Supplementary Materials:Environmental Variation and How its Spatial Structure Influences the Cross-Shelf Distribution of High-Latitude Coral Communities in South Africa

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**Electronic Supplementary Material 5**

**Table S1.** Distance-based linear model marginal tests for correlations between the 75 spatial variables and reef community structure (Model 2). Significant probability values are indicated in bold.

| **Variable** | **SS(Trace)** | **FPseudo** | **P(perm)** | **Proportion of variance** |
| --- | --- | --- | --- | --- |
| *S1* | 19906 | 14.423 | **0.0001** | 0.033432 |
| *S2* | 22714 | 16.539 | **0.0001** | 0.038149 |
| *S3* | 14910 | 10.71 | **0.0001** | 0.025041 |
| *S4* | 5325.1 | 3.7632 | **0.0011** | 0.008944 |
| *S5* | 26690 | 19.57 | **0.0001** | 0.044826 |
| *S6* | 10576 | 7.5411 | **0.0001** | 0.017763 |
| *S7* | 3503.7 | 2.4683 | 0.0165 | 0.005885 |
| *S8* | 2361.2 | 1.6603 | 0.0883 | 0.003966 |
| *S9* | 15335 | 11.024 | **0.0001** | 0.025755 |
| *S10* | 1755.7 | 1.2332 | 0.2272 | 0.002949 |
| *S11* | 7800.8 | 5.5359 | **0.0001** | 0.013102 |
| *S12* | 11125 | 7.9395 | **0.0001** | 0.018684 |
| *S13* | 3356.8 | 2.3643 | 0.022 | 0.005638 |
| *S14* | 4634.7 | 3.2714 | 0.0029 | 0.007784 |
| *S15* | 3600.5 | 2.537 | 0.0143 | 0.006047 |
| *S16* | 3039.7 | 2.1398 | 0.0328 | 0.005105 |
| *S17* | 2567.2 | 1.8057 | 0.0651 | 0.004312 |
| *S18* | 5142.8 | 3.6332 | **0.0015** | 0.008637 |
| *S19* | 4309.9 | 3.0405 | **0.0061** | 0.007239 |
| *S20* | 4150.4 | 2.9272 | **0.0062** | 0.006971 |
| *S21* | 3108.4 | 2.1884 | 0.032 | 0.005221 |
| *S22* | 7368.2 | 5.225 | **0.0002** | 0.012375 |
| *S23* | 3178.1 | 2.2377 | 0.0271 | 0.005338 |
| *S24* | 3210.6 | 2.2608 | 0.0207 | 0.005392 |
| *S25* | 3316.3 | 2.3356 | 0.0238 | 0.00557 |
| *S26* | 4641.3 | 3.2761 | **0.0022** | 0.007795 |
| *S27* | 4072 | 2.8715 | **0.0065** | 0.006839 |
| *S28* | 1747.4 | 1.2274 | 0.2423 | 0.002935 |
| *S29* | 2090.6 | 1.4693 | 0.1384 | 0.003511 |
| *S30* | 2996 | 2.1089 | 0.0342 | 0.005032 |
| *S31* | 1929.2 | 1.3555 | 0.1765 | 0.00324 |
| *S32* | 3646.6 | 2.5696 | 0.0136 | 0.006125 |
| *S33* | 3885 | 2.7388 | **0.0088** | 0.006525 |
| *S34* | 2606.5 | 1.8335 | 0.0658 | 0.004378 |
| *S35* | 2152.9 | 1.5133 | 0.1175 | 0.003616 |
| *S36* | 1940.7 | 1.3637 | 0.1713 | 0.00326 |
| *S37* | 2560.4 | 1.8009 | 0.0662 | 0.0043 |
| *S38* | 2341.8 | 1.6466 | 0.0938 | 0.003933 |
| *S39* | 1829.7 | 1.2854 | 0.2086 | 0.003073 |
| *S40* | 1653.1 | 1.161 | 0.2837 | 0.002776 |
| *S41* | 2803.9 | 1.973 | 0.0447 | 0.004709 |
| *S42* | 3465.3 | 2.4411 | 0.0159 | 0.00582 |
| *S43* | 1588.6 | 1.1156 | 0.3167 | 0.002668 |
| *S44* | 1898.6 | 1.3339 | 0.1904 | 0.003189 |
| *S45* | 2226.2 | 1.565 | 0.1107 | 0.003739 |
| *S46* | 1863.1 | 1.3089 | 0.1998 | 0.003129 |
| *S47* | 1918.2 | 1.3477 | 0.1845 | 0.003222 |
| *S48* | 3677.5 | 2.5916 | 0.0123 | 0.006176 |
| *S49* | 2197.6 | 1.5448 | 0.1215 | 0.003691 |
| *S50* | 1166.4 | 0.81851 | 0.5732 | 0.001959 |
| *S51* | 1746.3 | 1.2266 | 0.2412 | 0.002933 |
| *S52* | 1161.1 | 0.8148 | 0.5841 | 0.00195 |
| *S53* | 1304.2 | 0.9154 | 0.4831 | 0.00219 |
| *S54* | 1632.8 | 1.1467 | 0.2867 | 0.002742 |
| *S55* | 1931.3 | 1.357 | 0.1773 | 0.003244 |
| *S56* | 1618.2 | 1.1364 | 0.2997 | 0.002718 |
| *S57* | 876.97 | 0.6151 | 0.8094 | 0.001473 |
| *S58* | 1705.9 | 1.1982 | 0.2536 | 0.002865 |
| *S59* | 1396.3 | 0.98023 | 0.4171 | 0.002345 |
| *S60* | 2579.1 | 1.8142 | 0.064 | 0.004332 |
| *S61* | 1575.9 | 1.1066 | 0.3206 | 0.002647 |
| *S62* | 2253.3 | 1.5841 | 0.1054 | 0.003784 |
| *S63* | 2557.5 | 1.7989 | 0.0682 | 0.004295 |
| *S64* | 1528.9 | 1.0736 | 0.3305 | 0.002568 |
| *S65* | 1908.7 | 1.3411 | 0.1861 | 0.003206 |
| *S66* | 1937.8 | 1.3616 | 0.1703 | 0.003255 |
| *S67* | 1239.3 | 0.86977 | 0.5207 | 0.002081 |
| *S68* | 2245.6 | 1.5787 | 0.1093 | 0.003772 |
| *S69* | 1252.5 | 0.87901 | 0.511 | 0.002104 |
| *S70* | 2112.4 | 1.4847 | 0.1297 | 0.003548 |
| *S71* | 1279.4 | 0.89799 | 0.4884 | 0.002149 |
| *S72* | 1936 | 1.3603 | 0.183 | 0.003252 |
| *S73* | 1368.1 | 0.96037 | 0.4332 | 0.002298 |
| *S74* | 1366 | 0.95892 | 0.4363 | 0.002294 |
| *S75* | 2254.5 | 1.585 | 0.106 | 0.003786 |

Significant *P*-values are indicated in bold (α = 0.01). SS(Trace) = Sums of squares of trace statistic. *F*Pseudo = Pseudo *F*-statistic. *P*(perm) = Probability value by permutation.

**Table S2.** Distance-based linear model sequential tests for correlations between the spatial variables with reef community structure (Model 2). Total cumulative variance explained was 50.2%.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Spatial variable | Adj. R2 | SS(Trace) | FPseudo | P(perm) | Proportion of variance | Cumulative  variance explained | Res. df |
| *S5* | 0.042535 | 26690 | 19.57 | **0.0001** | 0.044826 | 0.044826 | 417 |
| +*S2* | 0.078566 | 22714 | 17.306 | **0.0001** | 0.038149 | 0.082975 | 416 |
| +*S1* | 0.11002 | 19906 | 15.702 | **0.0001** | 0.033432 | 0.11641 | 415 |
| +*S9* | 0.13387 | 15335 | 12.43 | **0.0001** | 0.025755 | 0.14216 | 414 |
| +*S3* | 0.15712 | 14910 | 12.418 | **0.0001** | 0.025041 | 0.1672 | 413 |
| +*S12* | 0.17403 | 11125 | 9.4554 | **0.0001** | 0.018684 | 0.18589 | 412 |
| +*S6* | 0.19009 | 10576 | 9.1676 | **0.0001** | 0.017763 | 0.20365 | 411 |
| +*S11* | 0.20147 | 7800.8 | 6.8582 | **0.0001** | 0.013102 | 0.21675 | 410 |
| +*S31* | 0.21216 | 7368.2 | 6.5658 | **0.0001** | 0.012375 | 0.22913 | 409 |
| +*S4* | 0.2194 | 5325.1 | 4.7892 | **0.0003** | 0.008944 | 0.23807 | 408 |
| +*S23* | 0.22635 | 5142.8 | 4.6668 | **0.0002** | 0.008637 | 0.24671 | 407 |
| +*S37* | 0.23247 | 4641.3 | 4.2453 | **0.0002** | 0.007795 | 0.2545 | 406 |
| +*S16* | 0.23861 | 4634.7 | 4.2734 | **0.0004** | 0.007784 | 0.26229 | 405 |
| +*S26* | 0.24421 | 4309.9 | 4.0034 | **0.0007** | 0.007239 | 0.26953 | 404 |
| +*S27* | 0.24957 | 4150.4 | 3.8827 | **0.0004** | 0.006971 | 0.2765 | 403 |
| +*S38* | 0.25481 | 4072 | 3.8362 | **0.0003** | 0.006839 | 0.28334 | 402 |
| +*S54* | 0.25975 | 3885 | 3.6845 | **0.0011** | 0.006525 | 0.28986 | 401 |
| +*S102* | 0.26436 | 3677.5 | 3.5095 | **0.001** | 0.006176 | 0.29604 | 400 |
| +*S51* | 0.26893 | 3646.6 | 3.5018 | **0.001** | 0.006125 | 0.30216 | 399 |
| +*S17* | 0.27344 | 3600.5 | 3.479 | **0.0008** | 0.006047 | 0.30821 | 398 |
| +*S7* | 0.27781 | 3503.7 | 3.4059 | **0.0012** | 0.005885 | 0.31409 | 397 |
| +*S77* | 0.28213 | 3465.3 | 3.3888 | **0.0018** | 0.00582 | 0.31991 | 396 |
| +*S15* | 0.28628 | 3356.8 | 3.3018 | **0.0009** | 0.005638 | 0.32555 | 395 |
| +*S36* | 0.29038 | 3316.3 | 3.2808 | **0.0011** | 0.00557 | 0.33112 | 394 |
| +*S35* | 0.29431 | 3210.6 | 3.194 | **0.0024** | 0.005392 | 0.33651 | 393 |
| +*S32* | 0.2982 | 3178.1 | 3.1791 | **0.0012** | 0.005338 | 0.34185 | 392 |
| +*S30* | 0.30198 | 3108.4 | 3.1263 | **0.0023** | 0.005221 | 0.34707 | 391 |
| +*S18* | 0.30567 | 3039.7 | 3.0735 | **0.0022** | 0.005105 | 0.35218 | 390 |
| +*S46* | 0.30929 | 2996 | 3.0451 | **0.0036** | 0.005032 | 0.35721 | 389 |
| +*S76* | 0.31258 | 2803.9 | 2.8635 | **0.0032** | 0.004709 | 0.36192 | 388 |
| +*S59* | 0.31553 | 2606.5 | 2.6735 | **0.0048** | 0.004378 | 0.36629 | 387 |
| +*S158* | 0.31845 | 2579.1 | 2.6567 | **0.0058** | 0.004332 | 0.37063 | 386 |
| +*S21* | 0.32136 | 2567.2 | 2.6557 | **0.0056** | 0.004312 | 0.37494 | 385 |
| +*S69* | 0.32427 | 2560.4 | 2.6601 | **0.0049** | 0.0043 | 0.37924 | 384 |
| +*S178* | 0.3272 | 2557.5 | 2.6687 | **0.0057** | 0.004295 | 0.38353 | 383 |
| +*S8* | 0.32978 | 2361.2 | 2.4733 | **0.0084** | 0.003966 | 0.3875 | 382 |
| +*S70* | 0.33233 | 2341.8 | 2.4624 | **0.0078** | 0.003933 | 0.39143 | 381 |
| +*S413* | 0.33474 | 2254.5 | 2.3791 | **0.0098** | 0.003786 | 0.39522 | 380 |
| +*S171* | 0.33716 | 2253.3 | 2.3865 | **0.0093** | 0.003784 | 0.399 | 379 |
| +*S261* | 0.33958 | 2245.6 | 2.3871 | **0.0083** | 0.003772 | 0.40277 | 378 |
| +*S83* | 0.34197 | 2226.2 | 2.3751 | **0.009** | 0.003739 | 0.40651 | 377 |
| +*S106* | 0.34432 | 2197.6 | 2.353 | 0.011 | 0.003691 | 0.4102 | 376 |
| +*S66* | 0.34661 | 2152.9 | 2.3132 | 0.0105 | 0.003616 | 0.41382 | 375 |
| +*S368* | 0.34882 | 2112.4 | 2.2774 | 0.0102 | 0.003548 | 0.41737 | 374 |
| +*S43* | 0.35101 | 2090.6 | 2.2614 | 0.0103 | 0.003511 | 0.42088 | 373 |
| +*S67* | 0.35293 | 1940.7 | 2.1056 | 0.0154 | 0.00326 | 0.42414 | 372 |
| +*S225* | 0.35485 | 1937.8 | 2.1087 | 0.0152 | 0.003255 | 0.42739 | 371 |
| +*S392* | 0.35678 | 1936 | 2.1131 | 0.0157 | 0.003252 | 0.43065 | 370 |
| +*S143* | 0.35871 | 1931.3 | 2.1142 | 0.0127 | 0.003244 | 0.43389 | 369 |
| +*S47* | 0.36065 | 1929.2 | 2.1184 | 0.0142 | 0.00324 | 0.43713 | 368 |
| +*S95* | 0.36258 | 1918.2 | 2.1126 | 0.0146 | 0.003222 | 0.44035 | 367 |
| +*S215* | 0.3645 | 1908.7 | 2.1086 | 0.016 | 0.003206 | 0.44356 | 366 |
| +*S81* | 0.36641 | 1898.6 | 2.1037 | 0.0153 | 0.003189 | 0.44674 | 365 |
| +*S84* | 0.36826 | 1863.1 | 2.0704 | 0.0169 | 0.003129 | 0.44987 | 364 |
| +*S72* | 0.37006 | 1829.7 | 2.0391 | 0.017 | 0.003073 | 0.45295 | 363 |
| +*S10* | 0.37172 | 1755.7 | 1.9618 | 0.0225 | 0.002949 | 0.4559 | 362 |
| +*S41* | 0.37338 | 1747.4 | 1.9577 | 0.0223 | 0.002935 | 0.45883 | 361 |
| +*S124* | 0.37505 | 1746.3 | 1.9617 | 0.0225 | 0.002933 | 0.46176 | 360 |
| +*S147* | 0.37664 | 1705.9 | 1.9212 | 0.0261 | 0.002865 | 0.46463 | 359 |
| +*S74* | 0.37814 | 1653.1 | 1.8663 | 0.0286 | 0.002776 | 0.4674 | 358 |
| +*S141* | 0.37961 | 1632.8 | 1.8477 | 0.0325 | 0.002742 | 0.47015 | 357 |
| +*S145* | 0.38106 | 1618.2 | 1.8355 | 0.0329 | 0.002718 | 0.47286 | 356 |
| +*S80* | 0.38246 | 1588.6 | 1.806 | 0.0334 | 0.002668 | 0.47553 | 355 |
| +*S163* | 0.38384 | 1575.9 | 1.7955 | 0.0356 | 0.002647 | 0.47818 | 354 |
| +*S182* | 0.38513 | 1528.9 | 1.7457 | 0.0409 | 0.002568 | 0.48075 | 353 |
| +*S149* | 0.38617 | 1396.3 | 1.597 | 0.0685 | 0.002345 | 0.48309 | 352 |
| +*S406* | 0.38716 | 1368.1 | 1.5672 | 0.0746 | 0.002298 | 0.48539 | 351 |
| +*S410* | 0.38815 | 1366 | 1.5674 | 0.0719 | 0.002294 | 0.48768 | 350 |
| +*S128* | 0.38902 | 1304.2 | 1.4985 | 0.0934 | 0.00219 | 0.48988 | 349 |
| +*S385* | 0.38984 | 1279.4 | 1.4721 | 0.1044 | 0.002149 | 0.49202 | 348 |
| +*S344* | 0.39062 | 1252.5 | 1.4429 | 0.1173 | 0.002104 | 0.49413 | 347 |
| +*S230* | 0.39137 | 1239.3 | 1.4295 | 0.1114 | 0.002081 | 0.49621 | 346 |
| +*S111* | 0.39198 | 1166.4 | 1.3468 | 0.1603 | 0.001959 | 0.49817 | 345 |
| +*S125* | 0.39259 | 1161.1 | 1.342 | 0.1684 | 0.00195 | 0.50012 | 344 |
| +*S146* | 0.39261 | 876.97 | 1.0136 | 0.4347 | 0.001473 | 0.50159 | 343 |

Significant *P*-values are indicated in bold (α = 0.01). Adj. R2 = Adjusted R2. SS(Trace) = Sums of squares of trace statistic. *F*Pseudo = Pseudo *F*-statistic. *P*(perm) = Probability value by permutation. Res. df = Residual degrees of freedom.