C-GRASS

Coordinating
Global
Research
Assessment of
Seagrass
Systems

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C-GRASS Vision:

A rigorous, dynamic picture of global seagrass status and trends …

and a global Community of Practice that stewards it for the public good.

C-GRASS Partners

Coordinating
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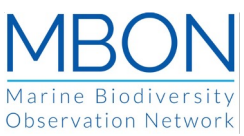
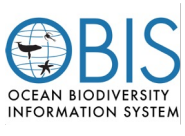
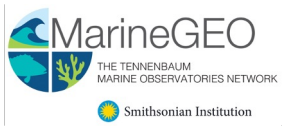
Systems







C-GRASS mission

Best practices

Produce a handbook of standard protocols and best practices for collecting, curating and sharing data on seagrass ecosystems.

Data schema

Develop recommended seagrass data schema and standardised vocabularies, aligning with Darwin Core and the EOV sub-variables.

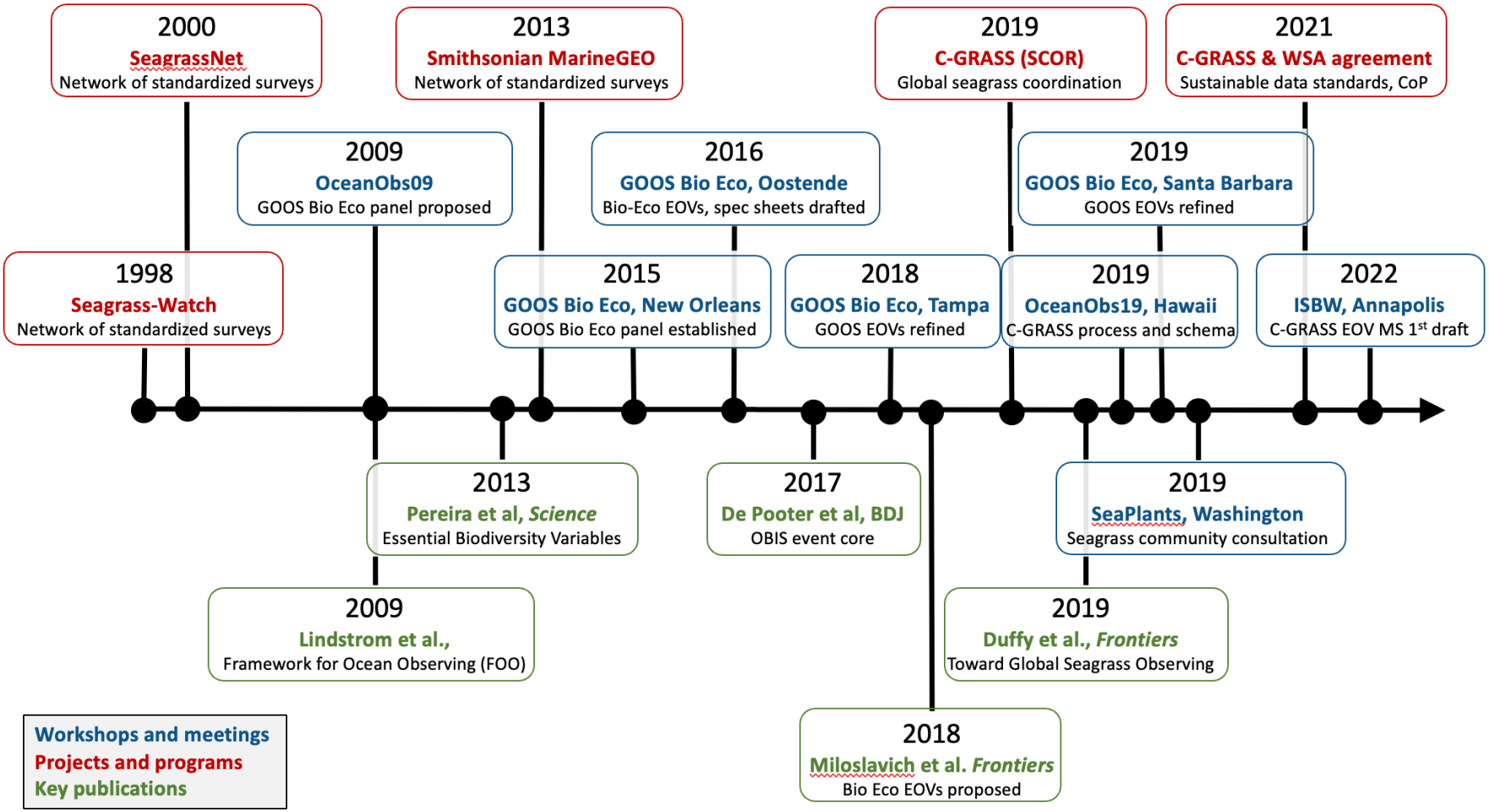
Community of practice

Organise an interdisciplinary community of practice around specific topics and approaches, in order to support implementation.

Data synthesis

Assemble a database of existing records of seagrass occurrence, aerial extent and in situ surveys, and a schema to harmonize disparate kind of data.

Seagrass EOV development: Timeline



Seagrass EOV development: Specifications

frontiers in Marine Science

SYSTEMATIC REVIEW
published: 04 July 2019
doi: 10.3389/fmars.2019.00317

Toward a Coordinated Global Observing System for Seagrasses and Marine Macroalgae

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Edited by:
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Reviewed by:
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Luigi Piazzi, University of Sassari, Italy

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Specialty section:
This article was submitted to Marine Ecosystem Ecology, a section of the journal Frontiers in Marine Science

Received: 07 November 2018
Accepted: 27 May 2019
Published: 04 July 2019

Citation:
Duffy JE, Benedetti-Cecchi L, Trinanes J, Muller-Karger FE, Ambo-Rappe R, Boström C, Buschmann AH, Byrnes J, Coles RG, Creed J, Cullen-Unsworth LC, Diaz-Pulido G, Duarte CM, Edgar GJ, Fortes M, Goni G, Hu C, Huang X, Hurd CL, Johnson C, Konar B, Krause-Jensen D, Krumhansl K, Macreadie P, Marsh H, McKenzie LJ, Mieszkowska N, Miloslavich P, Montes E, Nakaoka M, Norderhaug KM, Norlund LM, Orth RJ, Prathep A, Putman NF, Samper-Villarreal J, Serrao EA, Short F, Pinto IS, Steinberg P, Stuart-Smith R, Unsworth RKF, van Keulen M, van Tussenbroek BI, Wang M, Waycott M, Weatherdon LV, Wernberg T and Yaakub SM (2019) Toward a Coordinated Global Observing System for Seagrasses and Marine Macroalgae. Front. Mar. Sci. 6:317. doi: 10.3389/fmars.2019.00317

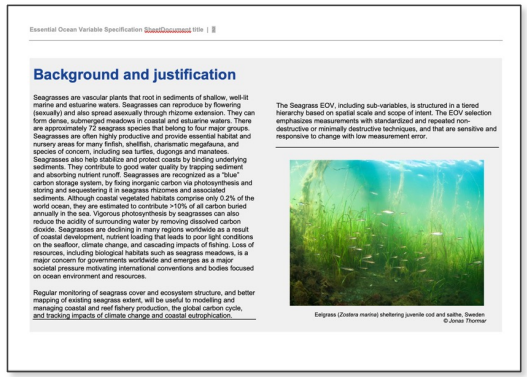
Version: 0.0 Month Year

Essential Ocean Variable Specification Sheet

Seagrass cover and composition

Global Ocean Observing System (2021). Essential Ocean Variable Specification Sheet: [Seagrass cover and composition]. GOOS Reference No; DOI: [to be assigned, e.g. by depositing on the Zenodo repository]

EOV Specification Sheet curated by:



Essential Ocean Variable Specification SheetDocument title | ||

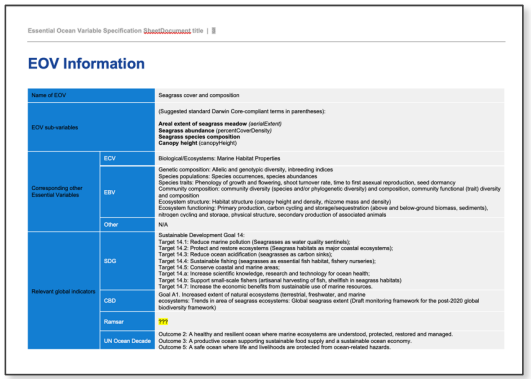
Background and justification

Seagrasses are vascular plants that root in sediments of shallow, well-lit marine and estuarine waters. Seagrasses can reproduce by flowering (sexually) and also spread asexually through rhizome extension. They can form dense, submerged meadows in coastal and estuarine waters. There are approximately 72 seagrass species that belong to four major groups. Seagrasses are often highly productive and provide essential habitat and nursery areas for many finfish, shellfish, charismatic megafauna, and species of concern, including sea turtles, dugongs and manatees. Seagrasses also help stabilize and protect coasts by binding underlying sediments. They contribute to good water quality by trapping sediment and absorbing nutrient runoff. Seagrasses are recognized as a "blue" carbon storage system, by fixing inorganic carbon via photosynthesis and storing and sequestering it in seagrass rhizomes and associated sediments. Although coastal vegetated habitats comprise only 0.2% of the world ocean, they are estimated to contribute >10% of all carbon buried annually in the sea. Vigorous photosynthesis by seagrasses can also reduce the acidity of surrounding water by removing dissolved carbon dioxide. Seagrasses are declining in many regions worldwide as a result of coastal development, nutrient loading that leads to poor light conditions on the seafloor, climate change, and cascading impacts of fishing. Loss of resources, including biological habitats such as seagrass meadows, is a major concern for governments worldwide and emerges as a major societal pressure motivating international conventions and bodies focused on ocean environment and resources.

Regular monitoring of seagrass cover and ecosystem structure, and better mapping of existing seagrass extent, will be useful to modelling and managing coastal and reef fishery production, the global carbon cycle, and tracking impacts of climate change and coastal eutrophication.

The Seagrass EOV, including sub-variables, is structured in a tiered hierarchy based on spatial scale and scope of intent. The EOV selection emphasizes measurements with standardized and repeated non-destructive or minimally destructive techniques, and that are sensitive and responsive to change with low measurement error.

Eelgrass (*Zostera marina*) sheltering juvenile cod and saithe, Sweden © *Jonas Thormar*



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EOV Information

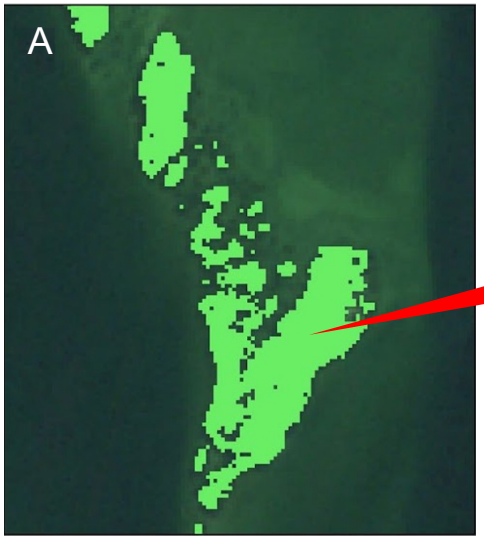
Name of EOV		Seagrass cover and composition
EOV sub-variables		(Suggested standard Darwin Core-compliant terms in parentheses): **Areal extent of seagrass meadow** (aerialExtent) **Seagrass abundance** (percentCoverDensity) **Seagrass species composition** **Canopy height** (canopyHeight)
Corresponding other Essential Variables	ECV	Biological/Ecosystems: Marine Habitat Properties
	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
	Other	N/A
Relevant global indicators	SDG	Sustainable Development Goal 14: Target 14.1: Reduce marine pollution (Seagrasses as water quality sentinels); Target 14.2: Protect and restore ecosystems (Seagrass habitats as major coastal ecosystems); Target 14.3: Reduce ocean acidification (seagrasses as carbon sinks); 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	Goal A1. Increased extent of natural ecosystems (terrestrial, freshwater, and marine ecosystems. Trends in area of seagrass ecosystems. Global seagrass extent (Draft monitoring framework for the post-2020 global biodiversity framework)
	Ramsar	???
	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.

Biology and Ecosystems Panel

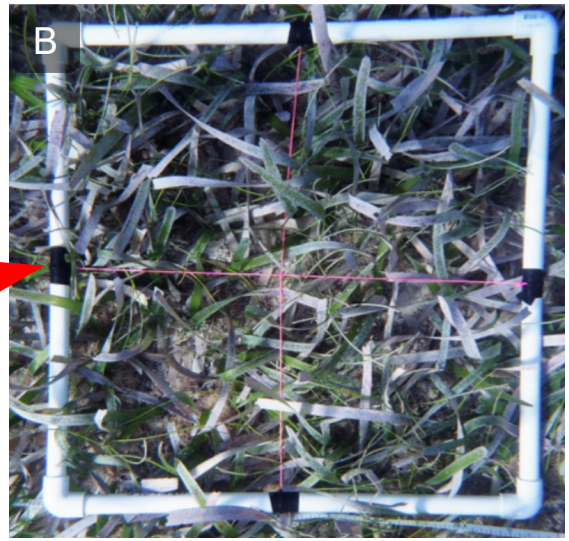
Seagrass Essential Ocean Variable: Sub-variables

Biology and Ecosystems Panel

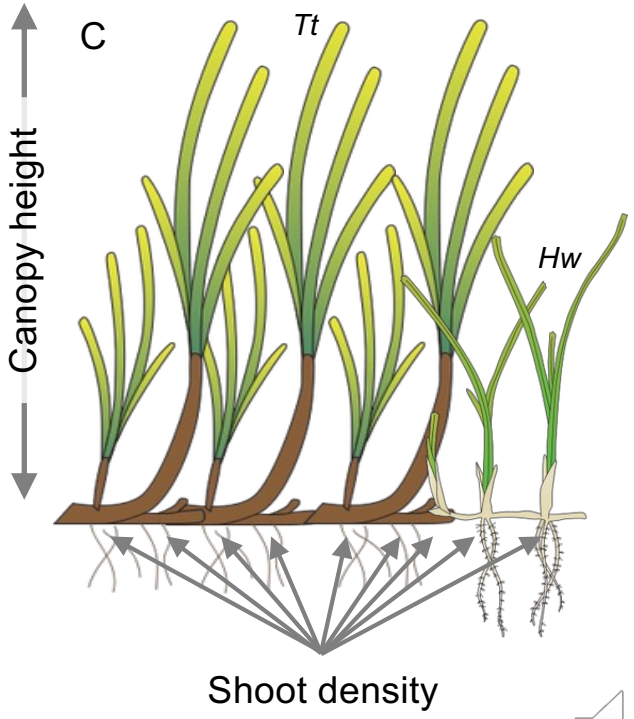
Areal extent



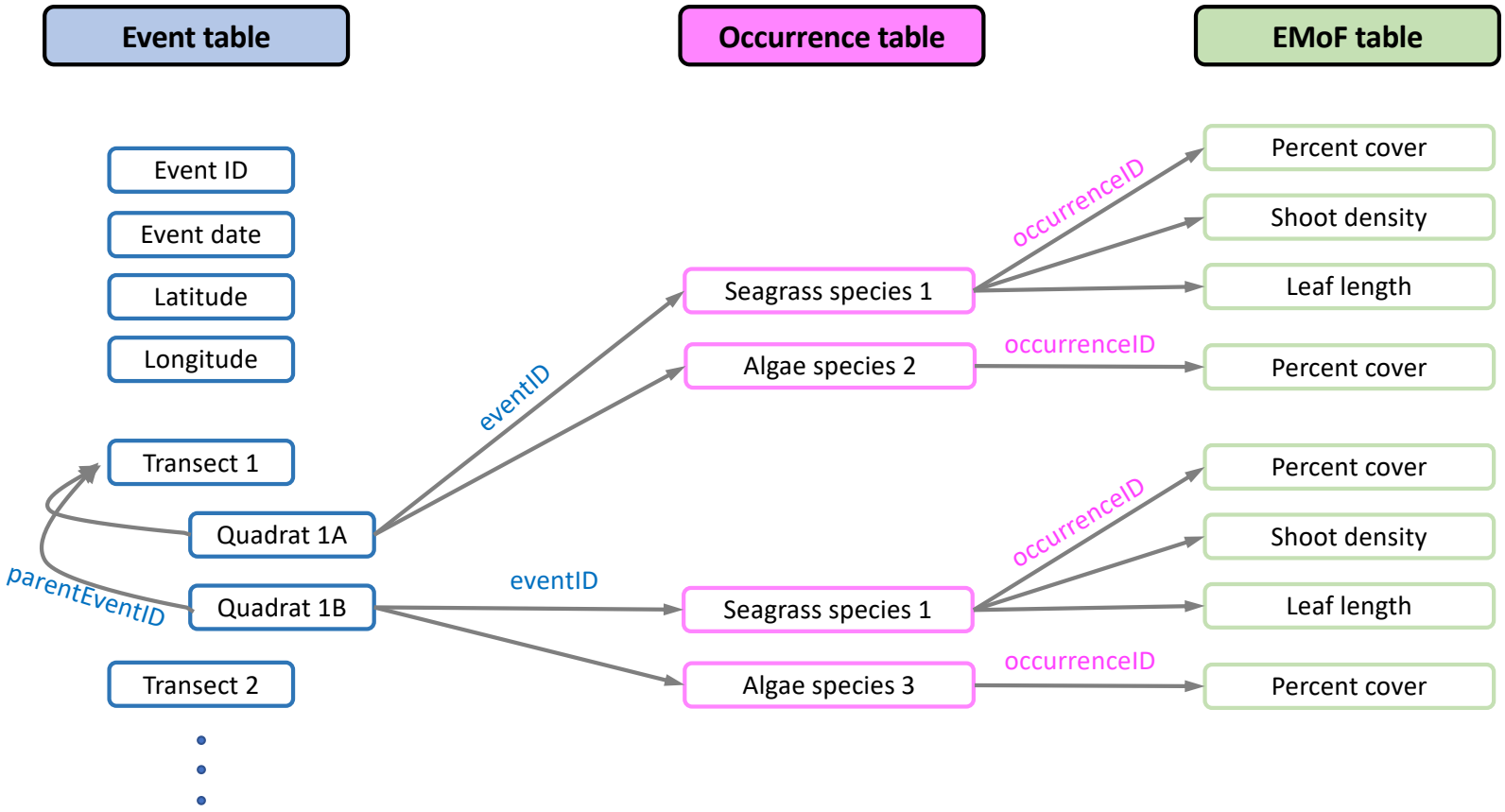
Percent cover



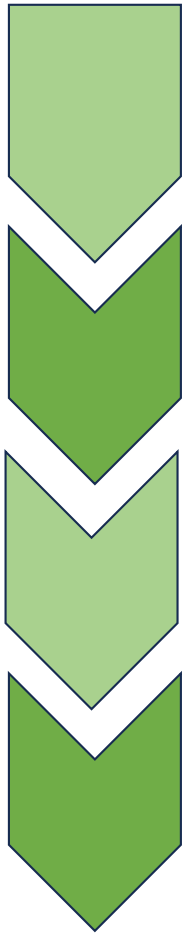
Species composition



Seagrass Essential Ocean Variable: Data schema



Seagrass Essential Ocean Variable: Path to completion



- **Seagrass networks established, coordinating standardized surveys**
  - Seagrass-Watch (1998)
  - SeagrassNet (2000)
  - Smithsonian MarineGEO (2013)
- **Essential Ocean Variable (EOV) concept developed**
  - Framework for Ocean Observing proposes EOVs (2009)
  - Global Ocean Observing System (GOOS) Biology & Ecosystem panel established (2015)
  - Biological and ecosystem EOVs drafted (2016)
- **Global coordination and consultation around seagrass cover and composition" EOV**
  - C-GRASS funded by SCOR (2019)
  - C-GRASS group proposes seagrass data schema, best practices, Community of Practice
  - Consultations with seagrass community: OceanObs (2019), SeaPlants (2019), ISBW (2022)
- **Proposed global standards for seagrass cover and composition EOV (MS in prep)**
  - Data schema linked to OBIS
  - Best practices, organized by tiered data quality model
  - **Seagrass EOV MS to be submitted for publication, early 2024**