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1 **Greater functional similarity in mobile compared to sessile assemblages colonizing**  
2 **artificial coastal habitats**

3

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15

16        **Abstract:**

17        Among anthropogenic habitats built in the marine environment, floating and non-  
18 floating structures can be colonized by distinct assemblages. However, there is little  
19 knowledge whether these differences are also reflected in the functional structure. This study  
20 compared the functional diversity of sessile and mobile invertebrate assemblages that settle  
21 over 3 months on floating vs. non-floating artificial habitats, in two Chilean ports. Using  
22 morphological, trophic, behavioral, and life history traits, we found differences between  
23 mobile and sessile assemblages regarding the effect of the type of habitat on the functional  
24 diversity. Compared to sessile assemblages, a greater functional similarity was observed for  
25 mobile assemblages, which suggests that their dispersal capacity enables them to balance the  
26 reduced connectivity between settlement structures. No traits, prevailing or selected in one  
27 or the other habitat type, was however clearly identified; a result warranting for further  
28 studies focusing on more advanced stages of community development.

29

30        **Keywords:** artificial structures, functional structure, mobile invertebrate, functional traits,  
31 marine urbanization, diversity

## 32            **Introduction**

33            Increasing anthropogenic coastal activities around the world have resulted in the  
34 construction of numerous man-made structures in the marine environment (Firth et al. 2016,  
35 Bishop et al. 2017). These structures such as dikes, breakwaters, piers, mariculture lines,  
36 offshore platforms, stand for a major driver of change in marine environments by replacing  
37 many natural habitats (Airoldi et al. 2009, Bulleri and Chapman 2010, Firth et al. 2016).  
38 While the rise of artificial structures in coastal and marine areas degrade, fragment, and  
39 deplete natural habitats (Bulleri and Chapman 2010, Bishop et al. 2017), they provide new  
40 surfaces available for the settlement, reproduction, and growth of many organisms.

41            Novel assemblages associated with marine artificial structures however commonly  
42 differ from those found in natural habitats, and often include a large proportion of stress-  
43 resistant or opportunistic species (Connell 2000, Perkol-Finkel et al. 2006, Aguilera et al.  
44 2014). Because they are embedded in an expanding propagule transport network, much of  
45 these species also appear to be non-indigenous or cryptogenic species (Glasby et al. 2007,  
46 Dafforn et al. 2009, Johnston et al. 2017, Leclerc et al. 2021). Overall, artificial structures  
47 facilitate the dispersal of a range of neocosmopolitan (sensu Darling and Carlton 2018)  
48 species (Mineur et al. 2012, Adams et al. 2014, Airoldi et al. 2015) contributing to the  
49 homogenization of coastal biota at regional and global scales (Villéger et al. 2011, Simberloff  
50 et al. 2013, Leclerc et al. 2020b). The physical characteristics of these artificial structures  
51 (e.g., material, roughness, structural complexity, inertia vs. movement capacity), and the  
52 levels disturbance in their surroundings (Bulleri and Chapman 2010, Airoldi and Bulleri  
53 2011) influence the composition of biotic assemblages (Connell 2000, Glasby and Connell  
54 2001, Holloway and Connell 2002, Firth et al. 2016).

55 Comparing natural vs. artificial habitats, some studies documented differing species  
56 compositions (Connell 2000, Glasby and Connell 2001, Holloway and Connell 2002, Sedano  
57 et al. 2020) and contrasting functional patterns between them (Mayer-Pinto et al. 2018, Janiak  
58 and Branson 2021). Similarly, among different types of artificial structures, differences in  
59 community composition and biotic interactions have also been shown (Connell 2001, Firth  
60 et al. 2016, Rogers et al. 2016, Strain et al. 2018, Giachetti et al. 2020). For instance, floating  
61 structures, such as buoys, pontoons or floating longlines, present contrasting species  
62 assemblages to those found on non-floating structures, such as the pillars of piers or docks  
63 (Connell 2001, Glasby 2001, Holloway and Connell 2002), and can differ in their  $\beta$ -diversity  
64 across multiple spatial scales (Leclerc et al. 2020a). The various studies that have tried to  
65 understand the mechanisms behind these differences have attributed them not only to the  
66 aforementioned physical properties of the structures but also to those to which these  
67 structures are subjected (e.g., water motion, connectivity with the benthos, exposure to  
68 predators and scavengers, disturbance regimes; Glasby 2001, Holloway and Connell 2002,  
69 Giachetti et al 2020). Hence, the differing conditions to which floating *versus* non-floating  
70 structures are subjected could act as filters for certain functional traits among the resulting  
71 assemblages (see Piola and Johnston 2009, Zhan et al. 2015, Aronson et al. 2016, Johnston  
72 et al. 2017). For instance, the establishment of certain species in a given artificial habitat may  
73 result from specific traits that favor the recruitment of those species and increase their local  
74 fitness in this specific habitat (Beauchard et al. 2017, Córdova and Zambrano 2015). Traits  
75 allowing for rapid colonization of novel empty patches (e.g., high reproductive and growth  
76 rates, large dispersal ability) may notably be favored on floating structures, which are prone  
77 to physical disturbances (among others, Holloway and Connell 2002, Johnston et al. 2017)  
78 due to their maintenance and replacement. Conversely, traits favoring competitive and

79 defensive abilities may rather be favored in non-floating structures, wherein stronger biotic  
80 interactions can take place (Leclerc et al. 2020b, López and Freestone 2021).

81 The communities colonizing these artificial habitats are generally composed of  
82 abundant sessile species, including habitat-formers for associated mobile species. Despite the  
83 importance of the interactions among these two species groups (Sellheim et al. 2010,  
84 Thomsen et al. 2014), only few studies examined the variations in the composition of the  
85 mobile species assemblage (e.g., Karalis et al. 2003, Leclerc and Viard 2018, Martínez-Laiz  
86 et al. 2019, Carvalho et al. 2013, Sedano et al. 2020). Thus, several questions are still  
87 unanswered, such as whether differences in the composition of sessile species and habitat  
88 formers are mirrored by changes in the composition of mobile species in the assemblage, and  
89 whether these changes are strong enough to be reflected in the functional structure of the  
90 resulting community. The few studies available suggest that the diversity and traits of habitat-  
91 forming species affect the structure of their associated sessile and mobile species (Yakovis  
92 et al. 2008, Sellheim et al. 2010, Leclerc and Viard 2018). However, unlike sessile species,  
93 mobile species have the ability to disperse and relocate after settlement to colonize new  
94 patches of habitat (e.g. Martins et al. 2017). This ability is advantageous under stressful  
95 conditions or in variable environments, as it provides mobile species with a greater plasticity  
96 in their use of habitats or micro-habitats. Therefore, variations in the mobile species  
97 component, due to habitat types (exposed to differing conditions), are expected to be smaller  
98 than in the sessile component of these communities.

99 The present study examined the species diversity and functional structure of sessile and  
100 mobile invertebrate assemblages that settle on floating versus non-floating artificial habitats,  
101 off the East Pacific coast, central Chile. Using morphological, trophic, behavioral, and life

102 history traits of sessile and mobile species, we particularly examined whether the functional  
103 differences among sessile taxa between the two habitat types are mirrored among mobile  
104 taxa. We predicted that the magnitude of the differences between habitats will be greater in  
105 the assemblages of sessile species than in those of mobile species, given the post-settlement  
106 dispersal capacity of the latter. To our knowledge, this is the first study dedicated to  
107 comparing the functional structure of communities of different types of artificial coastal  
108 habitats. The comparison of the composition, abundance, and diversity of functional traits  
109 (functional diversity) among the assemblages colonizing these artificial habitats may reveal  
110 mechanisms that determine the functional composition of these new arising man-made  
111 ecosystems (see Bremner et al. 2006, Mouchet et al. 2010, Beauchard et al. 2017). This  
112 knowledge could help predict how assemblages respond to habitat properties and aid  
113 conservation managers in the prediction of changes in ecosystem functioning related to  
114 coastal human activities.

115

116

117        **Materials and methods:**

118        *Study area*

119        The study area comprised two ports (separated by 30 linear km) of the Biobío Region,  
120 Chile: San Vicente (36.7591° S, 73.1551°W) and Coliumo (36.5377°S, 72.9571°W). As a  
121 sidenote, San Vicente is open to international trade, while Coliumo is only open to regional  
122 traffic (see Leclerc et al. 2018, 2020b), although maritime traffic was not the scope of our  
123 study. These two ports are located in two different bays (San Vicente and Coliumo bays)  
124 characterized by distinct biotic compositions in either natural (e.g. for intertidal mollusks;  
125 Aldea and Valdovinos, 2005) and artificial habitats, although little is known regarding soft  
126 sediment habitats in ports (but see Leclerc et al. 2018 for rapid assessment surveys of  
127 conspicuous taxa). Both ports present various types of artificial habitats that are part of the  
128 coastal infrastructure, and which were categorized for this study as: (1) non-floating habitats:  
129 those attached to the docks by rigid steel foundations/pillars and in direct contact with the  
130 benthos; and (2) floating habitats: comprising longlines or buoys that remain in the water  
131 column with a weaker, less prominent link to the benthos.

132

133        *Dataset overview, study design, sampling and species identification*

134        Our study capitalized on the sampling carried out between March and June, 2017, by  
135 Leclerc et al. (2020b), who focused on sessile assemblages. In brief, the sampling consisted  
136 of the deployment of a series of 15 cm x 15 cm black polypropylene settlement plates,  
137 arranged in structures (experimental units) held by PVC tubes (for details, see Leclerc et al.  
138 2020b). The plates were used to have a standardized substrate (surface and material) and new



139 available surface area (which is a main limiting resource, e.g. Sellheim et al. 2010) to be  
140 colonized by sessile and mobile taxa (flora and invertebrates).

141 In each of the study ports and on the two types of habitats (floating vs. non-floating),  
142 two experimental units bearing plates were placed vertically, separated by 20 m to 50 m, and  
143 at approximately 3 m to 4 m depth. In the non-floating habitats of both ports, these were  
144 placed on the pillars of the pier, while in floating habitats they were attached to buoys (San  
145 Vicente) or longline (Coliumo) by ropes. Four plates per experimental unit were removed  
146 three months after installation, which is sufficient time for the settlement and growth of the  
147 sessile and mobile assemblages to take place on the plates (see Leclerc and Viard 2018,  
148 Sellheim et al. 2010). The plates were individually transferred underwater in polypropylene  
149 rubble bags (mesh size < 0.5 mm) to minimize the loss of the mobile fauna, and were kept  
150 for 4 h in a tank with seawater until they were processed in the laboratory.

151 In the laboratory, sessile (Leclerc et al. 2020b) and mobile taxa (this study) were  
152 identified under a dissecting microscope at the lowest possible taxonomic level. The  
153 abundance of the sessile taxa was estimated as the coverage at 100 intersection points in an  
154 area of 120 cm × 120 cm, as detailed in Leclerc et al. (2020b), while the abundance of the  
155 mobile taxa was estimated by counting the number of individuals per plate. The mobile fauna  
156 was sampled, after the identification of the sessile taxa, by washing the plate using a 500 µm  
157 mesh sieve. The samples were preserved in 95 % EtOH for later identification. Most mobile  
158 taxa were identified morphologically to the genus or family level due to a lack of taxonomic  
159 literature for the South East Pacific taxa of many abundant groups (e.g., amphipods).

160

161            *Functional traits categorization*

162            After identification, the sessile and mobile taxa were classified according to several  
163 functional traits related to their life history, behavior, and feeding habits. In this work, sessile  
164 taxa were considered to be those species with no or low mobility, those considered as habitat  
165 formers, and those which, after their settlement, do not migrate between plates. Their  
166 functional traits were subdivided into different modalities as proposed by Bremner et al.  
167 (2003) and Beauchard et al. (2017). The information on life history traits of the individual  
168 taxa was extracted from different online sources, such as GBIF, NEMESIS, NIMPIS,  
169 MarLIN, NAS, MSIP, BIOTIC, Polytraits, as well as bibliographic sources. Each trait was  
170 categorized into three to five modalities (e.g., the trait “Larval development” was given three  
171 modalities: pelagic planktotrophic, pelagic lecithotrophic or direct benthic) obtaining a total  
172 of 11 traits and 46 modalities of traits, as detailed in the table 1. The affinity of each taxon  
173 with the modalities of each trait was assigned, so that the "total affinity" of each trait equaled  
174 1 (Chevenet et al. 1994). This fuzzy coding allows a taxon to display modalities of a trait to  
175 different degrees (Chevenet et al. 1994). When information about a particular trait in a taxon  
176 could not be obtained, the affinity value of a similar taxon within its taxonomic group (genus  
177 or family, whichever closest available) was used as a proxy, however only whenever  
178 variations of the trait within the taxonomic group chosen had not been reported. Otherwise,  
179 an equal affinity value was assigned for all modalities of that trait for the taxon.

180            Functional trait data was analyzed separately for each assemblage (mobile vs. sessile).  
181 From the trait matrix (“Traits-taxon matrix”) of the sessile and mobile assemblages,  
182 respectively, an analysis of biological traits was performed (BTA; Bremner et al. 2003,  
183 2006). This was based on combining this matrix with the taxa abundance matrix (“Taxon-

184 plate matrix") by means of a canonical scalar product that transforms and weights the scores  
185 (between 0 and 1 following the fuzzy coding) of each trait modality by the abundance of each  
186 taxon. This procedure allowed for the generation of a functional trait abundance matrix  
187 ("Traits-plate matrix"), on which the subsequent functional structure analyses were based.

188

### 189 *Data analysis*

190 The functional diversity of the community was estimated using the functional diversity  
191 indices wFDc and FDc (Petchey and Gaston 2006), based on the Gower similarity matrix of  
192 the FDiversity package (Casanoves et al. 2011), in R (R Development Core Team 2010).  
193 These indices are estimated by summing the length of the branches of a functional  
194 dendrogram of all the species from a cluster analysis, which uses profiles of multiple traits  
195 either by including their abundance (wFDc) or excluding their abundance (FDc). At the taxon  
196 level, we also estimated the richness (S) and the taxonomic diversity (Hill number  $2 : 1 / \lambda$ ;  
197 Hill 1973) of the sessile and mobile assemblages. To compare both the taxonomic and the  
198 functional diversities between the factor levels, an analysis of variance (ANOVA) was  
199 performed using the same, previously specified design. In addition, the effect size of each  
200 factor was estimated using the Omega squared index ( $\omega^2$ , Hays 1963). Prior to each ANOVA,  
201 normality and homogeneity of variances were checked using Shapiro-Wilk and Levene's  
202 tests, respectively. The data were transformed (square root transformation) when these tests  
203 resulted significant. These analyzes were performed using R version 4.0.3 (R Core Team  
204 2016).

205 The relationship between richness and functional diversity can further inform about the  
206 functional redundancy of communities (Micheli and Halpern 2005, Córdova and Zambrano

207 2015). Instead of summarizing the associated information in a single index (e.g. van der  
208 Linden et al. 2016), we herein characterized these relationships in both habitats and compared  
209 them using the Tsutakawa and Hewett Test (Tsutakawa and Hewett 1977) as a substitute for  
210 the ANCOVA test due to the non-fulfillment of the assumption of independence between the  
211 *Habitat* factor and the covariate richness of the species. This test allows to evaluate the  
212 equality of two populations when the observations are bivariate (XY; in this study X:  
213 Richness Y: Functional diversity) by determining whether the values of Y given X for one  
214 population dominate the other for every value of X (Williams 1977). The test involved fitting  
215 a regression line (the one that best fits using the Akaike criterion (AIC); in this case, a linear  
216 regression, see results) to the entire data set, and then comparing, through a contingency table  
217 analysis (using the  $\chi^2$  distribution), the distribution of bivariate data above and below the  
218 regression line (Williams 1977, Muñoz and George-Nacimiento 2008). These analyzes were  
219 performed using the PAST program, version 3.14 (Hammer et al. 2001).

220 To compare the functional structure between habitats of the sessile and mobile  
221 assemblages, Permutational Multivariate Analysis of Variance (PERMANOVA, Anderson  
222 2001) was performed with 4999 permutations. A three-way design was applied, considering  
223 the following factors: "Habitat" (two fixed levels: floating vs. non-floating), "Port" (two  
224 random levels: Coliumo vs. San Vicente), and "Experimental unit" (two random levels nested  
225 within "Port" and "Habitat"). Separate analyses were performed for sessile and mobile  
226 assemblages to avoid violation of independency, and because abundance was not estimated  
227 in the same way. The analyses were based on the Bray-Curtis similarity matrices generated  
228 from transformed data in order to downplay the importance of the most abundant traits and  
229 homogenize multivariate dispersion. We used the fourth root for the abundance of traits of  
230 mobile taxa and the square root for that of sessile taxa. Multivariate trait data were also

231 analyzed for their composition using a Jaccard's similarity matrix (i.e., presence-absence  
232 data). The homogeneity in the dispersion of the data was verified between the levels of the  
233 factors "Habitat" and "Port", using a Permutational Multivariate Dispersion Analysis  
234 (PERMDISP; Anderson et al. 2008). Principal coordinate analysis (PCO) and cluster analysis  
235 were performed to visualize and determine group similarity, respectively (Anderson et al.  
236 2008). To determine if there are significant differences between the levels of each factor in  
237 certain traits of the sessile and mobile assemblages, multivariate PERMANOVAs were  
238 performed for each of the traits separately using trait modalities as response variables. The  
239 analyzes were based on the Bray-Curtis similarity matrix generated from transformed data  
240 using the fourth root for the abundance of traits of mobile taxa, the square root for that of  
241 sessile taxa. All of these analyzes were performed using the PRIMER 6 program (Anderson  
242 et al. 2008).

## 243 **Results**

### 244 *Overall assessment of taxonomic diversity and functional traits*

245 A total of 126 taxa were found, including 43 sessile and 83 mobile taxa (Supporting  
246 information appendix S1). Sessile taxa were represented by 10 phyla (10 bryozoans, 9  
247 cnidarians, 7 chordates, 6 rhodophytes, 5 mollusks, 2 arthropods, 1 annelid, 1 sponge and 1  
248 chlorophyte, 1 ochrophyte), while mobile taxa comprised 5 phyla (43 arthropods, 24  
249 annelids, 13 mollusks, 2 nemerteans, and 1 echinoderm). Of the sessile taxa, the most  
250 represented taxonomic groups in terms of numbers of taxa and coverage were bryozoans (10  
251 taxa, for an average of 31% coverage per plate), followed by hydroids (9 taxa and 27 % of  
252 the coverage). Of the mobile taxa, the most represented taxonomic groups in terms of  
253 numbers of taxa and abundance were amphipods (29 taxa, for an average of 54 % of the total  
254 abundance per plate), followed by polychaetes (23 taxa and 21 % of abundance) and  
255 gastropods (13 taxa and 5 % of abundance). Oppositely, copepods, isopods, tanaidaceans,  
256 and echinoderms were the least present (only 1 or 2 taxa and less than 8 % of abundance).

257 The sessile assemblage, regardless of the habitat (non-floating and floating), was  
258 mainly dominated in terms of numbers of taxa and cover by suspension-feeders (35 taxa and  
259 97 % of the average total coverage per plate), as compared to autotrophs (8 and 3 %). These  
260 assemblages were dominated by colonial taxa (22 taxa and 67 % of cover), erect taxa (23 and  
261 81 %) and smaller than 50 mm taxa (31 and 91 %). These taxa had diverse reproductive  
262 modes: asexual (30 taxa and 35 % of cover), sexual with spawning events (23 and 24 %) or  
263 broadcasted developing larvae (22 and 41 %). Most larvae were lecithotrophic (35 taxa and  
264 86 % of cover), with a pelagic larval duration most often of less than 1 day (30 and 72 %).  
265 The longevity of the taxa was generally less than 1 year (30 taxa and 77 % of cover).

266 The assemblage of mobile invertebrates was equally distributed by predators (40 taxa  
267 and 32 % of the average total abundance per plate), detritivores (49 and 30 %) and filter-  
268 feeders (34 and 32 %). Their mobility was either low (46 taxa and 48 % of abundance) or  
269 moderate (42 and 42 %) and associated with behavior as burrowing in micro-refuges (42 and  
270 40 %), crawling (44 and 29 %) or crawling-swimming (36 and 30 %). Relatively elongated  
271 individuals predominated (68 taxa), with sizes less than 10 mm (49 taxa and 77 % of  
272 abundance), with a longevity less than 1 year (33 and 38 %) and 1 to 3 years (77 and 53 %).  
273 Different reproductive modes were observed, but most of them (51 taxa and 59 % of  
274 abundance) were sexual reproduction with parental egg care and the development of juvenile  
275 phases. Most taxa developed directly in the benthos (54 taxa and 62 % of abundance) and of  
276 the 38 % with larval development (49 taxa), 24 % had a pelagic larval duration of less than  
277 1 day (18 taxa).

278 *Contrasting effects of the type of habitat (floating vs. non-floating) on the taxonomic*  
279 *and functional diversity according to the assemblages (mobile vs. sessile)*

280 The taxonomic and functional diversity of the two categories of assemblages (i.e.,  
281 mobile vs. sessile) varied between non-floating and floating habitats, whatever the variable  
282 examined, and in the two ports (Fig. 1, Table 2). In sessile assemblages the differences  
283 between habitats were contrasting between the two ports, as evidenced by significant  
284 interactions (and associated effect sizes) *Habitat* and *Port* for all response variables (Table  
285 2). In San Vicente, sessile richness, diversity and both functional diversity indices were  
286 higher in the non-floating habitat, while the opposite was observed in Coliumo (Fig. 1).  
287 Conversely, for mobile assemblages, the differences observed between habitats were  
288 comparatively far more consistent in the two studied ports. With the exception of wFCD that

289 showed significant interaction, higher taxonomic and functional diversity (FDc only) of  
290 mobile assemblages were observed in floating than in non-floating habitats in both ports  
291 (Table 2, Fig. 1).

292 The functional diversity in non-floating and floating habitats showed a general positive  
293 linear relationship with taxa richness for both sessile and mobile assemblages (Fig. 2),  
294 although this relationship was better supported for sessile ( $r^2 = 0.58$   $p < 0.001$ ) than for  
295 mobile assemblage ( $r^2 = 0.16$   $p = 0.023$ , Fig. 2). According to the bivariate relationships  
296 between taxa richness and functional diversity, a contrasting functional redundancy between  
297 habitats for sessile assemblages was supported by the Tsutakawa and Hewett tests ( $\chi^2 = 8.33$   
298  $df = 1$ ;  $p = 0.004$ ). A lower slope for the linear relationships in floating habitats than in non-  
299 floating habitats was observed (Fig. 2; non-floating: slope = 0.29,  $r^2 = 0.73$ , floating: slope =  
300 0.09,  $r^2 = 0.73$ ). On the contrary, for mobile assemblage the bivariate relationships (richness,  
301 functional diversity) suggested a similar functional redundancy between habitats ( $\chi^2 = 1$   $df$   
302 = 1;  $p = 0.317$ ), with a similar slope between floating and non-floating habitats (Fig. 2; non-  
303 floating: slope = 0.12,  $r^2 = 0.22$ , floating: slope = 0.04,  $r^2 = 0.01$ ).

304 *Stronger effects of the type of habitat on the functional structure of sessile assemblages*  
305 *compared to mobile assemblages*

306 The functional compositions (presence-absence) of the sessile and mobile assemblages did  
307 not show significant differences between non-floating and floating habitats (Table 3).  
308 However, the functional structure weighted by the abundance (wFDc) showed a significant  
309 interaction between the factors, *Habitat* and *Port*, in both assemblages (Table 3). The PCO  
310 results also showed distinct clusters, for both composition and abundance (Fig. 3).  
311 Interestingly, in the sessile assemblages, when compared to the mobile, a greater



312 differentiation in the functional structure weighted by the abundance was observed between  
313 both habitats (cf. similarity thresholds in Fig. 3), as well as a greater similarity within and  
314 between the floating habitats of both ports. Likewise, the variation between plates in the  
315 abundance of the functional traits of the sessile assemblage was significantly greater in non-  
316 floating habitats than in floating habitats (PERMDISP  $F = 32.69$   $p < 0.001$ ). In addition,  
317 nested within habitat categories, experimental units display significant (and sizable) effects  
318 only for the sessile assemblages, in their (functional composition and abundance structure;  
319 Table 3). Overall, the mobile assemblages presented higher similarity in their composition  
320 and functional abundance than the sessile assemblages, regardless of the habitat or port (80  
321 % similarity, Fig. 3).

322         When analyzing the functional traits of the sessile assemblage separately, no effect of  
323 the *Habitat* factor was detected on the functional structure of the traits. However, significant  
324 interactions between *Habitat* and *Port* were observed for five (out of nine examined) traits,  
325 namely body form, individual/colony size, lifespan, reproductive mode, and pelagic larval  
326 duration (Table 4). It is also noteworthy that for the feeding trait (represented by two  
327 modalities), the factor *Habitat* had a high effect size in the multivariate analysis. Although a  
328 dominance of filter-feeders was observed in both habitats and ports (Fig. 4), their absolute  
329 coverage on the plates was greater in floating habitats than in non-floating ones (Fig. S1).  
330 Among the other functional traits evaluated, although the proportions of modalities varied  
331 between habitats, the differences were not consistent between ports for which these traits did  
332 not contribute to any further differentiation between the habitats, floating vs. non-floating  
333 (Fig. 4). Consistently with the analysis of functional composition and abundance structure,

334 significant spatial effects of the experimental units were observed on the modalities, only for  
335 the sessile assemblages (Table 4).

336 For the mobile assemblages, although all the traits had a high effect size of the *Habitat*  
337 factor, this effect was only significant in interaction with the factor *Port* (Table 5). This is  
338 also illustrated by the modality proportions of abundance within each functional trait across  
339 habitats and ports (Fig. 5, Fig. S2), for which variations were observed, although these were  
340 not as marked as for the sessile assemblage.

341

342        **Discussion**

343            The results of our study show that the differences reported by various authors in the  
344 community structure between different types of artificial habitats (Connell 2001, Glasby  
345 2001, Firth et al. 2016, Strain et al. 2018), including in the study area (Leclerc et al. 2020b),  
346 are also found in the functional structure of sessile and mobile marine assemblages. However,  
347 and in accordance with our predictions, these differences were not as noticeable in mobile  
348 assemblages as opposed to sessile assemblages. Our results showed that the mobile  
349 assemblages, unlike sessile ones, present a compositional structure and abundance of  
350 functional traits more similar than that of sessile assemblages, suggesting that the functional  
351 structure of these mobile assemblages is less affected by the type of artificial coastal  
352 structures (floating vs. non-floating) than that of sessile assemblages.

353            Floating and non-floating man-made marine structures have the potential to create  
354 habitats that attract diverse organisms, including habitat-formers that develop on the empty  
355 foundations of these structures (Connell 2000, Holloway and Connell 2002, Leclerc and  
356 Viard 2018). These habitat-forming organisms, most often sessile, facilitate the recruitment  
357 and the subsequent establishment of diverse sets of other species that use these taxa as a  
358 source of food and/or shelter (see Bruno and Bertness 2001, Karalis et al. 2003, Sellheim et  
359 al. 2010). Given these biotic interactions, changes in the species composition of sessile  
360 assemblages may further determine the composition and changes of the associated mobile  
361 assemblages (Sellheim et al. 2010, Sueiro et al. 2011, Leclerc and Viard 2018). For example,  
362 on floating structures, Leclerc and Viard (2018) found correlations between the richness and  
363 abundance of mobile fauna and the volume of interstices created by the sessile fauna. Other  
364 studies in ports however only reported few correlations between the compositions of the

365 sessile and mobile assemblages (see Birdsey et al. 2011, Lavender et al. 2017), and variables  
366 such as habitat cover, identity, and functional diversity of sessile assemblages did not predict  
367 the variation of the associated mobile assemblages (Birdsey et al. 2011). In our study,  
368 contrasting patterns were observed between sessile and mobile assemblages. In sessile  
369 assemblages, the functional structure varied between habitats within each port, and among  
370 experimental units (plots), with contrasting abundance of the functional traits. This pattern  
371 could be explained because sessile assemblages may be influenced by local settlement  
372 dynamics (e.g. Hedge and Johnston 2012, Leclerc et al. 2021), especially where taxa with  
373 propagules displaying short pelagic duration (notably lecithotrophic larvae) dominate, as  
374 upon our settlement plates. Conversely, in the mobile assemblages, the functional structure  
375 was more similar and the modalities of the traits showed similar proportions of abundance in  
376 habitats and ports, and seldom varied among experimental plots. Considering the prominent  
377 role of species abilities to post-settlement dispersal on the community structure of novel  
378 habitats (Palmer et al. 1996, Martins et al 2017), the intrinsic capability of movement among  
379 taxa is likely to be a critical factor explaining the observed greater functional similarity  
380 between habitats in mobile compared to sessile assemblages.

381         Moreover, while we observed complex variations in the richness and diversity  
382 (taxonomic and functional) of the sessile assemblages between habitats and ports, the mobile  
383 assemblages showed more consistent results, with the greatest richness and diversity found  
384 in the floating habitats at both ports. This indicates that despite the putative lower  
385 connectivity with the benthos of the floating habitats for many groups (especially non-  
386 swimming taxa), a substantial dispersal of mobile species towards floating habitats and  
387 between them is warranted. Considering that 60 % of the taxa has a direct development in

388 these habitats, dispersal of these mobile species is likely due to the migration of adults and  
389 juveniles. However, larval dispersal and recruitment of post-larval stages, either from nearby  
390 benthic habitats or from other artificial habitats (see Susick et al. 2020, Leclerc and Viard  
391 2018) is likely to play an important role for benthic-pelagic or holo-pelagic species (Hudson  
392 et al. 2016). In our experiments, the plates were deployed over 3 months, a time long enough  
393 for colonization by mobile species (including tube-dwelling taxa) from rocky subtidal  
394 habitats, especially during summer (Norderhaug et al. 2002, Waage-Nielsen et al. 2003).  
395 Additionally, these mobile assemblages can redistribute after settlement, colonize new  
396 patches of habitat in interconnected or nearby areas, becoming more diverse and abundant in  
397 areas further away from their source habitat/reef (Virnstein and Curran 1986, Martins et al.  
398 2017).

399 Floating habitats, being less accessible to non-swimming species, in particular non-  
400 swimming predators, show a lower predation pressure (Dumont et al. 2011, Rogers et al.  
401 2016, Leclerc et al. 2020a), which may in turn influence the diversity and structure of the  
402 community. For instance, in temperate marinas, low predation pressure by benthic predators  
403 in floating habitats had been shown to increase the biotic complexity of sessile assemblages,  
404 which in turn could favor colonization by mobile species (Leclerc and Viard 2018). In our  
405 study, the sessile assemblage had a 40 % greater coverage on the floating structures than on  
406 the non-floating ones, and we also found a higher percentage of empty patches in the  
407 settlement plates deployed on the non-floating structures. Although the present dataset does  
408 not allow to evaluate the relationship between the richness/diversity of the mobile  
409 assemblage and the functional composition of the sessile assemblage, it is likely that a greater  
410 coverage of the sessile assemblage favors the associated mobile assemblage of floating

411 habitats by providing an increased availability of microhabitats and refuges, decreasing  
412 predator-prey encounters for mobile species (Grabowski 2004, Scyphers and Powers 2013,  
413 Leclerc and Viard 2018). Nonetheless, other mechanisms to the aforementioned, such as  
414 differences of the biotic and abiotic stress gradients among habitats, may be responsible for  
415 the richer and more functionally diverse mobile fauna we measured on floating structures,  
416 for which further investigation is required. It is noteworthy that although remarkable  
417 differences in taxonomic diversity and functional richness were found for mobile  
418 assemblages between habitats, no difference in the functional structure could be detected  
419 when abundances (here the number of individuals) were considered. As suggested elsewhere  
420 (e.g. Hillebrand et al 2018, Boyé et al. 2020), this result warrants caution regarding blind  
421 uses of diversity metrics and encourages more comprehensive analyses incorporating species  
422 identity and the influence of their traits on the system dynamics to detect changes in  
423 biodiversity and ecosystem functioning.

424 Floating habitats differ from their non-floating counterparts in a considerable number  
425 of abiotic and biotic conditions (e.g., connection/link with the benthos, exposure to predators  
426 and scavengers, orientation to currents, and disturbance regimes). These conditions could act  
427 as a filter for certain functional traits (e.g., r-selected traits and/or tolerance to disturbance,  
428 see Piola and Johnston 2009, Zhan et al. 2015, Johnston et al. 2017, Leclerc et al. 2020b).  
429 When the filters are characteristic to a certain environment, then through similar selective  
430 processes, large scale patterns in the composition and functions of the assemblages of these  
431 environments may arise (Poff 1997, Statzner et al. 2004). However, among most of the traits  
432 considered in this study, more differences were found among structures or harbors than  
433 between habitats, and this may suggest that there was no differential selection of particular

434 traits between the types of habitats studied. However, our results showed a high percentage  
435 of taxa with traits characteristics of early successional stages such as small sizes (sessile:  
436 79% <50mm, mobile: 60% <10mm), short longevity (sessile 70% <1 year, mobile: 93% <3  
437 years) and short pelagic larval duration (70% sessile <1 day, mobile 69 % none or <1 day)  
438 (Giangrade et al. 1994, Odum 1969). Thus, the early stage of maturity of the study  
439 communities or the broad array of putative processes influencing spatial patterns in coastal  
440 biodiversity (see Benedetti-Cecchi 2001, Fraschetti et al. 2005, Chang and Marshall 2016)  
441 could also generate such results. Hence, considering that a greater complexity of interactions  
442 could occur in more advanced successional stages (e.g. Aguilera and Navarrete 2012),  
443 evaluating changes in functional traits later during succession may give a better  
444 approximation of the functional structure of these communities.

445       The dissimilarity of the relationships between the functional diversity of sessile taxa  
446 and their richness suggests that floating habitats present a functional redundancy superior to  
447 that of non-floating ones. Likewise, our results showed a greater functional similarity of the  
448 sessile assemblages among the plates of the floating habitats and a greater multivariate  
449 dispersion among those of the non-floating habitats. In general, disturbed environments can  
450 favor the establishment of species with more similar combinations of traits (Poff 1997,  
451 Leibold et al. 2004, Statzner et al. 2004, Valdivia et al. 2017, Leclerc 2018). However, our  
452 results do not allow us to know whether or not the environmental conditions in floating  
453 habitats, may be responsible for the similarity we found among the traits of these habitats.  
454 For example, the greater variability in the composition of traits among the plates of non-  
455 floating habitats could possibly be linked to the more intense predation pressure reported in  
456 these types of habitats (see Diaz and McQuaid 2011, Valdivia et al. 2017). In these habitats,

457 important variation in the effect of predation among patches and pillars had been previously  
458 reported (Leclerc et al. 2020a). As any other disturbance (Sousa 1984, Connell and Slatyer  
459 1977, Sousa 1979), predation at the microhabitat scale (within a single plate) on the one hand  
460 can reduce the richness and abundance of species (and proportionally the functional diversity  
461 of the community/assemblage), while on the other hand, the freed space on the plates, caused  
462 by predation, can increase the richness and abundance of species by repeatedly opening new  
463 patches/substrate available for the colonization by new species.

464         Likewise, it should be considered that greater similarities in the community structure  
465 of sessile assemblages in floating versus non-floating habitats have been reported (Holloway  
466 and Connell 2002, Leclerc et al. 2020), including on a regional scale (Leclerc et al. 2020b).  
467 According to many authors, floating structures have assemblages of particular species, where  
468 there is generally a greater abundance and richness of non-native species compared to no-  
469 floating structures (Holloway and Connell 2002, Glasby et al. 2007, Dafforn et al. 2009,  
470 Johnston et al. 2017, Leclerc and Viard 2018, Leclerc et al. 2020b). The susceptibility to  
471 invasion and to biotic homogenization of these floating structures (Leclerc et al. 2020b)  
472 might explain the greater similarity in the functional structure, diversity and redundancy, of  
473 the sessile assemblages in floating habitats, a hypothesis to be further tested, for instance by  
474 distinguishing native and non-native taxa at broader scales.

475         To conclude, our data showed that the functional structure of both sessile and mobile  
476 assemblages varies between floating and non-floating artificial habitats. However, such  
477 variations are minor among mobile assemblages as opposed to sessile ones. Dispersal ability  
478 of mobile species is likely to be a major determinant of this pattern. Our results suggest that  
479 despite the (almost) absence of any physical link between floating habitats and the benthos,



480 the dispersal capacity of much mobile species leads to richer and more diverse assemblages  
481 than expected in these habitats. In this study, we however did not find a clear suite of  
482 functional traits prevailing in one or the other habitat type, in either assemblages. As we only  
483 examined functional traits at an early successional state of these communities, we  
484 recommend evaluating their composition in more advanced stages of the community's  
485 development to evaluate 1) whether the low functional differences in the mobile assemblage  
486 are maintained, and 2) whether there is a selection over time of certain functional traits that  
487 differs between the types of habitats, floating vs. non-floating.

488

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501           **Author's contributions**

502           JCL, NF, FV and AB conceived the working hypotheses and designed the study. JCL  
503 led the fieldwork, sample collection and conducted the taxonomic analyses of the sessile  
504 assemblages. NF realized the taxonomic analyses of the mobile assemblages. NF did  
505 literature research to fill in the trait matrices and conducted all data analyses (taxonomic and  
506 functional diversities, statistics). NF led the writing, with substantial contributions from the  
507 other co-authors. All authors critically revised and edited the manuscript drafts.

508           **Data accessibility**

509           Some of the data are provided in the supplementary material associated with the  
510 manuscript. Detailed data will be made publicly available in the Dryad repository.

511       **References**

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777

778



779 **Tables**

780 **Table 1.** Selected biological traits and categories used to describe the functional structure of  
 781 sessile and mobile invertebrates assemblages in artificial marine habitats, in the Southeast  
 782 Pacific, Chile; after Bremner et al., (2003) and Beauchard et al., (2017).

Traits		Modality		Traits		Modality	
Feeding Habit	Autotroph Filter/suspension feeder Deposit feeder Predator Opportunist/scavenger Grazer	Adult mobility	None Low Medium High				
Individual /colonial size	1-10 mm 10-50 mm 50-100 mm 100-300 mm	Lifespan	<1 year >1-3 years 3-5 years >5 years				
Body form	Flat Mound Erect Elongate Little elongate/ellipsoid	Reproductive mode	Asexual Sexual (broadcast spawner) Sexual (planktonic larvae) Sexual (direct-developer)				
Sociability	Solitary Colonial	Larval development	Pelagic planktotrophic Pelagic lecithotrophic Direct benthic				
Degree of attachment	None Behavioral Temporary Permanent	Pelagic larval duration	None <1 day 1-7days 7-30 days >30 days				
Motility	Sessile Burrower Crawler Crawler-swimmer Swimmer						

783

784



786 **Table 2.** Results of the ANOVA for the difference of taxonomic and functional diversity of sessile and mobile invertebrate assemblages  
787 associated to artificial marine habitats in two ports of the Southeast Pacific, Chile. The value of F and  $\omega^2$  and its significance at  $\alpha = 0.05$   
788 in bold (\*:  $p < 0.05$ , \*\*:  $p < 0.01$ , \*\*\*:  $p < 0.001$ ) is given for each factor (*Habitat vs. Port*), and their interactions. Tests of homogeneity  
789 of variances are summarized by their p values.

790

Response variable	ANOVA Factor (df, total = 31)						Levene		
	Habitat = H		Port = P		H × P		Experimental Unit		p
	F	$\omega^2$	F	$\omega^2$	F	$\omega^2$	F	$\omega^2$	
<b>Richness(S)</b>									
Sessile	0.90	0.00	2.92	0.03	34.74***	0.49	1.20	0.05	0,64
Mobile	53.64***	0.63	0.19	0.00	2.04	0.01	0.80	0.03	0,63
<b>Taxa diversity (1/<math>\lambda</math>)</b>									
Sessile (*)	1.35	0.00	19.02**	0.10	104.9***	0.58	1.27	0.06	0.11
Mobile	45.62***	0.60	0.70	0.00	0.00	0.00	0.68	0.02	0.37
<b>Functional diversity (FDc)</b>									
Sessile	1.12	0.00	2.39	0.02	33.08***	0.47	1.78	0.08	0.45
Mobile	32.30***	0.60	0.02	0.00	3.76	0.04	1.62	0.08	0.51
<b>Functional diversity (wFDc)</b>									
Sessile	4.47	0.03	0.23	0.26	91.32***	0.44	7.83	0.14	0.07
Mobile	6.84*	0.41	2.88	0.02	33.84***	0.46	0.66	0.02	0.41

791 (\*) transformation Square-root

792

793 **Table 3.** PERMANOVA results for the differences in functional structure (composition and abundance) of the sessile and mobile  
 794 assemblages. The pseudo-F of PERMANOVA and PERMDISP (H × P) are given along with significance at  $\alpha = 0.05$  (\*:  $p < 0.05$ , \*\*:  $p < 0.01$ , \*\*\*:  $p < 0.001$ ) and the effect size ( $\omega^2$ ) of each factor.  
 795

Assemblage	Sessile						Mobile					
	Composition			Abundance			Composition			Abundance		
Transformation	None			Square-root			None			Fourth-root		
PERMDISP	F <sub>1,30</sub> = 1.09 p = 0.354			F <sub>1,30</sub> : 34.01 p < 0.001			F <sub>1,30</sub> : 8.23 p = 0.012			F <sub>1,30</sub> : 7.47 p = 0.013		
Source	df	Pseudo-F	$\omega^2$	df	Pseudo-F	$\omega^2$	df	Pseudo-F	$\omega^2$	df	Pseudo-F	$\omega^2$
Habitat = H	1	0.65	0,05	1	1.01	0,26	1	4.31	0,15	1	1.25	0,39
Port = P	1	3.02**	0,16	1	22.74**	0,50	1	6.97*	0,15	1	12.63*	0,08
H × P	1	1.19	0,05	1	10.87**	0,23	1	1.61	0,01	1	50.17**	0,32
Experimental Unit (H × P)	4	3.17***	0,21	4	5.92***	0,07	4	1.15	0,07	4	1.01	0,02
Res.	24			24			24			24		

796

797

798 **Table 4.** PERMANOVA results for the differences in the modality composition (weighted by abundances) of each functional trait of  
 799 taxa of the sessile assemblages of artificial marine habitats studied in two ports of the Southeast Pacific, Chile. The pseudo-F of  
 800 PERMANOVA and t value of PERMDISP (H × P) are given along with significance (in bold) at  $\alpha = 0.05$  (\*:  $p < 0.05$ , \*\*:  $p < 0.01$ , \*\*\*:  
 801  $p < 0.001$ ) and the effect size ( $\omega^2$ ) of each factor.

Functional traits	PERMANOVA Factor (df, total = 31)								PERMDISP
	Habitat = H		Port = P		H × P		Experimental units		
	Pseudo F	$\omega^2$	Pseudo F	$\omega^2$	Pseudo F	$\omega^2$	Pseudo F	$\omega^2$	
Feeding habit	4.06	0.43	3.72	0.08	4.31	0.10	<b>2.37*</b>	0.09	4.27
Body form	1.31	0.26	<b>7.89*</b>	0.26	<b>6.10*</b>	0.20	<b>6.41***</b>	0.12	<b>8.15**</b>
Body size	0.33	0.16	<b>14.01*</b>	0.22	<b>31.73**</b>	0.49	<b>6.47***</b>	0.06	<b>77.24***</b>
Sociability	4.51	0.25	<b>36.64**</b>	0.60	3.38	0.05	<b>11.86***</b>	0.06	<b>17.85***</b>
Lifespan	0.64	0.14	<b>23.69**</b>	0.48	<b>11.36**</b>	0.23	<b>7.87***</b>	0.07	<b>22.00***</b>
Degree of attachment	7.14	0.59	1.16	0.03	2.44	0.07	<b>5.91***</b>	0.13	0.90
Reproductive mode	1.05	0.35	<b>11.14**</b>	0.17	<b>21.93**</b>	0.33	<b>5.03***</b>	0.06	1.13
Larval development	-	0.24	<b>56.82**</b>	0.68	-	0.03	<b>5.75***</b>	0.05	<b>29.48***</b>
Pelagic larval duration	0.00	0.05	<b>106.37**</b>	0.74	<b>12.47*</b>	0.08	2.30	0.03	<b>44.92**</b>

802 The data were previously transformed (square root transformation) and was used the Bray-Curtis Index to generate the similarity matrix.

803 **Table 5.** PERMANOVA results for the differences the functional structure (weighted by abundances) of each functional trait of the taxa  
804 of the mobile assemblages in non-floating and floating habitats. The pseudo-F of PERMANOVA and t value of PERMDISP (H × P) are  
805 given along with the respective significance (in bold) at  $\alpha = 0.05$  (\*:  $p < 0.05$ , \*\*:  $p < 0.01$ , \*\*\*:  $p < 0.001$ ) and the effect size ( $\omega^2$ ) of  
806 each factor.

Functional traits	PERMANOVA Factor (df, total = 31)								PERMDISP
	Habitat = H		Port = P		H × P		Experimental Unit		
	Pseudo F	$\omega^2$	Pseudo F	$\omega^2$	Pseudo F	$\omega^2$	Pseudo F	$\omega^2$	
Feeding habit	0.95	0.36	<b>9.41*</b>	0.05	<b>61.68**</b>	0.25	0.97	0.01	0.17
Body form	1.08	0.26	<b>26.98**</b>	0.23	<b>27.23**</b>	0.24	1.05	0.03	0.21
Body size	1.73	0.44	6.49	0.04	<b>34.90*</b>	0.25	0.86	0.02	0.00
Mobility	1.31	0.42	<b>6.60*</b>	0.04	<b>45.86**</b>	0.32	1.07	0.02	<b>7.64**</b>
Adult mobility	0.93	0.34	<b>29.36*</b>	0.12	<b>85.01**</b>	0.28	0.79	0.01	0.77
Lifespan	0.96	0.38	<b>3.30</b>	0.01	<b>52.75*</b>	0.40	1.38	0.02	1.13
Degree of attachment	1.31	0.43	<b>9.08*</b>	0.04	<b>55.93**</b>	0.32	0.96	0.01	3.61
Reproductive mode	1.64	0.46	<b>9.79*</b>	0.05	<b>45.65**</b>	0.27	0.98	0.43	<b>5.79*</b>
Larval development	1.22	0.40	<b>11.21*</b>	0.06	<b>57.85**</b>	0.33	0.96	0.02	<b>4.09*</b>
Pelagic larval duration	0.00	0.38	<b>9.40*</b>	0.07	<b>36.40**</b>	0.30	1.14	0.02	<b>5.43*</b>

807

808 **Figure legends**

809

810 **Figure 1.** Indices of taxonomic and functional diversity of the sessile and mobile  
811 assemblages associated with non-floating vs floating habitats in the two ports: San Vicente  
812 and Coliumo, Southeast Pacific, Chile.

813

814 **Figure 2.** Relationship between functional diversity and taxa richness of sessile and mobile  
815 assemblages in non-floating vs. floating habitats. Data are pooled across ports.

816

817 **Figure 3.** Principal coordinates analysis (PCO) of the composition (presence-absence) and  
818 abundance of functional features of sessile and mobile assemblages on non-floating vs.  
819 floating habitats in two ports (San Vicente vs. Coliumo) in the Southeast Pacific, Chile.

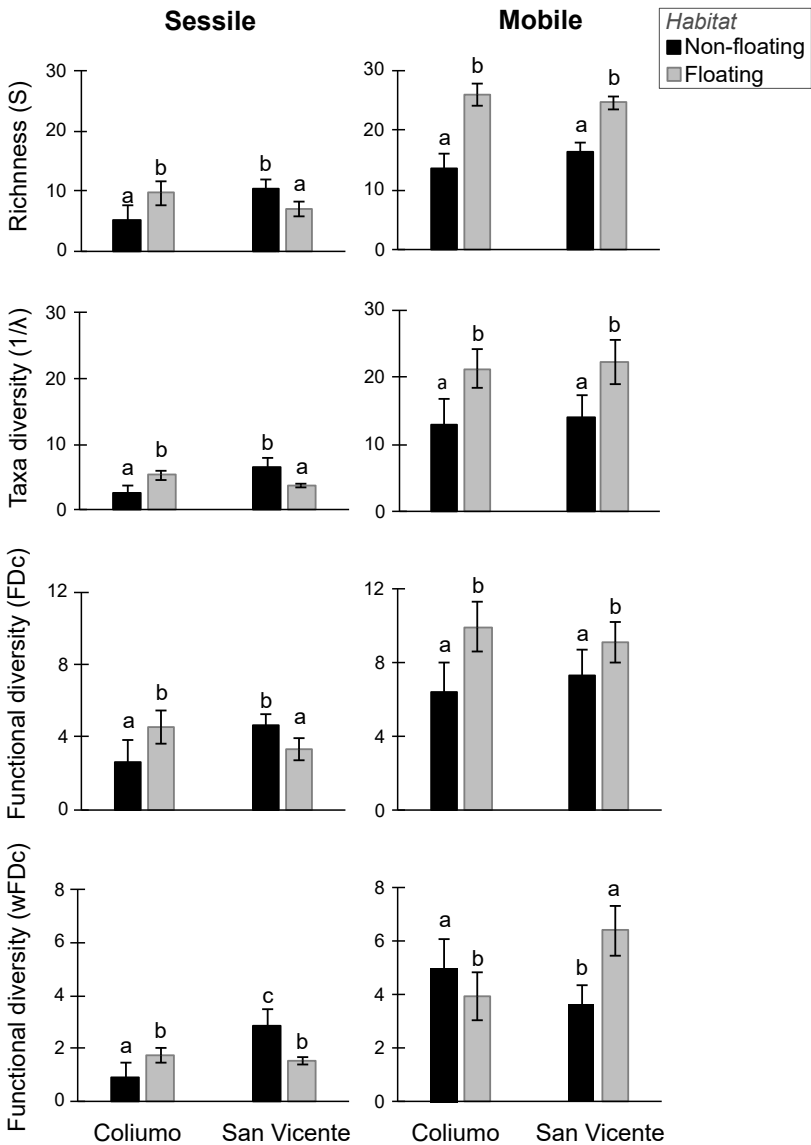
820

821 **Figure 4.** Proportion of the average abundance of each category of functional traits of the  
822 sessile assemblages of two types of habitats (NF: non-floating vs. F: floating) in two ports:  
823 San Vicente vs. Coliumo, Southeast Pacific, Chile.

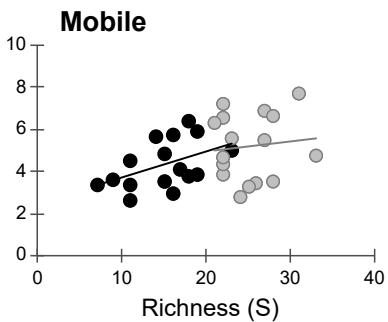
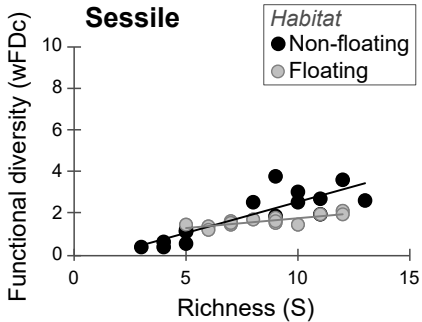
824

825 **Figure 5.** Proportion of the average abundance of each category of functional traits of the  
826 mobile assemblages of two types of habitats (NF: non-floating vs. F: floating) in two ports:  
827 San Vicente vs. Coliumo, Southeast Pacific, Chile.

828







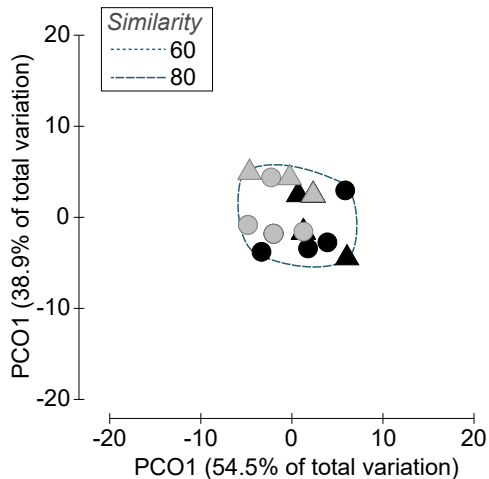
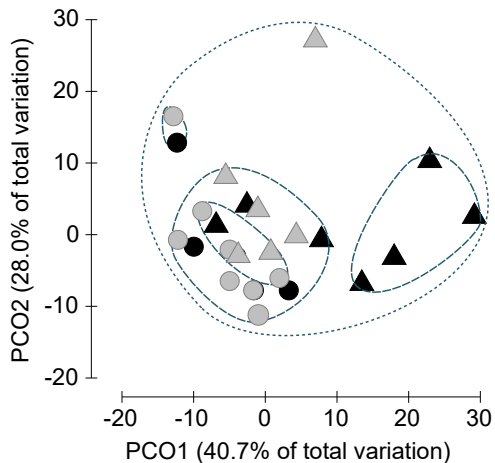
*Habitat-port*

- Non-floating-San Vicente
- ▲ Non-floating-Coliumo
- Floating-San Vicente
- ▲ Floating-Coliumo

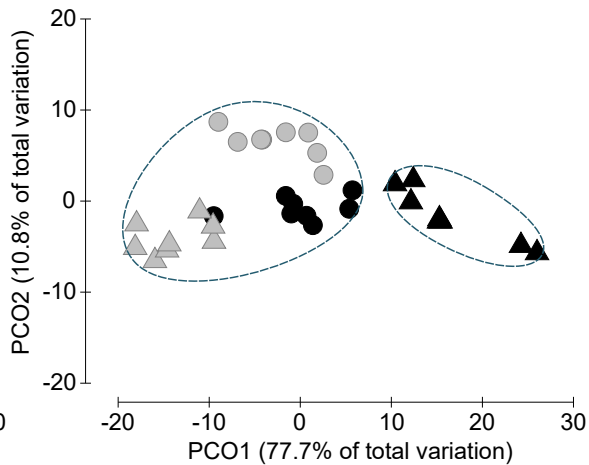
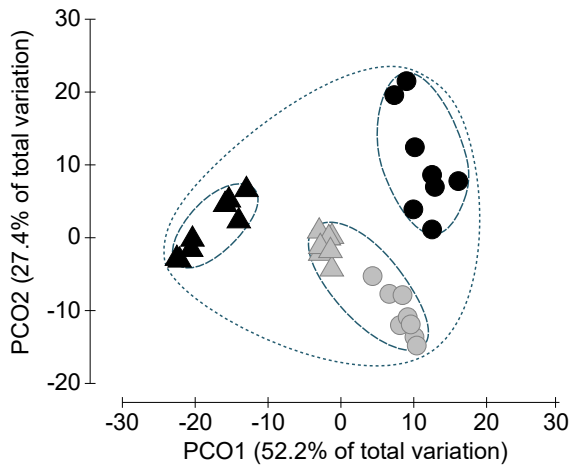
**Sessile**

**Mobile**

**Composition**

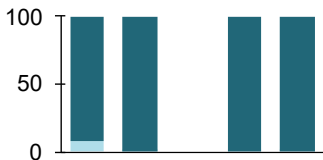


**Abundance**



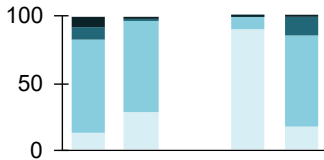
### Feeding Habit

Filter/suspension  
Autotroph



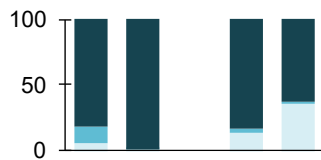
### Individual /colonial size

1-10mm 10-50mm  
50-100mm 100-300mm



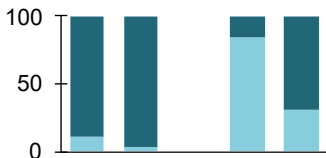
### Body form

Flat Mound Erect



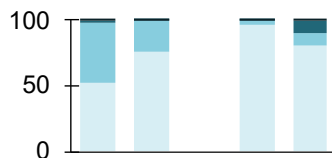
### Sociability

Solitary Colonial



### Lifespan

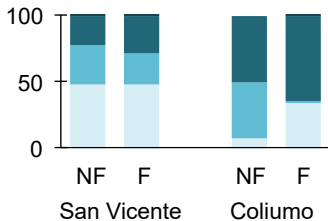
<1 year >1-3 years  
3-5 years >5 years



Abundance proportion (%)

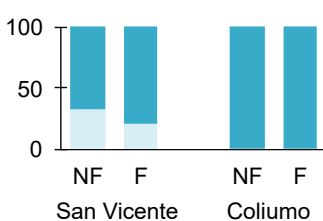
### Reproductive mode

Sexual (direct-developer)  
Sexual (planktonic larvae)  
Sexual (broadcast spawner)  
Asexual



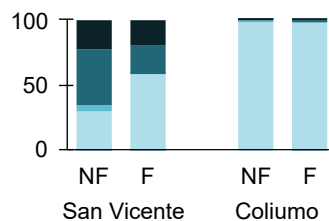
### Larval development

Direct benthic  
Pelagic lecithotrophic  
Pelagic planktotrophic



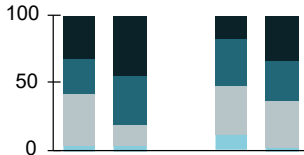
### Pelagic larval duration

None <1 day  
1-7days 7-30 days  
>30 days



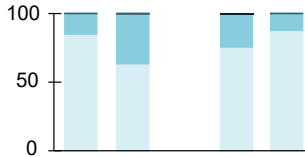
### Feeding Habit

- Predator
- Filter/suspension
- Deposit feeding
- Opportunist/scavenger
- Grazer



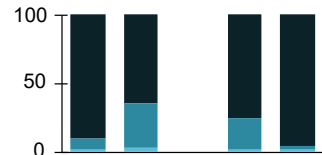
### Individual / colonial size

- 1-10mm
- 10-50mm
- 50-100mm
- 100-300mm



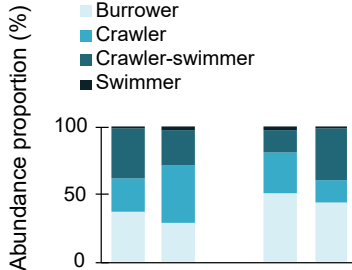
### Body form

- Mound
- Little elongate/ellipsoid
- Elongate



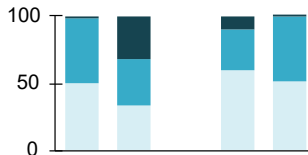
### Motility

- Burrower
- Crawler
- Crawler-swimmer
- Swimmer



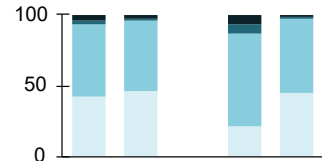
### Adult mobility

- Low
- Medium
- High



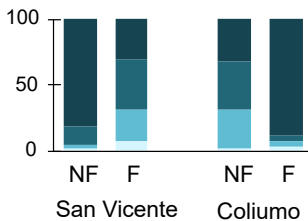
### Lifespan

- <1 year
- 3-5 years
- >1-3 years
- >5 years



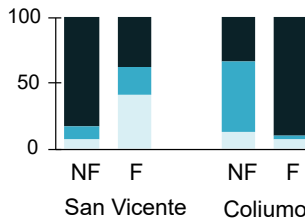
### Reproductive mode

- Sexual (direct-developer)
- Sexual (planktonic larvae)
- Sexual (broadcast spawner)
- Asexual



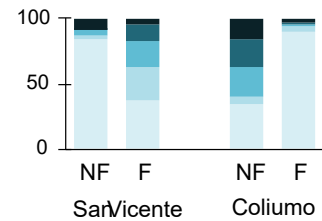
### Larval development

- Direct benthic
- Pelagic lecithotrophic
- Pelagic planktotrophic



### Pelagic larval duration

- None
- <1 day
- 1-7 days
- 7-30 days
- >30 days



**Supplementary material accompanying:**

**Greater functional similarity in mobile compared to sessile assemblages colonizing distinct artificial coastal habitats**

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**Table S1. Complete list of sessile and mobile taxa settled on plates**

<b>Sessile taxa</b>	
<b>Chlorophyta</b>	<i>Aulacomya atra</i> (Molina, 1782)
<i>Ulva</i> Linnaeus, 1753	<i>Mytilus galloprovincialis</i> Lamarck, 1819
	<i>Semimytilus algosus</i> (Gould, 1850)
	<i>Hiatella</i> Bosc, 1801
	<i>Crepidatella fecunda</i> (Lamarck, 1822)
<b>Ochrophyta</b>	<b>Crustacea</b>
Diatoms and Ectocarpales	<i>Austromegabalanus psittacus</i> (Molina, 1788)
	<i>Balanus laevis</i> Bruguière, 1789
<b>Rhodophyta</b>	
<i>Antithamnionella</i> Lyle, 1922	
Calcareous crusts	
<i>Ceramium</i> Roth, 1797	
<i>Polysiphonia</i> Greville, 1823	
Red turf (other)	
Rhodymeniales Schmitz in Engler, 1892	
<b>Porifera</b>	<b>Chordata</b>
<i>Leucosolenia</i> Bowerbank, 1864	<i>Didemnum</i> Savigny, 1816
	<i>Diplosoma listerianum</i> (Milne Edwards, 1841)
	<i>Asterocarpa humilis</i> (Heller, 1878)
	<i>Ciona robusta</i> Hoshino & Tokioka, 1967
	<i>Corella eumyota</i> Traustedt, 1882
	<i>Paramolgula</i> Traustedt, 1885
	<i>Pyura chilensis</i> Molina, 1782
<b>Cnidaria</b>	<b>Mobile taxa</b>
<i>Bougainvillia muscus</i> (Allman, 1863)	<b>Annelida</b>
<i>Amphisbetia operculata</i> (Linnaeus, 1758)	<i>Chone rosea</i> Hartmann-Schröder, 1965
<i>Coryne eximia</i> Allman, 1859	<i>Perkinsiana magalhaensis</i> (Kinberg, 1867)
<i>Hydractinia</i> Van Beneden, 1844	<i>Nereis callaona</i> (Grube, 1857)
<i>Obelia dichotoma</i> (Linnaeus, 1758)	Nereididae Blainville, 1818
<i>Obelia geniculata</i> (Linnaeus, 1758)	<i>Pholoe polymorpha</i> (Hartmann-Schröder, 1962)
<i>Orthopyxis</i> L. Agassiz, 1862	<i>Harmothoe magellanica</i> (McIntosh, 1885)
<i>Phialella quadrata</i> (Forbes, 1848)	<i>Paleanotus chrysolepis</i> Schmarda, 1861
<i>Plumularia setacea</i> (Linnaeus, 1758)	<i>Syllis pectinans</i> Haswell, 1920
	<i>Autolytus</i> Grube, 1850
<b>Bryozoa</b>	<i>Autolytus maclearanus</i> McIntosh, 1885
<i>Alcyonidioides mytili</i> (Dalyell, 1848)	<i>Proceraea micropedata</i> (Hartmann-Schröder, 1962)
<i>Amathia gracilis</i> (Leidy, 1855)	<i>Sphaerosyllis hystrix</i> Claparède, 1863
<i>Bugula neritina</i> (Linnaeus, 1758)	<i>Dipolydora socialis</i> (Schmarda, 1861)
<i>Bugulina flabellata</i> (Thompson in Gray, 1848)	<i>Polydora rickettsi</i> Woodwick, 1961
<i>Celleporella hyalina</i> (Linnaeus, 1767)	<i>Polycirrus multisetigerus</i> Hartmann-Schröder, 1962
<i>Chaperia acanthina</i> (Lamouroux, 1825)	<i>Nicolea chilensis</i> (Schmarda, 1861)
<i>Exochella</i> Jullien, 1888	Terebellini Johnston, 1846
<i>Schizoporella maulina</i> Moyano, 1983	Terebellidae sp1 Johnston, 1846
<i>Schizoporella</i> Hincks, 1877	Terebellidae sp2 Johnston, 1847
<i>Scruparia ambigua</i> (d'Orbigny, 1841)	<i>Nereiphylla</i> Blainville, 1828
	<i>Phyllodoce longipes</i> Kinberg, 1866
<b>Annelida</b>	<i>Eulalia</i> Savigny, 1822
<i>Spirorbis nordenskjoldi</i> Ehlers, 1900	
<b>Mollusca</b>	

*Diplocirrus* Haase, 1915  
*Oligochaeta* Grube, 1850

### **Mollusca**

*Doto* sp1 Oken, 1815  
*Doto* sp2 Oken, 1815

*Phidiana lottini* (Lesson, 1831)  
*Hancockia* Gosse, 1877  
*Orienthella trilineata* (O'Donoghue, 1921)  
*Nudibranchia* sp1  
*Nudibranchia* sp2  
*Thecacera darwini* Pruvot-Fol, 1950  
*Tegula* Lesson, 1832  
Patellidae Rafinesque, 1815  
*Alia unifasciata* (G. B. Sowerby I, 1832)  
*Mitrella* Risso, 1826  
*Nodilittorina* Martens, 1897

### **Crustacea**

Amphilochoidea sp1 Boeck, 1871  
Amphilochoidea sp2 Boeck, 1871  
Amphilochoidea sp3 Boeck, 1871  
Stenothoidae Boeck, 1871  
*Aora* Krøyer, 1845  
Aoridae sp1 Stebbing, 1899  
Aoridae sp2 Stebbing, 1899  
Aoridae sp3 Stebbing, 1899  
*Aoroides* Walker, 1898  
*Caprella equilibra* Say, 1818  
*Deutella venenosa* Mayer, 1890  
Thoridae Kingsley, 1879

Pycnogonida Latreille, 1810

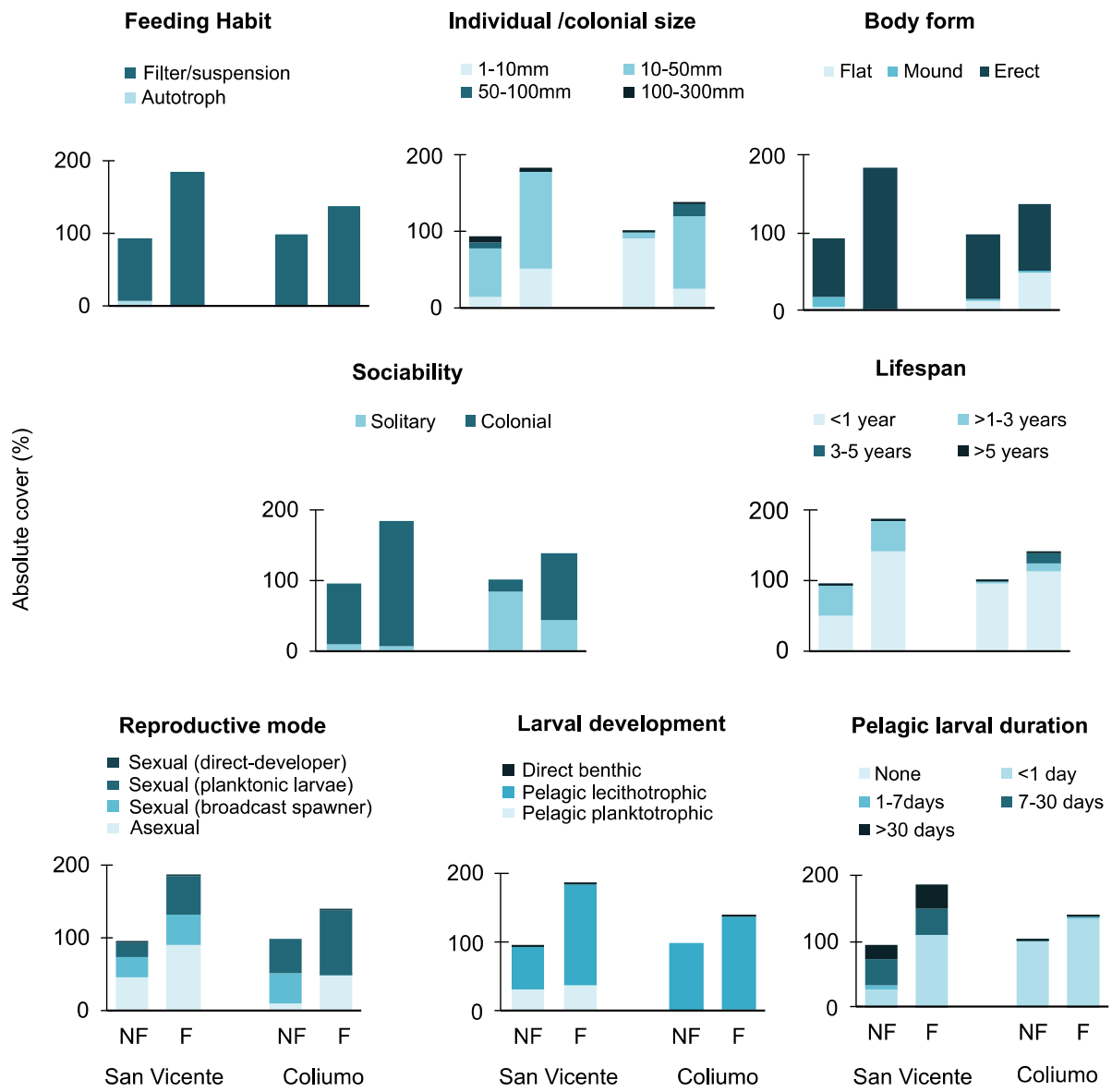
### **Echinodermata**

*Patiria chilensis* (Lutken, 1859)

*Monocorophium acherusicum* (Costa, 1853)  
Corophiidae Leach, 1814  
*Eurystheus* Spence Bate, 1856  
Photidae sp1 Boeck, 1871  
Photidae sp2 Boeck, 1871  
Photidae sp3 Boeck, 1871  
Photidae sp4 Boeck, 1871  
Photidae sp5 Boeck, 1871  
Photidae sp6 Boeck, 1871  
Ischyroceridae Stebbing, 1899  
*Ischyrocerus* sp1 Krøyer, 1838  
*Ischyrocerus* sp2 Krøyer, 1838  
*Ischyrocerus* sp3 Krøyer, 1838  
*Jassa slatteryi* Conlan, 1990  
*Jassa marmorata* Holmes, 1905  
*Jassa justii* Conlan, 1990  
*Elasmopus* Costa, 1853  
Dexaminidae Leach, 1814  
*Zeuxoides* Sieg, 1980  
Copepoda sp1 Milne Edwards, 1840  
Copepoda sp2 Milne Edwards, 1840  
Janiridae G. O. Sars, 1897  
Munnidae G. O. Sars, 1897  
*Pachycheles* Stimpson, 1858  
*Romaleon setosum* (Molina, 1782)  
*Halicarcinus planatus* (J.C. Fabricius, 1775)  
*Eurynome* Leach, 1814 [in Leach, 1813-1815]  
Majidae Samouelle, 1819  
*Pilumnoides perlatus* (Poëppig, 1836)  
*Nauticaris magellanica* (A.Milne-Edwards, 1891)

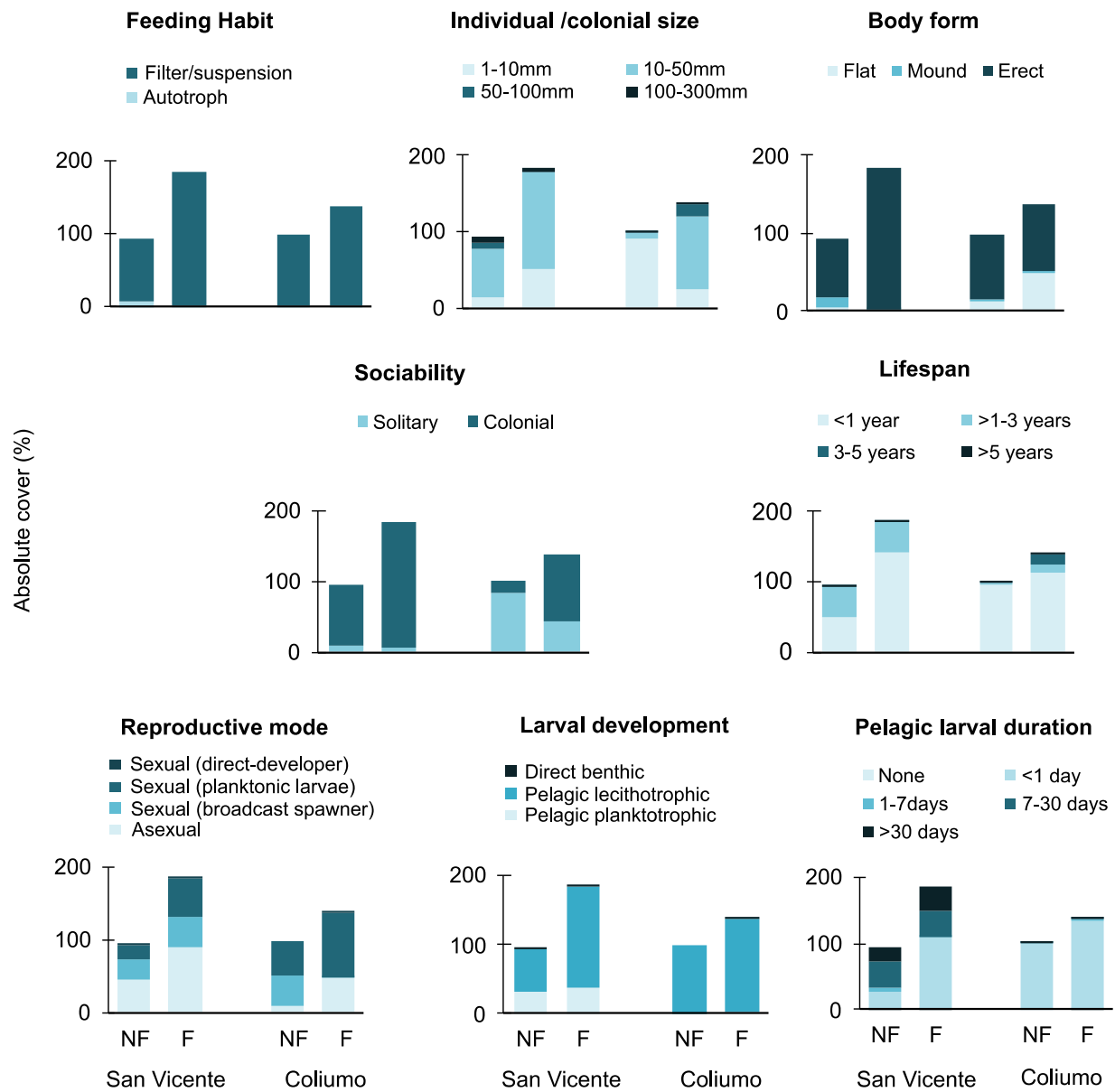
### **Nemertea**

Nemertea sp1  
Nemertea sp2



**Figure S1.** Absolute coverage of each category of functional traits of the sessile assemblages on two types of habitats (NF: non-floating vs. F: floating) in two ports: San Vicente vs. Coliumo, Southeast Pacific, Chile.





**Figure S1.** Absolute abundance of each category of functional traits of the mobile assemblages on two types of habitats (NF: non-floating vs. F: floating) in two ports: San Vicente vs. Coliumo, Southeast Pacific, Chile.