Table S2. Nucleotide differences across chloroplast genes of the three holopelagic *Sargassum* forms. (Multiple numbers in a given cell indicate multiple polymorphic sites; \* = the nucleotide at that site is identical to those in the other libraries; X = incomplete gene content, not considered in comparison). Chloroplast genomes (C1-C6) match mitogenome designations (see Table S1).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | *S. natans VIII* (SN8) | *S. natans I*(SN1) | *S. fluitans III*(SF3) |  | Differentiating Polymorphic Sites |
| Gene | Function | C3 | C4 | C6 | C2 | C5 | C1 |  | SN8 | SF3 | SN8 vs.SN1 | SN8 vs.SF3 | SN1 vs. SF3 |
| *acsF* | Light harvesting and chl biosynthesis | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *atpA* | Electron transport and ATP synthesis | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *atpB* | Electron transport and ATP synthesis | \*/\*/\* | \*/\*/\* | \*/\*/\* | \*/\*/\* | X | 1/2/3 |   |  |  |  | √ | √ |
| *atpD* | Electron transport and ATP synthesis | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *atpE* | Electron transport and ATP synthesis | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *atpF* | Electron transport and ATP synthesis | X | \* | \* | \* | 1 | X |   |  |  |  | √ | √ |
| *atpG* | Electron transport and ATP synthesis | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *atpH* | Electron transport and ATP synthesis | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *atpI* | Electron transport and ATP synthesis | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *cbbx* | Signal transduction | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ccs1* | Electron transport and ATP synthesis | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ccsA* | Electron transport and ATP synthesis | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *chlB* | Light harvesting and chl biosynthesis | \* | \* | \* | 1 | X | X |   |   |   | √ |  |  |
| *chlI* | Light harvesting and chl biosynthesis | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *chlL* | Light harvesting and chl biosynthesis | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *chlN* | Light harvesting and chl biosynthesis | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *clpC* | Proteolysis | \*/\*/\*/\*/\* | \*/\*/\*/\*/\* | \*/\*/\*/\*/\* | 1/\*/\*/4/\* | X | 1/2/3/\*/5 |   |  |  | √ | √ | √ |
| *dnaB* | Transcription and translation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *dnaK* | Chaperones | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ftrB* | Signal transduction | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ftsH* | Proteolysis | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *groEL* | Chaperones | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ilvB* | Carbon assimilation | X | X | X | \* | X | X |   |  |  |  |  |  |
| *ilvH* | Carbon assimilation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *orf219* | Conserved hypothetical genes | X | \* | \* | 1 | X | X |   |  |  | √ |  |  |
| *orf467* | Conserved hypothetical genes | X | X | X | X | X | X |   |  |  |  |  |  |
| *petA* | Electron transport and ATP synthesis | \* | \* | \* | \* | X | 1 |   |  |  |  | √ | √ |
| *petB* | Electron transport and ATP synthesis | \* | \* | \* | \* | X | 1 |   |  |  |  | √ | √ |
| *petD* | Electron transport and ATP synthesis | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *petF* | Electron transport and ATP synthesis | \* | \* | \* | \* | \* | X |   |  |  |  |  |  |
| *petG* | Electron transport and ATP synthesis | X | X | \* | \* | X | X |   |  |  |  |  |  |
| *petJ* | Electron transport and ATP synthesis | \* | X | X | X | X | X |   |  |  |  |  |  |
| *petL* | Electron transport and ATP synthesis | X | X | \* | \* | X | X |   |  |  |  |  |  |
| *petM* | Electron transport and ATP synthesis | X | \* | \* | \* | \* | X |   |  |  |  |  |  |
| *petN* | Electron transport and ATP synthesis | X | \* | \* | \* | \* | X |   |  |  |  |  |  |
| *psaA* | Photosystem I | \* | \* | \* | \* | X | 2 |   |  |  |  |  |  |
| *psaB* | Photosystem I | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *psaC* | Photosystem I | \* | \* | \* | \* | 1 | \* |   |   | √ |   |   |   |
| *psaD* | Photosystem I | \* | \* | \* | \* | X | 1 |   |  |  |  | √ | √ |
| *psaE* | Photosystem I | X | \* | \* | \* | \* | X |   |  |  |  |  |  |
| *psaF* | Photosystem I | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *psaI* | Photosystem I | \* | \* | \* | \* | X | X |   |  |  |  |  |  |
| *psaJ* | Photosystem I | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *psaL* | Photosystem I | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *psaM* | Photosystem I | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *psb28* | Photosystem II | \*/\* | \*/\* | \*/\* | \*/\* | X | 1/2 |   |  |  |  | √ | √ |
| *psbA* | Photosystem II | \* | \* | \* | \* | X | 1 |   |  |  |  |  |  |
| *psbB* | Photosystem II | \* | \* | \* | \* | X | 1 |   |  |  |  |  |  |
| *psbC* | Photosystem II | \*/\*/\* | \*/\*/\* | \*/\*/\* | \*/\*/\* | X | 1/2/3 |   |  |  |  | √ | √ |
| *psbD* | Photosystem II | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *psbE* | Photosystem II | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *psbF* | Photosystem II | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *psbH* | Photosystem II | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *psbI* | Photosystem II | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *psbJ* | Photosystem II | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *psbK* | Photosystem II | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *psbL* | Photosystem II | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *psbN* | Photosystem II | X | \* | \* | \* | \* | X |   |  |  |  |  |  |
| *psbT* | Photosystem II | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *psbV* | Photosystem II | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *psbX* | Photosystem II | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *psbY* | Photosystem II | X | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rbcL* | Carbon assimilation | \* | \* | \* | \* | X | 1 |   |  |  |  | √ | √ |
| *rbcR* | Signal transduction | X | \* | X | \* | X | X |   |  |  |  |  |  |
| *rbcS* | Carbon assimilation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rpl1* | Transcription and translation | \* | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rpl11* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rpl12* | Transcription and translation | \* | X | \* | \* | X | \* |   |  |  |  |  |  |
| *rpl13* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rpl14* | Transcription and translation | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *rpl16* | Transcription and translation | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *rpl18* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rpl19* | Transcription and translation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rpl2* | Transcription and translation | \* | \* | \* | 1 | X | \* |   |  |  | √ |  |  |
| *rpl20* | Transcription and translation | X | \* | \* | \* | \* | X |   |  |  |  |  |  |
| *rpl21* | Transcription and translation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rpl22* | Transcription and translation | \* | \* | \* | \* | X | 1 |   |  |  |  | √ | √ |
| *rpl23* | Transcription and translation | \* | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rpl24* | Transcription and translation | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *rpl27* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rpl29* | Transcription and translation | X | \* | \* | \* | \* | X |   |  |  |  |  |  |
| *rpl3* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rpl31* | Transcription and translation | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *rpl32* | Transcription and translation | \* | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rpl33* | Transcription and translation | X | X | X | \* | X | X |   |  |  |  |  |  |
| *rpl34* | Transcription and translation | X | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rpl35* | Transcription and translation | \* | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rpl36* | Transcription and translation | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *rpl4* | Transcription and translation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
|  |  | *S. natans VIII*(SN8) | *S.natans I*(SN1) | *S. fluitans III*(SF3) |  | Differentiating Polymorphic Sites |
| Gene | Function | C3 | C4 | C6 | C2 | C5 | C1 |  | SN8 | SF3 | SN8 vs.SN1 | SN8 vs.SF3 | SN1 vs. SF3 |
| *rpl5* | Transcription and translation | \* | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rpl6* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rpl9* | Transcription and translation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rpoA* | Transcription and translation | X | X | \* | \* | X | X |   |  |  |  |  |  |
| *rpoB* | Transcription and translation | X | \* | \* | 1 | X | X |   |  |  | √ |  |  |
| *rpoC1* | Transcription and translation | X | \* | \* | 1 | X | X |   |  |  | √ |  |  |
| *rpoC2* | Transcription and translation | X | \* | \* | 1 | X | X |   |  |  | √ |  |  |
| *rps1* | Transcription and translation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rps10* | Transcription and translation | \* | X | \* | \* | X | X |   |  |  |  |  |  |
| *rps11* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rps12* | Transcription and translation | \* | \* | \* | \* | X | 1 |   |  |  |  | √ | √ |
| *rps13* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rps14* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rps16* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rps17* | Transcription and translation | \* | \* | \* | \* | X | 1 |   |  |  |  | √ | √ |
| *rps18* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *rps19* | Transcription and translation | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *rps2* | Transcription and translation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rps20* | Transcription and translation | X | \* | \* | \* | \* | X |   |  |  |  |  |  |
| *rps3* | Transcription and translation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rps4* | Transcription and translation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rps5* | Transcription and translation | \* | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rps7* | Transcription and translation | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *rps8* | Transcription and translation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *rps9* | Transcription and translation | \* | \* | \* | \* | X | 1 |   |  |  |  | √ | √ |
| *secA* | Protein import | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *secY* | Protein import | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *sufB* | Fe-S assembly | \* | \* | \* | \* | X | X |   |  |  |  |  |  |
| *sufC* | Fe-S assembly | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *tatC* | Protein import | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *thiG* | Carbon assimilation | \*/\* | \*/\* | \*/\* | 1/\* | X | \*/2 |   |   |   | √ | √ | √ |
| *thiS* | Carbon assimilation | X | \* | \* | \* | \* | X |   |  |  |  |  |  |
| *trnL(taa) intron* | - | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *tsf* | Transcription and translation | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *tufA* | Transcription and translation | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *ycf12* | Photosystem II | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf19* | Conserved hypothetical genes | \* | \* | \* | 1 | X | X |   |  |  | √ |  |  |
| *ycf3* | Photosystem I | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf33* | Conserved hypothetical genes | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf34* | Conserved hypothetical genes | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf35* | Conserved hypothetical genes | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf37* | Conserved hypothetical genes | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf39* | Conserved hypothetical genes | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf4* | Photosystem I | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf41* | Conserved hypothetical genes | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf42* | Conserved hypothetical genes | \* | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf46* | Conserved hypothetical genes | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf47* | Conserved hypothetical genes | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf54* | Conserved hypothetical genes | \* | \* | \* | \* | X | X |   |  |  |  |  |  |
| *ycf65* | Conserved hypothetical genes | \* | \* | \* | \* | X | 1 |   |  |  |  | √ | √ |
| *ycf66* | Conserved hypothetical genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *16S rns-1 rRNA* | Ribosomal RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *16S rns-2 rRNA* | Ribosomal RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *23S rnl-1 rRNA* | Ribosomal RNA genes | 1 | 1 | 1 | 1 | X | X |   | √ |   | √ |   |   |
| *23S rnl-2 rRNA* | Ribosomal RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *5S rrn5-1 rRNA* | Ribosomal RNA genes | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *5S rrn5-2 rRNA* | Ribosomal RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnA-1(ugc) tRNA* | Transfer RNA genes | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *trnA-2(ugc) tRNA* | Transfer RNA genes | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *trnC(gca) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnD(guc) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnE(uuc) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnF(gaa) tRNA* | Transfer RNA genes | \* | X | \* | \* | X | \* |   |  |  |  |  |  |
| *trnG-1(gcc) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | 1 |   |  |  |  | √ | √ |
| *trnG-2(ucc) tRNA* | Transfer RNA genes | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *trnH(gug) tRNA* | Transfer RNA genes | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *trnI-1(gau) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnI-2(gau) tRNA* | Transfer RNA genes | \* | \* | \* | \* | 1 | \* |   |   | √ |   | √ | √ |
| *trnK(uuu) tRNA* | Transfer RNA genes | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *trnL-1(uaa) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnL-2(uag) tRNA* | Transfer RNA genes | X | \* | \* | \* | X | X |   |  |  |  |  |  |
| *trnM-1(cau) tRNA* | Transfer RNA genes | \* | X | \* | 1 | X | \* |   |  |  | √ |  | √ |
| *trnM-2(cau) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnM-3(cau) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnN(guu) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnP(ugg) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnQ(uug) tRNA* | Transfer RNA genes | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *trnR-1(acg) tRNA* | Transfer RNA genes | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *trnR-2(ucu) tRNA* | Transfer RNA genes | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |
| *trnS-1(gcu) tRNA* | Transfer RNA genes | \* | X | \* | \* | X | \* |   |  |  |  |  |  |
| *trnS-2(uga) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnT(ugu) tRNA* | Transfer RNA genes | \* | \* | \* | 1 | X | \* |   |  |  | √ |  | √ |
| *trnV(uac) tRNA* | Transfer RNA genes | \* | \* | \* | \* | X | \* |   |  |  |  |  |  |
| *trnW(cca) tRNA* | Transfer RNA genes | X | X | X | X | X | X |   |  |  |  |  |  |
| *trnY(gua) tRNA* | Transfer RNA genes | \* | \* | \* | \* | \* | \* |   |  |  |  |  |  |