Using diatoms and physical and chemical parameters to unveil cow-pasture impact in peat cores from a mountain mire in the south-eastern Alps

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Peatland is a major carbon (C) sink, sequestering more atmospheric carbon dioxide (CO₂) than any other terrestrial ecosystem. Peatlands, and especially bogs, are typically nutrient-poor environments, extremely sensitive to increases in nitrogen (N) deposition. In fact, increasing N content often causes a shift from a moss- to a vascular-plant-dominated vegetation resulting in lower C sequestration rates and/or mobilization of N and C stored in peat by promoting microbial activity. Peatlands are also very selective environments (sub-oxic to anoxic conditions, acidic pH, low N), and thus important habitats for nature conservation because of the occurrence of specifically adapted organisms. Peatlands cover ca. 3% of the world's land surface but Europe lost >60% of this habitat type in the last decades. Moreover, in Italy they are in a marginal position from the phytogeographical standpoint.

Cattle grazing and trampling is a cause of peatland degradation resulting in peat compaction, shift in plant and microbial community composition, and N inputs in form of excreta. In Alpine peatlands overgrazing has been identified as a main problem for habitat integrity and biodiversity.

In the present work, 50-cm deep Belarus cores were collected from the Canton di Ritorto peatland (Adamello-Brenta Nature Park, Trentino, Italy) along a grazing-induced disturbance gradient. The study site has a bog-like vegetation; common species are Pinus mugo, Carex pauciflora, C. echinata, Eriophorum vaginatum, Vaccinium uliginosum, and many Sphagnum species including S. capillifolium, S. medium, S. subfulvum, S. subnites. Peat thickness ranges between 40-160 cm, while electrical conductivity and pH at the surface range between 10-31 µS/cm and 4.0-5.2, respectively.

Cores were cut frozen into 3-cm sections, and analysed for bulk density, water and ash content, and elemental composition (C, N and S). Moreover, diatom taphocoenoses were studied in two peat cores (i.e., the most affected by grazing and the control), investigating alternate slices (i.e., at 6-cm resolution). Diatoms were prepared using hot hydrogen peroxide and/or muffling, and finally embedded in the Naphrax® resin to produce permanent mounts for identifications and counts. The whole procedure was kept quantitative to allow not only the assessment of the per cent
composition of taphocoenoses, but also the calculation of absolute abundances (N-valves/g-peat-
dw).

Preliminary data show that small-scale grazing significantly lowered water content (by 5-10%) and gravimetric water content (by 30-50%), and increased bulk density (1.5-2.2x) compared to the control. Moreover, N concentration was 2-to-3 times higher in grazing-affected sites. Differences between cores affected by grazing and the control were evident in the top 20 cm, whereas no significant differences were observed below 30 cm of depth. More than 80 diatom species were identified throughout the two cores. Several of these are included in threat categories of the Red List for central Europe, and we could also identify a putative species new to science, which is being characterized and described. Some species that tolerate moderate nutrient enrichment were found in the core at the "grazed" extreme of the gradient, whilst several species sensitive to organic pollution were detected only (or were clearly more frequent) in the control.