

Figure S1: Phylogeny including the Phaeophyceae and Viridiplantae with focus on the occurrence of plasmodesmata (PD)/ plasmodesmata-like cell connections (PDLs). The phylogeny is based on [7,77,106-108,110-113,130]. The information on PD presence is based on Tables 1, 2, S1. Dotted branches indicate polytonies which are not sufficiently supported yet or groups whose exact relationship is not essential for the topic of this review. The branch lengths do not represent phylogenetic distances.

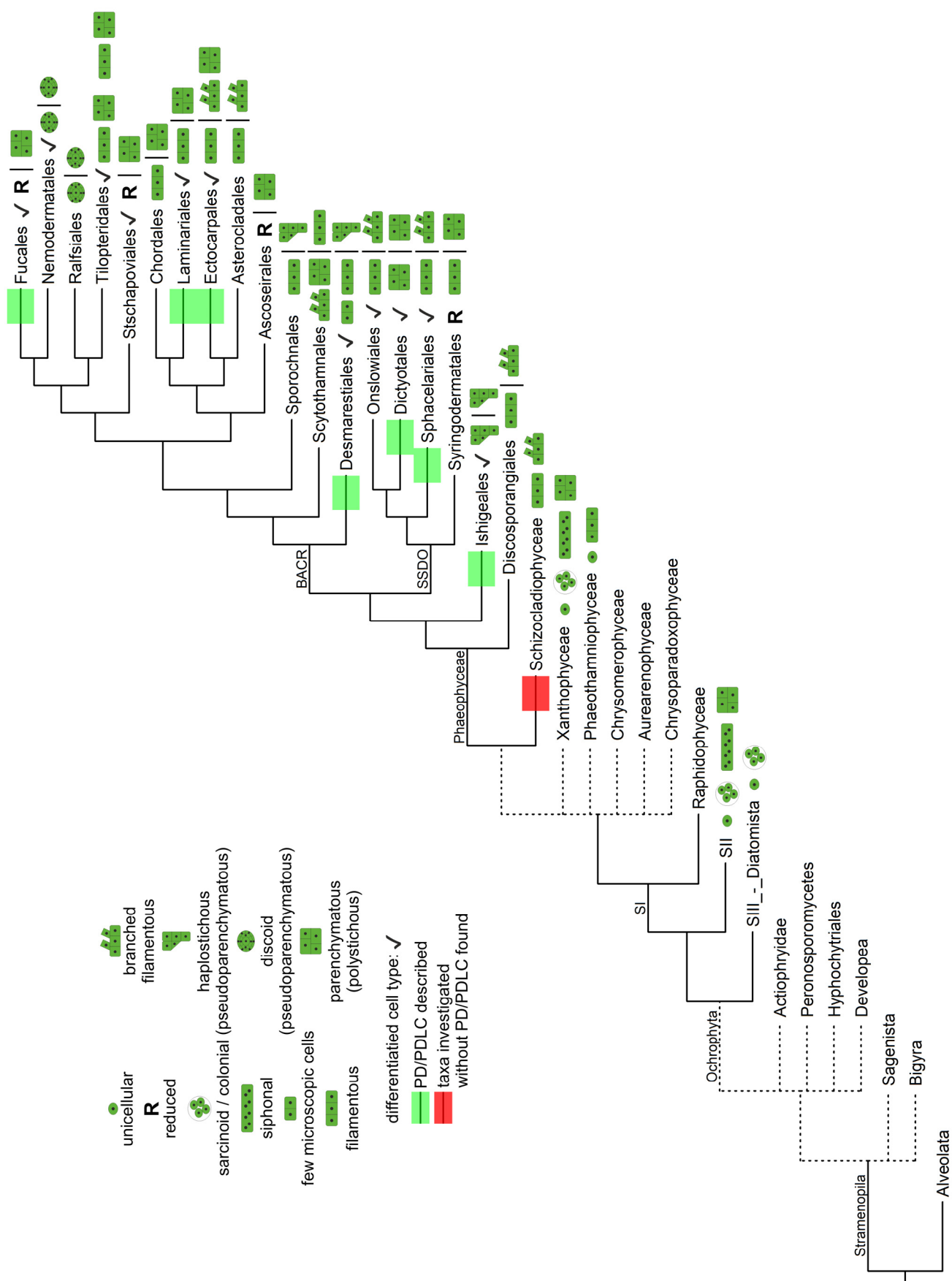


Figure S2: Phylogeny of the Stramenopila (especially Phaeophyceae) with focus on the occurrence of PDLCs (color blocks), body plans (pictographs, indicated for gametophytes and sporophytes separated by `|') and presence of cell differentiation (✓). The phylogeny is based on [77,106,110,130]. Body plan information and cell differentiation status is adopted from [130] with additional information from [5,77,110,151,288]. The information on PD presence is based on Tables 1, 2, S1. Dotted branches indicate polytonies which are not sufficiently supported yet or groups whose exact relationship is not essential for the topic of this review. The branch lengths do not represent phylogenetic distances.

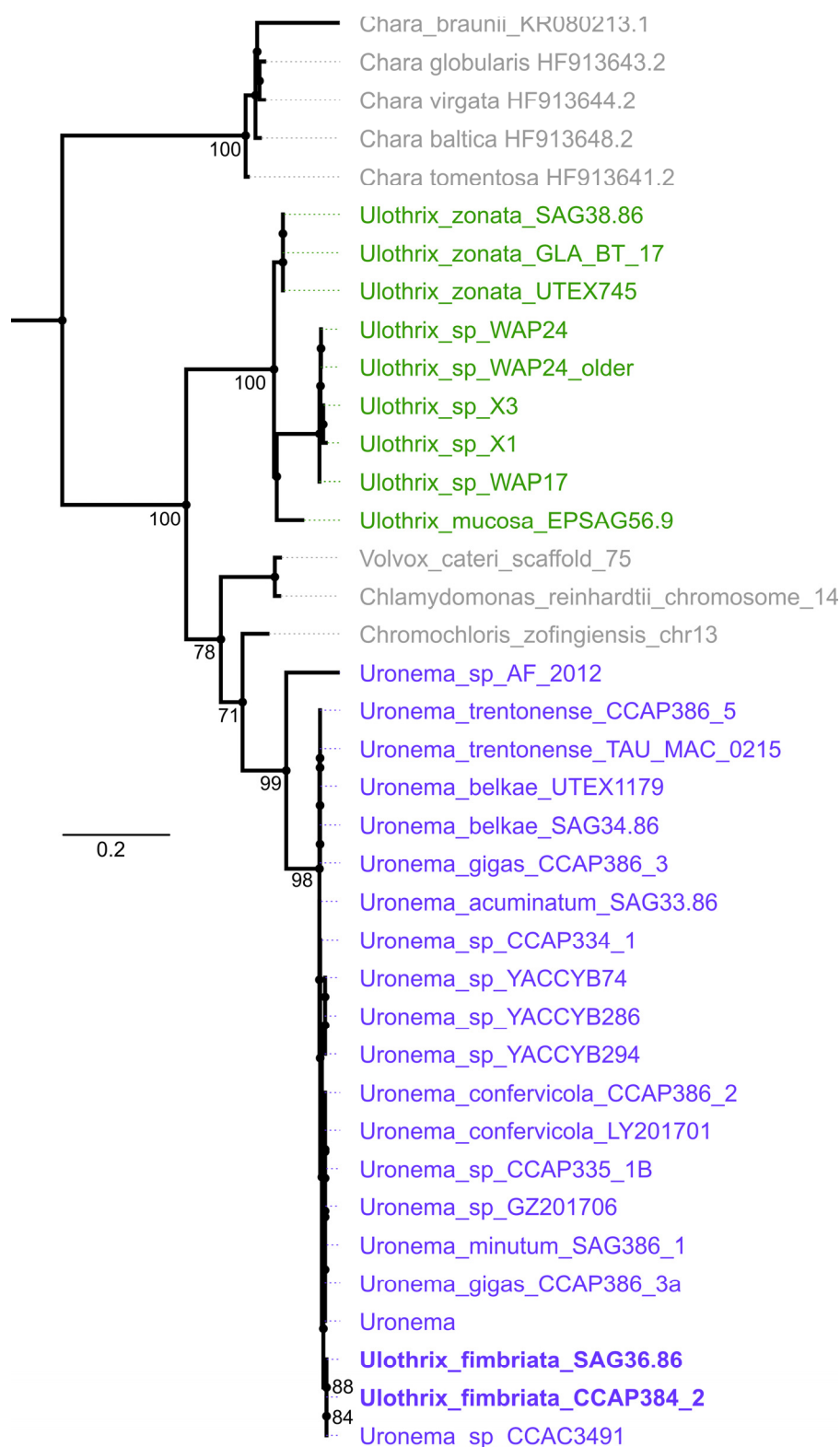


Figure S3: Midpoint rooted Maximum Likelihood phylogeny of 18S rRNA genes. Genomic sequences of 18S rRNA genes were retrieved from NCBI (*Ulothrix* sp. and *Uronema* sp.) and BLAST searches [223] using JGI Phytozome (*Volvox carteri*, *Chlamydomonas reinhardtii* and *Chromochloris zofingiensis*) [224] and NCBI (*Chara* sp.) [225]. Sequences were aligned using MAFFT (--localpair --maxiterate 10000 --reorder) [226]. Phylogeny (Maximum Likelihood, 100 bootstraps) was generated using iqtree (-T AUTO -m TEST -b 100 -con) [227]. (numbers show node support in %, *Ulothrix* sp. – green, *Uronema* sp. – blue, other – grey). The phylogeny was generated by Clemens Rössner JLU Giessen, Germany.

Table S1: List for the presence of PD/PDLCs and non-PD cell connection in Viridiplantae including current phylogenomic classification of species and studied strains (if traceable), mode of cell division (if mentioned), and inner structure of PD (if mentioned). If not mentioned otherwise in the comments column, [algabase.org](https://www.algabase.org) [110] was decisive for the determination of the current name and taxonomic classification. Direct quotes are in ‘...’ and refer to paper within the same row if not mentioned otherwise. X: PD present; -: explicitly mentioned that no PD were found.

The corresponding references are listed in the second excel sheet. Publications were chosen according to the following criteria: explicit mention PD/PDLCs presence or absence, cited by others for PD presence/absence, extensive TEM studies including cellular interfaces (e.g. mostly cell division studies). Not all publications which do not show PD in the observed species are included if they do not explicitly state the lack PD/PDLCs or publications that could not be accessed. All mentions of PD should be covered (except for some repetitions by the same authors for the same species).

as extra file: Table_S1.xlsx