Seasonal variation in the biochemical composition of Arctic macroalgae: Effect of warming and photoperiod.

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The effect of temperature and photoperiod along the year on the composition of 5 macroalgal species representative of the sublittoral system of Kongsfjorden was studied in laboratory conditions. These species were the ochrophytes *Saccharina latissima* and *Alaria esculenta*, the rhodophytes *Phycodrys rubens* and *Ptilota gunneri*, and the chlorophyte *Monostroma* aff. *arcticum* (only present from summer to early autumn). Three different seasons were compared: early March, early August and late September. Two temperatures were tested (4 and 8°C) as well as continuous irradiation (CL - simulating summer) and 12:12 h light:dark photoperiod (simulating equinoxes). Total **carbon** was not affected by warming or photoperiod, except in *S. latissima* in autumn under CL and 4°C, being 40% higher than with photoperiod. **Nitrogen** content generally increased by photoperiod, the highest being found in 12:12 L/D in all seasons. **Carbohydrates** were maximal in CL conditions in all species, indicating that their synthesis is light-stimulated, mainly in the equinoxes. In general, warming did not induce significant changes in carbohydrate content. **Lipid** content was affected by photoperiod only in brown algae. In *S. latissima* lipids presented maximum values in CL in the autumn equinox, while in *A. esculenta* was under photoperiod in summer. **Protein** content did not change with warming or photoperiod in three out of the five species, and only in *S. latissima* and *P. gunneri* proteins were higher in CL than under photoperiod in the autumn equinox. In summary, the results indicate that only isolated changes in the composition of these representative macrophytes may be expected under warming conditions in near-future scenarios, while a general increase in carbon, carbohydrates and proteins under CL was observed mainly in the autumn equinox. The relation of this increase with light utilisation performance will be discussed.