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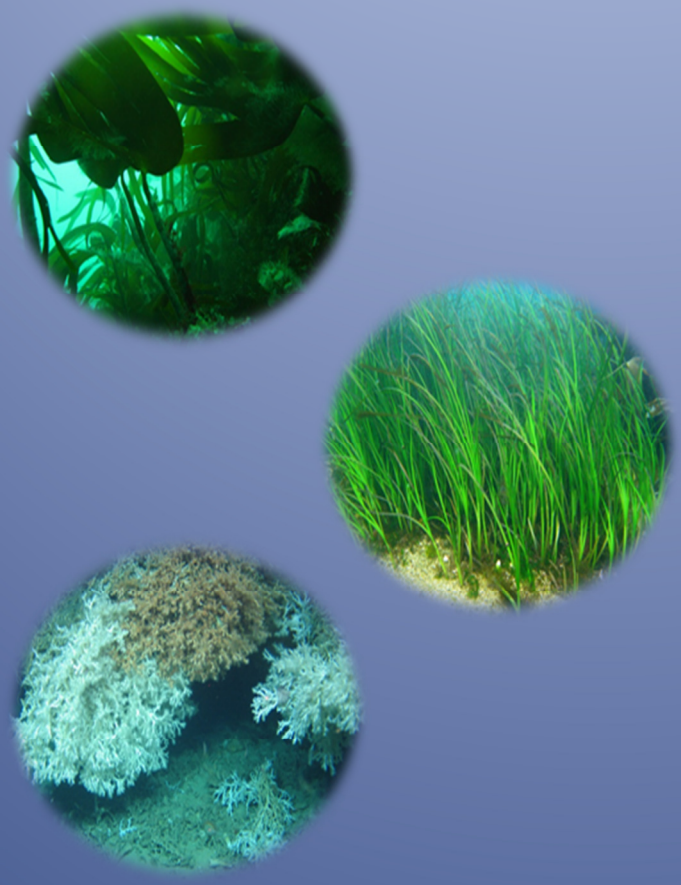
European Marine Observation and Data Network

Seabed Habitats Lot



Generating Essential Ocean Variables

The purpose of this document is to explain the methodology used in creating Essential Ocean Variables for the Atlas of Marine Life.

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This document gives an overview of the procedure used to create spatial data layers displaying seagrass, macroalgae and live coral from the existing library of habitat maps on the EMODnet Seabed Habitats map viewer. These layers present the first attempt to map areal extent of three Essential Ocean Variables (EOVs) in Europe. Together with the EOV data products developed by EMODnet Biology, they contribute to the growing Atlas of Marine Life in Europe.

Essential Ocean Variables

The Global Ocean Observing System (GOOS) aims to promote common standards for data collection around the world. As part of this it has identified a series of variables that it hopes will lead to consistency and cost-effective marine monitoring, globally; these are known as 'Essential Ocean Variables' (EOVs).

Of the ten EOVs in the 'Biology and Ecosystems' category there are three that relate to European seabed habitats, and within each EOV there are several sub-variables (specific variables that may be measured), one of which can be directly informed by habitat maps (Table 1).

EOV	**Relevant sub-variable**
Hard coral cover and composition	Live hard coral cover and extent
Seagrass cover and composition	Areal extent of seagrass meadows
Macroalgal canopy cover and composition	Areal extent

Table 1. EOV variables and their sub-variables which can be mapped using data from the EMODnet Seabed Habitats portal.

At the time of writing, the specification sheets for these habitats were still under development; therefore, the 3 EOV layers produced should also be seen as a "work in progress".

EMODnet Seabed Habitats Map Viewer

EMODnet Seabed Habitats (ESBH) collates habitat maps, habitat models and habitat point data (Figure 1). It also produces a broadscale predictive map – EUSeaMap – which displays EUNIS marine habitats in European waters. A library of over 750 habitat maps have been collated to date. These maps span the extent of the Northeast Atlantic Ocean, Baltic Sea, Mediterranean Sea and Black Sea. The maps are in themed categories: EUNIS, Habitats Directive Annex 1, Composite Data Products and broad-scale predictive maps. (The maps are fully INSPIRE compliant. All maps can be freely downloaded from the ESBH portal along with metadata and confidence scores for each map).

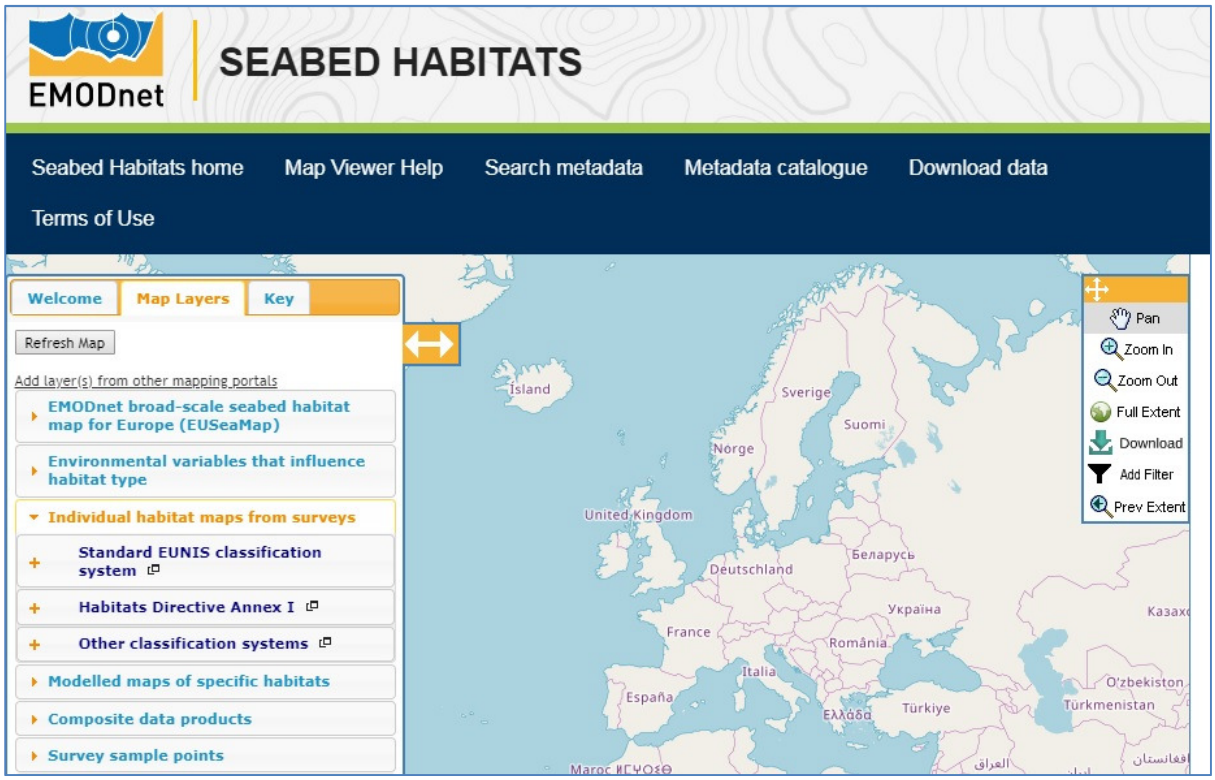

Figure 1. Categories of maps available for download from the EBSH map viewer.

The resources on this web viewer were used in the compilation of composite layers displaying the areal extent of the three EOVs listed above.

Generating EOV layers

A list of habitats was prepared for each EOV with input from all ESBH project partners. These are presented in Appendix 1. After agreeing on the habitat lists, the relevant data for each EOV were extracted from the library of habitat maps on the portal. An R script was used to extract the data from all EUNIS habitat maps. Data from other maps types were extracted manually. The data were merged into standardised, non-overlapping polygon shapefiles and published as web mapping service (WMS) layers from the ESBH viewer.

1. Seagrass cover

Seagrasses provide essential habitat and nursery areas for many marine fauna. There are approximately 72 seagrass species that belong to four major groups: Zosteraceae, Hydrocharitaceae, Posidoniaceae and Cymodoceaceae. *Zostera* beds and *Cymodecea* meadows are named on the OSPAR Threatened or Declining Habitats list (Appendix 2). *Posidonia* beds are protected under Annex I of the EU Habitats Directive (Appendix 3).

Seagrass habitat data have been collated from the following map categories from the ESBH portal (order reflects the priority):

(i) OSPAR threatened and/or declining habitats shapefile

(ii) Library of EUNIS habitat maps

(iii) non-EUNIS habitat maps

(iv) Annex I habitat maps

(iv) EUSeaMap (broad-scale predictive map)

Decision rules when dealing with overlaps

Layers (i), (ii) and (iii) are high resolution vector data. The EUSeaMap layer is a vectorised polygon layer converted from a 250 m model of predicted habitats. It was given the least priority on account of its course resolution (Figure 2a).

OSPAR data was given priority over any overlapping data from EUNIS or non-EUNIS maps. In areas where 2 EUNIS maps overlapped, the map with the highest confidence was given priority (Figure 2b). In areas where there was a mosaic of live *Posidonia* and dead *Posidonia*, the polygons displaying live *Posidonia* were selected for input into the final layer.

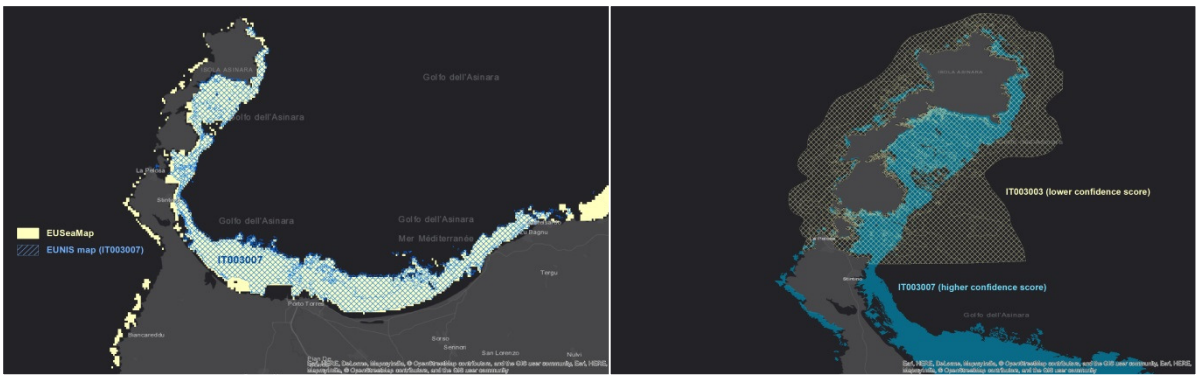

Figure 2. (a) Overlap between EUNIS habitat maps and EUSeaMap. (b) Overlaps between 2 EUNIS habitat maps with difference confidence assessment scores.

The final layer shows extent of seagrass collated by ESBH in European waters (Figure 3).

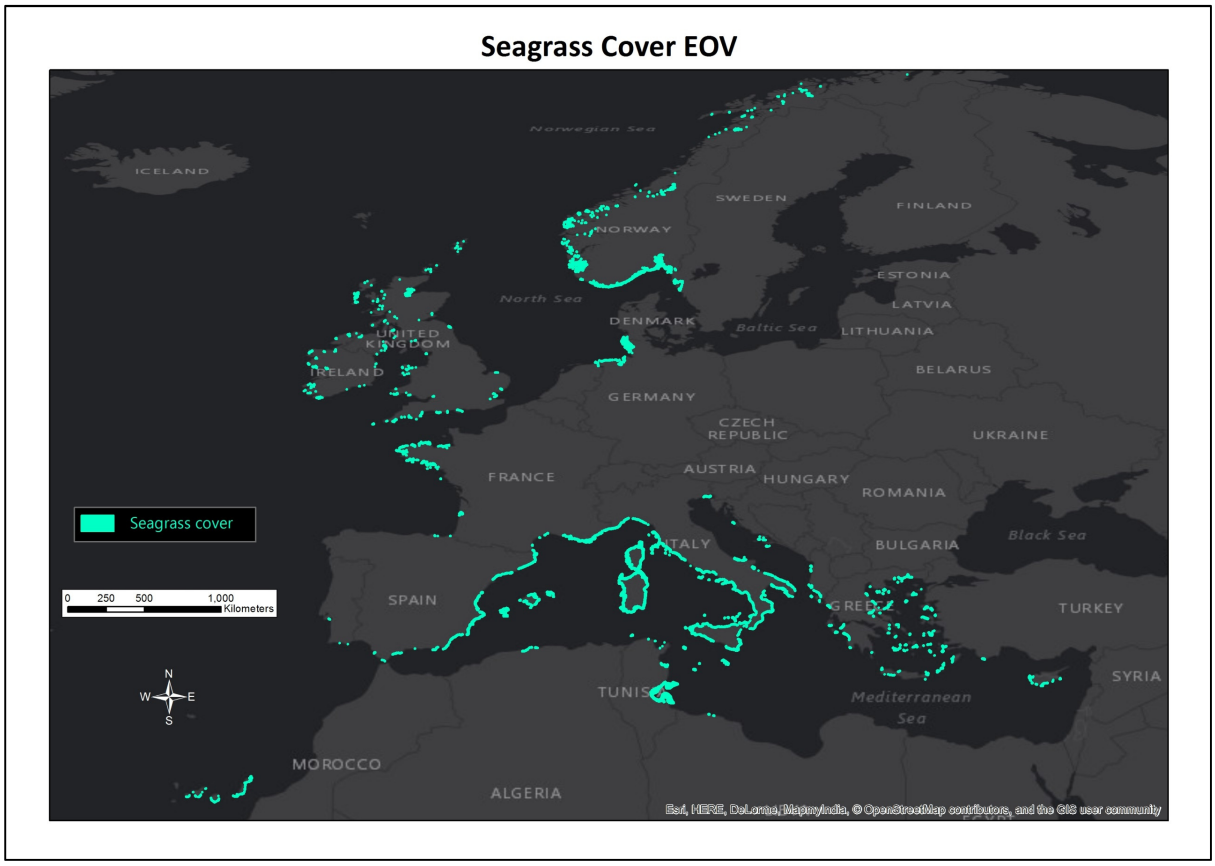

Figure 3. Collated seagrass polygon data from the ESBH map viewer used in the generation of the Seagrass EOV layer.

2. Macroalgal canopy cover

Kelp and fucoid brown algae are the dominant species that comprise macroalgal forests. Although not on any list of protected habitats, they provide many important functions including provision of nursery areas and protection from coastal erosion.

Macroalgal forest data have been collated from the following map categories from the ESBH portal (order reflects the priority):

(i) Library of EUNIS habitat maps

(ii) non-EUNIS habitat maps

In areas where 2 EUNIS maps overlapped, the map with the highest confidence score was given priority.

The final layer shows extent of macroalgal forests collated by ESBH in European waters (Figure 4).

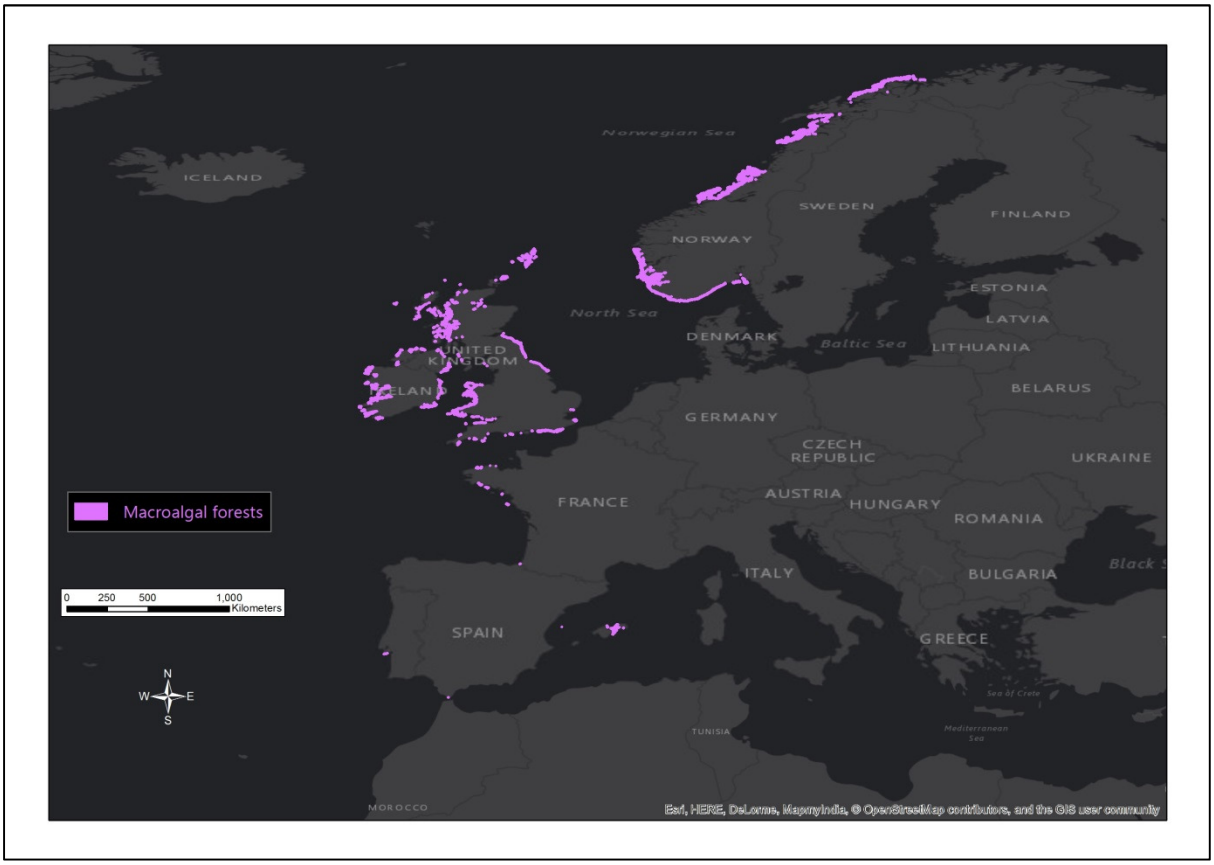

Figure 4. Collated kelp and fucoid polygon data from the ESBH map viewer used in the generation of the Macroalgal Canopy Cover EOV layer.

3. Live coral

The health and areal extent of the hard coral community within a reef are direct indicators of the ability of a system to sustain the diversity of associated species. *Lophelia pertusa* and Coral gardens are both on the OSPAR List of threatened and/or declining species and habitats.

Live coral habitat data have been collated from the following map categories from the ESBH portal (order reflects the priority):

(i) OSPAR threatened and/or declining habitats shapefile

(ii) Library of EUNIS habitat maps

The final layer shows extent of hard coral collated by ESBH in European waters (Figure 5).

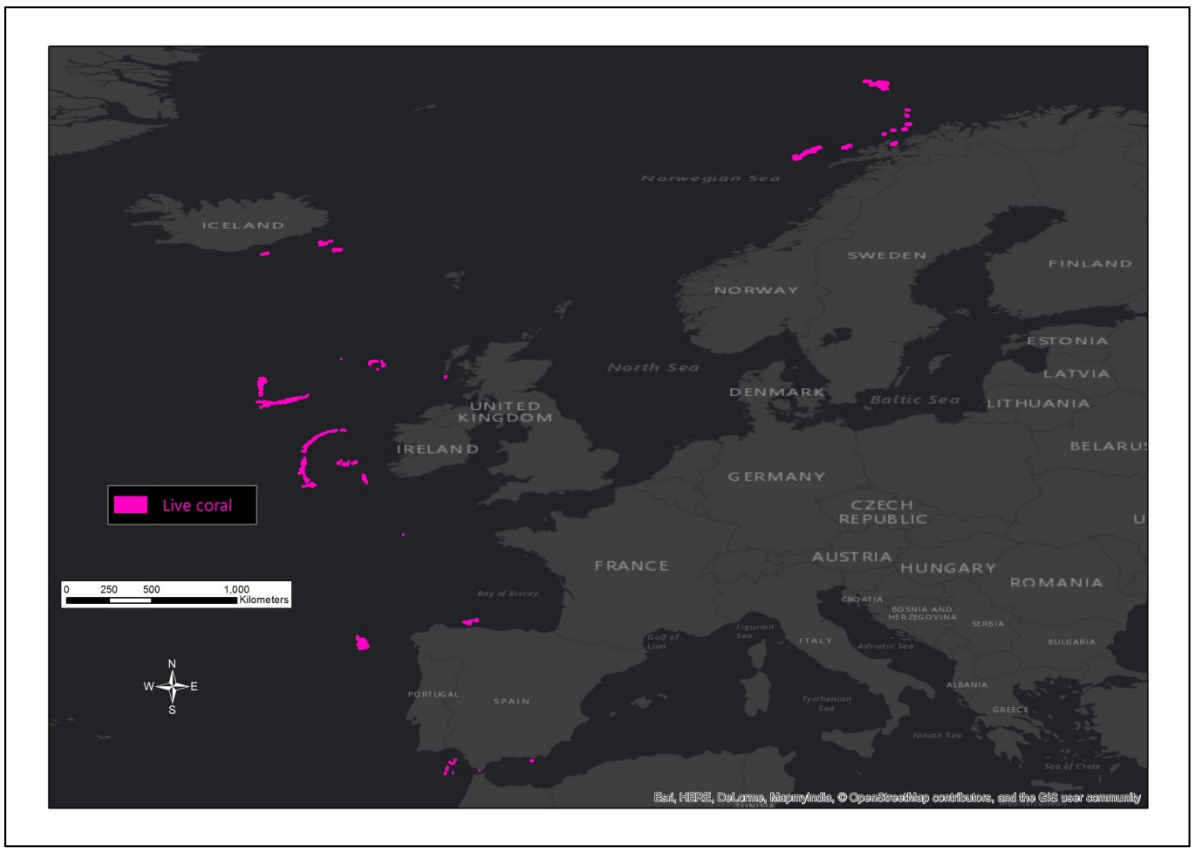

Figure 5. Collated coral polygon data from the ESBH map viewer used in the generation of the Live Coral EOV layer.

Limitations and future improvements

There are a few key limitations with these products that are important to highlight.

1. Incompleteness

The composite maps are the most comprehensive collection of maps related to these EOVs in Europe. However, they cannot be assumed to show the true extent of the habitats, and likewise areas that are not mapped do not necessarily imply that the habitat is absent.

This is due to multiple reasons including:

i. We cannot guarantee that the collection of maps contains all the European seabed habitat maps in existence.
ii. Much of the seabed has never been surveyed for these habitat types.
iii. Whilst some surveys may have targeted these habitat types, the data may not facilitate the mapping of areal extents. For example, the Live coral layer produced is missing a lot of data, particularly in the Irish EEZ. One likely reason for the absence is that the output from Remotely Operated Vehicle (ROV) Surveys – the preferred survey technique for deep water corals – is a series of photos and a point dataset indicating the presence of a species or habitat. The format makes it difficult to translate into a polygon shapefile measuring extent. Advances in photogrammetric techniques may change this in the future but for now the best data will most likely be from a model or a point dataset.

2. Change over time is not explicit

Using the current method, if a single site has been mapped repeatedly over time, all instances of the habitat will be included from all the maps. This would lead to an overestimate of the extent of the habitat within the site if the extent had decreased over time.

3. There is no distinction between 'absent habitat' and 'no data'

It may be useful for a user to know whether a habitat is not mapped somewhere because the area hasn't been surveyed, or because it was surveyed and another habitat was present.

For future versions of these composite products we recommend to:

i. Continue to collate individual habitat maps from surveys to provide the most comprehensive product possible.
ii. Amend the method to make a distinction between 'absent habitat' and 'no data'.

iii. Include a layer of point data - although points do not give an areal extent, they will help to indicate additional areas where the habitats have been observed but not necessarily mapped.

iv. Make the time element more prominent. The current products show data from many different years presented together; however in reality the extent of the habitats may change over time as a result of natural variability or human activities.

Appendix 1: Habitat lists for EOVs

Table 2 displays a list of habitat types from the EUNIS habitat classification system that the ESBH partners determined relate to the seagrass EOV. These were used to extract the relevant polygons from the individual EUNIS habitats maps and EUSeaMap. Also included are columns indicating with which Annex I and OSPAR habitats these habitat types might correspond.

EUNIS Name	EUNIS Code	EUNIS Level	Details/Comments	Generic name	Annex 1 Habitat	OSPAR
Facies of banks of dead leaves of [Posidonia oceanica] and other	A2.131	5	This facies is characterized by the accumulation of plant debris made up mostly of dead [Posidonia oceanica] leaves and/or other marine phanerogams species (e. g. [Cymodocea nodosa], [Zostera noltii], etc.)	Seagrass beds		
Seagrass beds on littoral sediments	A2.61	4	Dominants are [Zostera] spp.	Zostera beds	Mudflats and sandflats not covered by seawater at low tide	
Mainland Atlantic [Zostera noltii] or [Zostera angustifolia] meadows	A2.611	5	Formations of [Zostera noltii] or [Zostera angustifolia] of the Atlantic, North Sea and Baltic shores of continental Europe and of its continental shelf islands.	Zostera beds	Mudflats and sandflats not covered by seawater at low tide	Zostera beds
[Zostera noltii] beds in littoral muddy sand	A2.6111	6	Mid and upper shore wave-sheltered muddy fine sand or sandy mud with narrow-leafed eel grass [Zostera noltii] at an abundance of frequent or above. It should be noted that the presence of [Z. noltii] as scattered fronds does not	Zostera beds	Mudflats and sandflats not covered by seawater at low tide	Zostera beds
Macaronesian [Zostera noltii] meadows	A2.612	5	Very local [Zostera noltii] formations of Fuerteventura and Lanzarote.	Zostera beds		Zostera beds
Pontic [Zostera marina] and [Zostera noltii] meadows	A2.613	5	[Zostera marina] and [Zostera noltii] formations of Black Sea shores, particularly luxuriant in the limans of the northern Black Sea and the Azov Sea. In the Black Sea, the dominant species of the [Zostera] biocenosis are [Zostera	Zostera beds		
[Ruppia maritima] on lower shore sediment	A2.614	5	Proposed new unit. No description available.	Ruppia beds	Mudflats and sandflats not covered by seawater at low tide	
Sublittoral seagrass beds	A5.53	4	Beds of submerged marine angiosperms in the genera [Cymodocea], [Halophila], [Posidonia], [Ruppia], [Thalassia], [Zostera].	Seagrass beds	Mudflats and sandflats not covered by seawater at low tide / Sandbanks which are slightly covered by sea water all the time	
[Cymodocea] beds	A5.531	5	Formations of [Cymodocea nodosa] of the Atlantic shores of southern Iberia, northwestern Africa and the Macaronesian Islands.	Cymodocea beds		Cymodocea meadows
Macaronesian [Cymodocea] beds	A5.5311	6	Formations of [Cymodocea nodosa] or [Cymodocea] and [Caulerpa] spp., in particular [Caulerpa prolifera], occupying large surfaces, on sandy substrates at depths of 1-15 metres, around the Macaronesian Islands.	Cymodocea beds		Cymodocea meadows
Lusitanian [Cymodocea] beds	A5.5312	6	Formations of [Cymodocea nodosa] of the southernmost Atlantic coasts of the Iberian peninsula.	Cymodocea beds		Cymodocea meadows
Mediterranean [Cymodocea] beds	A5.5313	6	[Cymodocea nodosa] formations of the Mediterranean, permanently submerged in waters down to 10 metres deep, often in sheltered areas behind [Posidonia] reefs, monospecific or associated with either the alga [Caulerpa prolifera]	Cymodocea beds		Cymodocea meadows
Association with [Cymodocea nodosa] on well sorted fine sands	A5.53131	7	This association, characterised by the seagrass [Cymodocea nodosa], lives on soft bottoms formed by well sorted fine sands and can constitute a local facies with epiflora.	Cymodocea beds		Cymodocea meadows
Association with [Cymodocea nodosa] on superficial muddy sands in sheltered	A5.53132	7	This association is characterised by the seagrass [Cymodocea nodosa] and is present when the water is actively renewed and there is no trace of desalination.	Cymodocea beds		Cymodocea meadows
[Halophila] beds	A5.532	5	Deep water colonies of [Halophila] spp. or [Thalassia] spp. of the Mediterranean and the Macaronesian Atlantic.	Halophila beds		
Canary Island [Halophila] beds	A5.5321	6	[Halophila decipiens] colonies of Tenerife, at depths between 10 and 14 metres.	Halophila beds		
Mediterranean [Halophila] beds	A5.5322	6	The facies characterised by the seagrass [Halophila stipulacea] lives on soft bottoms with fine sands that are fairly enriched by fine particles. Colonies of [Halophila stipulacea] have invaded the Mediterranean as a result of the	Halophila beds		
[Zostera] beds in full salinity infralittoral sediments	A5.533	5	Beds of seagrass ([Zostera marina] or [Ruppia] spp.) in shallow sublittoral sediments. These communities are generally found in extremely sheltered embayments, marine inlets, estuaries and lagoons, with very weak tidal currents. They may inhabit low, vari	Zostera beds	Mudflats and sandflats not covered by seawater at low tide / Sandbanks which are slightly covered by sea water all the time	Zostera beds
[Zostera marina]/[angustifolia] beds on lower shore or infralittoral clean or muddy sand	A5.5331	6	Expanses of clean or muddy fine sand and sandy mud in shallow water and on the lower shore (typically to about 5 m depth) can have dense stands of [Zostera marina/angustifolia] [Note: the taxonomic status of [Z. angustifolia] is currently under considerat	Zostera beds	Mudflats and sandflats not covered by seawater at low tide / Sandbanks which are slightly covered by sea water all the time	Zostera beds
Mediterranean and Pontic [Zostera noltii] beds	A5.5332	6	Sparse meadows formed on muddy sands of the upper part of the infralittoral zone of Mediterranean coasts. This association is found in euryhaline and eurythermal waters and is characterised by the dwarf eel-grass [Zostera noltii]	Zostera beds		Zostera beds
Association with [Zostera noltii] in euryhaline and eurythermal environment	A5.53321	7	The association with [Zostera noltii] develops in lagoons that are subject to wide ranges of salinity, on varied loose substrata, from sand to mud, either at the entrances to the lagoons (graus) or even within the lagoons, where it	Zostera beds		Zostera beds
Association with [Zostera noltii] on superficial muddy sands in sheltered	A5.53322	7	Association with the [Zostera noltii] on muddy sands in sheltered waters. The [Zostera noltii] constitutes a bed in areas where there is an active deposit of fine matter. The epifauna of the vascular plants is poor. The population can	Zostera beds		Zostera beds
Association with [Zostera marina] in euryhaline and eurythermal environment	A5.5333	6	This association is found in euryhaline and eurythermal waters and it is characterised by the eel-grass [Zostera marina].	Zostera beds		Zostera beds
Mediterranean [Zostera hornemanniana] beds	A5.5334	6	Formations of the Mediterranean endemic [Zostera hornemanniana], vicariant of [Zostera marina], often confined to coastal lagoons, recorded also from the Istrio-Dalmatian archipelago.	Zostera beds		Zostera beds
[Ruppia] and [Zannichellia] communities	A5.534	5	Beds of seagrass ([Zostera marina] or [Ruppia] spp.) in shallow sublittoral sediments. These communities are generally found in extremely sheltered embayments, marine inlets, estuaries and lagoons, with very weak tidal	Ruppia beds		
Middle European [Ruppia] and [Zannichellia] communities	A5.5341	6	Submerged beds of [Ruppia maritima], [Ruppia cirrhosa], [Zannichellia pedicellata], [Chara] spp., [Tolypella nidifica] of brackish seas, sea inlets, estuaries, permanent pools of mud or sand flats, and coastal lagoons of Atlantic, North Sea	Ruppia beds		
Tethyan marine [Ruppia] communities	A5.5342	6	Submerged beds of [Ruppia maritima] or [Ruppia cirrhosa] and of [Chara] spp. of sea inlets, estuaries, permanent pools of mud or sand flats, and coastal lagoons of the Mediterranean, the Black Sea and the subtropical Atlantic, north	Ruppia beds		
[Ruppia maritima] in reduced salinity infralittoral muddy sand	A5.5343	6	In sheltered brackish muddy sand and mud, beds of [Ruppia maritima] and more rarely [Ruppia spiralis] may occur. These beds may be populated by fish such as [Gasterosteus aculeatus] which is less common on filamentous algal-	Ruppia beds		
[Posidonia] beds	A5.535	5	This assemblage is characterised by the presence of the marine seagrass (phanerogam) [Posidonia oceanica]. This species is endemic to the Mediterranean and constitutes characteristic formations called Posidonia meadows, located	Posidonia beds	Posidonia beds	
Ecomorphosis of striped [Posidonia oceanica] meadows	A5.5351	6	The striped [Posidonia oceanica] meadows facies is found at depth 0 - 5 metres. It appears as fairly narrow ribbons that can be several dozen metres long. These ribbons are separated by stretches of dead mat colonised by	Posidonia beds	Posidonia beds	
Ecomorphosis of "barrier-reef" [Posidonia oceanica] meadows	A5.5352	6	This ecomorphosis can be found in [Posidonia oceanica] beds present in sheltered bays. The vertical growth of the rhizomes leads to the raising of the mat, thus enabling the meadow to reach the surface.	Posidonia beds	Posidonia beds	
Facies of dead "mattes" of [Posidonia oceanica] without much epiflora	A5.5353	6	This facies is characterised by a dead mat of [Posidonia oceanica] without macro-epiflora.	Posidonia dead "mattes"	Posidonia beds	
Association with [Caulerpa prolifera] on [Posidonia] beds	A5.5354	6	This facies is characterised by the presence of the green alga [Caulerpa prolifera] in association with the [Posidonia oceanica] bed.	Posidonia beds	Posidonia beds	
[Zostera] beds in reduced salinity infralittoral sediments	A5.545	5		Zostera beds		Zostera beds

Table 2: List of habitats in Seagrass Cover EOV.

Table 3 displays a list of habitat types from the EUNIS habitat classification system that the ESBH partners determined relate to macroalgal cover EOV. These were used to extract the relevant polygons from the individual EUNIS habitat maps and EUSeaMap. Also included is a column entitled "Other Habitat Maps" which lists two habitat types identified from non-EUNIS habitat maps.

EUNIS Name	EUNIS Code	EUNIS Level	Generic name	Other Habitat Maps
Kelp with cushion fauna and/or foliose red seaweeds	A3.11	4	Kelp Forest or Kelp park	
[Alaria esculenta] on exposed sublittoral fringe bedrock	A3.111	5	Kelp Forest	
[Alaria esculenta], [Mytilus edulis] and coralline crusts on very exposed sublittoral fringe bedrock	A3.1111	6		
[Alaria esculenta] and [Laminaria digitata] on exposed sublittoral fringe bedrock	A3.1112	6		
[Alaria esculenta] forest with dense anemones and crustose sponges on extremely exposed infralittoral bedrock	A3.112	5	Kelp Forest	
[Laminaria hyperborea] forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock	A3.113	5	Kelp Forest	
[Laminaria hyperborea] with dense foliose red seaweeds on exposed infralittoral rock	A3.115	5	Kelp Forest	
[Laminaria hyperborea] forest with dense foliose red seaweeds on exposed upper infralittoral rock	A3.1151	6	Kelp Forest	
Mixed [Laminaria hyperborea] and [Laminaria ochroleuca] forest on exposed infralittoral rock	A3.1153	6	Kelp Forest	
[Laminaria hyperborea] and red seaweeds on exposed vertical rock	A3.117	5	Kelp Forest	
Association with [Cystoseira amentacea] (var. [amentacea], var. [stricta], var. [spicata])	A3.132	5		
Kelp and red seaweeds (moderate energy infralittoral rock)	A3.21	4		
[Laminaria digitata] on moderately exposed sublittoral fringe rock	A3.211	5	Kelp canopy and fucoids	
[Laminaria digitata] on moderately exposed sublittoral fringe bedrock	A3.2111	6	Kelp canopy and fucoids	
[Laminaria digitata] and under-boulder fauna on sublittoral fringe boulders	A3.2112	6	Kelp canopy and fucoids	
[Laminaria digitata] and piddocks on sublittoral fringe soft rock	A3.2113	6	Kelp canopy and fucoids	
[Laminaria hyperborea] on tide-swept, infralittoral rock	A3.212	5		
[Laminaria hyperborea] forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock	A3.2121	6	Kelp Forest	
[Laminaria hyperborea] on tide-swept infralittoral mixed substrata	A3.213	5		
[Laminaria hyperborea] forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata	A3.2131	6	Kelp Forest	
[Laminaria hyperborea] and foliose red seaweeds on moderately exposed infralittoral rock	A3.214	5		
[Laminaria hyperborea] forest and foliose red seaweeds on moderately exposed upper infralittoral rock	A3.2141	6	Kelp Forest	
[Sabellaria spinulosa] with kelp and red seaweeds on sand-influenced infralittoral rock	A3.2145	6	Kelp forest	
[Laminaria hyperborea] on moderately exposed vertical rock	A3.216	5		
Kelp and seaweed communities in tide-swept sheltered conditions	A3.22	4	Kelp forest	
[Laminaria digitata], ascidians and bryozoans on tide-swept sublittoral fringe rock	A3.221	5	Kelp forest	
Mixed kelp with foliose red seaweeds, sponges and ascidians on sheltered tide-swept infralittoral rock	A3.222	5	Kelp forest	
Mixed kelp and red seaweeds on infralittoral boulders, cobbles and gravel in tidal rapids	A3.223	5	Kelp forest	
Association with [Cystoseira tamariscifolia] and [Saccorhiza polyschides]	A3.234	5		
Association with [Cystoseira brachycarpa]	A3.239	5		
Mediterranean and Pontic Association with [Cystoseira crinita]	A3.23A	5		
Association with [Cystoseira crinitophylla]	A3.23B	5		
Association with [Cystoseira sauvageauana]	A3.23C	5		
Association with [Cystoseira spinosa]	A3.23D	5		
Silted kelp on low energy infralittoral rock with full salinity	A3.31	4	Kelp forest or kelp park	
Mixed [Laminaria hyperborea] and [Laminaria ochroleuca] forest on moderately exposed or sheltered infralittoral rock	A3.311	5	Kelp Forest	
Mixed [Laminaria hyperborea] and [Laminaria saccharina] on sheltered infralittoral rock	A3.312	5	Kelp forest or kelp park	
Mixed [Laminaria hyperborea] and [Laminaria saccharina] forest on sheltered upper infralittoral rock	A3.3121	6	Kelp Forest	
[Laminaria saccharina] on very sheltered infralittoral rock	A3.313	5	Kelp forest or kelp park	
[Laminaria saccharina] and [Laminaria digitata] on sheltered sublittoral fringe rock	A3.3131	6	Kelp canopy	
[Laminaria saccharina] forest on very sheltered upper infralittoral rock	A3.3132	6	Kelp Forest	
Silted cape-form [Laminaria hyperborea] on very sheltered infralittoral rock	A3.314	5	Kelp Forest	
Kelp in variable salinity on low energy infralittoral rock	A3.32	4		
[Laminaria saccharina] and [Psammechinus miliaris] on variable salinity grazed infralittoral rock	A3.322	5	Kelp Forest	
[Laminaria saccharina] with [Phyllophora] spp. and filamentous green seaweeds on variable or reduced salinity infralittoral rock	A3.323	5	Kelp Forest	
Association with [Cystoseira compressa]	A3.333	5		
Association with [Cystoseira zosteroides]	A4.261	5		
Association with [Cystoseira usneoides]	A4.262	5		
Association with [Cystoseira dubia]	A4.263	5		
Association with [Cystoseira corniculata]	A4.264	5		
Kelp and seaweed communities on sublittoral sediment	A5.52	4		
[Laminaria saccharina] and [Chorda filum] on sheltered upper infralittoral muddy sediment	A5.522	5		
[Laminaria saccharina] with [Psammechinus miliaris] and/or [Modiolus modiolus] on variable salinity infralittoral sediment	A5.523	5	Kelp Forest	
[Laminaria saccharina], [Gracilaria gracilis] and brown seaweeds on full salinity infralittoral sediment	A5.524	5		
Association with [Cystoseira barbata]	A5.52E	5		
N/A	N/A	N/A	Kelp Forest	Large Laminaria hyperborea kelp forests
N/A	N/A	N/A		Infralittoral rock with fucoids

Table 3: List of habitats in Macroalgal Canopy Cover EOV.

Table 4 displays a list of habitat types from the EUNIS habitat classification system that the ESBH partners determined relate to the live coral EOV. These were used to extract the relevant polygons from the individual EUNIS habitats maps and EUSeaMap. Also included are columns indicating with which Annex I and OSPAR habitats these habitat types might correspond.

EUNIS Name	EUNIS Code	EUNIS Level	Generic name	Annex 1 Habitat	Subtype	OSPAR
Circalittoral coral reef	A5.63	4	Coral reef	Reefs	Biogenic	
Circalittoral Lophelia pertusa reefs	A5.631	5	Cold-water coral	Reefs	Biogenic	Lophelia pertusa reefs
Communities of deep-sea corals	A6.61	4	Deep-sea coral	Reefs	Biogenic	
Deep-sea Lophelia pertusa reefs	A6.611	5	Cold-water coral	Reefs	Biogenic	Lophelia pertusa reefs
Carbonate mounds	A6.75	4	Coral carbonate mounds	Reefs	Biogenic	Carbonate mounds
N/A	N/A	N/A	Coral Gardens			Coral Gardens

Table 4: List of habitats in Live Coral EOV.

Appendix 2: OSPAR List of Threatened and/or Declining Habitats

Habitat type	EOV	EOV layer
Carbonate mounds	Yes	Live coral
Coral gardens	Yes	Live coral
Cymodocea meadows	Yes	Seagrass cover
Deep-Sea Sponge Aggregations		
Intertidal *Mytilus edulis* Beds on Mixed and Sandy Sediments		
Intertidal mudflats		
Littoral chalk communities		
Lophelia pertusa reefs	Yes	Live coral
Maerl beds		
Modiolus modiolus beds		
Oceanic ridges with hydrothermal vents		
Ostrea edulis beds		
Sabellaria spinulosa reefs		
Seamounts		
Sea-pen & burrowing megafauna communities		
Zostera beds	Yes	Seagrass cover

Table 5: Habitats selected from the OSPAR List for inclusion in the EOV layers.

Appendix 3: Marine habitats listed in Annex I of the EU Habitats Directive.

Habitat type	Code	EOV	EOV layer
Sandbanks	1110		
Posidonia Beds	1120	Yes	Seagrass cover
Estuaries	1130		
Mudflats and sandflats not covered by sea water at low tide	1140		
Coastal lagoons	1150		
Large shallow inlets and bays	1160		
Reefs	1170		
Submarine structures made by leaking gases	1180		
Submerged or partially submerged caves	8330		

Table 6: Habitats selected from the Annex I List for inclusion in the EOV layers.