

## Appendix A

**Table 4** Post-hoc pairwise comparisons using Tukey's honestly significant difference (HSD) test for the average summer (June-September) daily temperatures between 2010-2023 in Cap de Creus and Montgrí. A 95% Confidence Interval (CI) is used. Pairs of years showing significant differences are indicated with a (\*)

| Cap de Creus |          |           |          |         |
|--------------|----------|-----------|----------|---------|
| Years        | Lower CI | Mean Diff | Upper CI | p value |
| 2010 - 2011* | -0.686   | -0.481    | -0.276   | < 0.001 |
| 2010 - 2012  | -0.365   | -0.160    | 0.045    | 0.320   |
| 2010 - 2013* | 1.789    | 2.067     | 2.344    | < 0.001 |
| 2010 - 2015* | -0.939   | -0.734    | -0.529   | < 0.001 |
| 2010 - 2016* | -0.694   | -0.489    | -0.284   | < 0.001 |
| 2010 - 2017* | -0.679   | -0.474    | -0.269   | < 0.001 |
| 2010 - 2018* | 0.307    | 0.512     | 0.712    | < 0.001 |
| 2010 - 2019* | -0.670   | -0.465    | -0.260   | < 0.001 |
| 2010 - 2020* | -0.424   | -0.219    | -0.014   | 0.024   |
| 2010 - 2021* | -0.704   | -0.499    | -0.294   | < 0.001 |
| 2010 - 2022* | -0.674   | -0.468    | -0.263   | < 0.001 |
| 2010 - 2023* | -1.192   | -0.985    | -0.777   | < 0.001 |
| 2011 - 2012* | 0.116    | 0.321     | 0.526    | < 0.001 |
| 2011 - 2013* | 2.270    | 2.547     | 2.825    | < 0.001 |
| 2011 - 2015* | -0.458   | -0.253    | -0.048   | 0.003   |
| 2011 - 2016  | -0.214   | -0.008    | 0.197    | 1.000   |
| 2011 - 2017  | -0.198   | 0.007     | 0.212    | 1.000   |
| 2011 - 2018* | 0.788    | 0.993     | 1.198    | < 0.001 |
| 2011 - 2019  | -0.189   | 0.016     | 0.221    | 1.000   |
| 2011 - 2020* | 0.057    | 0.262     | 0.467    | 0.002   |
| 2012 - 2013* | 1.949    | 2.226     | 2.504    | < 0.001 |
| 2012 - 2015* | -0.779   | -0.574    | -0.369   | < 0.001 |
| 2012 - 2016* | -0.534   | -0.329    | -0.124   | < 0.001 |
| 2012 - 2017* | -0.519   | -0.314    | -0.109   | < 0.001 |
| 2012 - 2018* | 0.467    | 0.672     | 0.877    | < 0.001 |
| 2012 - 2019* | -0.510   | -0.305    | -0.100   | < 0.001 |
| 2012 - 2020  | -0.264   | -0.059    | 0.146    | 0.999   |
| 2012 - 2021* | -0.545   | -0.340    | -0.135   | < 0.001 |
| 2012 - 2022* | -0.514   | -0.308    | -0.103   | < 0.001 |
| 2012 - 2023* | -1.032   | -0.825    | -0.617   | < 0.001 |
| 2013 - 2015* | -3.078   | -2.801    | -2.523   | < 0.001 |
| 2013 - 2016* | -2.833   | -2.556    | -2.278   | < 0.001 |
| 2013 - 2017* | -2.818   | -2.541    | -2.263   | < 0.001 |
| 2013 - 2018* | -1.832   | -1.555    | -1.277   | < 0.001 |
| 2013 - 2019* | -2.809   | -2.531    | -2.254   | < 0.001 |
| 2013 - 2020* | -2.563   | -2.285    | -2.008   | < 0.001 |
| 2013 - 2021* | -2.813   | -2.566    | -2.288   | < 0.001 |
| 2013 - 2022* | -2.813   | -2.535    | -2.257   | < 0.001 |
| 2013 - 2023* | -3.331   | -3.051    | -2.772   | < 0.001 |
| 2015 - 2016* | 0.040    | 0.245     | 0.450    | 0.005   |
| 2015 - 2017* | 0.055    | 0.260     | 0.465    | 0.002   |
| 2015 - 2018* | 1.041    | 1.246     | 1.451    | < 0.001 |
| 2015 - 2019* | 0.064    | 0.269     | 0.474    | 0.001   |
| 2015 - 2020* | 0.310    | 0.515     | 0.720    | < 0.001 |
| 2015 - 2021* | 0.030    | 0.235     | 0.440    | 0.010   |
| 2015 - 2022* | 0.060    | 0.266     | 0.471    | 0.001   |
| 2015 - 2023* | -0.458   | -0.251    | -0.043   | 0.004   |
| 2016 - 2017  | -0.190   | 0.015     | 0.220    | 1.000   |
| 2016 - 2018* | 0.796    | 1.001     | 1.206    | < 0.001 |
| 2016 - 2019  | -0.181   | 0.024     | 0.229    | 1.000   |
| 2016 - 2020* | -0.065   | 0.271     | 0.476    | 0.001   |

|              |        |        |        |         |
|--------------|--------|--------|--------|---------|
| 2016 – 2021  | -0.215 | -0.010 | 0.195  | 1.000   |
| 2016 – 2022  | -0.185 | 0.021  | 0.227  | 1.000   |
| 2016 – 2023* | -0.703 | -0.495 | -0.288 | < 0.001 |
| 2017 – 2018* | 0.781  | 0.986  | 1.191  | < 0.001 |
| 2017 – 2019  | -0.196 | 0.009  | 0.214  | 1.000   |
| 2017 – 2020* | 0.050  | 0.255  | 0.460  | 0.003   |
| 2017 – 2021  | -0.230 | -0.025 | 0.180  | 1.000   |
| 2017 – 2022  | -0.200 | 0.006  | 0.211  | 1.000   |
| 2017 – 2023* | -1.704 | -0.511 | -0.303 | < 0.001 |
| 2018 – 2019* | -1.182 | -0.977 | -0.772 | < 0.001 |
| 2018 – 2020* | -0.936 | -0.731 | 0.526  | < 0.001 |
| 2019 – 2020* | 0.041  | 0.246  | 0.451  | 0.005   |
| 2019 – 2021  | -0.240 | -0.035 | 0.170  | 1.000   |
| 2019 – 2022  | -0.209 | -0.003 | 0.202  | 1.000   |
| 2019 – 2023* | -0.727 | -0.520 | -0.312 | < 0.001 |
| 2020 – 2021* | -0.486 | -0.281 | -0.076 | < 0.001 |
| 2020 – 2022* | -0.455 | -0.250 | -0.044 | 0.004   |
| 2021 – 2022  | -0.174 | 0.031  | 0.237  | 1.000   |
| 2021 – 2023* | -0.693 | -0.485 | -0.278 | < 0.001 |
| 2022 – 2023* | -0.725 | -0.516 | -0.308 | < 0.001 |

| Montgrí      |          |           |          |         |
|--------------|----------|-----------|----------|---------|
| Years        | Lower CI | Mean Diff | Upper CI | p value |
| 2010 – 2012* | -0.530   | 0.326     | -0.121   | < 0.001 |
| 2010 – 2013* | 0.126    | 0.321     | 0.517    | < 0.001 |
| 2010 – 2014* | -0.865   | -0.670    | -0.474   | < 0.001 |
| 2010 – 2015* | 1.231    | 1.519     | 1.806    | < 0.001 |
| 2010 – 2016* | -1.148   | -0.953    | -0.757   | < 0.001 |
| 2010 – 2017* | -1.347   | -1.151    | -0.956   | < 0.001 |
| 2010 – 2018* | -0.811   | -0.616    | -0.421   | < 0.001 |
| 2010 – 2019* | -1.089   | -0.894    | -0.698   | < 0.001 |
| 2010 – 2020* | -1.158   | -0.963    | -0.767   | < 0.001 |
| 2010 – 2021* | -1.027   | -0.832    | -0.637   | < 0.001 |
| 2010 – 2022* | -1.732   | -1.534    | -1.341   | < 0.001 |
| 2010 – 2023* | 2.412    | 2.992     | 3.572    | < 0.001 |
| 2012 – 2013* | 0.443    | 0.647     | 0.851    | < 0.001 |
| 2012 – 2014* | -0.548   | -0.344    | -0.140   | < 0.001 |
| 2012 – 2015* | 1.551    | 1.844     | 2.138    | < 0.001 |
| 2012 – 2016* | -0.831   | -0.627    | -0.423   | < 0.001 |
| 2012 – 2017* | -1.030   | -0.826    | -0.621   | < 0.001 |
| 2012 – 2018* | -0.495   | -0.290    | -0.086   | < 0.001 |
| 2012 – 2019* | -0.772   | -0.568    | -0.364   | < 0.001 |
| 2012 – 2020* | -0.841   | -0.637    | -0.433   | < 0.001 |
| 2012 – 2021* | -0.710   | -0.506    | -0.302   | < 0.001 |
| 2012 – 2022* | -1.415   | -1.211    | -1.007   | < 0.001 |
| 2012 – 2023* | 2.735    | 3.318     | 3.901    | < 0.001 |
| 2013 – 2014* | -1.186   | -0.991    | -0.796   | < 0.001 |
| 2013 – 2015* | 0.910    | 1.197     | 1.485    | < 0.001 |
| 2013 – 2016* | -1.469   | -1.274    | -1.079   | < 0.001 |
| 2013 – 2017* | -1.668   | -1.473    | -1.277   | < 0.001 |
| 2013 – 2018* | -1.133   | -0.937    | -0.742   | < 0.001 |
| 2013 – 2019* | -1.410   | -1.215    | -1.020   | < 0.001 |
| 2013 – 2020* | -1.480   | -1.284    | -1.089   | < 0.001 |
| 2013 – 2021* | -1.345   | -1.153    | -0.958   | < 0.001 |
| 2013 – 2022* | -2.054   | -1.858    | -1.663   | < 0.001 |
| 2013 – 2023* | 2.091    | 2.671     | 3.251    | < 0.001 |
| 2014 – 2015* | 1.901    | 2.188     | 2.476    | < 0.001 |
| 2014 – 2016* | -0.478   | -0.283    | -0.088   | < 0.001 |
| 2014 – 2017* | -0.677   | -0.482    | -0.286   | < 0.001 |

|              |        |        |        |         |
|--------------|--------|--------|--------|---------|
| 2014 – 2018  | -0.142 | 0.054  | 0.249  | 1.000   |
| 2014 – 2019* | -0.419 | -0.224 | -0.029 | 0.009   |
| 2014 – 2020* | -0.489 | -0.293 | -0.098 | < 0.001 |
| 2014 – 2021  | -0.358 | -0.162 | 0.033  | 0.224   |
| 2014 – 2022* | -1.062 | -0.867 | -0.672 | < 0.001 |
| 2014 – 2023* | 3.082  | 3.662  | 4.242  | < 0.001 |
| 2015 – 2016* | -2.759 | -2.471 | -2.184 | < 0.001 |
| 2015 – 2017* | -2.957 | -2.670 | -2.382 | < 0.001 |
| 2015 – 2018* | -2.422 | -2.135 | -1.847 | < 0.001 |
| 2015 – 2019* | -2.700 | -2.412 | -2.125 | < 0.001 |
| 2015 – 2020* | -2.769 | -2.481 | -2.194 | < 0.001 |
| 2015 – 2021* | -2.638 | -2.350 | -2.063 | < 0.001 |
| 2015 – 2022* | -3.343 | -3.055 | -2.768 | < 0.001 |
| 2015 – 2023* | 0.856  | 1.474  | 2.091  | < 0.001 |
| 2016 – 2017* | -0.394 | -0.199 | -0.003 | 0.042   |
| 2016 – 2018* | 0.141  | 0.337  | 0.532  | < 0.001 |
| 2016 – 2019  | -0.136 | 0.059  | 0.254  | 1.000   |
| 2016 – 2020  | -0.206 | -0.010 | 0.185  | 1.000   |
| 2016 – 2021  | -0.075 | 0.121  | 0.316  | 0.702   |
| 2016 – 2022* | -0.779 | -0.584 | -0.389 | < 0.001 |
| 2016 – 2023* | 3.365  | 3.945  | 4.525  | < 0.001 |
| 2017 – 2018  | 0.340  | 0.535  | 0.731  | < 0.001 |
| 2017 – 2019* | 0.062  | 0.258  | 0.453  | < 0.001 |
| 2017 – 2020  | -0.007 | 0.188  | 0.384  | 0.071   |
| 2017 – 2021* | 0.124  | 0.319  | 0.515  | < 0.001 |
| 2017 – 2022* | -0.581 | -0.385 | -0.190 | < 0.001 |
| 2017 – 2023* | 3.563  | 4.143  | 4.723  | < 0.001 |
| 2018 – 2019* | -0.473 | -0.278 | 0.082  | < 0.001 |
| 2018 – 2020* | -0.542 | -0.347 | -0.151 | < 0.001 |
| 2018 – 2021* | -0.411 | -0.216 | -0.021 | 0.016   |
| 2018 – 2022* | -1.116 | -0.921 | -0.725 | < 0.001 |
| 2018 – 2023* | 3.028  | 3.608  | 4.188  | < 0.001 |
| 2019 – 2020  | -0.265 | -0.069 | 0.126  | 0.994   |
| 2019 – 2021  | -0.134 | 0.062  | 0.257  | 0.998   |
| 2019 – 2022* | -0.838 | -0.643 | -0.448 | < 0.001 |
| 2019 – 2023* | 3.306  | 3.886  | 4.466  | < 0.001 |
| 2020 – 2021  | -0.064 | 0.131  | 0.326  | 0.576   |
| 2020 – 2022* | -0.769 | -0.574 | -0.379 | < 0.001 |
| 2020 – 2023* | 3.375  | 3.955  | 4.535  | < 0.001 |
| 2021 – 2022* | -0.900 | -0.705 | -0.509 | < 0.001 |
| 2021 – 2023* | 3.244  | 3.824  | 4.404  | < 0.001 |
| 2022 – 2023* | 3.949  | 4.529  | 5.109  | < 0.001 |

## Appendix B

**Table 5** Results of Yuen's tests for trimmed means (20% trimming for year-round data and 5% trimming for summer data) and Mann-Whitney U tests comparing phosphate ( $\text{PO}_4^{2-}$ ), nitrate ( $\text{NO}_3^-$ ), nitrite ( $\text{NO}_2^-$ ) and ammonium ( $\text{NH}_4^+$ ) concentrations between Cap de Creus and Montgrí. A 95% Confidence Interval (CI) is used. Nutrients showing significant differences ( $p < 0.05$ ) are indicated with a (\*)

| <b><u>Year-round</u></b> |                      |                |                 |                  |                 |                    |                       |                |
|--------------------------|----------------------|----------------|-----------------|------------------|-----------------|--------------------|-----------------------|----------------|
| <b>Nutrient</b>          | <b>Yuen's t (df)</b> | <b>p value</b> | <b>Lower CI</b> | <b>Mean Diff</b> | <b>Upper CI</b> | <b>Effect size</b> | <b>Mann-Whitney U</b> | <b>p value</b> |
| $\text{PO}_4^{2-}$ *     | 7.95 (41.2)          | < 0.001        | -0.254          | -0.203           | -0.151          | 0.91               | 185.5                 | < 0.001        |
| $\text{NO}_3^-$ *        | 3.98 (48.3)          | < 0.001        | -1.208          | -0.803           | -0.397          | 0.60               | 464.0                 | < 0.001        |
| $\text{NO}_2^-$ *        | 2.05 (38.5)          | 0.047          | -0.111          | -0.056           | -0.001          | 0.31               | 698.0                 | 0.015          |
| $\text{NH}_4^+$ *        | 5.56 (50.1)          | < 0.001        | -1.207          | -0.887           | -0.566          | 0.69               | 310                   | < 0.001        |

| <b><u>Summer</u></b> |                      |                |                 |                  |                 |                    |                       |                |
|----------------------|----------------------|----------------|-----------------|------------------|-----------------|--------------------|-----------------------|----------------|
| <b>Nutrient</b>      | <b>Yuen's t (df)</b> | <b>p value</b> | <b>Lower CI</b> | <b>Mean Diff</b> | <b>Upper CI</b> | <b>Effect size</b> | <b>Mann-Whitney U</b> | <b>p value</b> |
| $\text{PO}_4^{2-}$ * | 3.03 (12.2)          | 0.010          | -0.518          | -0.302           | -0.085          | 0.76               | 243.0                 | < 0.001        |
| $\text{NO}_3^-$ *    | 3.25 (13.6)          | 0.006          | -0.760          | -0.457           | -0.155          | 0.76               | 14.0                  | < 0.001        |
| $\text{NO}_2^-$ *    | 3.30 (14.1)          | 0.005          | -0.141          | -0.086           | -0.030          | 0.76               | 19.0                  | < 0.001        |
| $\text{NH}_4^+$ *    | 2.33 (13.5)          | 0.036          | -1.022          | -0.548           | -0.040          | 0.55               | 37.0                  | 0.010          |

## Appendix C

**Table 6** Descriptive statistics of the colony size distributions found in the *Cladocora caespitosa* populations assessed in Cap de Creus (CC) and Montgrí (M), reporting the number of colonies (N), skewness ( $g_1$ ), sample kurtosis ( $g_2$ ), corresponding confidence intervals (CI $_{g_1}$  and CI  $g_2$ ) and standard errors based on bootstrap (SE $_{g_1}$  and SE $_{g_2}$ ). Skewness and kurtosis are considered significant if the absolute values for coefficient/BootSE are higher than 2 (Sig. (> 2))

| Site | Year | N  | $g_1$ | CI $_{g_1}$    | SE $_{g_1}$ | Sig. (>2) | $g_2$ | CI $_{g_2}$    | SE $_{g_2}$ | Sig. (>2) |
|------|------|----|-------|----------------|-------------|-----------|-------|----------------|-------------|-----------|
| CC   | 2010 | 30 | 1.632 | 0.977 – 2.882  | 0.596       | 2.738     | 5.968 | -0.432 – 8.232 | 2.134       | 2.797     |
| CC   | 2024 | 20 | 1.670 | 0.570 – 3.146  | 0.700       | 2.384     | 6.396 | 0.359 – 11.252 | 2.309       | 2.771     |
| M    | 2010 | 30 | 0.578 | -0.225 – 1.184 | 0.331       | 1.746     | 2.856 | -1.029 – 1.549 | 0.650       | 4.394     |
| M    | 2024 | 23 | 0.881 | 0.173 – 1.643  | 0.401       | 2.197     | 2.439 | -1.723 – 1.771 | 1.122       | 2.174     |