

1 **Bryozoans from Chella Bank (Seco de los Olivos), with the description of a new**  
2 **species and some new records for the Mediterranean Sea**

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20

21 **Abstract**

22 Chella Bank (also known as Seco de los Olivos seamount) is a volcanic submarine elevation (76–

23 700 m deep) located ca. 16 km off the southern coast of Spain, within the Alboran Sea, in the

24 Atlantic-Mediterranean transition zone. It represents a biodiversity hot-spot for Europe, with more

25 than 600 species listed to date and contains several habitats included in the EU Habitats Directive.

26 During three ship-based expeditions, several areas of Chella Bank were surveyed and sampled in a

27 depth range of 95–729 m, resulting in new records that improve our knowledge on poorly studied  
28 phyla, such as bryozoans. In 14 of the 21 samples examined during this study, 43 bryozoan taxa  
29 could be identified. Among these, one species is described as new to science (*Buskea medwaves* sp.  
30 nov.) and three other ones are reported for the first time from the Mediterranean Sea, namely  
31 *Terminoflustra barleei* (Busk, 1860), *Marguetta pulchra* Jullien in Jullien & Calvet, 1903, and  
32 *Schizomavella (Schizomavella) linearis profunda* Harmelin & d’Hondt, 1992. Some species were  
33 abundant in the samples, such as *Adeonellopsis distoma* (Busk, 1859), *B. medwaves* sp. nov.,  
34 *Entalophoroecia cf. deflexa*, *Reteporella pelecanus* López de la Cuadra & García-Gómez, 2001.  
35 The highest species richness was detected in rhodolith beds and on coral rubble bottoms (especially  
36 exposed above the sediments) compared to other bottom types and habitats such as sandy bottoms  
37 and muddy bottoms. The finding highlights the importance of these environments for bryozoans.

38

39 **Keywords:** Alboran Sea; Cheilostomatida; Cyclostomatida; rhodoliths; coral rubble; Marine  
40 Protected Area.

41

42 This article is registered in ZooBank under urn:lsid:zoobank.org:pub:FEE571D4-B13A-4DCC-  
43 85DB-C27D3A4D57B5

44

45 *Buskea medwaves* is registered in ZooBank under urn:lsid:zoobank.org:act:48225D45-78B8-4498-  
46 A43A-C4F5639BE8EF

47

## 48 **Introduction**

49 The Alboran Sea, located in the Western Mediterranean Sea between the southern Iberian  
50 Peninsula and northern Africa, has a surface of 55,000 km<sup>2</sup> and a maximum depth of ca. 2000 m. It  
51 harbours a heterogeneous seafloor with submarine canyons, active faults, valleys, plateau, mounds,  
52 mud volcanoes, ridge banks and seamounts (Maldonado and Comas 1992; Würtz et al. 2015). The

53 Alboran Sea is connected to the Atlantic Ocean, through the Strait of Gibraltar. It has unique  
54 hydrodynamics (Parrilla and Kinder 1987; Tintoré et al. 1991), which are conditioned by the coastal  
55 and seabed morphology and are characterised by almost constant upwellings along its northern  
56 sector, resulting in one of the highest biological productive Mediterranean areas (Rodríguez 1982;  
57 Sarhan et al. 2000). Furthermore, species with different biogeographic affinities coexist in the  
58 Alboran Sea, including Atlantic-Mediterranean species and Mediterranean endemic species  
59 otherwise known from the temperate Lusitanian region or the warm Mauritanian region (Templado  
60 et al. 1986; Gofas 1998; Rueda et al. 2010; Urra et al. 2017). All these factors promote the existence  
61 of a wide variety of habitats and species-rich associated communities, making the Alboran Sea a  
62 biodiversity hot-spot within the Mediterranean basin (Templado et al. 1986; García Raso et al.  
63 2010; Templado 2011; Rueda et al. in press).

64 Seamounds and submerged banks are moderate to large seafloor rises, generally volcanic in  
65 origin and separated from the continental margins. Their particular topography generates specific  
66 oceanographic processes that influence the structure and composition of their biological  
67 communities (Samadi et al. 2007). The interaction of bottom currents with these topographic  
68 elevations cause the rise of cold, nutrient-rich deep waters (i.e. upwellings), promoting local  
69 productivity and benefiting the heterogeneous habitats and biota that they generally host (Morato  
70 and Clark 2007; Rogers 2018). Due to these features, these seafloor rises can sometimes represent  
71 hot-spots of biodiversity and “Vulnerable Marine Ecosystems” (defined in CM 11-06; see  
72 CCAMLR 2012), with the presence of both threatened and endemic species (McClain 2007; Rogers  
73 2018). This high biodiversity may suffer numerous anthropogenic pressures, such as the extraction  
74 of renewable (e.g. fish) and non-renewable (e.g. minerals, gas, oil) resources (de la Torre et al.  
75 2018; Rogers 2018). This makes seamounds and submerged banks very vulnerable areas, such as is  
76 the case of Chella Bank (also known as Seco de los Olivos seamount), which is located along the  
77 upper slope of the Almería margin (southern Spain), within the Alboran Sea. This basin is the  
78 westernmost part of the Mediterranean Sea and is greatly influenced by Atlantic waters and has

79 therefore been generally considered an Atlantic-Mediterranean marine transition. This seafloor rise  
80 harbours a high diversity and patchiness of habitats that are promoted by the high environmental  
81 variability resulting from its wide geomorphologic diversity, together with the presence of  
82 upwellings that favour the increase of local primary productivity (de la Torriente et al. 2014). The  
83 area is notable for the presence of threatened species as well as habitats formed by gorgonians,  
84 sponges and cold-water corals, which are included within the “1170 Reefs” habitat (Annex I) of the  
85 EU Habitats Directive (Council Directive 92/43/ECC). This natural heritage favoured the  
86 integration of this area into the EU Natura 2000 network in 2014 as the Site of Community  
87 Importance “Sur de Almería - Seco de los Olivos” (ESZZ16003). Nowadays, Chella Bank is  
88 considered a biodiversity hot-spot within the Alboran Sea, harbouring more than 600 species,  
89 including a wide variety of threatened and rare species for the Mediterranean Sea (Abad et al. 2007;  
90 de la Torriente et al. 2014, 2018; Ordines et al. 2019). Previous faunistic studies of this seamount  
91 have focused on the benthic habitats and their associated megafauna (de la Torriente et al. 2014,  
92 2018), and certain benthic groups such as brachiopods (Llompart 1988) and cnidarians (de la  
93 Torriente et al. 2014), whereas molluscs display an extraordinary biodiversity and are still under  
94 study (Caballero Herrera unpublished data). Therefore, a higher number of species could be  
95 expected. Nevertheless, the knowledge of other benthic groups, such as bryozoans, is very scarce  
96 for this seamount with only two species listed: *Reteporella grimaldii* (Jullien in Jullien & Calvet,  
97 1903) and *Pentapora fascialis* (Pallas, 1766) (de la Torriente et al. 2018; Natura 2000 Standard  
98 Data Form). Moreover, due to sampling limitations very few studies on bryozoans are available for  
99 the Alboran Sea (Álvarez 1992, 1994; Harmelin and d’Hondt 1992a, b; López de la Cuadra and  
100 García-Gómez 1994a), especially for deep-sea areas. Therefore, the aim of this study is twofold (i)  
101 identify and characterise the bryozoan fauna of Chella Bank and the adjacent bottoms; and (ii)  
102 analyse the relationships between bryozoans and local environmental characteristics (e.g. depth,  
103 sediment types). This contribution increases our knowledge on the biodiversity of this newly  
104 established Marine Protected Area of the Alboran Sea.

105

## 106 **Material and Methods**

107 Chella Bank (36° 31.27' N, 2° 50.43' W) (Fig. 1) occupies approximately 100 km<sup>2</sup> and covers a  
108 depth range of 76–700 m. It has a flattened main elevation, or “guyot”, and two shallower ridges  
109 culminating into “pinnacles”, with steeper slopes located to the north-east and west of the main  
110 elevation and culminating at ca. 200 m depth (Lo Iacono et al. 2008, 2012). The uneven topography  
111 with steep flanks, flat summit, rocky outcrops and sedimentary moats (Lo Iacono et al. 2008;  
112 Muñoz et al. 2008) offers a wide variety of bottom types (e.g. rhodolith beds, detritic sandy  
113 bottoms, coral-rubble bottoms, rocky bottoms, hemipelagic muddy bottoms), which host a great  
114 diversity of habitats and species. Many of the habitats have been characterised by de la Torriente et  
115 al. (2014, 2018), who also listed habitat-forming species linked to the "1170 Reef" habitat of the EU  
116 Habitats Directive, including gorgonians [e.g. *Eunicella verrucosa* (Pallas, 1766) and *Paramuricea*  
117 *clavata* (Risso, 1826)], sponges (e.g. *Asconema setubalense* Kent, 1870), and cold-water corals [e.g.  
118 *Desmophyllum pertusum* (Linnaeus, 1758) – previously known as *Lophelia pertusa* (Linnaeus,  
119 1758) – and *Madrepora oculata* Linnaeus, 1758)].

120 Sediment and benthic fauna samples were collected from the bank and the adjacent seafloor  
121 during three expeditions (1) MEDWAVES (Mediterranean out flow water and vulnerable  
122 ecosystems) 0916, within the framework of the EU H2020 ATLAS (A Transatlantic Assessment  
123 and Deep-water Ecosystem-based Spatial Management Plan for Europe) project (September–  
124 October 2016) on board R/V Sarmiento de Gamboa, (2) the MONCARAL (Montículos  
125 carbonatados mar de Alborán) 0516 (May–June 2016) on board R/V Ángeles Alvariño, and (3)  
126 MEDITS (Mediterranean international trawl survey) 1704 (April 2017) on board R/V Miguel  
127 Oliver. Twenty-one samples were collected with a Van Veen grab on different bottom types (soft  
128 bottoms with live and dead rhodoliths, soft bottoms with coral rubble of *M. oculata* and *D.*  
129 *pertusum*, sandy bottoms, hemipelagic muddy bottoms) and in depth range of 95–729 m (Fig. 1;  
130 Table 1). The Van Veen grab used during the MEDWAVES expedition had a dimension of 30×36

131 cm, whereas the one used during the MEDITS and MONCARAL expeditions had a dimension of  
132 ca. 20×29 cm. The two Van Veen grabs are not strictly similar, but they sampled the bottom in a  
133 similar way, with similar amounts of material collected. Five underwater video transects were also  
134 recorded during the MEDWAVES 0916 expedition using the ROV LIROPUS 2000 (model Super  
135 Mohawk II; equipped with a high definition Kongsberg video camera, a Kongsberg tooling camera  
136 and three frontal flash LED Matrix). Some bryozoan specimens were collected directly from the  
137 seabed with a ROV manipulator arm (Fig. 1; Table 1).

138 Samples were sieved on board with a 0.5 mm mesh width. In order to avoid damage during the  
139 sieving process, large but fragile colonies of some species (e.g. *Reteporella*) were separated from  
140 the sediment as soon as they were spotted. The samples were preserved in 70% ethanol and  
141 transported to the laboratory. Once there, bryozoan colonies were sorted using a stereomicroscope  
142 (Leica MZ12) and kept in ethanol 70% or they were dried for further identification.

143 The images of bryozoan colonies were obtained from gold-coated material (when alive, the  
144 fragments were cleaned and dried) through Scanning Electron Microscopy (SEM) at the *Centro de*  
145 *Microscopía, Universidad de Málaga, Spain* (JEOL JSM-840). Measurements were taken using the  
146 software Image J (<https://imagej.nih.gov/ij>). The material described in the present study is deposited  
147 in the *Museo Nacional de Ciencias Naturales* (MNCN), Madrid, Spain.

148 Sediment was characterised based on the main granulometric components (e.g. mud, sand,  
149 gravel, mixture of different size classes), the presence of live/dead rhodoliths and the types of  
150 bioclasts (mainly bivalves and coral remain). Annotations on exposed/buried bioclasts were made  
151 once the sample was on board and based on observations of the material collected (e.g. bioclasts  
152 colonized by epibenthic organisms vs. bioclasts not colonised and displaying dark colours that  
153 indicate possible burial in the sediments). These annotations were used for analysing the  
154 relationships between the bryozoan fauna (only considering the living specimens) and  
155 sediment/habitat type. For these studies, non-parametric (Kruskal-Wallis) and pairwise analyses (U-  
156 Mann Whitney) were used to test for differences in the bryozoan species richness in samples from

157 different sediment and habitats, as well as depths. Moreover, percentages of bryozoans with  
158 different growth forms (encrusting vs. erect) were compared at different depths using the non-  
159 parametric Z-test. These analyses were executed using the software IBM SPSS Statistics v. 20.

160

## 161 **Results**

### 162 *Bryozoan diversity and relationships with environmental features*

163 A total of 43 taxa were identified from 14 (out of 21) samples collected from different bottom  
164 types between 95 m and 790 m depth (bryozoan present until 450 m) within the Site of Community  
165 Importance (SCI) “Sur de Almería-Seco de los Olivos”. These data include 35 Cheilostomatida and  
166 eight Cyclostomatida (Table 2). A total of 26 families were recorded, mostly represented by one  
167 (57.7%) or two (27%) taxa. Four families (11.5%) (Bryocryptellidae, Calloporidae, Escharinidae  
168 and Phidoloporidae) included three taxa each, while one family (Celleporidae) was represented by  
169 four taxa. Six taxa were only identified to generic level and one species is described as new to  
170 science (*Buskea medwaves* sp. nov.).

171 Bryozoans were found in 14 predominantly shallow samples but were absent in the deeper  
172 samples (Table 1). Some species occurred in many samples, such as *Adeonellopsis distoma* (Busk,  
173 1859) and *B. medwaves* sp. nov. which were found in 10 samples, *Entalophoroecia* cf. *deflexa*  
174 (Couch, 1844) and *Reteporella pelecanus* López de la Cuadra & García-Gómez, 2001 in nine  
175 samples, with the latter also observed in the three ROV surveys. In addition to being common, *A.*  
176 *distoma* and *B. medwaves* sp. nov., together with *Tervia irregularis* (Meneghini, 1844), were also  
177 abundant, with a high number of fragments per sample. Sample VV-11 contained just one species,  
178 *Cellaria fistulosa* (Linnaeus, 1758), while sample VV-12 was the richest in species, including 60%  
179 of the total number of this study. In other samples (VV-13, VV-36, VV-39, and VV-40), the  
180 percentage of taxa varied from 42% to 37% of the total.

181 Among the living bryozoans, 52% had encrusting colonies and 48% erect colonies (Table 2). A  
182 bathymetrical trend was detected regarding growth forms, with the slight dominance of encrusting

183 colonies in shallow areas (down to 200 m) (56.7% encrusting taxa *versus* 43.3% erect taxa) (Z-test,  
184  $Z = 1.97$ ,  $p < 0.05$ ), whereas erect colonies dominated between 200 and 729 m depth (38.7%  
185 encrusting taxa *versus* 61.3% erect taxa) (Z-test,  $Z = -1.97$ ,  $p < 0.05$ ).

186 Depending on depth, the number of living bryozoan taxa was significantly different, with a  
187 maximum in shallow areas (down to 200 m) ( $14.0 \pm 7.4$  taxa per sample, mean  $\pm$  standard error),  
188 intermediate values between 201 and 500 m depth ( $8.9 \pm 6.3$  taxa per sample) and minima between  
189 500 and 729 m depth (0 taxa per sample) (Kruskal-Wallis,  $X^2 = 7.9$ ,  $p < 0.05$ ) (Fig. 2a). The  
190 number of taxa varied significantly, depending on the sediment type, with a maximum in mixed  
191 sediments with abundant exposed rhodolith/bioclots ( $17.4 \pm 2.2$  taxa per sample) and a minimum  
192 in muddy bottoms (0 taxa per sample) (Kruskal-Wallis,  $X^2 = 15.8$ ,  $p < 0.005$ ) (Fig. 2b). Regarding  
193 habitats, a similar trend was detected as that for sediments types, with maxima in rhodolith beds  
194 ( $15.0 \pm 6.4$  taxa per sample) and coral rubble bottoms ( $13.3 \pm 1.8$  taxa per sample), and minima in  
195 muddy bottoms (0 taxa per sample) (Kruskal-Wallis,  $X^2 = 14.1$ ,  $p < 0.005$ ).

196 Most taxa (67%) have a wide biogeographic distribution, from the North Atlantic Ocean to the  
197 Mediterranean Sea. These include *Copidozoum exiguum* (Barroso, 1920), *C. fistulosa*, *Puellina*  
198 *setosa* (Waters, 1899), *Escharoides mamillata* (Wood, 1844) and *T. irregularis*. Other taxa,  
199 including *Celleporina lucida* (Hincks, 1880a), *Herentia* aff. *hyndmanni* Johnston, 1847,  
200 *Palmiskenea gautieri* Madurell et al., 2013, and *R. pelecanus* (representing 11%) have been  
201 recorded from the Gulf of Cádiz to the Mediterranean Sea. Lower percentages (8%) are shown by  
202 taxa such as *Amphiblestrum lyrulatum* (Calvet, 1906), *Cribrilaria hincksi* (Friedl, 1917) and *P.*  
203 *fascialis*, that are known from Portugal to the Mediterranean Sea. Finally, 6% of the species  
204 including *Myriapora truncata* (Pallas, 1766) and *Plagioecia inoedificata* (Jullien, 1882) occur from  
205 Portugal to the Alboran Sea (Table 2). The species *Terminoflustra barleei* (Busk, 1860), *Marguetta*  
206 *pulchra* Jullien in Jullien & Calvet, 1903, and *Schizomavella (Schizomavella) linearis profunda*  
207 Harmelin & d'Hondt, 1992 are recorded for the first time in the Mediterranean Sea. One species of  
208 *Buskea (B. medwaves* sp. nov.) is new to science.



209

210 *New taxa and remarks on rare species*

211 Species which represent new records for the Mediterranean Sea, such as *T. barleei*, *M. pulchra*,  
212 and *S. (S.) linearis profunda* as well as the new species (*B. medwaves* sp. nov.), are commented in  
213 detail and illustrated in Figures 3–7; and *Scrupocellaria incurvata* Waters, 1897 is included here to  
214 document with SEM pictures the variable spines formula, previously not illustrated.

215

216 Family Flustridae Fleming, 1828

217 Genus *Terminoflustra* Silén, 1942

218 ***Terminoflustra barleei* (Busk, 1860)**

219 (Fig. 3a–b)

220

221 *Flustra barleei* Busk, 1860: 123; Hincks 1880b: 122, pl. 5, figs. 6–8.

222 *Chartella barleei*: Ryland and Hayward 1977: 82, fig. 30.

223 *Terminoflustra barleei*: Prenant and Bobin 1966: 189; d’Hondt 1973: 378, pl. 2, fig. 11; d’Hondt

224 1974: 29; Reverter-Gil and Fernández-Pulpeiro 2001: 58.

225

226 **Material examined**

227 **Chella Bank and adjacent bottoms:** MNCN 25.03/4214: VV-38, 24 October 2016, 250 m depth, 3

228 fragments alive; MNCN 25.03/4215: VV-39, 24 October 2016, 250 m depth, 6 fragments alive;

229 MNCN 25.03/4216: VV-40, 24 October 2016, 250 m depth, 8 fragments alive. All samples Instituto

230 Español de Oceanografía (IEO) coll.

231

232 **Short description**

233 Colony erect, flexible, delicate and transparent (Fig. 3a); from an encrusting basal part comes up

234 the bilaminar fronds whose zooids are disposed back to back. Zooids rectangular with lightly

235 calcified walls and without spines at the distal corners (Fig. 3b); operculum demarked by the distal  
236 and semicircular sclerite. Avicularia interzooidal with mandible semi-circular, directed laterally  
237 (Fig. 3b); ovicell endozooidal, opening distally to the operculum of the maternal zooids (Fig. 3b).  
238 Kenozooids present along the border of the branches, usually smaller than the autozooids.

239

#### 240 **Distribution/Ecology**

241 *Geographic distribution:* North Sea and northern Iberian Peninsula (50–630 m depth) (d’Hondt  
242 1973; Ryland and Hayward 1977; Reverter-Gil and Fernández-Pulpeiro 2001).

243 *Bottom type and associated fauna:* This species was collected on muddy bottoms (> 75% of silt and  
244 clay content, and exposed coral-rubble. The assemblage was dominated in species number by  
245 gastropods (17 spp.) and bivalves (15 spp.) and in number of individuals by ophiuroids. Among the  
246 bivalves, the mytilid *Dacrydium hyalinum* (Monterosato, 1875), the thyasirid *Mendicula*  
247 *ferruginosa* (Forbes, 1844) and the anomiid *Heteranomia squamula* (Linnaeus, 1758), were the  
248 most represented. Amphipoda and Tanaidacea dominated among crustaceans, whereas *Ophiura* sp.  
249 and *Ophiotrix* sp. represented common and dominant echinoderms. Finally, the brachiopods  
250 *Megathiris detruncata* (Gmelin, 1791) and *Megerlia truncata* (Linnaeus, 1767) were abundant and  
251 frequently found attached to the coral-rubble.

252

#### 253 **Remarks**

254 *Terminoflustra* has been mentioned as a synonym of *Chartella* (e.g. Hasting MS in Ryland 1969,  
255 p. 212). *Terminoflustra barleei* is similar to *Chartella tenella* (Hincks, 1887), an endemic species  
256 from the Mediterranean Sea (Hayward and McKinney 2002), which is characterised by the presence  
257 of a pair of short thin spines at the distal corners and by a triangular avicularium directed distally or  
258 obliquely to the distal axis of the branch. This is the first record for this species from the  
259 Mediterranean Sea and reinstates the presence of the genus *Terminoflustra* in this basin. Previously  
260 Rosso (2003) mentioned the occurrence of *Terminoflustra* sp. and later, suppressed this record

261 (Rosso and Di Martino 2016) because of the lack of a formal description and illustration of the  
262 specimen.

263

264 Family Candidae d'Orbigny, 1851

265 Genus *Scrupocellaria* van Beneden, 1845

266 *Scrupocellaria incurvata* Waters, 1897

267 (Fig. 4a–e)

268

269 *Scrupocellaria incurvata* Waters, 1897: 09, pl. 1, figs. 16–17; d'Hondt 1973: 372; d'Hondt 1974:  
270 31; Reverter-Gil and Fernández-Pulpeiro 2001: 70; Vieira et al. 2014: 9, fig. 7I.

271

#### 272 **Material examined**

273 **Chella Bank and adjacent bottoms:** MNCN 25.03/4217: VV-38, 24 October 2016, 250 m depth, 4  
274 fragments alive; MNCN 25.03/4218: VV-39, 24 October 2016, 250 m depth, 4 fragments alive;  
275 MNCN 25.03/4219: VV-40, 24 October 2016, 250 m depth, 1 fragment alive; MNCN 25.03/4220:  
276 VV-35, 24 October 2016, 320 m depth, 4 fragments alive; MNCN 25.03/4221: VV-36, 24 October  
277 2016, 321 m depth, 1 fragment alive. All samples IEO coll.

278

#### 279 **Short description**

280 Colonies erect, flexible and delicate, white in colour if dry, dichotomically branched. Branches  
281 formed by two series of zooids disposed alternately on one side and slightly turned outwards;  
282 autozooids elongate; gymnocyst well developed, smooth; opesia occupying less than one half of the  
283 frontal (Fig. 4a); narrow and crenulate cryptocyst; spine number variable within the colony, one to  
284 three spines in the outer distal corner and two or one in the inner corner (Fig. 4a–c); large and  
285 asymmetrical scutum covering completely the opesia and sometimes surpassing its distal area, with  
286 the proximal region more expanded than the distal part, inserted distally, near the more proximal

287 inner spine (Fig. 4a–c). Avicularium frontal, small, narrowly triangular, on a raised cystid placed  
288 below the opesia, present on some zooids, infrequent, mandible triangular and hooked. Lateral  
289 avicularia triangular, large and directed almost horizontally; rostrum serrated and hooked with  
290 complete crossbar (Fig. 4b, c); mandible triangular. Ovicell large but not prominent, longer than  
291 wide, slightly inclined, associated with a small frontal, distal avicularium and perforated by just a  
292 single medium pore near the proximal border (Fig. 4d). Vibracular chamber basal, about one third  
293 as long as the zooid but the same width, septal groove curved; seta long, curved, surpassing the  
294 width of the branch; radicular pore placed basally on the chamber; two vibracular chamber at the  
295 branch bifurcation (Fig. 4e).

296

### 297 **Distribution/ecology**

298 *Geographic distribution:* Mediterranean Sea and North Atlantic Ocean (105–650 m depth) (Zabala  
299 and Maluquer 1988; Reverter-Gil and Fernández-Pulpeiro 2001; Rosso and Di Martino 2016).

300 *Bottom type and associated fauna:* This species was mostly on bottoms consisting of mud and  
301 medium sand with coral-rubble and bioclasts, as well as on coarse sandy bottoms with rhodoliths.  
302 The associated fauna of mixed sandy bottoms with bioclasts and coral-rubble was mostly  
303 represented by molluscs (11 bivalves, four gastropods, two scaphopods and one polyplacophoran),  
304 and dominated by amphipods, such as gammarids and caprellids. Characteristic species included the  
305 bivalves *D. hyalinum* and the arcid *Bathyarca philippiana* (Nyst, 1848) and the cystiscid gastropod  
306 *Gibberula turgidula* (Locard & Caziot, 1900).

307

### 308 **Remarks**

309 *Scrupocellaria incurvata* is relatively rare and it was recorded previously from the  
310 Mediterranean Sea and the North Atlantic Ocean (Harmelin 1976; Zabala and Maluquer 1988;  
311 Reverter-Gil and Fernández-Pulpeiro 2001), associated to relatively deep soft bottoms. Vieira et al.  
312 (2014) illustrated part of the colony from MOM 420193 sample, commenting about its morphology

313 traits and also discussed and confirmed its place in the genus *Scrupocellaria*. It was described by  
314 some authors as having only one spine at each distal angle (1:1) (see Waters 1897; Jullien and  
315 Calvet 1903; Zabala and Maluquer 1988). Nevertheless, d'Hondt (1973, 1974) analysed several  
316 specimens from the Thalassa expedition and confirmed that it has more spines than previously  
317 described (1:1). He mentioned the occurrence of 3:2, 2:1 and 1:1 spines along the branches but did  
318 not present illustrations (d'Hondt 1974, p. 5). It is the case for the specimens collected at Chella  
319 Bank, whose autozooids only did not display the formula (1:1) (see Fig. 4b, c). This variable spine  
320 formula has been figured in the present study with SEM pictures for the first time.

321

322 Family Bryocryptellidae Vigneaux, 1949

323 Genus *Marguetta* Jullien in Jullien & Calvet, 1903

324 *Marguetta pulchra* Jullien in Jullien & Calvet, 1903

325 (Fig. 5a-c)

326

327 *Marguetta pulchra* Jullien in Jullien & Calvet, 1903: 73, pl. 7, fig. 3; Álvarez 1991: 91, pl. 4, fig.

328 9C; Reverter-Gil and Fernández-Pulpeiro 1999a: 1406, fig. 2.

329 *Porella pulchra*: Barroso, 1912: 34, fig. 7a, b.

330

### 331 **Material examined**

332 **Chella Bank and adjacent bottoms:** MNCN 25.03/4222: VV-36, 24 October 2016, 321 m depth, 1

333 fragment dead; MNCN 25.03/4223: VV-37, 24 October 2016, 322 m depth, 1 fragment alive. All

334 samples IEO coll.

335

### 336 **Short description**

337 Colony bilaminar (2–3 mm width, 1–2 mm thickness), erect and branching (Fig. 5a), formed by

338 zooids disposed back to back in longitudinal series. Frontal shield finely granular with few,

339 scattered small pseudopores and larger areolar pores (Fig. 5a). Primary orifice almost circular with  
340 a shallow concave proximal border. An almost circular avicularium, wider than long, is inserted  
341 inside the peristome (Fig. 5b). Frontal avicularia, small, circular to elliptical with dented rostrum,  
342 directed randomly, crossbar complete (Fig. 5c). Ovicell immersed, ooecium surface similar to the  
343 frontal shield (Fig 5a), encircled by small peripheral pores; aperture opening inside the peristome  
344 but not closed by the maternal operculum.

345

#### 346 **Distribution/ecology**

347 *Geographic distribution:* North Atlantic Ocean (Bay of Biscay) (134–1262 m depth) (Jullien and  
348 Calvet 1903; Reverter-Gil and Fernández-Pulpeiro 1999a; Reverter-Gil and Fernández-Pulpeiro  
349 2001).

350 *Bottom type and associated fauna:* This species was collected on medium sandy bottoms and  
351 hemipelagic muddy bottoms, in both cases with some coral rubble and bioclasts, as well as on  
352 gravel bottoms with rhodoliths. Molluscs were the best represented phylum in all cases, with *G.*  
353 *turgidula* and the gadilid scaphopod *Cadulus jeffreysi* (Monterosato, 1875) as characteristic species  
354 in the hemipelagic muddy bottoms, and the eulimid gastropod *Curveulima beneitoi* Peñas et al.,  
355 2006 in the gravel bottoms with rhodoliths.

356

#### 357 **Remarks**

358 *Marguetta*, *Porella* and *Palmiskeneia* are closely similar, and the both two latter genera are  
359 commonly found in the Mediterranean. However, they can be distinguished principally by the  
360 primary orifice shape. The primary orifice of *Marguetta* lacks a sinus, lyrula or condyles, and  
361 zooids have a short peristome with a single suborificial avicularium; in *Porella* the primary orifice  
362 has lyrula and condyles, and zooids have a well-developed peristome and avicularium suboral  
363 associated; *Palmiskeneia* has a primary orifice with condyles, and peristome well developed with  
364 avicularia in the inner wall and a tapered umbo above of each avicularium.

365 The fragments found in Chella Bank are very similar to those studied by Jullien and Calvet  
366 (1903), with the only difference being represented by the size of the frontal pseudopores, which are  
367 smaller in the material collected for the present study. These are the first Mediterranean records for  
368 both the genus and the species.

369

370 Family Bitectiporidae MacGillivray, 1895

371 Genus *Schizomavella* Canu & Bassler, 1917

372 *Schizomavella (Schizomavella) linearis profunda* Harmelin & d'Hondt, 1992

373 (Fig. 6a–c)

374

375 *Schizomavella linearis profunda* Harmelin & d'Hondt, 1992a: 45, pl. 6, figs. A, B; Souto et al.

376 2014a: 143, fig. 6D;

377 *Schizomavella (Schizomavella) linearis profunda*, Ramalho et al. 2020: 468, figs. 5C, D, 6A).

378

### 379 **Material examined**

380 **Chella Bank and adjacent bottoms:** MNCN 25.03/4224: VV-38, 24 October 2016, 250 m depth,

381 IEO coll., 2 fragments (1 alive, 1 dead).

382

### 383 **Distribution/ecology**

384 *Geographic distribution:* Atlantic Ocean (Portugal, Gulf of Cádiz) (35–930 m depth) (Harmelin and

385 d'Hondt 1992a; Souto et al. 2014a; Ramalho et al. 2020).

386 *Bottom type and associated fauna:* This species was collected on muddy bottoms with exposed

387 coral-rubble, where molluscs and ophiuroids dominated. The species *D. hyalinum*, *H. squamula* and

388 *M. ferruginosa* dominated among molluscs, together with amphipods, tanaidaceans and decapods

389 among crustaceans.

390

391 **Remarks**

392 Harmelin and d'Hondt (1992a) described the subspecies *S. (S.) linearis profunda* and mentioned  
393 that the main feature for distinguishing it from the typical form is the number of oral spines, which  
394 are 5–7 instead of 2–4. Souto et al. (2014a) found this subspecies in northern Portugal with the  
395 zooids having 5–6 oral spines. Some additional slight differences included flatter zooids and  
396 avicularia that are slightly more distally placed and directed distally. Subspecies recorded by  
397 Ramalho et al. (2020) from the Gulf of Cádiz share these features. Colonies from Chella Bank (Fig.  
398 6a–c) are more similar to the type material described from the Gulf of Cádiz by Harmelin and  
399 d'Hondt (1992a), having 6–7 oral spines and avicularia frequently directed medially although with  
400 a high intracolony variability.

401

402 Family Celleporidae Johnston, 1838

403 Genus *Buskea* Heller, 1867

404 ***Buskea medwaves* Ramalho sp. nov.**

405 (Fig. 7a–e; Table 3)

406

407 **Material examined**

408 **Chella Bank and adjacent bottoms:** Holotype: MNCN 25.03/4226: VV-38, 24 October 2016, 250  
409 m depth, 12 fragments (8 alive, 4 dead); Paratypes: MNCN 25.03/4225: VV-12, 02 June 2016, 95 m  
410 depth, 7 fragments (4 alive, 3 dead); MNCN 25.03/4227: VV-39, 24 October 2016, 250 m depth, 10  
411 fragments (3 alive, 7 dead); MNCN 25.03/4228: VV-40, 24 October 2016, 250 m depth, 1  
412 fragment, alive; MNCN 25.03/4229: VV-42, 25 October 2016, 280 m depth, 1 fragment, alive;  
413 MNCN 25.03/4230: VV-36, 24 October 2016, 321 m depth, 2 fragments (1 alive, 1 dead); MNCN  
414 25.03/4231: VV-37, 24 October 2016, 322 m depth, 1 fragment, dead. All samples IEO coll.

415

416 **Etymology**



417 This species was named '*medwaves*' in honour of the MEDWAVES 0916 expedition carried out  
418 within the framework of the EU H2020 ATLAS project.

419

#### 420 **Diagnosis**

421 Colony erect, dichotomously branched, and composed of zooids placed in back to back,  
422 regularly alternating pairs. Primary orifice semi-circular with short, narrow and rounded V-shaped  
423 or almost quadrate sinus with a pair of large condyles. Suboral mucro bearing a small avicularium  
424 on the inner side. Large adventitious avicularia placed on the frontal shield with a spatulate rostrum.  
425 Ovicell hyperstomial perforated by numerous circular pseudopores (18–21).

426

#### 427 **Description**

428 Colony erect, slender and dichotomously branched (Fig. 7a); white in colour when dry. Branches  
429 cylindrical composed of regularly alternating pairs of zooids placed back to back (Fig. 7a, b).  
430 Autozooids elongate, convex; frontal surface smooth, imperforate except for tiny and few areolar  
431 pores disposed far each other, forming a single row around the margin, not always visible, outlining  
432 the zooidal boundaries which otherwise are almost indistinct. Primary orifice semicircular, wider  
433 than long, with short, narrow and rounded up-side down trapezoidal with curved sides or almost  
434 quadrate sinus and a pair of large fan-shaped condyles (Fig. 7b). Peristome well developed,  
435 thickened, hiding the primary orifice, with a prominent medial suboral mucro placed directed at  
436 about 45° from the branch plane; mucro bearing a small adventitious avicularium on the dorsal side,  
437 at the tip (Fig. 7a, c) with triangular rostrum and mandible maintaining the same direction and  
438 inclination of the mucro, crossbar complete (Fig. 7c). Secondary orifice with a short pseudosinus  
439 besides the suboral mucro (Fig. 7a). Adventitious avicularia on the frontal shield and/or at the  
440 branch bifurcation, infrequent, large, with spatulate rostrum, randomly directed (obliquely distally)  
441 (Fig. 7a, d); crossbar not observed. Ovicell hyperstomial, slightly elongated and proximally sunken,  
442 perforated by circular pores, numbering 18–21, all placed in its mid-distal part, without labellum,

443 not closed by the maternal operculum (Fig. 7e); sometimes becoming immersed by secondary  
444 calcification.

445

#### 446 **Distribution/ecology**

447 *Bottom type and associated fauna:* This species was collected on a wide range of bottoms including  
448 medium sandy bottoms, hemipelagic muddy bottoms, muddy bottoms with coral-rubble and coarse  
449 sandy and gravelly bottoms with rhodoliths bottoms. The associated species included the bivalves  
450 *Kelliella miliaris* (Philippi, 1844) (Lasaecidae) and *Yoldiella philippiana* (Nyst, 1845) (Yoldiidae) in  
451 the muddy bottoms, and *Curveulima beneittoi* as well as the astartid bivalve *Goodallia triangularis*  
452 (Montagu, 1803) in the coarse sandy and gravelly bottoms.

453

#### 454 **Remarks**

455 *Buskea medwaves* sp. nov. shares some features with Mediterranean species belonging to two  
456 different genera. It is similar to *Palmicellaria elegans* Alder, 1864, in the colony shape, having  
457 biserial branches with zooids alternated and disposed back to back, and the single suboral  
458 avicularium. However, *P. elegans* has the mucro curved downwards or nearly at right angle in  
459 relation to the main axis of the branch and the avicularium having a semicircular mandible,  
460 occupying at the centre of the upper surface, while in the new species, mucro is at 45° in relation to  
461 the branch axis/plane and avicularium placed at the tip; *P. elegans* has a primary orifice with a  
462 smaller quadrate sinus, and lacks adventitious avicularia on the frontal surface.

463 A second similar species is *Buskea dichotoma* (Hincks, 1862) because of the median peristomial  
464 avicularium with triangular mandible. However, *B. dichotoma* is composed of alternating whorls of  
465 four to six zooids, primary orifice with wider sinus, additional small adventitious avicularia  
466 frequently occurring on old zooids, large interzooidal avicularium which also differ in the shape,  
467 and the ovicell perforated by up to 12 smaller pores. *Buskea billardi* (Calvet, 1906) is also similar in  
468 the colony shape (erect, slender, and cylindrical) with dichotomous branch and zooids disposed

469 alternately in pairs, back to back and basally in contact. However, *B. billardi* has primary orifice  
470 with a broad, shallow sinus, peristomial avicularium with semi-elliptical mandible, while other  
471 kinds of avicularia are absent, and ovicell with fewer, smaller, irregularly-shaped pores on the  
472 surface.

473

#### 474 **Discussion**

475 This is the first study on the bryozoan fauna associated with a seamount (and its adjacent areas)  
476 of the Alboran Sea, and it increases the knowledge on this phylum for the western Mediterranean  
477 Sea considerably. The absence of Ctenostomes in the studied material may be explained by their  
478 common association with seaweeds, calcareous algae, hydroids, tunicates, decapods and  
479 polychaetes (Hayward 1985). Despite their great abundance on sheltered rocky shores from shallow  
480 waters, very few species are known from deep waters (d'Hondt 1983; Gordon 1986).

481 The observed rate of taxa belonging to Cheilostomatida (81%) vs. Cyclostomatida (19%) is  
482 almost similar to that reported by Rosso and Di Martino (2016) in the Mediterranean Sea complete  
483 check-list (76.3% Cheilostomatida, 13.5% Cyclostomatida), except for the absence of  
484 Ctenostomatida (in the Mediterranean 10.2% Ctenostomatida). The best-represented families  
485 observed in this study, i.e. Calloporidae, Celleporidae and Phidoloporidae, have previously been  
486 documented as species-rich families for the Mediterranean Sea (Rosso and Di Martino 2016).

487 The proportion of the taxa erect, and encrusting colonies was almost equal in the samples  
488 analysed in the present study, with 52% having encrusting colonies and 48% having erect colonies.  
489 Nevertheless, taxa with encrusting colonies predominated at shallower depths (95–200 m), taxa  
490 with erect colonies were found mostly in samples from deeper bottoms (> 200 m depth). Deeper  
491 environments are in fact less prone to hydrodynamic conditions that favour the development of  
492 erect forms (Smith 1995). However, Harmelin (1988) paid attention to distribution of growth-forms,  
493 which may be much more complex in recent communities than in fossil ones, particularly from  
494 near-surface to the bathyal zone in the Mediterranean. Other environmental features must also be

495 considered, such as the vertical gradient and the geographic variability in physical and biotic  
496 parameters. Despite the abundance of erect taxa, most colonies were fragmented, except for some  
497 specimens of *Reteporella pelecanus* that were collected with the ROV. Conversely, most encrusting  
498 taxa were collected alive and without clear signs of abrasion. This difference may be due to the fact  
499 that encrusting colonies grow in the same plane of the substrates, being more protected than erect  
500 colonies, which would be more exposed to damage due to the protruding growth form, during the  
501 life and as a result of sampling.

502 Studies on the biogeographic distribution of bryozoan species across the Strait of Gibraltar and  
503 adjacent areas (Gulf of Cádiz and Alboran Sea) mentioned that these areas are influenced by  
504 Mediterranean and Atlantic waters and host species shared with these basins (Harmelin and  
505 d'Hondt 1992a, 1993; López de la Cuadra and García-Gómez 1994a; Ramalho et al. 2018a, 2020).  
506 They indicated that some species of Mediterranean affinity can be found in adjacent areas of the  
507 Atlantic Ocean and some species of Atlantic affinity can occur inside the western Mediterranean  
508 Sea, although they generally do not occur eastwards of the Alboran Sea. According to Partanello et  
509 al. (2007) the Alboran Sea represents a boundary area between the Mediterranean Sea and Atlantic  
510 Ocean for some species due to the presence of the “Almería-Oran Front”. This front would act as a  
511 marine barrier (physical, ecological) for the distribution of numerous species, as well as for the  
512 planktonic larval dispersion. This peculiarity has been observed for different faunal groups  
513 including sponges (Maldonado and Uriz 1995, Sitjà et al. in press), echinoderms (Gallardo Roldán  
514 et al. 2015) and molluscs (Urza et al. 2017), which makes the Alboran Sea a unique biodiversity  
515 hot-spot within the European context (Rueda et al. in press). Bryozoans also contribute to this  
516 model with *T. barleei*, *M. pulchra* and *S. (S.) linearis profunda* previously considered as restricted  
517 to the Atlantic Ocean, and here reported from the Alboran Sea.

518 Taxonomic studies on bryozoans of the Mediterranean Sea are plentiful and report high numbers  
519 of species (ca. 550 species according to Rosso and Di Martino, 2016; see references therein). Some  
520 studies are specific for adjacent areas such as the Strait of Gibraltar with ca. 120 spp. and the

521 Alboran Sea with ca. 130 spp. (Harmelin and d'Hondt 1992a, b; Álvarez 1992, 1994; López de la  
522 Cuadra and García-Gómez 1994a). This paper increases considerably the number of bryozoans for  
523 the Alboran Sea and the recent declared SCI “Sur de Almeria – Seco de los Olivos” from where just  
524 two bryozoan species (*R. grimaldii* – pending review, and *P. fascialis*) were previously known  
525 (Natura 2000 Standard Data Form; de la Torriente et al. 2014). From the 43 taxa recorded here, one  
526 is a new species (*B. medwaves* sp. nov.), 13 (Table 2 marked with #) are new records for the  
527 Alboran Sea, and three (*T. barleei*, *M. pulchra* and *S. (S.) linearis profunda*) are new records for the  
528 Mediterranean Sea. The number of species might be even higher because six taxa could not be  
529 identified at species level due to the absence of some important morphological structures  
530 (reproductive structures, avicularia, ancestrula – e.g. *Escharella* sp. *Annectocyma* sp. and  
531 *Exidmonea* sp.), or because the fragments were too small (*Stomatopora* sp. and *Crisia* sp.) or poorly  
532 preserved (*Hornera* sp.). Sampling using low-impact methods should be undertaken in other  
533 habitats of the SCI in order to improve further the faunistic list of bryozoans.

534 Some of the species collected in Chella Bank and its adjacent bottoms display a greater  
535 bathymetrical variability compared to their distribution range. *Fenestrulina malusii* (Audouin,  
536 1826), previously reported spread on shelf habitats, down to 100 m depth (Gautier 1962; Hayward  
537 and McKinney 2002; Madurell et al. 2013), thrives in Chella Bank between 250 and 321 m and  
538 deeper distributions (400 m) were reported by Ramalho et al. (2020). This suggests that this species  
539 could have a wider bathymetrical range than previously known or could represent a species  
540 complex. Another species, *P. fascialis*, usually recorded between 30 m and 60 m depth at the  
541 Mediterranean Sea (Gautier 1962; Hayward and McKinney 2002; Madurell et al. 2013; Pagès-  
542 Escolà et al. 2020) was detected in deeper bottoms (140–250 m) in the present study. Although  
543 most *P. fascialis* fragments collected at Chella Bank were alive, some colonies displayed abraded  
544 parts suggesting a potential displacement of dead colonies from shallower to deeper bottoms.

545 In the present study, 33% of the samples lacked bryozoan colonies. Smith (1995) proposed that  
546 the absence of bryozoan species in specific areas could suggest colonies burial, low salinity, lack or

547 instability of hard substrates, very deep or shallow water. Samples VV-09, -24, -25, -26, -31, -32  
548 and -34 were collected on muddy bottoms, which is in line with the observations made by Smith  
549 (1995) about the instability or lack of hard substrates. The highest number of taxa observed in the  
550 Seco de los Olivos was linked to samples collected in mixed bottoms with rhodoliths and those with  
551 exposed coral rubble. The role of such bioclasts for benthic biodiversity when compared to soft  
552 bottoms is widely known (Rasser and Riegl 2002; Riosmena-Rodríguez et al. 2017), and it is related  
553 to the higher availability of microhabitats, heterogeneity of substrates and diversity of food sources,  
554 among other factors. Nevertheless, specific studies on the bryozoan fauna and their associated  
555 substrates or habitats are scarce on a global scale and the information is scattered over a few works,  
556 mainly focussing on coral reefs or specific associations with algae, rhodoliths, sponges, decapods or  
557 corals (Harmelin 1997; Souto et al. 2014b; Almeida et al. 2017; Ramalho et al. 2018b; Rueda et al.  
558 2019). Rosso and Di Martino (2016) reported that the highest bryozoan diversity values for the  
559 Mediterranean Sea pertain to coralligenous and cave biocoenoses. The availability of suitable  
560 substrate or shelter may be a limiting factor to the settlement and development of bryozoan  
561 colonies, with higher species diversity found on mineralized skeletons (e.g. coral rubble, shells,  
562 rhodoliths) and other rigid substrates rather than on flexible substrates (e.g. macroalgae, seagrass),  
563 and on gravel (with rhodoliths/maërl) rather than on sandy sediments (Ryland 1970; McKinney and  
564 Jackson 1989; Smith 1995, Kukliński and Barnes 2005; Taylor 2016). This would be in line with  
565 the observations made by Madurell et al. (2013), who documented that muddy and sandy sediments  
566 generally showed few or no bryozoans in the Cap de Creus submarine canyon, whereas coarse  
567 sands and gravels presented a higher diversity, abundance and biomass. Most of the seabed around  
568 Chella Bank is muddy, which is not an optimal substrate for the settlement and further development  
569 of bryozoan larvae (Ryland 1970; Smith 1995). This could explain the low bryozoan biodiversity on  
570 those soft bottoms when compared with close areas with a heterogeneous seafloor regarding  
571 substrate types (Alboran Island, Strait of Gibraltar and Gulf of Cádiz) (e.g. Hayward and d'Hondt  
572 1992a; Álvarez 1992, 1994; López de la Cuadra and García-Gómez 1994a; Ramalho et al. 2020), as

573 observed for other groups (de la Torriente et al. 2014, 2018). The presence of bryozoan species  
574 from both the Atlantic Ocean and the Mediterranean Sea in Chella Bank shows the great ecological  
575 importance of this area, which represents an intermediary steppingstone for the dispersion of  
576 bryozoans in deep-sea areas of these two basins.

577

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587

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589

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598

599 **Conflict of interest**

600 The authors declare that they have no known competing financial interests or personal relationships  
601 that could have appeared to influence the work reported in this paper.

602

603 **Ethical approval**

604 All applicable international, national, and/or institutional guidelines for the care and use of animals  
605 were followed.

606

607 **Sampling and field studies**

608 All necessary permits for sampling and observational field studies have been obtained from the  
609 competent authorities.

610

611 **Data availability**

612 All data generated or analysed during this study are included in this published article.

613

614 **Author Contribution Statement**

615 Original samples were collected by JLR. Bryozoans were picked up from original samples by JU,  
616 JACH and LVR. Species identification and preparing the voucher specimens for museum storage  
617 were conducted by LVR. Data analysis was performed by JLR and LVR. Figures were processed by  
618 all authors. First draft of the manuscript was written by LVR and all authors commented and  
619 implemented it. All authors read and approved the final manuscript.

620

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904 **Legends**

905 **Fig. 1** Location map of Chella Bank (also known as Seco de los Olivos seamount) within the  
906 Alboran Sea (W Mediterranean Sea) **a** General view; **b** Bathymetric map of the study area,  
907 showing the main morphological features, with indication of sampling stations and ROV-  
908 transects (Dive). VV, Van Veen.

909  
910 **Fig. 2.** Species richness of living specimens of bryozoans at **(a)** different depths and **(b)** sediment  
911 types of Chella Bank and adjacent bottoms. BB, Mostly buried bioclasts (coral rubble,  
912 rhodoliths, shells); LEB, Low amount of exposed bioclasts (coral rubble, rhodoliths, shells);  
913 HEB, High amount of exposed bioclasts (coral rubble, rhodoliths, shells). Different letters above  
914 bars indicate significant differences ( $p < 0.05$ ) in U-Mann Whitney tests.

915  
916 **Fig. 3** *Terminoflustra barleei* (optical microscopy; MNCN 25.03/4216); **a** colony fragment with  
917 complete base; **b** detail view of the colony fragment showing some zooids and avicularium.

918  
919 **Fig. 4** *Scrupocellaria incurvata* (MNCN 25.03/4217). **a** internode showing the arrangement of the  
920 zooids; **b** two zooids with a large scutum, oral spines and lateral avicularia; **c** distal part of a  
921 zooid showing lateral avicularium and the 3 external and 2 internal oral spines; **d** part of the  
922 branch showing fertile zooids; **e** abfrontal side showing the arrangement of vibracula, paired at  
923 bifurcation.

924  
925 **Fig. 5** *Marguetta pulchra* (**a, c**: MNCN 25.03/4223; **b**: MNCN 25.03/4222). **a** colony fragment  
926 showing the zooids arrangements and some fertile zooids (\*); **b** orifice showing the oral  
927 proximal avicularium; **c** two frontal avicularia.

928

929 **Fig. 6** *Schizomavella (S.) linearis profunda* (MNCN 25.03/4224). **a** colony fragment showing the  
930 zooids arrangement; **b** zooid showing orifice with seven distal spines, and two frontal avicularia  
931 directed proximally; **c** part of the colony with two fertile zooids.

932

933 **Fig. 7** *Buskea medwaves* sp. nov. (MNCN 25.03/4226). **a** colony showing the arrangement of  
934 zooids and some spatulate avicularia; **b** transversal cut showing the pair of zooids disposed back  
935 to back and a primary orifice with sinus and condyles; **c** enlargement of the peristomial  
936 avicularium; **d** part of the branch with two zooids and two spatulate avicularia; **e** distal part of a  
937 zooid showing a broken peristome and porous ovicell.