Nestedness and turnover unveil inverse spatial patterns of compositional and functional $\beta$-
diversity at varying depth in marine benthos

Supplementary material

Appendix S1. List of sessile taxa recorded in the study area.
Appendix S2. Full list of functional traits.
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Appendix S6. PCoA ordination of islands $\times$ depths centroids.
Appendix S7. Pairwise values of compositional $\beta$-diversity and components.
Appendix S8. Pairwise values of functional $\beta$-diversity and components.
Appendix S9. Patterns of $\beta$-diversity vs. geographic distance at the scale of sites.
Appendix S10. Data.
**Appendix S1.** List of sessile taxa recorded in the study area.

| Foraminifera   | **Miniacina miniacea** (Pallas, 1766) |
|----------------|--------------------------------------|
|                | **Acetabularia acetabulum** (Linnaeus) P.C. Silva, 1952 |
|                | **Anadyomene stellata** (Wulfen) C. Agardh, 1823 |
|                | **Caulerpa cylindracea** Sonder, 1845 |
|                | **Codium bursa** (Olivi) C. Agardh, 1817 |
|                | **Codium coralloides** (Kützing) P.C. Silva, 1960 |
|                | **Dasycladus vermicularis** (Scopoli) Krasser, 1898 |
|                | **Flabellia petiolata** (Turra) Nizamuddin, 1987 |
|                | **Green Filamentous Algae** |
|                | **Halimeda tuna** (J. Ellis & Solander) J.V. Lamouroux, 1816 |
|                | **Palmophyllum crassum** (Naccari) Rabenhorst, 1868 |
|                | **Valonia macrophysa** Kützing, 1843 |
|                | **Amphiroa** spp. |
|                | **Botryocladia** sp. |
|                | **Dudresnaya verticillata** (Withering) Le Jolis, 1863 |
|                | **Ellisolandia elongata** (J. Ellis & Solander) K.R. Hind & G.W. Saunders, 2013 |
|                | **Encrusting Rhodophytes** |
|                | **Gloiocladia repens** (C. Agardh) Sánchez & Rodríguez-Prieto, 2007 |
|                | **Halopteris scoparia** (Linnaeus) Sauvageau, 1904 |
|                | **Jania rubens** (Linnaeus) J.V. Lamouroux, 1816 |
|                | **Jania virgata** (Zanardini) Montagne, 1846 |
|                | **Laurencia** spp. |
|                | **Peyssonnelia** spp. |
|                | **Tricleocarpa fragilis** (Linnaeus) Huisman & R.A. Townsend, 1993 |
|                | **Bryopsis, Cladophora** |
|                | **A. rigida** J.V. Lamouroux, 1816; A. cryptarthrodia Zanardini, 1844; A. beauvoisi J.V. Lamouroux, 1816 |
|                | **Lithophyllum, Lithothamnion, Neogoniolithon, Mesophyllum** |
|                | **L. obtusa** (Hudson) J.V. Lamouroux, 1813; L. microcladia Kützing, 1865; Chondrophycus sp.; P. rubra (Greville) J. Agardh, 1851; P. squamaria (S.G. Gmelin) Decaisne, 1842; P. rosamarina Boudouresque & Denizot, 1973 |
**Ochrophyta**

*Colpomenia sinuosa* (Mertens ex Roth) Derbès & Solier, 1851

*Cutleria* sp.

*Cystoseira compressa* (Esper) Gerloff & Nizamuddin, 1975

*Dictyopteris polypodioides* (A.P. De Candolle) J.V. Lamouroux, 1809

*Dictyota* spp.

*Discosporangium mesarthrocarpum* (Meneghini) Hauck, 1885

*Padina pavonica* (Linnaeus) Thivy, 1960

*Sargassum* sp.

**Porifera**

*Agelas oroides* (Schmidt, 1864)

*Aplysina aerophoba* (Nardo, 1833)

*Chondrosia reniformis* Nardo, 1847

*Cliona rhodensis* Rützler & Bromley, 1981

*Cliona schmidtii* (Ridley, 1881)

*Cliona viridis* (Schmidt, 1862)

*Crambe crambe* (Schmidt, 1862)

*Dysidea avara* (Schmidt, 1862)

*Hemimycale columnella* (Bowerbank, 1874)

*Ircinia variabilis* (Schmidt, 1862)

*Oscarella lobularis* (Schmidt, 1862)

*Petrosia (Petrosia) ficiformis* (Poiret, 1789)

*Phorbas fictitius* (Bowerbank, 1866)

*Sarcotragus spinulosus* Schmidt, 1862

*Scalarispongia scalaris* (Schmidt, 1862)

**Cnidaria**

*Balanophyllia (Balanophyllia) europaea* (Risso, 1826)

*Corallium cornucopiae* (Pallas, 1766)

*Hydroids*

*Leptopsammia pruvoti* Lacaze-Duthiers, 1897

**Annelida**

*Serpula vermicularis* Linnaeus, 1767

*Hydroides dianthus* (Verrill, 1873)

*Pomatoceros spirorbis*

**Mollusca**

*Rocellaria dubia* (Pennan, 1777)
| Kingdom       | Species                                                                 | Depth       |
|--------------|-------------------------------------------------------------------------|-------------|
| **Crustacea**| *Perforatus perforatus* (Bruguière, 1789)                                | 5 m depth   |
|              | *Chlidonia pyriformis* (Bertoloni, 1810)                                 | 5 m depth   |
|              | Encrusting Bryozoans                                                    | 5 m depth   |
|              | **Myriapora truncata** (Pallas, 1766)                                   | 15 m depth  |
|              | Nolella gigantea (Busk, 1856)                                           | 5 m depth   |
|              | **Smittina cervicornis** (Pallas, 1766)                                 | 15 m depth  |
|              | *Ascidia mentula* Müller, 1776                                          | 5 m depth   |
|              | *Ascidia* sp.                                                            | 5 m depth   |
|              | **Halocynthia papillosa** (Linnaeus, 1767)                               | 15 m depth  |
|              | Didemnidae                                                              | 5 m depth   |
|              | *Diplosoma listerianum* (Milne Edwards, 1841)                           | 5 m depth   |
|              | **Halocynthia papillosa** (Linnaeus, 1767)                               | 15 m depth  |
|              | Other                                                                    | Filamentous Algae |
|              | Filamentous Algae                                                       |             |
|              | Polysiphonia, Ceramium, Sphacelaria, Feldmannia, Hincksia                |             |

* = taxa found only at 5 m depth; ** = taxa found only at 15 m depth.
Appendix S2. Full list of functional traits.

The list of functional traits was compiled based on the framework proposed by Bremner et al. (2006, 2008), which identified 28 biological traits as key indicators of main ecosystem processes, properties and activities, including energy and elemental cycling (carbon, nitrogen, phosphorus, sulphur), silicon cycling, calcium carbonate cycling, food supply/export, productivity, habitat/shelter provision, temporal pattern (population variability, community resistance and resilience), propagule supply/export, adult immigration/emigration, and modification of physical processes. The processes of trait identification and selection integrated a recent reviews of biological and ecological species traits listing 42 traits defined specifically for benthic invertebrates (Costello et al. 2015).

Since our study focused on subtidal sessile assemblages on bedrock, traits that did not apply to this condition were not considered (e.g., bioturbation). Traits referring to physiography, hydrodynamic and tidal regimes, and biological zone of the benthic realm were also discarded, because the study exclusively concerned assemblages from open coast, exposed rocky reefs in the subtidal.

Traits that are difficult to quantify in the real world such as, for instance, the predictability of population dynamics, were excluded (Bremner et al. 2006). In some cases, multiple aspects where here condensed into a single trait; for example, information of growth form, shape, and habit was resumed into the single trait Body Complexity, accounting for both body shape and three-dimensional structure.

A total of 48 functional traits were selected (see Table A1). Information for each taxon recorded (see Appendix S1) and each functional trait was searched in the scientific literature, using the main search engines (i.e., Web of Science, Scopus, Google Scholar), and in several authoritative online databases (accessed in July 2018, see below for bibliographic and web references).

About 10% of organisms were identified only as genera, families or morphological groups. For genera and families, trait values were assigned based on information at these taxonomic levels, if available. In many cases the collection of destructive samples allowed the identification of intra-taxon species composition (see Appendix S1). Therefore, after checking intra-taxon similarity, it was possible to ascribe a common trait value for categorical and ordinal variables, whereas the average value was assigned for numeric variables. The same approach was used for morphological groups. When a common value could not be identified (i.e., when trait values largely differed among grouped species), ‘NA’ (not available) was inserted in the matrix. More generally, ‘NA’ was used also when no information was found on a given trait. For traits Biomass, Caloric content, and CaCO3 content, when data on the species was not available, trait values of a similar congeneric was used.
For six traits, data were found only for 1/3 taxa or less. These traits were not considered in the analysis of functional diversity due to the substantial lack of information. Also, nine traits were not included in the analysis (see Table A1) because all taxa accounted for the same value and, therefore, did not contribute to differences in functional diversity between depth or among islands.

Data for the 48 functional traits were provided in Appendix S3.
Table S1. Full list of selected functional traits. The 48 traits were grouped in seven categories involving key biological and ecological features referring to morphology, life cycles and growth, reproduction, dispersal and colonization, interactions with the environment, biological interactions, matter and energy flow. “Type” column indicates whether traits are expressed as a numeric, ordinal, or categorical variable. A short description of traits and the range of trait values is reported. The % of taxa for which functional trait values were available is also provided (“Data availability”). Traits considered in functional diversity analysis (33) are given in grey.

| Category               | Trait               | Description                                                                 | Type     | Values                                                                 | Notes | Data availability |
|------------------------|---------------------|-----------------------------------------------------------------------------|----------|------------------------------------------------------------------------|-------|-------------------|
| **Morphology**         | Body complexity     | Body shape and three-dimensional structure                                  | Ordinal  | 1 (Crustose, flat); 2 (Filamentous, tubular); 3 (globose, lobate); 4 (Shrub-like); 5 (Erect - coarsely branched); 6 (Erect - arborescent) | –     | 100%              |
| **Body size**          | Body size           | Dimension of the body/colony (cm)                                           | Ordinal  | 1 (1<); 2 (1-2); 3 (3-10); 4 (11-20); 5 (21-50); 6 (>50)              | –     | 100%              |
| **Flexibility**        | Flexibility         | Quality of bending without breaking (angle)                                 | Ordinal  | 1 (Rigid, <10°); 2 (Intermediate, >10° and <45°); 3 (Flexible, >45°)  | –     | 100%              |
| **Fragility**          | Fragility           | Likelihood to break as a result of physical impact                          | Ordinal  | 1 (Fragile); 2 (Intermediate); 3 (Robust)                              | –     | 100%              |
| **Life cycle and growth** | Growth form       | Individual or modular life form                                             | Categorical | S (Individual); M (Modular)                                      | –     | 100%             |
| **Life cycle**         | Life cycle          | Type of life cycle: haplontic (multicellular haploid stage, unicellular diploid stage), diplontic (the opposite of haplontic), or haplo-diplontic (presence of multicellular haploid and diploid stages) | Categorical | H (haplontic); D (diplontic); HD (haplo-diplontic)          | –     | 94%              |
| Developmental mechanism | Development of the organism through spores, planktotrophic larvae, or lecitotrophic larvae | Categorical | S (Spores); P (Planktotrophic); L (Lecithotrophic) | – | 91% |
|-------------------------|--------------------------------------------------------------------------------------------|-------------|-------------------------------------------------|---|---|
| Growth rate             | Rate of increasing in size (mm mo\(^{-1}\))                                                | Ordinal     | 1 (very slow: <0.1); 2 (slow: up to 1-2); 3 (moderate: up to 5); 4 (fast: up to 10); 5 (very fast: >10) | – | 87% |
| Life span               | Approximate duration of life (years)                                                      | Ordinal     | 1 (1 or less); 2 (few); 3 (10-30); 4 (>30)     | – | 91% |
| Reproductive type (sexual) | Type of sexual reproduction                                                                  | Categorical | H (Hermaphrodite/Monoecious); G (Gonochoristic/Dioecious) | – | 85% |
| Gamete type             | Morphology of male and female gametes                                                      | Categorical | I (Isogamous); A (Anisogamous); O (Oogamous)     | – | 91% |
| Reproductive season     | Range of months or season(s) for reproduction                                               | Categorical | Spring; Summer; Winter; Autumn; Combinations (e.g., Spring-Summer) | – | 61% |
| Reproductive strategy   | Type of life strategy encompassing a single (semelparous) or multiple (iteroparous) reproductive events during life | Categorical | S (Semelparous); I (Iteroparous)                | – | 90% |
| Generation time         | Time between two generations (years)                                                       | Ordinal     | 1 (<1); 2 (1); 3 (2-5); 4 (6-10); 5 (11-20); 6 (21-50); 7 (51-100); 8 (>100) | Insufficient information for most of taxa | 28% |
| Time to maturity        | Time to sexual maturity (years)                                                            | Ordinal     | 1 (<1); 2 (1); 3 (2-5); 4 (6-10); 5 (11-20); 6 (21-50); 7 (51-100); 8 (>100) | Insufficient information for most of taxa | 34% |
| **Fecundity** | **Size of eggs** | **Numeric** | **µm** | **Insufficient information for most of the taxa** | **27%** |
| **Fecundity-Number of eggs** | **Number of eggs** | **Numeric** | **Number of eggs** | **Insufficient information for most of the taxa** | **13%** |
| **Fertilization type** | **External or internal fertilization** | **Categorical** | **I (Internal); E (External)** | **All taxa have external fertilization** | **100%** |
| **Spatial distribution** | **Distribution range at basin scale (Mediterranean Sea)** | **Categorical** | **A (Central Mediterranean); B (Western and Central Mediterranean); C (Mediterranean basin-scale); D (Alien)** | **94%** |
| **Duration of larval stage (pelagic)** | **Time spent by larval stages in the water column before settlement (days)** | **Categorical** | **1 (<7); 2 (7-15); 3 (15-30); 4 (>30)** | **97%** |
| **Asexual reproduction** | **Presence or absence of any type of asexual reproduction** | **Categorical** | **Y (Present); N (Absent)** | **100%** |
| **Recruitment success** | **Rate of post-settlement survival** | **Numeric/Ordinal** | **Number or % of surviving recruits** | **Insufficient information for most of the taxa** | **0%** |
| **Migration** | **Ability to migrate** | **Ordinal** | **1 (Resident); 2 (Passive); 3 (Active)** | **All taxa are resident** | **100%** |
| **Mobility** | **Movement type** | **Categorical** | **S (Swimmer); C (Crawler); B (Burrower); D (Drifter); A (Attached)** | **All taxa are sessile (Attached)** | **100%** |
| **Regeneration potential** | **Potential of surviving after injury or damage through regeneration of lost tissues** | **Categorical** | **Y (Present); N (Absent)** | **All taxa have regeneration potential** | **100%** |
| **Dispersal potential (larval)** | Distance of larval dispersal | Ordinal | 1 (very low: <1 m); 2 (low: 10s m); 3 (medium: 100s m); 4 (high: 1000s m); 5 (very high: 10s km) | Insufficient information for most of the taxa | 30% |
| **Dispersal potential (adult)** | Distance of adult dispersal | Ordinal | 1 (very low: <1 m); 2 (low: 10s m); 3 (medium: 100s m); 4 (high: 1000s m); 5 (very high: 10s km) | None for all taxa (all are sessile) | 100% |
| **Living habit/environmental position** | Position with respect to the substrate | Categorical | ENDO (Endobenthic); EPI (Epibenthic) | – | 100% |
| **Strength of attachment to substrate** | Difficulty of being detached from the substrate | Ordinal | 1 (Low); 2 (Moderate); 3 (High) | – | 100% |
| **Min depth** | Approximate upper limit of depth distribution range (m) | Ordinal | 1 (0-2); 2 (3-5); 3 (5-15) | – | 96% |
| **Max depth** | Approximate lower limit of depth distribution range (m) | Ordinal | 1 (<15); 2 (15-50); 3 (50-100); 4 (100-200); 5 (>200) | – | 93% |
| **Min salinity** | Approximate lower limit of the salinity range | Numeric | PSU | – | 85% |
| **Max temperature** | Approximate upper limit of temperature range | Numeric | °C | – | 88% |
| **Max N** | Approximate upper limit of nitrogen range | Numeric | µmol/L | – | 79% |
| **Max P** | Approximate upper limit of phosphorous range | Numeric | µmol/L | – | 78% |
| Biological interactions | Min $O\%$ saturation | Degree of attachment to substrate | Substratum preferences | Sociability | Defence | Biogenic habitat provision | Scale of habitat provision | Food type/diet | Dependency |
|-------------------------|-----------------------|----------------------------------|------------------------|------------|--------|---------------------------|--------------------------|----------------|------------|
|                         | Approximate lower limit of oxygen saturation range | Quality of being permanently or temporary attached to the substrate | Type of typical substrate | Aptitude to live with conspecific or to form colonies | Presence of defence against predators, competitors | Quality of providing shelter or secondary substrate for other organisms | Persistence in providing shelter, secondary substrate or forming biogenic habitat | Type of food ingested | Presence of symbiotic interactions |
|                         | Numeric               | Categorical                      | Categorical            | Ordinal    | Categorical               | Ordinal                       | Ordinal                   | Categorical   | Categorical |
|                         | % $O_2$ saturation    | P (Permanently); T (Temporary)   | e.g., bedrock, sand, mud, boulders | 1 (Solitary); 2 (Gregarious); 3 (Colonial) | None; Physical; Chemical; Physical-chemical | 1 (None); 2 (Shelter); 3 (Substrate); 4 (Substrate + Shelter) | 1 (None); 2 (Ephemeral); 3 ( Moderate); 4 (Long-lasting) | Chemical uptake; Suspended matter (including living matter) | e.g., independent, parasitic, commensal, mutualistic |
|                         | –                     | All taxa are permanently attached | All taxa are typical of bedrock | –          | –                  | –              | –                  | –              | All taxa are independent |
|                         | 73%                   | 100%                             | 100%                   | 100%       | 85%                | 99%            | 100%            | 100%            | 100%        |
## Matter and energy flow

| **Feeding habit** | Strategy employed for food collection/production | Ordinal | 1 (Producer); 2 (Passive suspension feeder); 3 (Active suspension feeders); 4 (Predators) |
|-------------------|-------------------------------------------------|---------|-----------------------------------------------------------------|
| **Biomass**       | Biomass                                         | Numeric | g of dry weight per 100 g of fresh weight                       |
|                   |                                                 |         | –                                                               | 100% |
| **Caloric content** | Energy content of tissues                       | Numeric | KJ g\(^{-1}\) ash-free weight                                  |
|                   |                                                 |         | –                                                               | 99%  |
| **CaCO\(_3\) content** | Amount CaCO\(_3\) in tissues (% per g dry weight) | Ordinal | 1 (None/low: <30%); 2 (Intermediate: 30-60%); 3 (High: 60-80%); 4 (Very high: >80%) | 100% |
Reference for traits

Literature

Adl, S. M. et al. 2012. The Revised Classification of Eukaryotes. – *J. Eukaryot. Microbiol.* 59: 429–514.

Afonso-Carrillo, J. et al. 2006. *Botryocladia chiajeana* and *Botryocladia macaronesica* sp. nov. (Rhodymeniaceae. Rhodophyta) from the Mediterranean and the eastern Atlantic, with a discussion on the closely related genus *Irvinea*. – *Phycologia* 45: 277–292.

Airi, V. et al. 2014. Reproductive Efficiency of a Mediterranean Endemic Zooxanthellate Coral Decreases with Increasing Temperature along a Wide Latitudinal Gradient. – *PLoS ONE* 9: e91792.

Becerro, M. A. et al. 2003. Biogeography of sponge chemical ecology: comparisons of tropical and temperate defenses. – *Oecologia* 135: 91–101.

Becerro, M. A. and Turon, X. 1992. Reproductive Cycles of the Ascidians *Microcosmus sabatieri* and *Halocynthia papillosa* in the Northwestern Mediterranean. – *Mar. Ecol.* 13: 363–373.

Benita, M. et al. 2018. *Padina pavonica*: Morphology and Calcification Functions and Mechanism. – *Am. J. Plant Sci.* 9: 1156–1168.

Berger, S. and Liddle, L. B. 2003. The life cycle of *Acetabularia* (Dasycladales. Chlorophyta): textbook accounts are wrong. – *Phycologia.* 42: 204–207.

Betti, F. et al. 2011. Life history of *Cornularia cornucopiae* (Anthozoa: Octocorallia) on the Conero Promontory (North Adriatic Sea). – *Mar. Ecol.* 33: 49–55.

Bradbury, I. R. et al. 2008. Global patterns in marine dispersal estimates: the influence of geography, taxonomic category and life history. – *Proc. R. Soc. London B Biol. Sci.* 275: 1803–1809.

Brey, T. et al. 1988. Energy content of macrobenthic invertebrates: general conversion factors from weight to energy. – *J. Exp. Mar. Biol. Ecol.* – 117: 271–278.

Bürger, K. et al. 2017. Morphological changes with depth in the calcareous brown alga *Padina pavonica*. – *Bot. Mar.* 60: 171–180.

Cabioch, J. et al. 2006. Guide des Algues des mers d’Europe. – Delachaux & Niestle.

Casoli, E. et al. 2016. Impact and colonization dynamics of the bivalve *Rocellaria dubia* on limestone experimental panels in the submerged Roman city of Baiae (Naples. Italy). – *Int. Biodeter. Biodegr.* 108: 9–15.

Cebrián, E. et al. 2000. Shallow rocky bottom benthic assemblages as calcium carbonate producers in the Alboran Sea (southwestern Mediterranean). – *Oceanol. Acta.* 23: 311–322.
Chihara, M. 1974. The significance of reproductive and spore germination characteristics to the systematic of the corallinaceae: nonarticulated coralline algae. – *J. Phycol.* 10: 266–274.

Clayton, M. N. 1992. Propagules of marine macroalgae: Structure and Development. – *Br. Phycol. J.* 27: 219–232.

Corriero, M. M. et al. 2013. Sexual reproduction in *Sarcotragus spinosulus* from two different shallow environments. – *Mar. Ecol.* 34: 394–408.

Costantini, F. et al. 2018. Chasing genetic structure in coralligenous reef invertebrates: patterns, criticalities and conservation issues. – *Sci. Rep.* 8: 5844.

Crisp, D. J. and Bourget, E. 1985. Growth in Barnacles. – *Adv. Mar. Biol.* 22: 199–244.

Daniel, K. S. and Therriault, T. W. 2007. Biological synopsis of the invasive tunicate *Didemnum* sp. – *Can. Manuscr. Rep. Fish. Aquat. Sci.* 2788: 1–53.

de Caralt, S. et al. 2010. *In situ* aquaculture methods for *Dysidea avara* (Demospongiae, Porifera) in the Northwestern Mediterranean. – *Mar. Drugs.* – 8: 1731-1742.

Dethier, M. N. and Steneck, R. S. 2001. Growth and persistence of diverse intertidal crusts: survival of the slow in a fast-paced world. – *Mar. Ecol. Progr. Ser.* 223: 89–100.

Dumais, J. et al. 2000. *Acetabularia*: A Unicellular Model for Understanding Subcellular Localization and Morphogenesis during Development. – *J. Plant Growth Regul.* 19: 253–264.

Ereskovsky, A. et al. 2013. Pluriannual study of the reproduction of two Mediterranean *Oscarella* species (Porifera. Homoscleromorpha): cycle, sex-ratio, reproductive effort and phenology. – *Mar. Biol.* 160: 423–438.

Falace, A. et al. 2005. Morphological and reproductive phenology of *Cystoseira compressa* (Esper) Gerloff & Nizzamudin (Fucales: Fucophyceae) in the Gulf of Trieste (North Adriatic Sea). – *Ann. Ser. Hist. Nat.* 15: 71–78.

Ferretti, C. et al. 2009. Growth dynamics and bioactivity variation of the Mediterranean demosponges *Agelas ooides* (Agelasida, Agelasidae) and *Petrosia ficiformis* (Haplosclerida, Petrosiidae). – *Mar. Ecol.* 30: 327-336.

Garate, L. et al. 2016. Contrasting growth and survival of two cryptic sponge species sharing habitats in western Mediterranean. XIX Iberian Symposium on Marine Biology Studies. – *Front. Mar. Sci.* doi: 10.3389/conf.FMARS.2016.05.00170.

Garrabou, J. and Zabala, M. 2001. Growth Dynamics in Four Mediterranean Demosponges. – *Estuar. Coast. Shelf Sci.* 52: 293–303.

Geertz-Hansen, O. et al. 1994. Functional implications of the form of *Codium bursa*, a balloon-like Mediterranean macroalga. – *Mar. Ecol. Progr. Ser.* 108: 153–160.

Goffredo, S. et al. 2011. Sexual reproduction in the Mediterranean endemic orange coral *Astroides calycularis* (Scleractinia: Dendrophylliidae). – *Bull. Mar. Sci.* 87: 589–604.
Goffredo, S. et al. 2004. Growth and population dynamics model of the Mediterranean solitary coral *Balanophyllia europaea* (Scleractinia, Dendrophylliidae). – *Coral Reefs* 23: 433–443.

Grantham, B. A. et al. 2003. Dispersal potential of marine invertebrates in diverse habitats. – *Ecol. Appl.* 13: S108–S116.

Herbert, R. J. H. et al. 2003. Range extension and reproduction of the barnacle *Balanus perforatus* in the eastern English Channel. – *J. Mar. Biol. Assoc. U. K.* 83: 73–82.

Hereu, B. et al. 2008. Multiple controls of community structure and dynamics in a sublittoral marine environment. – *Ecology* 89: 3423–3435.

Hoyt, W. D. 1910. Alternation of Generations and Sexuality in *Dictyota dichotoma*. – *Bot. Gazette.* 49: 55–57.

Hughes, D. J. et al. 2007. Survivorship and tube growth of reef-building *Serpula vermicularis* (Polychaeta: Serpulidae) in two Scottish sea lochs. – *Aquat. Conserv.: Mar. Freshw. Ecosyst.* 18: 117–129.

Kinlan, B. P. et al. 2005. Propagule dispersal and the scales of marine community process. – *Divers. Distrib.* 11: 139–148.

Kinlan, B. P. and Gaines, S. D. 2003. Propagule dispersal in marine and terrestrial environments: a community perspective. – *Ecology* 84: 2007–2020.

Klein, J. and Verlaque, M. 2008. The *Caulerpa racemosa* invasion: A critical review. – *Mar. Pollut. Bull.* 56: 205–225.

Kupriyanova, E. K. et al. 2001. A review of life history in serpulimorph polychaetes: ecological and evolutionary perspectives. – *Oceanogr. Mar. Biol. Ann. Rev.* 39: 1–101.

Lamare, M. D. and Wing, S. R. 2001. Calorific content of New Zealand marine macrophytes. – *New Zeal. J. Mar. Freshw. Res.* 35: 335–341.

Lindsay, S. M. 2010. Frequency of injury and the ecology of regeneration in marine benthic invertebrates. – *Integr. Comp. Biol.* 50: 479–493.

Lombardi, C. et al. 2011. Effects of ocean acidification on growth, organic tissue and protein profile of the Mediterranean bryozoan *Myriapora truncata*. – *Mar. Ecol. Progr. Ser.* 13: 251–262.

Lombardi, C. et al. 2015. Morphological plasticity in a calcifying modular organism: evidence from an in situ transplant experiment in a natural CO2 vent system. – *R. Soc. Open Sci.* 2: 140413.

Maldonado, M. and Riesgo, A. 2009. Gametogenesis, embryogenesis, and larval features of the oviparous sponge *Petrosia ficiformis* (Haplosclerida, Demospongiae). – *Mar. Biol.* 156: 2181–2197.

Maldonado, M. et al. 2012. Ancient Animals, New Challenges: Developments in Sponge Research. – Springer Netherlands.
Martin, D. and Uriz, M. J. 1993. Chemical bioactivity of Mediterranean benthic organisms against embryos and larvae of marine invertebrates. – J. Exp. Mar. Biol. Ecol. 173: 11–27.

Nannini, M. et al. 2015. Effects of thermal stress on the growth of an intertidal population of *Ellisolambia elongata* (Rhodophyta) from N–W Mediterranean Sea. – Mar. Environ. Res. 112 (B): 11–19.

Neto, A. I. 2000. Observations on the Biology and Ecology of Selected Macroalgae from the Littoral of São Miguel (Azores). – Bot. Mar. 43: 483–498.

Nicol, W. L. and Reisman, H. M. 1976. Ecology of the Boring Sponge (*Cliona celata*) at Gardiner's Island, New York. – Chesapeake Sci. 17: 1–7.

Novaczek, I. et al. 1989. Thermal tolerance of *Stypocaulon scoparium* (Phaeophyta, Sphacelariales) from eastern and western shores of the North Atlantic Ocean. – Helgol. Meeresunters 43: 183–193.

Ostrovsky, A. N. 2014. Evolution of Sexual Reproduction in Marine Invertebrates. Example of gymnolaemate bryozoans. – Springer Netherlands.

Ozgun, S. and Turan, F. 2015. Biochemical composition of some brown algae from Iskenderun Bay, the northeastern Mediterranean coast of Turkey. – J. Black Sea/Medit. Environ. 21: 125–134.

Patarra, R. F. et al. 2017. Effects of light, temperature and stocking density on *Halopteris scoparia* growth. – J. Appl. Phycol. 29: 405–411.

Paul, N. A. et al. 2014. Comparative production and nutritional value of “sea grapes” – the tropical green seaweeds *Caulerpa lentillifera* and *C. racemosa*. – J. Appl. Phycol. 26: 1833–1844.

Pérez-Lópeza, P. D. et al. 2017. Life cycle assessment of in situ mariculture in the Mediterranean Sea for the production of bioactive compounds from the sponge *Sarcotragus spinosulus*. – J. Clean. Prod. 142: 4356–4368.

Pisuta, D. P. and Pawlik, J. R. 2002. Anti-predatory chemical defenses of ascidians: secondary metabolites or inorganic acids? – J. Exp. Mar. Biol. Ecol. 270: 203–214.

Portacci, G. et al. 2006. Il monitoraggio del benthos di Porto Cesareo (LE) (Mar Ionio): autoecologia e dinamica di popolazioni epibentoniche. – Biol. Mar. Medit. 13: 265–267.

Quintanilla, E. et al. 2013. Sexual reproductive cycle of the epibiotic soft coral *Alcyonium coralloides* (Octocorallia, Alcyonacea). – Aquat. Biol. 18: 113–124.

Ribes, M. et al. 1998. Seasonal variation of in situ feeding rates by the temperate ascidian *Halocynthia papillosa*. – Mar. Ecol. Progr. Ser. 175: 201–213.

Ricciardi, A. and Bourget, E. 1998. Weight-to-weight conversion factors for marine benthic macroinvertebrates. – Mar. Ecol. Progr. Ser. 163: 245–251.
Riesgo, A. et al. 2014. Inferring the ancestral sexuality and reproductive condition in sponges (Porifera). – Zool. Scripta 43: 101–117.

Rodríguez-Prieto, C. et al. 2007. Vegetative and reproductive morphology of Gloiocladia repens (C. Agardh) Sánchez et Rodríguez-Prieto comb. nov. (Rhodymeniales, Rhodophyta), with a taxonomic re-assessment of the genera Fauchea and Gloiocladia. – Eur. J. Phycol. 42: 145–162.

Rützler, K. and Bromley, R. G. 1981. Cliona rhodensis. New Species (Porifera: Hadromerida) from the Mediterranean. – Proc. Biol. Soc. Wash. 94: 1219–1225.

Sansón, M. et al. 2002. Sublittoral and Deep-Water Red and Brown Algae New from the Canary Islands. – Bot. Mar. 45: 35–49.

Sarà, M. 1974. Sexuality in the Porifera. – It. J. Zool. 41: 327–348.

Sartoni, G. and De Biasi, A. M. 1999. A survey of the marine algae of Milos Island, Greece. – Cryptogamie Algol. 20: 271–283.

Shanks, A. L. 2009. Pelagic Larval Duration and Dispersal Distance Revisited. – Biol. Bull. 216: 373–385.

Shanks, A. L. et al. 2003. Propagule dispersal distance and the size and spacing of marine reserves. – Ecol. Appl. 13: S159–S169.

Steimle, F. W. Jr. and Terranova, R. J. 1985. Energy Equivalents of Marine Organisms from the Continental Shelf of the Temperate Northwest Atlantic. – J. Northwest Atl. Fish. Sci. 6: 117–124.

Teixidó, N. et al. 2006. Demographic dynamics over long-term period of the coralligenous communities in the NW Mediterranean Sea. XIV Simposio Ibérico de Estudios de Biología Marina. Barcelona, 12-15 September.

Teixidó, N. et al. 2011. Low Dynamics, High Longevity and Persistence of Sessile Structural Species Dwelling on Mediterranean Coralligenous Outcrops. – PLoS ONE 6: e23744.

Teixidó, N. et al. 2009. Decadal demographic trends of a long-lived temperate encrusting sponge. – Mar. Ecol. Progr. Ser. 375: 113–124.

Terlizzi, A. et al. 2011. Detrimental physiological effects of the invasive alga Caulerpa racemosa on the Mediterranean white seabream Diplodus sargus. – Aquat. Biol. 12: 109–117.

Thoms, C. et al. 2004. Chemical defense of Mediterranean sponges Aplysina cavernicola and Aplysina aerophoba. – Z. Naturforsch. 59:113–22.

Toste, M. F. et al. 2003. Life history of Colpomenia Sinuosa (Scytosiphonaceae, Phaeophyceae) in the Azores. – J. Phycol. 39: 1268–1274.

Turon, X. et al. 2013. Lights and shadows: growth patterns in three sympatric and congeneric sponges (Ircinia spp.) with contrasting abundances of photosymbionts. – Mar. Biol. 160: 2743–2754.
Varela-Álvarez, E. et al. 2012. Mediterranean Species of *Caulerpa* Are Polyploid with Smaller Genomes in the Invasive Ones. – *PLoS ONE* **7**: e47728.

Vizetto-Duarte, C. et al. 2015. Fatty acid profile of different species of algae of the *Cystoseira* genus: a nutraceutical perspective. – *Nat. Prod. Res.* **29**: 1264–1270.

Vroom, P. S. et al. 2003. Field biology of *Halimeda tuna* (Bryopsidales, Chlorophyta) across a depth gradient: comparative growth, survivorship, recruitment, and reproduction. – *Hydrobiologia* **501**: 149–166.

**Websites**

http://macoi.ci.uc.pt (Portuguese seaweeds website, University of Coimbra, Portugal)

http://dryades.units.it (University of Trieste, Italy)

https://www.marlin.ac.uk/biotic (BIOTIC – Biological Traits Information Catalogue – The Marine Life Information Network. Marine Biological Association of the UK)

http://eol.org (The Encyclopedia of Life, Smithsonian Institution's National Museum of Natural History (USA) and other international partners)

http://www.marinexspecies.org (World Register of Marine Species – WoRMS Editorial Board, 2018. World Register of Marine Species. Available at VLIZ)

http://www.algaebase.org (Guiry, M. D. and Guiry, G.M. 2018. AlgaeBase. World-wide electronic publication. National University of Ireland, Galway)

https://www.sealifebase.ca (Palomares, M. L. D. and Pauly, D. 2018. SeaLifeBase. World Wide Web electronic publication)

http://www.habitas.org.uk (National Museums Northern Ireland)

https://species.nbnatlas.org (National Biodiversity Network. UK)

http://www.iobis.org (Ocean Biogeographic Information System – Intergovernmental Oceanographic Commission (IOC) of UNESCO and other international partners)
Appendix S3. Functional trait values for all taxa found in the study (see Appendix S1). Values are reported for all the 48 functional traits listed in Table S1 (Appendix S2). NA = not available/not found.

| Morphology | Life cycle and growth |
|------------|-----------------------|
|            | Body complexity | Body size | Flexibility | Fragility | Growth form | Life cycle | Developmental mechanism | Growth rate | Life span |
| Jania rubens | 6               | 3         | 2           | 1         | M           | HD         | S                | 5           | 1         |
| Acetabularia acetabulum | 2               | 3         | 3           | 1         | I           | D          | S                | 5           | 2         |
| Agelas oroides | 3               | 4         | 2           | 2         | M           | D          | L                | 4           | 3         |
| Amphipora | 6               | 3         | 1           | 1         | M           | HD         | S                | NA          | 2         |
| Anadyomene stellata | 4               | 2         | 3           | 1         | M           | D          | S                | 4           | 1         |
| Aplysina aerophoba | 5               | 5         | 2           | 2         | M           | D          | L                | 1           | 2         |
| Ascidia mentula | 3               | 3         | 2           | 2         | I           | D          | L                | NA          | 3         |
| Ascidia sp. 1 | 3               | 3         | 2           | 2         | I           | D          | L                | NA          | 3         |
| Perforatus perforatus | 3               | 2         | 1           | 3         | I           | D          | P                | 5           | 2         |
| Balanophylla (Balanophyllia) europaea | 3               | 3         | 1           | 2         | I           | D          | NA              | 1           | 3         |
| Botryocladia sp. | 3               | 2         | 2           | 1         | M           | HD         | S                | 4           | 2         |
| Caulerpa cylindracea | 5               | 6         | 3           | 1         | M           | H          | S                | 5           | 2         |
| Chidonia pyriformis | 2               | 1         | 2           | 1         | M           | D          | L                | NA          | NA        |
| Chondrosia reniformis | 3               | 5         | 2           | 2         | M           | D          | L                | 1           | 4         |
| Cliona schmidt | 1               | 3         | 1           | 1         | M           | D          | L                | 4           | 2         |
| Codium bursa | 3               | 4         | 2           | 3         | M           | D          | S                | 4           | 2         |
| Codium coralloides | 3               | 5         | 2           | 2         | M           | D          | S                | 4           | 2         |
| Colpomenia sinuosa | 3               | 4         | 2           | 1         | M           | HD         | S                | 4           | 1         |
| Ellisolandia elongata | 6               | 3         | 3           | 2         | M           | HD         | S                | 2           | 2         |
| Cutleria sp. | 1               | 3         | 1           | 1         | M           | HD         | S                | 4           | 1         |
| Cystoseira compressa | 6               | 5         | 3           | 3         | M           | D          | S                | 3           | 2         |
| Dasycladus vermicularis | 3               | 3         | 2           | 1         | M           | D          | S                | NA          | 1         |
| Latin Name                          | Value 1 | Value 2 | Value 3 | Value 4 | Value 5 | Value 6 |
|------------------------------------|---------|---------|---------|---------|---------|---------|
| Dictyopteris polypodioides         | 5       | 5       | 3       | 2       | M       | HD      |
| Dictyota spp.                      | 5       | 5       | 3       | 2       | M       | HD      |
| Didemnidae                         | 1       | 2       | 1       | 1       | M       | D       |
| Diplosoma listerianum              | 1       | 4       | 1       | 1       | M       | D       |
| Dudensnaya verticillata            | 6       | 3       | 3       | 1       | M       | HD      |
| Dysidea avara                      | 3       | 4       | 2       | 2       | M       | D       |
| Erect Bryozoans                    | 6       | 3       | 1       | 1       | M       | D       |
| Encrusting Rhodophytes             | 1       | 4       | 1       | 2       | M       | HD      |
| Encrusting Bryozoans               | 1       | 4       | 1       | 1       | M       | D       |
| Crambe crambe                      | 1       | 5       | 1       | 2       | M       | D       |
| Gloiocladia repens                 | 5       | 3       | 3       | 2       | M       | NA      |
| Filamentous Algae                  | 2       | 2       | 3       | 1       | M       | NA      |
| Discosporangium mesarthrocarpum    | 4       | 3       | 3       | 1       | M       | NA      |
| Flabellia petiolata                | 5       | 3       | 2       | 2       | M       | D       |
| Rocellaaria dubia                  | 3       | 2       | 1       | 1       | I       | D       |
| Green Filamentous Algae            | 2       | 2       | 2       | 1       | M       | D       |
| Cliona viridis                     | 1       | 4       | 1       | 1       | M       | D       |
| Halimeda tuna                      | 5       | 4       | 2       | 1       | M       | D       |
| Jania virgata                      | 6       | 3       | 2       | 1       | M       | HD      |
| Halocynthia papillosa              | 3       | 4       | 2       | 1       | M       | D       |
| Hemimycale columella               | 1       | 4       | 1       | 1       | M       | D       |
| Hydroids                           | 2       | 2       | 2       | 1       | M       | D       |
| Ircinia variabilis                 | 3       | 5       | 2       | 3       | M       | D       |
| Laurencia obtusa                   | 6       | 4       | 3       | 2       | M       | HD      |
| Leptopsammia pravoti               | 3       | 3       | 1       | 1       | I       | D       |
| Scalarispongia scalaris            | 3       | 5       | 2       | 3       | M       | D       |
| Miniacina miniacea                 | 3       | 1       | 1       | 1       | I       | HD      |
| Myriapora truncata                 | 5       | 3       | 1       | 1       | M       | D       |
| Species                        | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | S13 | S14 | S15 | S16 |
|-------------------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|
| Nolella gigantea              |  2 |  1 |  1 |  1 |    |    |    |    |    |     |     |     |     |     |     |     |
| Oscarella lobularis           |  3 |  4 |  2 |  1 |    |    |    |    |    |     |     |     |     |     |     |     |
| Padina pavonica               |  4 |  3 |  2 |  2 |    |    |    |    |    |     |     |     |     |     |     |     |
| Palmophyllum crassum          |  1 |  4 |  1 |  1 |    |    |    |    |    |     |     |     |     |     |     |     |
| Peyssonella (Petrosia) ficiformis |  3 |  5 |  1 |  3 |    |    |    |    |    |     |     |     |     |     |     |     |
| Cliona rhodensis              |  1 |  3 |  1 |  1 |    |    |    |    |    |     |     |     |     |     |     |     |
| Phorbas fictitius             |  1 |  4 |  1 |  1 |    |    |    |    |    |     |     |     |     |     |     |     |
| Sarcotragus spinosulus        |  6 |  6 |  3 |  2 |    |    |    |    |    |     |     |     |     |     |     |     |
| Sargassum sp.                 |  2 |  3 |  1 |  1 |    |    |    |    |    |     |     |     |     |     |     |     |
| Smittina cervicornis          |  5 |  3 |  1 |  1 |    |    |    |    |    |     |     |     |     |     |     |     |
| Cornularia cornucopiae        |  2 |  1 |  1 |  1 |    |    |    |    |    |     |     |     |     |     |     |     |
| Halopteris scoparia           |  6 |  4 |  3 |  2 |    |    |    |    |    |     |     |     |     |     |     |     |
| Tricleocarpa fragilis         |  5 |  3 |  2 |  1 |    |    |    |    |    |     |     |     |     |     |     |     |
| Valonia macrophysa            |  3 |  2 |  1 |  1 |    |    |    |    |    |     |     |     |     |     |     |     |
| Vermetidae                    |  2 |  3 |  1 |  2 |    |    |    |    |    |     |     |     |     |     |     |     |
| Species                              | Reproductive type | Gamete type | Fertilization type | Reproductive season | Reproductive strategy | Generation time | Time to maturity | Fecundity - Egg size | Fecundity - Number of eggs |
|--------------------------------------|-------------------|-------------|-------------------|---------------------|-----------------------|------------------|-------------------|----------------------|---------------------------|
| Jania rubens                        | G                 | O           | E                 | Spring-Summer       | S                     | 1                | 1                 | 20-90 µm             | NA                        |
| Acetabularia acetabulum              | H                 | I           | E                 | NA                  | I                     | NA              | 3                 | NA                   | NA                        |
| Agelas oroides                      | G                 | O           | E                 | NA                  | I                     | NA              | NA               | NA                   | NA                        |
| Amphiroa sp.                         | G                 | O           | E                 | Spring-Summer       | I                     | NA              | NA               | NA                   | NA                        |
| Anadyomene stellata                 | G                 | A           | E                 | NA                  | S                     | 1                | 1                 | NA                   | NA                        |
| Aplysina aerophoba                  | G                 | O           | E                 | NA                  | I                     | NA              | NA               | NA                   | NA                        |
| Ascidia mentula                     | H                 | O           | E                 | Spring-Summer       | I                     | NA              | NA               | 0.15 nm              | 6-8 mm³                    |
| Ascidia sp. 1                       | H                 | O           | E                 | Spring-Summer       | NA                    | NA              | NA               | NA                   | NA                        |
| Perforatus perforatus               | H                 | O           | E                 | Spring-Summer       | I                     | 1               | 1                 | 221 µm               | 100s to 1000s             |
| Balanophyllia (Balanophyllia) europaea | H             | O           | E                 | Summer-Winter       | I                     | NA              | 3                 | 400 µm               | 8-14 mm³                   |
| Botryocladia sp.                    | G                 | NA          | E                 | Summer              | I                     | NA              | NA               | NA                   | NA                        |
| Caulera cylindracea                 | H                 | I           | E                 | Summer              | I                     | NA              | NA               | NA                   | NA                        |
| Chidonia pyriformis                 | H                 | O           | E                 | NA                  | NA                    | NA              | NA               | NA                   | NA                        |
| Chondrosia reniformis               | G                 | O           | E                 | Summer              | I                     | NA              | NA               | NA                   | NA                        |
| Cliona schmidt                      | G                 | O           | E                 | Summer              | I                     | NA              | NA               | NA                   | NA                        |
| Codium bursa                        | G                 | A           | E                 | NA                  | I                     | NA              | NA               | NA                   | NA                        |
| Codium coralloides                  | G                 | A           | E                 | NA                  | I                     | NA              | NA               | NA                   | NA                        |
| Colpomenia sinuosa                  | G                 | A           | E                 | Spring              | S                     | 1               | 1                 | NA                   | NA                        |
| Ellisolandia elongata               | G                 | O           | E                 | Winter-Spring       | I                     | NA              | NA               | 20-90 µm             | NA                        |
| Cutleria sp.                        | G                 | A           | E                 | NA                  | S                     | 1               | 1                 | NA                   | NA                        |
| Cystoseira compressa                | G                 | O           | E                 | NA                  | I                     | NA              | NA               | 60-250 µm            | NA                        |
| Dasycladus vermicularis             | G                 | I           | E                 | NA                  | S                     | 1               | 1                 | NA                   | NA                        |
| Species                          | Habitat      | Stage            | Density | Size       | Abundance  |
|---------------------------------|--------------|------------------|---------|------------|------------|
| Dictyopteris polypodioides      | G O E        | Summer           | S       | 1          | 1          |
| Dictyota spp.                   | G O E        | Summer           | S       | 1          | 1          |
| Didemnidae                      | H O E        | Spring-Summer    | S       | NA         | 2          |
| Diplosoma listerianum           | H O E        | Summer-Autumn    | S       | 1          | 1          |
| Dudresnaya verticillata         | G O E        | Spring-Summer    | S       | 1          | 1          |
| Dysidea avara                   | H O E        | Summer           | I       | NA         | NA         |
| Erect Bryozoans                 | NA O E       | Summer-Autumn    | S       | 1          | 1          |
| Encrusting Rhodophytes          | G O E        | Spring-Summer    | S       | NA         | NA         |
| Encrusting Bryozoans            | H O E        | Summer           | I       | NA         | NA         |
| Crambe crambe                   | H O E        | Summer           | I       | NA         | NA         |
| Gloioclada repens               | H NA E       | Summer-Autumn    | NA      | NA         | NA         |
| Filamentous Algae               | NA NA E      | NA               | NA      | S          | 1          |
| Discosporangium mesarthrocarpum | NA NA E      | NA               | NA      | S          | 1          |
| Flabellia petioluta             | G A E        | NA               | I       | NA         | NA         |
| Roccellaria dubia               | NA O E       | NA               | I       | NA         | NA         |
| Green Filamentous Algae         | G A E        | NA               | S       | 1          | 1          |
| Cliona viridis                  | H O E        | Summer           | I       | NA         | NA         |
| Halimeda tuna                   | G A E        | Summer-Autumn    | S       | 1          | NA         |
| Jania virgata                   | G O E        | Spring-Summer    | S       | 1          | 1          |
| Halocynthia papillosa           | H O E        | Summer-Autumn    | I       | NA         | NA         |
| Hemimycale columella            | H O E        | Summer           | I       | NA         | NA         |
| Hydroids                        | G O E        | NA               | I       | NA         | NA         |
| Ircinia variabilis              | H O E        | Spring-Summer    | I       | NA         | NA         |
| Laurencia obtusa                | G O E        | NA               | S       | 1          | NA         |
| Leptopsammia privati            | G O E        | Summer           | I       | NA         | NA         |
| Scalarispongia scalaris         | G O E        | Summer           | I       | NA         | NA         |
| Miniacina miniacea              | NA I E       | NA               | I       | NA         | NA         |
| Myriapora truncata              | G O E        | Spring           | NA      | NA         | NA         |
| Species                     | HW | OD | ED | Season       | Size | Notes          |
|-----------------------------|----|----|----|--------------|------|----------------|
| Nolella gigantea            | NA | O  | E  | NA           | NA   | NA             |
| Oscarella lobularis         | H  | O  | E  | Spring-Summer| I    | NA 150 µm      |
| Padina pavonica             | H  | O  | E  | Spring-Summer| S    | 1 180 µm       |
| Palmophyllum crassum        | NA | NA | E  | NA           | I    | NA            |
| Petrosia (Petrosia) ficiformis | G | O  | E  | Spring-Summer| I    | NA 200 µm 4 mm³|
| Peyssonella spp.            | H  | O  | E  | NA           | I    | NA            |
| Cliona rhodensis            | H  | O  | E  | Summer       | I    | NA            |
| Phorbas fictitious          | NA | O  | E  | NA           | NA   | NA            |
| Sarcotragus spinosulus      | H  | O  | E  | Summer       | I    | NA 60-250 µm  |
| Sargassum sp.               | H  | O  | E  | Summer       | I    | NA            |
| Serpulidae                  | H  | O  | E  | Spring-Summer| I    | 1 40-230 µm    |
| Smittina cervicornis        | H  | O  | E  | NA           | I    | NA            |
| Cornularia cornucopiae      | NA | O  | E  | Spring-Summer| NA   | NA            |
| Halopteris scoparia         | H  | O  | E  | Autumn-Winter| I    | NA            |
| Tricleocarpa fragilis       | G  | O  | E  | NA           | S    | NA            |
| Valonia macrophysa          | NA | NA | E  | Spring-Summer| S    | NA            |
| Vermetidae                  | G  | O  | E  | Spring-Summer| I    | NA            |
Appendix S3. (continued).

| Species                          | Spatial distribution | Duration of larval stage | Asexual reproduction | Recruitment success | Migration | Mobility | Regeneration potential | Dispersal potential (larval) | Dispersal potential (adult) |
|----------------------------------|----------------------|--------------------------|----------------------|---------------------|-----------|----------|------------------------|----------------------------|---------------------------|
| Jania rubens                    | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Acetabularia acetabulum          | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Agelas oroides                  | C                    | 2                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Amphiroa spp.                   | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Anadyomene stellata             | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Aplysina aerophoba              | C                    | 2                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Ascidia mentula                 | C                    | 2                        | N                    | NA                  | 1         | A        | Y                      | 4                          | 1                         |
| Ascidia sp. 1                   | NA                   | NA                       | N                    | NA                  | 1         | A        | Y                      | 4                          | 1                         |
| Perforatus perforatus           | C                    | 2                        | N                    | NA                  | 1         | A        | Y                      | 5                          | 1                         |
| Balanophyllia (Balanophyllia) europaea | C  | 4                        | N                    | NA                  | 1         | A        | Y                      | 5                          | 1                         |
| Botryocladia sp.                | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Caulerpa cylindracea            | D                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Chlidonia pyriformis            | B                    | 2                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Chondrosia reniformis           | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | 5                          | 1                         |
| Cliona schmidtii                | C                    | 2                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Codium bursa                    | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | 4                          | 1                         |
| Codium coralloides              | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | 4                          | 1                         |
| Colpomenia sinuosa              | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | 2                          | 1                         |
| Ellisolandia elongata           | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Cutleria sp.                    | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Cystoseira compressa            | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Dasycladus vermicularis         | C                    | 1                        | Y                    | NA                  | 1         | A        | Y                      | NA                         | 1                         |
| Species                        | Region | Y | NA | A | Y | NA | 1 |
|-------------------------------|--------|---|----|---|----|----|---|
| Dictyopteris polypodioides    | C      | 1 | Y  | NA| 1  | A  | Y | NA| 1 |
| Dictyota spp.                 | C      | 1 | Y  | NA| 1  | A  | Y | NA| 1 |
| Didemnidae                    | C      | 1 | Y  | NA| 1  | A  | Y | NA| 1 |
| Diplosoma listerianum         | A      | 3 | Y  | NA| 1  | A  | Y | NA| 1 |
| Didrasnaya verticillata       | C      | 1 | Y  | NA| 1  | A  | Y | NA| 1 |
| Dysidea avara                 | C      | 2 | Y  | NA| 1  | A  | Y | NA| 1 |
| Erect Bryozoans               | B      | 2 | Y  | NA| 1  | A  | Y | 3 | 1 |
| Encrusting Rhodophytes        | C      | 1 | Y  | NA| 1  | A  | Y | 3 | 1 |
| Encrusting Bryozoans          | B      | 2 | Y  | NA| 1  | A  | Y | NA| 1 |
| Crambe crambe                 | C      | 1 | Y  | NA| 1  | A  | Y | 5 | 1 |
| Gloiocladia repens            | C      | 1 | Y  | NA| 1  | A  | Y | NA| 1 |
| Filamentous Algae             | NA     | 1 | Y  | NA| 1  | A  | Y | 5 | 1 |
| Discosporangium mesarthrocarpum| C    | 1 | Y  | NA| 1  | A  | Y | NA| 1 |
| Flabellia petiolata           | C      | 1 | Y  | NA| 1  | A  | Y | NA| 1 |
| Roccellaria dubia             | C      | 2 | N  | NA| 1  | A  | Y | NA| 1 |
| Green Filamentous Algae       | C      | 1 | Y  | NA| 1  | A  | Y | NA| 1 |
| Cliona viridis                | C      | 2 | Y  | NA| 1  | A  | Y | NA| 1 |
| Halimeda tuna                 | C      | 1 | Y  | NA| 1  | A  | Y | NA| 1 |
| Jania virgata                 | C      | 1 | Y  | NA| 1  | A  | Y | NA| 1 |
| Halocynthia papillosa         | C      | 2 | Y  | NA| 1  | A  | Y | 4 | 1 |
| Hemimycale columella          | A      | 2 | Y  | NA| 1  | A  | Y | NA| 1 |
| Hydroids                      | NA     | 3 | Y  | NA| 1  | A  | Y | NA| 1 |
| Ircinia variabilis            | C      | 1 | Y  | NA| 1  | A  | Y | 5 | 1 |
| Laurencia obtusa              | C      | 1 | Y  | NA| 1  | A  | Y | NA| 1 |
| Leptopsamnia pruvoti          | B      | 4 | Y  | NA| 1  | A  | Y | 4 | 1 |
| Scalarispongia scalaris       | NA     | 2 | Y  | NA| 1  | A  | Y | NA| 1 |
| Miniacina miniacea            | C      | NA | Y  | NA| 1  | A  | Y | NA| 1 |
| Species                      | Column 1 | Column 2 | Column 3 | Column 4 | Column 5 | Column 6 | Column 7 | Column 8 |
|------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Myriapora truncata           | B        | 2        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Nolella gigantea             | B        | 2        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Oscarea lobularis            | C        | 2        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Padina pavonica              | C        | 1        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Palmophyllum crassum         | C        | 2        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Petrosia (Petrosia) ficiformis| C      | 1        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Peyssonellia spp.            | C        | 1        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Cliona rhodensis             | B        | 2        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Phorbas fictitius            | C        | 1        | Y        | NA       | 1        | A        | Y        | 2        | 1       |
| Sarcotragus spinosulus       | C        | 2        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Sargassum sp.                | C        | 3        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Serpulidae                   | C        | 3        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Smitina cervicornis          | B        | 2        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Cornularia cornucopiae       | C        | 3        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Halopteris scoparia          | C        | 1        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Tricleocarpa fragilis        | C        | 1        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Valonia macrophysa           | C        | 1        | Y        | NA       | 1        | A        | Y        | NA       | 1       |
| Vermetidae                   | C        | 3        | N        | NA       | 1        | A        | Y        | 2        | 1       |
## Appendix S3. (continued).

| Species                        | Living habit - environmental position | Substrate preference | Degree of attachment to substrate | Strength of attachment to substrate | Min depth | Max depth | Min salinity | Max Temperature | Max N | Max P | Min O% saturation |
|--------------------------------|---------------------------------------|----------------------|-----------------------------------|-------------------------------------|-----------|-----------|--------------|-----------------|-------|-------|-------------------|
| Jania rubens                  | EPI                                   | Bedrock              | P                                 | 1                                   | 1         | 50        | 38.0         | 26.0            | 1.69  | 0.23  | 97.4               |
| Acetabularia acetabulum        | EPI                                   | Bedrock              | P                                 | 1                                   | 1         | 10        | 38.0         | 17.0            | 1.69  | 0.23  | 97.4               |
| Agelas oroides                | EPI                                   | Bedrock              | P                                 | 3                                   | 3         | 40        | 37.9         | 17.0            | 0.54  | 0.13  | 99.49              |
| Amphiroa spp.                 | EPI                                   | Bedrock              | P                                 | 3                                   | 1         | 40        | 37.1         | 26.0            | 0.70  | 0.11  | 103.8              |
| Anadyomene stellata           | EPI                                   | Bedrock              | P                                 | 2                                   | 2         | 30        | 35.7         | 27.0            | 5.24  | 0.50  | 85.85              |
| Aplysina aerophoba            | EPI                                   | Bedrock              | P                                 | 3                                   | 1         | 130       | 35.0         | 27.5            | NA    | NA    | NA                 |
| Ascidia mentula               | EPI                                   | Bedrock              | P                                 | 2                                   | 2         | 200       | 20.0         | 28.0            | 0.12  | 0.65  | 94.5               |
| Ascidia sp. 1                 | EPI                                   | Bedrock              | P                                 | 2                                   | NA       | NA        | NA           | NA              | NA    | NA    | NA                 |
| Perforatus perforatus         | EPI                                   | Bedrock              | P                                 | 3                                   | 1         | 20        | NA           | NA              | NA    | NA    | NA                 |
| Balanophyllia (Balanophyllia) europaea | EPI                                   | Bedrock              | P                                 | 3                                   | 1         | 100       | NA           | 27.0            | 0.28  | NA    | NA                 |
| Botryocladia sp.              | EPI                                   | Bedrock              | P                                 | 1                                   | 1         | NA        | 34.3         | 28.7            | 5.24  | 0.50  | 85.9               |
| Caulerpa cylindracea          | EPI                                   | Bedrock              | P                                 | 2                                   | 1         | 70        | 34.4         | 29.0            | 2.38  | 0.31  | 87.7               |
| Chlidonaria pyriformis        | EPI                                   | Bedrock              | P                                 | 1                                   | 2         | 70        | 35.2         | 25.7            | 0.86  | 0.13  | 97.19              |
| Chondrosia reniformis         | EPI                                   | Bedrock              | P                                 | 3                                   | 2         | 80        | 36.0         | 24.0            | 4.13  | 0.28  | 79.9               |
| Cliona schmidtii             | ENDO                                  | Bedrock              | P                                 | 3                                   | 2         | 80        | 36.3         | 26.0            | 4.13  | 0.28  | 79.9               |
| Codium bursa                  | EPI                                   | Bedrock              | P                                 | 2                                   | 2         | 30        | 37.9         | 17.4            | 1.69  | 0.23  | 97.4               |
| Codium coralloides           | EPI                                   | Bedrock              | P                                 | 2                                   | 2         | NA        | NA           | NA              | NA    | NA    | NA                 |
| Colpomenia sinuosa           | EPI                                   | Bedrock              | P                                 | 1                                   | 1         | 40        | 34.9         | 26.4            | 5.11  | 0.71  | 99.6               |
| Ellisolandia elongata         | EPI                                   | Bedrock              | P                                 | 3                                   | 1         | 20        | 38.0         | 17.4            | 1.42  | 0.18  | 101.0              |
| Cutleria sp.                 | EPI                                   | Bedrock              | P                                 | 3                                   | 2         | 30        | 38.2         | 16.3            | 7.12  | 0.45  | 102.0              |
| Cystoseira compressa         | EPI                                   | Bedrock              | P                                 | 3                                   | 1         | 20        | 38.0         | 17.0            | 1.42  | 0.18  | 101.0              |
| Dasycladus vermicularis       | EPI                                   | Bedrock              | P                                 | 2                                   | 2         | 100       | 37.1         | 26.0            | 0.99  | 0.18  | 99.9               |
| Dictyopteris polypodioides    | EPI                                   | Bedrock              | P                                 | 2                                   | 1         | 40        | 35.0         | 25.3            | 7.25  | 0.50  | 99.7               |
| Species                        | Growth Form/Depth | Environment     | Width | Height | Calculated Red | Calculated Green | % Red | % Green |
|-------------------------------|-------------------|-----------------|-------|--------|----------------|------------------|------|--------|
| Dictyota spp.                 | EPI Bedrock P     | 2 1 40          | 35.0  | 26.0   | 7.25 0.50      | 97.4             |
| Didemnidae                    | EPI Bedrock P     | 2 1 20          | 35.0  | 25.0   | NA NA NA       | 88.7             |
| Diplosoma listerianum         | EPI Bedrock P     | 1 1 20          | 35.2  | 27.7   | 6.73 1.17      | 100.0            |
| Dudresnaya verticillata       | EPI Bedrock P     | 3 2 50          | 35.5  | 15.7   | 1.33 0.25      | 99.1             |
| Dysidea avara                 | EPI Bedrock P     | 2 1 >200        | 34.9  | 27.0   | 2.79 1.52      | 71.1             |
| Erect Bryozoans               | EPI Bedrock P     | 2 2 30          | 38.0  | 17.0   | 1.69 0.23      | 97.4             |
| Green Filamentous Algae       | EPI Bedrock P     | 1 NA NA NA      | 37.5  | 17.5   | NA NA NA       | 102.6            |
| Discosporangium mesarthrocarpum| EPI Bedrock P     | 1 2 70          | NA    | NA     | NA NA NA       | NA               |
| Flabellia petiolata           | EPI Bedrock P     | 1 1 30          | 37.9  | 17.4   | 1.42 0.18      | 98.3             |
| Rocellaria dubia              | ENDO Bedrock P    | 1 1 40          | NA    | 14.0   | 7.49 0.54      | 98.5             |
| Green Filamentous Algae       | EPI Bedrock P     | 1 1 90          | 34.4  | 28.9   | 7.42 1.03      | 102.6            |
| Clypeaster hirsutus            | ENDO Bedrock P    | 1 1 60          | 37.0  | 26.4   | 1.42 0.18      | 99.5             |
| Halimeda tuna                 | EPI Bedrock P     | 1 1 20          | 37.9  | 17.1   | 0.21 0.13      | 102.6            |
| Halocynthia papillosa         | EPI Bedrock P     | 1 2 100         | 37.9  | NA     | 1.69 0.23      | 97.4             |
| Hemimycale columella          | EPI Bedrock P     | 2 1 50          | 35.4  | 12.0   | 8.32 0.63      | 97.0             |
| Hydroids                      | EPI Bedrock P     | 1 NA NA NA      | 37.9  | 17.1   | NA NA NA       | NA               |
| Ircinia variabilis            | EPI Bedrock P     | 3 1 >200        | 37.9  | 24.3   | 3.96 0.21      | 98.7             |
| Laurencia obtusa              | EPI Bedrock P     | 2 1 30          | 38.0  | 26.4   | 1.42 0.18      | 103.8            |
| Leptopsammia pruvoti          | EPI Bedrock P     | 1 3 >200        | 38.4  | 17.3   | 2.72 0.12      | 99.5             |
| Scalarispongia scalaris       | EPI Bedrock P     | 3 1 70          | 37.7  | 16.3   | 1.05 0.22      | 101.1            |
| Miniacina miniacea            | EPI Bedrock P     | 1 1 200         | 34.7  | 28.9   | 0.83 0.36      | 94.0             |
| Myriapora truncata            | EPI Bedrock P     | 2 2 >200        | 37.5  | 20.0   | NA NA NA       | NA               |
| Nolella gigantea              | EPI Bedrock P     | 1 3 200         | 38.4  | 15.7   | 0.87 0.13      | 94.7             |
| Species                          | Distribution | Substrate | Size | Width | Height | Density | Height | Weight | Score |
|---------------------------------|--------------|-----------|------|-------|--------|---------|--------|--------|-------|
| Oscarella lobularis             | EPI          | Bedrock   | P    | 2     | 1      | 40      | 35.0   | 16.0   | 7.49  | 0.54  | 97.3  |
| Padina pavonica                 | EPI          | Bedrock   | P    | 1     | 1      | 40      | 34.4   | 28.5   | 2.38  | 0.31  | 97.4  |
| Palmophyllum crassum            | EPI          | Bedrock   | P    | 2     | 2      | 130     | 36.4   | 26.1   | 3.80  | 0.34  | 91.2  |
| Petrosia (Petrosia) ficiformis  | EPI          | Bedrock   | P    | 3     | 2      | 80      | 36.3   | 23.3   | 3.01  | 0.23  | 94.4  |
| Peyssonnelia spp.               | EPI          | Bedrock   | P    | 3     | 2      | 60      | 35.4   | 24.4   | 2.38  | 0.31  | 87.7  |
| Cliona rhodensis                | ENDO         | Bedrock   | P    | 2     | 1      | 20      | 36.1   | 23.7   | 1.69  | 0.23  | 98.5  |
| Phorbas fictitius               | EPI          | Bedrock   | P    | 2     | 1      | 40      | 32.8   | 27.8   | 7.25  | 0.50  | 99.7  |
| Sarcotragus spinosulus          | EPI          | Bedrock   | P    | 3     | 3      | >200    | 37.8   | 17.1   | 3.92  | 0.21  | 91.3  |
| Sargassum sp.                   | EPI          | Bedrock   | P    | 2     | 1      | 30      | NA     | 25.6   | NA    | NA    | NA    |
| Serpulidae                      | EPI          | Bedrock   | P    | 3     | 1      | >200    | 34.2   | 23.7   | 13.30 | 0.92  | 89.0  |
| Smittina cervicornis            | EPI          | Bedrock   | P    | 2     | 1      | 120     | 35.0   | 25.0   | NA    | NA    | NA    |
| Cornularia cornucopiae          | EPI          | Bedrock   | P    | 1     | 2      | 20      | NA     | NA     | NA    | NA    | NA    |
| Halopteris scoparia             | EPI          | Bedrock   | P    | 3     | 1      | 20      | 38.0   | 30.0   | 1.42  | 0.18  | 101.0 |
| Tricleocarpa fragilis           | EPI          | Bedrock   | P    | 2     | 1      | 100     | 32.5   | 27.2   | NA    | NA    | NA    |
| Valonia macrophysa              | EPI          | Bedrock   | P    | 1     | 1      | 110     | 35.2   | 26.9   | 2.09  | 0.22  | 94.3  |
| Vermetidae                      | EPI          | Bedrock   | P    | 3     | 1      | >200    | 35.4   | 23.3   | 18.20 | 1.24  | NA    |
| Biological interactions | Matter and energy flow |
|-------------------------|------------------------|
| Sociability | Dependency | Defence | Biogenic habitat provision | Scale of habitat provision | Food type/diet | Feeding habit | Biomass | Caloric content | CaCO₃ content |
| Jania rubens | 1 | Independent | None | 2 | 2 | Chemical uptake | 1 | 25 | 17.0 | 2 |
| Acetabularia acetabulum | 1 | Independent | None | 1 | 1 | Chemical uptake | 1 | 25 | 16.9 | 1 |
| Agelas oroides | 3 | Independent | Chemical | 2 | 3 | Suspended matter | 3 | 17 | 22.5 | 1 |
| Amphiroa spp. | 1 | Independent | Physical | 1 | 1 | Chemical uptake | 1 | 25 | 17.0 | 2 |
| Anadyomene stellata | 1 | Independent | None | 1 | 1 | Chemical uptake | 1 | 25 | 16.9 | 1 |
| Aplysina aerophoba | 3 | Independent | Chemical | 2 | 3 | Suspended matter | 3 | 17 | 22.5 | 1 |
| Ascidia mentula | 1 | Independent | NA | 2 | 1 | Suspended matter | 3 | 6 | 21.6 | 1 |
| Ascidia sp. 1 | 1 | Independent | NA | 2 | 1 | Suspended matter | 3 | 6 | 21.6 | 1 |
| Perforatus perforatus | 2 | Independent | Physical | 1 | 1 | Suspended matter | 3 | 7 | 22.7 | 3 |
| Balanophyllia (Balanophyllia) europaea | 1 | Independent | Chemical | 3 | 4 | Suspended matter | 4 | 14 | 16.1 | 4 |
| Botryocladia sp. | 1 | Independent | None | 1 | 1 | Chemical uptake | 1 | 25 | 17.0 | 1 |
| Caulerpa cylindracea | 3 | Independent | Chemical | 1 | 1 | Chemical uptake | 1 | 21 | 9.2 | 1 |
| Chilone pyriforis | 3 | Independent | None | 1 | 1 | Suspended matter | 3 | NA | 21.6 | 3 |
| Chondrosia reniformis | 3 | Independent | None | 2 | 3 | Suspended matter | 3 | 17 | 22.5 | 1 |
| Cliona schmidti | 3 | Independent | Physical | 1 | 1 | Suspended matter | 3 | 17 | 22.5 | 1 |
| Codium bursa | 1 | Independent | None | 3 | 1 | Chemical uptake | 1 | 25 | 16.0 | 1 |
| Codium coralloides | 1 | Independent | None | 1 | 1 | Chemical uptake | 1 | 25 | 16.0 | 1 |
| Colpomenia sinuosa | 1 | Independent | None | 1 | 1 | Chemical uptake | 1 | 25 | 17.6 | 1 |
| Ellisolamia elongata | 1 | Independent | Physical-chemical | 2 | 1 | Chemical uptake | 1 | 25 | 20.8 | 2 |
| Cutleria sp. | 1 | Independent | None | 1 | 1 | Chemical uptake | 1 | 25 | 17.6 | 1 |
| Cystoseira compressa | 1 | Independent | None | 4 | 4 | Chemical uptake | 1 | 25 | 18.9 | 1 |
| Dasycladus vermicularis | 1 | Independent | None | 2 | 2 | Chemical uptake | 1 | 25 | 16.9 | 1 |
| Dictyopteris polyiodioides | 1 | Independent | None | 4 | 3 | Chemical uptake | 1 | 25 | 17.6 | 1 |
| Species                      | Design          | Source       | Method          | Component          | Tolerance | Tolerance | Tolerance | Tolerance | Tolerance | Tolerance |
|------------------------------|-----------------|--------------|-----------------|-------------------|------------|-----------|-----------|-----------|-----------|-----------|
| Dictyota spp.                | 1 Independent   | None         | 2 Chemical uptake | 1 2 Chemical uptake | 1 25 17.6 1
| Didemnidae                   | 3 Independent   | Chemical     | 1 1 Suspended matter | 3 6 21.6 1
| Diplosoma listerianum       | 3 Independent   | Chemical     | 1 1 Suspended matter | 3 6 21.6 1
| Dudresnaya verticillata     | 1 Independent   | None         | 2 2 Chemical uptake | 1 25 17.0 1
| Dysidea avara               | 3 Independent   | Chemical     | 2 3 Suspended matter | 3 17 22.5 1
| Erect Bryozoans             | 3 Independent   | NA           | 2 2 Suspended matter | 3 18 21.6 3
| Encrusting Rhodophytes      | 3 Independent   | Physical     | 3 4 Chemical uptake | 1 52 17.0 1
| Encrusting Bryozoans        | 3 Independent   | NA           | 1 1 Suspended matter | 3 18 21.6 3
| Crambe crambe               | 3 Independent   | Chemical     | 2 1 Suspended matter | 3 17 22.5 1
| Gloiocladia repens          | 1 Independent   | None         | 1 1 Chemical uptake | 1 25 17.0 1
| Filamentous Algae           | 1 Independent   | None         | 1 1 Chemical uptake | 1 25 17.0 1
| Discosporangium mesarthocarpum | 1 Independent   | None         | 2 2 Chemical uptake | 1 25 17.6 1
| Filabellia petiolata        | 1 Independent   | None         | 2 2 Chemical uptake | 1 25 16.9 1
| Rocellaria dubia            | 1 Independent   | Physical     | 1 1 Suspended matter | 3 9 22.6 4
| Green Filamentous Algae     | 1 Independent   | None         | 1 1 Chemical uptake | 1 25 17.8 1
| Cliona viridis              | 3 Independent   | Physical     | 1 1 Suspended matter | 3 17 22.5 1
| Halimeda tuna               | 1 Independent   | None         | 4 3 Chemical uptake | 1 25 16.9 2
| Jania virgata               | 1 Independent   | None         | 2 2 Chemical uptake | 1 25 17.0 2
| Halocynthia papillosa       | 1 Independent   | NA           | 2 1 Suspended matter | 3 6 21.6 1
| Hemimycale columella        | 3 Independent   | Chemical     | 1 1 Suspended matter | 3 17 22.5 1
| Hydroids                    | 3 Independent   | Chemical     | 1 1 Suspended matter | 4 NA 20.6 1
| Ircinia variabilis          | 3 Independent   | Chemical     | 2 3 Suspended matter | 3 17 22.5 1
| Laurencia obtusa            | 1 Independent   | None         | 4 3 Chemical uptake | 1 25 17.0 1
| Leptopsammia pruvoti       | 1 Independent   | Chemical     | 1 1 Suspended matter | 4 14 16.1 4
| Scalarispongia scalaris     | 3 Independent   | NA           | 2 3 Suspended matter | 3 17 22.5 1
| Minicula miniacea           | 3 Independent   | None         | 1 1 Suspended matter | 2 1 NA 3
| Myriapora truncata          | 3 Independent   | Physical-chemical | 2 3 Suspended matter | 3 18 21.6 3
| Nolella gigantea            | 3 Independent   | NA           | 1 1 Suspended matter | 3 18 21.6 3

- **Design**: 1 Independent, 3 Independent
- **Source**: None, Chemical
- **Method**: Chemical uptake, Suspended matter
- **Component**: Chemical, Suspended matter
- **Tolerance**: 17.6, 21.6
| Taxon                                      | Impact | Type       | Impact Type | Stress Cause | Chemistry | Suspension | N | Temperature | P1 | P2 | P3 | P4 |
|-------------------------------------------|--------|------------|-------------|---------------|-----------|------------|---|-------------|----|----|----|----|
| **Oscarella lobularis**                   | 3      | Independent| NA          | 2             | 3         | Suspended matter | 3 | 17          | 22.5| 1  |
| **Padina pavonica**                       | 1      | Independent| None        | 2             | 2         | Chemical uptake    | 1 | 25          | 17.6| 1  |
| **Palmophyllum crassum**                  | 3      | Independent| None        | 1             | 1         | Chemical uptake    | 1 | 25          | 16.9| 1  |
| **Petrosia (Petrosia) ficiformis**        | 3      | Independent| Chemical    | 2             | 3         | Suspended matter   | 3 | 17          | 22.5| 1  |
| **Peyssonelia spp.**                      | 3      | Independent| None        | 4             | 3         | Chemical uptake    | 1 | 52          | 17.0| 2  |
| **Cliona rhodensis**                      | 3      | Independent| Physical    | 1             | 1         | Suspended matter   | 3 | 17          | 22.5| 1  |
| **Phorbas fictitius**                     | 3      | Independent| NA          | 1             | 1         | Suspended matter   | 3 | 17          | 22.5| 1  |
| **Sarcotragus spinosulus**                | 3      | Independent| NA          | 2             | 3         | Suspended matter   | 3 | 17          | 22.5| 1  |
| **Sargassum sp.**                         | 1      | Independent| None        | 4             | 4         | Chemical uptake    | 1 | 25          | 17.6| 1  |
| **Serpulidae**                            | 2      | Independent| Physical    | 3             | 4         | Suspended matter   | 2 | 20          | 22.0| 3  |
| **Smittina cervicornis**                  | 3      | Independent| Physical    | 2             | 3         | Suspended matter   | 3 | 18          | 21.6| 3  |
| **Cornularia cornucopiae**                | 3      | Independent| None        | 1             | 1         | Suspended matter   | 3 | 17          | 16.1| 3  |
| **Halopteris scoparia**                   | 1      | Independent| None        | 4             | 3         | Chemical uptake    | 1 | 25          | 17.6| 1  |
| **Tricleocarpa fragilis**                 | 1      | Independent| None        | 2             | 3         | Chemical uptake    | 1 | 25          | 17.0| 1  |
| **Valonia macrophysa**                    | 1      | Independent| None        | 1             | 1         | Chemical uptake    | 1 | 25          | 16.9| 1  |
| **Vermetidae**                            | 2      | Independent| Physical    | 3             | 4         | Suspended matter   | 2 | 8           | 22.0| 4  |
**Appendix S4.** Principal Coordinates Analysis (PCoA) of the 33 functional traits selected (see Appendix S2). The analysis was based on the Gower dissimilarity matrix obtained from the rectangular matrix of 67 taxa × 33 functional traits (Appendix S3).

| Axis | Eigenvalue | Variation explained by individual axis (%) | Cumulative % |
|------|------------|------------------------------------------|--------------|
| 1    | 22565.0    | 44.1%                                     | 44.1%        |
| 2    | 8714.1     | 17.0%                                     | 61.1%        |
| 3    | 5418.4     | 10.6%                                     | 71.7%        |
| 4    | 4117.3     | 8.0%                                      | 79.7%        |
| 5    | 3671.4     | 7.2%                                      | 86.9%        |
| 6    | 3505.6     | 6.9%                                      | 93.8%        |
| 7    | 2332.5     | 4.6%                                      | 98.3%        |
### Appendix S5. PERMDISP testing for differences in multivariate dispersion of sites.

#### Table S5A. PERMDISP testing for differences among islands in multivariate dispersion of sites.

Tests were performed on compositional and functional dissimilarities and their separated components of turnover and nestedness at each depth. Tests were based on 999 permutations.

| Depth | Component | F     | p(perm) | tβ | p(perm) |
|-------|-----------|-------|---------|----|---------|
| 5 m   | β         | 1.789 | 0.384   | 1.179 | 0.591   |
| 15 m  | β         | 2.261 | 0.293   | 2.030 | 0.393   |
| 5 m   | βTURN     | 0.546 | 0.830   | 0.232 | 0.967   |
| 15 m  | βTURN     | 3.537 | 0.076   | 0.890 | 0.708   |
| 5 m   | βNES      | 0.738 | 0.830   | 0.526 | 0.906   |
| 15 m  | βNES      | 2.506 | 0.196   | 0.497 | 0.889   |

#### Table S5B. PERMDISP testing for differences between depths in multivariate dispersion of sites.

Tests were performed on compositional and functional dissimilarities and their separated components of turnover and nestedness. Pair-wise tests between depths for each island were also provided. All tests were based on 999 permutations. KO = Kerkira, KE = Kefalonia, PX = Paxi, ZA = Zakynthos, LE = Lefkada, ME = Meganisi.

| Overall | Pair-wise tests for each island |
|---------|---------------------------------|
|         | KE | KO | LE | ME | PX | ZA |
| F       | p(perm) | F | p | F | p | F | p | F | p | F | p |
| β       | 3.465 | 0.055 | 1.442 | 0.28 | 1.017 | 0.541 | 1.196 | 0.219 | 0.776 | 0.522 | 1.619 | 0.193 | 5.627 | 0.028 |
| βTURN   | 2.855 | 0.072 | 2.353 | 0.122 | 1.742 | 0.303 | 0.596 | 0.488 | 0.768 | 0.359 | 1.703 | 0.318 | 1.809 | 0.144 |
| βNES    | 1.287 | 0.715 | 1.679 | 0.205 | 1.145 | 0.644 | 0.047 | 1     | 0.179 | 0.953 | 0.535 | 0.707 | 1.422 | 0.224 |
| fβ      | 1.546 | 0.571 | 0.284 | 0.822 | 0.695 | 0.681 | 1.437 | 0.202 | 1.036 | 0.398 | 0.167 | 0.923 | 1.494 | 0.429 |
| fβTURN  | 0.544 | 0.944 | 0.615 | 0.709 | 0.318 | 0.727 | 0.26  | 0.779 | 0.525 | 0.335 | 1.415 | 0.279 | 0.266 | 0.898 |
| fβNES   | 0.468 | 0.984 | 0.623 | 0.626 | 0.252 | 0.83  | 0.249 | 0.822 | 0.562 | 0.616 | 0.744 | 0.641 | 1.283 | 0.551 |
Appendix S6. PCoA ordination of islands x depths centroids based on compositional and functional dissimilarities separated for turnover and nestedness components. Light blue = 5 m, dark blue = 15 m. KO = Kerkira, KE = Kefalonia, PX = Paxi, ZA = Zakynthos, LE = Lefkada, ME = Meganisi.
Appendix S7. Pairwise values of compositional $\beta$-diversity ($\beta$) and its turnover ($\beta_{\text{TURN}}$) and nestedness-resultant ($\beta_{\text{NES}}$) components between assemblages from different islands, calculated at the two investigated depths (5 and 15 m).

|       | KE | KO | LE | ME | PX | ZA |
|-------|----|----|----|----|----|----|
| **5 m** |    |    |    |    |    |    |
| $\beta$ KE |    |    |    |    |    |    |
| KO | 0.49 |    |    |    |    |    |
| LE | 0.28 0.51 |    |    |    |    |    |
| ME | 0.35 0.52 0.29 |    |    |    |    |    |
| PX | 0.35 0.55 0.43 0.37 |    |    |    |    |    |
| ZA | 0.29 0.47 0.33 0.38 0.38 |    |    |    |    |    |
| $\beta_{\text{TURN}}$ KE |    |    |    |    |    |    |
| KO | 0.35 |    |    |    |    |    |
| LE | 0.15 0.47 |    |    |    |    |    |
| ME | 0.21 0.50 0.25 |    |    |    |    |    |
| PX | 0.21 0.53 0.41 0.37 |    |    |    |    |    |
| ZA | 0.06 0.46 0.26 0.35 0.35 |    |    |    |    |    |
| $\beta_{\text{NES}}$ KE |    |    |    |    |    |    |
| KO | 0.14 |    |    |    |    |    |
| LE | 0.13 0.05 |    |    |    |    |    |
| ME | 0.14 0.02 0.04 |    |    |    |    |    |
| PX | 0.15 0.02 0.02 0.00 |    |    |    |    |    |
| ZA | 0.23 0.01 0.07 0.03 0.03 |    |    |    |    |    |
|       | KE | KO | LE | ME | PX | ZA |
| **15 m** |    |    |    |    |    |    |
| $\beta$ KE |    |    |    |    |    |    |
| KO | 0.48 |    |    |    |    |    |
| LE | 0.41 0.40 |    |    |    |    |    |
| ME | 0.38 0.44 0.33 |    |    |    |    |    |
| PX | 0.43 0.35 0.34 0.43 |    |    |    |    |    |
| ZA | 0.32 0.48 0.41 0.42 0.47 |    |    |    |    |    |
| $\beta_{\text{TURN}}$ KE |    |    |    |    |    |    |
| KO | 0.44 |    |    |    |    |    |
| LE | 0.32 0.36 |    |    |    |    |    |
| ME | 0.33 0.44 0.27 |    |    |    |    |    |
| PX | 0.32 0.28 0.32 0.37 |    |    |    |    |    |
| ZA | 0.27 0.41 0.27 0.33 0.32 |    |    |    |    |    |
| $\beta_{\text{NES}}$ KE |    |    |    |    |    |    |
| KO | 0.03 |    |    |    |    |    |
| LE | 0.09 0.05 |    |    |    |    |    |
| ME | 0.04 0.00 0.05 |    |    |    |    |    |
| PX | 0.11 0.07 0.02 0.06 |    |    |    |    |    |
| ZA | 0.05 0.07 0.14 0.08 0.14 |    |    |    |    |    |
Appendix S8. Pairwise values of functional $\beta$-diversity ($F^\beta$) and its turnover ($F^\beta_{\text{TURN}}$) and nestedness-resultant ($F^\beta_{\text{NES}}$) components between assemblages from different islands, calculated at the two investigated depths (5 and 15 m).

|       | 5 m       | 15 m      |
|-------|-----------|-----------|
| $F^\beta$ | KE KO LE ME PX ZA | KE KO LE ME PX ZA |
| KE     |           |           |
| KO     | 0.61      | 0.44      |
| LE     | 0.26 0.66 | 0.50 0.32 |
| ME     | 0.34 0.64 0.27 | 0.45 0.27 0.28 |
| PX     | 0.28 0.62 0.31 0.19 | 0.50 0.22 0.22 0.28 |
| ZA     | 0.37 0.61 0.35 0.30 0.22 | 0.28 0.38 0.44 0.40 0.46 |
| $F^\beta_{\text{TURN}}$ | KE KO LE ME PX ZA | KE KO LE ME PX ZA |
| KE     |           |           |
| KO     | 0.54      | 0.10      |
| LE     | 0.02 0.64 | 0.07 0.24 |
| ME     | 0.02 0.59 0.20 | 0.11 0.26 0.20 |
| PX     | 0.06 0.61 0.30 0.09 | 0.07 0.10 0.20 0.18 |
| ZA     | 0.01 0.54 0.24 0.26 0.06 | 0.22 0.09 0.06 0.11 0.07 |
| $F^\beta_{\text{NES}}$ | KE KO LE ME PX ZA | KE KO LE ME PX ZA |
| KE     |           |           |
| KO     | 0.07      | 0.34      |
| LE     | 0.24 0.01 | 0.42 0.08 |
| ME     | 0.32 0.05 0.08 | 0.34 0.01 0.08 |
| PX     | 0.21 0.01 0.01 0.10 | 0.43 0.12 0.02 0.10 |
| ZA     | 0.36 0.07 0.11 0.04 0.16 | 0.07 0.29 0.38 0.29 0.39 |
Appendix S9. Patterns of $\beta$-diversity vs. geographic distance at the scale of sites.

| $\beta$-diversity | Intercept | Slope  | $p$  | $R$  |
|-------------------|-----------|--------|------|------|
| ($\beta_{\text{TURN}}$) | 5 m      | 0.325  | 0.0013 | 0.001 | 0.115 |
|                   | 15 m     | 0.391  | 0.0010 | 0.001 | 0.069 |
| ($\beta_{\text{NES}}$) | 5 m      | 0.108  | -0.0001 | 0.178 | 0.007 |
|                   | 15 m     | 0.096  | -0.0001 | 0.997 | 0.000 |
| $F_{\beta_{\text{TURN}}}$ | 5 m     | 0.211  | 0.0011 | 0.001 | 0.090 |
|                   | 15 m     | 0.243  | 0.0002 | 0.214 | 0.006 |
| $F_{\beta_{\text{NES}}}$ | 5 m     | 0.234  | -0.0006 | 0.004 | 0.030 |
|                   | 15 m     | 0.188  | 0.0006 | 0.003 | 0.032 |
## Appendix S10. Presence/absence data for the six islands at 5m and 15m depth.

| Island | KE_5m | ME_5m | LE_5m | LE_15m | ZA_5m | KE_15m | ME_15m | LE_15m | ZA_15m |
|--------|-------|-------|-------|--------|-------|--------|-------|-------|-------|
|        | 1 1 0 1 1 1 0 0 0 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |
|        | 1 1 0 1 1 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |
|        | 1 1 0 1 1 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |
|        | 1 1 0 1 1 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |

### Flora

| Flora | KE_5m | ME_5m | LE_5m | LE_15m | ZA_5m | KE_15m | ME_15m | LE_15m | ZA_15m |
|-------|-------|-------|-------|--------|-------|--------|-------|-------|-------|
|       | 1 1 1 1 1 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |
|       | 1 1 1 1 1 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |
|       | 1 1 1 1 1 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |
|       | 1 1 1 1 1 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |

### Fauna

| Fauna | KE_5m | ME_5m | LE_5m | LE_15m | ZA_5m | KE_15m | ME_15m | LE_15m | ZA_15m |
|-------|-------|-------|-------|--------|-------|--------|-------|-------|-------|
|       | 1 1 0 1 1 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |
|       | 1 1 0 1 1 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |
|       | 1 1 0 1 1 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |
|       | 1 1 0 1 1 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 | 1 1 1 1 0 1 0 0 1 |