



## 28 **1. Introduction**

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30 Ecological systems are inherently complex entities, where a large number of organisms  
31 and species interact (Johnson *et al.*, 1996; Chapin III *et al.*, 2000). Ecologists aim at  
32 disentangling how species vary in their abundances through a range of spatial and  
33 temporal scales, using a range of sampling procedures (Bellchambers and Lestang, 2005;  
34 Michel *et al.*, 2010). Therefore, a set of varying techniques, through variable sampling  
35 routines, can be implemented to study whatever ecological metric. In subtidal habitats,  
36 for instance, organisms of varying taxonomic lineages can be sampled and/or collected  
37 through destructive and non-destructive techniques (Pagola-Carte *et al.*, 2002).  
38 Importantly, it remains elusive whether the way we quantify ecological metrics might  
39 influence our perception of ecological patterns (Huston, 1997). For example, in the  
40 particular case of reef fish, differences in the diversity and abundance between the inner  
41 and outer sides of marinas are considerably influenced by the way reef fish are counted,  
42 i.e. through visual counts, fish traps or baited cameras (Bosch *et al.*, 2017).

43

44 Decapods are one of the most conspicuous faunal groups in nearshore habitats, seagrass  
45 meadows in particular, linking primary production and higher trophic levels (Nelson,  
46 1981; Mateo *et al.*, 2006). In turn, decapods have been used as model organisms to study  
47 faunal relationships in relation to meadow complexity and structure (Lee, *et al.*, 2001;  
48 Shinomiya *et al.*, 2017). Several studies have reported a trend of higher decapod diversity  
49 and abundance at night (Bauer, 1985; García Raso *et al.*, 2006; Daoulati *et al.*, 2014).  
50 Decapods typically present circadian rhythms in their swimming and locomotion  
51 activities in response to light intensity (Aguzzi *et al.*, 2009). More specifically, the daily  
52 activity of decapods (in the form of swimming) is related with perception of light in the

53 environment (Bauer, 1985). In addition, light modulates the type and the intensity of inter-  
54 and intraspecific competition of decapods (Kronfeld-Schor and Dayan, 2003).

55

56 Different techniques have been employed to sample decapods associated with seagrass  
57 meadows (Heck and Wilson, 1990), including bottom trawls (García Raso *et al.*, 2006;  
58 Daoulati *et al.*, 2014), hand-nets (Bauer, 1985; Schaffmeister *et al.*, 2006), airlift pumps  
59 (Mateo-Ramírez and García Raso, 2012), corers (Stoner and Lewis, 1985; Borg *et al.*,  
60 2002), manual extraction of rhizomes (García Raso, 1990), traps (Carrozzo *et al.*, 2014;  
61 Xu *et al.*, 2016) and light traps (McLeod and Costello, 2017). Thus, the use of different  
62 sampling techniques can provide a different ‘picture’ of the community (Bellchambers  
63 and Lestang, 2005; Michel *et al.*, 2010). In turn, understanding how the different  
64 techniques preferentially sample different components of the community is crucial to  
65 select appropriate combinations, or just a single sampling technique (Michel *et al.*, 2010).  
66 For instance, hand-nets mainly sample organisms associated with the foliar stratum of  
67 seagrass meadows (Borg and Schembri, 2000), while airlift pumps often collect  
68 organisms associated with the rhizomes (Sánchez-Jerez *et al.*, 1999; Mateo-Ramírez and  
69 García Raso, 2012; Mateo-Ramírez *et al.*, 2016). Baited traps have been seldom used to  
70 sample decapods in seagrass meadows (Carrozzo *et al.*, 2014; Xu *et al.*, 2016), which can  
71 capture scavenger species of different sizes (Aedo and Arancibia, 2003).

72

73 In this study, the diel (diurnal *versus* nocturnal) activity rhythm of seagrass-associated  
74 decapod crustaceans was investigated by means of three sampling techniques. We aimed  
75 to test whether perception of circadian rhythms of a case-study community, here decapod  
76 crustaceans, vary according to ‘how’ the community is sampled. Specifically, the  
77 abundance, biomass and structure of seagrass-associated decapod assemblages between

78 the day and night were compared, addressing whether these patterns were consistent  
79 between three sampling techniques: hand-net, airlift pump and baited traps.

80

## 81 **2. Materials and methods**

82

### 83 ***2.1. Study area and sampling procedure***

84

85 This study was carried out between the 6<sup>th</sup> and 11<sup>th</sup> of July 2016 at a shallow water (7-8  
86 m depth) site dominated by continuous (70-80% of cover) meadows of the seagrass  
87 *Cymodocea nodosa*. The study area, Playa del Pajar (Fig.1), is located on the southeastern  
88 coast of the island of Gran Canaria (Canary Islands, northeastern Atlantic). The meadow  
89 has a seagrass cover of 24,700 m<sup>2</sup> and an average shoot density of  $324 \pm 58$  shoots m<sup>-2</sup>  
90 (Tuya *et al.*, 2014).

91

92 Two SCUBA divers collected four samples twice a day, during five successive days,  
93 through three sampling techniques: a hand-net, an airlift pump and baited traps (Fig. A.1).  
94 Hand-net samples (n=40 in total) were collected over 15 m long transects; the net has a  
95 40 x 20 cm mouth and a mesh size of 500  $\mu$ m. Airlift pump samples (n=40 in total) were  
96 collected over a 50 x 50 cm quadrat through a 500  $\mu$ m mesh size collector, using a  
97 constant suction time of 3 min. Samples were collected at 11.00 a.m. (i.e., daytime) and  
98 11.00 p.m. (i.e., nighttime). Experimental traps consisted of a 46 x 20 x 20 cm (length x  
99 width x height) stainless steel frame, covered with a 2 x 1 mm mesh net, including a  
100 concave mouth (16 x 6 cm, width x height) in one of the sides. Experimental traps (n=40  
101 in total) were deployed during periods of 12 hours: from 7 a.m. to 7 p.m. (i.e., daytime)

102 and from 7 p.m. to 7 a.m. (i.e. night time). The distance between adjacent traps was 30 m  
103 to optimize the effective fishing area of traps (Aedo and Arancibia, 2003).

104

105 For samples collected through the hand-net and airlift pump, all fauna was preserved in  
106 70% ethanol. Under a binocular microscope, decapods were classified to species (when  
107 was possible) or genus level, following the species identification keys provided by  
108 Burukovskii, (1982), Holthuis *et al.* (1993), Ingle (1993, 1997) and Smaldon *et al.* (1993).

109 For each taxon, the total number of individuals and the individual specimen mass (wet  
110 mass) were obtained (to the nearest 0.0001 g). Each individual was measured three times  
111 to avoid bias. For traps, decapods were sorted by taxon and each specimen body mass  
112 measured (to the nearest 0.001 g). The structure of the seagrass meadow was assessed,  
113 on each day and diel sampling, by counting the number of seagrass shoots within each of  
114 four 25 x 25 cm quadrats. Additionally, randomly selected shoots (n=10) were collected  
115 to determine their foliar surface.

116

## 117 **2.2. Data analysis**

118

119 Permutational Multivariate Analysis of Variance (PERMANOVA, Anderson *et al.*, 2008)  
120 tested whether the assemblage structure of decapods, in terms of both abundances and  
121 biomasses, significantly differed between the techniques (fixed factor with three levels),  
122 diel timing (fixed factor with two levels) and days (random factor with 5 levels).  
123 Additionally, shoot density and seagrass foliar surface were included, as covariates, to  
124 account for potential differences in the amount of habitat available among replicates.  
125 Pairwise comparisons, through 999 permutations of the raw data, resolved diel  
126 differences, separately for each technique, when a significant “Sampling technique x Diel

127 timing” interaction was obtained. To enable among-techniques comparisons, data were  
128 initially standardized to a common area. A resemblance matrix, using the Bray-Curtis  
129 similarity index, was then constructed (Clarke and Warwick, 2001). Non-metric  
130 multidimensional scaling ordination (nMDS) was used to explore differences in  
131 assemblage structure, using both standardized abundances and biomasses data (Clarke  
132 and Warwick, 2001). The Similarity Percentage analysis procedure (SIMPER, Clarke and  
133 Warwick, 1994, 2001) identified the main taxa contributing (> 1.5 %) to diel differences,  
134 separately for each technique.

135

136 Differences in the total abundance and total biomass of decapods, corresponding to the  
137 summation of all taxa per sample, were tested through 3-way, permutation-based,  
138 ANCOVAs, following the same design and criteria as stated above for the multivariate  
139 data, but using Euclidean distances as the resemblance distance. Permutation-based  
140 univariate approaches were preferred, due to their larger flexibility in terms of parametric  
141 assumptions.

142

143 Diel differences in the body mass distribution and median of the main taxa (those  
144 contributing to > 1.5 % of the total abundance) were compared, separately for each taxon,  
145 through the Kolmogorov-Smirnov non-parametric test. The same procedure tested for  
146 pooled daily differences between each pair of techniques.

147

148 Statistical analyses were performed by means of the Primer v.6 with PERMANOVA+  
149 software (Clarke and Warwick, 1994; Anderson *et al.*, 2008) and the IBM SPSS Statistics  
150 software (Field, 2013).

151

### 152 **3. Results**

153

154 A total of 2,401 specimens, belonging to 20 taxa within four decapod infraorders:  
155 Anomura, Brachyura, Caridea and Gebiidea, were recorded (Table A.1). Carideans  
156 (2,125 individuals belonging to 4 families) were the dominant taxa, in terms of  
157 abundance, followed by Brachyurans (217 individuals, 2 families), Anomurans (58  
158 individuals, 1 family) and Gebiidaens (1 individual, 1 family). Brachyurans dominated,  
159 in terms of biomass (98.41%), followed by Carideans (1.03%) and Anomurans (0.56%).

160

#### 161 **3.1. Multivariate results**

162

163 The community structure of decapods, in terms of their abundances and biomasses,  
164 differed between the day and night, according to the sampling technique (“Sampling  
165 technique x Diel timing”,  $p < 0.05$ , Table 1). The hand-net showed diel differences in  
166 assemblage structure, both in terms of abundances and biomasses ( $p < 0.01$ , Table 1). Two  
167 assemblages related with diel timing were observed in the nMDS plots (Fig. 2A and 2B).  
168 When collected through the hand-net, the assemblage structure of decapods was affected  
169 by seagrass structure, in terms of seagrass shoot density ( $p < 0.01$ ), but not in terms of  
170 seagrass foliar surface ( $p > 0.33$ , Table 1). The airlift pump showed diel differences in  
171 decapod assemblage structure in terms of biomasses ( $p = 0.03$ , Table 1), showing two  
172 assemblages related with diel timing in the nMDS plot (Fig. 2D). No diel differences in  
173 assemblage structure, however, were observed in terms of abundances (Fig. 2C,  $p = 0.10$ ,  
174 Table 1). These results were irrespective of seagrass structure ( $p > 0.09$ , Table 1). The  
175 assemblage structure of decapods differed between the day and night, when collected  
176 through baited traps, in terms of abundances ( $p = 0.02$ , Table 1). Two assemblages of

177 samples with regard to diel timing were observed in the nMDS plot (Fig. 2E). In contrast,  
178 no diel differences in assemblage structure were observed in terms of biomasses (Fig. 2F,  
179  $p=0.24$ , Table 1). These results were irrespective of seagrass structure ( $p>0.51$ , Table 1).

180

181 The SIMPER routine indicated that, when the assemblage was sampled through the hand  
182 net, the most important taxa contributing to diel differences (50.21%, Table 2) were:  
183 *Processa edulis* (Risso, 1816), *Hippolyte* sp1., *Hippolyte garciaraso* d'Udekem d'Acoz,  
184 1996, and *Hippolyte leptocerus* (Heller, 1863). When collected through the airlift pump,  
185 the most important taxa contributing to diel differences (51.53%, Table 2) were: *Athanas*  
186 *nitescens*, *Hippolyte* sp1., *Hippolyte garciaraso*, *Processa edulis*. In the case of baited  
187 traps, the most important taxa contributing to diel differences (58.44%, Table 2) were:  
188 *Cronius ruber* (Lamarck, 1818), *Pagurus anachoretus* and *Portunus hastatus* (Linnaeus,  
189 1767).

190

### 191 **3.2. Univariate results: diel patterns in abundance and biomass**

192

193 Similar to multivariate responses, both the total abundance and total biomass of decapods  
194 differed between the day and night according to the sampling technique (“Sampling  
195 technique x Diel timing”,  $p<0.05$ , Table 1). For the hand-net, a larger total abundance and  
196 biomass of decapods were collected at night (Fig. 3A and 3B,  $p<0.02$ ). When collected  
197 through the hand-net, the total abundance and biomass of decapods was affected by the  
198 seagrass structure, in terms of seagrass shoot density ( $p<0.01$ ), but not in terms of seagrass  
199 foliar surface ( $p>0.33$ ). The airlift pump collected a larger total biomass of decapods at  
200 night (Fig. 3D,  $p=0.03$ ), but not for the total abundance (Fig. 3C,  $p=0.45$ ). These results  
201 were irrespective of seagrass structure ( $p>0.13$ ). On the contrary, traps collected a larger



202 total abundance of decapods at night (Fig. 3F,  $p=0.01$ ), but not for the total biomass (Fig  
203 3E,  $p=0.05$ ). Again, these results were irrespective of seagrass structure ( $p>0.12$ ).

204

### 205 **3.3. Univariate results: diel patterns in species body mass distribution**

206

207 Three taxa (*H. garciaraso*, *Hippolyte* sp1. and *Hippolyte varians*) showed wider body  
208 mass distributions and a higher median when captured by the hand-net, relative to the  
209 airlift pump (Fig. 4A, 4B and 4C,  $p<0.02$ ). *Hippolyte garciaraso* and *Hippolyte* sp1.  
210 showed diel differences in body mass distribution and median when captured by both the  
211 hand net and the airlift pump (Fig. 4A and 4B,  $p<0.01$ ). *Processa edulis* showed a wider  
212 body mass median, but not mass distribution, when captured by the hand-net, relative to  
213 the airlift pump (Fig. 4L, 4L and 4L,  $p<0.01$ ,  $p=0.068$ ). The body mass distribution and  
214 median of the hermit crab, *P. anachoretus*, was wider and larger, respectively, when  
215 collected by traps, relative to the other sampling techniques, particularly at night (Fig.  
216 4D,  $p<0.01$ ).

217

## 218 **4. Discussion**

219

220 The main outcome of this study was that perception of diel patterns of seagrass associated  
221 decapods varied according to the methodology implemented. As a result, the three  
222 sampling techniques provided a different, but complementary, ‘picture’ of the decapod  
223 assemblage associated with the seagrass *Cymodocea nodosa*.

224

225 The total abundance, total biomass and assemblage structure of decapods sampled by the  
226 hand-net consistently varied between the day and night, with larger abundances and

227 biomasses collected at night. This pattern is common for decapods living in seagrass  
228 meadows (Bauer, 1985; García Raso *et al.*, 2006; Daoulati *et al.*, 2014), despite variation  
229 at small temporal scales, e.g. days (García-Sanz *et al.* 2016; this study). The hand-net  
230 preferentially collect animals within the foliar stratum of seagrass meadows (Borg and  
231 Schembri, 2000; Michel *et al.*, 2010), which has facilitated detection of diel activity  
232 rhythms, in terms of diel variability in abundances, biomasses and diversity (Bauer, 1985;  
233 Reed and Manning, 2000; De Grave *et al.*, 2006). Typically, these differences are  
234 attributed to the emergence of species from their refuges in/on the sediment at night. For  
235 instance, Bauer (1985) identified *Alpheus normanni* Kingsley, 1878 and *Processa* spp. as  
236 the main contributors to diel variation in seagrass fauna, because these taxa remain in  
237 their burrows during the daytime, but move at night. Similarly, *Processa* spp. were absent  
238 during daytime samples (Reed and Manning, 2000; De Grave *et al.*, 2006), but were  
239 among the dominant species at night. Importantly, species belonging to the Processidae  
240 family are present in daytime samples when other sampling techniques are carried out,  
241 e.g. beam-trawls (Štević, 1991), or via an airlift pump (Mateo-Ramírez and García Raso,  
242 2012). The catchability of decapods by hand-nets is enhanced at night, since the  
243 swimming activity of the leaf stratum dweller decapod species often increase at night.  
244 For example, Bauer (1985) observed that hippolytid shrimps, such as *Latreutes fucorum*,  
245 were clinging on seagrass leaves during the day and swam more often at night. This  
246 pattern explains a 15-fold increase in abundances of *L. fucorum* from day to night (De  
247 Grave *et al.*, 2006). Concurrently, net avoidance during the day has also been proposed  
248 as a concurrent explanation for the increased abundances of decapods at night (Bauer,  
249 1985). In our study, the main decapod species contributing to dissimilarities, both in terms  
250 of abundances and biomasses, between the day and night for the hand-net were, indeed,  
251 *A. nitescens* and *P. edulis*, together with other members of the genus *Hippolyte* and *L.*

252 *fucorum*. Interestingly, *P. fasciatus*, previously classified as a diurnal species (San  
253 Vicente and Sorbe, 2001), also contributed to the nocturnal increase. *Portunus hastatus*,  
254 a crab that buries in sand during the day, was a significant contributor to diel  
255 dissimilarities only in terms of biomass, as they are much larger than the rest of captured  
256 species, but found in low abundances. The spider crab, *Macropodia rostrata*, was also  
257 more abundant at night, which is coherent with the increased nocturnal activity previously  
258 reported (Daoulati *et al.*, 2014). In summary, diel patterns described by the hand-net seem  
259 to be related to a limitation of the instrument, i.e. its capturability, rather than by the  
260 migration of organisms in the meadow, as many organisms are always present, but their  
261 susceptibility to the capture by the hand-net is modified by their diel behaviour pattern.

262

263 When collected through the airlift pump, diel differences were only observed in terms of  
264 total decapod biomass, but not in terms of total decapod abundance. This sampling  
265 technique is relatively effective to sample both the above-ground (foliar) and below-  
266 ground (rhizomes) compartments (Borg and Schembri, 2000; Michel *et al.*, 2010). In  
267 other words, the airlift pump capture both organisms within the foliar stratum and those  
268 buried in the sediment, or hidden in cavities of the substrate during the day. The lack of  
269 diel differences in abundances are partly related to the behaviour of *Hippolyte* shrimps,  
270 which showed high abundances during the day. These shrimps often remain within the  
271 seagrass leaf canopy during the daytime, and so are easily captured by the airlift pump.  
272 At night, however, these shrimps become more active swimmers, and so they are less  
273 accessible by the airlift pump, but more accessible through the hand-net (Bauer, 1985).  
274 The remaining fraction of decapods collected by the airlift pump are burrowing species,  
275 which are numerically more abundant during the night, because of an increasing activity  
276 outside of their burrows, hence counterbalancing the larger abundances of *Hippolyte*

277 shrimps collected at the daytime. This is the case for *A. nitescens*, *P. fasciatus* and *P.*  
278 *edulis*, which often occupy burrows during the day and became active predators at night  
279 (San Vicente and Sorbe, 2001; García Raso *et al.*, 2006). As these taxa tend to have larger  
280 sizes, and so biomasses, than *Hippolyte* shrimps, they significantly contribute to the larger  
281 biomasses of decapods collected at night by the airlift pump.

282

283 Traps recorded a significantly higher total abundance of decapods at night. Traps  
284 exclusively collected three decapod species: *Cronius ruber*, which was limited to traps  
285 deployed at night; *Portunus hastatus*, also captured by the hand net, and *P. anachoretus*,  
286 which was collected by all techniques. The crab *P. hastatus* is a nocturnal species, i.e.  
287 larger abundances are collected at night, often associated with fine-sediment substrates,  
288 including sandy and vegetated bottoms covered by *C. nodosa* and other seagrasses  
289 (García Raso *et al.*, 2006; this study). *Cronius ruber* is also a nocturnal species, hiding  
290 during the daytime and foraging at night (González *et al.*, 2017). It is noteworthy that the  
291 hermit crab, *P. anachoretus*, showed larger abundances in diurnal samples. Hermit crabs  
292 carry their own refuge around, and therefore are less vulnerable to predation; their activity  
293 is not only limited to the night hours (Hazlett, 1966). Traps collect information over an  
294 entire sampling period (12 hours periods, in our case study); i.e., traps do not provide an  
295 instantaneous snapshot, as the other two techniques. In terms of the biomass of captured  
296 decapods, baited traps separated two assemblages with no relation with diel patterns. This  
297 is related to the presence/absence of portunids, due to their high masses compared with  
298 *A. anachoretus*. Baited traps act as a passive gear; this technique relies on the activity of  
299 collected species, i.e. their behavioural patterns. Therefore, the effect of the bait could  
300 affect the normal activity of species, modifying their behaviour. Due to the lower species  
301 diversity of captured decapods, baited traps are inappropriate to describe decapods

302 associated with seagrasses. Despite this, our results suggest that traps can be effective to  
303 capture species with low densities, in particular those within the poorly known Portunidae  
304 family in seagrass meadows, for example *Cronius rubber*, an invasive species whose  
305 effects on the ecosystem are still to be quantified (Gonzalez *et al.*, 2017). Indeed, Xu *et*  
306 *al.* (2016) captured four species of decapods using traps, including the Portunid *Ovalipes*  
307 *catharus* (White in White and Dubbleday, 1843) and Carrozzo *et al.* (2014) captured the  
308 Portunid *Callinectes sapidus* Rathbun, 1896.

309

310 This study has shown that the distribution of body mass (i.e. size) of collected species  
311 varied with the sampling technique and the diel activity of collected animals. The  
312 selectivity of each sampling technique is inherently different, so each sampling gear has  
313 a different ‘perception’ of the biomass/size distribution of species. This selectivity is also  
314 affected by behavioural differences between sexes and/or size classes of the same species  
315 (Potter *et al.*, 1991). Our results point towards the existence of two main decapod groups  
316 inhabiting *C. nodosa* seagrass meadows, from a functional point of view. First, night  
317 motile decapods, mainly dominated by the genus *Hippolyte*, which displays a different  
318 size distribution for each sampler, i.e. the hand-net collect adult specimens during the  
319 night, while smaller sizes are collected by the airlift pump at night. This indicates that the  
320 nocturnal activity of this species is more intense for adult specimens, which are more  
321 vulnerable to the hand net. Smaller specimens majorly remain associated with the leaf  
322 canopy, even at night. Secondly, night burrower predators are best represented through  
323 the airlift pump, as this technique covers the whole range of sizes, specifically in the  
324 nocturnal samples. A complete □picture□, therefore, would be accounted by combining  
325 these two sampling gears.

326

327 In summary, the use of various sampling techniques has shown that perception of diel  
328 patterns of a particular assemblage, here seagrass-associated decapods, depend on the  
329 species' vulnerability to each technique, which is intrinsically linked with their  
330 selectivity. Collection of animals, and so the calculation of ecological metrics (i.e.  
331 abundances and biomasses) depend on the accessibility of the sampling technique to  
332 species, which is connected with their behaviour rather than by their appearance in the  
333 meadow.

334

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343

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528 **Figure captions**

529

530 **Figure 1.** Location of the study site on the southern coast of Gran Canaria Island.

531

532 **Figure 2.** Non metric Multidimensional Scaling (nMDS) ordination plots reflecting diel  
533 similarities in decapod assemblage structure for each sampling technique (hand net: A,  
534 B; airlift pump: C, D and traps: E, F), according to abundances (A, C and E) and  
535 biomasses (B, D and F).

536

537 **Figure 3.** Total abundance (A, C and E ind m<sup>-2</sup>) and biomass (B, D and F; g m<sup>-2</sup>) of  
538 decapods collected during the day and night by each sampling technique (hand net: A, B,  
539 airlift pump: C, D and baited traps: E, F). Different letters above bars denote statistically  
540 significant differences. Error bars are +SD of means.

541

542 **Figure 4.** Box-plot showing day and night body mass ranges of the main seagrass  
543 decapods collected by the hand-net, the airlift pump and baited traps. Different letters  
544 above bars denote statistically significant differences (p<0.05) between diel phases;  
545 different letters above horizontal lines denote statistically significant differences (p<0.05)  
546 between sampling techniques. The line within each box is the median value, box ends are  
547 the inner and outer quartiles, whiskers are the inner and outer tenths. *Hippolyte*  
548 *garciaraso* (A), *Hippolyte* sp1. (B), *Hippolyte varians* (C), *Pagurus anachoretus* (D),

549 *Hippolyte inermis* (E), *Hippolyte leptocerus* (F), *Hippolyte* sp2. (G), *Athanas nitescens*  
550 (H), *Latreutes fucorum* (I), *Macropodia rostrata* (J), *Philocheras fasciatus* (K) and  
551 *Processa edulis* (L).

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553 **Table captions**

554

555 **Table 1.** Results of the PERMANOVAs and ANCOVAs testing for diel differences in  
556 decapod assemblage structure, in terms of abundances and biomasses, the total abundance  
557 and the total biomass of decapods, according to sampling techniques. \*,  $p < 0.05$ ; \*\*,  $p$   
558  $< 0.001$ .

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560 **Table 2.** Results of the SIMPER routine showing those decapod taxa majorly contributing  
561 to diel differences (% C, percentage of contribution) for each sampling technique. AD,  
562 average dissimilarity.

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578 **Supplementary material**

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580 **Figure A1.** Photographs of each sampling technique. A diver sweeping the meadow  
581 with a hand-net (A), two divers collecting seagrass fauna through the airlift pump (B),  
582 and a diver collecting a baited trap deployed on the meadow (C).

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584 **Table A1.** Diel abundances (ind m<sup>-2</sup>) of decapods collected by the three sampling  
585 techniques.

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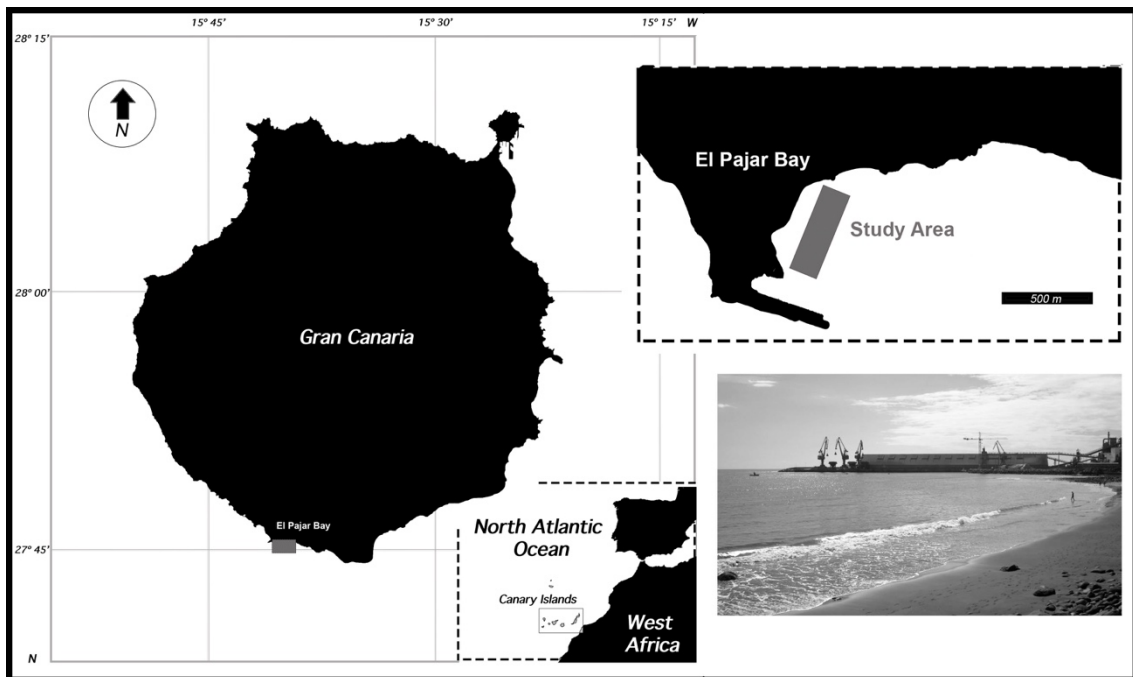
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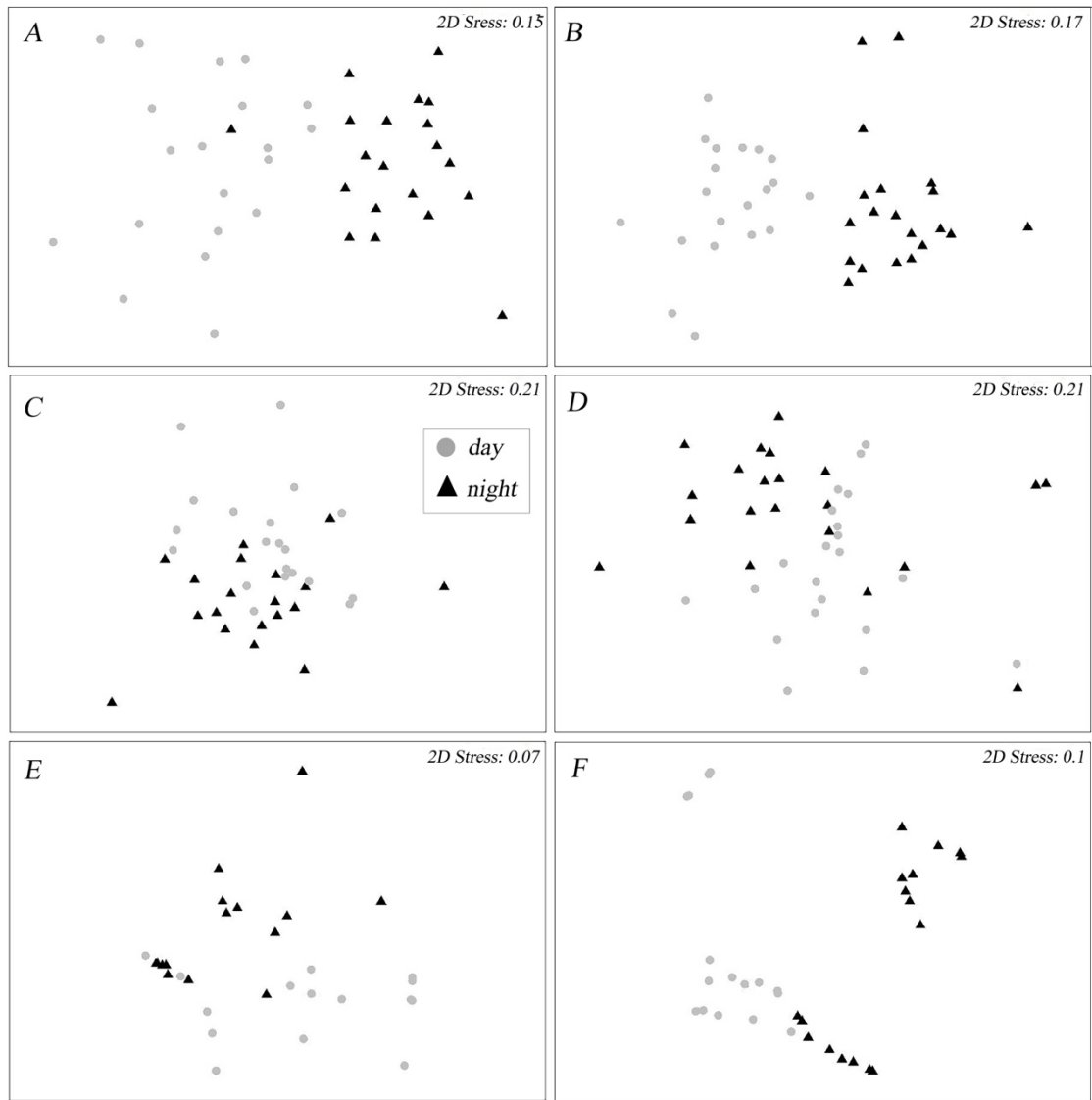
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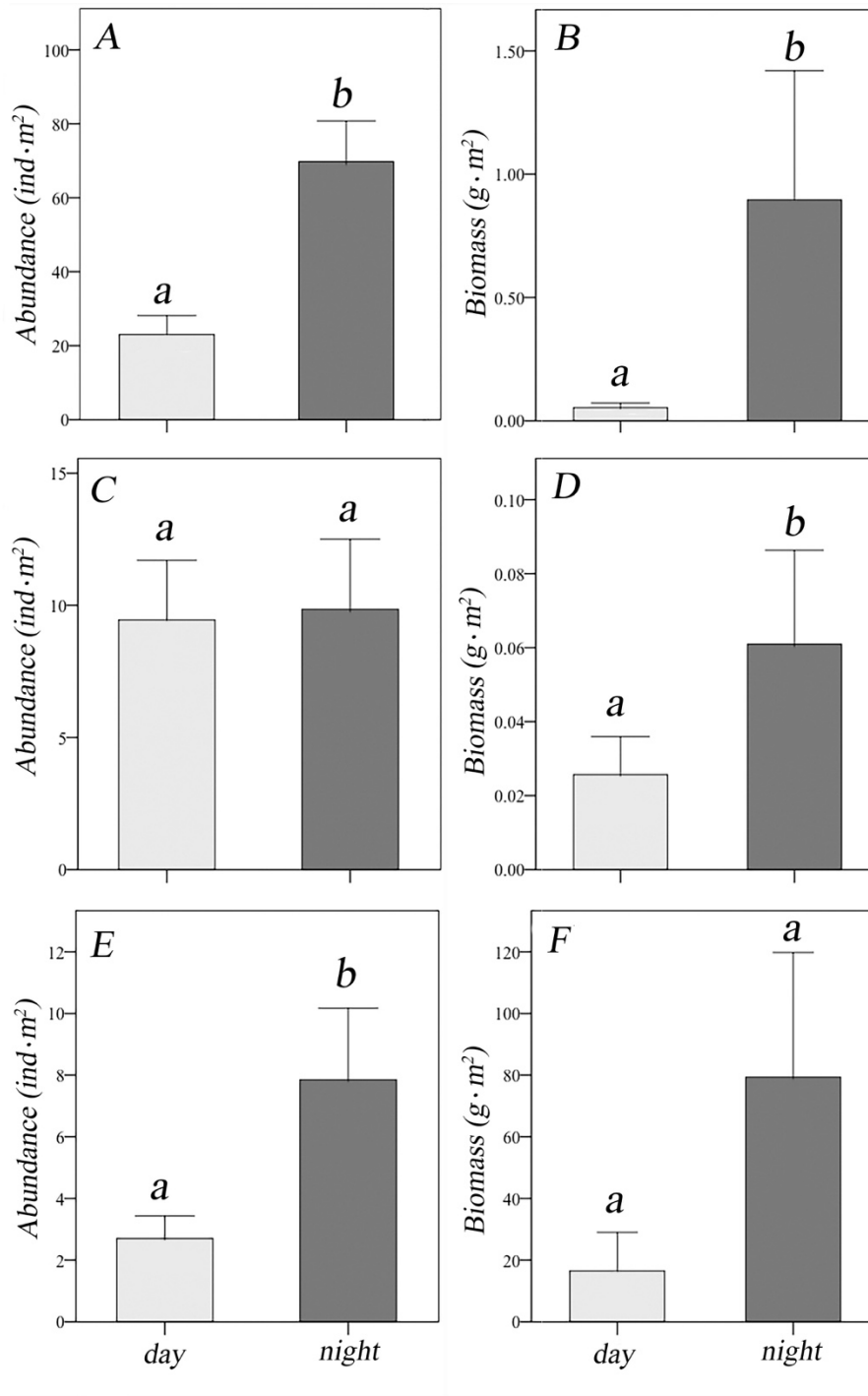
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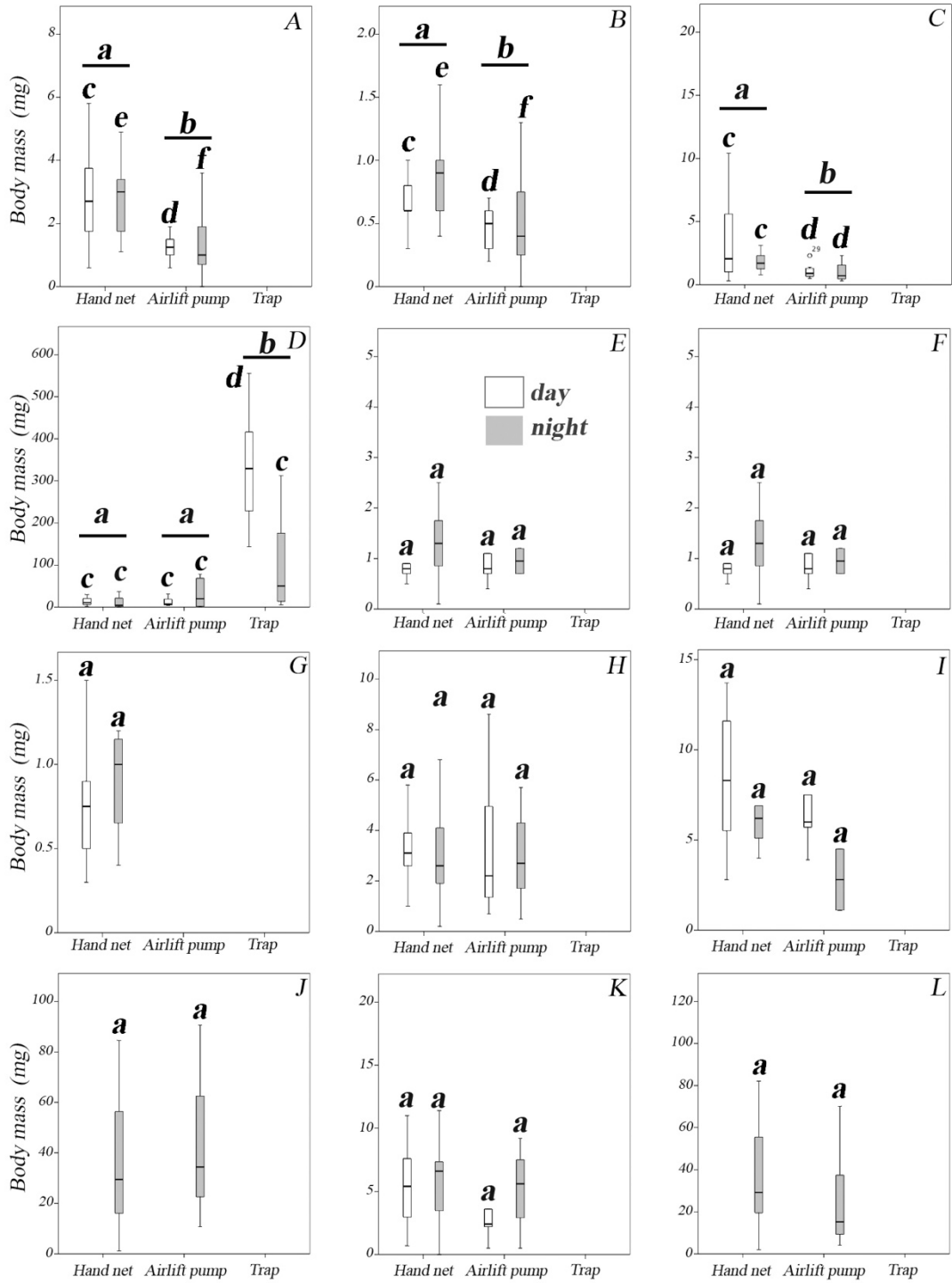
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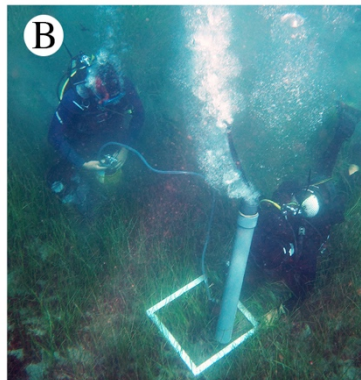
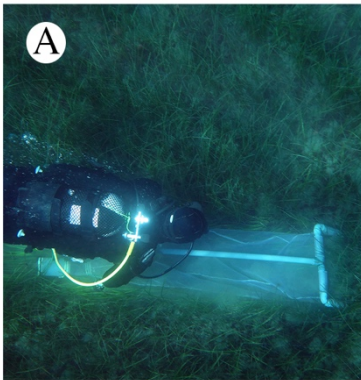
630 Figure 3

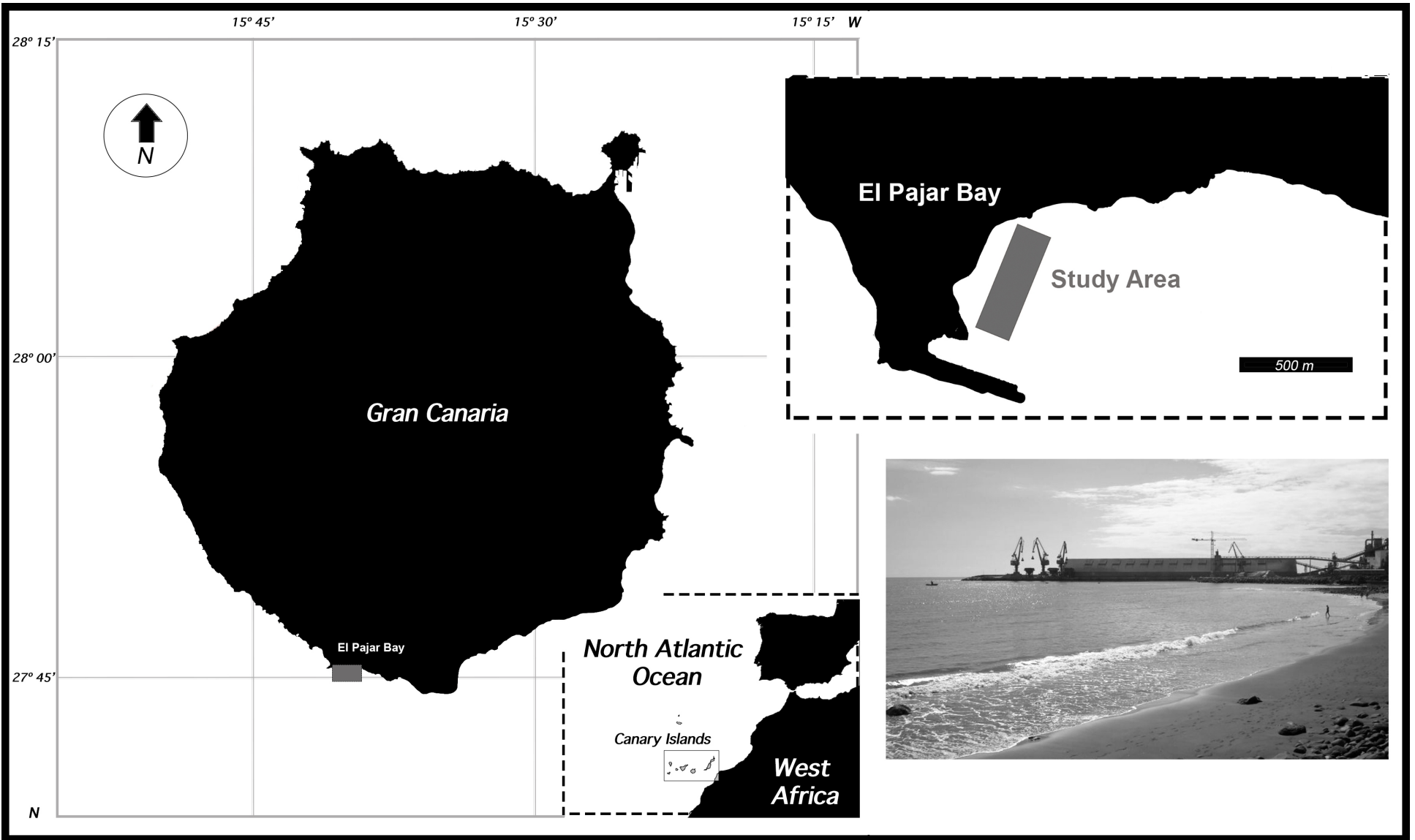


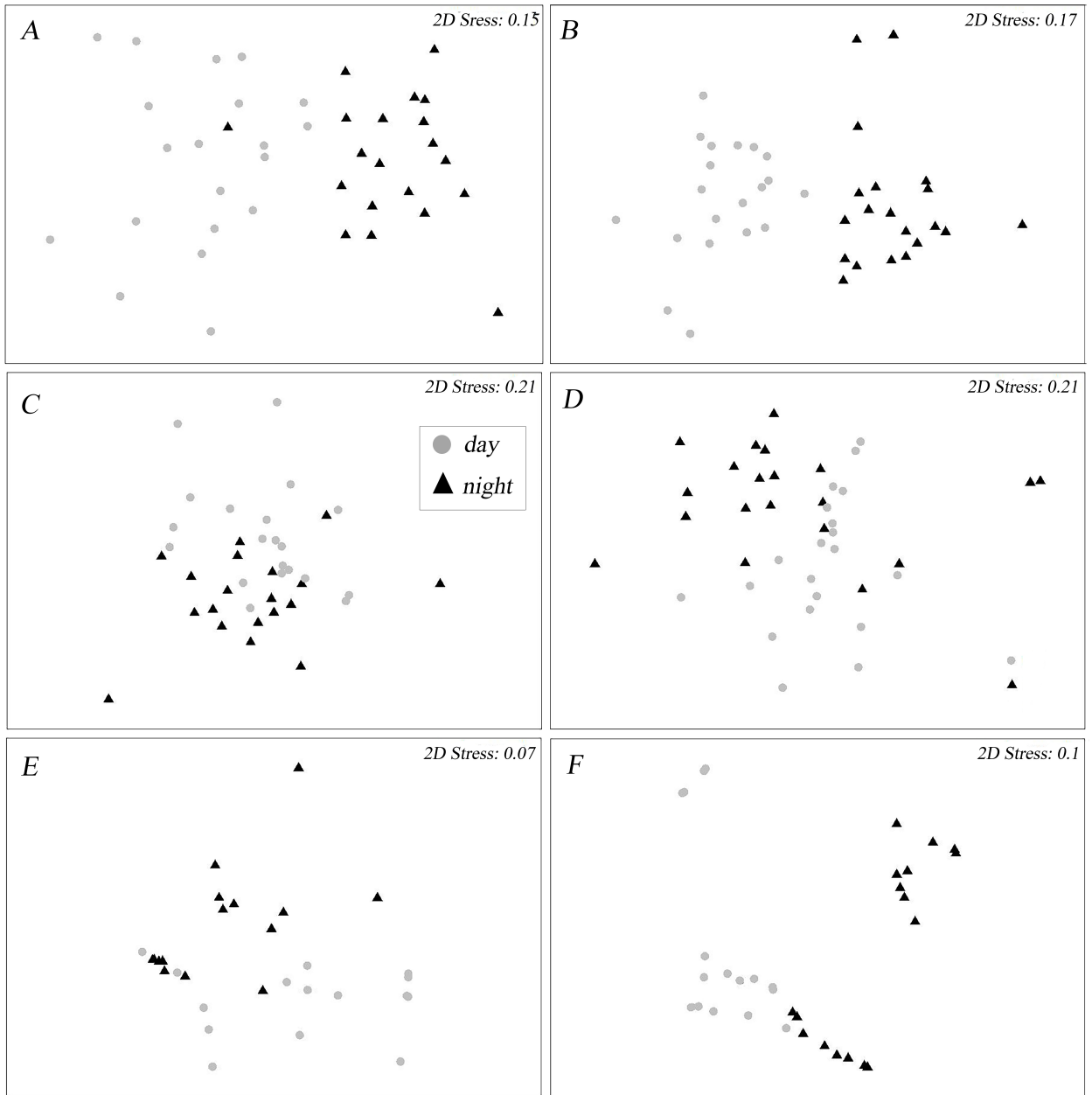
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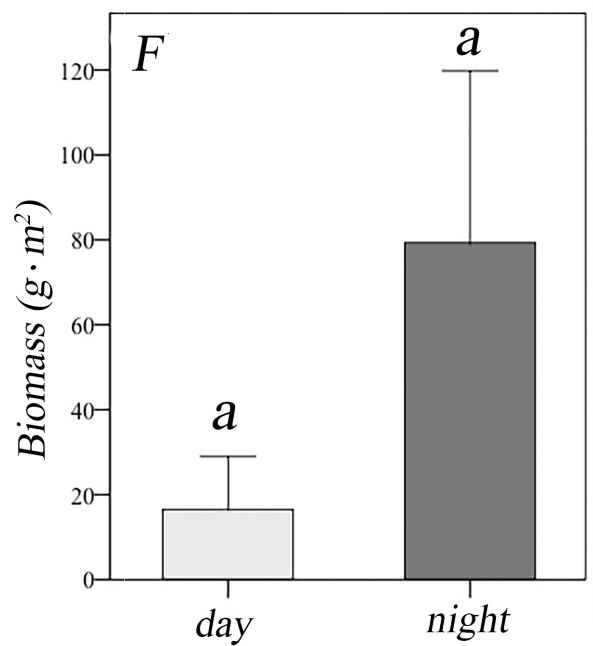
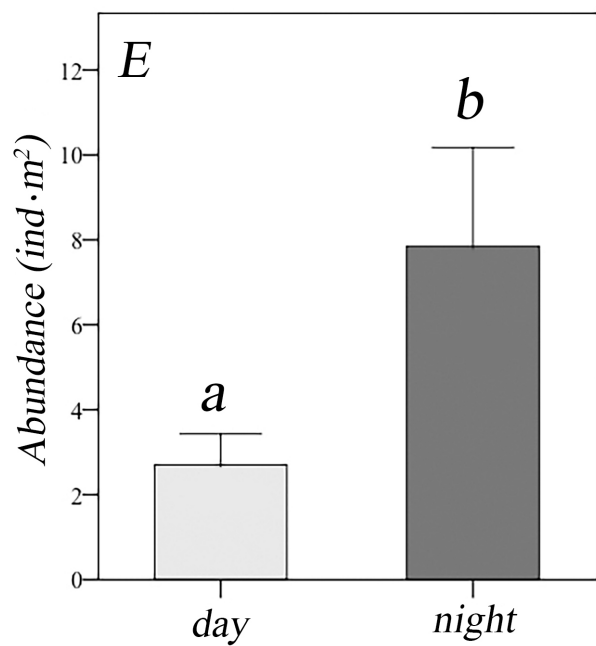
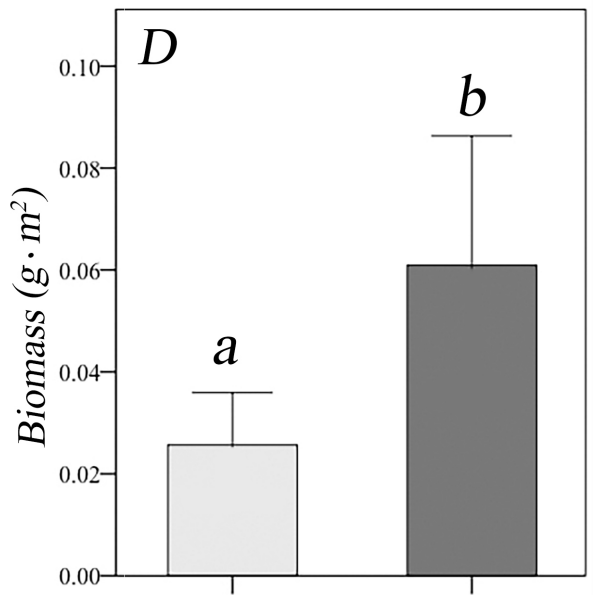
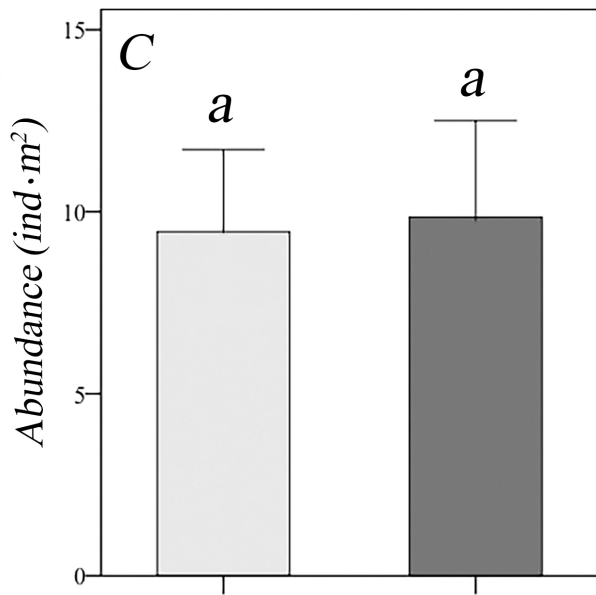
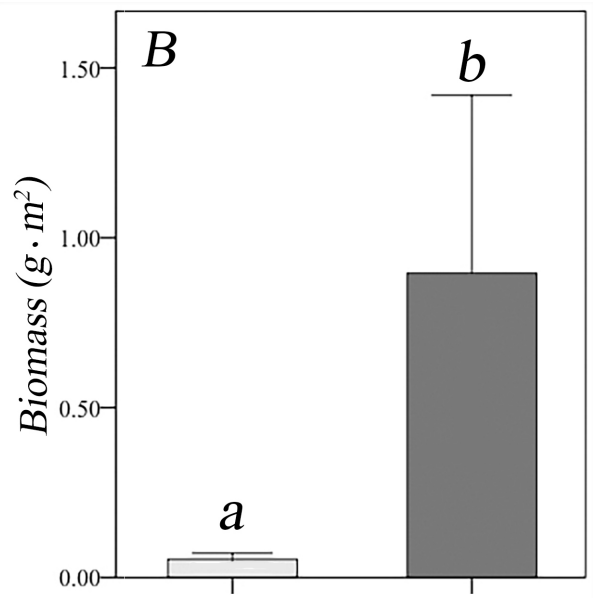
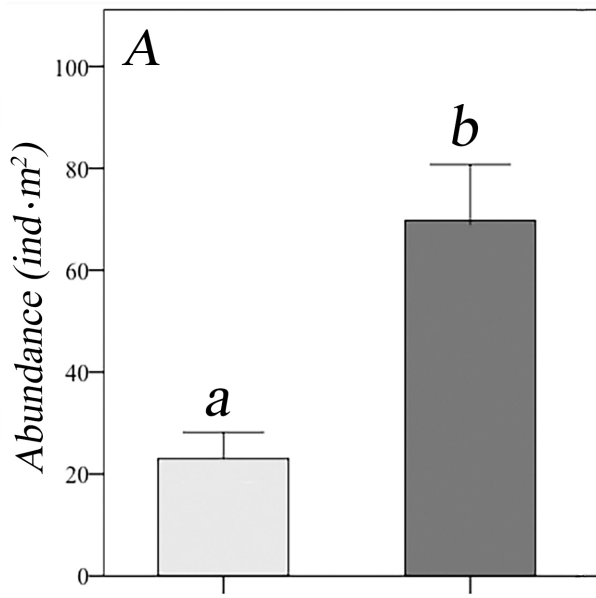
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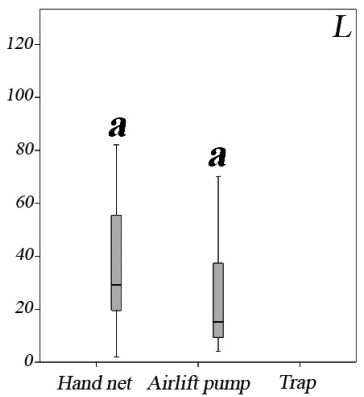
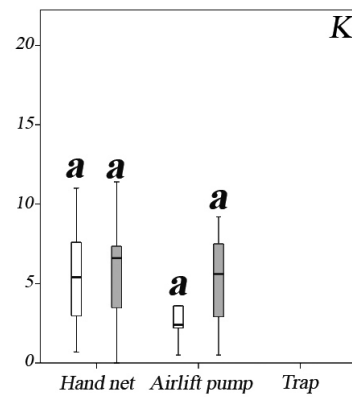
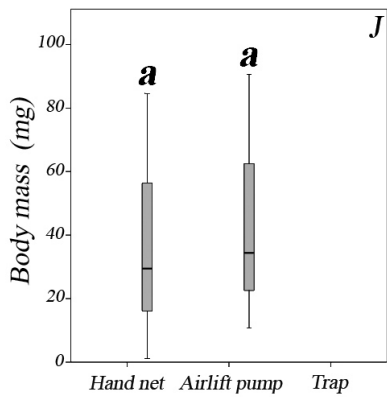
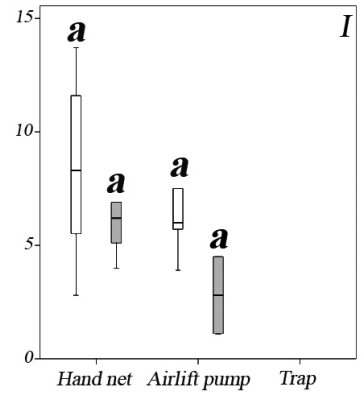
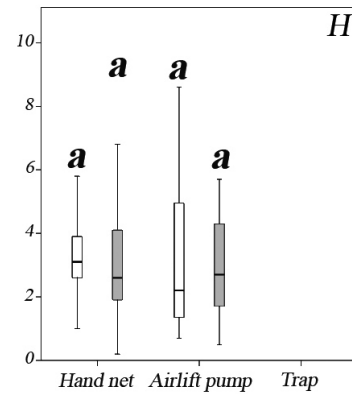
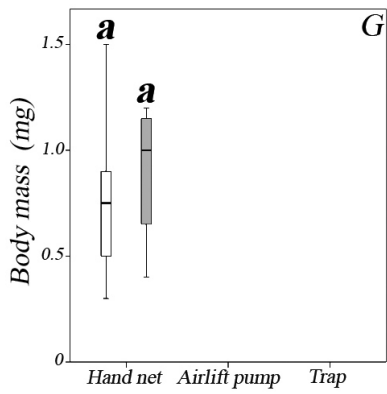
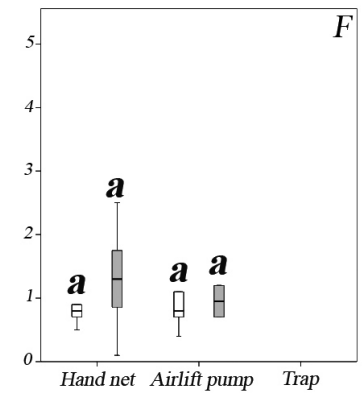
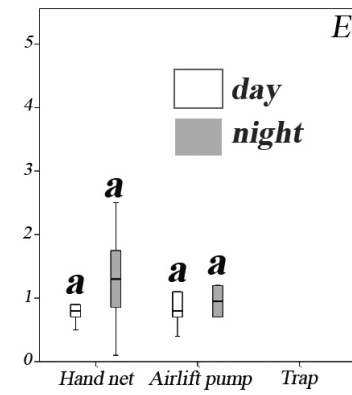
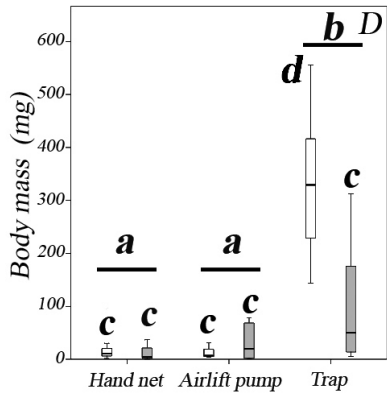
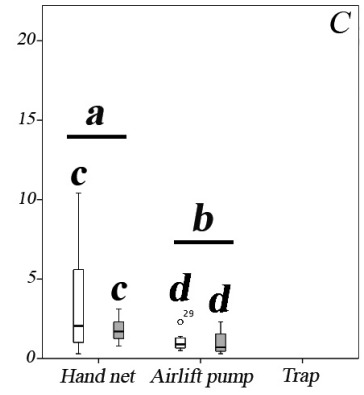
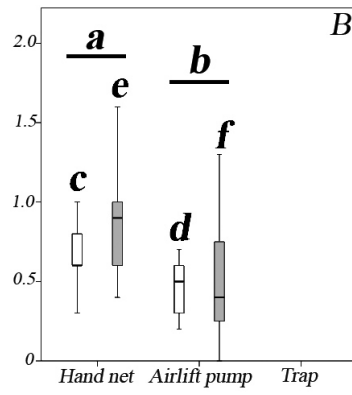
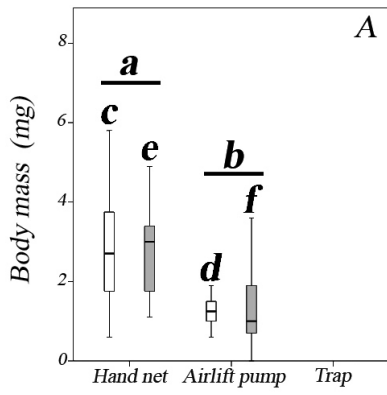


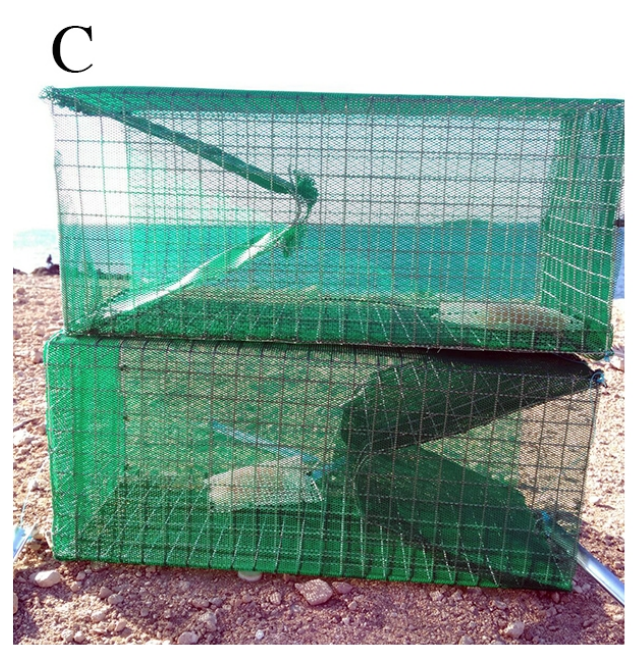
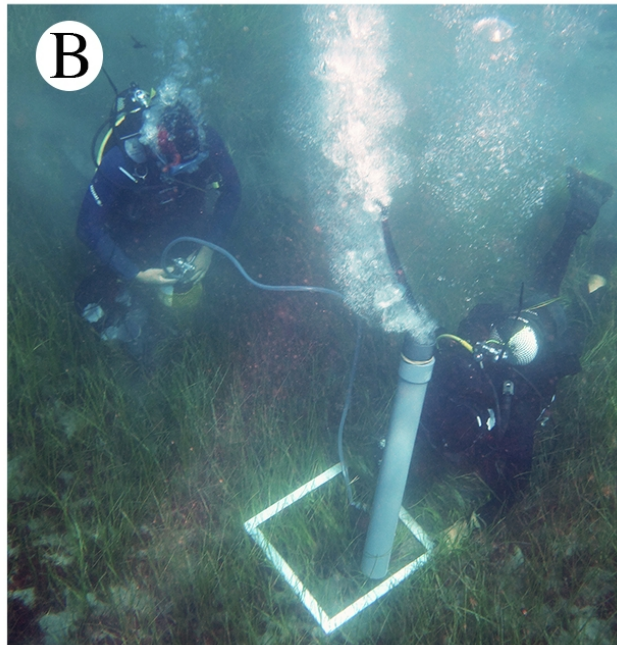
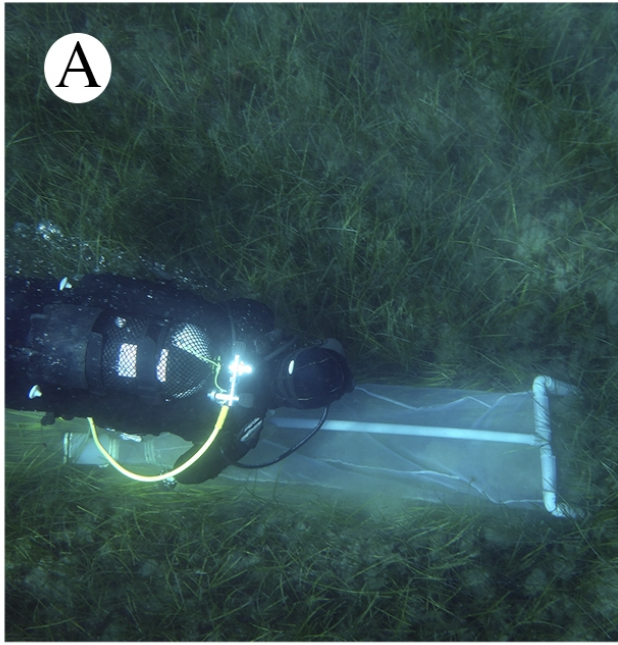














**Hand-net**Day & Night  
AD = 50.21

Species	Night	Day	C %
	Mean Abundance	Mean Abundance	
<i>Processa edulis</i>	1.35	0.00	17.18
<i>Hippolyte</i> sp1.	2.20	1.48	12.15
<i>Hippolyte garciaraso</i>	2.00	1.25	11.18
<i>Hippolyte leptocerus</i>	0.93	0.17	10.80
<i>Hippolyte varians</i>	0.99	0.51	7.99
<i>Athanas nitescens</i>	0.75	0.49	7.28
<i>Philocheras fasciatus</i>	0.63	0.24	7.06
<i>Hippolyte inermis</i>	0.41	0.20	5.15
<i>Hippolyte</i> sp2.	0.20	0.32	4.95
<i>Macropodia rostrata</i>	0.39	0.00	4.88
<i>Latreutes fucorum</i>	0.34	0.21	4.64

**Airlift pump**Day & Night  
AD = 51.53

Species	Night	Day	C %
	Mean Abundance	Mean Abundance	
<i>Athanas nitescens</i>	3.15	2.78	18.05
<i>Hippolyte</i> sp1.	2.29	2.49	15.90
<i>Hippolyte garciaraso</i>	2.61	2.95	15.46
<i>Processa edulis</i>	1.37	0.00	10.31
<i>Hippolyte leptocerus</i>	0.20	1.06	9.15
<i>Philocheras fasciatus</i>	0.91	0.54	8.24
<i>Hippolyte varians</i>	0.44	0.78	7.49
<i>Pagurus anachoretus</i>	0.60	0.30	5.58

**Traps**Day & Night  
AD: 58.24

Species	Night	Day	C %
	Mean Abundance	Mean Abundance	
<i>Portunus hastatus</i>	0.08	0.05	46.99
<i>Pagurus anachoretus</i>	0.02	0.04	33.41
<i>Cronius ruber</i>	0.02	0.00	19.60

Species	Hand net		Airlift pump		Trap		
	Day	Night	Day	Night	Day	Night	
Anomura, Paguridea							
<b>Paguridae</b>							
<i>Anapagurus breviaculeatus</i> Fenizia, 1937	-	0.025	-	-	-	-	
<i>Pagurus anachoretus</i> Risso, 1827	0.019	0.044	0.3	0.6	0.001	0.001	
Brachyura, Majoidea							
<b>Inachidae</b>							
<i>Macropodia rostrata</i> (Linnaeus, 1761)	-	0.263	0.1	0.3	-	-	
Brachyura, Portunoidea							
<b>Portunidae</b>							
<i>Cronius ruber</i> (Lamarck, 1818)	-	-	-	-	-	0.001	
<i>Portunus hastatus</i> (Linnaeus, 1767)	-	0.031	-	-	0.004	0.005	
Caridea, Alpheoidea							
<b>Alpheidae</b>							
<i>Athanas nitescens</i> (Leach, 1813)	0.188	0.444	5.3	6.8	-	-	
<b>Hippolytidae</b>							
<i>Eualus cranchii</i> (Leach, 1817)	-	0.019	-	-	-	-	
<i>Eualus pusiolus</i> (Krøyer, 1841)	-	0.006	-	-	-	-	
<i>Hippolyte garciarasoii</i> d'Udekem d'Acoz, 1996	0.881	2.144	5.1	4.6	-	-	
<i>Hippolyte inermis</i> Leach, 1816	0.050	0.213	-	-	-	-	
<i>Hippolyte leptocerus</i> (Heller, 1863)	0.063	0.675	1.3	0	-	-	
<i>Hippolyte varians</i> Leach, 1814	0.213	0.569	0.9	0.5	-	-	
<i>Hippolyte</i> sp1	1.181	2.644	4.6	3.3	-	-	
<i>Hippolyte</i> sp2	0.138	0.113		0.1			
<i>Latreutes fucorum</i> (Fabricius, 1798)	0.069	0.138	0.6	0.2	-	-	
Caridea, Crangonoidea							
<b>Crangonidae</b>							
<i>Philocheras fasciatus</i> (Risso, 1816)	0.075	0.331	0.6	1.3	-	-	
<i>Philocheras trispinosus</i> (Hailstone & Westwood, 1835)	-	0.006	-	-	-	-	
Caridea, Processoidea							
<b>Processidae</b>							
<i>Processa edulis</i> (Risso, 1816)	-	1.031	-	1.80	-	-	
<i>Processa modica</i> Williamson & Rochanaburanon, 1979	-	0.025	-	-	-	-	
Gebiidea, Upogebiidea							
<b>Upogebiidae</b>							
<i>Upogebia pusilla</i> (Petagna, 1792)	-	-	0.1	-	-	-	
	Number of species	10	18	10	11.0	2	3
	Total individuals m <sup>-2</sup>	2.875	8.718	18.9	19.7	0.005	0.007