online data portal for EOV data, improve visibility via ODIS by registering with the **ODIS Catalogue of Sources**. For help, consult the [ODIS Book](https://book.odis.org/gettingStarted.html), contact [info@odis.org](mailto:info@odis.org), or post an issue on the [ODIS GitHub repository](https://github.com/iodepo/odis-arch). If your EOV data is in an existing repository[[4]](#footnote-3), it may already be connected with ODIS. Confirm by searching the ODIS Catalogue for the relevant repository. If it’s not listed, ask the repository admin to reach out to [info@odis.org](mailto:info@odis.org) to connect the repository with ODIS.

## 3c. Publish Non-BioEco Data

Data collected that is not directly related to biological occurrences must also be made FAIR. We encourage any non-BioEco data that was taken at the same time as BioEco data to be published together in OBIS. To do this, you can utilise the ExtendedMeasurementOrFact table. Using this approach will avoid datasets being split into several separate datasets, which are then difficult to combine again. Specific details on using these terms and tables are outlined in the OBIS Manual.

For guidance on data flows for **physical** or **biochemical** data not collected alongside BioEco data, please refer to the [relevant EOV specification sheet](https://goosocean.org/what-we-do/framework/essential-ocean-variables). Metadata about observing platforms should be made available through [OceanOPS](https://www.ocean-ops.org/). See [https://www.ocean-ops.org/metadata/](https://www.ocean-ops.org/metadata/#background) for guidance.

# 4. Verify success

To verify that your (meta)data are Findable (the F of FAIR), check that the name of your entry appears in the [ODIS Dashboard](http://dashboard.odis.org/). You can also search in the [ODIS Catalogue of Sources](https://catalogue.odis.org/search) to confirm your entry appears appropriately. To verify that BioEco datasets published to OBIS are accessible (the A of FAIR), search by dataset name through the OBIS Mapper (<https://mapper.obis.org/>) or the Homepage portal (<https://obis.org/datasets>). The GOOS BioEco Portal will harvest programme metadata directly from ODIS and populate it into the BioEco Portal. This connection is currently a work in progress, but will streamline the metadata sharing process.

# Help Resources

**ODIS**

* General help <https://book.odis.org/index.html>
* Connecting to ODIS <https://book.odis.org/gettingStarted.html>
* ODIS Catalogue of Sources: <https://catalogue.odis.org/>
* Schema.org framework <https://schema.org/>

**OBIS**

* OBIS Manual: <https://manual.obis.org/>
* OBIS YouTube data formatting and publishing videos: <https://www.youtube.com/playlist?list=PLlgUwSvpCFS4TS7ZN0fhByj_3EBZ5lXbF>
* Darwin Core term reference list: <https://dwc.tdwg.org/terms/>
* WoRMS taxonomy: <https://www.marinespecies.org/>
* Spreadsheet template generator <https://www.nordatanet.no/aen/template-generator/config%3DDarwin%20Core>

**GOOS BioEco Portal**

* Documentation <https://iobis.github.io/bioeco-docs/>
* Access <https://bioeco.goosocean.org/>

Seagrass cover and composition data schema

The data schema consists of a standardised template and vocabulary for organising seagrass data and metadata to facilitate efficient comparisons and inclusion in public data repositories. It is aligned with OBIS and GBIF.

Metadata. includes all the requirements stated above, with the dataset needing to include a title, citation (which can be autogenerated on submission), contact person or organisation that curates the resource, and an abstract. Ideally, the data set should also have information on data ownership, a data use license, and project and funding information.

Data schema. The data schema uses the Darwin Core OBIS-ENV-DATA schema (De Pooter et al., 2017). The format used by OBIS organizes the data into three tables, which can be submitted as CSV files. These tables include:

Event table - describes the sampling events that produced the seagrass and associated data.

Occurrence table - Lists the species (scientificName) of organism(s) recorded from the sampling event, including seagrasses, fulfilling the species composition sub-variable of the seagrass EOV, as well the names of any other organisms sampled

Extended-measurement-or-fact (EMoF) table - Provides a place to record other ecological and environmental information related to the species observed in the occurrence table, including the sub-variables percent cover and areal extent of the seagrass EOV, as well as any supporting variables measured.

The data schema can be downloaded here.

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**Standards and reference materials**

**Integrated EOV products and visualisations**

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# Acronyms and Abbreviations

**CBD:** Convention on Biological Diversity

**C-GRASS:** Coordinated Research Assessment of Seagrass Systems, Working Group 158 of the Scientific Committee for Oceanic Research (SCOR).

**EBV:** Essential Biodiversity Variables

**ECV:** Essential Climate Variables

**EML:**Ecological Metadata Language

**EMoF:**Extended Measurement or Fact

**EOV:** Essential Ocean Variables

**ERDDAP:**[Environmental Research Division Data Access Program](https://coastwatch.pfeg.noaa.gov/erddap/information.html#cite)

**FAIR:** findable, accessible, interoperable, and reusable

**GBF:** Global Biodiversity Framework

**GBIF:** Global Biodiversity Information Facility

**GCOS:** Global Climate Observing System

**GEO BON:** Group on Earth Observations Biodiversity Observation Network

**GOOS:** Global Ocean Observing System

**IOC:** Intergovernmental Oceanographic Commission

**IOCCP:** International Ocean Carbon Coordination Project

**IODE:** International Oceanographic Data and Information Exchange

**IPCC:** Intergovernmental Panel on Climate Change

**MBON:** Marine Biodiversity Observation Network

**NCEI:** National Centres for Environmental Information

**OBIS:** Ocean Biodiversity Information System

**ODIS:** Ocean Data Information System

**OCG:** Observation Coordination Group

**OOPC**: Ocean Observations Physics and Climate Panel

**SDG**: Sustainable Development Goals

**UNFCCC:** United Nations Framework Convention on Climate Change

**UNEP:** United Nations Environment Programme

# Glossary of terms

| **Derived products:** outputs calculated from the EOV and sub-variables, often in combination with the supporting variables, that contribute to evaluating change in phenomena. For example, evaporation can be determined from sea surface temperature measurements; air-sea fluxes of CO2 can be derived from inorganic carbon EOV; fish stock productivity can be determined from fish abundance.  **Indicators:** An indicator can be defined as a ‘measure based on verifiable data that conveys information about more than just itself’. This means that indicators are purpose dependent - the interpretation or meaning given to the data depends on the purpose or issue of concern. (BIP definition)  **Measurement Uncertainty:** the parameter, associated with the result of a measurement, that characterises the dispersion of the values that could reasonably be attributed to the measurand (GUM)[1](https://wmoomm-my.sharepoint.com/personal/bmartinmiguez_wmo_int/Documents/WORK/GCOS/GCOS%20TT/ECVs%20Rationalization/Definitions%20and%20Adoption%20Process/ECVs%20Adoption%20process_2024_clean.docx#_bookmark3). It includes all contributions to the uncertainty, expressed in units of 2 standard deviations, unless stated otherwise  **Phenomena:** properties (e.g., of a species such as distribution), processes (e.g., of the ocean such as surface ocean heat flux), or events (e.g., such as algal blooms) that have distinct spatial and temporal scales, and when observed, inform evaluations of ocean state and ocean change  **Stability**: The change in bias over time. Stability is quoted per decade.  **Supporting variables**: other measurements that are useful to provide scale or context to the sub-variables of the EOV (e.g., pressure measurements to provide information on the depth at which subsurface currents are estimated, sea temperature to understand dissolved inorganic carbon, water turbidity to support estimations of hard coral cover ).  **Sub-variables**: key measurements that are used to estimate the EOV (e.g., counts of individuals to provide an estimate of species abundance (such as fish, mammals, seabirds or turtles), partial pressure of carbon dioxide (pCO2)to estimate ocean inorganic carbon, or wave height to estimate sea state).  **Timeliness:** The time expectation for availability of data measured from the data acquisition time. |  | **Seagrass areal extent**: Area in km2 occupied by seagrass meadow within spatial boundaries of a specified area  **Seagrass percent cover**: Proportion of substrate in a sample area that is covered (substrate not visible) by seagrass  **Seagrass species composition**: contribution of each seagrass species or functional group to seagrass abundance and/or extent  **Seagrass canopy height**: Median vertical distance from the sediment surface to the highest reach of seagrass leaves in the water column  **Seagrass shoot length**: Mean length of a sample of seagrass shoots from the base of the shoot to its tip, measured either in situ or in samples returned to the lab  **Seagrass shoot density**: The number of seagrass shoots per unit seabed area  **Seagrass above-ground biomass:** Total dry mass of above-ground seagrass tissue (shoots and leaves) within a sample of specified size  **Seagrass below-ground biomass:** Total dry mass of below-ground seagrass tissue (roots and rhizomes) within a sample of specified size |
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**Appendix -** Additional information

| **A1. Applications This table provides examples of applications of this EOV, including, contribution to other essential variable frameworks, multilateral environmental agreements, contribution to indicators and GOOS applications** | | |
| --- | --- | --- |
| **EOV** | | Seagrass cover and composition |
| **CORRESPONDING ESSENTIAL VARIABLES** | ECV | Marine habitats |
| EBV | Genetic composition: Allelic and genotypic diversity, inbreeding indices  Species populations: Species occurrences, species abundances  Species traits: Phenology of growth and flowering, shoot turnover rate, time to first asexual reproduction, seed dormancy  Community composition: community diversity (species and/or phylogenetic diversity) and composition, community functional (trait) diversity and composition  Ecosystem structure: Habitat structure (canopy height and density, rhizome mass and density)  Ecosystem functioning: Primary production, carbon cycling and storage/sequestration (above and below-ground biomass, sediments), nitrogen cycling and storage, physical structure, secondary production of associated animals |
| **GLOBAL INDICATORS EOV CAN CONTRIBUTE** | **SDG** | Sustainable Development Goal 14:  Target 14.1: Reduce marine pollution (sSeagrasses as water quality sentinels);  Target 14.2: Protect and restore ecosystems (sSeagrass habitats as major coastal ecosystems);  Target 14.3: Reduce ocean acidification (seagrasses as carbon sinks[1] );  Target 14.4: Sustainable fishing (seagrasses as essential fish habitat, fishery nurseries);  Target 14.5: Conserve coastal and marine areas;  Target 14.a: Increase scientific knowledge, research and technology for ocean health;  Target 14.b: Support small-scale fishers (artisanal harvesting of fish, shellfish in seagrass habitats)  Target 14.7: Increase the economic benefits from sustainable use of marine resources. |
| **CBD GBF** | Goal A: Protect and Restore  Goal B: Prosper with Nature  Target 1: Plan and Manage all Areas To Reduce Biodiversity Loss  Target 2: Restore 30% of all Degraded Ecosystems  Target 6: Reduce the Introduction of Invasive Alien Species by 50% and Minimize Their Impact  Target 9: Manage Wild Species Sustainably To Benefit People  Target 21: Ensure That Knowledge Is Available and Accessible To Guide Biodiversity Action |
| **CLIMATE** | UNFCCC: Nationally Determined Contributions: seagrass extent  US Global Change Research Program: Climate indicators: Marine species distribution |
| **RAMSAR** | Target 8: National wetland inventories have been either initiated, completed, or updated and disseminated and used for promoting the conservation and effective management of all wetlands;  Target 11: Wetland functions, services and benefits are widely demonstrated, documented and disseminated;  Target 12: Restoration is in progress in degraded wetlands, with priority to wetlands that are relevant for biodiversity conservation, disaster risk reduction, livelihoods and/or climate change mitigation adaptation. |
|  | UN Ocean Decade | Outcome 2: A healthy and resilient ocean where marine ecosystems are understood, protected, restored and managed.  Outcome 3: A productive ocean supporting sustainable food supply and a sustainable ocean economy.  Outcome 5: A safe ocean where life and livelihoods are protected from ocean-related hazards.  Outcome 7: An inspiring and engaging ocean where society understands and values the ocean in relation to human wellbeing and sustainable development. |
| **GOOS APPLICATIONS** | | Ocean health |

| Essential Ocean Variable Specification Sheet Sponsored by:  A star in the sky  Description automatically generated with low confidence Logo, company name  Description automatically generated Logo  Description automatically generated with low confidence Shape  Description automatically generated with low confidence |
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1. In evaluations of programmes, projects, or other initiatives which claim EOV data generation, evaluators are encouraged to verify that data is discoverable and accurately represented in the GOOS BioEco Portal. [↑](#footnote-ref-0)
2. ODIS, part of IOC-UNESCO’s International Oceanographic Data and Information Exchange (IODE), is a global federation of data systems sharing interoperable (meta)data about holdings, services, and other resources to enhance cross-domain data accessibility. [↑](#footnote-ref-1)
3. OBIS is a global biodiversity hub and IOC-UNESCO IODE component, connecting +30 nodes, +1000 institutions, and 99 countries, interoperating with other major biodiversity hubs like GBIF and serves as an ODIS node. [↑](#footnote-ref-2)
4. E.g. phylogenetic/functional DNA sequence data in the European Nucleotide Archive, taxa-based occurrence data in OBIS, images in institutional repositories, or acoustic data in a regional data hub. [↑](#footnote-ref-3)