**Table S6**. Correlation coefficient and adjusted P-values for correlation between substitution rates and plastome rearrangement measured by inversion distance. Significant P-values are highlighted in red font.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Species | *dN* Cor | *dN* Adjusted  P value | *dS* Cor | *dS* Adjusted  P value | Clade |
| *Leptocylindrus danicus* | 0.249362463 | 1 | 0.274406108 | 1 | radial1 |
| *Proboscia* sp. | 0.281901059 | 1 | 0.209321483 | 1 | radial2 |
| *Actinocyclus subtilis* | 0.421786386 | 0.299431933 | 0.363209145 | 0.921825966 | radial3 |
| *Coscinodiscus radiatus* | 0.416940345 | 0.331100498 | 0.38572864 | 0.612029705 | radial3 |
| *Rhizosolenia setigera* | 0.466018696 | 0.111588386 | 0.369400225 | 0.825877165 | radial3 |
| *Guinardia striata* | 0.511819208 | 0.034681049 | 0.43514724 | 0.225242417 | radial3 |
| *Rhizosolenia fallax* | 0.504714175 | 0.042023163 | 0.463100951 | 0.119579107 | radial3 |
| *Rhizosolenia imbricata* | 0.449402086 | 0.164155514 | 0.440441621 | 0.200582541 | radial3 |
| *Lithodesmium undulatum* | 0.173043419 | 1 | 0.163370113 | 1 | polar1 |
| *Eunotogramma* sp. | 0.142648235 | 1 | 0.161402882 | 1 | polar1 |
| *Roundia cardiophora* | 0.674043907 | 0.000102068 | 0.689209635 | 4.90E-05 | polar1 |
| *Thalassiosira weissflogii* | 0.697095747 | 3.28E-05 | 0.695149186 | 3.63E-05 | polar1 |
| *Discostella pseudostelligera* | 0.696753636 | 3.34E-05 | 0.699876785 | 2.84E-05 | polar1 |
| *Thalassiosira oceanica* | 0.775774078 | 2.64E-07 | 0.778485249 | 2.16E-07 | polar1 |
| *Cyclotella nana* | 0.710748719 | 1.59E-05 | 0.713458405 | 1.37E-05 | polar1 |
| *Cyclotella* sp.L04\_2 | 0.702493306 | 2.48E-05 | 0.714705524 | 1.28E-05 | polar1 |
| *Cyclotella* sp.WC03\_2 | 0.702450644 | 2.48E-05 | 0.714486026 | 1.30E-05 | polar1 |
| *Plagiogrammopsis van heurckii* | 0.539178885 | 0.015901802 | 0.517654516 | 0.029528124 | polar1 |
| *Trieres sinensis* | 0.55324712 | 0.010370159 | 0.55223179 | 0.010701918 | polar1 |
| *Triceratium dubium* | 0.54893446 | 0.011846083 | 0.548404246 | 0.012039974 | polar1 |
| *Cerataulina daemon* | 0.385386993 | 0.61597059 | 0.414586181 | 0.347493932 | polar2 |
| *Acanthoceras zachariasii* | 0.607803552 | 0.001625466 | 0.549880351 | 0.011507131 | polar2 |
| *Chaetoceros simplex* | 0.607150507 | 0.001665304 | 0.529659953 | 0.021014678 | polar2 |
| *Attheya longicornis* | 0.324697507 | 1 | 0.330594406 | 1 | polar3 |
| *Biddulphia tridens* | 0.573014743 | 0.00550208 | 0.545305193 | 0.013231303 | polar3 |
| *Biddulphia biddulphiana* | 0.590314317 | 0.003053483 | 0.565746504 | 0.006978508 | polar3 |
| *Asterionellopsis glacialis* | 0.41273536 | 0.360865861 | 0.250482164 | 1 | araphid1 |
| *Plagiogramma staurophorum* | 0.48560559 | 0.069037318 | 0.401567136 | 0.451263897 | araphid1 |
| *Psammoneis obaidii* | 0.444644599 | 0.182706417 | 0.278596095 | 1 | araphid1 |
| *Asterionella formosa* | 0.479432935 | 0.080560614 | 0.445734299 | 0.178303945 | araphid2 |
| *Astrosyne radiata* | 0.743113847 | 2.41E-06 | 0.598559319 | 0.002278767 | araphid2 |
| *Synedra acus* | 0.62298395 | 0.000911655 | 0.439424521 | 0.205129545 | araphid2 |
| *Licmophora* sp. | 0.682795027 | 6.72E-05 | 0.496816073 | 0.051773684 | araphid2 |
| *Eunotia naegelii* | 0.493281213 | 0.05675078 | 0.390963517 | 0.554255499 | raphid |
| *Cylindrotheca closterium* | 0.58102035 | 0.004207043 | 0.453658639 | 0.148968941 | raphid |
| *Seminavis robusta* | 0.574853202 | 0.005176409 | 0.422466096 | 0.295205369 | raphid |
| *Entomoneis* sp*.* | 0.660163357 | 0.00019283 | 0.586512136 | 0.003485367 | raphid |
| *Fistulifera* sp. JPCC DA0580 | 0.507540489 | 0.038952023 | 0.436830462 | 0.21713278 | raphid |
| *Didymosphenia germinata* | 0.601524138 | 0.002047095 | 0.505160094 | 0.041524793 | raphid |
| *Phaeodactylum tricornutum* | 0.599266452 | 0.002221449 | 0.516731197 | 0.030295096 | raphid |