**Supplementary Material: “Morphometric analysis of the shell of the intertidal gastropod *Echinolittorina lineolata* (d’Orbigny, 1840) in different latitudes along the Brazilian coast”**

**Supplementary Table S1:** Results of the Tukey test to compare the post of means between sexes and latitudes. Bold numbers have significant values. Legend: M: male, F: female.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Shell length (SL)*** |  |  |  |  |
| *Sex (M: male. F: female)* | *diff* | *lwr* | *upr* | *p adj* |
| *M-F* | -0.3110485 | -0.4577868 | -0.1643102 | **3.58E-05** |
| *Latitude* | *diff* | *lwr* | *upr* | *p adj* |
| 14°S - 3°S | 15.342.186 | 12.786.341 | 178.980.311 | **0** |
| 21°S - 3°S | 28.363.369 | 25.773.826 | 309.529.125 | **0** |
| 23°S - 3°S | 11.801.807 | 0.9265578 | 143.380.367 | **0** |
| 21°S - 14°S | 13.021.183 | 10.412.425 | 156.299.408 | **0** |
| 23°S - 14°S | -0.3540379 | -0.6096224 | -0.09845341 | **0.0021835** |
| 23°S - 21°S | -16.561.562 | -19.151.105 | -139.720.186 | **0** |
| *Sex and Latitude (M: male, F: female)* | *diff* | *lwr* | *upr* | *p adj* |
| M:3°S - F:3°S | -0.3558985 | -0.7950607 | 0.08326367 | 0.2127713 |
| F:14°S - F:3°S | 14.970.065 | 11.310.350 | 186.297.793 | **0** |
| M:14°S - F:3°S | 12.635.792 | 0.7696867 | 175.747.169 | **0** |
| F:21°S - F:3°S | 28.147.166 | 24.345.196 | 319.491.368 | **0** |
| M:21°S - F:3°S | 25.187.894 | 20.562.125 | 298.136.630 | **0** |
| F:23°S - F:3°S | 10.887.619 | 0.7122742 | 146.524.962 | **0** |
| M:23°S - F:3°S | 0.9816425 | 0.5424803 | 142.080.465 | **0** |
| F:14°S - M:3°S | 18.529.050 | 14.227.241 | 228.308.580 | **0** |
| M:14°S - M:3°S | 16.194.777 | 10.762.924 | 216.266.297 | **0** |
| F:21°S - M:3°S | 31.706.152 | 27.282.689 | 361.296.142 | **0** |
| M:21°S - M:3°S | 28.746.879 | 23.598.114 | 338.956.442 | **0** |
| F:23°S - M:3°S | 14.446.604 | 10.054.982 | 188.382.261 | **0** |
| M:23°S - M:3°S | 13.375.410 | 0.8435938 | 183.148.820 | **0** |
| M:14°S - F:14°S | -0.2334273 | -0.7193511 | 0.25249652 | 0.827908 |
| F:21°S - F:14°S | 13.177.102 | 0.9479239 | 168.749.649 | **0** |
| M:21°S - F:14°S | 10.217.829 | 0.567724 | 147.584.187 | **0** |
| F:23°S - F:14°S | -0.4082446 | -0.774216 | -0.04227308 | **0.0167558** |
| M:23°S - F:14°S | -0.515364 | -0.9455448 | -0.08518316 | **0.007019** |
| F:21°S - M:14°S | 15.511.375 | 10.544.116 | 204.786.335 | **0** |
| M:21°S - M:14°S | 12.552.102 | 0.6929254 | 181.749.502 | **0** |
| F:23°S - M:14°S | -0.1748173 | -0.6687098 | 0.31907523 | 0.9615416 |
| M:23°S - M:14°S | -0.2819367 | -0.825122 | 0.26124856 | 0.7632217 |
| M:21°S - F:21°S | -0.2959273 | -0.7615282 | 0.16967364 | 0.5287181 |
| F:23°S - F:21°S | -17.259.547 | -21.061.518 | -134.575.770 | **0** |
| M:23°S - F:21°S | -18.330.742 | -22.754.204 | -139.072.791 | **0** |
| F:23°S - M:21°S | -14.300.275 | -18.926.044 | -0.96745055 | **0** |
| M:23°S - M:21°S | -15.371.469 | -20.520.234 | -102.227.038 | **0** |
| M:23°S - F:23°S | -0.1071194 | -0.5462816 | 0.33204275 | 0.9956702 |
|  |  |  |  |  |
| ***Shell width (SW)*** |  |  |  |  |
| *Sex (M: male, F: female)* | *diff* | *lwr* | *upr* | *p adj* |
| *M-F* | -0.2284561 | -0.3231581 | -0.133754 | **2.70E-06** |
| *Latitude* | *diff* | *lwr* | *upr* | *p adj* |
| 14°S - 3°S | 10.560.414 | 0.8910921 | 122.099.066 | **0** |
| 21°S - 3°S | 19.971.148 | 18.299.907 | 216.423.892 | **0** |
| 23°S - 3°S | 0.9060241 | 0.7423408 | 106.970.742 | **0** |
| 21°S - 14°S | 0.9410734 | 0.7727093 | 110.943.759 | **0** |
| 23°S - 14°S | -0.1500173 | -0.3149666 | 0.01493196 | 0.0896376 |
| 23°S - 21°S | -10.910.907 | -12.582.148 | -0.92396664 | **0** |
| *Sex and Latitude (M: male, F: female)* | *diff* | *lwr* | *upr* | *p adj* |
| M:3°S - F:3°S | -0.279451991 | -0.5628787 | 0.003974746 | 0.0565058 |
| F:14°S - F:3°S | 1.024.760.291 | 0.7885694 | 1.260.951.167 | **0** |
| M:14°S - F:3°S | 0.843262458 | 0.5245138 | 1.162.011.083 | **0** |
| F:21°S - F:3°S | 1.956.582.744 | 17.112.110 | 2.201.954.524 | **0** |
| M:21°S - F:3°S | 1.792.247.253 | 14.937.091 | 2.090.785.407 | **0** |
| F:23°S - F:3°S | 0.848857143 | 0.6058793 | 1.091.834.994 | **0** |
| M:23°S - F:3°S | 0.724974239 | 0.4415475 | 1.008.400.975 | **0** |
| F:14°S - M:3°S | 1.304.212.281 | 10.265.819 | 1.581.842.627 | **0** |
| M:14°S - M:3°S | 1.122.714.449 | 0.7721532 | 1.473.275.663 | **0** |
| F:21°S - M:3°S | 2.236.034.735 | 19.505.531 | 2.521.516.414 | **0** |
| M:21°S - M:3°S | 2.071.699.243 | 17.394.079 | 2.403.990.544 | **0** |
| F:23°S - M:3°S | 1.128.309.133 | 0.8448824 | 1.411.735.870 | **0** |
| M:23°S - M:3°S | 1.004.426.230 | 0.6856423 | 1.323.210.159 | **0** |
| M:14°S - F:14°S | -0.181497832 | -0.4951036 | 0.132107939 | 0.6475021 |
| F:21°S - F:14°S | 0.931822453 | 0.6931696 | 1.170.475.348 | **0** |
| M:21°S - F:14°S | 0.767486962 | 0.4744461 | 1.060.527.785 | **0** |
| F:23°S - F:14°S | -0.175903148 | -0.412094 | 0.060287729 | 0.3148866 |
| M:23°S - F:14°S | -0.299786052 | -0.5774164 | -0.022155706 | **0.0238713** |
| F:21°S - M:14°S | 1.113.320.286 | 0.7927431 | 1.433.897.515 | **0** |
| M:21°S - M:14°S | 0.948984794 | 0.5860971 | 1.311.872.489 | **0** |
| F:23°S - M:14°S | 0.005594684 | -0.3131539 | 0.324343309 | 1.0000000 |
| M:23°S - M:14°S | -0.11828822 | -0.4688494 | 0.232272994 | 0.9704288 |
| M:21°S - F:21°S | -0.164335491 | -0.4648253 | 0.136154282 | 0.711152 |
| F:23°S - F:21°S | -1.107.725.601 | -13.530.974 | -0.862353821 | **0** |
| M:23°S - F:21°S | -1.231.608.505 | -15.170.902 | -0.946126826 | **0** |
| F:23°S - M:21°S | -0.94339011 | -12.419.283 | -0.644851955 | **0** |
| M:23°S - M:21°S | -1.067.273.014 | -13.995.643 | -0.734981713 | **0** |
| M:23°S - F:23°S | -0.123882904 | -0.4073096 | 0.159543833 | 0.887573 |
|  |  |  |  |  |
| ***Shell opening length (AL)*** |  |  |  |  |
| *Sex* | *diff* | *lwr* | *upr* | *p adj* |
| *M-F* | -0.1468096 | -0.225647 | -0.06797227 | **0.0002765** |
| *Latitude* | *diff* | *lwr* | *upr* | *p adj* |
| 14°S - 3°S | 0.79516612 | 0.6578495 | 0.93248274 | **0** |
| 21°S - 3°S | 164.958.132 | 15.104.542 | 178.870.844 | **0** |
| 23°S - 3°S | 0.74463855 | 0.6083758 | 0.88090131 | **0** |
| 21°S - 14°S | 0.8544152 | 0.7142558 | 0.99457465 | **0** |
| 23°S - 14°S | -0.05052757 | -0.1878442 | 0.08678906 | 0.7789918 |
| 23°S - 21°S | -0.90494277 | -10.440.699 | -0.76581565 | **0** |
| *Sex and Latitude (M: male, F: female)* | *diff* | *lwr* | *upr* | *p adj* |
| M:3°S - F:3°S | -0.20303201 | -0.4389785 | 0.0329145 | 0.1517191 |
| F:14°S - F:3°S | 0.76859483 | 0.5719711 | 0.9652185 | **0** |
| M:14°S - F:3°S | 0.64391805 | 0.3785668 | 0.9092693 | **0** |
| F:21°S - F:3°S | 162.687.223 | 14.226.056 | 18.311.388 | **0** |
| M:21°S - F:3°S | 148.609.158 | 12.375.651 | 17.346.180 | **0** |
| F:23°S - F:3°S | 0.67466667 | 0.472393 | 0.8769404 | **0** |
| M:23°S - F:3°S | 0.66204996 | 0.4261035 | 0.8979965 | **0** |
| F:14°S - M:3°S | 0.97162684 | 0.7405057 | 12.027.480 | **0** |
| M:14°S - M:3°S | 0.84695006 | 0.5551156 | 11.387.845 | **0** |
| F:21°S - M:3°S | 182.990.424 | 15.922.470 | 20.675.614 | **0** |
| M:21°S - M:3°S | 168.912.358 | 14.124.984 | 19.657.488 | **0** |
| F:23°S - M:3°S | 0.87769867 | 0.6417522 | 11.136.452 | **0** |
| M:23°S - M:3°S | 0.86508197 | 0.5997014 | 11.304.626 | **0** |
| M:14°S - F:14°S | -0.12467678 | -0.3857467 | 0.1363931 | 0.8322222 |
| F:21°S - F:14°S | 0.8582774 | 0.6596041 | 10.569.507 | **0** |
| M:21°S - F:14°S | 0.71749674 | 0.4735467 | 0.9614468 | **0** |
| F:23°S - F:14°S | -0.09392817 | -0.2905519 | 0.1026955 | 0.8320026 |
| M:23°S - F:14°S | -0.10654487 | -0.337666 | 0.1245763 | 0.8564044 |
| F:21°S - M:14°S | 0.98295418 | 0.7160807 | 12.498.277 | **0** |
| M:21°S - M:14°S | 0.84217352 | 0.5400775 | 11.442.695 | **0** |
| F:23°S - M:14°S | 0.03074862 | -0.2346026 | 0.2960998 | 0.9999679 |
| M:23°S - M:14°S | 0.01813191 | -0.2737026 | 0.3099664 | 0.9999996 |
| M:21°S - F:21°S | -0.14078065 | -0.3909318 | 0.1093705 | 0.6798433 |
| F:23°S - F:21°S | -0.95220556 | -11.564.722 | -0.747939 | **0** |
| M:23°S - F:21°S | -0.96482227 | -12.024.795 | -0.7271651 | **0** |
| F:23°S - M:21°S | -0.81142491 | -10.599.513 | -0.5628985 | **0** |
| M:23°S - M:21°S | -0.82404161 | -11.006.668 | -0.5474164 | **0** |
| M:23°S - F:23°S | -0.01261671 | -0.2485632 | 0.2233298 | 0.9999998 |
|  |  |  |  |  |
| ***Shell opening width (AW)*** |  |  |  |  |
| *Sex* | *diff* | *lwr* | *upr* | *p adj* |
| *M-F* | -0.1333648 | -0.1910429 | -0.07568675 | **6.70E-06** |
| *Latitude* | *diff* | *lwr* | *upr* | *p adj* |
| 14°S - 3°S | 0.66046966 | 0.5600077 | 0.76093161 | **0** |
| 21°S-3°S | 120.474.373 | 11.029.572 | 130.653.025 | **0** |
| 23°S-3°S | 0.57162651 | 0.4719356 | 0.67131744 | **0** |
| 21°S-14°S | 0.54427407 | 0.4417323 | 0.64681585 | **0** |
| 23°S-14°S | -0.08884316 | -0.1893051 | 0.01161879 | 0.1042741 |
| 23°S-21°S | -0.63311722 | -0.7349037 | -0.5313307 | **0** |
| *Sex and Latitude (M: male, F: female)* | *diff* | *lwr* | *upr* | *p adj* |
| M:3°S - F:3°S | -0.16187822 | -0.3344986 | 0.01074215 | 0.0845091 |
| F:14°S - F:3°S | 0.64709927 | 0.5032478 | 0.79095075 | **0** |
| M:14°S - F:3°S | 0.52456478 | 0.3304317 | 0.71869786 | **0** |
| F:21°S - F:3°S | 118.788.967 | 10.384.466 | 133.733.276 | **0** |
| M:21°S - F:3°S | 107.328.571 | 0.8914618 | 125.510.965 | **0** |
| F:23°S - F:3°S | 0.52580952 | 0.3778245 | 0.67379459 | **0** |
| M:23°S - F:3°S | 0.48861358 | 0.3159932 | 0.66123395 | **0** |
| F:14°S - M:3°S | 0.80897749 | 0.6398874 | 0.97806758 | **0** |
| M:14°S - M:3°S | 0.686443 | 0.4729345 | 0.89995146 | **0** |
| F:21°S - M:3°S | 134.976.789 | 11.758.960 | 152.363.982 | **0** |
| M:21°S - M:3°S | 123.516.393 | 10.327.827 | 143.754.514 | **0** |
| F:23°S - M:3°S | 0.68768774 | 0.5150674 | 0.86030811 | **0** |
| M:23°S - M:3°S | 0.6504918 | 0.4563372 | 0.84464638 | **0** |
| M:14°S - F:14°S | -0.12253449 | -0.3135353 | 0.06846634 | 0.5162294 |
| F:21°S - F:14°S | 0.5407904 | 0.3954394 | 0.68614137 | **0** |
| M:21°S - F:14°S | 0.42618644 | 0.2477106 | 0.60466224 | **0** |
| F:23°S - F:14°S | -0.12128975 | -0.2651412 | 0.02256173 | 0.1712013 |
| M:23°S - F:14°S | -0.15848569 | -0.3275758 | 0.0106044 | 0.0848396 |
| F:21°S - M:14°S | 0.66332489 | 0.4680781 | 0.85857167 | **0** |
| M:21°S - M:14°S | 0.54872093 | 0.3277051 | 0.7697368 | **0** |
| F:23°S - M:14°S | 0.00124474 | -0.1928883 | 0.19537782 | 1.0000000 |
| M:23°S - M:14°S | -0.0359512 | -0.2494597 | 0.17755725 | 0.9996024 |
| M:21°S - F:21°S | -0.11460396 | -0.2976165 | 0.06840861 | 0.5484182 |
| F:23°S - F:21°S | -0.66208015 | -0.8115232 | -0.51263706 | **0** |
| M:23°S - F:21°S | -0.69927609 | -0.873148 | -0.52540417 | **0** |
| F:23°S - M:21°S | -0.54747619 | -0.7293001 | -0.36565225 | **0** |
| M:23°S - M:21°S | -0.58467213 | -0.7870533 | -0.38229092 | **0** |
| M:23°S-F:23°S | -0.03719594 | -0.2098163 | 0.13542442 | 0.9980186 |
|  |  |  |  |  |
| ***Proportionality*** |  |  |  |  |
| *Sex (M: male, F: female)* | *diff* | *lwr* | *upr* | *p adj* |
| *M-F* | 0.004676399 | -0.00698857 | 0.01634137 | 0.4314406 |
| *Latitude* | *diff* | *lwr* | *upr* | *p adj* |
| 23°S - 21°S | -0.031609503 | -0.052195091 | -0.011023915 | **0.0004925** |
| 3°S - 21°S | -0.012151672 | -0.032737259 | 0.008433916 | 0.4257481 |
| 14°S - 21°S | 0.005015012 | -0.015723322 | 0.025753345 | 0.9247371 |
| 3°S - 23°S | 0.019457831 | -0.000703938 | 0.039619601 | 0.063075 |
| 14°S - 23°S | 0.036624515 | 0.016306813 | 0.056942216 | **0.0000247** |
| 14°S - 3°S | 0.017166683 | -0.003151018 | 0.037484385 | 0.1309423 |
| *Sex and Latitude (M: male, F: female)* | *diff* | *lwr* | *upr* | *p adj* |
| M:21°S - F:21°S | -0.01290556 | -0.049918527 | 0.024107408 | 0.9645658 |
|  |  |  |  |  |
| F:23°S - F:21°S | -0.041964168 | -0.072187951 | -0.011740385 | **0.0007252** |
| M:23°S - F:21°S | -0.025370881 | -0.06053522 | 0.009793457 | 0.3566505 |
| F:3°S - F:21°S | -0.021202263 | -0.051426046 | 0.00902152 | 0.3945348 |
| M:3°S - F:21°S | -0.008157767 | -0.043322105 | 0.027006572 | 0.9968359 |
| F:14°S - F:21°S | -0.001856016 | -0.031252197 | 0.027540165 | 0.9999995 |
| M:14°S - F:21°S | 0.006173152 | -0.033314097 | 0.045660401 | 0.9997573 |
| F:23°S - M:21°S | -0.029058608 | -0.065831184 | 0.007713968 | 0.241524 |
| M:23°S - M:21°S | -0.012465322 | -0.053395457 | 0.028464814 | 0.9834931 |
| F:3°S - M:21°S | -0.008296703 | -0.045069279 | 0.028475873 | 0.9973455 |
| M:3°S - M:21°S | 0.004747793 | -0.036182342 | 0.045677929 | 0.9999676 |
| F:14°S - M:21°S | 0.011049544 | -0.025045896 | 0.047144983 | 0.9829934 |
| M:14°S - M:21°S | 0.019078712 | -0.025620149 | 0.063777572 | 0.8995747 |
| M:23°S - F:23°S | 0.016593286 | -0.018317933 | 0.051504506 | 0.8356431 |
| F:3°S - F:23°S | 0.020761905 | -0.009167005 | 0.050690815 | 0.4097643 |
| M:3°S - F:23°S | 0.033806401 | -0.001104819 | 0.068717621 | 0.0656764 |
| F:14°S - F:23°S | 0.040108152 | 0.011015231 | 0.069201073 | **0.0008223** |
| M:14°S - F:23°S | 0.04813732 | 0.00887531 | 0.08739933 | **0.005139** |
| F:3°S - M:23°S | 0.004168618 | -0.030742602 | 0.039079838 | 0.9999606 |
| M:3°S - M:23°S | 0.017213115 | -0.022053244 | 0.056479473 | 0.8860195 |
| F:14°S - M:23°S | 0.023514865 | -0.010682382 | 0.057712112 | 0.4217917 |
| M:14°S - M:23°S | 0.031544034 | -0.011636507 | 0.074724574 | 0.3401367 |
| M:3°S - F:3°S | 0.013044496 | -0.021866724 | 0.047955716 | 0.9486343 |
| F:14°S - F:3°S | 0.019346247 | -0.009746674 | 0.048439168 | 0.4675794 |
| M:14°S - F:3°S | 0.027375415 | -0.011886595 | 0.066637425 | 0.4028216 |
| F:14°S - M:3°S | 0.00630175 | -0.027895496 | 0.040498997 | 0.9992799 |
| M:14°S - M:3°S | 0.014330919 | -0.028849622 | 0.057511459 | 0.9730391 |
| M:14°S - F:14°S | 0.008029168 | -0.030599368 | 0.046657705 | 0.9984269 |

**Supplementary Table S2:** Results of the covariance analysis (ANCOVA) of the shell length and *Echinolittorina lineolata* in different latitudes along the Brazilian coast with the shell width as a covariate. Legend: values in bold show a statistically significant difference.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Sum Sq** | **Df** | **F value** | **Pr (>F)** |
| **(Intercept)** | 1.3 | 1 | 176.406 | **3.046e-05** |
| **Latitude** | 2.11 | 3 | 95.423 | **3.584e-06** |
| **Shell width (SW)** | 476.21 | 1 | 6642.3829 | **< 2.2e-16** |
| **Residuals** | 47.23 | 641 |  |  |

**Supplementary Table S3:** Results of the covariance analysis (ANCOVA) of the shell opening length for *Echinolittorina lineolata* in different latitudes along the Brazilian coast with shell opening width as a covariate. Legend: values in bold show a statistically significant difference.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Sum Sq** | **Df** | **F value** | **Pr (>F)** |
| **(Intercept)** | 4.070 | 1 | 195.589 | **< 2.2e-16** |
| **Latitude** | 1.045 | 3 | 16.744 | **1.751e-10** |
| **Shell opening width (AW)** | 67.970 | 1 | 3266.446 | **< 2.2e-16** |
| **Residuals** | 13.338 | 641 |  |  |

**Supplementary Figure S1:** Sampling sites. (A) 3° - Paracuru - Ceará, (B) 14° - Ilhéus - Bahia, (C) 21° - Marataízes - Espírito Santo and (D) 23° - Bertioga - São Paulo.

