Supplementary table 1. Chloroplast genome data used in this study.

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| --- | --- | --- | --- |
| Species | Strain identifier | Genbank accession no. | Genome size |
| *Ankyra judayi* | SAG 17.84 | KT199255 | 157224 bp |
| *Bracteacoccus aerius* | UTEX 1250 | KT199254 | 165732 bp |
| *Bracteacoccus giganteus* | UTEX 1251 | KT625421 | 242897 bp |
| *Bracteacoccus minor* | UTEX 66 | KT199253 | 192761 bp |
| *Chlorotetraedron incus* | SAG 43.81 | KT199252 | 193197 bp |
| *Chromochloris zofingiensis* | UTEX 56 | KT199251 | 188935 bp |
| *Hariotina* sp. | MMOGRB0030F | KX131180 | 210757 bp |
| *Hydrodictyon reticulatum* | HAM0289 | KY114065 | 225641 bp |
| *Kirchneriella aperta* | SAG 2004 | KT199250 | 207516 bp |
| *Monoraphidium neglectum* | SAG 48.87 | CM002678 | 135362 bp |
| *Mychonastes jurisii* | SAG 37.98 | KT625411 | 103047 bp |
| *Mychonastes homosphaera* | CAUP H6502 | KT199249 | 102718 bp |
| *Neochloris aquatica* | UTEX 138 | KT199248 | 166767 bp |
| *Pectinodesmus pectinatus* | - | KU847995 | 196809 bp |
| *Pediastrum duplex* | EL0201CT | KY114064 | 232554 bp |
| *Pseudomuriella schumacherensis* | SAG 2137 | KT199256 | 220357 bp |
| *Tetradesmus obliquus* | UTEX 393 | DQ396875 | 161452 bp |
| *Tetrabaena socialis* | - | KX232643 | 405647 bp |
| *Chlamydomonas applanata* | SAG:11-9 | KT625417 | 203225 bp |
| *Dunaliella salina* | - | NC016732 | 269044 bp |

Supplementary table 2. Survey of some morphological features of *Coelastrella* species.

|  |  |  |  |
| --- | --- | --- | --- |
| Species | Cell form | Cell wall ribs | Cell dimensions（μm) |
| *C. saipanensis* | spherical | 10-20 | 5-10- (14)μm |
| *C. oocystiformis* | young:spindle  mature: ellipsoidal,oval | 8-14 | (6.5)9-18μm×(4.5)7-14μm |
| *C. terrestris* | spindle | 8-12 | (5)-14-22×(3.5)-6-15μm |
| *C. levicostata* | spindle | 6-8 | 9-19×6.5-15μm |
| *C. rubescens* | young: spindle, spherical  mature: spherical | ~10 | 3.5-6-(11)μm |
| *C. striolata* | ellipsoidal to globose | 16-40 | (6)12-20(22)μm×  (4.5)9.5-18(22.5)μm |
| *C. multistriata* | ovoid, ellipsoidal to globose | 16-40 | (4)9-12(13) ×(3)7-11(12) μm |
| *C. aeroterrestrica* | spherical | 6-16 | (3.5)5-10(12) μm |
| *C. ellipsodea* | spherical or ellipsoidal | ~15 | 8–10×6–9 μm |
| *C. multistriata* var*. grandicosta* | ellipsoidal or irregular ellipsoidal | 9-12 | 7-12×6-9 μm |
| *C. vacuolata* | young: spindle  mature: spherical or ellipsoidal | none | 5.5-12×3.5-11μm |

Supplementary table 3. List of genes in the *Coelastrella saipanensis* plastid genome.

|  |  |  |
| --- | --- | --- |
| **Category for genes** | **Group of genes** | **Name of genes** |
| Self replication | Ribosomal RNAs | *rrl*1*, rrf*1*, rrs*1 |
|  | Transfer RNAs | *trn*A(ugc) 1, *trn*C(gca), *trn*D(guc), *trn*E(uuc) 1, *trn*F(gaa), *trn*G(gcc), *trn*G(ucc), *trn*H(gug) 1, *trn*I(gau) 1, *trn*K(uuu), *trn*L(uaa), *trn*L(uag), *trn*Me(cau)1, *trn*Mf(cau), *trn*N(guu), *trn*P(ugg), *trn*Q(uug), *trn*R(acg), *trn*R(ucu), *trn*S(gcu) 1, *trn*S(uga), *trn*T(ugu), *trn*V(uac), *trn*W(cca), *trn*Y(gua) |
|  | Ribosomal protein(SSU) | *rps*2, *rps*3, *rps*4, *rps*7, *rps*8, *rps*9, *rps*11, *rps*12, *rps*14, *rps*18, *rps*19 |
|  | Ribosomal protein(LSU) | *rpl*2, *rpl*5, *rpl*12, *rpl*14, *rpl*16, *rpl*20, *rpl*23, *rpl*36 |
|  | RNA polymerase | *rpo*A, *rpo*Ba, *rpo*Bb, *rpo*C1, *rpo*C2 |
| Genes for photosynthesis | Photosystem I | psaA, psaB, psaC, psaJ, ycf3, ycf4 |
|  | Photosystem II | *psb*A, *psb*B, *psb*C, *psb*D, *psb*E, *psb*F, *psb*H, *psb*I, *psb*J, *psb*K, *psb*L, *psb*M, *psb*N, *psb*T, *psb*Z, ycf12 |
|  | Cytochrome b/f complex | *pet*A, *pet*B, *pet*D, *pet*G, *pet*L |
|  | *ATP* synthase | *atp*A, *atp*B, *atp*E, *atp*F, *atp*H, *atp*I |
|  | Rubisco large subunit | *rbc*L |
| Other genes | Chlorophyll biosynthesis genes | *chl*B, *chl*L, *chl*N |
|  | Envelop membrane protein | *cem*A |
|  | c-type cytochrome synthesis *ccs*A gene | *ccs*A |
|  | Translation initiation factor IF-1 | *inf*A |
|  | Transcription elongation factor Tu | *tuf*A |
|  | Cell division protein | ftsH |
|  | protease | *clp*P |
|  | protein import | *ycf*1 |
|  | DNA polymerase | orf642 |
|  | reverse transcriptase/ maturase | orf177, orf 1036 |
|  | endonucleases | orf229, orf336, orf283, orf132, orf256, orf236, orf222, orf242, orf249, orf359, orf353 |
| Genes of unknown function | Hypothetical chloroplast reading frames | freestanding: orf345, orf 833, orf103, orf106, orf102, orf148 1, orf117 1  intronic: orf118, orf405, orf100 |

1Genes that have two copies in this genome.