The application of landscape ecology techniques for managing disturbed Mediterranean coastal seascapes.

By

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Appendix A – Equations

A1. Spatial pattern metrics

Metric name	Metric	Equation	Variables	Units	Description	Range
Number of patches	NP	$NP = n_i$	n_i = number of patches in the landscape of patch type (class) i.	None	NP equals the number of patches in each class.	NP ≥ 1, without limit.
Class area	CA	$CA = \sum_{j=1}^{n} a_{ij}$	a_{ij} = area (m^2) of patch ij.	Square meters	CA equals the sum of the areas (m^2) of all patches in each class.	CA > 0, without limit
Edge density	ED	$ED = \frac{E}{A}$	E = total edge (m) A = total area (ha)	Meters per hectare	Edge density (m/ha) equals the length (m) of all borders between different patch types (classes) in a reference area divided by the total area of the reference unit.	ED ≥ 0, without limit. ED = 0 when there is no class edge in the landscape; that is, when the entire landscape and landscape border, if present, consists of the corresponding patch type and the user specifies that none of the landscape boundary and background edge be treated as edge.
Mean patch size	MPS	$MPS = \frac{CA}{NP}$	CA = class area NP = number of patches	Square meters	The mean patch size is the class area divided by the number of patches.	MPS > 0, without limit
Stand deviation of patch size	PSSD	$PSSD = \sqrt{\frac{\sum_{i=1}^{m}\sum_{j=1}^{n}\left[a_{ij} - \left(\frac{TA}{N}\right)\right]^2}{N}}$	a_{ij} = area of patch with patch type i and j patches TA = total area	Square meters	PSSD is a measure of absolute variation. It is a function of the mean patch size and the difference in patch size among patches.	PSSD > 0, without limit

Metric name	Metric	Equation	Variables	Units	Description	Range
			N = total number of patches			
Total edge	TE	$TE = \sum_{k=1}^{m} e_{ik}$	e_{ik} = total length (m) of edge in landscape involving patch type (class) i	Meters	TE equals the sum of the lengths (m) of all edge segments involving the corresponding patch type.	TE ≥ 0, without limit.
Mean patch edge	MPE	$MPE = \frac{TE}{NP}$	TE = total edge NP = number of patches	Meters	The average amount of edge per patch.	MPE > 0, without limit
Proportion	PROP	$PROP = \frac{CA}{TA}$	CA = class area TA = total area	None	The proportion of each class relative to the entire map	PROP > 0, without limit
Mean shape index	MSI	$MSI = \frac{P_{ij}}{\min P_{ij}}$	p_{ij} = perimeter of patch ij in terms of number of patch surfaces. min p_{ij} = minimum perimeter of patch ij in terms of number of patch surfaces.	None	Shape complexity relates to the geometry of patches--whether they tend to be simple and compact, or irregular and convoluted.	MSI = 1 when the patch is maximally compact (i.e., square or almost square) and increases without limit as patch shape becomes more irregular.

Metric name	Metric	Equation	Variables	Units	Description	Range
Mean perimeter:area ratio	MPAR	$MPAR = \frac{P_{ij}}{a_{ij}}$	p_{ij} = perimeter (m) of patch ij. a_{ij} = area (m^2) of patch ij.	None	MPAR equals the ratio of the patch perimeter (m) to area (m^2).	MPAR > 0, without limit.
Mean fractal dimension	MFRACT	$MFRACT = \frac{2\ln(0.25\ P_{ij})}{\ln a_{ij}}$	p_{ij} = perimeter (m) of patch ij. a_{ij} = area (m^2) of patch ij.	None	The fractal dimension reflects shape complexity across a range of spatial scales (patch sizes). Thus, like the shape index (MSI), it overcomes one of the major limitations of the straight perimeter-area ratio as a measure of shape complexity.	1 ≤ MFRACT ≤ 2. A fractal dimension greater than 1 indicates an increase in patch shape complexity. MFRACT approaches 1 for shapes with very simple perimeters such as circles or squares, and approaches 2 for shapes with highly convoluted, plane-filling perimeters.
Division	DIV	$DIV = \left[1 - \sum_{j=1}^{n}\left(\frac{a_{ij}}{A}\right)^2\right]$	a_{ij} = area (m^2) of patch ij. A = total landscape area (m^2).	Proportion	DIVISION is based on the cumulative patch area distribution and is interpreted as the probability that two randomly chosen pixels in the landscape are not situated in the same patch of the corresponding patch type.	0 ≤ DIVISION < 1 DIVISION = 0 when the landscape consists of single patch. DIVISION approaches 1 when the focal patch type consists of single, small patch one cell in area. As the proportion of the landscape comprised of the focal patch type decreases and as those patches decrease in size, DIVISION approaches 1.
Splitting index	SPLIT	$SPLIT = \frac{A^2}{\sum_{i=1}^{m}\sum_{j=1}^{n} a_{ij}^2}$	a_{ij} = area (m^2) of patch ij. A = total landscape area (m^2).	None	SPLIT is based on the cumulative patch area distribution and is interpreted as the effective mesh number, or number of patches with a constant patch size when the landscape is subdivided into S patches, where S is the value of the	1 ≤ SPLIT ≤ number of cells in the landscape squared SPLIT = 1 when the landscape consists of single patch. SPLIT increases as the landscape is increasingly subdivided into

Metric name	Metric	Equation	Variables	Units	Description	Range
					splitting index.	smaller patches and achieves its maximum value when the landscape is maximally subdivided; that is, when every cell is a separate patch.
Mesh	MESH	$MESH = \frac{\sum_{i=1}^{m}\sum_{j=1}^{n} a_{ij}^{2}}{A}$	a_{ij} = area (m^2) of patch ij. A = total landscape area (m^2).	Hectares	MESH is based on the cumulative patch area distribution and is interpreted as the size of the patches when the landscape is subdivided into S patches, where S is the value of the splitting index. Note, MESH is redundant with DIVISION above, i.e., they are perfectly, but inversely, correlated, but both metrics are included because of differences in units and interpretation.	cell size ≤ MESH ≤ total landscape area (A) The lower limit of MESH is constrained by the cell size and is achieved when the landscape is maximally subdivided; that is, when every cell is a separate patch. MESH is maximum when the landscape consists of a single patch.

A2. Simpson's Diversity Indices

Composition	Abbreviation	Description	Equation
Richness	R	Richness is simply the number of different patch types.	n
Diversity	D	Diversity is a composite measure of richness and evenness. It measures the probability that any two randomly selected habitat patches will be of the same type.	$D = \frac{1}{\sum\left(\left({}^{CA}/_{TA}\right)^{2}\right)}$
Evenness	E	Evenness is the relative abundance of different patch types, typically emphasizing either relative dominance or its compliment, equitability. There are many possible evenness (or dominance) measures corresponding to the many diversity measures. Evenness is usually reported as a function of the maximum diversity possible for a given richness. That is, evenness is given as 1 when the patch mosaic is perfectly diverse given the observed patch richness, and approaches 0 as evenness decreases. Evenness is sometimes reported as its complement, dominance, by subtracting the observed diversity from the maximum for a given richness. In this case, dominance approaches 0 for maximum equitability and increases >0 for higher dominance.	$E = \frac{D}{n}$

Where n = number of patches, CA = class area and TA = total area of study site

A3. Carbon capture

Cymodocea nodosa	Biomass (gDW m^{-2})	%Carbon	Formula – continuous meadows	Formula – degraded meadows
Leaf	319	34	$Mg\ C_{Cn} = \frac{\left((\sum biomass) \times area\right) \times \left(\%C/_{100}\right)}{10^6}$	$Mg\ C_{Cn} = \frac{\left((\sum biomass) \times (area \times 0.75)\right) \times \left(\%C/_{100}\right)}{10^6}$
Rhizome	263	42		
Root	125	32		

Values based on Perez et al. 1994

Posidonia oceanica	Biomass (gDW $shoot^{-1}$)	Biomass – continuous meadows (gDW m^{-2})	Biomass – degraded meadows (gDW m^{-2})	% Carbon
Leaf[1]	0.57	356.25	267.33	37.8
Rhizome[2]	0.79	493.75	370.51	38.4
Root[2]	0.47	293.75	220.43	41.5
Formula	$Mg\ C_{Po} = \frac{\left((\sum biomass \times shoots\ m^{-2}) \times area\right) \times \left(\%\ C/_{100}\right)}{10^6}$			

[1]Based on Fourqurean et al. 2007
[2]Based on Alcoverro et al. 2001

Appendix B – Data

B1. Seascape maps

The seascape maps were obtained from the Posidonia LIFE project website in kml format. The original maps can be downloaded from: http://lifeposidonia.caib.es/user/carto/cos_en.htm

The original habitats were reclassified using the classes in Table B1.

Table B1: List of the habitat names used in the original benthic maps and classes used in the dissertation

Original name	Habitat code	Reclassified name
Comunidad de roca infralitoral	1	Rock
Alternancia comunidad de roca	1	Rock
Comunidad de arenas finas	2	Sediment, fine
Arenas finas	2	Sediment, fine
Fondos blandos	3	Sediment, fine, well calibrated
ARENAS FINAS BIEN CALIBRADAS	3	Sediment, fine, well calibrated
ARENAS_FINAS_BIEN_CALIBR	3	Sediment, fine, well calibrated
Ripples	4	Sediment, coarse, with current
Arenas gruesas sometidas a cor	4	Sediment, coarse, with current
ARENAS GRUESAS SOMETIDAS A CORRIENTES DE FONDO	4	Sediment, coarse, with current
Comunidad de arenas gruesas	4	Sediment, coarse, with current
ARENAS_GRUESAS_SOMETIDAS	4	Sediment, coarse, with current
ARENAS MAL CALIBRADAS	5	Sediment, poorly calibrated
ARENAS_MAL_CALIBRADAS	5	Sediment, poorly calibrated
Comunidad esci ├ífila dispersa	6	Algae, sciaphilic, dispersed
Comunidad esci ├ífila roca infra	7	Algae, sciaphilic
COMUNIDAD_ESCI ├üFILA_DE_L	7	Algae, sciaphilic
COMUNIDAD ESCI ├üFILA DE LA ROCA INFRALITORAL	7	Algae, sciaphilic
COMUNIDAD_ESCI ├üFILA_SOBR	7	Algae, sciaphilic
COMUNIDAD FOTOFILA DISPERSA ROCA INFRALITORAL	8	Algae, photophilic, dispersed
Comunidad fotofila dispersa	8	Algae, photophilic, dispersed
COMUNIDAD_FOT ├ôFILA_ROCA_	9	Algae, photophilic
Comunidad fotofila roca infral	9	Algae, photophilic
Comunidad de algas fot ├ôfilas	9	Algae, photophilic
COMUNIDAD FOT ├ôFILA_ROCA_	9	Algae, photophilic
COMUNIDAD FOT ├ôFILA ROCA INFRALITORAL	9	Algae, photophilic
Coral ├ígeno	10	Coralligenous, continuous
Coraligeno disperso	11	Coralligenous, dispersed
CORALIGENO_DISPERSO	11	Coralligenous, dispersed
Comunidad de Cymodocea nodosa profunda	12	Cymodocea nodosa, continuous
Cymodocea densa	12	Cymodocea nodosa, continuous
PRADERA DE Cymodocea nodosa	12	Cymodocea nodosa, continuous

PRADERA_DE_CYMODOCEA_NOD	12	Cymodocea nodosa, continuous
Cymodocea dispersa	13	Cymodocea nodosa, dispersed
PRADERA DISPERSA DE Cymodocea nodosa	13	Cymodocea nodosa, dispersed
Pradera Cymodocea Caulerpa	14	Cymodocea nodosa, mixed, Caulerpa prolifera
Detritico costero vidalia	15	Detritus
Detr ├¡tico vidalia-fondos preco	15	Detritus
Detritico costero	15	Detritus
DETR ├ìTICO COSTERO T ├íPICO	15	Detritus
Comunidad de arenas gruesas y detr ├¡tico	15	Detritus
Detr ├¡tico Spatangus	15	Detritus
Detr ├¡tico Vidalia y Eunicella	15	Detritus
Detr ├¡tico costero guijarros	15	Detritus
DETR ├ìTICO_COSTERO_T ├íPICO	15	Detritus
Detritico costero peyssonelias	15	Detritus
DETR ├ìTICO COSTERO - GRANDES HYDROZOOS	15	Detritus
DETR ├ìTICO COSTERO - M ├äERL	15	Detritus
DETR ├ìTICO_COSTERO_-_MAER	15	Detritus
DETR ├ìTICO_COSTERO_-_ARTH	15	Detritus
Posidonia	16	Posidonia oceanica, continuous
Comunidad de Posidonia oceanica	16	Posidonia oceanica, continuous
PRADERA CONTINUA DE Posidonia oceanica	16	Posidonia oceanica, continuous
PRADERA_CONTINUA_DE_POSI	16	Posidonia oceanica, continuous
Posidonia continua	16	Posidonia oceanica, continuous
Pradera continua de Posidonia	16	Posidonia oceanica, continuous
Posidonia aislada	17	Posidonia oceanica, isolated
HACES AISLADOS DE Posidonia oceanica	17	Posidonia oceanica, isolated
HACES_AISLADOS_DE_POSIDO	17	Posidonia oceanica, isolated
Haces aislados de Posidonia	17	Posidonia oceanica, isolated
Posidonia cubetas	18	Posidonia oceanica, sink holes
Posidonia con cubetas	18	Posidonia oceanica, sink holes
Posidonia degradada	19	Posidonia oceanica, degraded
PRADERA DEGRADADA DE Posidonia oceanica	19	Posidonia oceanica, degraded
PRADERA_DEGRADADA	19	Posidonia oceanica, degraded
Alternancia CRI-Posidonia	20	Posidonia oceanica, rocks
ALTERNANCIA_COMUNIDAD_DE	20	Posidonia oceanica, rocks
ALTERNANCIA COMUNIDAD DE ROCA Y Posidonia oceanica	20	Posidonia oceanica, rocks
Posidonia roca	20	Posidonia oceanica, rocks
Posidonia canales	21	Posidonia oceanica, channels
PRADERA DE Posidonia oceanica CON CANALES	21	Posidonia oceanica, channels
Comunidad mixta de algas fot ├│filas y Posidonia oceanica	22	Posidonia oceanica, mixed, algae
ALTERNANCIA DE Posidonia oceanica Y PRECORALIGENO	23	Posidonia oceanica, mixed, precoralligenous
PRECORALIGENO	24	Precoralligenous, continuous
Precoraligeno sobre fondos dur	24	Precoralligenous, continuous
PRECORAL ├íGENO	24	Precoralligenous, continuous

PRECORALIGENO DISPERSO	25	Precoralligenous, dispersed
Comunidad de Caulerpa prolifera	26	Caulerpa prolifera
Features	27	Features

B2. Bathymetry

The resolution of the bathymetry data varied between study sites. Where possible, the finest scale resolution was used in the analysis. The resolution of the bathymetry data at each site is given in Table B2 and the depth profiles in Figure B1.

Table B2: Information regarding the bathymetry of each site is given

Study site	Resolution	Average depth	Maximum depth
Muntanyes d'Artà	10m	-32,14	-50
Cap de Barbaria	10m	-18,89	-40
Cabrera Archipelago	5m	-31,79	-85
Costa de Llevant	5m	-18,58	-40
La Mola	10m	-21,99	-50
Llots de Ponent	10m	-12,72	-40
Es Vedra	5m	-17,29	-50

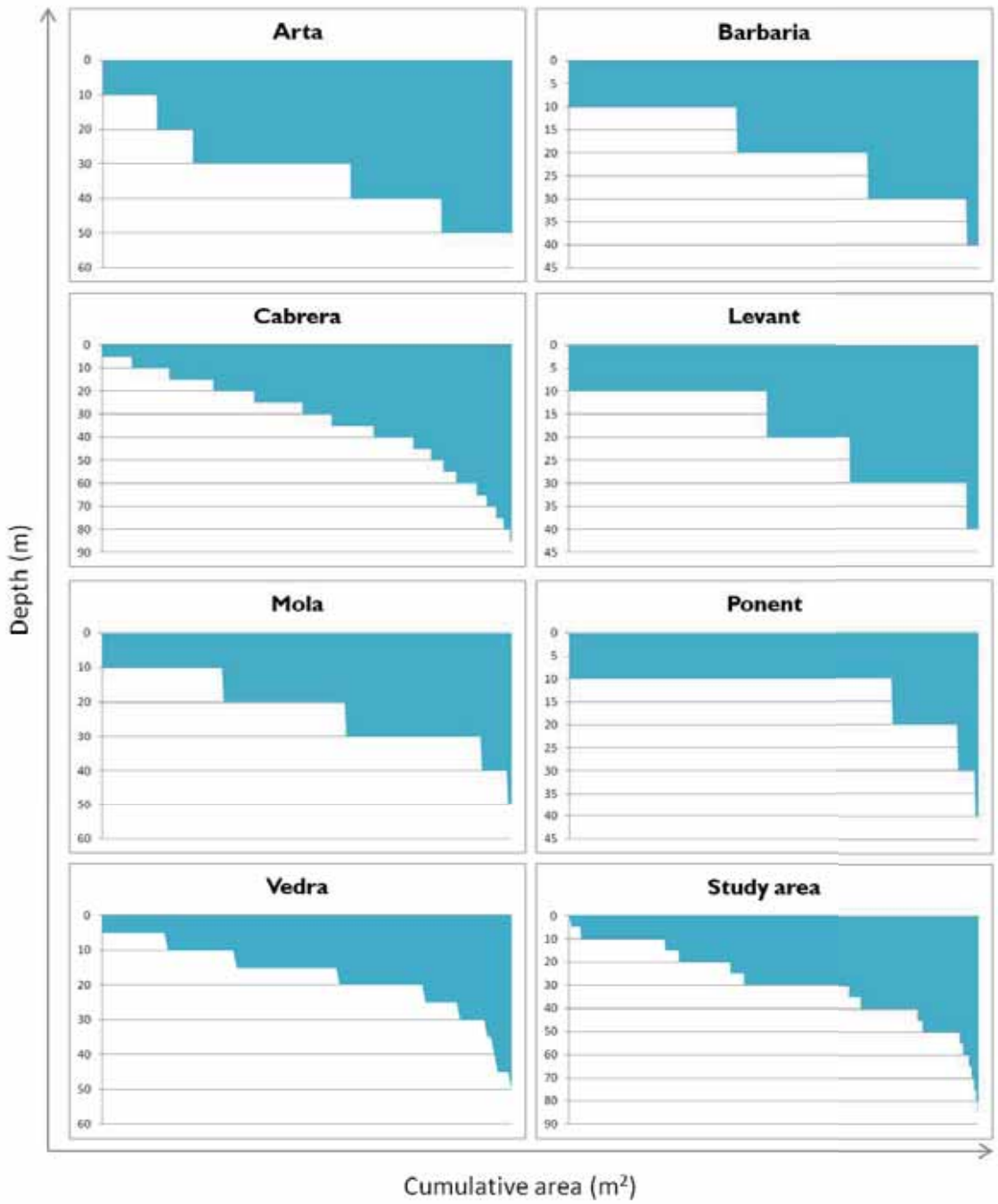

Figure B1: The depth profiles for the study sites are given with the depth (in metres) of the focal habitats on the y-axis and the cumulative area (in m^2) on the x-axis

B3. Disturbance data

3.1. Human Influence Index

The Global Human Influence Index was developed by the Wildlife Conservation Society (WCS) and the Columbia University Center for International Earth Science Information Network (CIESIN) as part of the Last of the Wild Project. It is a global dataset with a spatial resolution of 1 km grid cells. The index is based on nine data layers that include:

- Human population pressure (population density),

- Human land use and infrastructure (built-up areas, night-time lights, land use/land cover), and
- Human access (coastlines, roads, railroads, navigable rivers).

3.2. Land-based pollutants

The following detailed description of how land-based pollutants were modelled by Halpern et al. (2008) is taken from the supplementary material available from: http://www.sciencemag.org/content/suppl/2008/02/12/319.5865.948.DC1.full

Halpern et al. (2008) evaluated the impact of land-based anthropogenic drivers of change on ocean ecosystems with a 4 step process.

First, watershed boundaries were developed with an automated flow-accumulation process (S2) on the basis of 30 arc-second (nominally 1km2) SRTM30 Digital Elevation Model (DEM) data (http://glcf.umiacs.umd.edu/data/srtm/) and manually validated against the 391 Global Terrestrial Network for River Discharge (GTN-R) large watersheds (http://gtn-r.bafg.de), VMAP0 stream and river data (S3), global coastline data (S4), SRTM 3 arc-second DEM data, Landsat imagery, and satellite imagery viewed in Google Earth. These new watersheds represent a significant improvement over the Hydro 1K (http://edc.usgs.gov/products/elevation/gtopo30/hydro/) boundaries and focus on high accuracy for the boundaries of watersheds that reach the ocean and the coastal pour-points for watersheds.

Second, data for land-based drivers (nutrient input, non-point source organic and inorganic pollution, and direct impact of humans) were spatially distributed onto the landscape with ancillary data. Nutrient and non-point source organic pollution data came from Food and Agriculture Organization (FAO) national statistics (http://faostat.fao.org) on average annual use of fertilizers (nutrients) and pesticides (organic pollutants) for the years 1993-2002 and 1992-2001, respectively, and were distributed across landscapes in agricultural lands with dasymetric techniques (S5). These techniques use ancillary data to distribute values and were developed for mapping human population densities; here the ancillary data were land-use categories from the 2 U.S. Geologic Survey (http://edcsns17.cr.usgs.gov/glcc/) which identify native, cultivated, and urbanized land uses at 1 km2 resolution. Non-point source inorganic pollution was modeled with global 1 km2 impervious surface area data (http://www.ngdc.noaa.gov/dmsp/) under the assumption that most of this pollution comes from urban runoff. These data will not capture point-sources of pollution or non-point sources where paved roads do not exist (e.g., select places in developing countries).

Third, values for these three anthropogenic drivers were then aggregated to the watershed and distributed to the pour point (i.e., stream and river mouths) for the watershed with raster statistics (i.e., aggregation by watershed). Finally, spread of the driver values into coastal waters at each pour point was modeled with a cost-path surface (S6) on the basis of a decay function that assigns a fixed amount of the driver (in our case, 0.5% of the value in the previous cell) in the initial cell and then evenly distributes the

remaining amount of driver in all adjacent and 'unvisited' cells, repeated until a minimum threshold (0.05% of global maximum) is reached. This approach to modeling river plumes is diffusive and so allows drivers to wrap around headlands and islands, but does not account for nearshore advection that acts to push drivers in particular directions. Because nearshore circulation patterns are known for only a few small regions of the world, we conservatively used this diffusive model.

Our fourth land-based anthropogenic driver was the direct impact of humans, such as coastal engineering, intertidal trampling and noise pollution from land, which likely scale with population size. This driver was modeled as the sum of the coastal population, defined as the number of people within a moving circular window around an arbitrary focal coastal cell of radius 25 km on the basis of the 2005 LandScan 30 arc-second population data (http://www.ornl.gov/sci/landscan/). This value was then assigned to the adjacent ocean cell since this driver primarily affects intertidal and very nearshore ecosytems. (Halpern et al. 2008)

Halpern, B. S., S. Walbridge, K. A. Selkoe, C. V. Kappel, F. Micheli, C. D'Agrosa, J. F. Bruno, K. S. Casey, C. Ebert, H. E. Fox, R. Fujita, D. Heinemann, H. S. Lenihan, E. M. P. Madin, M. T. Perry, E. R. Selig, M. Spalding, R. Steneck, and R. Watson. 2008. A Global Map of Human Impact on Marine Ecosystems. Science **319**:948-952.

Appendix C – Policy & Management

C1. The Barcelona Convention

Originally adopted by 16 countries and the European Commission in 1976, the Barcelona Convention was later amended in 1995 and now includes 22 parties. The current priorities for the Mediterranean are: i) to reduce land-sourced pollution considerably; ii) to protect marine and coastal habitats and threatened species; iii) to make maritime activities aware of the Mediterranean marine environment and improve their safety; iv) to intensify integrated coastal zone planning; v) to monitor the spread of invasive species; vi) to control oil pollution promptly; and vii) to further promote sustainable development in the Mediterranean region.

The Barcelona Convention has given rise to seven protocols focused largely on pollution, but also including the Protocol concerning specially protected areas and biological diversity in the Mediterranean (1995) and the Protocol on Integrated Coastal Zone Management in the Mediterranean (2011b).

C2. The SPA/BD Protocol

The Specially Protected Areas and Biological Diversity Protocol (SPA/BD) was acceded by the European Community in 1984 and later amended in 1995, coming into force in 1999. The protocol stipulates that parties develop guidelines for establishing and managing specially protected areas with the aim of protecting natural resources and biodiversity. These guidelines should prohibit waste discharge, regulate shipping operations, control the introduction of non-indigenous or genetically modified species, and protect ecological and biological processes. The SPA/DB protocol is the main tool for implementing the Convention on Biological Diversity (1992) and has lead to a network of Specially Protected Areas (SPAs) and Specially Protected Areas of Mediterranean Importance (SPAMIs).

C3. The ICZM Protocol

The Protocol on Integrated Coastal Zone Management (ICZM) was signed in Madrid in 2008 and entered into force on the 24 March 2011 as the first instrument of international law to be devoted entirely to ICZM. The objective of ICZM is to facilitate sustainable development in the coastal zone while preserving the integrity of natural resources. The implementation of ICZM principles has not been uniform and in 2012, only 50% of the European Union was estimated to have implemented the protocol. The lag in adopting the ICZM principles was largely attributed to an absence of clear administrative responsibility and a lack of commonly agreed objectives and timeframes for the implementation of ICZM (EEA 2013).

C4. Marine Strategy Framework Directive

The Marine Strategy Framework Directive (MSFD) was adopted in 2008 with the aim of achieving Good Environmental Status (GES) by 2020. A significant goal for achieving GES is the maintenance of biodiversity. The MSFD is based on the ecosystem-based approach to management (EBM). Four European seas are included in the MSFD, namely the Baltic Sea, the North-east Atlantic Ocean, the Mediterranean Sea and the Black Sea. Member states are required to develop marine strategies to achieve GES for their territorial waters in accordance with other member states in the same marine region.

C5. Water Framework Directive

The EU Water Framework Directive (WFD) was adopted in 2000. The objective of this directive is the good qualitative and quantitative status of all water bodies, including coastal regions up to 1 nautical mile from the shore. The proposed deadline for achieving the good status of water bodies is 2015.

C6. Habitats Directive

Adopted in 1992, the Directive for the Conservation of natural habitats and of wild fauna and flora, known as the Habitats Directive, is a cornerstone of European nature conservation policy. The aim of the HD is to conserve biodiversity. The annexes of the HD list the natural habitats and wild species that require conservation or restoration to a favourable conservation status, the species requiring designation of Special Areas of Conservation and a number of habitats and species of European importance whose protection requires the implementation of robust conservation measures. As a directive, the commitment of a country to the objectives in legally binding, however the means of achieving the objective is flexible and is normally based on national legislation.

C7. Sites of Community Importance

Sites of Community importance are delineated under the Habitats Directive to maintain or restore specific natural habitat types or species to a favourable conservation status. The management of SCIs is minimal with general laws restricting sea use being applicable. The regulation of activities within the SCIs:

1. prohibits the extraction of aggregates, sand and sediment;
2. limits the speed at which boats may travel within specific zones and prohibits discharge from vessels;
3. allows for fishing (the General Fishing Law applies), restricts trawling without authorization and prohibits aquaculture;
4. allows for anchoring anywhere within the SCI, but not on seagrass meadows or maerl;
5. permits scuba diving, but spearfishing and the feeding of fish is prohibited.

A full list of the permitted activities is available in Spanish below.

Título II. De las actividades reguladas

Artículo 2. Extracción de áridos

1. Se prohíbe la extracción de áridos para la construcción en el marco de lo establecido en el artículo

124.2 del Real Decreto 1471/1989, de 1 de diciembre, por el que se aprueba el Reglamento General para Desarrollo y Ejecución de la Ley 22/1988, de 28 de julio, de Costas.

2. Asimismo se prohíbe la extracción de arena y otros sedimentos con la finalidad de regenerar playas, exceptuando los que se extraigan de la parte sumergida proximal (nearshore) de la propia cala o playa objeto de regeneración. Sólo excepcionalmente en proyectos instados por las administraciones públicas, para el cumplimiento de sus fines, se podrán efectuar extracciones en aquellas zonas de este LIC en las que no se produzcan efectos apreciables en las praderas de Posidonia oceanica, Cymodocea nodosa, y sobre fondos de maërl, todo ello en el marco de lo dispuesto en el articulo 39 de la Ley 5/2005 para la Conservación de los Espacios de Relevancia Ambiental y, artículos concordantes de la Directiva 92/43/CEE y sin perjuicio de la reglas de prevalencia establecidas en la normativa de Costas.

Artículo 3. Tránsito marino

1. En las zonas de baño debidamente balizadas e indicadas como tales, estará prohibida la navegación deportiva y de recreo, y la utilización de cualquier tipo de embarcación o medio flotante movido a vela o motor conforme a lo dispuesto en el artículo 69 del Real Decreto 1471/1989, de 1 de diciembre, por el que se aprueba el Reglamento General para Desarrollo y Ejecución de la Ley 22/1988, de 28 de julio, de Costas.

2. Del mismo modo en los tramos de costa que no estén balizados como zona de baño se entenderá que ésta ocupa una franja de mar contigua a la costa de una anchura de 200 metros en las playas y 50 metros en el resto de la costa. Dentro de estas zonas no se podrá navegar a una velocidad superior a tres nudos, debiendo adoptarse las precauciones necesarias para evitar riesgos a la seguridad humana.

3. Sin perjuicio de lo dispuesto en el art. 69 del Reglamento General para el desarrollo y ejecución de la Ley de Costas, aprobado por Real Decreto 1471/1989, la Conselleria competente en materia de medio ambiente, podrá solicitar al órgano competente, el establecimiento de limitaciones o restricciones adicionales. Estas medidas, que podrán ser de carácter temporal o permanente, se implantarán sobre el tránsito marino en determinadas zonas, cuando se justifique que se aplican para la conservación de los hábitats de este LIC. Dichas medidas obligatoriamente se tendrán que publicar en los boletines oficiales pertinentes, y la zona limitada o restringida, se deberá balizar para su ubicación y conocimiento.

4. Asimismo el lanzamiento o varada de embarcaciones deberá hacerse a través de canales debidamente señalizados.

5. Está prohibido cualquier tipo de vertido desde las embarcaciones.

Artículo 4. Pesca y recogida de muestras

1. Para todas las modalidades de pesca que se realicen en este LIC será de aplicación la legislación general para la pesca en aguas costeras del mar balear.

2. Queda absolutamente restringida la pesca de arrastre y de cerco en todo el ámbito del LIC. Para el normal desarrollo de estas modalidades de pesca será requerida la autorización del órgano competente en materia de pesca.

3. La autorización para la recogida de muestras biológicas con finalidades científicas y educativas en el ámbito de toda la zona LIC que se delimita, deberá ser expedida por la Dirección General de Biodiversidad.

4. Se prohíbe con carácter general cualquier tipo de actividad de acuicultura, cultivos marinos o similares en el interior de este LIC.

Artículo 5. Protección de especies

1. Se establecerá anualmente, mediante resolución del órgano competente en materia de pesca, un período de veda y las tallas mínimas para la captura de la cigarra de mar o Scyllarides latus en el ámbito de todo el LIC.

2. La nacra o Pinna nobilis, cuya captura o recolección está prohibida por su condición de especie catalogada, será objeto de medidas de especial vigilancia e inspección.

3. La Conselleria de Medi Ambient, en colaboración con la Dirección General de Pesca, promoverá estudios para el posterior control y erradicación de las especies alóctonas invasoras.

Artículo 6. Fondeos

Todo el ámbito del LIC tiene la consideración de área de fondeo libre condicionado, es decir en esta área se puede fondear libremente, teniendo en cuenta, sin embargo, que el patrón debe cuidar que el fondeo, entendido como la fijación de un sistema de anclaje sobre el fondo marino, se produce sobre fondo arenoso, evitando en lo posible, la fijación del ancla sobre praderas de Posidonia oceanica o fondos de maërl.

Artículo 7. Buceo

1. La práctica del buceo con escafandra autónoma en el ámbito de este LIC se considera permitida, excepto en aquellas zonas que se restrinja esta actividad por motivos de conservación.

2. En cualquier caso os buceadores no podrán llevar ni en mano ni en sus embarcaciones instrumentos que se puedan utilizar para la pesca o extracción de especies marinas.

3. Del mismo modo se prohíbe la alimentación o "feeding" de las especies.

4. Por motivos de conservación la Dirección General de Biodiversidad podrá instar la toma de medidas de control sobre las inmersiones en las cuevas submarinas que se localicen en este LIC para evitar los efectos de una excesiva presencia antropica.

Artículo 8. Emisarios submarinos

La instalación de emisarios submarinos en las zonas declaradas sensibles de este LIC y la autorización de sus vertidos deberá ajustarse a lo previsto en la normativa balear sobre zonas sensibles.

Appendix D – Species lists

Species lists were available for the three study sites on the island of Mallorca, namely Muntanyes d'Artà, Cabrera Archipelago and Costa de Llevant. The species list for Muntanyes d'Artà was compiled by the CEAB-CSIC as part of the report "Bionomía bentónica del Parc de Llevant-Artà, la reserva de Migjorn i Sa Dragonera " (E. Ballesteros and E. Cebrián, 2005). The CEAB-CSIC and the Direcció General de Pesca del Govern Balear were responsible for compiling the species list for the Cabrera Archipelago between the years 2002 - 2004 in the project entitled "Estudio sobre la bionomía bentónica y las comunidades de peces en diversas zonas de la isla de Mallorca." The species list for the Costa de Llevant is the minimum list of species present as a full species inventory is still to be performed. This list is derived from the study entitled "Avaluació de les comunitats bentòniques del Parc Natural de Mondragó" (Ballesteros et al., 2001) and commissioned by the Direcció General de Biodiersitat del Govern de les Illes Balears. A translation of the phyla is given in Table D4.

Table D1: The following species are present in the Muntanyes d'Artà study site.

ALGAS ROJAS	**ALGAS VERDES**	**ALGAS PARDAS**
Acrosorium venulosum	*Acetabularia acetabulum*	*Acinetospora vidovichii*
Acrothamnion preissii	*Acetabularia parvula*	*Aglaozonia chilosa*
Aglaothamnion tripinnatum	*Anadyomene stellata*	*Arthrocladia villosa*
Alsidium corallinum	*Bryopsis plumosa*	*Asperococcus turneri*
Amphiroa cryptarthrodia	*Caulerpa prolifera*	*Cladosiphon cylindricus*
Amphiroa rigida	*Cladophora pellucida*	*Cladostephus hirsutus*
Boergeseniella fruticulosa	*Cladophora prolifera*	*Cystoseira balearica*
Bonnemaisonia asparagoides	*Cladophora sp.*	*Cystoseira barbata*
Botryocladia borgesenii	*Cladophoropsis monodensis*	*Cystoseira cf. elegans*
Botryocladia botryoides	*Codium bursa*	*Cystoseira compressa*
Botryocladia chiajeana	*Chaetomorpha aerea*	*Cystoseira compressa v. pustulata*
Brongniartella byssoides	*Dasycladus vermicularis*	*Cystoseira crinita*
Ceramium ciliatum	*Flabellia petiolata*	*Cystoseira foeniculacea*
Ceramium diaphanum	*Halicystis parvula*	*Cystoseira sp.*
Ceramium flaccidum	*Halimeda tuna*	*Cystoseira spinosa*
Ceramium rubrum	*Palmophyllum crassum*	*Cystoseira stricta*
Chondria boryana	*Penicillus capitatus*	*Dictyopteris polypodioides*
Chondria tenuissima	*Pseudochlorodesmis furcellata*	*Dictyota dichotoma*
Chondrophycus tenerrimus	*Valonia aegagropila*	*Dictyota dichotoma v. intricata*
Chrysymenia ventricosa	*Valonia macrophysa*	*Dictyota fasciola*
Corallina elongata	*Valonia utricularis*	*Dictyota linearis*
Cryptonemia lomation		*Dictyotaceae n.i.*
Dasya sp.	**FANERÓGAMAS**	*Ectocarpaceae n.i.*
Digenea simplex	*Cymodocea nodosa*	*Giraudia sphacelarioides*
Eupogodon planus	*Posidonia oceanica*	*Halopteris filicina*
Eupogodon spinellus		*Halopteris scoparia*
Falkenbergia sp.	**LIQUENES**	*Laminaria rodriguezii*
Feldmannophycus rayssiae	*Arthropyrenia halodytes*	*Leathesia mucosa*
Hydrolithon farinosum	*Verrucaria amphibia*	*Lobophora variegata*
Gastroclodium clavatum		*Myrionema magnusii*

Gelidium pusillum
Gracilaria sp.
Gulsonia nodulosa
Haliptilon virgatum
Halopitys incurvus
Halymenia floresia
Halymenia latifolia
Halymenia trigona
Herposiphonia secunda
Hildenbrandia rubra
Hypnea musciformis
Hypoglossum hypoglossoides
Jania cf. adhaerens
Laurencia gr. obtusa
Laurencia microcladia
Osmundea pelagosae
Laurencia sp.
Lithophyllum cabiochae
Lithophyllum stictaeforme
Lithothamnion minervae
Mesophyllum alternans
Neogoniolithon brassica-florida
Neogoniolithon mamillosum
Osmundaria volubilis
Peyssonnelia dubyi
Peyssonnelia rosa marina
Peyssonnelia rubra
Peyssonnelia sp.
Peyssonnelia squamaria
Phyllophora crispa
Phymatholithon calcareum
Plocamium cartilagineum
Polysiphonia sertularioides
Polysiphonia subulifera
Polystrata fosliei
Pterosiphonia parasitica
Rhodymenia ardissonei
Rityphloea tinctoria
Rodriguezella straforellii
Schottera nicaeensis
Scinaia sp.
Sebdenia dichotoma
Sphaerococcus coronopifolius
Tricleocarpa sp.
Wormersleyella setacea
Wrangellia penicillata
Wurdermania miniata

CNIDARIOS
Aglaophenia sp. (grossa)
Aiptasia diaphana
Aiptasia mutabilis
Alcyonium acaule
Anemonia sulcata

FORAMINÍFEROS
Miniacina miniacea

ESPONJAS
Aaptos aaptos
Acanthella acuta
Agelas oroides
Aka sp. (groga)
Aplysilla rosea
Aplysilla sulfurea
Axinella damicornis
Axinella verrucosa
Batzella inops
Cacospongia mollior
Cacospongia scalaris
Agelas sp.
Clathrina clathrus
Clathrina sp.1(blanca)
Clathrina sp.2 (rosa)
Clathrina sp.3 (transparent)
Cliona celata
Cliona schmidtii
Cliona viridis
Crambe crambe
Chondrosia reniformis
Darwinella sp. (taronja)
Dendroxea lenis
Dendroxea sp. (uni-capa)
Desmacion sp.
Diplastrella bistellata
Diplastrella sp. (+gruixuda)
Dysidea avara
Dysidea fragilis
Epipolasis spelaea
Erylus euastrum
Eurypon sp.
Gellius lacazei
Haliclona sp.
Halicnemia patera
Halisarca dujardini
Hemimycale columella
Hexadella pruvotii
Hexadella racovitzai
Hippospongia communis
Hymedesmia peachi
Hymedesmia sp.1
Hymedesmia sp.2 (Amarillo limón)
Hymedesmia versicolor
Ircinia dendroides
Ircinia fasciculata
Ircinia oros
Ircinia variabilis
Jaspis johnstoni
Merlia lipoclavidisca
Nemoderma tingitanum
Nereia filiformis
Padina pavonica
Phyllariopsis brevipes
Pseudolithoderma adriaticum
Ralfia verrucosa
Sargassum vulgare
Sphacelaria cirrosa
Sphacelaria plumula
Sporochnus pedunculatus
Stilophora rhizodes
Zanardinia prototypus
Zonaria tournefortii

BRIOZOOS
Aetea truncata
Beania hirtissima
Beania magellanica
Buffonellaria armata
Caberea boryi
Celleporina caminata
Celleporina n. sp.
Crassimarginatella maderensis
Crassimarginatella solidula
Cribilaria flabellifera
Cribilaria pedunculata
Cribilaria radiata
Cribrilaria innominata
Crisia sigmoidea
Crisia sp.
Chlidonia pyriformis
Desmeplagioecia violacea
Diaporoecia indistincta
Diaporoecia tubulosa
Diplosolen obelium
Disporella hispida
Electra posidoniae
Enthalophoroecia deflexa stomat.
Escharina porosa
Escharina vulgaris
Escharoides coccinea
Fenestrulina malusii
Fenestrulina joannae
Frondipora verrucosa
Haplopoma bimucronatum
Hincksina flustroides
Hippomenella mucronelliformis
Hippopodinella kirchenpaueri
Margaretta cereoides
Metroperiella leprarioides
Microporella ciliata
Microporella marsupiata
Myriapora truncata
Omalosecosa ramulosa

Balanophyllia europaea
Campanularia assymetrica
Caryophyllia inornata
Caryophyllia smithii
Cereus pedunculatus
Cerianthus membranaceus
Cladocora caespitosa
Clavularia crassa
Condylactis aurantiaca
Cornularia cornucopiae
Cribinopsis crassa
Eudendrium sp.
Eunicella singularis
Hoplangia durotrix
Leptopsammia pruvoti
Madracis pharensis
Nemertesia antennina
Paraerythropodium coralloides
Parazoanthus axinellae
Plumularia obliqua posidoniae
Stephanoscyphus sp.
Sertularia perpusilla

PECES
Apogon imberbis
Atherina hepsetus
Auxis rochei
Aydablennius sphynx
Balistes carolinensis
Belone belone gracilis
Boops boops
Bothus podas podas
Chelon labrosus
Chromis chromis
Conger conger
Corcyrogobius liechtensteini
Coris julis
Coryphaena hippurus
Dactylopterus volitans
Dasyatis pastinaca
Dentex dentex
Dicentrarchus labrax
Didogobius splechtnai
Diplodus annularis
Diplodus puntazzo
Diplodus sargus
Diplodus vulgaris
Echiichtys vipera
Epinephelus costae
Epinephelus marginatus
Gammogobius steinitzi
Gobius bucchichi
Gobius cruentatus
Gobius niger
Merlia normani
Monocrepidium vermiculatum
Myceliospongia cf. aranea
Oscarella lobularis
Oscarella tuberculata
Oscarella tuberculata
Penares helleri
Petrosia ficiformis
Phakelia rugosa
Phorbas fictitius
Phorbas tenacior
Pione vastifica
Plakina trilopha
Pleraplysilla spinifera
Pseudoagelas sp.
Raspaciona aculeata
Reniera fulva
Reniera mucosa
Reniera valliculata
Rhabderemia minutula
Sarcotragus muscarum
Sarcotragus spinosula
Scopalina sp.
Spirastrella cunctatrix
Spongia officinalis
Spongia virgultosa
Spongionella pulchella
Spongosorites cf. flavens
Spongosorites genitrix
Spongosorites sp.
Suberites carnosus
Sycon elegans
Sycon sp.
Terpios fugax
Tethya sp.
Topsentia contorta
Topsentia garciae
Tymosiopsis sp.

ARTRÓPODOS
Acanthonyx lunulatus
Alpheus dentipes
Athanas nitescens
Calcinus ornatus
Chthamalus montagui
Chthamalus stellatus
Clibanarius erythropus
Dardanus arrosor
Dardanus callidus
Diogenes pugilator
Dromia personata
Eriphia verrucosa
Euraphia depressa
Eurynome spinosa
Parasmittina tropica rouvillei
Pentapora fascialis
Pentapora ottomulleriana
Plagioecia saniensis
Platonea stoechas
Porella minuta
Reptadeonella violacea
Rosseliana rosseli
Rynchozoon neapolitanum
Scrupocellaria delilii
Scrupocellaria maderensis
Scrupocellaria reptans
Schizobrachiella sanguinea
Schizomavella auriculata
Schizomavella hastata
Schizomavella linearis
Schizomavella rudis
Schizotheca dunkeri
Schizotheca fissa
Schizotheca serratimargo
Sertella couchii
Sertella mediterranea
Sertella sp.
Smittina cervicornis
Smittoidea reticulata
Spiralaria gregaria
Turbicellepora avicularis
Turbicellepora cf. nonulosa
Turbicellepora coronopusoida

EQUIURIDOS
Bonellia viridis

MOLUSCOS
Aeolidacea n.i.
Aplysia punctata
Arca noae
Berghia caerulescens
Berthella aurantiaca
Berthella ocellata
Corallophila sp.
Cratena peregrina
Chromodoris purpurea
Dendrodoris grandiflora
Dendrodoris limbata
Dendropoma petraeum
Discodoris ctromaculata
Doridaceae n.i.
Doris verrucosa
Doto coronata
Elysia timida
Erosaria spurca
Flabellina affinis
Gibbula sp.

Gobius paganellus
Gobius vittatus
Labrus merula
Labrus viridis
Lipophrys nigriceps
Lipophrys pavo
Lithognathus mormyrus
Mullus surmuletus
Muraena helena
Mycteroperca rubra
Oblada melanura
Oligopus ater
Pagellus acarne
Pagellus erythrinus
Pagrus pagrus
Parablennius gattorugine
Parablennius pilicornis
Parablennius rouxii
Parablennius tentacularis
Parablennius zvonimiri
Phycis phycis
Pomatochistus sp.
Sarda sarda
Sarpa salpa
Sciaena umbra
Scorpaena maderensis
Scorpaena notata
Scorpaena porcus
Scorpaena scrofa
Seriola dumerili
Serranus cabrilla
Serranus hepatus
Serranus scriba
Sparus aurata
Sphyraena viridensis
Spicara maena
Spicara smaris
Spondyliosoma cantharus
Symphodus cinereus cinereus
Symphodus doderleini
Symphodus mediterraneus
Symphodus melanocercus
Symphodus ocellatus
Symphodus roissali
Symphodus rostratus
Symphodus tinca
Synodus saurus
Thalassoma pavo
Trachinotus ovatus
Trachinus araneus
Trachinus radiatus
Tripterygion delaisi xanthosoma
Tripterygion melanurus
Tripterygion tripteronotus

Galathea boliviari
Galathea strigosa
Hemimysis margalefii
Herbstia condylata
Inachus phalangium
Inachus thoracicus
Ligia italica
Lissa chiragra
Lysmata seticaudata
Macropodia rostrata
Maja crispata
Pachygrapsus marmoratus
Pagurus anachoretus
Palaemon adspersus
Palaemon elegans
Palaemon serratus
Palaemon xiphias
Palinurus elephas
Pilumnus hirtellus
Pinnotheres pinnotheres
Pisa armata
Pisidia longicornis
Pontonia pinnophylax
Porcellana platycheles
Scyllarides latus
Scyllarus arctus
Siriella adriatica
Stenopus spinosus
Thoralus cranchii

EQUINODERMOS
Arbacia lixula
Echinaster sepositus
Holothuria polii
Holothuria tubulosa
Ophiothrix fragilis
Paracentrotus lividus
Spatangus purpureus
Sphaerechinus granularis

ANELIDOS POLIQUETOS
Ditrupa arietina
Myxicola aesthetica
Protula sp.
Sabella pavonina
Sabella spallanzani
Salmacina dysteri
Serpula vermicularis

CIANOBACTERIAS
Brachytrichia quojii
Calothrix crustacea
Rivularia atra
Rivularia mesenterica

Godiva banyulensis
Hypselodoris elegans
Hypselodoris fontandraui
Littorina neritoides
Lurida lurida
Monodonta turbinata
Mytilus galloprovincialis
Patella aspera
Patella ulyssiponensis
Phyllidia pulitzeri
Platydoris argo
Spondylus gaederopus
Susania testudinaria
Thais haemastoma
Trunculariopsis trunculus

TUNICADOS
Aplidium tabarquensis
Ascidia mentula
Clavelina nana
Cystodites dellechiajei
Didemnum sp.2 (blanc)
Didemnum sp.4 (sorrenc)
Diplosoma spongiforme
Ecteinascidia herdmani
Halocynthia papillosa
Lissoclinum perforatum
Pseudodistoma crucigaster
Pseudodistoma cyrnusense
Pyura dura

BRAQUIÓPODOS
Crania anomala
Argyrotheca sp.

Uranoscopus scaber	*Symploca hydnoides*
Xyrichthys novacula	
Zeus faber	

Table D2: The following species are present in the Cabrera Archipelgao study site.

CIANOBACTERIAS	**ALGAS VERDES**	**ALGAS PARDAS**
Calothrix confervicola	*Acetabularia acetabulum*	*Aglaozonia chilosa*
Calothrix crustacea	*Acetabularia calyculus*	*Arthrocladia villosa*
Rivularia atra	*Acetabularia parvula*	*Asperococcus turneri*
Rivularia mesenterica	*Anadyomene stellata*	*Cladosiphon cylindricus*
Symploca hydnoides	*Caulerpa prolifera*	*Cladosiphon sp.*
	Caulerpa racemosa	*Cladostephus hirsutus*
ALGAS ROJAS	*Cladophora laetevirens*	*Cystoseira balearica*
Acrosorium venulosum	*Cladophora prolifera*	*Cystoseira cf. elegans*
Acrothamnion preissii	*Cladophora sp.*	*Cystoseira compressa*
Aglaothamnion tripinnatum	*Codium bursa*	*Cystoseira compressa v. pustulata*
Alsidium corallinum	*Dasycladus vermicularis*	*Cystoseira crinita*
Amphiroa beauvoisii	*Flabellia petiolata*	*Cystoseira foeniculacea*
Amphiroa cryptarthrodia	*Halicystis parvula*	*Cystoseira spinosa*
Amphiroa rigida	*Halimeda tuna*	*Cystoseira stricta*
Bonnemaisonia asparagoides	*Palmophyllum crassum*	*Dictyopteris polypodioides*
Botryocladia borgesenii	*Penicillus capitatus*	*Dictyota dichotoma*
Botryocladia botryoides	*Pseudochlorodesmis furcellata*	*Dictyota dichotoma v. intricata*
Ceramium ciliatum	*Valonia aegagropila*	*Dictyota fasciola*
Ceramium diaphanum	*Valonia macrophysa*	*Dictyota linearis*
Ceramium flaccidum	*Valonia utricularis*	*Ectocarpaceae n.i.*
Ceramium rubrum		*Giraudia sphacelarioides*
Ceramium sp.	**FANERÓGAMAS**	*Halopteris filicina*
Chondria boryana	*Cymodocea nodosa*	*Halopteris scoparia*
Chondria tenuissima	*Posidonia oceanica*	*Lobophora variegata*
Chondrophycus tenerrimus		*Myrionema magnusii*
Contarinia peyssonneliaeformis	**LIQUENES**	*Nereia filiformis*
Corallina elongata	*Verrucaria amphibia*	*Padina pavonica*
Cordylecladia erecta		*Sargassum vulgare*
Cryptonemia lomation	**FORAMINÍFEROS**	*Spermatochnus paradoxus*
Cryptonemia tunaeformis	*Miniacina miniacea*	*Sphacelaria plumula*
Dasya corymbifera		*Sporochnus pedunculatus*
Digenea simplex	**ESPONJAS**	*Stilophora rhizodes*
Eupogodon penicillatus	*Aaptos aaptos*	*Stictyosiphon adriaticus*
Eupogodon planus	*Adocia simulans*	*Taonia atomaria*
Feldmannophycus rayssiae	*Agelas oroides*	*Zanardinia prototypus*
Hydrolithon farinosum	*Aka sp. (groga)*	
Gelidium latifolium	*Aka sp. (transparent)*	**PECES**
Gelidium pectinatum	*Aplysina aerophoba*	*Apogon imberbis*
Gelidium pusillum	*Axinella damicornis*	*Atherina hepsetus*
Chondracanthus acicularis	*Axinella verrucosa*	*Auxis rochei*

Gracilaria corallicola
Gracilaria verrucosa
Haematocelis rubens
Haliptilon virgatum
Halopitys incurvus
Herposiphonia secunda
Hildenbrandia rubra
Hypnea musciformis
Hypoglossum hypoglossoides
Kallymenia requienii
Kallymenia sp.
Kallymenia spathulata
Laurencia microcladia
Osmundea pelagosae
Laurencia sp.
Lithophyllum byssoides
Lithophyllum stictaeforme
Lithothamnion cf. racemus
Lithothamnion corallioides
Lithothamnion minervae
Lithothamnion valens
Mesophyllum alternans
Neogoniolithon brassica-florida
Neogoniolithon mamillosum
Neurocaulon foliosum
Osmundaria volubilis
Peyssonnelia aff. crispata
Peyssonnelia armorica
Peyssonnelia cf. armorica
Peyssonnelia harveyana
Peyssonnelia inamoena
Peyssonnelia rosa marina
Peyssonnelia sp.
Peyssonnelia squamaria
Peyssonnelia stoechas
Phyllophora heredia
Phyllophora crispa
Phymatholithon calcareum
Plocamium cartilagineum
Polysiphonia elongata
Polysiphonia flexella
Polysiphonia opaca
Polysiphonia ornata
Polysiphonia pulvinata
Polysiphonia sertularioides
Polysiphonia subulifera
Cacospongia mollior
Clathrina clathrus
Clathrina sp.1(blanca)
Cliona celata
Cliona schmidtii
Cliona viridis
Corticium candelabrum
Crambe crambe
Crella elegans
Chondrosia reniformis
Dendroxea lenis
Dictyonella sp.
Diplastrella bistellata
Diplastrella sp. (Soller)
Dysidea avara
Epipolasis spelaea
Erylus euastrum
Eurypon sp.
Guanche sp.
Hymedesmia sp.1
Ircinia fasciculata
Ircinia oros
Ircinia variabilis
Leucosolenia variabilis
Myceliospongia cf. aranea
Oscarella lobularis
Oscarella tuberculata
Oscarella sp.1 (taronja)
Petrosia ficiformis
Phorbas fictitius
Phorbas tenacior
Pione vastifica
Pleraplysilla spinifera
Raspaciona aculeata
Reniera mucosa
Reniera sp.
Sarcotragus muscarum
Sarcotragus spinosula
Spirastrella cunctatrix
Spongia officinalis
Spongia virgultosa
Suberites domuncula
Terpios fugax
Tethya aurantium
Topsentia garciae
Tymosiopsis sp.
Aydablennius sphynx
Balistes carolinensis
Belone belone gracilis
Boops boops
Bothus podas podas
Chelon labrosus
Chromis chromis
Conger conger
Coris julis
Coryphaena hippurus
Dactylopterus volitans
Dasyatis pastinaca
Dentex dentex
Dicentrarchus labrax
Diplodus annularis
Diplodus puntazzo
Diplodus sargus
Diplodus vulgaris
Echiichtys vipera
Epinephelus costae
Epinephelus marginatus
Gobius bucchichi
Gobius cruentatus
Gobius niger
Gobius paganellus
Labrus merula
Labrus viridis
Lipophrys nigriceps
Lipophrys pavo
Lithognathus mormyrus
Mullus surmuletus
Muraena helena
Mycteroperca rubra
Oblada melanura
Pagellus acarne
Pagellus erythrinus
Pagrus pagrus
Parablennius gattorugine
Parablennius pilicornis
Parablennius rouxii
Parablennius tentacularis
Parablennius zvonimiri
Phycis phycis
Pomatochistus sp.
Sarda sarda
Sarpa salpa

Polystrata fosliei
Pterosiphonia parasitica
Rhodophyllis divaricata
Rhodymenia ardissonei
Rhodymenia sp.
Rityphloea tinctoria
Rodriguezella pinnata
Schottera nicaeensis
Titanoderma sp.
Tricleocarpa sp.
Wormersleyella setacea
Wrangellia penicillata

MOLUSCOS
Arca noae
Callista chione
Chiton sp.
Dendropoma petraeum
Diodora italica
Erosaria spurca
Flabellina affinis
Littorina neritoides
Littorina punctata
Lurida lurida
Monodonta turbinata
Mytilus galloprovincialis
Patella aspera
Pecten jacobaeus
Rudicardium tuberculatum
Thais haemastoma
Turritella sp.

BRIOZOOS
Amathia semiconvoluta
Bugula sp.
Caberea boryi
Cellaria salicornioides
Crisia sp.
Electra posidoniae
Fenestrulina joannae
Margaretta cereoides
Myriapora truncata
Pentapora fascialis
Reptadeonella violacea
Rynchozoon neapolitanum
Savygniella lafontii

CNIDARIOS
Aglaophenia sp. (grossa)
Aiptasia mutabilis
Anemonia sulcata
Balanophyllia europaea
Campanularia assymetrica
Calliactis parasitica
Caryophyllia inornata
Cereus pedunculatus
Cerianthus membranaceus
Cladocora caespitosa
Clavularia crassa
Cribinopsis crassa
Eudendrium sp.
Eunicella singularis
Leptopsammia pruvoti
Madracis pharensis
Nemertesia antennina
Parazoanthus axinellae
Phyllangia mouchezii
Plumularia obliqua posidoniae
Polycyathus muellerae
Sertularia perpusilla

ANELIDOS POLIQUETOS
Ditrupa arietina
Myxicola aesthetica
Protula sp.
Sabella pavonina
Sabella spallanzani
Salmacina dysteri
Serpula vermicularis

TUNICADOS
Aplidium conicum
Aplidium "pseudo-albicans"
Aplidium tabarquensis
Botryllus schlosseri
Cystodites dellechiajei
Didemnum maculosum
Didemnum sp.1 (blanc)
Ecteinascidia herdmani
Eudistoma sp.
Halocynthia papillosa
Lissoclinum perforatum

Sciaena umbra
Scorpaena maderensis
Scorpaena notata
Scorpaena porcus
Scorpaena scrofa
Seriola dumerili
Serranus cabrilla
Serranus hepatus
Serranus scriba
Sparus aurata
Sphyraena viridensis
Spicara maena
Spicara smaris
Spondyliosoma cantharus
Symphodus cinereus cinereus
Symphodus doderleini
Symphodus mediterraneus
Symphodus melanocercus
Symphodus ocellatus
Symphodus roissali
Symphodus rostratus
Symphodus tinca
Synodus saurus
Thalassoma pavo
Trachinotus ovatus
Trachinus araneus
Trachinus radiatus
Tripterygion delaisi xanthosoma
Tripterygion melanurus
Tripterygion tripteronotus
Uranoscopus scaber
Xyrichthys novacula
Zeus faber

EQUINODERMOS
Arbacia lixula
Astropecten aranciacus
Echinaster sepositus
Holothuria sanctori
Holothuria sp.
Holothuria tubulosa
Luidia ciliaris
Ophidiaster ophidianus
Ophioderma longicaudum
Ophiothrix fragilis
Paracentrotus lividus

Scrupocellaria sp.
Schizobrachiella sanguinea
Sertella feuerbornii
Sertella sp.
Smittina cervicornis
Turbicellepora avicularis

EQUIURIDOS
Bonellia viridis

Phallusia mamillata
Polysyncraton sp.
Pseudodistoma crucigaster
Pseudodistoma cyrnusense
Rophalaea neapolitana
Synoicum blochmani

Spatangus purpureus
Sphaerechinus granularis

ARTRÓPODOS
Chthamalus montagui
Chthamalus stellatus
Dardanus arrosor
Euraphia depressa
Pisa armata
Pisa sp.

Table D3: The species present in the Costa de Llevant study site are given.

CIANOBACTERIAS
Brachytrichia quojii
Calothrix confervicola
Calothrix crustacea
Hyella caespitosa
Rivularia atra
Rivularia mesenterica
Symploca hydnoides

ALGAS ROJAS
Acrodiscus vidovichii
Acrosorium uncinatum
Acrothamnion preissii
Alsidium corallinum
Amphiroa beauvoisii
Amphiroa rigida
Antithamnion cruciatum
Apoglossum ruscifolium
Botryocladia boergesenii
Botryocladia botryoides
Callithamnion decompositum
Callithamnion granulatum
Ceramium ciliatum
Ceramium codii
Ceramium diaphanum
Ceramium flaccidum
Ceramium giacconei
Ceramium rubrum
Ceramium strictum
Champia parvula
Chondria boryana
Contarinia squamariae
Corallina elongata

ALGAS VERDES
Acetabularia acetabulum
Acetabularia parvula
Anadyomene stellata
Bryopsis muscosa
Caulerpa prolifera
Caulerpa taxifolia
Chaetomorpha capillaris v. crispa
Cladophora coelothrix
Cladophora laetevirens
Cladophora pellucida
Cladophora prolifera
Codium bursa
Dasycladus vermicularis
Derbesia tenuissima
Flabellia petiolata
Halicystis parvula
Halimeda tuna
Palmophyllum crassum
Penicillus capitatus
Pseudochlorodesmis furcellata
Ulva rigida
Valonia macrophysa
Valonia utricularis

PECES
Apogon imberbis
Atherina boyeri
Atherina hepsetus
Auxis rochei
Aydablennius sphynx
Balistes carolinensis
Belone belone gracilis

ALGAS PARDAS
Aglaozonia parvula
Castagnea cylindrica
Cladostephus hirsutus
Colpomenia sinuosa
Cystoseira balearica
Cystoseira compressa
Cystoseira spinosa
Cystoseira stricta
Dictyopteris membranacea
Dictyota dichotoma
Dictyota dichotoma v. intricata
Dilophus fasciola
Giffordia mitchelliae
Giraudia sphacelarioides
Halopteris filicina
Halopteris scoparia
Lobophora variegata
Myrionema magnusii
Nereia filiformis
Padina pavonica
Ralfsia verrucosa
Sargassum vulgare
Scytosiphon lomentaria
Sphacelaria cirrosa
Sphacelaria plumula
Sphacelaria tribuloides
Stilophora rhizodes
Taonia atomaria
Zanardinia prototypus
Zonaria tournefortii

ESPONJAS

Corallina granifera
Cordylecladia erecta
Crouania attenuata
Cryptomenia lomation
Cryptomenia tunaeformis
Dasya corymbifera
Dasya hutchinsiae
Digenea simplex
Dipterosiphonia rigens
Erythroglossum sandrianum
Eupogodon planus
Falkenbergia rufolanosa
Fauchea repens
Fosliella farinosa
Gastroclonium clavatum
Gelidiella pannosa
Gelidium latifolium
Gelidium pusillum
Gigartina acicularis
Gloiocladia furcata
Halopitys incurvus
Herposiphonia secunda
Hypnea musciformis
Hypoglossum hypoglossoides
Jania adhaerens
Jania corniculata
Laurencia microcladia
Laurencia papillosa
Liagora viscida
Lithophyllum frondosum
Lithophyllum incrustans
Lithophyllum lichenoides
Lithothamnion corallioides
Lithothamnion valens
Lophocladia lallemandii
Lophosiphonia scopulorum
Mesophyllum alternans
Nemalion helminthoides
Osmundea truncata
Peyssonelia aff. crispata
Peyssonelia bornetii
Peyssonelia dubyi
Peyssonelia harveyana
Peyssonelia rosa-marina
Peyssonelia rubra
Peyssonelia squamaria

Boops boops
Bothus podas podas
Chelon labrosus
Chromis chromis
Conger conger
Coris julis
Coryphaena hippurus
Dactylopterus volitans
Dasyatis pastinaca
Dentex dentex
Dicentrarchus labrax
Diplodus annularis
Diplodus puntazzo
Diplodus sargus
Diplodus vulgaris
Engraulis encrasicholus
Epinephelus alexandrinus
Epinephelus marginatus
Eutrigla gurnardus
Gobius bucchichi
Gobius cobitis
Gobius cruentatus
Gobius geniporus
Gobius niger
Gobius paganellus
Labrus merula
Labrus viridis
Lepadogaster candollei
Lepadogaster purpurea
Lithognathus mormyrus
Liza aurata
Lophius piscatorius
Mola mola
Mugil cephalus
Mullus surmuletus
Muraena helena
Myliobatis aquila
Oblada melanura
Oedalechilus labeo
Pagellus acarne
Pagellus erythrinus
Pagrus pagrus
Parablennius gattorugine
Parablennius incognitus
Parablennius rouxii
Parablennius tentacularis

Acanthella acuta
Agelas oroides
Axinella damicornis
Cacospongia mollior
Chondrosia reniformis
Clathrina clathrus
Clathrina contorta
Clathrina coriacea
Cliona celata
Cliona schmidtii
Cliona vastifica
Cliona viridis
Crambe crambe
Dendroxea lenis
Diplastrella bistellata
Dysidea avara
Erylus euastrum
Hemimycale columella
Hippospongia communis
Ircinia fasciculata
Ircinia oros
Ircinia variabilis
Oscarella lobularis
Oscarella tuberculata
Petrosia ficiformis
Phorbas fictitius
Phorbas tenacior
Pleraplysilla spinifera
Raspaciona aculeata
Sarcotragus muscarum
Sarcotragus spinosula
Spirastrella cunctatrix
Spongia officinalis
Spongia virgultosa
Sycon elegans
Sycon raphanus
Terpios fugax
Tethya aurantium

CNIDARIOS

Actinia equina
Aglaophenia harpago
Aglaophenia kirchenpaueri
Aglaophenia octodonta
Aglaophenia pluma
Aiptasia diaphana

Phyllophora crispa
Phymatolithon calcareum
Phymatolithon lenormandii
Plocamium cartilagineum
Pneophyllum lejolisii
Polysiphonia fruticulosa
Polysiphonia ornata
Polysiphonia sertularioides
Polysiphonia setacea
Polysiphonia sphaerocarpa
Polysiphonia subulifera
Polystrata fosliei
Porphyra leucosticta
Pterocladia capillacea
Pterosiphonia parasitica
Pterosiphonia pennata
Pterothamnion crispum
Rhodophyllis divaricata
Rhodymenia ardissonei
Rytiphloea tinctoria
Schottera nicaeensis
Sphaerococcus coronopifolius
Spongites hauckii
Spongites notarisii
Spongites ramulosa
Spyridia filamentosa
Titanoderma pustulatum
Tricleocarpa sp.
Osmundaria volubilis
Wrangelia penicillata

FANERÓGAMAS
Posidonia oceanica
Cymodocea nodosa

LIQUENES
Verrucaria amphibia

FORAMINIFEROS
Miniacina miniacea

ANELIDOS POLIQUETOS
Autotylus quidecimdentatus
Ditrupa arietina
Eunice torquata
Eupolymnia nebulosa
Phycis phycis
Polyprion americanus
Raja clavata
Sarda sarda
Sardina pilchardus
Sardinella aurita
Sarpa salpa
Sciaena umbra
Scomber japonicus
Scomber scombrus
Scorpaena maderensis
Scorpaena notata
Scorpaena porcus
Scorpaena scrofa
Seriola dumerili
Serranus cabrilla
Serranus hepatus
Serranus scriba
Solea vulgaris
Sparus aurata
Sphyraena sphyraena
Spicara maena
Spicara smaris
Spondyliosoma cantharus
Symphodus cinereus
Symphodus doderleini
Symphodus mediterraneus
Symphodus melanocercus
Symphodus ocellatus
Symphodus roissali
Symphodus rostratus
Symphodus tinca
Synodus saurus
Thalassoma pavo
Thunus thynnus
Torpedo torpedo
Trachinotus ovatus
Trachinus araneus
Trachinus draco
Trachinus radiatus
Trachurus mediterraneus
Trachurus trachurus
Trigla lucerna
Trigloporus lastovitza
Tripterygion delaisi xanthosoma
Tripterygion melanurus
Aiptasia mutabilis
Anemonia sulcata
Antennella secundaria
Balanophyllia europaea
Balanophyllia regia
Bouganvillea ramosa
Campanularia hincksi
Caryophyllia inornata
Cereus pedunculatus
Cerianthus membranaceus
Cladocora caespitosa
Clava multicornis
Clavularia crassa
Clytia hemisphaerica
Clytia paulensis
Cordylophora pusilla
Corynactis viridis
Eudendrium capillare
Eudendrium motzkossowskae
Eudendrium racemosum
Eudendrium ramosum
Eunicella verrucosa
Halecium pusillum
Hoplangia durotrix
Leptopsammia pruvoti
Madracis pharensis
Nausithoë punctata
Nemertesia antennina
Obelia dichotoma
Obelia geniculata
Orthopyxis assymetrica
Parazoanthus axinellae
Plumularia obliqua f. posidoniae
Polycyathus muellerae
Sertularella crassicaulis
Sertularella polyzonias
Sertularia perpusilla

BRIOZOOS
Aetea anguina
Aetea truncata
Annectocyma tubulosa
Beania hirtissima
Beania magellanica
Caberea boryi
Calpensia nobilis

Exogone naidina
Exogone verugera
Glycera tesselata
Harmothoe spinifera
Lepidonotus clava
Lumbrinereis coccinea
Lumbrinereis funchalensis
Myxicola aesthetica
Nereis pelagica
Nereis rava
Ophiodromus pallidus
Owenia fusiformis
Phloe inornata
Platynereis dumerilii
Pomatoceros triqueter
Protula tubularia
Pseudobrania clavata
Sabella pavonina
Sabella spallanzani
Serpula vermicularis
Sphaerosyllis histrix
Sphaerosyllis pirifera
Spirobranchus polytrema
Syllidia armata
Syllis amica
Syllis armillaris
Syllis hyalina
Syllis truncata-criptica
Syllis variegata
Trypanosyllis zebra
Vermiliopsis infundibulum

ARTROPODOS
Acanthonyx lunulatus
Aëdes mariae
Alpheus dentipes
Anilocra mediterranea
Athanas nitescens
Balanus perforatus
Caprella acanthifera
Chthamalus montagui
Chthamalus stellatus
Clibanarius erythropus
Dardanus arrosor
Dardanus callidus
Dexamine spinosa
Tripterygion tripteronotus
Uranoscopus scaber
Xyrichthys novacula
Zeus faber

MOLUSCOS
Acanthocardia echinata
Acanthocardia tuberculata
Acantochitona fascicularis
Alvania (Turbona) cimex
Alvania montagui
Anomia ephippium
Arca noae
Astrea rugosa
Barbatia barbata
Bittium exiguum
Bittium reticulatum
Buccinulum corneum
Cantharus dorbignyi
Cardium sp.
Cerithium rupestre
Cerithium vulgatum
Chamelea gallina
Chlamys varia
Columbella rustica
Cratena peregrina
Donax trunculus
Erosaria spurca
Flabellina affinis
Gibbula ardens
Gibbula divaricata
Haliotis lamellosa
Hiatella artica
Hypselodoris elegans
Lepidochitona corrugata
Lima lima
Lithophaga lithophaga
Littorina neritoides
Loligo vulgaris
Loripes lacteus
Luria lurida
Monodonta turbinata
Ocinebrina aciculata
Octopus vulgaris
Patella caerulea
Patella rustica
Cellaria salicornioides
Celleporina caminata
Celleporina decipiens
Chlidonia pyriformis
Chorizopora brogniartii
Collarina balzaci
Crisia eburnea
Crisia eburnea f. harme lini
Crisia fistulosa
Crisia sigmoidea
Disporella hispida
Electra posidoniae
Fenestrulina joannae
Frondipora verrucosa
Haplopoma impressum
Lichenopora radiata
Margaretta cereoides
Mimoslla gracilis
Mimosella verticilata
Myriapora truncata
Parasmittina tropica
Platonea stoechas
Puellina gattyae
Puellina hincksi
Reptadeonella violacea
Rhynchozoon neapolitanum
Savygniella lafontii
Schizobrachiella sanguinea
Schizomavella auriculata
Schizomavella hastata
Schizomavella mamillata
Schizomavella linearis
Schizoporella dunkeri
Schizoporella errata
Schizotheca serratimago
Scrupocellaria delilii
Scrupocellaria reptans
Sertella couchii
Sertella feuerbornii
Sertella septentrionalis
Synnotum aegyptiacum
Tubulipora lilacea
Walkeria uva

EQUINODERMOS
Amphipholis squamata

Eriphia verrucosa
Euraphia depressa
Galathea bolivari
Galathea strigosa
Gnatophyllum elegans
Ligia italica
Macropodia rostrata
Maera inaequipes
Maja crispata
Ochtebius quadricollis
Pachygrapsus marmoratus
Pagurus anachoretus
Palaemon elegans
Palaemon serratus
Palaemon xiphias
Palinurus elephas
Pinnotheres pinnotheres
Pisidia longicornis
Pontonia pinnophylax
Porcellana platycheles
Scyllarides latus
Scyllarus arctus
Stenopus spinosus
Trigriopus brevicornis

EQUIURIDOS
Bonellia viridis

Patella ulyssiponensis
Pinna nobilis
Rissoa ventricosa
Sepia officinalis
Serpulorbis arenaria
Spisula subtruncata
Thais haemastoma
Trunculariopsis trunculus
Venus verrrucosa
Vermetus triqueter

ASCIDIAS
Aplidium coeruleum
Aplidium pseudolobatum
Botrylloides leachi
Clavelina nana
Cystodites dellechiajei
Didemnum maculosum
Diplosoma spongiforme
Distomus variolosus
Halocynthia papillosa
Lissoclinum perforatum
Phallusia fumigata
Polysyncraton bilobatum
Pseudodistoma crucigaster
Pseudodistoma cyrnusense
Pyura dura

Antedon mediterranea
Arbacia lixula
Asterina gibbosa
Astropecten aranciacus
Astropecten jonstoni
Brissus unicolor
Centrostephanus longispinus
Coscinasterias tenuispina
Echinaster sepositus
Echinocardium cordatum
Echinocyamus pusillus
Hacelia attenuata
Holothuria forskali
Holothuria polii
Holothuria sanctori
Holothuria tubulosa
Marthasterias glacialis
Ophidiaster ophidianus
Ophiocomina nigra
Ophioderma longicaudum
Ophiomyxa pentagona
Ophiothrix fragilis
Paracentrotus lividus
Spatangus purpureus
Sphaerechinus granularis

SIPUNCULIDOS
Phascolosoma granulatum

Table D4: The Spanish phyla are translated into English below.

Spanish	English	Spanish	English
ALGAS PARDAS	Brown algae	EQUINODERMOS	Echinoderms
ALGAS ROJAS	Red algae	EQUIURIDOS	Echiura
ALGAS VERDES	Green algae	ESPONJAS	Sponges
ANELIDOS POLIQUETOS	Polychaete annelids	FANERÓGAMAS	Phanerogams
ARTRÓPODOS	Arthropods	FORAMINÍFEROS	Foraminifera
ASCIDIAS	Ascidians	LIQUENES	Lichens
BRAQUIÓPODOS	Brachiopods	MOLUSCOS	Molluscs
BRIOZOOS	Bryozoans	PECES	Fish
CIANOBACTERIAS	Cyanobacteria	SIPUNCULIDOS	Sipunculids
CNIDARIOS	Cnidaria	TUNICADOS	Tunicates