Supplementary Material

1 Supplementary Tables

Table S1. Summary statistics for Hg (µg kg^{-1}), C (%), N (%), C/N and %Dark Roots including number of cores, mean, standard deviation (SD), minimum, maximum, median, and interquartile range for all cores displayed per region.

Region	# cores	Mean	SD	Min	Max	Median	Q1	Q3
Hg (µg kg^{-1})								
All	9	39.9	36.1	4.3	218	29.5	19.2	48.1
Northern Scandinavia	5	43.2	32.8	7.2	185.9	31	23.2	54.9
West-Central Canada	4	37.2	38.4	4.3	218	25.5	15.8	44.7
%C								
All	9	44.2	7.3	17.5	57.6	44.9	42.9	49
Northern Scandinavia	5	44.9	9.2	18.1	57.6	48.9	38.6	51.3
West-Central Canada	4	43.5	4.9	17.5	51.4	44	43.2	45.5
%N								
All	9	1.5	0.9	0.2	4.5	1.5	0.6	2.1
Northern Scandinavia	5	2.1	0.7	0.7	4.5	2.1	1.7	2.6
West-Central Canada	4	0.9	0.6	0.2	2.8	0.6	0.4	1.2
C/N								
All	9	50	40.5	11.1	216.8	26.7	20.5	71.7
Northern Scandinavia	5	22.9	6.5	11.1	53.9	21.3	19.2	25.4
West-Central Canada	4	76.1	42.4	15.5	216.8	69.3	35.9	111
%Dark Roots								
All	9	18.3	20.4	0.5	90	10	5	30
Northern Scandinavia	5	12.9	22.7	0.5	80	2.5	1	10
West-Central Canada	4	20.9	18.8	3	90	12	7.8	31.3

Table S2. Individual core depth (cm), average and range concentration of Hg (µg Hg kg^{-1}) per depth section (0-20 cm, 20-100 cm and >100 cm) of each site.

Site	Core depth (cm)	Hg (µg Hg kg^{-1}) 0 - 20 cm		Hg (µg Hg kg^{-1}) 20 - 100 cm[1)]		Hg (µg Hg kg^{-1}) >100 cm	
		Average	**Min-Max**	**Average**	**Min-Max**	**Average**	**Min-Max**
Alvi	175	122	77 - 180	30	24 - 55	26	16 - 37
Dáava 1)	95	78	40 - 108	29	15 - 35	-	-
Karlebotn	100	63	55 - 71	24	16 - 42	-	-
Laskelv 1)	80	106	70 - 151	36	2 - 58	-	-
Šuoššjávri	227.5	128	83 - 186	51	28 - 73	19	7.3 - 30
Ennadai Lake	186	70	27 - 188	27	5 - 74	11	4.3 - 39
Herchmer Palsa	133	93	24 - 202	48	24 - 79	47	38 - 58
McClintock	164	59	38 - 103	34	18 - 72	31	14 - 54
Selwyn Lake	197	94	24 - 218	21	9.2 - 50	25	9.4 - 62

[1)] Values for Dávva and Lakselv are given for 20-95 and 20-80 cm, respectively, due to the depth shorter depth of the cores.

Table S3. Net accumulation rates of peat (peat AR, mm yr^{-1}), C (C-AR g C m^{-2} yr^{-1}) and Hg (Hg-AR, µg Hg m^{-2} yr^{-1}) in the uppermost peat section with corresponding depths (cm) and peat layer ages (calibrated years before present, cal. yr BP).

Region	Site	Recent peat AR (mm yr^{-1})	Recent C-AR (g C m^{-2} yr^{-1})	Recent Hg-AR (µg Hg m^{-2} yr^{-1})	Depth (cm)	Age of peat layer (cal. yr BP)
Northern Scandinavia	Alvi	0.12	9.1	1.8	0-20	448-2792
	Dávva	0.16	10	2.2	0-10	116-435
	Karlebotn	0.13	13	1.8	0-20	1009
	Lakselv	0.30	25	6.9	0-15	182-2017
	Šuoššjávri	0.24	21	6.7	0-18	155
Canada	Ennadai Lake	0.040	3.2	0.77	0-12	2643
	Herchmer Palsa	*	*	*	0-15	34*
	McClintock	0.36	14	1.9	0-18	501
	Selwyn Lake	0.095	6.1	2.4	0-10	1058

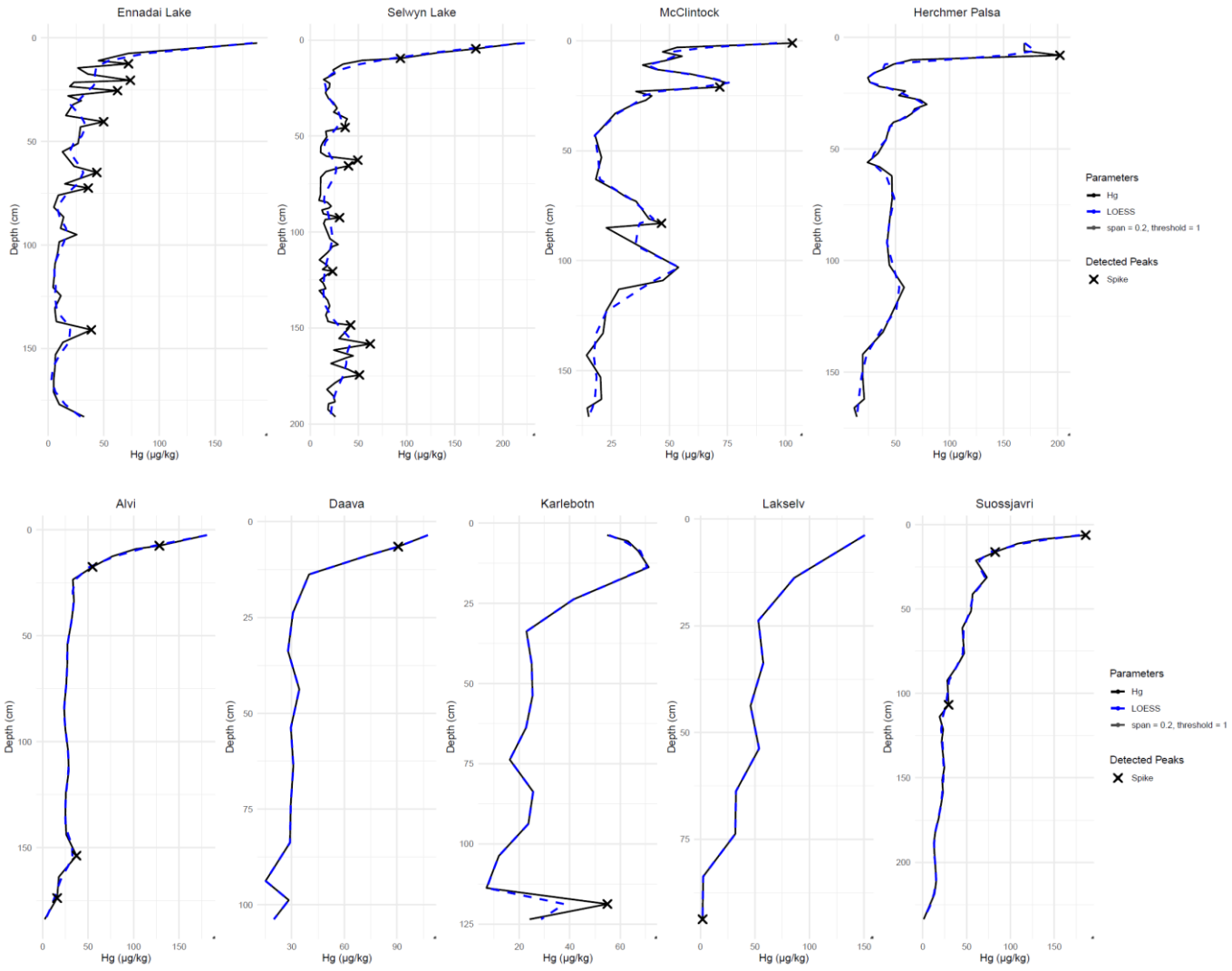
*modern age result for values for Herchmer Palsa was excluded as the calculated age (34 yr) is within the uncertainly of the dating method

Table S4. Multivariate analysis of peat AR, C-AR and Hg-AR (with the uppermost peat layer excluded, Figure S1) and non-parametric Spearman's test results (correlation in bold if $p<0.05$) for both regions. Two points were considered outliers due to anomalous C-AR (Davva, 78.75 cm: 209.2 g C m^{-2} yr^{-1}; Šuoššjávri, 226.3 cm: 77.7 g C m^{-2} yr^{-1}).

Variable	Northern Scandinavia			Canada		
	peat AR	C-AR	Hg-AR	peat AR	C-AR	Hg-AR
peat AR	-	**<0.0001**	0.15	-	**0.001**	0.53
C-AR	**<0.0001**	-	**0.026**	**0.001**	-	**0.003**
Hg-AR	0.15	**0.026**	-	0.53	**0.003**	-

2 Supplementary Figures

Figure S1. Peak identification for Hg profiles through LOESS/LOWESS (Locally Weighted Scatterplot Smoothing). The black line represents the original data points for Hg concentration, the blue dotted line represents the smoothed background concentration and the crosses are the detected peaks (threshold 1, span: 0.2).



Supplementary Material

Figure S2. Profiles of Hg with the uppermost peat section (red dots) which was treated separately from the subsurface layers (black dots). The depth of the excluded layer depends on the depth or the uppermost dated section or when the modern age signal was considered not relevant (Alvi: 20 cm, Dávva: 10 cm, Karlebotn: 20 cm, Lakselv: 15 cm, Šuoššjávri: 18 cm, Herchmer Palsa: 15 cm, Ennadai Lake: 12 cm, McClintock: 18 cm, Selwyn Lake: 10 cm).

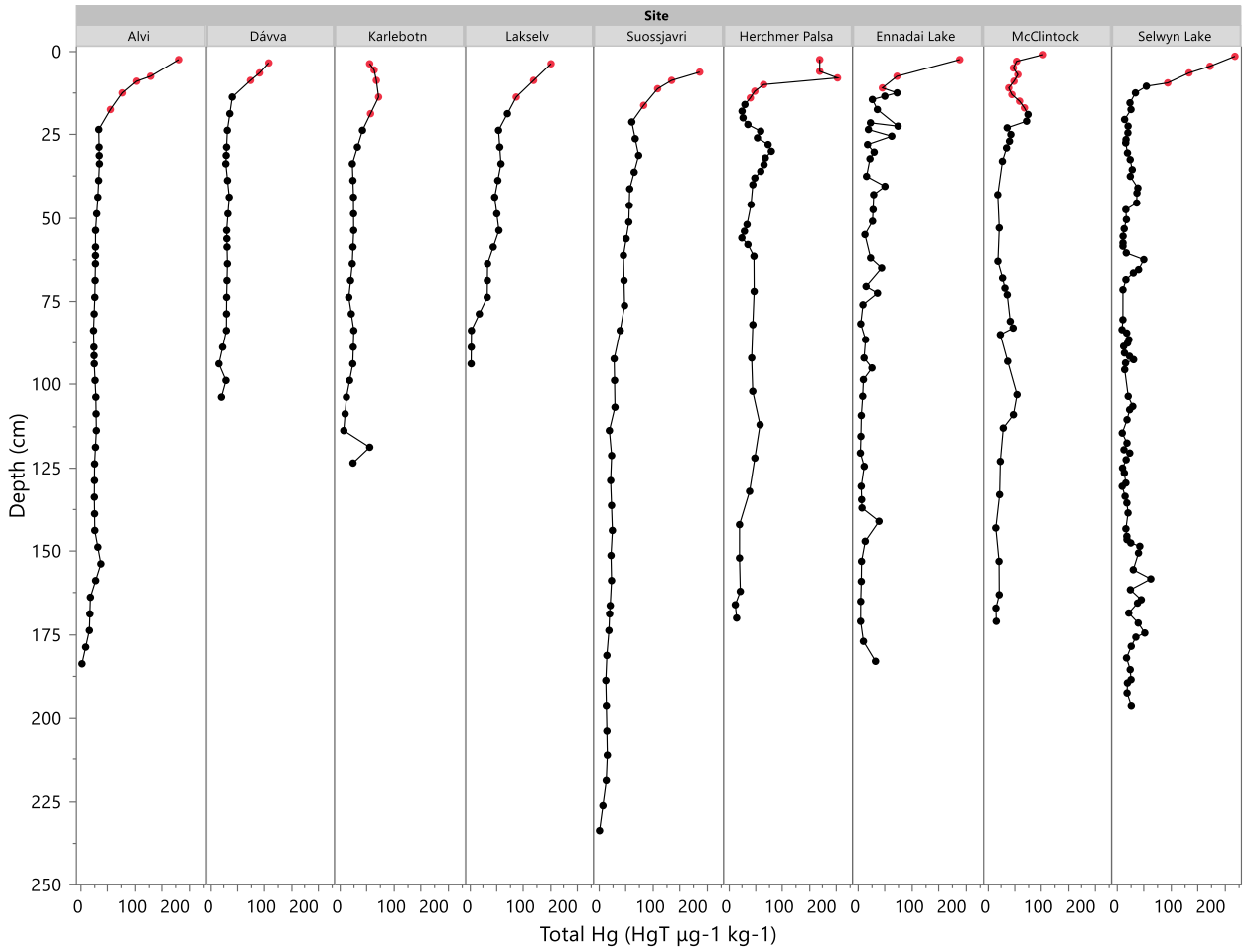


Figure S3. Regression analysis for individual cores of log normalized Hg concentration and log normalized Hg to C ratio (RHgC) versus C/N ratios for (A) northern Scandinavia and (B) Canada. Positively correlated for log Hg versus C/N were: McClintock (p=0.02), Karlebotn (p=0.06); negatively correlated were: Šuoššjávri (p<0.0001) and Selwyn Lake (p=0.03). For RHgC versus C/N negatively correlated were: Šuoššjávri (p<0.0001).