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THE DISTRIBUTION OF TERRESTRIAL BIOMARKERS ALONG AN ESTUARINE-BASIN TRANSECT IN THE NORTHERN BOTHNIAN BAY

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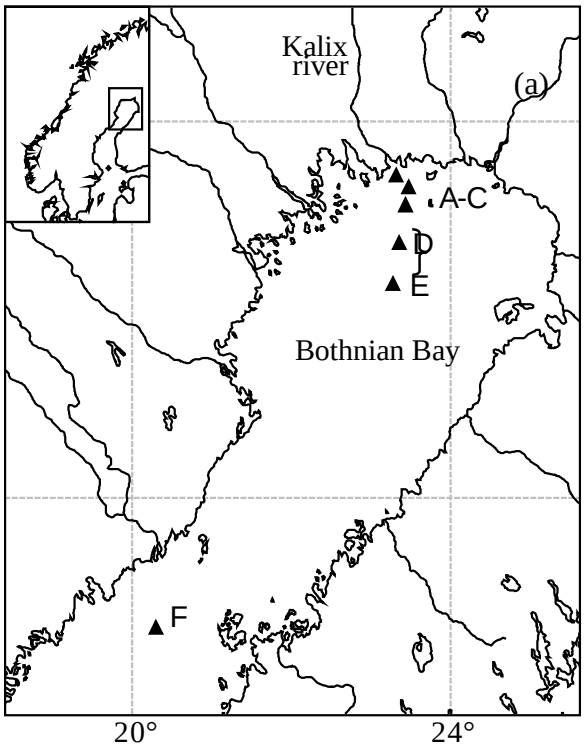
Climate warming is expected to be strongest in high latitude areas such as the Arctic and sub-Arctic (Zwiers, 2002), which is also where a large fraction of the global soil organic matter is held (Dixon et al., 1994). Surface sediment in coastal areas provides an integrated signal of land-derived carbon export fluxes. In this study, we present the results from a surface sediment transect through the northern Bothnian Bay, from the Kalix river mouth to the open basin, providing a baseline study on the terrestrial molecular distribution. Furthermore, the propensity of biomarker deposition along the transect is investigated. This information can be used to predict the impact on mineralisation processes in sub-Arctic shelf areas. The Kalix river is the largest unregulated river system in northern Europe, draining a sub-Arctic catchment. This easily accessible estuary has been shown to resemble the western Great Russian Arctic Rivers (Gustafsson et al., 2000; Ingri et al., 2004; Guo et al., 2004) and can therefore be used as a valuable model system.

The bulk surface sediments (Figure 1a) showed consistent trends in both $\delta^{13}C$ (values between -27.4 and -24.5‰) and total organic carbon (TOC) (between 45.8 and 15.0 mg/g) from the river mouth to the open basin. In the inner estuary (station A), long-chain *n*-alkanes (ΣC_{27}-C_{31}), *n*-alkanoic acids (ΣC_{24}-C_{28}), *n*-alkanols (ΣC_{24}-C_{28}) were present in concentrations of 163, 275 and 390 µg/gOC respectively (Figure 1b). The oc-normalized concentrations of *n*-alkanes and *n*-alkanols were higher further out in the estuary and the basin (station B-E), whereas oc-normalized concentrations of *n*-alkanoic acids decreased. A terrestrial origin of the *n*-alkanes was confirmed by an odd-over-even predominance illustrated by carbon preference index values between 4.1 and 2.2. In addition, two terrestrially-derived sterols (i.e. β-sitosterol and campesterol) were present in concentrations varying along the transect (Figure 1c). Concentrations of dinosterol, a marine sterol originating from dinoflagellates, were increasing when going from the river mouth towards the open basin. From the analysed terrestrial compounds, long chain *n*-alkanols and *n*-alkanoic acids appear to be more amenable to degradation than *n*-alkanes. This can be illustrated by decreasing high-molecular weight ratios for *n*-alkanoic acids and *n*-alkanols to *n*-alkanes when going from the estuary to the open basin (Figure 1d). There is a decoupling in spatial distribution of different terrestrial

biomarker classes along the transect, suggestive of differential recalcitrancy or transport potential. This study demonstrates that concentrations of terrestrial compounds in the Bothnian Bay are higher than in most other northern latitude coastal areas, making this a useful setting to perform compound-specific radiocarbon studies on terrestrial compounds in the near future. The results of this study will also be compared with Bothnian Bay water column samples and surface sediments from the Ob estuary in western Siberia.



(b)

	n-alkanes Σ C_{25-29}	*n*-alk. acids Σ C_{24-28}	*n*-alkanols Σ C_{24-28}
A	163.8	275.3	390.0
B	171.0	158.5	658.5
C	186.0	199.4	447.7
D	289.8	213.4	620.0
E	334.1	113.8	512.7
F	54.1	261.9	225.6

(c)

	β-sitosterol	campesterol	dinosterol
A	269.7	63.6	23.6
B	1466.7	316.4	104.1
C	167.9	33.6	107.7
D	852.3	186.7	105.1
E	122.7	25.2	100.6
F	102.9	42.9	142.5

(d)

	HMW *n*-alkanoic acids / HMW *n*-alkanes	HMW *n*-alkanols/ HMW *n*-alkanes
A	1.5	1.5
B	0.7	2.2
C	0.7	1.3
D	0.5	1.1
E	0.2	0.8
F	3.1	2.5

Figure 1. (a) Map of the Bothnian Bay surface sediment transect, (b and c) concentrations in ug/gOC of the three most abundant long-chain *n*-alkanes, *n*-alkanoic acids and *n*-alkanols and three major sterols, (d) ratios of high-molecular weight of *n*-alkanoic acids and *n*-alkanols to *n*-alkanes.

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