**Supplementary Data Figure S1.** *Circinaria hispida* phycobiont diversity by 454-pyrosequencing: Rooted nrITS DNA gene tree representing 21 *Trebouxia* sequences including representative sequences from each *Trebouxia* lineage detected (T1-T4), and a selection of nrITS *Trebouxia* species from SAG, UTEX and *Trebouxia* sp. TR9 retrieved from the GenBank. Pyrosequencing consensus sequences were encoded as: OTUcode\_number of sequences. Values at branches refer to BI posterior probabilities and ML bootstrap values, respectively.

**Supplementary Data Figure S2.** *Flavoparmelia soredians* phycobiont diversity by 454-pyrosequencing: Rooted nrITS DNA gene tree representing 11 *Trebouxia* sequences including representative sequences from the *Trebouxia* lineage detected (F1), and a selection of nrITS *Trebouxia* species from SAG, UTEX and *Trebouxia* sp. TR9 retrieved from the GenBank. Pyrosequencing consensus sequences were encoded as: OTUcode\_number of sequences. Values at branches refer to BI posterior probabilities and ML bootstrap values, respectively.

**Supplementary Data Figure S3.** Pyrenoid detail from *Trebouxia* T1-type phycobionts in symbiotic and culture states by TEM. Comparative analyses. **A-C-E-G**: isolated cultures T1. **B-D-F-H**: intrathalline T1. Scales: **A, C** = 400 nm; **B, D, E, F, G,** **H** = 300 nm. Abbreviations: Chl, Chloroplast; Pg, Pyrenoglobuli.

**Supplementary Data Figure S4.** Pyrenoid detail from *Trebouxia* T2-type phycobionts in symbiotic and culture states by TEM. Comparative analyses. **A-C-E-G**: isolated cultures T2. **B-D-F-H**: intrathalline T2. Scales: **A, C, E, G** = 400 nm; **B, D, F** = 500 nm and **H** = 700 nm. Abbreviations: BT, Black tubules; Chl, Chloroplast; WT, White tubules.

**Supplementary Data Figure S5.** Pyrenoid detail from *Trebouxia* T3-type phycobionts in symbiotic and culture states by TEM. Comparative analyses. **A-C-E-G**: isolated cultures T3. **B-D-F-H**: intrathalline T3. Scales: **A** = 300 nm; **F** = 400 nm; **B, D, H** = 500 nm and **C, E, G** = 600 nm. Abbreviations: Chl, Chloroplast; PyS, Small pyrenoidal structures.

**Supplementary Data Figure S6.** Pyrenoid detail from *Trebouxia* T4-type phycobionts in symbiotic and culture states by TEM. Comparative analyses. **A-C-E-G**: isolated cultures T4. **B-D-F-H**: intrathalline T4. Scales: **E** = 300 nm; **D, F, G** = 500 nm and **A, B, C, H** = 600 nm. Abbreviations: Chl, Chloroplast; Pg, Pyrenoglobuli; WT, White tubules.

**Supplementary Data Figure S7.** Pyrenoid detail from *Trebouxia* F1-type phycobionts in symbiotic and culture states by TEM. Comparative analyses. **A-C-E-G**: isolated cultures F1. **B-D-F-H**: intrathalline F1. Scales: **A, C, E** = 400 nm; **B, D, G, H** = 500 nm and **F** = 600 nm. Abbreviations: Chl, Chloroplast; Pg, Pyrenoglobuli; T, Tubules.