Table 3. Selected enzyme activities of the investigated subpolar soils

	C_{bioorg}	Oil-C	DHA	β-GL	ARG	ARYL
Moist mineral soil *(Histic Cryaquept)* under ruderal grass vegetation with oil contamination						
1.1	30.4	46.5	313	4	1.1	7
1.2	330.5	33.5	412	18	2.6	ND
1.3	2.9	0.4	7	1	ND	5
... without oil contamination						
2.1	47.4	0.9	431	19	11.7	39
2.2	392	1.8	131	82	39.4	7
2.3	10.5	0.03	2	2	1.4	ND
Peat soil *(Sphagnic Cryofibrist)* without oil contamination						
3.1	496.7	2.8	NA	14	11.0	2
3.2	489.1	4.3	NA	20	11.7	NA
Peat soil *(Sphagnic Cryofibrist)* with oil contamination						
4.1	360.2	1.3	NA	49	11.6	NA
4.2	436.6	3.1	NA	17	9.5	NA
Moist mineral soil *(Histic Cryaquept)* under an open pine and birch forest with oil contamination						
5.0	345.5	3.8	522	96	63.2	226
5.1	479.9	1.8	195	50	40.8	7
5.2	96.6	0.1	132	18	1.8	35
5.3	15.0	0.03	6	3	3.1	3
... without oil contamination						
6.1	386.1	2.9	277	118	18	ND
6.2	3.9	0.1	51	2	0.9	4
6.3	2.9	0.02	<1	<1	3.4	3
Pasture[A]	70.6	ND	197	127	6.6	ND
Cultivated land[A]	16.6	ND	72	68	4.7	455
Forest[A]	177.0	ND	6	138	8.9	ND

[A]unpublished data from long-term control sites in North Germany
ND: not determined, not detectable; NA: not available
C_{bioorg}: soil derived and biogenic organic carbon in mg g^{-1} soil dry mass (DM) DHA: dehydrogenase activity in µg TPF g^{-1} soil dry mass, β-GL: β-glucosidase in µg saligenine g^{-1} soil-DM, ARG: arginine ammonification in µg NH_4-N g^{-1} soil-DM, ARYL: arylsulfatase in µg phenol g^{-1} soil-DM

Nevertheless a far-reaching interpretation of qCO_2 should be avoided due to the extremely low level R_{mic} and SIR-C_{mic}, which might affect the mathematical calculation within the measurement errors (Alef, 1991, Schinner et al., 1996). In addition, the observed CFE data raise the question as to whether crude oil contamination really induces a stress situation for the microorganisms if oil in soil enhances the microbial biomass instead of restricting it (Table 2).

For the enzyme activities we found similar disappointing results as for the biomass estimations. Dehydrogenase (DHA) and arylsulfatase activities (ARYL) were not suitable for the investigations of peat soils due to the brown color of the extract which derived from the humic compounds (Alef, 1991). This was also found for deposits in brown coal mining areas (Kolk et al., 1996). Obviously this effect was not induced directly from the crude oil as the data from the mineral soils suggest. The DHA reacts positively on oil as the comparison between the samples 5.1 and 6.1 suggests: DHA was significantly higher with a low C_{bioorg} and a high oil content. This was also found for the soil samples 1.2 and 2.2. Negative impacts of oil on DHA were only observed with very high contents (e.g sample 1.1). In comparison with temperate soils the DHA was much higher. However the peat soils β-glucosidase