A comprehensive assessment of the intertidal biodiversity along the Portuguese coast in the early 2000s

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Abstract

Background

The unprecedented rates of current biodiversity loss have motivated a renewed interest in environmental and biodiversity monitoring. The need for sustained monitoring strategies has prompted not only the establishment of new long-term monitoring programmes, but also the rescue of data from historical or otherwise archived sources. Amongst the most valuable datasets are those containing information on intertidal systems, as they are particularly well suited for studying the biological effects of climate change. The Portuguese rocky coast is quite interesting for studying the effects of climate change on the distribution of species due to its geographical orientation, latitudinal patterns in temperature, species richness, species' distribution patterns and availability of historical information. This work aims at providing a comprehensive picture of the distribution and abundance of intertidal macro-invertebrates and macro-algae along the Portuguese rocky coast in the early 2000s.
New information

This study provides a description of the rocky shore intertidal biodiversity of the mainland Portuguese coast in the early 2000s. The spatial distribution and semi-quantitative abundance of a total of 238 taxa were assessed at 49 wave-exposed locations. These data provide a comprehensive baseline against which biodiversity changes can be effectively and objectively evaluated.

Keywords

intertidal, biodiversity, rocky shores, historical data, Portugal

Introduction

Biodiversity is now declining globally at rates unprecedented in human history (Ceballos et al. 2017, IPBES 2019). This process is being mainly driven by habitat degradation and loss and compounded by the recent climate change (IPCC 2014). Biodiversity loss has been severely affecting species distributions, community structure, ecosystem function, ecosystem services, food security and public health (Edwards and Richardson 2004, Hawkins et al. 2008, Wernberg et al. 2011, IPBES 2019). This so-called "biodiversity crisis" has motivated a renewed interest in effective environmental and biodiversity monitoring (Navarro et al. 2017, CBD 2010). Broad-scale, sustained observations, including historical data rescue, are now regarded as essential to understand past trends and to produce accurate forecasts which are needed to provide information for policy decisions (Hawkins et al. 2013).

Intertidal systems are well suited for studies focusing on the effects of climate variability and climate change on biodiversity, as they are amongst the most thermally complex environments on Earth (Pincebourde et al. 2008) and are strongly influenced by meteorological conditions (Bates et al. 2018, Zamir et al. 2018). They are inhabited by marine organisms that must withstand terrestrial conditions during low tide. Stressful events may have dire consequences for these species (Jurgens et al. 2015), which are, therefore, regarded as sensitive indicators of climate variability and change (Helmuth et al. 2006).

Stemming from its peculiar geographic, climatic and oceanographic setting, the biogeography of the Portuguese rocky coast is quite interesting and offers exceptional conditions for studying the effects of climate change on the distribution of species. First, the coast is mostly linear with a north-to-south orientation and with a latitudinal gradient in temperature during the winter, from relatively cold water in the north to relatively warm water in the south. In the summer, that latitudinal gradient is often intensified by the effects of coastal upwelling, which brings deep cold water to the surface near the coast, especially in the northern portion of the country (Lemos and Pires 2004, Lima et al. 2007, Seabra et al. 2015). These clinal variations in temperature result in a region of contact between...
meridional (warm-water) and septentrional (cold-water) fauna and flora, where the
distribution limits of several species are reached (Fischer-Piétte 1959, Fischer-Piétte and
Gaillard 1959, Fischer-Piétte 1963, Ardré 1970, Santos 2000, Araújo et al. 2009, Lima et
al. 2007). Second and also due to the cold effects of upwelling, the northern Portuguese
coast is, on the one hand, a biogeographic enclave for cold-water species, such as
Himanthalia elongata, Saccharina latissima or Pelvetia canaliculata, which can only be
found again thousands of kilometres further north, in Brittany (France). On the other hand,
many warm-water species, such as Codium adhaerens, Padina pavonica or Valonia
utricularis, occur both towards either the north or the south, but not in this region; in other
words, their distribution features a prominent gap in northern Portugal (van den Hoek and
and Donze 1967, Lima et al. 2007). Third, shifts in species distributions have been
described since the 1950s, not only for this particular stretch of coastline, but also for the
neighbouring regions in the Iberian Peninsula (Fischer-Piétte and Forest 1951, Fischer-
Piétte 1957, Fischer-Piétte and Prenant 1957Fischer-Piétte 1960, Ardré 1971, Santos
2000, Lima et al. 2006, Lima et al. 2007, Berke et al. 2010, Wethey et al. 2011, Rubal et al.
2013). Fourth, recent evidence suggests that, due to the effects of coastal upwelling, the
Portuguese coast has been warming at a slower pace than its neighbouring regions, but
that effect may become compromised in the near future (Varela et al. 2018, Seabra et al.
2019). Thus, the long-term monitoring of this region is essential to understand if changes in
the distribution of its inhabiting species are either the result of climate change or local
impacts (Hawkins 2012).

This work aims at providing a comprehensive picture of the distribution and abundance of
intertidal macro-invertebrates and macro-algae along the Portuguese rocky coast in the
early 2000s. These data, previously unpublished, may be used for environmental
management (e.g. as an aid for the decision processes leading to the establishment of
coastal protection areas), in conservation contexts (e.g. for environmental impact
assessments studies), in ecological studies (e.g. to better understand the complex
relationships between environment and biodiversity) or in climate change studies (since
alterations in species distributions may be used as warning signs of the effects of climate
change).

**Sampling methods**

**Study extent:** Data were collected during the autumns of 2001 and 2002 (Table 1). Sampling was carried out at 49 wave-exposed rocky shore locations along the Portuguese coast, covering the three major rocky stretches of shoreline (Fig. 1, Fig. 2, Table 1). In the northern region, we sampled the locations of Moledo do Minho, Vila Praia de Âncora, Afife, Montedor, Forte da Vigia, Praia Norte, Amorosa, Mindelo, Vila Chã, Labruje, Angeiras, Cabo do Mundo, Homem do Leme, Valadares, Miramar and Aguda. In the central region, we sampled Nazaré, São Martinho do Porto, Baleal, Papoa, São Bernardino, Santa Cruz, São Lourenço, Ericeira, São Julião, Magoito, Adraga, Abano, Cabo Raso, Avencas, Cabo Espichel and Portinho da Arrábida. In the southern region, we sampled São Torpes, Oliveirinha, Queimado, Vila Nova de Milfontes, Zambujeira do Mar, Vale dos Homens,
Monte Clérigo, Arrifana, Castelejo, Martinhal, Ingrina, Praia da Luz, Porto de Mós, Dona Ana, Castelo and Olhos de Água. The location of Buarcos, roughly at the mid-point between the northern and the central stretches of rocky coast, was also included in this study.

Table 1.
Names of the locations visited in this study, sampling date, coordinates and low tide height on the day of sampling. Map reference numbers are cross-referenced with Fig. 1.

| Map reference | Location                          | Sampling date | Latitude | Longitude | Astronomical low tide height (m below mean sea water level) |
|---------------|-----------------------------------|---------------|----------|-----------|-----------------------------------------------------------|
| 1             | Moledo do Minho                   | 2001-09-19    | 41.841824| -8.873979 | -1.70                                                    |
| 2             | Vila Praia de Âncora              | 2001-09-20    | 41.816049| -8.872269 | -1.60                                                    |
| 3             | Afife                             | 2002-11-07    | 41.784753| -8.873573 | -1.58                                                    |
| 4             | Montedor                          | 2001-09-20    | 41.736517| -8.876095 | -1.60                                                    |
| 5             | Forte da Vigia                    | 2001-09-19    | 41.699426| -8.857093 | -1.71                                                    |
| 6             | Praia Norte                       | 2002-11-06    | 41.698016| -8.859335 | -1.69                                                    |
| 7             | Amorosa                           | 2002-06-25    | 41.642586| -8.825918 | -1.24                                                    |
| 8             | Mindelo                           | 2001-09-17    | 41.309900| -8.742765 | -1.57                                                    |
| 9             | Vila Chã                           | 2001-09-17    | 41.295714| -8.737265 | -1.57                                                    |
| 10            | Labruje                           | 2002-11-05    | 41.274929| -8.729791 | -1.69                                                    |
| 11            | Angeiras                          | 2002-11-05    | 41.264639| -8.729113 | -1.69                                                    |
| 12            | Cabo do Mundo                     | 2001-09-18    | 41.223489| -8.716956 | -1.68                                                    |
| 13            | Homem do Leme                     | 2001-09-18    | 41.159700| -8.686061 | -1.68                                                    |
| 14            | Valadares                         | 2001-09-16    | 41.088863| -8.658663 | -1.40                                                    |
| 15            | Miramar                           | 2002-11-04    | 41.068286| -8.658869 | -1.58                                                    |
| 16            | Aguda                             | 2001-09-16    | 41.043782| -8.652202 | -1.40                                                    |
| 17            | Buarcos                           | 2002-01-02    | 40.177513| -8.903539 | -1.44                                                    |
| 18            | Nazaré                            | 2001-10-19    | 39.603837| -9.080406 | -1.48                                                    |
| 19            | São Martinho do Porto             | 2001-10-19    | 39.511391| -9.142621 | -1.48                                                    |
| 20            | Baleal                            | 2001-10-18    | 39.375856| -9.339807 | -1.59                                                    |
| 21            | Papoa                             | 2001-10-18    | 39.373440| -9.377283 | -1.58                                                    |
| 22            | São Bernardino                    | 2002-12-03    | 39.309556| -9.347106 | -1.42                                                    |
| Map reference | Location               | Sampling date | Latitude   | Longitude  | Astronomical low tide height (m below mean sea water level) |
|---------------|------------------------|---------------|------------|------------|-------------------------------------------------------------|
| 23            | Santa Cruz             | 2002-12-04    | 39.132919  | -9.386206  | -1.51                                                       |
| 24            | São Lourenço           | 2002-12-04    | 39.014081  | -9.423544  | -1.50                                                       |
| 25            | Ericeira               | 2001-10-17    | 38.961181  | -9.420290  | -1.59                                                       |
| 26            | São Julião             | 2002-12-04    | 38.933212  | -9.420080  | -1.49                                                       |
| 27            | Magoito                | 2001-10-17    | 38.865024  | -9.450610  | -1.58                                                       |
| 28            | Adraga                 | 2002-12-06    | 38.805798  | -9.485069  | -1.40                                                       |
| 29            | Abano                  | 2002-12-05    | 38.741236  | -9.473426  | -1.48                                                       |
| 30            | Cabo raso              | 2001-10-16    | 38.709571  | -9.486673  | -1.47                                                       |
| 31            | Avencas                | 2001-10-16    | 38.688432  | -9.360986  | -1.49                                                       |
| 32            | Cabo Espichel          | 2001-12-06    | 38.423685  | -9.215187  | -0.91                                                       |
| 33            | Portinho da Arrábida   | 2002-12-06    | 38.478248  | -8.981859  | -1.39                                                       |
| 34            | São Torpes             | 2002-10-08    | 37.912645  | -8.802884  | -1.63                                                       |
| 35            | Oliveirinha            | 2001-11-17    | 37.891804  | -8.797249  | -1.35                                                       |
| 36            | Queimado               | 2002-10-08    | 37.820059  | -8.793436  | -1.63                                                       |
| 37            | Vila Nova de Milfontes | 2001-11-17    | 37.720834  | -8.792484  | -1.35                                                       |
| 38            | Zambujeira do Mar      | 2001-11-16    | 37.524209  | -8.788036  | -1.45                                                       |
| 39            | Vale dos Homens        | 2002-10-07    | 37.382567  | -8.826646  | -1.64                                                       |
| 40            | Monte Clérigo          | 2001-11-16    | 37.340579  | -8.854811  | -1.44                                                       |
| 41            | Arrifana               | 2002-10-07    | 37.289191  | -8.864691  | -1.64                                                       |
| 42            | Castelejo              | 2001-11-15    | 37.102461  | -8.945659  | -1.45                                                       |
| 43            | Martinhal              | 2002-10-06    | 37.021090  | -8.921792  | -1.53                                                       |
| 44            | Ingrina                | 2001-11-15    | 37.045155  | -8.877728  | -1.45                                                       |
| 45            | Praia da Luz           | 2001-11-14    | 37.084187  | -8.729989  | -1.38                                                       |
| 46            | Porto de Mós           | 2002-10-06    | 37.083850  | -8.681465  | -1.53                                                       |
| 47            | Dona Ana               | 2001-11-14    | 37.091115  | -8.668970  | -1.38                                                       |
| 48            | Castelo                | 2002-10-05    | 37.072434  | -8.298182  | -1.38                                                       |
| 49            | Olhos de Água          | 2002-10-05    | 37.089327  | -8.188497  | -1.38                                                       |
Sampling description: Each of the 49 studied locations were extensively surveyed from the splash fringe level in the high intertidal (area of occurrence of littorinids and lichens) to the low fringe level at the low intertidal (area of occurrence of red, green and brown algae, see Fig. 2). At each location, a two-people team worked from one hour before the low tide peak to one hour after low tide (Fig. 3). The average astronomical low tide height during
surveys was -1.51 ± 0.14 m below mean sea water level (Table 1). The occurrence and abundance of all easily-identified taxa (animals and algae, sensu latu) were recorded in situ. A semi-quantitative estimation of abundance was assigned to each taxa identified during the survey. We used a modified version of the scale established by Crisp and Southward (1958) — SACFOR, where abundances were encoded from 6 to 0 (where 6 means Superabundant; 5, Abundant; 4, Common; 3, Frequent; 2, Occasional; 1, Rare; and 0, not found). Small animals or algae (turfs) or other taxa of dubious classification were collected and their identification finalised in the lab under a stereomicroscope (Fig. 3). Additionally, whole substrate samples were collected by scraping the substrate with a paint scraper spatula at three tidal levels: (1) amongst barnacles, (2) amongst mussels and honeycomb worm reefs (Sabellaria alveolata) and (3) amongst red, green and brown algae and preserved in a solution of 4% formaldehyde in seawater (Fig. 3). The scraped area was approximately 150-225 cm² per sample. The number of samples varied between four and six, accordingly to the spatial heterogeneity of each substrate, but totalling approximately 900 cm² per shore and substrate. Later, in the lab, formaldehyde was removed from samples by washing them with running water and smaller organisms were separated from larger mussels, honeycomb worm reefs or canopy algae using a 0.25 cm mesh sieve and identified to the lowest taxonomic level possible.

Quality control: In addition to AlgaeBase (Guiry and Guiry 2021), authoritative identification guides and keys for the Eastern Atlantic and Mediterranean were used. Specifically, Dixon and Irvine (1977), Hiscock (1979), Irvine (1983), Bárbara and Cremades
(1987), Christensen (1987), Fletcher (1987), Saldanha (1988), Burrows (1991), Cabioc'h et al. (1992), Maggs and Hømmersand (1993), Hiscock (1986), Irvine and Chamberlain (1994), Brodie and Irvine (2003) were used for algae and Naylor (1972), Lincoln (1979), Manuel (1981), Graham (1988), Hayward and Ryland (1991) were used for animals. All scientific names were standardised against the WoRMS - The World Register of Marine Species using the Taxon Match tool available at http://www.marinespecies.org/aphia.php?p=match (accessed on: 07-07-2021).

Step description: The steps that led to the final release of the dataset were as follows: (1) In-situ identification of species and attribution of a semi-quantitative abundance SACFOR score; (2) destructive sampling (substrate scraping) at three tidal levels and preservation of samples in formaldehyde; (3) cleaning of formaldehyde, sorting and identification of specimens in the lab; (4) conversion of paper-based records from the field and from the lab into an electronic data format (spreadsheets); (5) integration of the field and laboratory datasets into a standardised format; (6) retrieval of missing geographical information, georeferencing of coordinates through Google Earth and general quality control; (7) standardisation of taxonomy against the World Register of Marine Species; (8) export of data as a DarwinCore Archive and (9) generation of dataset-level metadata.

Geographic coverage

Description: Sampling was done along the three major rocky stretches of the entire coast of mainland Portugal, covering an extension of approximately 700 km from Moledo do Minho to Olhos de Água.

Coordinates: 37.021090 and 41.841824 Latitude; -9.486673 and -8.188497 Longitude.

Taxonomic coverage

Taxa included:

| Rank      | Scientific Name |
|-----------|-----------------|
| kingdom   | Plantae         |
| kingdom   | Animalia        |
| kingdom   | Chromista       |
| kingdom   | Bacteria        |
| kingdom   | Fungi           |

Temporal coverage

Data range: 2001-9-16 - 2002-12-06.
Usage licence

Usage licence: Open Data Commons Attribution License

IP rights notes: Data users are free to share, create and adapt the dataset as long as they adequately attribute (cite) this work.

Data resources

Data package title: Intertidal Biodiversity along the Portuguese Coast (2001-2002)

Resource link: http://ipt.gbif.pt/ipt/resource?r=ibpc

Alternative identifiers: https://doi.org/10.15468/mbg5p3

Number of data sets: 1

  Data set name: Intertidal Biodiversity along the Portuguese coast (2001-2002)
  Download URL: http://ipt.gbif.pt/ipt/resource?r=ibpc
  Data format: Darwin Core archive

Description: The data presented in this paper derives from visual and destructive surveys done along the Portuguese coast in the early 2000s. The dataset published in GBIF has the structure of a Sampling event dataset with two data subsets: Events (Core) and Associated occurrences. These data have been published as a Darwin Core Archive (DwCA), which is a standardised format for sharing biodiversity data. The Sampling Event (Core) contains 49 records (eventID). The extension data (Associated Occurrences) sheet has 11662 occurrences.

| Column label       | Column description                                           |
|--------------------|--------------------------------------------------------------|
| eventID            | Unique identifier associated with an event                   |
| samplingProtocol   | Sampling method used during the event                        |
| samplingEffort     | Description of effort during the sampling event              |
| eventDate          | The date of the event                                        |
| year               | The year of the event                                        |
| month              | The month of the event                                       |
| day                | The day of the event                                         |
| eventRemarks       | Astronomical low tide height during the event                |
| country            | Country where the event took place                           |
| countryCode        | The unique code of the country where the event took place    |
| Field                        | Description                                                                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| locationID                   | An identifier for the location information from Geonames                                                                                   |
| decimalLatitude              | The geographical latitude of the event                                                                                                     |
| decimalLongitude             | The geographical longitude of the event                                                                                                    |
| geodeticDatum                | The geodetic datum upon which the geographical coordinates are based                                                                     |
| coordinatePrecision          | The precision of the coordinates                                                                                                           |
| coordinateUncertaintyInMetres| The uncertainty of the coordinates, in metres                                                                                            |
| type                         | Type of dataset                                                                                                                             |
| ownerInstitutionCode         | Identifier code of the owner institution                                                                                                   |
| habitat                      | The habitat in which the event took place                                                                                                  |
| waterBody                    | The water body in which the event took place                                                                                                |
| rightsHolder                 | The rights holder of the dataset                                                                                                            |
| bibliographicCitation        | Bibliographic citation of the dataset publication                                                                                          |
| occurrenceID                 | Unique identifier associated with the occurrence of a species                                                                               |
| basisOfRecord                | The specific nature of the data record                                                                                                      |
| organismQuantity             | An enumeration value for the quantity of a species                                                                                           |
| organismQuantityType         | The quantification scale of the quantity of a species                                                                                       |
| occurrenceStatus             | A statement about the presence or absence of a species in a location                                                                      |
| scientificName               | The full scientific name, with authorship and date information, if known                                                                   |
| scientificNameID             | Unique identifier of a species, obtained from WoRMS                                                                                         |
| kingdom                      | The full scientific name of the kingdom in which the taxon is classified                                                                   |
| phylum                       | The full scientific name of the phylum in which the taxon is classified                                                                      |
| class                        | The full scientific name of the class in which the taxon is classified                                                                       |
| order                        | The full scientific name of the order in which the taxon is classified                                                                     |
| family                       | The full scientific name of the family in which the taxon is classified                                                                     |
| genus                        | The full scientific name of the genus in which the taxon is classified                                                                      |
| specificEpithet              | The specific epithet of the species                                                                                                         |
| taxonRank                    | The taxonomic rank of the most specific name in scientificName                                                                             |
| recordedBy                   | Person(s) responsible for sampling the occurrence                                                                                           |
**Additional information**

A total of 238 taxa (Table 2) were identified: 99 Plantae, 36 Chromista, 100 Animalia, two Fungi and one Bacterium (Pereira et al. 2021). A description of number of taxa of each Phylum per location is present in Table 3. The site with the least amount of species was Adraga and the one with the most was Nazaré, both sites in central Portugal. On average, the surveyed locations in northern Portugal had a higher number of species (67 species per location), followed by the locations in southern Portugal (66 species per site). On average, locations in central Portugal (59 species per site) had the lowest number of species (Table 3).

| Scientific name                  | Scientific name ID (Worms)                        | Order      | Family          |
|----------------------------------|--------------------------------------------------|------------|-----------------|
| *Eulalia viridis* (Linnaeus, 1767) | urn:lsid:marinespecies.org:taxname:130639         | Phylodocida| Phylodocidae    |
| *Filograna implexa* (Berkeley, 1835) | urn:lsid:marinespecies.org:taxname:130989         | Sabellida  | Serpulidae      |
| *Sabella spallanzanii* (Gmelin, 1791) | urn:lsid:marinespecies.org:taxname:130969         | Sabellida  | Sabellidae      |
| *Sabellaria alveolata* (Linnaeus, 1767) | urn:lsid:marinespecies.org:taxname:130866         |            | Sabellaridae    |
| *Spirobranchus triqueter* (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:131027         | Sabellida  | Serpulidae      |
| *Austrominius modestus* (Darwin, 1854) | urn:lsid:marinespecies.org:taxname:106209         | Balanomorpha| Elminidae       |
| *Cancer pagurus* (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:107276         | Decapoda   | Cancridae       |
| *Carcinus maenas* (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:107381         | Decapoda   | Carcinidae      |
| *Chthamalus montagui* (Southward, 1976) | urn:lsid:marinespecies.org:taxname:106230         | Balanomorpha| Chthamalidae    |
| *Chthamalus stellatus* (Poli, 1791) | urn:lsid:marinespecies.org:taxname:106231         | Balanomorpha| Chthamalidae    |
| *Diogenes pugilator* (P. Roux, 1829) | urn:lsid:marinespecies.org:taxname:107199         | Decapoda   | Diogenidae      |

**Table 2.**

List of species surveyed, scientific name ID from the World Register of Marine Species (WoRMS) and taxonomic ranks.
| Scientific name                  | Scientific name ID (Worms)                                      | Order      | Family      |
|----------------------------------|----------------------------------------------------------------|------------|-------------|
| *Eriphia verrucosa* (Forskål, 1775) | urn:lsid:marinespecies.org:taxname:107409                      | Decapoda   | Eriphiidae  |
| *Galathea strigosa* (Linnaeus, 1761) | urn:lsid:marinespecies.org:taxname:107155                      | Decapoda   | Galatheidae |
| *Ligia italica* (Fabricius, 1798)  | urn:lsid:marinespecies.org:taxname:156211                      | Isopoda    | Ligiidae    |
| *Ligia oceanica* (Linnaeus, 1767)  | urn:lsid:marinespecies.org:taxname:146999                      | Isopoda    | Ligiidae    |
| *Lophozozymus incisus* (H. Milne Edwards, 1834) | urn:lsid:marinespecies.org:taxname:444382                     | Decapoda   | Xanthidae   |
| *Maja squinado* (Herbst, 1788)     | urn:lsid:marinespecies.org:taxname:107350                      | Decapoda   | Majidae     |
| *Necora puber* (Linnaeus, 1767)    | urn:lsid:marinespecies.org:taxname:107398                      | Decapoda   | Polybiidae  |
| *Pachygrapsus marmoratus* (J.C. Fabricius, 1787) | urn:lsid:marinespecies.org:taxname:107455                     | Decapoda   | Grapsidae   |
| *Palaemon serratus* (Pennant, 1777) | urn:lsid:marinespecies.org:taxname:107616                      | Decapoda   | Palaemonidae|
| *Perforatus perforatus* (Bruguière, 1789) | urn:lsid:marinespecies.org:taxname:106219                      | Balanomorpha | Balanidae   |
| *Pilumnus hirtellus* (Linnaeus, 1761) | urn:lsid:marinespecies.org:taxname:107418                      | Decapoda   | Pilumnidae  |
| *Pirimela denticulata* (Montagu, 1808) | urn:lsid:marinespecies.org:taxname:107278                      | Decapoda   | Carcinidae  |
| *Pollicipes pollicipes* (Gmelin, 1791) | urn:lsid:marinespecies.org:taxname:106177                      | Pollicipedomorpha | Pollicipedidae |
| *Porcellana platycheles* (Pennant, 1777) | urn:lsid:marinespecies.org:taxname:107190                      | Decapoda   | Porcellanidae|
| *Lichina pygmaea* (Lightf.) C. Agardh, 1817 | urn:lsid:marinespecies.org:taxname:147720                      | Lichinales | Lichinaceae |
| *Verrucaria maura* (Wahlenberg, 1803) | urn:lsid:marinespecies.org:taxname:147758                      | Verrucariales | Verrucariaceae |
| *Electra pilosa* (Linnaeus, 1767)   | urn:lsid:marinespecies.org:taxname:111355                      | Cheilostomatida | Electridae |
| *Turbicellepora avicularis* (Hincks, 1860) | urn:lsid:marinespecies.org:taxname:111285                      | Cheilostomatida | Celleporidae |
| Scientific name                   | Scientific name ID (Worms)                                                                 | Order              | Family            |
|----------------------------------|------------------------------------------------------------------------------------------|--------------------|-------------------|
| Bryopsis (J.V.Lamouroux, 1809)   | urn:lsid:marinespecies.org:taxname:143812                                                | Bryopsidales       | Bryopsidaceae     |
| Cladophora (Kützing, 1843)       | urn:lsid:marinespecies.org:taxname:143996                                                | Cladophorales      | Cladophoraceae    |
| Codium adhaerens (C.Agardh, 1822) | urn:lsid:marinespecies.org:taxname:145078                                                | Bryopsidales       | Codiaceae         |
| Codium bursa (Olivi) C.Agardh, 1817 | urn:lsid:marinespecies.org:taxname:145079                                               | Bryopsidales       | Codiaceae         |
| Codium tomentosum (Stackhouse, 1797) | urn:lsid:marinespecies.org:taxname:145092                                               | Bryopsidales       | Codiaceae         |
| Ulva (Linnaeus, 1753)            | urn:lsid:marinespecies.org:taxname:144296                                                | Ulvales            | Ulvaceae          |
| Valonia (C.Agardh, 1823)         | urn:lsid:marinespecies.org:taxname:144267                                                | Cladophorales      | Valoniaceae       |
| Coryphoblennius galerita (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:126762                                               | Blenniiformes      | Blennidae         |
| Diplodus (Rafinesque, 1810)      | urn:lsid:marinespecies.org:taxname:126076                                                | Eupercaria incertae sedis | Sparidae |
| Gaidropsarus mediterraneus (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:126457                                               | Gadiformes         | Lotidae           |
| Gobius paganellus (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:126893                                               | Gobiiformes        | Gobiidae          |
| Lepadogaster (Goüan, 1770)       | urn:lsid:marinespecies.org:taxname:125781                                               | Gobiesociformes    | Gobiesocidae      |
| Lipophrys pholis (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:126768                                               | Blenniiformes      | Blennidae         |
| Nerophis lumbriciformis (Jenyns, 1835) | urn:lsid:marinespecies.org:taxname:127383                                               | Syngnathiformes    | Syngnathidae      |
| Parablennius gattorugine (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:126770                                               | Blenniiformes      | Blennidae         |
| Salaria pavo (Risso, 1810)       | urn:lsid:marinespecies.org:taxname:302108                                                | Blenniiformes      | Blennidae         |
| Actinia equina (Linnaeus, 1758)   | urn:lsid:marinespecies.org:taxname:100803                                                | Actiniaria         | Actiniidae        |
| Actinia fragacea Tugwell, 1856    | urn:lsid:marinespecies.org:taxname:100805                                                | Actiniaria         | Actiniidae        |
| Scientific name                                      | Scientific name ID (Worms)                           | Order           | Family            |
|------------------------------------------------------|------------------------------------------------------|-----------------|-------------------|
| *Actinothoe sphyrodeta* (Gosse, 1858)                | urn:lsid:marinespecies.org:taxname:100986             | Actiniaria      | Sagaritidae       |
| *Anemonia viridis* (Forsskål, 1775)                 | urn:lsid:marinespecies.org:taxname:100808             | Actiniaria      | Actiniidae        |
| *Anthopleura thallia* (Gosse, 1854)                 | urn:lsid:marinespecies.org:taxname:100812             | Actiniaria      | Actiniidae        |
| *Aulactinia verrucosa* (Pennant, 1777)              | urn:lsid:marinespecies.org:taxname:100819             | Actiniaria      | Actiniidae        |
| *Caryophyllia* (Caryophyllia) *smithii* (Stokes & Broderip, 1828) | urn:lsid:marinespecies.org:taxname:1288958           | Scleractinia    | Caryophyllidae    |
| *Cereus pedunculatus* (Pennant, 1777)               | urn:lsid:marinespecies.org:taxname:100987             | Actiniaria      | Sagaritidae       |
| *Clytia hemisphaerica* (Linnaeus, 1767)             | urn:lsid:marinespecies.org:taxname:152074             | Leptothecata    | Campanulariidae   |
| *Corynactis viridis* (Allman, 1846)                 | urn:lsid:marinespecies.org:taxname:101016             | Corallimorpharia | Corallimorphidae |
| *Obelia geniculata* (Linnaeus, 1758)                | urn:lsid:marinespecies.org:taxname:117388             | Leptothecata    | Campanulariidae   |
| *Urticina felina* (Linnaeus, 1761)                  | urn:lsid:marinespecies.org:taxname:100798             | Actiniaria      | Actiniidae        |
| *Calothrix C.Agardh ex Bornet & Flahault, 1886      | urn:lsid:marinespecies.org:taxname:146624             | Nostocales      | Rivulariaceae     |
| *Asterias rubens* (Linnaeus, 1758)                  | urn:lsid:marinespecies.org:taxname:123776             | Forcipulatida   | Asteriidae        |
| *Asterina gibbosa* (Pennant, 1777)                  | urn:lsid:marinespecies.org:taxname:123987             | Valvatida       | Asterinidae       |
| *Coscinasterias tenuispina* (Lamarck, 1816)         | urn:lsid:marinespecies.org:taxname:123795             | Forcipulatida   | Asteriidae        |
| *Holothuria* (Linnaeus, 1767)                       | urn:lsid:marinespecies.org:taxname:123456             | Holothuriida    | Holothuriidae     |
| *Holothuria* (Panningothuria) *forskali* Delle (Chiaje, 1823) | urn:lsid:marinespecies.org:taxname:124501             | Holothuriida    | Holothuriidae     |
| *Marthasterias glacialis* (Linnaeus, 1758)          | urn:lsid:marinespecies.org:taxname:123803             | Forcipulatida   | Asteriidae        |
| Scientific name                          | Scientific name ID (Worms)                                                                 | Order                  | Family                  |
|-----------------------------------------|------------------------------------------------------------------------------------------|------------------------|-------------------------|
| Ophiocomina nigra (Abildgaard in O.F. Müller, 1789) | urn:lsid:marinespecies.org:taxname:125027                                               | Ophiacantherida        | Ophiotomidae            |
| Ophiothrix fragilis (Abildgaard in O.F. Müller, 1789) | urn:lsid:marinespecies.org:taxname:125131                                               | Amphilepidida          | Ophiotrichidae          |
| Paracentrotus lividus (Lamarck, 1816)    | urn:lsid:marinespecies.org:taxname:124316                                               | Camarodonta            | Parechinidae            |
| Acanthochitona crinita (Pennant, 1777)   | urn:lsid:marinespecies.org:taxname:136875                                               | Chitonida              | Acanthochitonidae       |
| Aplysia (Linnaeus, 1767)                | urn:lsid:marinespecies.org:taxname:137654                                               | Aplysiida              | Aplysiida               |
| Aplysia fasciata (Poiret, 1789)         | urn:lsid:marinespecies.org:taxname:138755                                               | Aplysiida              | Aplysiida               |
| Bolma rugosa (Linnaeus, 1767)           | urn:lsid:marinespecies.org:taxname:751225                                               | Trochida               | Turbinida               |
| Calliostoma zizyphinum (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:141767                                               | Trochida               | Calliostomatidae        |
| Conus (Linnaeus, 1758)                  | urn:lsid:marinespecies.org:taxname:137813                                               | Neogastropoda          | Conidae                 |
| Diodora graeca (Linnaeus, 1758)         | urn:lsid:marinespecies.org:taxname:139951                                               | Lepetellida            | Fissurellida            |
| Doris pseudoargus (Rapp, 1827)          | urn:lsid:marinespecies.org:taxname:138763                                               | Nudibranchia           | Doridida                |
| Gibbula magus (Linnaeus, 1758)          | urn:lsid:marinespecies.org:taxname:141790                                               | Trochida               | Trochida                |
| Hiatilella arctica (Linnaeus, 1767)     | urn:lsid:marinespecies.org:taxname:140103                                               | Adapedonta             | Hiatilella              |
| Lasaea rubra (Montagu, 1803)            | urn:lsid:marinespecies.org:taxname:140176                                               | Galeommatida           | Lasaeida                |
| Littorina littorea (Linnaeus, 1758)     | urn:lsid:marinespecies.org:taxname:140262                                               | Littorinimorpha        | Littorinidae            |
| Littorina obtusata (Linnaeus, 1758)     | urn:lsid:marinespecies.org:taxname:140263                                               | Littorinimorpha        | Littorinidae            |
| Littorina saxatilis (Oliv, 1792)        | urn:lsid:marinespecies.org:taxname:140264                                               | Littorinimorpha        | Littorinidae            |
| Melarhaphe neritoides (Linnaeus, 1758)  | urn:lsid:marinespecies.org:taxname:151586                                               | Littorinimorpha        | Littorinidae            |
| Scientific name                          | Scientific name ID (Worms)                                                                 | Order               | Family            |
|-----------------------------------------|------------------------------------------------------------------------------------------|---------------------|-------------------|
| *Modiolus barbatus* (Linnaeus, 1758)    | urn:lsid:marinespecies.org:taxname:140464                                                | Mytilida            | Mytilidae         |
| *Musculus costulatus* (Risso, 1826)     | urn:lsid:marinespecies.org:taxname:140471                                                | Mytilida            | Mytilidae         |
| *Mytilus galloprovincialis* (Lamarck, 1819) | urn:lsid:marinespecies.org:taxname:140481                                                | Mytilida            | Mytilidae         |
| *Nucella lapillus* (Linnaeus, 1758)     | urn:lsid:marinespecies.org:taxname:140403                                                | Neogastropoda       | Muricidae         |
| *Ocenebra erinaceus* (Linnaeus, 1758)   | urn:lsid:marinespecies.org:taxname:140405                                                | Neogastropoda       | Muricidae         |
| *Octopus vulgaris* (Cuvier, 1797)       | urn:lsid:marinespecies.org:taxname:140605                                                | Octopoda            | Octopodida        |
| *Onchidella celtica* (Audouin & Milne-Edwards, 1832) | urn:lsid:marinespecies.org:taxname:140626                                                | Systellommatophora  | Onchidiidae       |
| *Ostrea edulis* (Linnaeus, 1758)        | urn:lsid:marinespecies.org:taxname:140658                                                | Ostreida            | Ostreidae         |
| *Patella aspera* (Röding, 1798)         | urn:lsid:marinespecies.org:taxname:456570                                                | Patellida           | Patellidae        |
| *Patella depressa* (Pennant, 1777)      | urn:lsid:marinespecies.org:taxname:151374                                                | Patellida           | Patellidae        |
| *Patella pellucida* (Linnaeus, 1758)    | urn:lsid:marinespecies.org:taxname:162669                                                | Patellida           | Patellidae        |
| *Patella rustica* (Linnaeus, 1758)      | urn:lsid:marinespecies.org:taxname:140683                                                | Patellida           | Patellidae        |
| *Patella vulgata* (Linnaeus, 1758)      | urn:lsid:marinespecies.org:taxname:140685                                                | Patellida           | Patellidae        |
| *Phorcus lineatus* (da Costa, 1778)     | urn:lsid:marinespecies.org:taxname:153534                                                | Trochida            | Trochidae         |
| *Sepia officinalis* (Linnaeus, 1758)    | urn:lsid:marinespecies.org:taxname:141444                                                | Sepiida             | Sepiidae          |
| *Siphonaria pectinata* (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:141470                                                | Siphonariida        | Siphonariidae     |
| *Steromphala cineraria* (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:141782                                                | Trochida            | Trochidae         |
| *Steromphala pennanti* (Philippi, 1846) | urn:lsid:marinespecies.org:taxname:141792                                                | Trochida            | Trochidae         |
| Scientific name                  | Scientific name ID (Worms) | Order       | Family            |
|---------------------------------|----------------------------|-------------|-------------------|
| Steromphala umbilicalis (da Costa, 1778) | urn:lsid:marinespecies.org:taxname:141801 | Trochida    | Trochidae         |
| Stramonita haemastoma (Linnaeus, 1767) | urn:lsid:marinespecies.org:taxname:224350 | Neogastropoda | Muricidae         |
| Trapania maculata (Haeuffling, 1960) | urn:lsid:marinespecies.org:taxname:140044 | Nudibranchia | Goniodorididae    |
| Tricola pullus (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:141700 | Trochida    | Phasianellidae    |
| Tritia incrassata (Strøm, 1768) | urn:lsid:marinespecies.org:taxname:140503 | Neogastropoda | Nassariidae       |
| Tritia reticulata (Linnaeus, 1758) | urn:lsid:marinespecies.org:taxname:140513 | Neogastropoda | Nassariidae       |
| Trivia monacha (da Costa, 1778) | urn:lsid:marinespecies.org:taxname:141744 | Littorinimorpha | Triviidae       |
| Alaria esculenta (Linnaeus) Greville, 1830 | urn:lsid:marinespecies.org:taxname:145716 | Laminariales | Alariaceae        |
| Ascophyllum nodosum (Linnaeus) Le Jolis, 1863 | urn:lsid:marinespecies.org:taxname:145541 | Fucales     | Fucaceae          |
| Bifurcaria bifurcata (R.Ross, 1958) | urn:lsid:marinespecies.org:taxname:145503 | Fucales     | Sargassaceae      |
| Cladostephus spongiosus (Hudson) C.Agardh, 1817 | urn:lsid:marinespecies.org:taxname:145888 | Sphacelariales | Cladostephaceae |
| Colpomenia peregrina (Sauvageau, 1927) | urn:lsid:marinespecies.org:taxname:145856 | Ectocarpales | Scytosiphonaceae  |
| Cystoseira (C.Agardh, 1820) | urn:lsid:marinespecies.org:taxname:144126 | Fucales     | Sargassaceae      |
| Cystoseira humilis (Schousboe ex Kützing, 1860) | urn:lsid:marinespecies.org:taxname:145520 | Fucales     | Sargassaceae      |
| Cystoseira tamariscifolia (Hudson) Papenfuss, 1950 | urn:lsid:marinespecies.org:taxname:145536 | Fucales     | Sargassaceae      |
| Desmarestia aculeata (Linnaeus) J.V.Lamouroux, 1813 | urn:lsid:marinespecies.org:taxname:145307 | Desmarestiales | Desmarestiaceae |
| Desmarestia dresnayi (J.V.Lamouroux ex Léman, 1819) | urn:lsid:marinespecies.org:taxname:145308 | Desmarestiales | Desmarestiaceae |
| Scientific name               | Scientific name ID (Worms)                                      | Order          | Family          |
|------------------------------|----------------------------------------------------------------|----------------|-----------------|
| Desmarestia ligulata         | urn:lsid:marinespecies.org:taxname:145309                     | Desmarestiales | Desmarestiaceae |
| (Stackhouse) J.V.Lamouroux, 1813 |                                                              |                |                 |
| Dictyopteris polymodioides   | urn:lsid:marinespecies.org:taxname:145360                     | Dictyotales    | Dictyotaceae    |
| (A.P.De Candolle) J.V.Lamouroux, 1809 |                                                              |                |                 |
| Dictyota dichotoma (Hudson) J.V.Lamouroux, 1809 | urn:lsid:marinespecies.org:taxname:145367                     | Dictyotales    | Dictyotaceae    |
| Ectocarpus (Lyngbye, 1819)   | urn:lsid:marinespecies.org:taxname:144099                     | Ectocarpales   | Ectocarpaceae   |
| Fucus serratus (Linnaeus, 1753) | urn:lsid:marinespecies.org:taxname:145546                     | Fucales        | Fucaceae        |
| Fucus spiralis (Linnaeus, 1753) | urn:lsid:marinespecies.org:taxname:145547                     | Fucales        | Fucaceae        |
| Fucus vesiculosus (Linnaeus, 1753) | urn:lsid:marinespecies.org:taxname:145548                     | Fucales        | Fucaceae        |
| Halidrys siliquosa (Linnaeus) | urn:lsid:marinespecies.org:taxname:145540                     | Fucales        | Sargassaceae    |
| Lyngbye, 1819                |                                                               |                |                 |
| Halopteris filicina (Grateloup) Kützing, 1843 | urn:lsid:marinespecies.org:taxname:145906                     | Sphacelariales | Stypocaulaceae  |
| Halopteris scoparia (Linnaeus) | urn:lsid:marinespecies.org:taxname:145907                     | Sphacelariales | Stypocaulaceae  |
| Sauvageau, 1904              |                                                               |                |                 |
| Himanthalia elongata (Linnaeus) S.F.Gray, 1821 | urn:lsid:marinespecies.org:taxname:145551                     | Fucales        | Himanthaliaceae |
| Laminaria hyperborea (Gunnerus) Foslie, 1884 | urn:lsid:marinespecies.org:taxname:145725                     | Laminariales   | Laminariaceae   |
| Laminaria ochroleuca Bachelot de la Pylaie, 1824 | urn:lsid:marinespecies.org:taxname:145728                     | Laminariales   | Laminariaceae   |
| Leathesia marina (Lyngbye) Decaisne, 1842 | urn:lsid:marinespecies.org:taxname:144953                     | Ectocarpales   | Chordariaceae   |
| Padina pavonica (Linnaeus) Thivy, 1960 | urn:lsid:marinespecies.org:taxname:145385                     | Dictyotales    | Dictyotaceae    |
| Pelvetia canaliculata (Linnaeus) Decaisne & Thuret, 1845 | urn:lsid:marinespecies.org:taxname:145550                     | Fucales        | Fucaceae        |
| Scientific name                        | Scientific name ID (Worms)                                                                 | Order                  | Family                     |
|---------------------------------------|--------------------------------------------------------------------------------------------|------------------------|-----------------------------|
| *Petalonia fascia* (O.F. Müller)      | urn:lsid:marinespecies.org:taxname:145863                                                   | Ectocarpales           | Scytosiphonaceae            |
| Kuntze, 1898                          |                                                                                           |                        |                             |
| *Phyllariopsis purpurascens* (C.Agardh) E.C.Henry & G.R.South, 1987 | urn:lsid:marinespecies.org:taxname:145733                                                   | Tilopteridales         | Phyllariaceae               |
| *Saccharina latissima* (Linnaeus) C.E.Lane, C.Mayes, Druel & G.W.Saunders, 2006 | urn:lsid:marinespecies.org:taxname:145730                                                   | Laminariales           | Laminariaceae              |
| *Saccorhiza polyschides* (Lightfoot) Batters, 1902 | urn:lsid:marinespecies.org:taxname:145735                                                   | Tilopteridales         | Phyllariaceae               |
| *Sargassum* (C.Agardh, 1820)          | urn:lsid:marinespecies.org:taxname:144132                                                   | Fucales                | Sargassaceae               |
| *Sargassum muticum* (Yendo) Fensholt, 1955 | urn:lsid:marinespecies.org:taxname:494791                                                   | Fucales                | Sargassaceae               |
| *Sphacelaria* (Lyngbye, 1818)         | urn:lsid:marinespecies.org:taxname:144272                                                   | Sphacelariales         | Sphacelariaceae            |
| *Taonia atomaria* (Woodward) J.Agardh, 1848 | urn:lsid:marinespecies.org:taxname:145393                                                   | Dictyotales            | Dictyonaceae               |
| *Treptacantha baccata* (S.G.Gmelin) Orellana & Sansón, 2019 | urn:lsid:marinespecies.org:taxname:145507                                                   | Fucales                | Sargassaceae               |
| *Treptacantha nodicaulis* (Withering) Orellana & Sansón, 2019 | urn:lsid:marinespecies.org:taxname:145526                                                   | Fucales                | Sargassaceae               |
| *Cliona celata* (Grant, 1826)         | urn:lsid:marinespecies.org:taxname:134121                                                   | Clionaida              | Clionidae                  |
| *Halichondria* (Halichondria) panicea (Pallas, 1766) | urn:lsid:marinespecies.org:taxname:132627                                                   | Suberitida             | Halichondriidae            |
| *Hymeniacidon perlevis* (Montagu, 1814) | urn:lsid:marinespecies.org:taxname:150223                                                   | Suberitida             | Halichondriidae            |
| *Acrosorium ciliolatum* (Harvey) (Kylin, 1924) | urn:lsid:marinespecies.org:taxname:295874                                                   | Ceramiales             | Delesseriaceae             |
| *Ahnfeltia plicata* (Hudson) (Fries, 1836) | urn:lsid:marinespecies.org:taxname:144422                                                   | Ahnfeltiales           | Ahnfeltiaceae              |
| Scientific name | Scientific name ID (Worms) | Order | Family |
|-----------------|----------------------------|-------|--------|
| *Ahnfeltiopsis devoniensis* (Greville) P.C.Silva & DeCew, 1992 | urn:lsid:marinespecies.org:taxname:145651 | Gigartinales | Phyllophoraceae |
| *Amphiroa* (J.V.Lamouroux, 1812) | urn:lsid:marinespecies.org:taxname:144003 | Corallinales | Lithophyllaceae |
| *Apoglossum ruscifolium* (Turner) J.Agardh, 1898 | urn:lsid:marinespecies.org:taxname:144737 | Ceramiales | Delesseriaceae |
| *Asparagopsis* (Montagne, 1840) | urn:lsid:marinespecies.org:taxname:295876 | Bonnemasioniales | Bonnemasionaceae |
| *Asparagopsis armata* (Harvey, 1855) | urn:lsid:marinespecies.org:taxname:144438 | Bonnemasioniales | Bonnemasionaceae |
| *Bonnemaisonia hamifera* (Hariot, 1891) | urn:lsid:marinespecies.org:taxname:144442 | Bonnemasioniales | Bonnemasionaceae |
| *Bornetia secundiflora* (J.Agardh) Thuret, 1855 | urn:lsid:marinespecies.org:taxname:144524 | Ceramiales | Ceramiaceae |
| *Calliblepharis ciliata* (Hudson) Kützing, 1843 | urn:lsid:marinespecies.org:taxname:145613 | Gigartinales | Cystocloniaceae |
| *Calliblepharis jubata* (Goodenough & Woodward) Kützing, 1843 | urn:lsid:marinespecies.org:taxname:145614 | Gigartinales | Cystocloniaceae |
| *Callithamnion* (Lyngbye, 1819) | urn:lsid:marinespecies.org:taxname:143832 | Ceramiales | Callithamniaceae |
| *Callithamnion tetragonum* (Withering) S.F.Gray, 1821 | urn:lsid:marinespecies.org:taxname:144529 | Ceramiales | Callithamniaceae |
| *Callithamnion tetricum* (Dillwyn) S.F.Gray, 1821 | urn:lsid:marinespecies.org:taxname:144530 | Ceramiales | Callithamniaceae |
| *Carradoriella denudata* (Dillwyn) A.M.Savoie & G.W.Saunders, 2019 | urn:lsid:marinespecies.org:taxname:144623 | Ceramiales | Rhodomelaceae |
| *Catenella caespitosa* (Withering) L.M.Irvine, 1976 | urn:lsid:marinespecies.org:taxname:145605 | Gigartinales | Caulacanthaceae |
| *Caulacanthus ustulatus* (Mertens ex Turner) Kützing, 1843 | urn:lsid:marinespecies.org:taxname:145606 | Gigartinales | Caulacanthaceae |
| *Ceramium echionotum* (J.Agardh, 1844) | urn:lsid:marinespecies.org:taxname:144547 | Ceramiales | Ceramiaceae |
| Scientific name                        | Scientific name ID (Worms)                                      | Order       | Family         |
|---------------------------------------|-----------------------------------------------------------------|-------------|----------------|
| Ceramium virgatum (Roth, 1797)        | urn:lsid:marinespecies.org:taxname:178915                      | Ceramiales  | Ceramiaceae    |
| Chambria parvula (C.Agardh) Harvey, 1853 | urn:lsid:marinespecies.org:taxname:145804                      | Rhodymeniales | Champiaceae   |
| Chondracanthus acicularis (Roth) Fredericq, 1993 | urn:lsid:marinespecies.org:taxname:145623                      | Gigartinales | Gigartinaceae |
| Chondracanthus teedei (Mertens ex Roth) Kützing, 1843 | urn:lsid:marinespecies.org:taxname:162858                      | Gigartinales | Gigartinaceae |
| Chondria coerulescens (J.Agardh) Sauvageau, 1897 | urn:lsid:marinespecies.org:taxname:1311369                     | Ceramiales  | Rhodomelaceae  |
| Chondria dasyphylla (Woodward) C.Agardh, 1817 | urn:lsid:marinespecies.org:taxname:144799                      | Ceramiales  | Rhodomelaceae  |
| Chondrus crispus (Stackhouse, 1797)   | urn:lsid:marinespecies.org:taxname:145625                      | Gigartinales | Gigartinaceae |
| Chylocladia verticillata (Lightfoot) Bliding, 1928 | urn:lsid:marinespecies.org:taxname:145808                      | Rhodymeniales | Champiaceae   |
| Compsothamnion thuioides (Smith) Nägeli, 1862 | urn:lsid:marinespecies.org:taxname:144573                      | Ceramiales  | Ceramiaceae    |
| Corallina (Linnaeus, 1758)            | urn:lsid:marinespecies.org:taxname:144007                      | Corallinales | Corallinaceae |
| Gastroclonium ovatum (Hudson) Papenfuss, 1944 | urn:lsid:marinespecies.org:taxname:145810                      | Rhodymeniales | Champiaceae   |
| Gastroclonium reflexum (Chauvin) Kützing, 1849 | urn:lsid:marinespecies.org:taxname:145811                      | Rhodymeniales | Champiaceae   |
| Gelidium corneum (Hudson) J.V.Lamouroux, 1813 | urn:lsid:marinespecies.org:taxname:145579                      | Gelidiales   | Gelidiaceae    |
| Scientific name                        | Scientific name ID (Worms)                                      | Order       | Family                  |
|---------------------------------------|-----------------------------------------------------------------|-------------|-------------------------|
| Gelidium pulchellum (Turner) Kützing, 1868 | urn:lsid:marinespecies.org:taxname:145588                       | Gelidiales  | Gelidiaceae             |
| Gelidium spinosum (S.G.Gmelin) P.C.Silva, 1996 | urn:lsid:marinespecies.org:taxname:145594                       | Gelidiales  | Gelidiaceae             |
| Gigartina pistillata (S.G.Gmelin) Stackhouse, 1809 | urn:lsid:marinespecies.org:taxname:145626                       | Gigartinales| Gigartinae              |
| Gracilaria foliifera (Forsskål) Børjesen, 1932 | urn:lsid:marinespecies.org:taxname:145699                       | Gracilariales| Gracilariaceae          |
| Gracilaria gracilis (Stackhouse) Steentoft, L.M.Irvine & Farnham, 1995 | urn:lsid:marinespecies.org:taxname:145700                       | Gracilariales| Gracilariaceae          |
| Gracilaria multipartita (Clemente) Harvey, 1846 | urn:lsid:marinespecies.org:taxname:145704                       | Gracilariales| Gracilariaceae          |
| Grateloupia doryphora (Montagne) M.Howe, 1914 | urn:lsid:marinespecies.org:taxname:145247                       | Halymeniales| Halymeniaceae           |
| Grateloupia filicina (J.V.Lamouroux) C.Agardh, 1822 | urn:lsid:marinespecies.org:taxname:145248                       | Halymeniales| Halymeniaceae           |
| Griffithsia (C.Agardh, 1817)          | urn:lsid:marinespecies.org:taxname:143841                       | Ceramiales  | Wrangeliaceae           |
| Gymnogongrus (Martius, 1833)          | urn:lsid:marinespecies.org:taxname:144168                       | Gigartinales| Phyllophoraceae         |
| Gymnogongrus crenulatus (Turner) J.Agardh, 1851 | urn:lsid:marinespecies.org:taxname:145656                       | Gigartinales| Phyllophoraceae         |
| Halopithys incurva (Hudson) Batters, 1902 | urn:lsid:marinespecies.org:taxname:144812                       | Ceramiales  | Rhodomelaceae           |
| Halurus equisetifolius (Lightfoot) Kützing, 1843 | urn:lsid:marinespecies.org:taxname:146345                       | Ceramiales  | Wrangeliaceae           |
| Halurus flosculosus (J.Ellis) Maggs & Hommersand, 1993 | urn:lsid:marinespecies.org:taxname:144595                       | Ceramiales  | Wrangeliaceae           |
| Heterosiphonia plumosa (J.Ellis) Batters, 1902 | urn:lsid:marinespecies.org:taxname:144732                       | Ceramiales  | Dasyaceae               |
| Hypnea musciformis (Wulfen) J.V.Lamouroux, 1813 | urn:lsid:marinespecies.org:taxname:145634                       | Gigartinales| Cystoclioniaceae        |
| Scientific name                      | Scientific name ID (Worms) | Order          | Family             |
|--------------------------------------|----------------------------|----------------|--------------------|
| Hypoglossum hypoglossoides           | urn:lsid:marinespecies.org:taxname:144756 | Ceramiales     | Delesseriaceae     |
| (Stackhouse) Collins & Hervey, 1917  |                            |                |                    |
| Itonoa marginifera (J.Agardh)        | urn:lsid:marinespecies.org:taxname:145638 | Nemastomatales | Nemastomataceae    |
| Masuda & Guiry, 1995                 |                            |                |                    |
| Jania rubens (Linnaeus)              | urn:lsid:marinespecies.org:taxname:145130 | Corallinales   | Corallinaceae      |
| J.V.Lamouroux, 1816                  |                            |                |                    |
| Jania squamata (Linnaeus)            | urn:lsid:marinespecies.org:taxname:145114 | Corallinales   | Corallinaceae      |
| J.H.Kim, Guiry & H.-G.Choi, 2007     |                            |                |                    |
| Laurencia obtusa (Hudson)            | urn:lsid:marinespecies.org:taxname:144827 | Ceramiales     | Rhodomelaceae      |
| J.V.Lamouroux, 1813                  |                            |                |                    |
| Leptosiphonia brodiei (Dillwyn)      | urn:lsid:marinespecies.org:taxname:162854 | Ceramiales     | Rhodomelaceae      |
| A.M.Savoie & G.W.Saunders, 2019      |                            |                |                    |
| Lithophyllum (Philippi, 1837)        | urn:lsid:marinespecies.org:taxname:205926 | Corallinales   | Lithophyliliaceae  |
| Lithophyllum byssoides (Lamarck)     | urn:lsid:marinespecies.org:taxname:145140 | Corallinales   | Lithophyliliaceae  |
| Foslie, 1900                         |                            |                |                    |
| Lomentaria articulata (Hudson)       | urn:lsid:marinespecies.org:taxname:145195 | Rhodymeniales  | Lomentariaceae     |
| Lyngbye, 1819                        |                            |                |                    |
| Lomentaria clavellosa (Lightfoot ex Turner) Gaillon, 1828 | urn:lsid:marinespecies.org:taxname:145825 | Rhodymeniales  | Lomentariaceae     |
| Lophosiphonia obscura (C.Agardh)     | urn:lsid:marinespecies.org:taxname:146367 | Ceramiales     | Rhodomelaceae      |
| Falkenberg, 1897                     |                            |                |                    |
| Mastocarpus stellatus (Stackhouse)   | urn:lsid:marinespecies.org:taxname:145650 | Gigartinales   | Phyllophoraceae    |
| Guiry, 1984                          |                            |                |                    |
| Mesophyllum lichenoides (J.Ellis)    | urn:lsid:marinespecies.org:taxname:145188 | Hapalidiales   | Mesophyliaceae     |
| Me.Lemoine, 1928                     |                            |                |                    |
| Metacallophyllis lacinata (Hudson)   | urn:lsid:marinespecies.org:taxname:145262 | Gigartinales   | Kallymeniaceae     |
| A.Vergés & L.Le Gall, 2017           |                            |                |                    |
| Nemalion elminthoides (Velley)       | urn:lsid:marinespecies.org:taxname:145765 | Nemaliales     | Nemaliaceae        |
| Batters, 1902                        |                            |                |                    |
| Nitophyllum punctatum (Stackhouse)   | urn:lsid:marinespecies.org:taxname:144770 | Ceramiales     | Delesseriaceae     |
| Greville, 1830                       |                            |                |                    |
| Scientific name                        | Scientific name ID (Worms)                                      | Order      | Family             |
|----------------------------------------|----------------------------------------------------------------|------------|--------------------|
| Osmundea hybrida (A.P.de Candolle) K.W.Nam, 1994 | urn:lsid:marinespecies.org:taxname:144842                      | Ceramiales | Rhodomelaceae      |
| Osmundea pinnatifida (Hudson) Stackhouse, 1809 | urn:lsid:marinespecies.org:taxname:144847                      | Ceramiales | Rhodomelaceae      |
| Palmaria palmata (Linnaeus) F.Weber & D.Mohr, 1805 | urn:lsid:marinespecies.org:taxname:145771                      | Palmariales | Palmariaceae       |
| Peyssonnelia (Decaisne, 1841)           | urn:lsid:marinespecies.org:taxname:144051                      | Peyssonneliales | Peyssonneliaceae |
| Phyllophora crispa (Hudson) P.S.Dixon, 1964 | urn:lsid:marinespecies.org:taxname:145660                      | Gigartinales | Phyllophorateae    |
| Plocamium cartilagineum (Linnaeus) P.S.Dixon, 1967 | urn:lsid:marinespecies.org:taxname:145782                      | Plocamiales | Plocamiaceae       |
| Polysiphonia (Greville, 1823)           | urn:lsid:marinespecies.org:taxname:143853                      | Ceramiales | Rhodomelaceae      |
| Polysiphonia macrocarpa (C.Agardh) Sprengel, 1827 | urn:lsid:marinespecies.org:taxname:548028                      | Ceramiales | Rhodomelaceae      |
| Porphyra (C.Agardh, 1824)               | urn:lsid:marinespecies.org:taxname:143808                      | Bangiales  | Bangiaceae         |
| Pterocladia capillacea (S.G.Gmelin) Santelices & Hommersand, 1997 | urn:lsid:marinespecies.org:taxname:145599                      | Gelidiales | Pterocladaceae     |
| Pterosiphonia complanata (Clemente) Falkenberg, 1897 | urn:lsid:marinespecies.org:taxname:146368                      | Ceramiales | Rhodomelaceae      |
| Pterothamnion crispum (Ducluzeau) Nägeli, 1862 | urn:lsid:marinespecies.org:taxname:144682                      | Ceramiales | Ceramiaceae        |
| Pterothamnion plumula (J.Ellis) Nägeli, 1855 | urn:lsid:marinespecies.org:taxname:144683                      | Ceramiales | Ceramiaceae        |
| Rhodymenia holmesii (Ardissone, 1893)   | urn:lsid:marinespecies.org:taxname:145853                      | Rhodymeniales | Rhodymeniaceae    |
| Rissoella verruculosa (Bertoloni) J.Agardh, 1851 | urn:lsid:marinespecies.org:taxname:145669                      | Gigartinales | Rissoellaceae     |
| Schizymenia dubyi (Chauvin ex Duby) J.Agardh, 1851 | urn:lsid:marinespecies.org:taxname:145673                      | Nemastomatales | Schizymeniaceae  |
| Scinaia furcellata (Turner) J.Agardh, 1851 | urn:lsid:marinespecies.org:taxname:145743                      | Nemaliales  | Scinaicaceae       |
| Scientific name                          | Scientific name ID (Worms)                                      | Order       | Family               |
|-----------------------------------------|----------------------------------------------------------------|-------------|----------------------|
| *Scinaia interrupta* (A.P.de Candolle) M.J.Wynne, 1989 | urn:lsid:marinespecies.org:taxname:239045                         | Nemaliales  | Scinaiaceae          |
| *Sphaerococcus coronopifolius* (Stackhouse, 1797)         | urn:lsid:marinespecies.org:taxname:145908                         | Gigartinales| Sphaerococcaceae     |
| *Stenogramma interruptum* (C.Agardh) Montagne, 1846       | urn:lsid:marinespecies.org:taxname:145667                         | Gigartinales| Phyllophoraceae      |
| *Tsengia bairdii* (Farlow) K.C.Fan & Y.P.Fan, 1962        | urn:lsid:marinespecies.org:taxname:145649                         | Halymeniales| Tsengiaceae          |
| *Vertebrata fucoides* (Hudson) Kuntze, 1891               | urn:lsid:marinespecies.org:taxname:144639                         | Ceramiales  | Rhodophyta           |
| *Vertebrata nigra* (Hudson) Díaz-Tapia & Maggs, 2017      | urn:lsid:marinespecies.org:taxname:144651                         | Ceramiales  | Rhodophyta           |
| *Vertebrata thuoyoides* (Harvey) Kuntze, 1891             | urn:lsid:marinespecies.org:taxname:144790                         | Ceramiales  | Rhodophyta           |
| *Xiphosiphonia pennata* (C.Agardh) Savoie & G.W.Saunders, 2016 | urn:lsid:marinespecies.org:taxname:144852                         | Ceramiales  | Rhodophyta           |

Table 3.

Number of taxa identified per Phylum in each location. A - Cnidaria; B - Echinodermata; C - Arthropoda; D - Chordata; E - Annelida; F - Mollusca; G - Porifera; H - Rhodophyta; I - Ochrophyta; J - Chlorophyta; K - Ascomycota; L - Bryozoa

| Location                    | A | B | C | D | E | F | G | H | I | J | K | L | Total |
|-----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|-------|
| Moledo do Minho             | 3 | 3 | 5 | 2 | 2 | 11| 1 | 33| 12| 2 | 2 | 0 | 76    |
| Vila Praia de Âncora        | 3 | 3 | 8 | 1 | 2 | 14| 1 | 40| 13| 2 | 2 | 0 | 89    |
| Afife                       | 3 | 3 | 11| 2 | 1 | 15| 1 | 32| 12| 2 | 2 | 1 | 85    |
| Montedor                    | 6 | 5 | 15| 4 | 26| 3 | 41| 13| 2 | 1 | 0 | 121  |
| Forte da Vigia              | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32| 13| 3 | 1 | 0 | 49    |
| Praia Norte                 | 1 | 2 | 3 | 1 | 1 | 11| 0 | 16| 7 | 1 | 1 | 0 | 44    |
| Amorosa                     | 4 | 2 | 7 | 3 | 1 | 15| 2 | 29| 15| 2 | 0 | 1 | 81    |
| Mindelo                     | 4 | 2 | 6 | 0 | 2 | 8 | 1 | 34| 11| 2 | 2 | 0 | 72    |
| Vila Chã                    | 2 | 3 | 3 | 1 | 1 | 11| 0 | 37| 12| 2 | 1 | 0 | 73    |
| Labruje                     | 2 | 3 | 5 | 2 | 2 | 12| 1 | 21| 9 | 2 | 0 | 1 | 60    |
| Angeiras                    | 3 | 1 | 7 | 3 | 1 | 14| 1 | 24| 9 | 2 | 0 | 0 | 65    |
| Location                  | A | B | C | D | E | F | G | H | I | J | K | L | Total |
|---------------------------|---|---|---|---|---|---|---|---|---|---|---|---|------|
| Cabo do Mundo             | 5 | 3 | 4 | 0 | 1 | 13| 0 | 23| 6 | 2 | 0 | 1 | 58   |
| Homem do Leme             | 4 | 3 | 7 | 2 | 1 | 13| 1 | 27| 4 | 2 | 1 | 1 | 66   |
| Valadares                 | 2 | 2 | 2 | 0 | 1 | 8 | 1 | 26| 3 | 2 | 0 | 0 | 47   |
| Miramar                   | 2 | 0 | 3 | 0 | 1 | 10| 1 | 12| 4 | 2 | 0 | 0 | 35   |
| Aguda                     | 4 | 1 | 7 | 2 | 1 | 9 | 1 | 35| 5 | 2 | 0 | 1 | 68   |
| Buarcos                   | 2 | 2 | 4 | 1 | 1 | 8 | 1 | 26| 3 | 2 | 1 | 0 | 53   |
| Nazaré                    | 1 | 2 | 10| 1 | 3 | 19| 3 | 84| 13| 7 | 1 | 0 | 144  |
| São Martinho do Porto     | 2 | 2 | 4 | 1 | 1 | 13| 2 | 26| 7 | 2 | 1 | 0 | 61   |
| Baleal                    | 3 | 1 | 7 | 1 | 1 | 11| 1 | 43| 14| 5 | 1 | 0 | 88   |
| Papoa                     | 2 | 1 | 4 | 0 | 0 | 9 | 1 | 20| 6 | 4 | 2 | 0 | 49   |
| São Bernardo              | 2 | 2 | 4 | 1 | 1 | 11| 1 | 14| 6 | 2 | 1 | 0 | 45   |
| Santa Cruz                | 2 | 0 | 3 | 1 | 2 | 12| 0 | 16| 4 | 3 | 1 | 0 | 44   |
| São Lourenço              | 6 | 2 | 1 | 1 | 2 | 12| 1 | 23| 9 | 2 | 2 | 0 | 66   |
| Ericeira                  | 2 | 2 | 4 | 2 | 1 | 9 | 1 | 30| 7 | 2 | 0 | 0 | 60   |
| São Julião                | 1 | 0 | 3 | 2 | 2 | 11| 0 | 15| 3 | 3 | 0 | 0 | 40   |
| Magoito                   | 3 | 1 | 5 | 2 | 0 | 9 | 1 | 20| 5 | 2 | 0 | 0 | 48   |
| Adraga                    | 1 | 0 | 4 | 0 | 1 | 7 | 1 | 11| 4 | 2 | 0 | 0 | 31   |
| Abano                     | 2 | 0 | 5 | 1 | 2 | 10| 1 | 9 | 0 | 1 | 1 | 0 | 32   |
| Cabo raso                 | 4 | 1 | 5 | 2 | 2 | 11| 1 | 37| 6 | 4 | 2 | 0 | 75   |
| Aveiras                   | 2 | 3 | 8 | 3 | 1 | 15| 1 | 26| 7 | 3 | 0 | 0 | 69   |
| Cabo Espichel             | 2 | 3 | 2 | 0 | 0 | 8 | 0 | 11| 5 | 4 | 0 | 0 | 35   |
| Portinho da Arrábida      | 2 | 0 | 3 | 1 | 2 | 9 | 1 | 24| 8 | 4 | 1 | 0 | 55   |
| São Torpes                | 3 | 1 | 7 | 3 | 2 | 11| 0 | 29| 9 | 3 | 1 | 0 | 69   |
| Oliveirainha              | 2 | 1 | 4 | 0 | 2 | 8 | 0 | 29| 13| 6 | 0 | 0 | 65   |
| Queimado                  | 4 | 1 | 8 | 3 | 2 | 13| 1 | 23| 10| 4 | 1 | 0 | 70   |
| Vila Nova de Milfontes    | 1 | 0 | 4 | 0 | 1 | 9 | 0 | 28| 9 | 3 | 1 | 0 | 56   |
| Zambujeira do Mar         | 3 | 2 | 5 | 0 | 1 | 11| 2 | 37| 9 | 3 | 1 | 0 | 74   |
| Vale dos Homens           | 6 | 2 | 6 | 2 | 3 | 12| 1 | 27| 6 | 3 | 0 | 0 | 68   |
| Monte Clérigo             | 3 | 1 | 4 | 0 | 2 | 13| 1 | 33| 12| 3 | 1 | 0 | 73   |
| Arrifana                  | 8 | 2 | 7 | 3 | 2 | 12| 1 | 25| 5 | 2 | 1 | 1 | 69   |
| Location     | A | B | C | D | E | F | G | H | I | J | K | L | Total |
|--------------|---|---|---|---|---|---|---|---|---|---|---|---|-------|
| Castelejo    | 4 | 1 | 5 | 2 | 0 | 9 | 2 | 38| 8 | 3 | 1 | 1 | 74   |
| Martinhal    | 3 | 6 | 8 | 4 | 1 | 13| 0 | 19| 8 | 5 | 2 | 0 | 69   |
| Ingrina      | 1 | 2 | 4 | 0 | 2 | 15| 0 | 32| 9 | 4 | 0 | 1 | 70   |
| Praia da Luz| 2 | 2 | 4 | 0 | 2 | 11| 2 | 23| 9 | 4 | 1 | 0 | 60   |
| Porto de Mós | 1 | 1 | 8 | 6 | 2 | 14| 0 | 17| 9 | 3 | 1 | 0 | 62   |
| Dona Ana     | 1 | 2 | 5 | 0 | 1 | 8 | 0 | 24| 6 | 5 | 0 | 0 | 52   |
| Castelo      | 2 | 1 | 6 | 1 | 2 | 9 | 1 | 26| 9 | 4 | 0 | 0 | 61   |
| Olhos de Água| 5 | 1 | 8 | 0 | 3 | 12| 0 | 17| 6 | 4 | 1 | 1 | 58   |

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**Author contributions**

JP: Data curation and manuscript preparation

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AMS: In situ and laboratory identifications, field and laboratory work and manuscript preparation.

CM: Data curation and manuscript preparation.

RS: Data curation and manuscript preparation.

FPL: In situ and laboratory identifications, field and laboratory work, data curation and manuscript preparation.
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