

**Cunha MR, Matos FL, Génio L, Hilário A, Moura CJ, Ravara A, Rodrigues CF (2013) Are organic falls bridging reduced environments in the deep sea? – Results from colonization experiments in the Gulf of Cadiz.**

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## Supporting Information

**Text S1. Environmental and biological characterization of the three study sites.**

**Figure S1. Location of the three study sites (Mercator, Meknès and Darwin mud volcanoes) in the Gulf of Cádiz.** Black dots show the position of other mud volcanoes in the region.

**Table S1. List of the taxa identified from the colonization experiments (CHEMEOCOLI) deployed in the Gulf of Cádiz.** Classification according to the World Register of Marine Species ([www.marinespecies.org](http://www.marinespecies.org) accessed May 2013). The taxa in blue were found only in the external parts of the CHEMEOCOLI. The occurrence of new records (in bold) and background fauna in the substrata enclosed by the 2mm mesh net is shown for each sub-region (El Arrache, Carbonate Province) and substrate type (wood, alfalfa, carbonate). Each taxon was assigned to one of 20 different trophic groups.

**Table S2. Breakdown of percentual contributions from SIMPER analysis for comparisons between mud volcanoes: Mercator (Mer); Meknès (Mek) and Darwin (Dar).** The taxa listed contribute at least 1.5%. Numbers in bold mark the six dominant species at each site.

**Table S3. Breakdown of percentual contributions from SIMPER analysis for comparisons between substrate types: wood (W), alfalfa (A) and carbonate (C).** The taxa listed contribute at least 1.5%. Numbers in bold mark the six dominant species in each substrate type.

## **Supporting Information**

### **Text S1. Environmental and biological characterization of the three study sites**

**Mercator MV.** The shallowest study site, Mercator (350 m), is located at the El Arrache field on the upper slope of the Moroccan margin [1] where the proximity to the euphotic zone and to the African coast adds to the great productivity observed in the area. Colonisation experiments were deployed in the crater at the top of Mercator where the seafloor shows patches of disturbed sediments from which gas venting is occasionally observed [2]. The sediment consists of brown pelagic silty clay covering grey matrix-supported breccia with clasts of different lithology and size with disseminated sulphides (pyrite-marcasite) and filled fractures. The sulphides form framboidal aggregates, generally less than 2mm and several carbonated cemented clasts within clayey matrix. Mercator MV is an example of gas production by admixture of thermogenic sources from different depths and influence of evaporite deposits. Nuzzo et al. [3] the porewater is extremely enriched in chloride ( $\text{Cl}^-$  reaching up to 5.3 M thus, exceeding normal seawater values by a factor of 9) and  $\text{SO}_4$  consistent with the dissolution of minerals (e.g. halite and gypsum), additionally, the fluids are highly enriched in Li and B indicating a deep fluid source from mineral dewatering reactions at elevated temperatures [4]; radiogenic  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios are consistent with a terrigenous/continental deep source of the fluids [5], and the carbon isotopic signature of methane ( $\delta^{13}\text{C}$ : -33.8 to -38.8‰) indicates high thermal maturity [3,6,7]. The upward fluid flow rates were estimated as ~6 cm/a at the top of the MV, gradually decreasing to 0.3 cm/a towards the rim [4].

The megafauna at Mercator mud volcano is sparse, with some fish (*Helicolenus* sp.), crinoids and cidarid echinoids associated mainly to the boulders in the crater and the sea-pen *Pennatula aculeata* anchored in the sediments at the rim. Solitary corals (*Caryophyllia* sp.) accompanied by Cidaridae echinoids and Onuphidae polychaetes (*Hyalinoecia tubicola*) are the most conspicuous organisms seen during video surveys of the crater. Over 300 macrofaunal species are known to occur in Mercator MV [8, MR Cunha unpublished data]. The chemosymbiotic fauna recorded in this mud volcano includes the bivalves *Solemya elarraicensis*, *Lucinoma asaphaeus*, *Axinulus*

*croulinensis* (mixotrophic species); *Thyasira granulosa* (mixotrophic species) and five Frenulata species, *Polybrachia* sp.1, *Siboglinum* Ib, *Siboglinum* Ic, *Siboglinum* Id, and *Siboglinum* sp.1 [9].

**Meknès MV.** In the Moroccan margin the extensive authigenic Carbonate Province at intermediate depths (700-1200m) is accompanied by the frequent occurrence of mounds, thickets and debris of mostly dead cold-water scleractinean corals. Meknès MV is the southernmost mud volcano in this region rising isolated among an extensive field of small coral mounds at ca. 700m depth. The porewater is characterized by a moderate depletion of Cl<sup>-</sup> [5,7]. The carbon isotopic signature of methane is more depleted ( $\delta^{13}\text{C}$ : -48.9 to -52.8‰) than in Mercator MV suggesting lower thermal maturity [3].

Colonisation experiments were deployed at the crater which is formed by stiff, sometimes heavily disturbed, greenish grey mud breccia with scattered clasts of different lithology and size (2mm -5 cm in diameter) and a striking large number of empty shells of the gastropod *Neptunea contraria*. The surveys over Meknès showed coral rubble and small coral thickets colonised by sponges and octocorals at the lower flanks of the mud volcano contrasting with the almost bare mud breccia of the crater inhabited only by *N. contraria*, *Paromola cuvieri* and *Helicolenus* sp. Except for a few individuals of these three species, living megafauna is rarely sighted in the crater. Over 175 macrofaunal species are known to occur in Meknès MV [8, M.R. Cunha unpublished data]. The chemosymbiotic fauna recorded in this mud volcano includes the bivalve *Solemya elarraicensis* and two Frenulata species *Siboglinum* If and *Siboglinum* sp.2 [9].

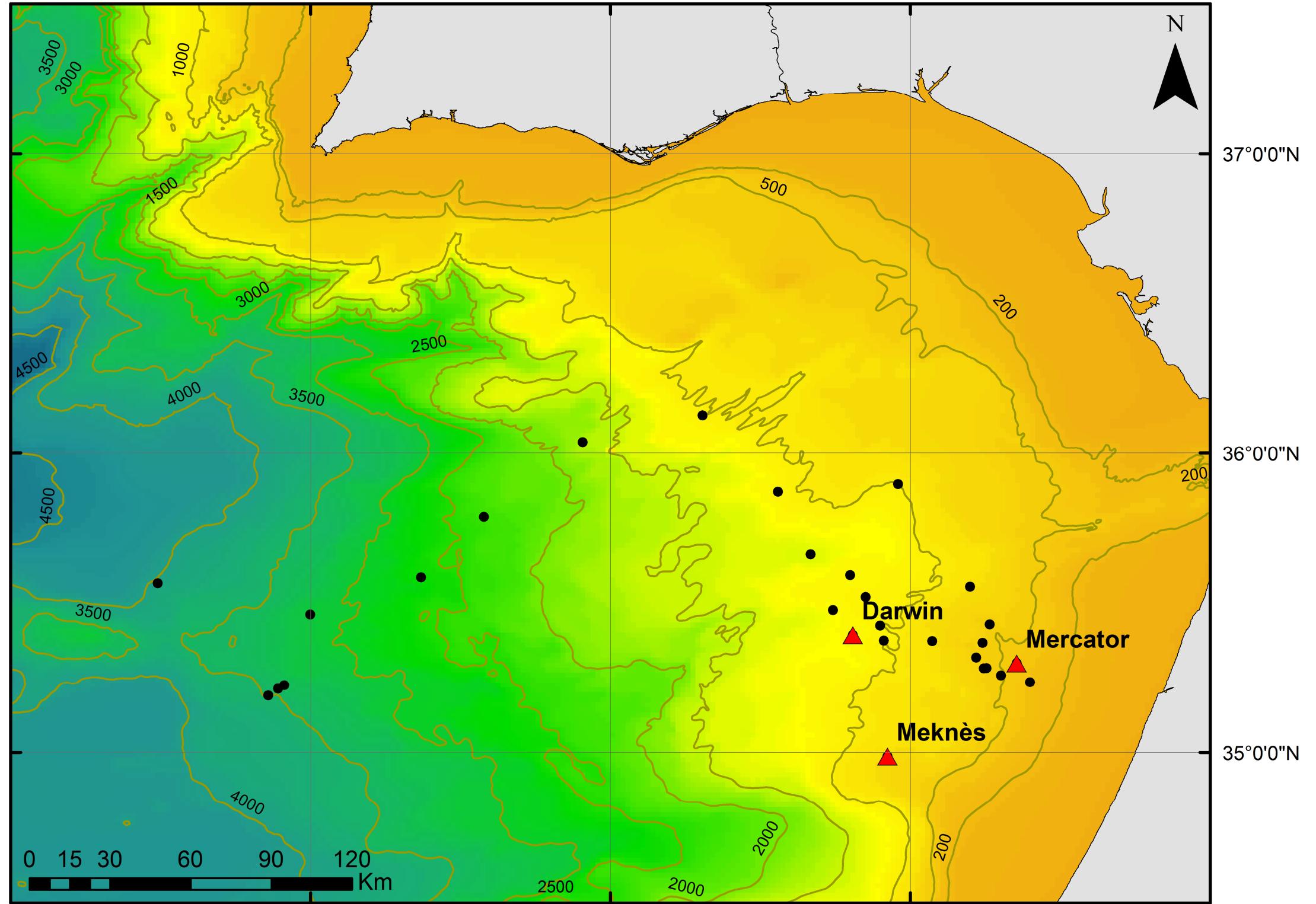
**Darwin MV.** The carbonate province also includes the Darwin mud volcano (ca. 1100m). Darwin MV differs from the other mud volcanoes in this area because its crater is completely covered by large carbonate slabs and crusts; the fissures among slabs and depressions with scattered crust are filled with abundant shell ash and occasionally small clumps of living “*Bathymodiolus*” *mauritanicus*. *Paromola cuvieri*, soft corals and other epifauna were occasionally sighted on the surface of rocks and sediment. Over 100 macrofaunal species are known to occur in Darwin MV (MR. Cunha unpublished data) where the gastropod fauna is particularly diverse [10]. The chemosymbiotic fauna recorded in this mud volcano includes the bivalves *Isorropodon megadesmus*, *Solemya*

*elarraicensis* and “*Bathymodiolus*”*mauritanicus*, and two Frenulata species, *Siboglinum* Ia and *Siboglinum* Ie [9].

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**Table S1.** List of the taxa identified from the colonization experiments (CHEMECOLI) deployed in the Gulf of Cadiz. Classification according to the World Register of Marine Species ([www.marinespecies.org](http://www.marinespecies.org) accessed May 2013). The taxa in blue were found only in the external parts of the CHEMECOLI. The occurrence of new records (in bold) and background fauna in the substrata enclosed by the 2mm mesh net is shown for each sub-region (El Arrache, Carbonate Province) and substrate type (wood, alfalfa, carbonate). Each taxon was assigned to one of 20 different trophic groups.

Major taxa	Family	Species name/code	Habit	Mode	Feeding		EA		CP	
					TG	Food type	TG	W	A	C
<b>PORIFERA</b>										
Unassigned	Unassigned	Porifera unassigned	Ep/S/R	Om/Su	pom		16	-	-	-
<b>CNIDARIA</b>										
<b>Hydrozoa</b>										
Unassigned	Unassigned	Hydrozoa unassigned	Ep/S/A	Ca/Su	zoo		5	U	U	U
Anthoathecata	Tubicoloididae	<i>Tubicoloides striatum</i> Moura, Cunha & Schuchert, 2007	Ep/S/A	Ca/Su	zoo		5	-	-	-
	Eudendriidae	<i>Eudendrium</i> sp.	Ep/S/A	Ca/Su	zoo		5	-	-	-
Leptothecata	Campanulariidae	<i>Clytia</i> sp.	Ep/S/A	Ca/Su	zoo		5	R	-	R
		<i>Clytia linearis</i> (Thorneley, 1900)	Ep/S/A	Ca/Su	zoo		5	R	R	R
	Campanulinidae	Campanulinidae unassigned	Ep/S/A	Ca/Su	zoo		5	-	-	U
		<i>Campanulina panicula</i> G.O. Sars, 1874	Ep/S/A	Ca/Su	zoo		5	-	L	-
	Halecidae	<i>Haleciumpf. tenellum</i> Hincks, 1861	Ep/S/A	Ca/Su	zoo		5	R	-	-
	Lafoeidae	<i>Cryptolaria pectinata</i> (Allman, 1888)	Ep/S/A	Ca/Su	zoo		5	-	R	-
		<i>Filellum serratum</i> (Clarke, 1879)	Ep/S/A	Ca/Su	zoo		5	L	L	-
		<i>Zygophylax biarmata</i> Billard, 1905	Ep/S/A	Ca/Su	zoo		5	-	L	-
	Tiarannidae	<i>Modeeria rotunda</i> (Quoy & Gaimard, 1827)	Ep/S/A	Ca/Su	zoo		5	-	-	-
<b>Anthozoa</b>										
Actiniaria	Unassigned	Actiniaria unassigned	Ep/S/A	Ca/Su	zoo		5	-	-	U
<b>Scyphozoa</b>										
Coronata	Nausithoidae	<i>Nausithoe</i> sp.	Ep/S/A	U						U
<b>NEMERTEA</b>										
Unassigned	Unassigned	Nemertea unassigned	Ss/M/F	Ca/Pr	mac		6	U	-	U
<b>SIPUNCULA</b>										
Unassigned	Unassigned	Sipuncula unassigned	Sr/D/F	Om/Dt	pom;mic;mac		12	U	-	U

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**ANNELIDA****Oligochaeta**

Unassigned

Unassigned

**Oligochaeta unassigned****Ss/M/F****Om/Dt****pom;mic****1****Polychaeta**

Incerate sedis

Protodrilidae

***Protodrilus* sp.****Sr/M/F****Mc/Gr****mic****11****-****-****N****N****-**

Aciculata

Amphinomidae

***Linopherus* cf. *hemuli* (Fauchald, 1972)****Ss/M/F****Ca/Pr****mac****6****-****-****N****-**

Dorvilleidae

***Pareurythoe* cf. *borealis* (M.Sars,1862)****Ss/M/F****Ca/Pr****mac****6****R****-****R****-*****Ophryotrocha* sp01****Sr/M/F****Om/Sc;Gr****pom;mic;mei****2****N****N****-****N****-*****Ophryotrocha* sp02****Sr/M/F****Om/Sc;Gr****pom;mic;mei****2****N****N****-****N****N*****Ophryotrocha* sp03****Sr/M/F****Om/Sc;Gr****pom;mic;mei****2****N****-****-****-*****Ophryotrocha* sp04****Sr/M/F****Om/Sc;Gr****pom;mic;mei****2****N****-****-****-*****Ophryotrocha* sp05****Sr/M/F****Om/Sc;Gr****pom;mic;mei****2****N****-****N****N*****Ophryotrocha* sp06****Sr/M/F****Om/Sc;Gr****pom;mic;mei****2****-****-****N****N*****Ophryotrocha* sp07****Sr/M/F****Om/Sc;Gr****pom;mic;mei****2****-****-****-****-*****Ophryotrocha* sp08****Sr/M/F****Om/Sc;Gr****pom;mic;mei****2****-****-****N****N*****Protodorvillea kefersteini* (McIntosh, 1869)****Ss/M/F****Ca/Pr****mei****8****-****-****N****-**

Lumbrineridae

Lumbrineridae unassigned

**Ss/M/F****Ca/Pr****mei;mac****8****-****-****-****U**

Chrysopetalidae

*Lumbrineriopsis paradoxa* (Saint-Joseph,1888)**Ss/M/F****Ca/Pr****mei;mac****8****-****-****N****-**

Glyceridae

Chrysopetalidae unassigned

**Sr/M/F****Ca/Pr****mei;mac****9****U****-****-****-**

Hesionidae

*Glycera tesselata* Grübe, 1840**Ss/M/F****Ca/Pr****mac****6****-****-****L****-**

Hesionidae unassigned

**Ss/M/F****Ca/Pr****mac****6****U****-****U****-*****cf. Amphiduros* sp.****Sr/M/F****Ca/Pr;Sc****mac****4****N****N****-****N***Leocrates atlanticus* (McIntosh, 1885)**Ss/M/F****Ca/Pr****mac****6****L****-****L****L*****Nereimyra* sp.(juveniles)****Ss/M/F****Ca/Pr****mac****6****N****-****N****N*****Nereimyra punctata* (Muller, 1788)****Ss/M/F****Ca/Pr****mac****6****-****-****-****-***Eunereis longíssima* Johnston, 1840**Ss/D/T****Om/De****sed;pom;mic****13****L****-****-****-*****Nicon sínica* Wu & Sun, 1979****Sr/D/T****Om/Dt;Pr****pom;mic;mei****2****-****-****-****-**

Phyllodocidae

*Phylloedo madeirensis* Langerhans, 1880**Sr/M/F****Ca/Pr;Sc****mac****4****R****-****-****-**

Polynoidae

*Harmothoe evei* Kirkegaard, 1980**Sr/M/F****Ca/Pr****mac****7****R****R****R****-**

Sigalionidae

*Subadyte pellucida* (Ehlers, 1864)**Ss/M/F****Ca/Pr****mac****6****L****L****R****R**

Syllidae

*Pholoides dorsipapillatus* (Marenzeller, 1893)**Ss/M/F****Ca/Pr****mac****6****-****-****-****-***Sthenelais cf. boa* (Johnston,1833)**Ss/M/F****Ca/Pr****mac****6****-****-****-****-**

Eusyllinae unassigned

**Ss/M/F****Ca/Pr****mei****8****U****-****U****-**

Exogoninae unassigned

**Sr/M/F****Mc/Gr****mic****10****U****-****U****U****-**

Canalipalpata	Sabellidae	Sabellidae unassigned	Ep/S/T	Om/Su	pom	16	-	-	U	-	-	-
	Sabellidae	Serpulidae unassigned	Ep/S/T	Om/Su	pom	16	U	-	-	-	-	-
	Siboglinidae	<i>Siboglinum</i> sp.	Ss/S/T	Ch	-	20	-	-	-	-	R	-
	Spionidae	<i>Polydora</i> sp.	Sr/D/T	Om/De;Su	sed;pom;mic	14	-	-	-	-	-	-
		<i>Prionospio</i> sp01	Sr/D/T	Om/De;Su	sed;pom;mic	14	-	U	-	U	-	-
		<i>Prionospio</i> sp02	Sr/D/T	Om/De;Su	sed;pom;mic	14	-	-	-	-	-	-
		<i>Prionospio</i> cf. <i>aluta</i> Maciolek, 1985	Sr/D/T	Om/De;Su	sed;pom;mic	14	L	-	-	L	-	-
		<i>Prionospio steenstrupi</i> Malmgren, 1867	Sr/D/T	Om/De;Su	sed;pom;mic	14	-	-	-	-	-	-
	Acrocirridae	<i>Macrochaeta</i> sp.	Sr/M/F	Om/De	sed;pom;mic	14	-	-	-	-	-	-
	Ampharetidae	<i>Amage</i> sp.	Sr/D/T	Om/De	sed;pom;mic	14	L	-	-	R	-	R
		<i>Melinnopsis</i> sp.	Sr/D/T	Om/De	sed;pom;mic	14	L	L	-	R	R	-
	Ctenodrilidae	<i>Raricirrus beryli</i> Petersen & George, 1991	Sr/M/F	Mc/Gr	mic	10	N	-	-	N	N	-
	Terebellidae	Terebellidae unassigned	Sr/D/T	Om/De	sed;pom;mic	14	U	-	U	-	U	-
		<i>cf. Amphitrite</i> sp.	Sr/D/T	Om/De	sed;pom;mic	14	-	-	-	-	-	-
		<i>Neoamphitrite affinis</i> (Malmgren, 1866)	Sr/D/T	Om/De	sed;pom;mic	14	R	-	-	-	-	-
		<i>Nicolea</i> cf. <i>venustula</i> (Montagu, 1818)	Sr/D/T	Om/De	sed;pom;mic	14	-	-	-	-	-	N
		<i>Polycirrus norvegicus</i> Wollebaek, 1912	Sr/D/T	Om/De	sed;pom;mic	14	L	L	L	-	-	-
Scolecida	Capitellidae	Capitellidae sp01	Ss/D/F	Om/De	sed;pom;mic	13	U	-	U	U	U	-
		Capitellidae sp02	Ss/D/F	Om/De	sed;pom;mic	13	U	U	-	-	-	-
		Capitellidae sp03	Ss/D/F	Om/De	sed;pom;mic	13	U	-	-	U	-	-
		Capitellidae sp04	Ss/D/F	Om/De	sed;pom;mic	13	U	-	-	-	-	-
		Capitellidae sp05	Ss/D/F	Om/De	sed;pom;mic	13	-	U	U	-	-	-
	Maldanidae	Maldanidae unassigned	Ss/D/T	Om/De	sed;pom;mic	13	U	-	-	-	-	-
		<i>Euclymene</i> cf. <i>oerstedi</i> (Claparède, 1863)	Ss/D/T	Om/De	sed;pom;mic	13	-	-	-	-	-	-
	Orbiniidae	Orbiniidae unasssigned	Ss/M/F	Om/De	sed;pom;mic	13	-	-	-	-	-	-
		<i>Leitoscoloplos</i> cf. <i>mammosus</i> Mackie, 1987	Ss/M/F	Om/De	sed;pom;mic	13	-	-	L	-	-	-
	Paraonidae	<i>Aricidea suecica meridionalis</i> Laubier & Ramos, 1974	Sr/D/B	Om/De	sed;pom;mic	14	L	-	-	-	-	-
		<i>Levinsenia gracilis</i> (Tauber, 1879)	Sr/D/B	Om/De	sed;pom;mic	14	-	-	-	-	-	-
		<i>Paradoneis lyra</i> (Southern, 1914)	Sr/D/B	Om/De	sed;pom;mic	14	-	-	L	-	-	-
		Scalibregmatidae unassigned	Ss/M/B	Om/De	sed;pom;mic	13	-	-	-	-	-	-
<b>MOLLUSCA</b>												
<b>Gastropoda</b>												
Caenogastropoda	Eulimidae	Eulimidae unassigned	Sr/M/X	Ca/Sp	mac	17	-	-	-	-	R	R
	Rissoidae	Rissoidae unassigned	Sr/M/F	Mc/Gr	mic	10	U	-	-	-	-	-
		<i>cf. Alvania</i> sp.	Sr/M/F	Mc/Gr	mic	10	-	-	-	-	-	-

			<i>Alvania cimicoides</i> (Forbes, 1844)	Sr/M/F	Mc/Gr	mic	10	-	-	-	-	-	
			<i>Alvania cf. zylensis</i> Gofas & Warén, 1982	Sr/M/F	Mc/Gr	mic	10	R	-	-	-	-	
			cf. <i>Obtusella</i> sp.	Sr/M/F	Mc/Gr	mic	10	-	-	-	-	R	
			<b><i>Pseudosetia</i> spD</b>	Sr/M/F	Mc/Gr	mic	10	N	N	-	-	-	
		Columbellidae	<i>Amphissa acutecostata</i> (Philippi, 1844)	Sr/M/F	Ca/Pr	mac	7	-	-	-	-	-	
		Marginellidae	Marginellidae spA	Sr/M/F	Ca/Pr	mac	7	-	L	-	-	-	
		Muricidae	<b><i>Pagodula echinata</i> (Kiener, 1840)</b>	Sr/M/F	Ca/Pr	mac	7	-	-	-	-	-	
	Cocculiniformia	Cocculinidae	<b><i>Coccopigya</i> sp.</b>	Sr/M/F	Mc/Gr	mic	11	N	-	-	N	N	
Heterobranchia		Unassigned	Nudibranchia unassigned	Sr/M/F	Ca/Pr	mei;mac	7	-	-	-	-	U	
		Cimidae	<i>Cima cuteculata</i> Warén, 1993	Sr/M/F	Mc/Gr	mic	11	-	-	-	-	-	
		Xylodisculidae	<i>Graphis gracilis</i> (Monterosato, 1874)	Sr/M/F	U		U	-	-	-	-	L	
Neomphalina		Melanodrymiidae	<b><i>Xylodiscula</i> sp.</b>	Sr/M/F	Mc/Gr	mic	11	N	N	-	N	N	
Vetigastropoda		Pseudococculinidae	<b>cf. <i>Leptogyra</i> sp.</b>	Sr/M/F	Mc/Gr	mic	10	-	-	-	N	N	
		Larocheidae	<b><i>Copulabyssia</i> sp</b>	Sr/M/F	Mc/Gr	mic	11	N	N	-	N	N	
		Unassigned	<b><i>Bathyxylophila</i> sp. nov</b>	Sr/M/F	Mc/Gr	mic	11	-	-	-	N	N	
		Calliotropidae	<i>Moelleriopsis messanensis</i> (Seguenza, 1876)	Sr/M/F	Mc/Gr	mic	10	-	-	-	-	-	
		Unassigned	<i>Putzeysia</i> cf. <i>wiseri</i> (Clacara, 1842)	Sr/M/F	Mc/Gr	mic	10	-	-	-	-	L	
		Skeneidae	<b><i>Vetigastropoda</i> (skeneimorph)</b>	Sr/M/F	U		U	-	-	-	-	-	
			<i>Cirsonella romettensis</i> (Granata-Grillo, 1877)	Sr/M/F	U		U	-	-	-	-	L	
			cf. <i>Lissospira</i> sp.	Sr/M/F	U		U	-	-	-	-	R	
<b>Bivalvia</b>													
	Unassigned	Unassigned	Bivalvia unassigned (juveniles)	U	U		U	U	-	-	U	-	-
Heterodonta		Cuspidariidae	<b><i>Cuspidaria</i> sp.</b>	Sr/D/F	Ca/Pr	zoo;mei	9	-	-	-	-	-	
		Pholadidae	<b><i>Xylophaga dorsalis</i> (Turton, 1819)</b>	Sr/S/Z	Om/Hs;Su	pom;ter	19	N	-	N	N	N	
		Kelliellidae	<b><i>Xyloredo</i> sp.</b>	Sr/S/Z	Om/Hs;Su	pom;ter	19	-	-	-	N	-	
Protobranchia		Neilonellidae	<i>Kelliella</i> sp. (juveniles)	Ss/D/F	Om/De;Su	sed;pom;mic	13	L	-	-	-	-	
		Yoldiidae	<i>Neilonella latior</i> (Jeffreys, 1876)	Ss/D/F	Om/De	sed;mic	13	-	-	-	-	-	
		Nuculidae	<i>Yoldiella</i> sp.(juveniles)	Ss/D/B	Om/De	sed;pom;mic	13	-	-	-	-	R	
		Solemyidae	<i>Ennucula bushae</i> (Dollfus, 1898)	Ss/M/F	Om/De	sed;pom;mic	13	R	-	-	-	-	
Pteriomorphia		Mytilidae	Solemyidae (juveniles)	Ss/D/F	Ch	-	20	L	L	L	L	L	
		Pectinidae	<b><i>Idas modiolaeformis</i> (Sturany, 1896)</b>	Ep/D/A	Om/Ch;Su	pom	20	N	N	-	N	N	
		Propeamussidae	<i>Delectopecten vitreus</i> (Gmelin, 1791)	Ep/D/F	Om/Su	pom	16	-	-	-	-	-	
			<b><i>Propeamussium</i> sp.</b>	Ep/D/F	Om/Su	pom	16	-	-	-	-	-	

Cirripedia	Verrucidae	<i>Verruca</i> sp.	Ep/S/R	Om/Su	pom	16	-	-	-	-	-	-
<b>Malacostraca</b>												
Decapoda	Unassigned	<i>Dendrobrachiata</i> unassigned	Sr/M/F	Om/Dt;Pr;Sc	pom;mic	2	-	-	-	-	-	-
	Alpheidae	<i>Alpheus</i> sp.	Sr/M/F	Om/Dt;Pr;Sc	pom;mic;mei	2	-	-	-	-	-	-
	Stenopodidae	<i>Richardina</i> sp.	Sr/M/F	Om/Dt;Pr;Sc	pom;mic;mei	2	-	-	-	-	-	-
	Leucosiidae	<i>Ebalia nux</i> A. Milne-Edwards, 1883	Sr/M/F	Om/Dt;Pr;Sc	pom;mic;mei	2	-	-	-	-	-	-
	Xanthidae	<i>Monodaeus couchii</i> (Couch, 1851)	Sr/M/F	Om/Dt;Pr;Sc	pom;mic;mei	2	-	L	L	-	-	-
Euphausiacea		<i>Meganyctiphanes cf.norwegica</i> (M. Sars, 1857)	Ep/M/F	U		U	-	-	-	-	-	-
Nebaliacea		<i>Nebalia</i> spA	Sr/M/F	Ca/Sc	mac	4	L	L	-	-	L	-
		<i>Nebalia</i> spB	Sr/M/F	Ca/Sc	mac	4	L	L	-	-	-	-
Amphipoda	Unassigned	<i>Amphipoda</i> unassigned	U	U		U	-	-	-	-	-	-
	Aoridae	Aoridae unassigned	Sr/D/T	Om/Su	pom;mic	15						
	Calliopidae	<i>Leptamphopus</i> sp122	Ep/M/F	Ca/Pr	zoo	5	-	N	-	-	-	-
		<i>Leptamphopus</i> sp123	Ep/M/F	Ca/Pr	zoo	5	-	-	-	-	N	-
	Caprellidae	<i>Phthisica</i> sp. nov.?	Sr/M/F	Mc/Gr	mic	10	-	-	-	-	-	-
	Dulichiidae	<i>Dulichiopsis nordlandica</i> (Boeck, 1870)	Sr/M/T	Mc/Gr	mic	10	-	L	-	-	-	-
	Eusiridae	<i>Eusirus longipes</i> Boeck, 1861	Ep/M/F	Ca/Pr	zoo	5	L	-	-	-	-	-
	Liljeborgiidae	<i>Idunella</i> sp.	U	U		U	-	-	-	-	-	-
		<i>Liljeborgia cf. dellavalei</i> Stebbing, 1906	U	U		U	-	-	-	-	-	-
	Lysianassidae	Lysianassidae spD	Sr/M/F	Ca/Sc	mac	4	-	-	-	-	-	U
		<i>Ensayara</i> cf. <i>carpinei</i> Bellan-Santini, 1974	Sr/M/F	Om/Dt;Pr;Sc	mac	3	N	N	-	-	-	-
		<i>Normanion ruffoi</i> Diviacco & Vader, 1988	Sr/M/F	Om/Dt;Pr;Sc	mac	3	-	-	-	-	-	-
		<i>Orchomene grimaldii</i> Chevreux, 1890	Sr/M/F	Om/Dt;Pr;Sc	mac	3	N	N	-	-	N	-
	Melitidae	<i>Tryphosella simillima</i> Ruffo, 1985	Sr/M/F	Ca/Sc	mac	4	-	R	-	-	-	-
	Melphidippidae	<i>Eriopisa elongata</i> (Bruzelius, 1859)	Sr/M/F	Om/Dt	pom	12	-	-	-	-	-	-
	Oedicerotidae	<i>Melphidippella macra</i> (Norman, 1869)	Ep/M/F	Om/Su	pom;zoo	16	-	-	-	-	-	-
	Pardaliscidae	Oedicerotidae unassigned	Ss/M/F	Ca/Pr	mei	8	-	-	-	-	-	-
		Pardaliscidae unassigned	Ep/M/F	Ca/Pr	zoo	5	-	-	-	-	-	-
		<i>Pardaliscoides</i> sp.	Ep/M/F	Ca/Pr	zoo	5	-	-	-	-	-	-
	Photidae	<i>Photis longicaudata</i> (Bate & Westwood, 1862)	Sr/D/T	Om/Su	pom;mic	15	-	-	L	-	-	-
	Phoxocephalidae	<i>Harpinia</i> sp.	Sr/M/B	Ca/Pr	mei	9	-	L	-	-	-	-
	Phrosinidae	<i>Primno macropa</i> Guérin-Méneville, 1836	Ep/M/F	U		U	-	-	-	-	-	-
	Pleustidae	Pleustidae spA	Sr/M/F	Ca/Pr	mac	7	U	U	-	-	-	-
		<i>cf. Pleusymtes mediterraneus</i> (Ledoyer, 1986)	Sr/M/F	Ca/Pr	mac	7	-	-	-	-	-	-
	Sebidae	<i>Seba aloe</i> Karaman, 1971	Sr/M/F	Mc/Gr	mic	10	-	-	-	L	L	-

				Sr/M/F	Ca/Pr	mac	7	-	-	-	-	-	-
Cumacea	Stenothoidae	<i>Stenothoe</i> sp.		Sr/M/F	Mc/Gr	mic	10	-	-	-	-	-	-
	Leuconidae	<i>Leucon</i> sp.		Ep/M/F	Om/Su	pom	16	-	-	-	-	-	-
	Nannastacidae	Nannastacidae unassigned		Ss/M/F	Om/Dt	pom;mic	1	-	-	-	-	-	-
Isopoda	Desmossomatidae	Desmossomatidae unassigned		Ss/M/F	Om/Dt	pom;mic	1	-	-	-	-	R	-
		<i>Chelator</i> sp.		Ss/M/F	Om/Dt	pom;mic	1	-	-	-	-	R	-
		<i>Prochelator</i> sp.		Ep/M/X	Ca/Sp	fis	18	L	L	L	-	-	-
		<i>Gnathia</i> sp.		Sr/M/F	Om/Dt	pom;mic	12	-	-	-	-	L	-
	Gnathiidae	<i>Austrofilius cf. mediterraneus</i> Castello, 2002		Sr/M/F	Om/Dt	pom	12	-	-	-	R	R	-
		<i>Janira maculosa</i> Leach, 1814		Sr/M/F	Om/Dt	pom	12	-	-	-	L	-	-
		<i>Munna</i> sp.		Sr/M/F	Om/Dt	pom	12	L	-	L	L	-	-
		<i>Disconectes</i> sp.		Sr/M/F	Om/Dt	pom;mic	12	-	-	-	-	-	-
Mysida	Mysidae	<i>Ilyarachna</i> sp.		Sr/M/F	Om/Dt	pom;mic	12	-	-	-	-	-	-
		<i>Mysida</i> unassigned		U	U	U	-	-	-	-	-	-	-
Tanaidacea	Apseudidae	<i>Apseudes setiferus</i> Bacescu, 1981		Sr/D/F	Om/Dt	pom	12	R	R	-	-	-	-
	Unassigned	Tanaidomorpha unassigned		Sr/D/T	Om/Dt	pom	12	-	-	-	-	-	-
	Leptocheliidae	<i>Mesotanais pinguiculus</i> Blazewicz-Paszkowycz, Bamber & Cunha, 2011		Sr/D/T	Om/Dt	pom	12	-	-	-	L	L	L
	Leptognathiidae	<i>Leptognathia</i> sp.		Sr/D/T	Om/Dt	pom	12	-	-	-	-	-	-
	Pseudotanaidae	<i>Pseudotanais tympanobaculum</i> Błażewicz-Paszkowycz, Bamber & Cunha, 2011		Sr/D/T	Om/Dt	pom	12	-	-	-	-	-	-
	Tanaellidae	<i>Araphura macrobelone</i> Błażewicz-Paszkowycz, Bamber & Cunha, 2011		Sr/D/T	Om/Dt	pom	12	-	-	-	-	-	-
		<i>Tanaella unguicillata</i> Norman & Stebbing, 1886		Sr/D/T	Om/Dt	pom	12	-	-	-	-	-	-
<b>ECHINODERMATA</b>													
<b>Ophiuroidea</b>		Unassigned	Ophiurida unassigned (juv.)	Sr/D/F	Om/Su;De	pom;mic;zoo	15	R	R	R	R	R	R
<b>Crinoidea</b>		Unassigned	Crinoidea unassigned (juv.)	Sr/S/A	U	U	-	-	-	-	-	-	U
<b>BRYOZOA</b>		Unassigned	Bryozoa unassigned	Ep/S/R	Om/Su	pom	16	-	U	-	-	-	-

**Feeding habit.** Source of food: epibenthic (Ep); seafloor surface (Sr); subsurface (Ss). Motility: mobile (M); discretely motile, movement not necessary for feeding (D); sessile (S).

Habit: free living or active burrower (F); tubicolous (T); sedentary, living in burrow (B); encrusting, requiring large area of attachment (R); attached, requiring one point of attachment (A); parasitic (X); unassigned (U). **Feeding mode.** Type of symbiosis: chemotrophic (Ch); heterotrophic (Hs). Diet: carnivorous (Ca), omnivorous (Om), feeding on microbes (Mc). Mode: deposit feeder, ingest sediment (De); detritus feeder, ingests particulate matter (Dt); suspension, filter feeder , strains particles from the water (Su); grazer, feeds by scraping (Gr); predator, eats living animals (Pr); scavenger, eats carrion (Sc); suctorial parasite (Sp); symbiotic (Sym); unassigned (U). **Food type and size.** Sediment (sed),

particulate organic matter (pom); wood and other terrestrial or coastal plant material (ter); single celled organisms (mic); meiofauna (mei); macrofauna (mac); zooplankton (zoo); fish (fis); unassigned (U). The trophic scheme is based on Macdonald et al. [1]. Trophic information was obtained from stable isotope data (mostly unpublished) and from the literature for each individual species wherever possible; if the feeding behaviour of a particular species was unknown, it was assumed to feed in a similar manner to congeneric or confamilial species, or species within the same major group.

**Trophic guilds.** For simplification we established 20 different trophic guilds based on source of food, feeding mode and diet: 1. Omnivores on subsurface items; 2. Omnivores on surface small items; 3. Omnivores on surface large items; 4. Scavengers; 5. Predators on zooplankton; 6. Predators on subsurface macrofauna; 7. Predators on surface macrofauna; 8. Predators on subsurface meiofauna; 9. Predators on surface meiofauna; 10. Microbial grazers; 11. Microbial grazers, wood specialists; 12. Detritivores; 13. Subsurface deposit feeders; 14. Surface deposit feeders; 15. Suspension feeders on surface items; 16. Suspension feeders on epibenthic items; 17. Suctorial parasites on macrofauna; 18. Suctorial parasites on fish; 19. Heterotrophic symbiosis; 20. Chemotrophic symbiosis; U. unassigned.

**Sub-regions:** El Arrache, Mercator MV (EA); Carbonate Province, Meknès and Darwin MV (CP). **Type of substrate:** wood (W); alfalfa (A); carbonate (C). **Occurrence:** new occurrences (N); taxa previously recorded in the region (R); taxa previously recorded in the study site (L); unassigned taxa (U).

## Reference:

1. Macdonald TA, Burd BJ, Macdonald VI, van Roodselaar A (2010) Taxonomic and feeding guild classification for the marine benthic macroinvertebrates of the Strait of Georgia, British Columbia. *Can Tech Rep Fish Aquat Sci* 2874: iv + 63 p.

Table S2. Breakdown of percentual contributions from SIMPER analysis for comparisons between mud volcanoes: Mercator (Mer); Meknès (Mek) and Darwin (Dar). The taxa listed contribute at least 1.5%. Numbers in bold mark the six dominant species at each site.

		Abundance (ind.m <sup>-2</sup> )				% Contribution			% Contribution			
		Total	Mer	Mek	Dar	TG	Mer	Mek	Dar	Mer/Mek	Mer/Dar	Mek/Dar
			654.1	637.6	886.0		AS:18.4	AS:20.6	AS:28.7	AD:92.4	AD:91.6	AD:71.2
<b>Cnidaria</b>												
Hydrozoa	Hydrozoa und <i>Clytia linearis</i>	1.0	0.0	0.7	E-P	7.5	---	•	1.5	•	•	•
		0.7	0.3	0.0	E-P	3.7	•	---	•	•	•	•
<b>Sipuncula</b>	Sipuncula und.	0.5	0.0	0.0	S-Dt	3.1	---	---	•	•	•	---
<b>Nemertea</b>	Nemertea und.	0.2	0.3	0.7	S-P	•	•	1.7	•	•	•	•
<b>Annelida</b>												
incertae sedis	<i>Protodrilus</i> sp.	0.0	0.0	10.3	S-Gr	---	---	2.4	---	•	•	1.8
	<i>Ophryotrocha</i> sp01	15.0	1.3	0.0	S-O	•	•	---	1.5	•	•	•
Aciculata	<i>Ophryotrocha</i> sp02	<b>16.2</b>	4.0	4.3	S-O	1.7	3.3	•	1.9	1.5	1.5	1.5
	<i>Ophryotrocha</i> sp08	0.0	<b>14.3</b>	8.0	S-O	---	3.7	2.5	2.0	•	•	2.3
Canalipalpata	<i>Leocrates atlanticus</i>	0.5	1.0	0.3	S-P	•	8.3	•	1.5	•	•	•
	<i>Nereimyra</i> sp.	2.2	1.3	12.3	S-P	•	2.3	3.6	•	1.7	2.2	2.2
Scolecida	<i>Harmothoe evei</i>	5.0	0.3	0.0	S-P	18.3	•	---	2.7	2.1	•	•
	<i>Subadyte pelucida</i>	0.7	0.3	1.3	S-P	3.7	•	•	•	•	•	•
Mollusca	Exogoninae sp.	0.2	0.0	7.3	S-Gr	•	---	1.7	•	•	•	1.5
	<i>Amage</i> sp.	0.2	1.7	42.7	S-De	•	•	5.1	•	3.1	3.9	3.9
Heterodonta	<i>Mellinopsis</i> sp.	1.8	<b>49.0</b>	<b>79.3</b>	S-De	•	8.1	7.4	4.0	4.4	5.7	5.7
	<i>Raricirrus beryli</i>	9.0	4.3	24.3	S-Gr	•	•	4.6	1.7	2.5	3.0	3.0
Protobranchia	<i>Polycirrus norvegicus</i>	3.3	0.0	0.0	S-De	4.8	---	---	•	•	---	---
	<i>Capitellidae</i> sp05	1.0	0.0	0.0	S-De	5.7	---	---	1.6	•	•	---
Pteriomorphia	<i>Xylophaga dorsalis</i>	<b>362.3</b>	3.7	3.7	Sy	14.1	1.7	•	8.9	7.5	•	•
	<i>Solemyidae</i> juv.	0.7	4.3	0.7	Sy	1.8	•	•	•	•	•	•
Caenogastropoda	<i>Idas modiolaeformis</i>	0.3	<b>101.7</b>	<b>106.0</b>	Sy	•	14.5	9.5	5.8	4.9	6.8	6.8
	<i>Eulimidae</i> sp01	0.0	0.0	0.7	S-Sp	---	---	•	---	•	•	•
Cocculiniformia	<i>Coccopigya</i> sp.	0.5	7.7	57.0	S-Gr	•	4.4	3.7	1.6	3.1	3.9	3.9
	<i>Xylodiscula</i> sp.	0.5	1.7	31.3	S-Gr	•	2.3	2.2	•	2.2	2.2	2.8

Vetigastropoda	<i>Copulabyssia</i> sp.	3.2	<b>253.7</b>	<b>179.7</b>	S-Gr	•	26.3	13.7	9.4	6.4	9.8
<b>Arthropoda</b>											
Amphipoda	<i>Leptamphopus</i> sp122	<b>26.8</b>	0.0	0.0	E-P	•	---	---	2.7	1.9	---
	<i>Orchomene grimaldii</i>	<b>147.2</b>	0.7	0.0	S-O	5.9	•	---	5.7	4.7	•
	<i>Seba aloe</i>	0.0	<b>153.7</b>	<b>213.0</b>	S-Gr	---	20.7	10.9	7.4	6.6	9.0
Isopoda	<i>Gnathia</i> sp.	<b>10.2</b>	0.0	0.0	E-Sp	6.5	---	---	3.0	2.2	---
	<i>Janira maculosa</i>	0.0	1.7	0.0	S-Dt	---	1.7	---	•	---	•
	<i>Munna</i> sp.	0.8	1.3	0.3	S-Dt	1.6	•	•	•	•	•
Tanaidacea	<i>Apseudes setiferus</i>	1.3	0.0	0.0	S-Dt	1.9	---	---	•	•	---
	<i>Mesotanais pinguiculus</i>	0.0	3.7	<b>59.7</b>	S-Dt	---	2.9	13.5	•	5.1	5.7
<b>Echinodermata</b>											
Ophiurida	Ophiurida juv.	0.7	0.3	24.3	S-Su	3.7	•	10.3	•	3.1	4.8
% Contribution of selected taxa		93.5	92.5	93.8		87.8	100.0	96.3	74.9	76.8	75.7

TG: trophic guild; AS: average similarity; AD: Average dissimilarity; E: epibenthic source of food; S: sediment surface or subsurface source of food; De: deposit feeder; Dt: detritus feeder; Gr: Grazer; O: Omnivore; P: predator; Sp: suctorial parasite; Su: suspension feeder; Sy: symbiotic; •: contributions lower than 1.5%.

Table S3. Breakdown of percentual contributions from SIMPER analysis for comparisons between substrate types: wood (W), alfalfa (A) and carbonate (C). The taxa listed contribute at least 1.5%. Numbers in bold mark the six dominant species in each substrate type.

		Density (ind.m <sup>-2</sup> )				% Contribution			% Contribution			
		Total	W	A	C	TG	W	A	C	W/A	W/C	A/C
			1302.8	786.3	35.0		AS:29.6	AS:15.6	AS:9.8	AD:74.3	AD:93.3	AD:92.5
<b>Cnidaria</b>												
Hydrozoa	Hydrozoa und	0.3	0.5	<b>1.3</b>	E-P	•	•	31.3	•	•	•	•
	<i>Clytia linearis</i>	0.5	0.3	0.5	E-P	•	•	9.2	•	•	•	•
<b>Nemertea</b>												
Nemertea und.		0.3	0.0	0.5	S-P	•	---	8.4	•	•	•	•
<b>Annelida</b>												
Aciculata	<i>Ophryotrocha</i> sp01	23.5	0.0	0.0	S-O	3.7	---	---	2.6	2.9	---	
	<i>Ophryotrocha</i> sp02	25.8	4.8	0.0	S-O	2.8	5.3	---	2.1	2.8	1.6	
	<i>Ophryotrocha</i> sp08	11.8	5.0	0.0	S-O	•	2.1	---	1.7	1.8	•	
	cf. <i>Amphiduros</i> sp.	2.8	1.3	0.0	S-Sc	1.7	4.0	---	•	•	•	
	<i>Leocrates atlanticus</i>	1.0	0.3	0.5	S-P	•	•	15.8	•	•	•	
	<i>Nereimyra</i> sp.	8.5	5.0	0.0	S-P	3.0	•	---	1.5	1.9	•	
	<i>Harmothoe evei</i>	3.5	2.8	<b>1.5</b>	S-P	1.9	4.4	8.4	•	•	2.1	
	<i>Subadyte pelucida</i>	0.6	1.3	0.3	S-P	1.5	4.1	•	•	•	•	
Canalipalpata	<i>Amage</i> sp.	24.5	9.0	0.0	S-De	2.0	•	---	2.4	2.6	•	
	<i>Mellinopsis</i> sp.	<b>72.3</b>	26.8	0.0	S-De	7.1	13.0	---	4.1	5.2	4.6	
	<i>Raricirrus beryli</i>	20.8	14.3	0.0	S-Gr	2.9	3.3	---	2.50	3.0	2.1	
	<i>Polycirrus norvegicus</i>	3.8	0.5	0.8	S-De	•	2.2	•	•	•	•	
Scolecida	Capitellidae sp05	0.0	0.3	<b>1.3</b>	S-De	---	•	11.8	•	•	•	
<b>Mollusca</b>												
Heterodonta	<i>Xylophaga dorsalis</i>	<b>543.3</b>	0.8	5.0	Sy	22.2	•	•	13.2	15.5	1.5	
Pteriomorphia	<i>Idas modiolaeformis</i>	<b>88.8</b>	<b>67.5</b>	0.0	Sy	6.2	10.5	---	4.8	5.5	5.2	
Cocculiniformia	<i>Coccopigya</i> sp.	9.5	<b>39.8</b>	0.0	S-Gr	3.8	2.4	---	2.6	2.1	2.8	
Heterobranchia	<i>Xylodiscula</i> sp.	2.8	22.8	0.0	S-Gr	2.0	4.0	---	1.6	•	2.3	
Vetigastropoda	<i>Copulabyssia</i> sp.	<b>200.5</b>	<b>129.3</b>	0.0	S-Gr	11.8	17.1	---	7.1	8.6	7.7	
<b>Arthropoda</b>												
Leptostraca	<i>Nebalia</i> sp01	1.5	2.5	0.0	S-Sc	•	4.7	---	•	•	1.5	
Amphipoda	<i>Ensayara carpinei</i>	1.0	13.3	0.0	S-O	•	•	---	1.5	•	2.4	
	<i>Leptamphopus</i> sp122	0.0	<b>40.3</b>	0.0	E-P	---	2.2	---	2.6	---	4.8	

	<i>Orchomene grimaldii</i>	<b>61.8</b>	<b>159.5</b>	0.0	S-O	•	2.1	---	6.1	3.0	8.6
Isopoda	<i>Seba aloe</i>	<b>117.3</b>	<b>157.8</b>	0.0	S-Gr	6.08	11.6	---	6.3	6.1	7.2
	<i>Gnathia</i> sp.	1.0	1.3	<b>13.0</b>	E-Sp	•	•	8.4	•	1.7	2.6
	<i>Munna</i> sp.	2.3	0.0	0.3	S-Dt	3.37	---	•	•	•	•
Tanaidacea	<i>Mesotanais pinguiculus</i>	10.8	35.0	<b>1.8</b>	S-Dt	•	2.6	•	2.5	1.7	3.0
<b>Echinodermata</b>	Ophiurida juv.	3.5	14.3	<b>1.8</b>	S-Su	2.98	•	6.8	•	•	2.2
% Contribution of selected taxa		95.4	96.1	80.7		88.1	99.1	100.0	73.9	74.9	73.5

TG: trophic guild; AS: average similarity; AD: Average dissimilarity; E: epibenthic source of food; S: sediment surface or subsurface source of food; De: deposit feeder; Dt: detritus feeder; Gr: Grazer; O: Omnivore; P: predator; Sc: scavenger; Sp: suctorial parasite; Su: suspension feeder; Sy: symbiotic; •: contributions lower than 1.5%.