**Table S1** Summary of descriptive statistics of all six shell characters in general measurements analysis.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Individual** | **Locality** | **Clade** | **N1** | **N2** | **R** | **AA** | **SH** | **SW** |
| AJ05 | AJ | B | 11 | 6 | 1 | 90.759 | 16.317 | 16.423 |
| BH04 | BH | A | 11 | 6 | 1 | 85.683 | 19.923 | 17.977 |
| BH05 | BH | A | 10 | 6 | 1 | 80.470 | 20.077 | 16.957 |
| BH06 | BH | B | 11 | 5 | 1 | 87.764 | 22.117 | 19.550 |
| BH07 | BH | A | 10 | 6 | 1 | 79.762 | 22.670 | 19.700 |
| BH08 | BH | A | 10 | 5 | 0 | 87.625 | 18.507 | 16.307 |
| BH09 | BH | A | 10 | 5 | 0 | 80.781 | 19.230 | 16.437 |
| BH10 | BH | A | 12 | 5 | 1 | 80.929 | 16.407 | 14.803 |
| BH11 | BH | A | 10 | 5 | 0 | 82.089 | 16.717 | 14.800 |
| BH12 | BH | A | 11 | 7 | 1 | 81.212 | 19.030 | 17.037 |
| BH14 | BH | A | 10 | 5 | 1 | 79.308 | 13.927 | 12.120 |
| BH15 | BH | A | 11 | 5 | 1 | 87.028 | 12.097 | 11.303 |
| BH16 | BH | B | 10 | 7 | 0 | 72.308 | 17.213 | 14.840 |
| BH17 | BH | B | 11 | 5 | 1 | 82.458 | 14.123 | 12.733 |
| BH18 | BH | A | 10 | 5 | 1 | 80.475 | 13.320 | 12.523 |
| BH19 | BH | A | 10 | 5 | 1 | 89.608 | 13.620 | 13.000 |
| BH20 | BH | A | 11 | 5 | 1 | 84.986 | 11.823 | 11.230 |
| BH21 | BH | A | 11 | 5 | 1 | 94.528 | 10.237 | 9.797 |
| BH22 | BH | A | 9 | 6 | 0 | 87.316 | 11.853 | 11.577 |
| BH23 | BH | A | 11 | 5 | 1 | 89.586 | 12.093 | 11.500 |
| BH24 | BH | A | 12 | 5 | 1 | 90.186 | 11.797 | 11.297 |
| BH25 | BH | A | 11 | 5 | 1 | 84.151 | 10.503 | 9.997 |
| BH26 | BH | A | 9 | 6 | 1 | 92.225 | 9.860 | 9.703 |
| BH27 | BH | A | 10 | 5 | 1 | 82.402 | 10.450 | 9.730 |
| CD01 | CD | C | 10 | 5 | 0 | 83.292 | 19.017 | 18.000 |
| CD02 | CD | D | 8 | 6 | 0 | 87.157 | 18.187 | 14.733 |
| CD03 | CD | E | 8 | 7 | 0 | 90.691 | 19.057 | 17.167 |
| CD04 | CD | D | 8 | 7 | 0 | 97.573 | 21.540 | 19.503 |
| CD05 | CD | D | 8 | 7 | 0 | 95.601 | 19.437 | 17.760 |
| CD06 | CD | D | 8 | 7 | 0 | 92.084 | 16.027 | 13.833 |
| CD07 | CD | D | 7 | 7 | 0 | 100.480 | 15.910 | 14.477 |
| CD08 | CD | D | 7 | 7 | 0 | 88.332 | 16.937 | 14.530 |
| CD09 | CD | D | 7 | 6 | 1 | 91.323 | 17.787 | 15.797 |
| CD10 | CD | D | 9 | 7 | 1 | 96.777 | 17.857 | 17.357 |
| CD11 | CD | D | 8 | 8 | 1 | 92.248 | 18.517 | 16.453 |
| CD12 | CD | D | 8 | 7 | 0 | 88.069 | 20.387 | 17.690 |
| CD13 | CD | D | 9 | 5 | 0 | 95.687 | 17.913 | 16.103 |
| CD14 | CD | D | 7 | 6 | 0 | 102.438 | 14.440 | 13.463 |
| CD15 | CD | D | 8 | 7 | 1 | 96.287 | 21.930 | 19.853 |
| CD16 | CD | D | 8 | 6 | 1 | 94.608 | 18.213 | 16.587 |
| CD17 | CD | D | 8 | 7 | 0 | 102.544 | 19.480 | 17.370 |
| CD19 | CD | D | 8 | 7 | 0 | 97.496 | 19.470 | 16.507 |
| CD20 | CD | D | 7 | 7 | 0 | 91.212 | 17.750 | 15.170 |
| CD21 | CD | D | 8 | 6 | 0 | 89.572 | 19.243 | 16.393 |
| CD22 | CD | D | 9 | 6 | 0 | 89.646 | 19.373 | 17.893 |
| CD23 | CD | D | 6 | 7 | 0 | 83.714 | 18.507 | 15.053 |
| CD24 | CD | D | 8 | 7 | 1 | 94.357 | 18.563 | 15.637 |
| DS01 | DS | E | 9 | 7 | 1 | 100.269 | 22.780 | 20.140 |
| DS02 | DS | B | 9 | 6 | 1 | 70.421 | 32.330 | 25.897 |
| DS03 | DS | E | 8 | 6 | 0 | 94.473 | 20.783 | 18.783 |
| DS04 | DS | D | 8 | 6 | 1 | 90.955 | 18.183 | 15.940 |
| DS05 | DS | E | 9 | 6 | 1 | 107.293 | 25.383 | 21.160 |
| DS06 | DS | B | 10 | 6 | 1 | 65.299 | 31.670 | 23.380 |
| DS08 | DS | B | 11 | 5 | 1 | 85.287 | 20.500 | 18.233 |
| DS09 | DS | D | 10 | 6 | 1 | 97.811 | 14.217 | 13.023 |
| DS10 | DS | E | 9 | 6 | 1 | 109.776 | 17.817 | 16.613 |
| DS11 | DS | E | 8 | 7 | 0 | 103.990 | 15.373 | 13.953 |
| DS12 | DS | E | 9 | 6 | 1 | 94.068 | 20.907 | 18.423 |
| DS13 | DS | E | 10 | 6 | 1 | 108.092 | 14.440 | 14.273 |
| DS14 | DS | B | 11 | 5 | 1 | 99.660 | 15.230 | 14.580 |
| DS15 | DS | D | 9 | 7 | 1 | 89.200 | 22.943 | 20.357 |
| DS16 | DS | B | 9 | 6 | 1 | 83.046 | 20.013 | 18.010 |
| DS17 | DS | E | 8 | 6 | 0 | 103.389 | 19.777 | 17.493 |
| DS18 | DS | B | 11 | 6 | 1 | 69.147 | 21.237 | 17.400 |
| DS19 | DS | A | 10 | 6 | 0 | 87.520 | 20.340 | 17.783 |
| DS20 | DS | E | 9 | 7 | 1 | 113.615 | 18.770 | 18.213 |
| DS21 | DS | E | 9 | 6 | 1 | 96.740 | 16.083 | 16.100 |
| DS22 | DS | B | 10 | 5 | 0 | 90.007 | 21.000 | 17.780 |
| DS23 | DS | B | 9 | 6 | 1 | 88.015 | 23.137 | 20.387 |
| DS24 | DS | E | 9 | 6 | 0 | 102.291 | 13.777 | 13.703 |
| DS25 | DS | B | 11 | 6 | 1 | 99.416 | 18.577 | 18.223 |
| DS26 | DS | B | 10 | 6 | 1 | 89.680 | 22.640 | 19.030 |
| DS27 | DS | B | 11 | 6 | 0 | 97.925 | 15.873 | 15.793 |
| DS28 | DS | E | 9 | 7 | 1 | 88.479 | 18.803 | 16.640 |
| DS29 | DS | E | 10 | 7 | 1 | 93.931 | 17.050 | 15.927 |
| DS30 | DS | D | 10 | 6 | 1 | 93.309 | 17.663 | 17.003 |
| DS31 | DS | B | 11 | 6 | 1 | 90.338 | 17.820 | 16.490 |
| DS32 | DS | E | 8 | 7 | 1 | 90.137 | 17.347 | 15.857 |
| DS33 | DS | E | 9 | 6 | 1 | 92.072 | 20.740 | 18.740 |
| DS34 | DS | D | 10 | 7 | 1 | 90.762 | 14.820 | 13.883 |
| DS35 | DS | B | 10 | 6 | 1 | 89.615 | 19.373 | 17.380 |
| DS36 | DS | E | 9 | 7 | 1 | 96.976 | 17.677 | 16.280 |
| DS37 | DS | B | 11 | 5 | 1 | 86.474 | 17.417 | 15.560 |
| DS38 | DS | B | 10 | 6 | 1 | 97.306 | 13.437 | 13.893 |
| DS39 | DS | B | 10 | 5 | 1 | 89.433 | 17.217 | 15.640 |
| DS40 | DS | E | 10 | 7 | 0 | 89.478 | 14.960 | 14.433 |
| DS41 | DS | E | 10 | 7 | 1 | 97.687 | 16.807 | 15.937 |
| DS42 | DS | E | 9 | 7 | 1 | 90.297 | 15.353 | 14.740 |
| DS43 | DS | B | 11 | 5 | 1 | 93.995 | 14.453 | 13.997 |
| DS44 | DS | B | 10 | 5 | 1 | 89.409 | 17.723 | 16.630 |
| DS45 | DS | B | 10 | 6 | 1 | 88.770 | 15.933 | 15.977 |
| DS46 | DS | E | 7 | 8 | 1 | 83.920 | 17.693 | 15.900 |
| DS47 | DS | B | 10 | 6 | 1 | 81.097 | 16.320 | 15.203 |
| DS48 | DS | D | 8 | 7 | 1 | 96.468 | 17.400 | 16.950 |
| DT01 | DT | B | 11 | 6 | 1 | 92.108 | 8.900 | 8.837 |
| DT02 | DT | B | 10 | 5 | 0 | 89.982 | 11.797 | 11.330 |
| DT03 | DT | B | 11 | 6 | 0 | 88.790 | 12.347 | 11.507 |
| DT04 | DT | B | 10 | 6 | 1 | 84.012 | 14.483 | 12.863 |
| DT05 | DT | B | 11 | 5 | 0 | 85.271 | 10.460 | 9.703 |
| DT06 | DT | B | 12 | 5 | 1 | 87.930 | 12.263 | 11.477 |
| DT07 | DT | B | 10 | 6 | 1 | 89.647 | 9.227 | 9.403 |
| DT08 | DT | B | 12 | 5 | 0 | 83.022 | 9.077 | 9.150 |
| DT09 | DT | B | 11 | 5 | 1 | 89.630 | 9.853 | 9.663 |
| DT10 | DT | B | 10 | 5 | 1 | 89.028 | 10.950 | 10.680 |
| DT11 | DT | B | 12 | 5 | 1 | 90.557 | 8.417 | 8.843 |
| DT12 | DT | B | 11 | 6 | 1 | 88.290 | 10.377 | 10.310 |
| DT13 | DT | B | 12 | 5 | 1 | 85.069 | 9.607 | 9.603 |
| DT14 | DT | B | 11 | 5 | 0 | 80.611 | 9.403 | 9.223 |
| DT15 | DT | B | 11 | 6 | 1 | 88.600 | 10.240 | 10.140 |
| DT17 | DT | B | 10 | 6 | 0 | 80.506 | 9.043 | 8.300 |
| DT18 | DT | B | 11 | 6 | 1 | 85.433 | 10.457 | 10.167 |
| DT19 | DT | B | 10 | 5 | 1 | 85.982 | 9.247 | 9.167 |
| DT20 | DT | B | 11 | 5 | 0 | 89.543 | 9.503 | 9.160 |
| DT21 | DT | B | 10 | 5 | 1 | 86.177 | 8.853 | 8.423 |
| DT22 | DT | B | 12 | 5 | 1 | 96.291 | 8.687 | 9.170 |
| DT23 | DT | B | 12 | 5 | 1 | 87.380 | 8.720 | 8.430 |
| DT24 | DT | B | 11 | 6 | 0 | 83.257 | 9.460 | 9.317 |
| JZ01 | JZ | D | 9 | 6 | 0 | 91.908 | 18.197 | 16.787 |
| JZ02 | JZ | D | 10 | 6 | 0 | 90.206 | 16.647 | 15.740 |
| JZ03 | JZ | D | 9 | 6 | 0 | 95.272 | 15.640 | 14.993 |
| JZ04 | JZ | D | 8 | 7 | 1 | 97.099 | 17.153 | 16.287 |
| JZ05 | JZ | D | 9 | 6 | 1 | 92.827 | 15.843 | 14.753 |
| JZ06 | JZ | D | 8 | 7 | 0 | 90.479 | 17.727 | 15.863 |
| JZ07 | JZ | D | 8 | 7 | 0 | 99.551 | 14.583 | 13.510 |
| JZ08 | JZ | D | 8 | 7 | 1 | 100.354 | 13.403 | 12.327 |
| JZ09 | JZ | D | 7 | 7 | 0 | 103.537 | 15.007 | 13.347 |
| JZ10 | JZ | D | 9 | 6 | 0 | 97.678 | 16.013 | 14.943 |
| JZ11 | JZ | D | 7 | 7 | 0 | 88.448 | 18.230 | 16.027 |
| JZ12 | JZ | D | 10 | 5 | 1 | 110.355 | 16.120 | 15.147 |
| JZ13 | JZ | D | 8 | 6 | 0 | 95.387 | 13.700 | 13.303 |
| JZ14 | JZ | D | 9 | 6 | 0 | 96.255 | 13.550 | 12.990 |
| JZ15 | JZ | D | 9 | 6 | 0 | 98.305 | 15.183 | 14.130 |
| JZ16 | JZ | D | 10 | 6 | 0 | 98.727 | 14.777 | 14.000 |
| JZ17 | JZ | D | 10 | 5 | 0 | 87.224 | 12.540 | 11.523 |
| JZ18 | JZ | D | 9 | 6 | 0 | 88.935 | 12.793 | 11.933 |
| JZ19 | JZ | D | 9 | 6 | 0 | 94.897 | 12.907 | 12.413 |
| JZ20 | JZ | D | 11 | 6 | 0 | 94.220 | 11.703 | 11.580 |
| JZ21 | JZ | D | 10 | 6 | 0 | 94.158 | 10.470 | 10.393 |
| JZ22 | JZ | D | 10 | 5 | 0 | 95.662 | 10.757 | 10.497 |
| KN01 | KN | D | 9 | 7 | 0 | 103.720 | 19.263 | 18.097 |
| KN02 | KN | D | 9 | 6 | 0 | 92.582 | 18.177 | 16.483 |
| KN05 | KN | D | 10 | 5 | 1 | 109.157 | 13.597 | 13.373 |
| KN06 | KN | D | 8 | 7 | 0 | 87.148 | 20.237 | 17.440 |
| KN09 | KN | D | 9 | 6 | 0 | 97.490 | 22.597 | 20.647 |
| KN11 | KN | D | 7 | 6 | 0 | 97.989 | 18.070 | 16.127 |
| KN12 | KN | D | 9 | 7 | 0 | 98.164 | 21.240 | 18.627 |
| KN13 | KN | D | 10 | 6 | 0 | 93.428 | 17.930 | 15.907 |
| KN14 | KN | D | 10 | 6 | 1 | 101.306 | 17.003 | 16.000 |
| KN15 | KN | D | 9 | 5 | 1 | 97.130 | 14.293 | 13.093 |
| KN16 | KN | D | 9 | 6 | 0 | 104.604 | 14.430 | 13.693 |
| KN18 | KN | D | 8 | 6 | 0 | 102.081 | 19.620 | 18.347 |
| KN20 | KN | D | 8 | 6 | 0 | 98.452 | 17.260 | 16.480 |
| KN21 | KN | D | 8 | 7 | 0 | 101.951 | 20.290 | 18.970 |
| KN22 | KN | D | 9 | 6 | 0 | 97.389 | 18.217 | 16.870 |
| KN23 | KN | D | 10 | 5 | 1 | 96.272 | 15.473 | 14.807 |
| KN24 | KN | D | 9 | 4 | 1 | 94.461 | 15.170 | 14.580 |
| KS01 | KS | E | 10 | 5 | 1 | 99.180 | 16.257 | 14.950 |
| KS02 | KS | D | 9 | 6 | 1 | 92.033 | 13.867 | 13.130 |
| KS05 | KS | E | 9 | 7 | 1 | 102.159 | 14.657 | 14.210 |
| KS06 | KS | E | 9 | 5 | 1 | 97.181 | 15.523 | 14.530 |
| KS09 | KS | E | 11 | 5 | 1 | 99.603 | 13.587 | 13.370 |
| KS10 | KS | E | 9 | 9 | 1 | 97.644 | 15.043 | 14.747 |
| KS11 | KS | E | 11 | 6 | 1 | 93.539 | 14.773 | 14.017 |
| KS12 | KS | E | 11 | 6 | 0 | 98.521 | 12.847 | 13.343 |
| KS13 | KS | E | 11 | 6 | 1 | 91.906 | 11.070 | 11.077 |
| KS14 | KS | B | 10 | 6 | 1 | 89.549 | 14.110 | 13.143 |
| KS15 | KS | E | 10 | 5 | 0 | 95.482 | 12.350 | 12.183 |
| KS16 | KS | E | 11 | 5 | 0 | 99.365 | 13.067 | 13.710 |
| KS17 | KS | E | 10 | 6 | 1 | 92.620 | 14.533 | 13.470 |
| KS18 | KS | E | 10 | 6 | 1 | 95.366 | 12.943 | 12.523 |
| KS19 | KS | E | 9 | 6 | 0 | 93.121 | 11.520 | 10.820 |
| KS20 | KS | D | 10 | 6 | 0 | 95.319 | 11.673 | 11.970 |
| KS24 | KS | E | 10 | 6 | 1 | 89.266 | 11.003 | 10.483 |
| NB01 | NB | B | 11 | 5 | 1 | 87.293 | 15.577 | 14.483 |
| NB02 | NB | B | 11 | 5 | 1 | 82.510 | 13.007 | 12.200 |
| NB03 | NB | B | 11 | 6 | 0 | 94.800 | 15.573 | 14.647 |
| NB04 | NB | B | 9 | 6 | 1 | 86.739 | 13.550 | 12.960 |
| NB05 | NB | B | 13 | 5 | 1 | 86.827 | 13.063 | 12.243 |
| NB06 | NB | B | 12 | 5 | 1 | 84.757 | 11.523 | 10.683 |
| NB07 | NB | B | 11 | 5 | 1 | 92.564 | 11.317 | 10.903 |
| NB08 | NB | B | 12 | 5 | 1 | 92.486 | 12.860 | 12.457 |
| NB09 | NB | B | 11 | 5 | 1 | 82.780 | 12.820 | 11.847 |
| NB10 | NB | B | 10 | 6 | 1 | 91.828 | 14.010 | 13.333 |
| NB11 | NB | B | 10 | 5 | 1 | 85.042 | 13.233 | 12.697 |
| NB13 | NB | B | 11 | 5 | 1 | 82.231 | 14.127 | 12.957 |
| NB14 | NB | B | 12 | 6 | 1 | 84.427 | 15.410 | 13.800 |
| NB15 | NB | B | 10 | 5 | 1 | 83.070 | 15.800 | 14.287 |
| NB16 | NB | B | 12 | 5 | 1 | 85.601 | 14.710 | 13.647 |
| NB17 | NB | B | 11 | 6 | 1 | 84.193 | 15.680 | 14.020 |
| NB18 | NB | B | 10 | 6 | 1 | 82.891 | 16.393 | 14.280 |
| NB19 | NB | B | 11 | 5 | 1 | 84.947 | 14.923 | 14.203 |
| NB20 | NB | B | 12 | 5 | 1 | 83.163 | 11.377 | 10.657 |
| NB21 | NB | B | 13 | 5 | 1 | 83.351 | 12.240 | 11.607 |
| NB22 | NB | B | 10 | 5 | 1 | 83.790 | 16.780 | 14.863 |
| NB23 | NB | B | 12 | 5 | 1 | 85.770 | 14.807 | 13.883 |
| NB24 | NB | B | 11 | 6 | 1 | 85.244 | 15.227 | 14.003 |
| QD01 | QD | D | 10 | 6 | 1 | 93.055 | 14.443 | 13.643 |
| QD02 | QD | D | 8 | 7 | 1 | 93.394 | 15.830 | 14.593 |
| QD03 | QD | D | 8 | 6 | 0 | 97.209 | 14.843 | 13.633 |
| QD04 | QD | D | 8 | 7 | 0 | 109.546 | 14.233 | 13.600 |
| QD07 | QD | D | 7 | 8 | 0 | 90.707 | 16.000 | 14.773 |
| QD08 | QD | D | 8 | 6 | 0 | 88.436 | 15.363 | 13.940 |
| QD09 | QD | D | 7 | 7 | 1 | 92.516 | 14.060 | 12.443 |
| QD10 | QD | D | 8 | 6 | 0 | 98.425 | 11.240 | 11.227 |
| QD11 | QD | D | 8 | 7 | 0 | 105.704 | 14.240 | 14.027 |
| QD12 | QD | D | 9 | 6 | 1 | 104.278 | 14.057 | 13.583 |
| QD13 | QD | D | 7 | 7 | 0 | 97.104 | 15.043 | 13.903 |
| QD14 | QD | D | 8 | 7 | 1 | 92.410 | 15.313 | 13.940 |
| QD16 | QD | D | 7 | 7 | 0 | 100.184 | 12.263 | 11.340 |
| QD17 | QD | D | 10 | 6 | 1 | 96.946 | 11.790 | 11.230 |
| QD18 | QD | C | 11 | 5 | 1 | 84.606 | 10.647 | 10.820 |
| QD19 | QD | D | 8 | 6 | 1 | 103.333 | 10.703 | 10.263 |
| QD20 | QD | D | 9 | 6 | 1 | 103.017 | 9.617 | 9.077 |
| QD21 | QD | D | 8 | 7 | 0 | 97.210 | 9.607 | 9.513 |
| QD22 | QD | D | 9 | 6 | 0 | 91.506 | 13.270 | 12.147 |
| QD23 | QD | C | 10 | 5 | 1 | 83.969 | 11.043 | 10.657 |
| QD25 | QD | D | 9 | 5 | 0 | 95.826 | 10.430 | 10.457 |
| SW01 | SW | B | 11 | 4 | 1 | 87.073 | 9.393 | 9.213 |
| SW02 | SW | B | 10 | 5 | 1 | 85.197 | 11.373 | 11.313 |
| SW03 | SW | B | 11 | 5 | 1 | 81.339 | 9.833 | 9.403 |
| SW04 | SW | B | 11 | 6 | 1 | 88.698 | 18.890 | 17.790 |
| SW05 | SW | B | 11 | 6 | 1 | 78.299 | 10.127 | 10.083 |
| SW06 | SW | B | 10 | 5 | 1 | 91.041 | 9.660 | 9.967 |
| SW08 | SW | B | 10 | 5 | 1 | 81.255 | 9.747 | 9.220 |
| SW09 | SW | B | 10 | 5 | 1 | 77.065 | 10.463 | 9.990 |
| SW10 | SW | B | 10 | 5 | 1 | 84.383 | 9.283 | 9.240 |
| SW11 | SW | B | 11 | 5 | 1 | 86.793 | 10.120 | 10.310 |
| SW12 | SW | B | 10 | 5 | 1 | 83.843 | 9.970 | 9.717 |
| SW13 | SW | B | 10 | 5 | 1 | 88.201 | 11.100 | 11.087 |
| SW14 | SW | B | 10 | 6 | 1 | 86.317 | 8.883 | 9.007 |
| SW15 | SW | B | 12 | 5 | 1 | 83.814 | 9.987 | 9.750 |
| SW16 | SW | B | 11 | 5 | 1 | 86.011 | 9.340 | 8.937 |
| SW17 | SW | B | 11 | 6 | 1 | 84.419 | 8.727 | 8.590 |
| SW18 | SW | B | 9 | 5 | 1 | 86.235 | 8.897 | 8.437 |
| SW19 | SW | B | 11 | 5 | 1 | 89.437 | 8.977 | 8.573 |
| SW20 | SW | B | 10 | 5 | 1 | 83.019 | 10.040 | 9.050 |
| SW21 | SW | B | 12 | 5 | 1 | 87.788 | 8.430 | 8.277 |
| SW22 | SW | A | 9 | 5 | 1 | 85.444 | 9.163 | 8.947 |
| SW23 | SW | B | 10 | 5 | 1 | 81.896 | 9.470 | 8.787 |
| SW24 | SW | B | 9 | 6 | 1 | 84.182 | 10.027 | 9.783 |
| YJ01 | YJ | B | 10 | 6 | 1 | 96.941 | 12.737 | 11.950 |
| YJ02 | YJ | B | 10 | 5 | 1 | 82.637 | 14.770 | 13.423 |
| YJ03 | YJ | B | 9 | 6 | 0 | 91.657 | 13.577 | 12.527 |
| YJ04 | YJ | B | 10 | 5 | 1 | 86.637 | 14.217 | 12.603 |
| YJ05 | YJ | B | 9 | 6 | 1 | 92.368 | 14.933 | 14.293 |
| YJ06 | YJ | B | 10 | 6 | 1 | 88.420 | 14.467 | 13.100 |
| YJ07 | YJ | B | 10 | 5 | 1 | 83.722 | 13.967 | 12.703 |
| YJ08 | YJ | B | 11 | 5 | 1 | 82.904 | 17.387 | 14.963 |
| YJ10 | YJ | B | 7 | 6 | 1 | 81.535 | 16.377 | 14.867 |
| YJ11 | YJ | B | 10 | 5 | 1 | 86.042 | 14.540 | 12.870 |
| YJ12 | YJ | B | 10 | 6 | 1 | 84.067 | 15.513 | 13.853 |
| YJ13 | YJ | B | 9 | 6 | 1 | 75.052 | 18.307 | 15.690 |
| YJ14 | YJ | B | 8 | 6 | 1 | 85.419 | 15.400 | 13.697 |
| YJ15 | YJ | B | 9 | 6 | 1 | 80.540 | 17.697 | 15.753 |
| YJ16 | YJ | B | 11 | 6 | 1 | 88.550 | 14.843 | 13.853 |
| YJ17 | YJ | B | 10 | 5 | 1 | 88.746 | 14.823 | 13.290 |
| YJ18 | YJ | B | 9 | 7 | 1 | 79.091 | 18.877 | 16.760 |
| YJ19 | YJ | B | 11 | 5 | 0 | 88.375 | 13.153 | 11.827 |
| YJ20 | YJ | B | 10 | 6 | 1 | 80.539 | 20.220 | 17.317 |
| YJ21 | YJ | B | 9 | 5 | 1 | 87.717 | 18.630 | 16.027 |
| YJ22 | YJ | B | 10 | 6 | 1 | 80.945 | 18.127 | 15.927 |
| YJ23 | YJ | B | 10 | 5 | 1 | 85.980 | 14.747 | 13.630 |
| YJ24 | YJ | B | 10 | 5 | 1 | 81.086 | 18.547 | 16.633 |
| ZH01 | ZH | E | 9 | 7 | 1 | 79.715 | 22.693 | 19.143 |
| ZH02 | ZH | B | 11 | 5 | 1 | 72.978 | 16.420 | 14.663 |
| ZH03 | ZH | B | 8 | 6 | 1 | 70.818 | 17.460 | 15.353 |
| ZH04 | ZH | B | 10 | 6 | 1 | 70.029 | 21.417 | 18.310 |
| ZH05 | ZH | B | 10 | 6 | 1 | 80.900 | 16.977 | 16.160 |
| ZH06 | ZH | B | 10 | 6 | 1 | 73.860 | 19.390 | 17.090 |
| ZH07 | ZH | B | 9 | 5 | 1 | 81.713 | 15.260 | 14.400 |
| ZH08 | ZH | B | 9 | 6 | 1 | 72.388 | 19.270 | 16.557 |
| ZH09 | ZH | B | 11 | 6 | 1 | 72.457 | 19.193 | 17.230 |
| ZH10 | ZH | B | 10 | 6 | 1 | 68.629 | 18.523 | 15.533 |
| ZH11 | ZH | B | 11 | 6 | 1 | 83.260 | 16.333 | 15.180 |
| ZH12 | ZH | B | 11 | 5 | 1 | 78.617 | 14.110 | 13.157 |
| ZH13 | ZH | B | 11 | 5 | 1 | 75.776 | 14.027 | 13.173 |
| ZH14 | ZH | B | 11 | 5 | 1 | 73.283 | 13.910 | 13.023 |
| ZH15 | ZH | B | 10 | 5 | 1 | 78.083 | 13.170 | 11.757 |
| ZH16 | ZH | B | 11 | 5 | 1 | 77.939 | 12.747 | 11.990 |
| ZH17 | ZH | B | 12 | 5 | 1 | 79.297 | 13.837 | 12.727 |
| ZH18 | ZH | B | 10 | 5 | 1 | 85.259 | 17.873 | 16.623 |
| ZH19 | ZH | B | 10 | 5 | 1 | 79.044 | 16.013 | 14.140 |
| ZH20 | ZH | B | 9 | 5 | 1 | 84.048 | 14.553 | 13.407 |
| ZH21 | ZH | B | 10 | 5 | 1 | 80.401 | 14.167 | 12.833 |
| ZH22 | ZH | B | 11 | 5 | 1 | 77.203 | 15.413 | 13.890 |
| ZH23 | ZH | B | 12 | 6 | 1 | 77.131 | 15.297 | 13.520 |
| ZH24 | ZH | B | 11 | 5 | 1 | 87.336 | 13.510 | 12.860 |

N1, number of spiral ribs on the lower side of the last whorl; N2, number of spiral ribs on the upper side of the last whorl; R, roughness of granules on the spiral ribs (flat = 0; granular = 1) above the suture near the aperture; AA, apical acuteness; SH, shell height; SW, shell width.

**Table S2** Summary of p-value statistics in environmental modelling between morphological distance and environmental distance.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **PC1** | **PC2** | **PC5** | **PC6** |
| Bio1 | 0.885 | 0.634 | 0.171 | 0.275 |
| Bio2 | 0.723 | 0.973 | 0.224 | 0.406 |
| Bio3 | 0.962 | 0.747 | 0.797 | 0.588 |
| Bio4 | 0.824 | 0.828 | 0.290 | 0.361 |
| Bio5 | 0.563 | 0.536 | 0.011\*\* | 0.753 |
| Bio6 | 0.905 | 0.740 | 0.172 | 0.348 |
| Bio7 | 0.819 | 0.786 | 0.255 | 0.315 |
| Bio8 | 0.728 | 0.962 | 0.432 | 0.435 |
| Bio9 | 0.680 | 0.994 | 0.243 | 0.415 |
| Bio10 | 0.768 | 0.539 | 0.061\* | 0.314 |
| Bio11 | 0.959 | 0.713 | 0.194 | 0.318 |
| Bio12 | 0.414 | 0.686 | 0.115 | 0.655 |
| Bio13 | 0.812 | 0.629 | 0.695 | 0.485 |
| Bio14 | 0.139 | 0.939 | 0.121 | 0.429 |
| Bio15 | 0.215 | 0.706 | 0.205 | 0.441 |
| Bio16 | 0.976 | 0.563 | 0.565 | 0.502 |
| Bio17 | 0.133 | 0.975 | 0.118 | 0.310 |
| Bio18 | 0.915 | 0.735 | 0.557 | 0.543 |
| Bio19 | 0.493 | 0.944 | 0.226 | 0.226 |
| temperature | 0.675 | 0.701 | 0.139 | 0.312 |
| salinity | 0.513 | 0.925 | 0.980 | 0.964 |

\*\*, significant code; \*, marginally significant code; Bio1, annual mean temperature; Bio2, mean diurnal range (mean of monthly (max temp – min temp)); Bio3, isothermality (Bio2/Bio7)(\*100); Bio5, max temperature of warmest month; Bio6, min temperature of coldest month; Bio7, temperature annual range (Bio5-Bio6); Bio8, mean temperature of wettest quarter; Bio9, mean temperature of driest quarter; Bio10, mean temperature of warmest quarter; Bio11, mean temperature of coldest quarter; Bio12, annual precipitation; Bio13, precipitation of wettest month; Bio14, precipitation of driest month; Bio15, precipitation seasonality (Coefficient of variation); Bio16, precipitation of wettest quarter; Bio17, precipitation of driest quarter; Bio18, precipitation of warmest quarter; Bio19, precipitation of coldest quarter.