OA2.9 - Mixotrophic protist photosynthesis, an overlooked but important aspect of the peatland carbon cycle

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Mixotrophic protists are increasingly recognized for their significant contribution to aquatic carbon (C) cycling, while in terrestrial systems these organisms are often overlooked, particularly in one of the most soil carbon rich ecosystems, peatlands. Peatlands sequester and store large amounts of C (*ca*. 400–600Gt) in the form of slowly decomposing plant material as peat. Peat-forming mosses (*Sphagnum* spp) provide a habitat for a large diversity of aquatic organisms by maintaining waterlogged conditions. Mixotrophic protists constitute a large proportion of these organisms, often exceeding 70% of the total microbial biomass. With their contribution to CO_2 assimilation by the moss and by modifying C cycling of the microbial food web, mixotrophic protists may be major players in peatland C cycling.

Using a combination of results from field and microcosm experiments, we show that mixotrophic protists in *Sphagnum* play an important role in modulating peatland C cycle. In a climate change experiment, we found that repeated summer warming led to a 50% reduction in the biomass of the dominant peatland mixotrophs, the mixotrophic testate amoebae (MTA). The biomass of other microbial groups (including decomposers) remained unchanged, suggesting MTA to be particularly sensitive to temperature. By experimental manipulation of the abundance of MTA we were able to show that a 50% reduction in MTA biomass resulted in a significant reduction (up to 13%) in net C uptake by the *Sphagnum* moss community. These findings suggest that reduced abundance of MTA with climate warming could lead to reduced peatland C fixation. However, such reduction might depend on the dominant nutritional strategy of mixotrophs (phototrophy vs. predation). Indeed, in a complementary microcosm experiment, we found that ^{15}N and ^{13}C isotopic signatures of MTA strongly vary according to prey availability. This indicates that the effects of mixotrophs (i.e. phototroph-dominant vs. heterotroph-dominant) to peatland C dynamics might differ according to the structure of the microbial food web.

These results provide support for a novel hypothesis that mixotrophic protists play an important functional role in the peatland C cycle. It is urgent we better quantify the influence of mixotrophic protists in the ecology and biogeochemistry of peatlands because rapid changing climate and land use threaten to critically influence peatland C cycling.