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| Supplementary Table 1. Environmental and anthropogenic characteristics of the study sites. PAR = average annual value of photosynthetic active radiation; SST = average annual value of sea surface temperature; Chl*a* = average annual value of Chlorophyll a concentration; Pw = average annual wave power; HAPI = Human Activities and Pressures Index, according to Valdazo *et al*. (2017)\*. Geomorphological variables according to Ballesteros et al. (2007). | | | | | | | | | |
| Site | PAR  (E cm-2 s-1) | SST (⁰C) | Chl*a*  (mg m-3) | Pw  (Kw m-1) | Coastline  morphology | Substrate  constitution | Coastline  slope | Coastline  orientation | HAPI |
| PLC | 42.27 | 21.21 | 0.19 | 10.5 | Low coast | Basalt | Horizontal | Northwest | 1.93 |
| CON | 40.56 | 21.36 | 0.18 | 12.75 | Low coast | Basalt | Sub-vertical | Northwest | 3.24 |
| SAL | 41.75 | 21.09 | 0.21 | 4.5 | Low coast | Basalt | Horizontal | East | 4 |
| CLA | 41.74 | 21.09 | 0.21 | 4.5 | Low coast | Basalt | Sub-vertical | East | 4 |
| \*higher values mean more pressures. | | | | | | | | | |

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| Supplementary Table S2. Results of the two-sample Kolmogorov-Smirnov test (D) checking for differences in size-structure between sites and months. | | | | |
| Population 1 | | Population 2 | D | P-value |
| Month | | |  |  |
| May Playa Canaria | June Playa Canaria | | 0.286 | 0.963 |
| May Playa Canaria | July Playa Canaria | | 0.286 | 0.963 |
| May Playa Canaria | August Playa Canaria | | 0.286 | 0.963 |
| May Playa Canaria | September Playa Canaria | | 0.143 | 1 |
| May Playa Canaria | October Playa Canaria | | 0.286 | 0.963 |
| May Playa Canaria | November Playa Canaria | | 0.286 | 0.963 |
| May Playa Canaria | December Playa Canaria | | 0.428 | 0.541 |
| May Playa Canaria | February Playa Canaria | | 0.428 | 0.541 |
| May Playa Canaria | April Playa Canaria | | 0.286 | 0.963 |
| June Playa Canaria | July Playa Canaria | | 0.286 | 0.963 |
| June Playa Canaria | August Playa Canaria | | 0.286 | 0.963 |
| June Playa Canaria | September Playa Canaria | | 0.286 | 0.963 |
| June Playa Canaria | October Playa Canaria | | 0.428 | 0.575 |
| June Playa Canaria | November Playa Canaria | | 0.286 | 0.963 |
| June Playa Canaria | December Playa Canaria | | 0.286 | 0.937 |
| June Playa Canaria | February Playa Canaria | | 0.428 | 0.541 |
| June Playa Canaria | April Playa Canaria | | 0.286 | 0.963 |
| July Playa Canaria | August Playa Canaria | | 0.286 | 0.963 |
| July Playa Canaria | September Playa Canaria | | 0.286 | 0.963 |
| July Playa Canaria | October Playa Canaria | | 0.428 | 0.575 |
| July Playa Canaria | November Playa Canaria | | 0.428 | 0.575 |
| July Playa Canaria | December Playa Canaria | | 0.428 | 0.541 |
| July Playa Canaria | February Playa Canaria | | 0.571 | 0.203 |
| July Playa Canaria | April Playa Canaria | | 0.286 | 0.963 |
| August Playa Canaria | September Playa Canaria | | 0.286 | 0.963 |
| August Playa Canaria | October Playa Canaria | | 0.286 | 0.937 |
| August Playa Canaria | November Playa Canaria | | 0.143 | 1 |
| August Playa Canaria | December Playa Canaria | | 0.286 | 0.937 |
| August Playa Canaria | February Playa Canaria | | 0.286 | 0.937 |
| August Playa Canaria | April Playa Canaria | | 0.143 | 1 |
| September Playa Canaria | October Playa Canaria | | 0.285 | 0.963 |
| September Playa Canaria | November Playa Canaria | | 0.285 | 0.963 |
| September Playa Canaria | December Playa Canaria | | 0.428 | 0.541 |
| September Playa Canaria | February Playa Canaria | | 0.428 | 0.541 |
| September Playa Canaria | April Playa Canaria | | 0.285 | 0.963 |
| October Playa Canaria | November Playa Canaria | | 0.285 | 0.963 |
| October Playa Canaria | December Playa Canaria | | 0.143 | 1 |
| October Playa Canaria | February Playa Canaria | | 0.285 | 0.937 |
| October Playa Canaria | April Playa Canaria | | 0.286 | 0.937 |
| November Playa Canaria | December Playa Canaria | | 0.143 | 1 |
| November Playa Canaria | February Playa Canaria | | 0.286 | 0.937 |
| November Playa Canaria | April Playa Canaria | | 0.143 | 1 |
| December Playa Canaria | February Playa Canaria | | 0.143 | 1 |
| December Playa Canaria | April Playa Canaria | | 0.286 | 0.937 |
| February Playa Canaria | April Playa Canaria | | 0.286 | 0.937 |
| May Confital | June Confital | | 0.428 | 0.575 |
| May Confital | July Confital | | 0.286 | 0.963 |
| May Confital | August Confital | | 0.428 | 0.575 |
| May Confital | September Confital | | 0.571 | 0.212 |
| May Confital | October Confital | | 0.286 | 0.963 |
| May Confital | November Confital | | 0.286 | 0.963 |
| May Confital | December Confital | | 0.428 | 0.541 |
| May Confital | February Confital | | 0.286 | 0.963 |
| May Confital | April Confital | | 0.286 | 0.963 |
| June Confital | July Confital | | 0.286 | 0.963 |
| June Confital | August Confital | | 0.571 | 0.212 |
| June Confital | September Confital | | 0.571 | 0.212 |
| June Confital | October Confital | | 0.428 | 0.575 |
| June Confital | November Confital | | 0.571 | 0.212 |
| June Confital | December Confital | | 0.428 | 0.541 |
| June Confital | February Confital | | 0.428 | 0.575 |
| June Confital | April Confital | | 0.285 | 0.962 |
| July Confital | August Confital | | 0.428 | 0.575 |
| July Confital | September Confital | | 0.571 | 0.212 |
| July Confital | October Confital | | 0.428 | 0.575 |
| July Confital | November Confital | | 0.428 | 0.575 |
| July Confital | December Confital | | 0.428 | 0.575 |
| July Confital | February Confital | | 0.428 | 0.575 |
| July Confital | April Confital | | 0.286 | 0.963 |
| August Confital | September Confital | | 0.286 | 0.963 |
| August Confital | October Confital | | 0.286 | 0.963 |
| August Confital | November Confital | | 0.143 | 1 |
| August Confital | December Confital | | 0.428 | 0.541 |
| August Confital | February Confital | | 0.143 | 1 |
| August Confital | April Confital | | 0.428 | 0.575 |
| September Confital | October Confital | | 0.286 | 0.963 |
| September Confital | November Confital | | 0.286 | 0.963 |
| September Confital | December Confital | | 0.428 | 0.541 |
| September Confital | February Confital | | 0.286 | 0.963 |
| September Confital | April Confital | | 0.571 | 0.212 |
| October Confital | November Confital | | 0.286 | 0.963 |
| October Confital | December Confital | | 0.286 | 0.937 |
| October Confital | February Confital | | 0.143 | 1 |
| October Confital | April Confital | | 0.428 | 0.575 |
| November Confital | December Confital | | 0.428 | 0.541 |
| November Confital | February Confital | | 0.143 | 1 |
| November Confital | April Confital | | 0.428 | 0.575 |
| December Confital | February Confital | | 0.285 | 0.937 |
| December Confital | April Confital | | 0.428 | 0.541 |
| February Confital | April Confital | | 0.428 | 0.575 |
| May Salinetas | June Salinetas | | 0.143 | 1 |
| May Salinetas | July Salinetas | | 0.286 | 0.963 |
| May Salinetas | August Salinetas | | 0.286 | 0.937 |
| May Salinetas | September Salinetas | | 0.286 | 0.937 |
| May Salinetas | October Salinetas | | 0.143 | 1 |
| May Salinetas | November Salinetas | | 0.428 | 0.575 |
| May Salinetas | December Salinetas | | 0.428 | 0.575 |
| May Salinetas | February Salinetas | | 0.143 | 1 |
| May Salinetas | April Salinetas | | 0.286 | 0.963 |
| June Salinetas | July Salinetas | | 0.286 | 0.963 |
| June Salinetas | August Salinetas | | 0.428 | 0.575 |
| June Salinetas | September Salinetas | | 0.286 | 0.937 |
| June Salinetas | October Salinetas | | 0.286 | 0.963 |
| June Salinetas | November Salinetas | | 0.286 | 0.937 |
| June Salinetas | December Salinetas | | 0.286 | 0.963 |
| June Salinetas | February Salinetas | | 0.286 | 0.963 |
| June Salinetas | April Salinetas | | 0.285 | 0.963 |
| July Salinetas | August Salinetas | | 0.143 | 1 |
| July Salinetas | September Salinetas | | 0.286 | 0.937 |
| July Salinetas | October Salinetas | | 0.286 | 0.963 |
| July Salinetas | November Salinetas | | 0.286 | 0.963 |
| July Salinetas | December Salinetas | | 0.428 | 0.575 |
| July Salinetas | February Salinetas | | 0.143 | 1 |
| July Salinetas | April Salinetas | | 0.286 | 0.963 |
| August Salinetas | September Salinetas | | 0.428 | 0.541 |
| August Salinetas | October Salinetas | | 0.143 | 1 |
| August Salinetas | November Salinetas | | 0.428 | 0.575 |
| August Salinetas | December Salinetas | | 0.428 | 0.575 |
| August Salinetas | February Salinetas | | 0.143 | 1 |
| August Salinetas | April Salinetas | | 0.286 | 0.963 |
| September Salinetas | October Salinetas | | 0.286 | 0.937 |
| September Salinetas | November Salinetas | | 0.286 | 0.937 |
| September Salinetas | December Salinetas | | 0.286 | 0.937 |
| September Salinetas | February Salinetas | | 0.286 | 0.937 |
| September Salinetas | April Salinetas | | 0.286 | 0.937 |
| October Salinetas | November Salinetas | | 0.286 | 0.963 |
| October Salinetas | December Salinetas | | 0.428 | 0.575 |
| October Salinetas | February Salinetas | | 0.143 | 1 |
| October Salinetas | April Salinetas | | 0.286 | 0.963 |
| November Salinetas | December Salinetas | | 0.286 | 0.963 |
| November Salinetas | February Salinetas | | 0.286 | 0.963 |
| November Salinetas | April Salinetas | | 0.286 | 0.963 |
| December Salinetas | February Salinetas | | 0.428 | 0.575 |
| December Salinetas | April Salinetas | | 0.428 | 0.575 |
| February Salinetas | April Salinetas | | 0.286 | 0.963 |
| May Salinetas | June Salinetas | | 0.286 | 0.963 |
| May Salinetas | July Salinetas | | 0.286 | 0.963 |
| May Salinetas | August Salinetas | | 0.286 | 0.963 |
| May Salinetas | September Salinetas | | 0.428 | 0.575 |
| May Salinetas | October Salinetas | | 0.286 | 0.963 |
| May Salinetas | November Salinetas | | 0.571 | 0.212 |
| May Salinetas | December Salinetas | | 0.143 | 1 |
| May Salinetas | February Salinetas | | 0.143 | 1 |
| May Salinetas | April Salinetas | | 0.286 | 0.937 |
| June Salinetas | July Salinetas | | 0.1423 | 1 |
| June Salinetas | August Salinetas | | 0.143 | 1 |
| June Salinetas | September Salinetas | | 0.428 | 0.575 |
| June Salinetas | October Salinetas | | 0.286 | 0.963 |
| June Salinetas | November Salinetas | | 0.428 | 0.575 |
| June Salinetas | December Salinetas | | 0.428 | 0.541 |
| June Salinetas | February Salinetas | | 0.286 | 0.963 |
| June Salinetas | April Salinetas | | 0.428 | 0.575 |
| July Salinetas | August Salinetas | | 0.286 | 0.963 |
| July Salinetas | September Salinetas | | 0.428 | 0.575 |
| July Salinetas | October Salinetas | | 0.286 | 0.963 |
| July Salinetas | November Salinetas | | 0.428 | 0.575 |
| July Salinetas | December Salinetas | | 0.428 | 0.541 |
| July Salinetas | February Salinetas | | 0.286 | 0.963 |
| July Salinetas | April Salinetas | | 0.428 | 0.575 |
| August Salinetas | September Salinetas | | 0.428 | 0.575 |
| August Salinetas | October Salinetas | | 0.286 | 0.963 |
| August Salinetas | November Salinetas | | 0.571 | 0.212 |
| August Salinetas | December Salinetas | | 0.428 | 0.541 |
| August Salinetas | February Salinetas | | 0.286 | 0.963 |
| August Salinetas | April Salinetas | | 0.286 | 0.963 |
| September Salinetas | October Salinetas | | 0.286 | 0.963 |
| September Salinetas | November Salinetas | | 0.286 | 0.963 |
| September Salinetas | December Salinetas | | 0.286 | 0.937 |
| September Salinetas | February Salinetas | | 0.286 | 0.963 |
| September Salinetas | April Salinetas | | 0.286 | 0.963 |
| October Salinetas | November Salinetas | | 0.428 | 0.575 |
| October Salinetas | December Salinetas | | 0.286 | 0.937 |
| October Salinetas | February Salinetas | | 0.286 | 0.963 |
| October Salinetas | April Salinetas | | 0.286 | 0.963 |
| November Salinetas | December Salinetas | | 0.428 | 0.541 |
| November Salinetas | February Salinetas | | 0.428 | 0.575 |
| November Salinetas | April Salinetas | | 0.428 | 0.575 |
| December Salinetas | February Salinetas | | 0.143 | 1 |
| December Salinetas | April Salinetas | | 0.143 | 1 |
| February Salinetas | April Salinetas | | 0.143 | 1 |
| Sites | | |  |  |
| May Playa Canaria | | May Confital | 0.286 | 0.963 |
| May Playa Canaria | | May Salinetas | 0.428 | 0.575 |
| May Playa Canaria | | May Clavellinas | 0.143 | 1 |
| May Confital | | May Salinetas | 0.286 | 0.963 |
| May Confital | | May Clavellinas | 0.286 | 0.963 |
| May Salinetas | | May Clavellinas | 0.286 | 0.963 |
| June Playa Canaria | | June Confital | 0.428 | 0.575 |
| June Playa Canaria | | June Salinetas | 0.286 | 0.963 |
| June Playa Canaria | | June Clavellinas | 0.428 | 0.575 |
| June Confital | | June Salinetas | 0.285 | 0.963 |
| June Confital | | June Clavellinas | 0.428 | 0.575 |
| June Salinetas | | June Clavellinas | 0.428 | 0.575 |
| July Playa Canaria | | July Confital | 0.428 | 0.575 |
| July Playa Canaria | | July Salinetas | 0.143 | 1 |
| July Playa Canaria | | July Clavellinas | 0.286 | 0.963 |
| July Confital | | July Salinetas | 0.286 | 0.963 |
| July Confital | | July Clavellinas | 0.143 | 1 |
| July Salinetas | | July Clavellinas | 0.286 | 0.963 |
| August Playa Canaria | | August Confital | 0.286 | 0.963 |
| August Playa Canaria | | August Salinetas | 0.286 | 0.963 |
| August Playa Canaria | | August Clavellinas | 0.286 | 0.963 |
| August Confital | | August Salinetas | 0.428 | 0.575 |
| August Confital | | August Clavellinas | 0.286 | 0.963 |
| August Salinetas | | August Clavellinas | 0.143 | 1 |
| September Playa Canaria | | September Confital | 0.286 | 0.963 |
| September Playa Canaria | | September Salinetas | 0.428 | 0.541 |
| September Playa Canaria | | September Clavellinas | 0.428 | 0.575 |
| September Confital | | September Salinetas | 0.571 | 0.203 |
| September Confital | | September Clavellinas | 0.428 | 0.575 |
| September Salinetas | | September Clavellinas | 0.286 | 0.937 |
| October Playa Canaria | | October Confital | 0.286 | 0.963 |
| October Playa Canaria | | October Salinetas | 0.428 | 0.575 |
| October Playa Canaria | | October Clavellinas | 0.286 | 0.963 |
| October Confital | | October Salinetas | 0.428 | 0.575 |
| October Confital | | October Clavellinas | 0.143 | 1 |
| October Salinetas | | October Clavellinas | 0.428 | 0.575 |
| November Playa Canaria | | November Confital | 0.286 | 0.963 |
| November Playa Canaria | | November Salinetas | 0.428 | 0.575 |
| November Playa Canaria | | November Clavellinas | 0.428 | 0.575 |
| November Confital | | November Salinetas | 0.428 | 0.575 |
| November Confital | | November Clavellinas | 0.571 | 0.212 |
| November Salinetas | | November Clavellinas | 0.143 | 1 |
| December Playa Canaria | | December Confital | 0.143 | 1 |
| December Playa Canaria | | December Salinetas | 0.571 | 0.203 |
| December Playa Canaria | | December Clavellinas | 0.143 | 1 |
| December Confital | | December Salinetas | 0.428 | 0.541 |
| December Confital | | December Clavellinas | 0.143 | 1 |
| December Salinetas | | December Clavellinas | 0.428 | 0.541 |
| February Playa Canaria | | February Confital | 0.428 | 0.541 |
| February Playa Canaria | | February Salinetas | 0.428 | 0.541 |
| February Playa Canaria | | February Clavellinas | 0.286 | 0.937 |
| February Confital | | February Salinetas | 0.286 | 0.963 |
| February Confital | | February Clavellinas | 0.286 | 0.963 |
| February Salinetas | | February Clavellinas | 0.286 | 0.963 |
| April Playa Canaria | | April Confital | 0.286 | 0.963 |
| April Playa Canaria | | April Salinetas | 0.428 | 0.575 |
| April Playa Canaria | | April Clavellinas | 0.143 | 1 |
| April Confital | | April Salinetas | 0.286 | 0.963 |
| April Confital | | April Clavellinas | 0.428 | 0.575 |
| April Salinetas | | April Clavellinas | 0.428 | 0.575 |

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| Supplementary Table 3. Optimal GAM models explaining annual variation in the frond density of *C. abies-marina*. | | | | | |
| Models and terms | | Estimate df | t value | F value | P |
| Total density (D3) | | | | | |
|  | Intercept | 2.254 | 99.69 |  | <2x10-16 \*\*\* |
|  | Pw | - | - | - | - |
|  | s(PAR) | 4.345 |  | 2.083 | 0.0007 \*\*\* |
|  | s(SST) | - |  | - | - |
| Non-fertile density (NFD5) | | | | | |
|  | Intercept | 2.14 | 84.72 |  | <2x10-16 \*\*\* |
|  | Pw | - | - | - | - |
|  | s(PAR) | 4.953 |  | 2.87 | 5.5x10-5\*\*\* |
|  | s(SST) | - |  | - | - |
| Fertile density (FD7) | | | | | |
|  | Intercept | 1.36 | 28.18 |  | <2x10-16 \*\*\* |
|  | Pw | -0.059 | -10.45 |  | <2x10-16 \*\*\* |
|  | s(PAR) | 8.125 |  | 4.893 | 7.10x10-7 \*\*\* |
|  | s(SST) | 8.571 |  | 5.567 | 7.78x10-8 \*\*\* |
| \*P<0.05; \*\*P < 0.01; \*\*\*P < 0.001 | | | | | |

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| Supplementary Table 4. Optimal GAM models explaining annual variation in the frond biomass of *C. abies-marina*. | | | | | |
| Model term | | Estimate df | t value | F value | P |
| Total biomass (B7) | | | | | |
|  | Intercept | -0.429 | -5.899 |  | 1.3x10-7 \*\*\* |
|  | Pw | -0.062 | -7.305 |  | 4.8x10-12 \*\*\* |
|  | s(PAR) | 6.126 |  | 4.213 | 4x10-7 \*\*\* |
|  | s(SST) | 8.302 | - | 5.316 | 2.7x10-8 \*\*\* |
| Non-fertile biomass (NFB4) | | | | | |
|  | Intercept | -1.90 | -51.81 |  | <2x10-16 \*\*\* |
|  | Pw | - | - | - | - |
|  | s(PAR) | 7.427 |  | 2.741 | 0.0004 \*\*\* |
|  | s(SST) | 7.568 |  | 2.144 | 0.004 \*\* |
| Fertile biomass (FB7) | | | | | |
|  | Intercept | 0.669 | 22.164 |  | <2x10-16 \*\*\* |
|  | Pw | -0.026 | -7.341 |  | 3.9x10-12 \*\*\* |
|  | s(PAR) | 6.891 |  | 3.811 | 6.9x10-6 \*\*\* |
|  | s(SST) | 8.509 |  | 5.027 | 1.8x10-7 \*\*\* |
| \*P<0.05; \*\*P < 0.01; \*\*\*P < 0.001 | | | | | |

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| Supplementary Table 5. Optimal GAM models explaining annual variation in the length of *C. abies-marina*. | | | | | |
| Models and terms | | Estimate df | T value | F value | P |
| Adult length (LA11) | | | | | |
|  | Intercept | 0.115 | 22.56 |  | <2x10-16 \*\*\* |
|  | Pw | 0.004 | 6.691 |  | 1.7x10-10 \*\*\* |
|  | s(PAR) | 8.195 |  | 2.050 | 0.0065 \*\* |
|  | s(SST) | 4.687 |  | 1.382 | 0.0103 \* |
| Fertile length (LF10) | | | | | |
|  | Intercept | 17.87 | 22.844 |  | <2x10-16 \*\*\* |
|  | Pw | -0.675 | -7.446 |  | 2.1x10-12 \*\*\* |
|  | s(PAR) | 6.523 |  | 2.634 | 0.0003 \*\*\* |
|  | s(SST) | 7.784 |  | 2.979 | 0.00015 \*\*\* |
| \*P<0.05; \*\*P < 0.01; \*\*\*P < 0.001 | | | | | |

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| Supplementary Table 6. Annual production of *C. abies-marina* fronds. t: time (days), B1 and B2 are the biomasses (g dwt m–2) at the start and the end of each period, P: production (g dwt m–2), r (daily biomass turnover ratio). | | | | | | |
| Site | Period | t | B2 | B1 | P | r |
| PLC | May 14 – Jun 14 | 30 | 6185 | 3033.3 | . | 0.024 |
| Jun 14 - Jul 14 | 30 | 5111.7 | 6185.0 | - |  |
| Jul14 - Aug 14 | 30 | 4460 | 5111.67 | - |  |
| Aug14 –Sep 14 | 30 | 3908.3 | 4460.0 | - |  |
| Sep 14 - Oct 14 | 30 | 2811.6 | 3908.33 | - |  |
| Oct 14 – Nov 14 | 30 | 1680.0 | 2811.67 | - |  |
| Nov 14 – Dec 14 | 30 | 1350.0 | 1680.0 | - |  |
| Dec 14 – Feb 15 | 60 | 1653.3 | 1350.0 | 303.3 | 0.003 |
| Feb 15 – Apr 15 | 60 | 2880.0 | 1653.3 | 1226.6 | 0.009 |
|  | Annual production |  |  |  | 4681.7 |  |
| CON | May 14 – Jun 14 | 30 | 7936.7 | 6295.0 | 1641.7 | 0.008 |
| Jun 14 - Jul 14 | 30 | 8265.0 | 7936.7 | 328.3 | 0.001 |
| Jul14 - Aug 14 | 30 | 6361.6 | 8265.0 | - |  |
| Aug14 –Sep 14 | 30 | 2260.0 | 6361.6 | - |  |
| Sep 14 - Oct 14 | 30 | 3838.3 | 2260.0 | 1578.3 | 0.017 |
| Oct 14 – Nov 14 | 30 | 2471.7 | 3838.3 | - |  |
| Nov 14 – Dec 14 | 30 | 1206.7 | 2471.7 | - |  |
| Dec 14 – Feb 15 | 60 | 1578.8 | 1206.7 | 372.1 | 0.004 |
| Feb 15 – Apr 15 | 60 | 3485.0 | 1578.8 | 1906.3 | 0.013 |
| Annual production |  |  |  | 5823.7 |  |
| SAL | May 14 – Jun 14 | 30 | 9063.33 | 7536.67 | 1526.66 | 0.006 |
| Jun 14 - Jul 14 | 30 | 7926.67 | 9063.33 | - |  |
| Jul14 - Aug 14 | 30 | 5398.33 | 7926.67 | - |  |
| Aug14 –Sep 14 | 30 | 7156.67 | 5398.33 | 1758.34 | 0.009 |
| Sep 14 - Oct 14 | 30 | 5483.33 | 7156.67 | - |  |
| Oct 14 – Nov 14 | 30 | 7968.33 | 5483.33 | 2485.00 | 0.012 |
| Nov 14 – Dec 14 | 30 | 4475.00 | 7968.33 | - |  |
| Dec 14 – Feb 15 | 60 | 4515 | 4475.00 | 40 | 0.0001 |
|  | Feb 15 – Apr 15 | 60 | 5248.33 | 4515.00 | 733.33 | 0.002 |
|  | Annual production |  |  |  | 6543.33 |  |
| CLA | May 14 – Jun 14 | 30 | 6228.33 | 2565.00 | 3663.33 | 0.029 |
| Jun 14 - Jul 14 | 30 | 5713.33 | 6288.33 | - |  |
| Jul14 - Aug 14 | 30 | 4348.33 | 5713.33 | - |  |
| Aug14 –Sep 14 | 30 | 5010.00 | 4348.33 | 661.67 | 0.005 |
| Sep 14 - Oct 14 | 30 | 4620.00 | 5010.00 | - |  |
| Oct 14 – Nov 14 | 30 | 4610.00 | 4620.00 | - |  |
| Nov 14 – Dec 14 | 30 | 2236.67 | 4610.00 | - |  |
| Dec 14 – Feb 15 | 60 | 2275.00 | 2236.67 | 38.4 | 0.0003 |
|  | Feb 15 – Apr 15 | 60 | 2386.67 | 2275.00 | 111.67 | 0.0008 |
| Annual production (g dwt m–2)  Mean annual frond production (g dwt m–2) | | | | | 4475.07  5380.95 |  |



Supplementary Figure 1. Temporal changes in environmental predictors. **(A)** photosynthetically active radiation (PAR, Einstein s-1 cm-2); **(B)** sea surface temperature (SST, ⁰C); **(C)** wave power (Pw, Kw m-1); **(D)** Chlorophyll a (Chl *a*, mg m-3).

![Imagen que contiene objeto

Descripción generada automáticamente]()

Supplementary Figure 2. Temporal variations in the frond length of *Cystoseira abies-marina* for each site.