Fig. S1. Life cycle of *Gracilaria.* The life cycle consists of an alternation between haploid dioecious gametophytes and a diploid tetrasporophyte. The tetrasporophyte produces meiospores through meiosis, which develop as gametophytes after release. The sex of the gametophytes is determined by haploid sex chromosomes (UV system). Spores that receive the V sex chromosome develop as male gametophytes whereas spores that carry U chromosome will produce female gametophytes. After fertilization, the zygote develops within the carposporophyte on the female gametophyte and is mitotically amplified—producing thousands of diploid carpospores that after release will give rise to tetrasporophytes.

Fig. S2. Venn diagram of shared and species-specific orthogroups and orphan genes among the four sequenced *Gracilaria* species.