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EMODnet Seabed Habitats

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EMODnet Phase IV

A combined, harmonized data product showing the best evidence for extent and distribution of coralligenous and other calcareous bioconcretions in the Mediterranean

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Document info

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A combined, harmonized data product showing the best evidence for extent and distribution of coralligenous and other calcareous bioconcretions in the Mediterranean

1 Introduction

1.1 EMODnet Seabed Habitats as a resource of seabed habitat maps and data in Europe

EMODnet Seabed Habitats hosts the largest European collection of habitat maps from individual surveys and survey-based sample points. As of September 2021 there were nearly 1000 habitat maps from surveys and nearly 500,000 sample points, freely available to view via the EMODnet Seabed Habitats online interactive map or by web map service (WMS). Of these, around 900 habitat maps and 355,000 sample points are also freely available to download from the EMODnet Seabed Habitats download page or by web feature service (WFS) (https://www.emodnet-seabedhabitats.eu/access-data/).

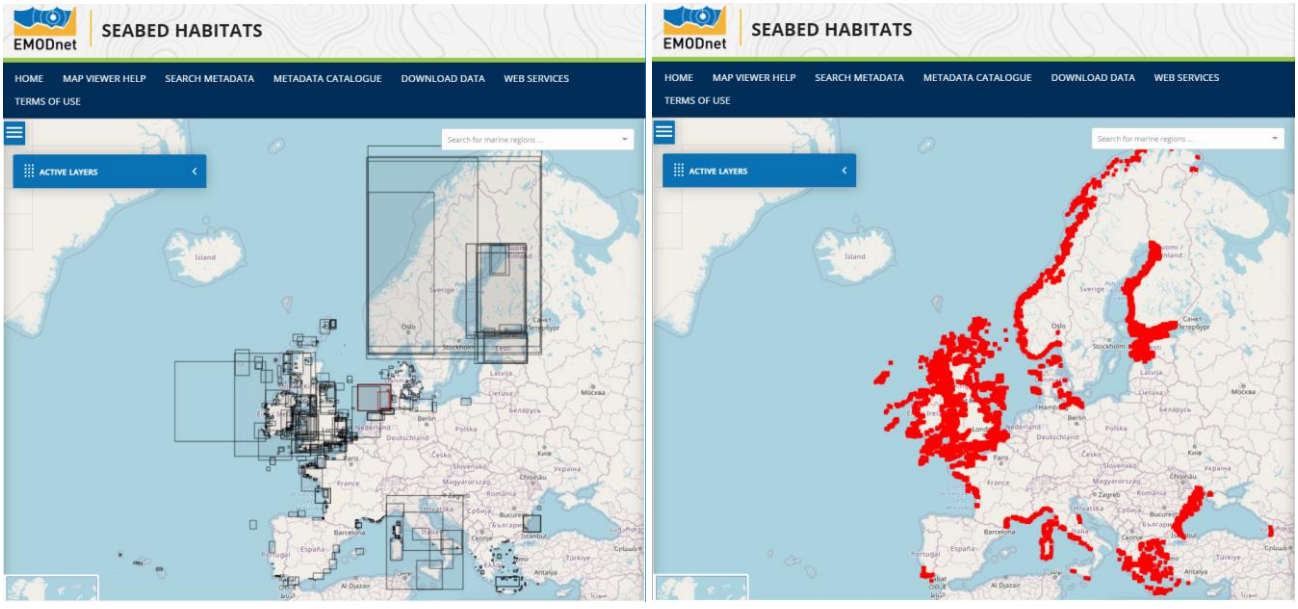

Figure 1: Habitat maps and survey sample points on the EMODnet Seabed Habitats interactive map.

This compilation of polygons and points, with standardised attributes, presents a great opportunity to create new products which aim to answer specific questions, such as 'what is the current known extent of habitat X in region Y?'.

1.2 Stakeholder requirements

In order to understand stakeholders' requirements for products such as these, the 2019-2021 EMODnet Seabed Habitats consortium conducted a review (Lillis et al, 2020), which concluded that the following data

product would be appreciated by RAC/SPA and others: Combined, harmonized data product showing the best evidence for **extent and distribution of coralligenous and other calcareous bioconcretions in the Mediterranean.**

RAC/SPA is responsible for the implementation of the Regional Action Plans for the conservation of marine key habitats, which includes **Coralligenous and other calcareous bio-concretions**, as described in the Action Plan for the protection of the coralligenous and other calcareous bio-concretions in the Mediterranean (UNEP/MAP, 2017). An important action towards achieving these actions plans is a summary of knowledge on these important marine key habitats and their distribution around the Mediterranean.

EMODnet Seabed Habitats is well-placed to produce this product as:

- We have a remit to "Construct products from one or more data sources that provide users with information about the distribution of parameters in time and space create data products" (Task 2 of the tender specification)
- We are custodians of the most comprehensive library of seabed habitat maps in Europe
- We are custodians of the most comprehensive collection of point observations of seabed habitats in Europe
- We have partners with close ties to RAC/SPA, who can ensure that the product is fit-for-purpose.

1.3 Product specification

The Lillis et al. (2020) review produced a specification for such a product, as follows:

- Data format: vector polygon and points
- Scale/resolution: best possible
- Extent: Mediterranean Sea
- Attribute table schema: Not specified
- Classification system: "Coralligenous and other calcareous bio-concretions" as defined in UNEP/MAP (2017)
- Deadline for completion: May 2021, ahead of the National Focal Point meeting
- Data to include:
    - EUNIS habitat maps from surveys in the Mediterranean, filtered to extract polygons on the habitat of interest
    - Habitats Directive Annex I and Barcelona convention habitat maps from surveys in the Mediterranean, filtered to extract polygons on the habitat of interest
    - Habitat point observations, clipped to the Mediterranean, and filtered to extract data on the habitat of interest
- Method for dealing with overlapping polygons: Not specified

The data product would be accompanied by a report (this report), the purpose of which is to describe the data sources and methods used to construct the product. It should contain enough information for a user to understand what data was used, and for somebody to reproduce the process in future. It should be published on the EMODnet Seabed Habitats website.

1.4 Defining coralligenous and other calcareous bio-concretions

In order to extract the relevant data from existing sources, a list of relevant habitat types in existing classification systems was needed. The RAC/SPA Action Plan (UNEP/MAP, 2017) does not include this

information and only alludes to the requirement to form a 'Definition of what assemblages are to be included in this Action plan' as the first step on the timeline (page 23).

The work to define these assemblages is being carried out by the Ecosystem Approach Correspondence Groups on Monitoring (CORMON), Biodiversity and Fisheries. A working document[1] presented at the June 2021 meeting of this group stressed the need to consult the EUNIS habitat classification and the recently updated Barcelona Convention habitat classification for the Mediterranean (SPA/RAC-UN Environment/MAP, 2019a, b; Montefalcone et al, 2021), which identify the specific coralligenous and rhodolith habitats that would, together, form this definition. The working document proposed a list of Barcelona Convention habitats that should be used to form this definition, but it is not yet final.

1.5 Aims and objectives

The aim, then, was to produce a combined, harmonized data product showing the best evidence for extent and distribution of coralligenous and other calcareous bioconcretions in the Mediterranean. The production of this compilation can be divided into several objectives:

1. Identify and access the most complete sources of polygon and point data on seabed habitat types in the Mediterranean.
2. Define this habitat in terms of the most common classification systems used to classify habitat maps and sample points in the Mediterranean.
3. Extract polygons and points from these sources which match the definition of coralligenous and other calcareous bio-concretions.
4. Compile all data into a single data product, making sure the provenance of every polygon and point is clear in the attribute table.

2 Method

2.1 Identify and access the most complete sources of data

The EMODnet Seabed Habitats survey sample points database contains around 500,000 seabed habitat observations in Europe, over 45,000 of them are in the Mediterranean. Its format is based upon that of the Darwin Core Archive event-core data structure, which is flexible data structure allowing habitat types in multiple classification systems. This was the place we looked for point data.

The EMODnet Seabed Habitats library of habitat maps from surveys contains around 1,000 habitat maps around Europe, over 200 of them are in the Mediterranean. This was the place we looked for polygon data.

[1] Working document "Monitoring Guidelines/Protocols for IMAP common indicators 1 and 2 on Benthic Habitats - Update of Monitoring Protocols on Benthic Habitats" presented to Meeting of the Ecosystem Approach Correspondence Groups on Monitoring (CORMON), Biodiversity and Fisheries Videoconference, 10-11 June 2021

2.2 Define the habitat in terms of common classification systems

The CORMON working document proposed a draft list of Barcelona Convention habitats that could be included in the definition of Coralligenous and other calcareous bioconcretations. The list is a draft and not final:

INFRALITTORAL
- MB1.5 Infralittoral rock
  - MB1.55 Coralligenous (enclave of circalittoral)

CIRCALITTORAL
- MC1.5 Circalittoral rock
  - MC1.51 Coralligenous cliffs
    - MC1.51a Algal-dominated coralligenous
      - MC1.511a Association with encrusting Corallinales
      - MC1.512a Association with Fucales or Laminariales
      - MC1.513a Association with sciaphilic algae, (except Fucales, Laminariales, encrusting Corallinales, and Caulerpales)
      - MC1.514a Association with non-indigenous Mediterranean *Caulerpa* spp.
    - MC1.51b Invertebrate-dominated coralligenous
      - MC1.511b Facies with small sponges
      - MC1.512b Facies with large and erect sponges
      - MC1.513b Facies with Hydrozoa
      - MC1.514b Facies with Alcyonacea
      - MC1.515b Facies with Ceriantharia
      - MC1.516b Facies with Zoantharia
      - MC1.517b Facies with Scleractinia
      - MC1.518b Facies with Vermetidae and/or Serpulidae
      - MC1.519b Facies with Bryozoa
      - MC1.51Ab Facies with Ascidiacea
    - MC1.51c Invertebrate-dominated coralligenous covered by sediment
      - See MC1.51b for examples of facies
  - MC1.52 Continental shelf rock
    - MC1.52a Coralligenous outcrops
      - MC1.521a Facies with small sponges
      - MC1.522a Facies with Hydrozoa
      - MC1.523a Facies with Alcyonacea
      - MC1.524a Facies with Antipatharia
      - MC1.525a Facies with Scleractinia
      - MC1.526a Facies with Bryozoa
      - MC1.527a Facies with Polychaeta
      - MC1.528a Facies with Bivalvia
      - MC1.529a Facies with Brachiopoda
    - MC1.52b Coralligenous outcrops covered by sediment
      - See MC1.52a for examples of facies
    - MC1.52c Deep banks
      - MC1.521c Facies with Antipatharia
      - MC1.522c Facies with Alcyonacea
      - MC1.523c Facies with Scleractinia
- MC2.5 Circalittoral biogenic habitat
  - MC2.51 Coralligenous platforms

MC2.511 Association with encrusting Corallinales
MC2.512 Association with Fucales
MC2.513 Association with non-indigenous Mediterranean *Caulerpa* spp.
MC2.514 Facies with small sponges
MC2.515 Facies with large and erect sponges
MC2.516 Facies with Hydrozoa
MC2.517 Facies with Alcyonacea
MC2.518 Facies with Zoantharia
MC2.519 Facies with Scleractinia
MC2.51A Facies with Vermetidae and/or Serpulidae
MC2.51B Facies with Bryozoa
MC2.51C Facies with Ascidiacea

MC3.51 Coastal detritic bottoms
MC3.511 Association with Laminariales
MC3.512 Facies with large and erect sponges
MC3.513 Facies with Hydrozoa
MC3.514 Facies with Alcyonacea
MC3.515 Facies with Pennatulacea
MC3.516 Facies with Polychaeta (Salmacina-Filograna complex included)
MC3.517 Facies with Bivalvia
MC3.518 Facies with Bryozoa
MC3.519 Facies with Crinoidea
MC3.51A Facies with Ophiuroidea
MC3.51B Facies with Echinoidea
MC3.51C Facies with Ascidiacea

MC3.52 Coastal detritic bottoms with rhodoliths
MC3.521 Association with maërl
MC3.522 Association with *Peyssonnelia* spp.
MC3.523 Association with Laminariales
MC3.524 Facies with large and erect sponges
MC3.525 Facies with Hydrozoa
MC3.526 Facies with Alcyonacea
MC3.527 Facies with Pennatulacea
MC3.528 Facies with Zoantharia
MC3.529 Facies with Ascidiacea

However, most of the habitat maps in the EMODnet library are classified in the EUNIS classification. Therefore, to enable the extraction of relevant habitats from EMODnet we also identified the equivalent habitat types in both 2007-11 and 2019 version of the EUNIS (see Section 3.2).

2.3 Extract the relevant data from the identified sources

The next step, therefore, was to access the two data sources described above, and to extract only the habitat classes that represented Coralligenous and other calcareous bioconcretions.

2.4 Compile into a single data product

The last step was to merge all data together into a single product with a consistent attribute table. Within the attribute table is a unique identifier for the original source of the polygon (ORIG_ID). Using this, a user can look up the original dataset using the EMODnet Seabed Habitats layer search.

3 Results

3.1 Identify and access the most complete sources of data

The EMODnet Seabed Habitats survey sample points database and the EMODnet Seabed Habitats library of habitat maps from surveys were accessed on 2021-09-17. These may be accessed by Web Feature Service; however, in this case we directly accessed the PostgreSQL database, which underpins the EMODnet Seabed Habitats service.

3.2 Define the habitat in terms of common classification systems

So that we could extract the relevant points and points from EMODnet Seabed Habitats, we identified the equivalent EUNIS v2007-11 and EUNIS v2019 habitats and biocoenoses to the list of Barcelona Convention habitats and biocoenoses listed in Section 2.2. These crosswalks are listed in full in the Appendix.

The result was the following list of EUNIS v2007-11 classes:

- A3.13* Mediterranean and Pontic communities of infralittoral algae very exposed to wave action
- A4.26* Mediterranean coralligenous communities moderately exposed to hydrodynamic action
- A4.32* Mediterranean coralligenous communities sheltered from hydrodynamic action
- A5.46* Mediterranean animal communities of coastal detritic bottoms
- A5.51* Maerl beds

And the following list of EUNIS v2019 classes:

- MB151A Association with *Alsidium helmenthochorton*
- MC151* Coralligenous biocenosis
- MC251 Coralligenous platforms
- MC351* Biocenosis of Mediterranean coastal detritic bottoms (without rhodolithes)
- MC352* Assemblages of Mediterranean coastal detritic bottoms biocenosis with rhodolithes

Asterisks (*) indicate that all child classes are also included in the definition.

3.3 Extract the relevant data from the identified sources

3.3.1 EMODnet Seabed Habitats survey sample points database

In this instance, we found no data matching the Barcelona Convention habitat codes listed in Section 2.2. However, points were extracted using the EUNIS codes listed in Section 3.2. A summary of the points matching each relevant habitat class is provided in Table 2.

Table 1: number of points of each habitat class extracted from the Mediterranean habitat maps from survey.

EUNIS 2007 Habitat code	Points returned	Number of Points
A3.13*	N	NA
A4.26*	Y	346
A4.32*	N	NA
A5.46*	Y	1044
A5.51*	Y	429

3.3.2 EMODnet Seabed Habitats library of habitat maps from surveys

A summary of the number of polygons matching each relevant habitat class is provided in Table 2.

Table 2: number of polygons of each habitat class extracted from the Mediterranean habitat maps from survey.

EUNIS 2007 Habitat code	Polygons returned	Area (km^2)
A3.13*	Y	75.8
A4.26*	Y	801.8
A4.32*	N	NA
A5.46*	Y	5,305.2
A5.51*	Y	663.8

3.4 Compile into a single data product

A single data product was created by combining the extracted points (***Figure 2***) and polygons (Figure 3). This product is now available on the EMODnet Seabed Habitats portal to view and download. Metadata can be found on the EMODnet Seabed Habitats metadata catalogue. It is also available by web map service and web feature service.

Figure 2 - Point data of Coralligenous platforms and other Biogenic concretions in the Mediterranean

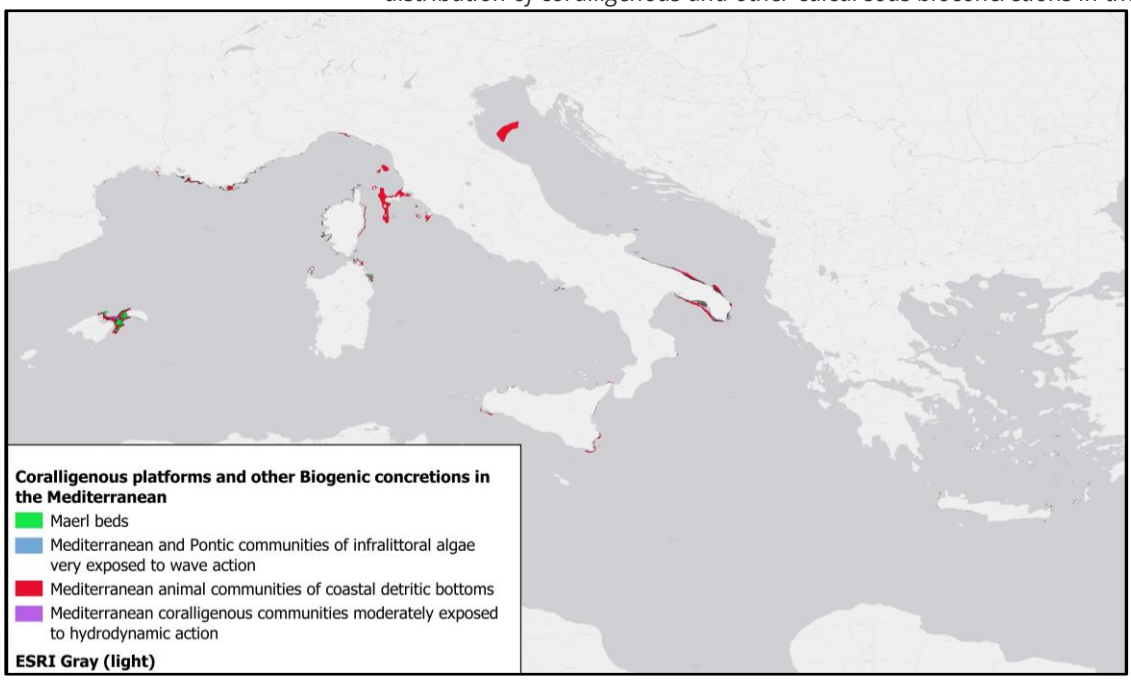

Figure 3 - Coralligenous platforms and other Biogenic concretions in the Mediterranean

4 Discussion

The distribution of both point and polygon data is heavily concentrated within a small number of countries, which indicates which countries have been more involved in EMODnet Seabed Habitats, rather than the areas where the habitat is truly concentrated. It is important to identify further sources of data on this important habitat, and ingest it into the EMODnet system so that it is available for all.

5 Conclusion

The EMODnet Seabed Habitats consortium has produced the first Mediterranean-wide map of coralligenous and other calcareous bioconcretions. This was made possible by the efforts of the consortium to collate, standardise and publish over 200 individual habitat maps from surveys in the Mediterranean via the EMODnet Seabed Habitats portal.

The product should be viewed as a first draft because there are many more areas where we know that this habitat occurs in the Mediterranean, but which are not yet represented due to a lack of data. As the consortium gathers more habitat maps and point observations in the coming phase of the project, this product will continue to improve.

6 References

Lillis, H., Manca, E., Vasquez, M. Agnesi, S., Annunziatellis, A., Laamanen, L., Todorova, V. And Tunesi, L. (2020). A review of stakeholder needs for combined, harmonized data products for seabed habitats in Europe. Available online at https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/seabedhabitats_20200920_D3_07_reviewofstakeholderneeds_compositeproducts.pdf

Montefalcone M, Tunesi L, Ouerghi A. A review of the classification systems for marine benthic habitats and the new updated Barcelona Convention classification for the Mediterranean. Mar Environ Res. 2021 Jul;169:105387. doi: 10.1016/j.marenvres.2021.105387. Epub 2021 Jun 8. PMID: 34153621.

SPA/RAC–UN Environment/MAP, 2019: Updated Classification of Benthic Marine Habitat Types for the Mediterranean Region. Available online at: https://www.rac-spa.org/sites/default/files/doc_fsd/habitats_list_en.pdf

7 Appendix: Coralligenous and other calcareous bioconcretions crosswalks

Listed below is the draft list of Barcelona Convention habitats from Section 2.2 with equivalent EUNIS codes as indicated in blue text (EUNIS v2019) and red text (EUNIS v2007-11) below. Grey text indicates habitats and biocoenoses for which it is not possible to provide an equivalent EUNIS code. It is important to note that this is only the interpretation of the EMODnet Seabed Habitats consortium and therefore the end product should be treated as unofficial and a work in progress.

INFRALITTORAL
- MB1.5 (MB15 EUNIS 2019) (A3 EUNIS 2007-11) Infralittoral rock
  - MB1.55 (MB151a EUNIS2019) (A3.13 EUNIS 2007-11) Coralligenous (enclave of circalittoral)

CIRCALITTORAL
- MC1.5 (MC15 EUNIS 2019) (A4 EUNIS 2007-11) Circalittoral rock
  - MC1.51 (MC151 EUNIS 2019) (A4.26 or A4.32 EUNIS 2007-11) Coralligenous cliffs
    - MC1.51a Algal-dominated coralligenous
      - MC1.511a Association with encrusting Corallinales
      - MC1.512a Association with Fucales or Laminariales
      - MC1.513a Association with sciaphilic algae, (except Fucales, Laminariales, encrusting Corallinales, and Caulerpales)
      - MC1.514a Association with non-indigenous Mediterranean Caulerpa spp.
    - MC1.51b Invertebrate-dominated coralligenous
      - MC1.511b Facies with small sponges
      - MC1.512b Facies with large and erect sponges
      - MC1.513b Facies with Hydrozoa
      - MC1.514b Facies with Alcyonacea
      - MC1.515b Facies with Ceriantharia
      - MC1.516b Facies with Zoantharia
      - MC1.517b Facies with Scleractinia
      - MC1.518b Facies with Vermetidae and/or Serpulidae
      - MC1.519b Facies with Bryozoa
      - MC1.51Ab Facies with Ascidiacea
    - MC1.51c Invertebrate-dominated coralligenous covered by sediment
      - See MC1.51b for examples of facies
  - MC1.52 Continental shelf rock
    - MC1.52a Coralligenous outcrops
      - MC1.521a Facies with small sponges
      - MC1.522a Facies with Hydrozoa
      - MC1.523a Facies with Alcyonacea
      - MC1.524a Facies with Antipatharia
      - MC1.525a Facies with Scleractinia

MC1.526a Facies with Bryozoa
MC1.527a Facies with Polychaeta
MC1.528a Facies with Bivalvia
MC1.529a Facies with Brachiopoda
MC1.52b Coralligenous outcrops covered by sediment
See MC1.52a for examples of facies
MC1.52c Deep banks
MC1.521c Facies with Antipatharia
MC1.522c Facies with Alcyonacea
MC1.523c Facies with Scleractinia
MC2.5 Circalittoral biogenic habitat
MC2.51 (MC251 EUNIS 2019) (A4.26D EUNIS 2007-11) Coralligenous platforms
MC2.511 Association with encrusting Corallinales
MC2.512 Association with Fucales
MC2.513 Association with non-indigenous Mediterranean Caulerpa spp.
MC2.514 Facies with small sponges
MC2.515 Facies with large and erect sponges
MC2.516 Facies with Hydrozoa
MC2.517 Facies with Alcyonacea
MC2.518 Facies with Zoantharia
MC2.519 Facies with Scleractinia
MC2.51A Facies with Vermetidae and/or Serpulidae
MC2.51B Facies with Bryozoa
MC2.51C Facies with Ascidiacea
MC3.51 (MC351 EUNIS 2019) (A5.46 EUNIS 2007-11) Coastal detritic bottoms
MC3.511 Association with Laminariales
MC3.512 Facies with large and erect sponges
MC3.513 Facies with Hydrozoa
MC3.514 Facies with Alcyonacea
MC3.515 Facies with Pennatulacea
MC3.516 Facies with Polychaeta (Salmacina-Filograna complex included)
MC3.517 Facies with Bivalvia
MC3.518 Facies with Bryozoa
MC3.519 Facies with Crinoidea
MC3.51A Facies with Ophiuroidea
MC3.51B Facies with Echinoidea
MC3.51C Facies with Ascidiacea
MC3.52 (MC352 EUNIS 2019) (A5.51 or A5.516 EUNIS 2007-11) Coastal detritic bottoms with rhodoliths
MC3.521 Association with maërl
MC3.522 Association with Peyssonnelia spp.
MC3.523 Association with Laminariales
MC3.524 Facies with large and erect sponges
MC3.525 Facies with Hydrozoa