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The characteristics of dissolved organic matter in Baltic coastal sea ice and underlying waters: allochthonous or autochthonous origins.

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Dissolved organic matter (DOM) can be present at high concentrations within sea ice, although little is known about its characteristics and hereby sources, dynamics and fate. As in underlying waters, DOM within sea ice is a source of carbon and nutrients to the microbial community and also influences the light environment. The origin of the DOM can be either autochthonous; i.e. produced by organisms within the ice, or allochthonous; originating from the underlying water mass and either transported into the ice or trapped within the ice matrix. In this study the characteristics of DOM within and below coastal sea ice in the western Bothnian Sea was examined in order to determine its source. The study site was in an area influenced by the discharge of the river Öreälven (Sweden). Concentrations of dissolved organic carbon and nitrogen (DOC, DON) were measured and DOM was characterised by absorption and fluorescence spectroscopy. Concentrations of DOC and DON, and DOM light absorption were lower within the ice than in the underlying water. DOM concentrations and characteristics were much more variable within the ice in comparison to the underlying water. The DOM fluorescence signal measured could be separated into five different sub-fractions; 3 with characteristics similar to humic material and two with a protein-

like fluorescence. The fractions were identical to those previously found in the Baltic Sea. The fluorescence fingerprinting identified three distinct DOM pools. A freshwater pool, a marine pool and that present within the ice. The fact that their spectral characteristics differed suggests that the DOM pools differed in chemical composition, most likely reflecting differing sources and history (e.g. exposure to degradation processes and exclusion during ice formation). DOC concentrations in the water and within the ice were correlated to and could be predicted by one of the humic sub-fraction fluorescence. DON concentrations however were modelled best by both a humic and protein-like fluorescence indicating the importance of both river borne terrestrial humic material and autochthonous production on the organic nitrogen load.