EFFECT OF PEATLAND DEGRADATION ON BRYOPHYTE SPECIES COMPOSITION IN LATVIA AND LITHUANIA

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INTRODUCTION

Bryophytes are pioneer species that occupy degraded sites, both after natural disturbances (e.g. fire) and human impact (e.g. logging). Post-harvested peatlands can be inhabited by bryophyte species that are adapted to extreme conditions such as drought, exposure to high sun radiation, wind erosion, etc. Still, bryophyte richness is higher in intact or less affected peatlands – raised bogs, transition mires and fens with different ecological niches. The role of bryophytes, especially *Sphagnum*, in mires involves also peat formation and carbon sequestration. Climate change mitigation by reducing greenhouse gas (GHG) emissions, low groundwater fluctuations are only some functions that are strongly related to processes in intact peatlands.

METHODS & MATERIALS

To study bryophyte species composition in peatlands with different management history, data were collected in eight sites: three peatlands with minor drainage impact in Latvia (a, b, c) and five significantly drained, post-harvested peatlands in Lithuania (d-h) (figure 1). Used degradation classes are: 0-near natural; 1-minor impact; 2-medium degradation; 3-strongly degraded. There are two different degradation classes on average on each site, with Puščia Peatland and Madiešēnu Mire representing three classes, but Aukštumala Peatland only one class. Vegetation cover (bryophytes, lichens, herbs, shrubs, trees) and physical parameters (degree of site degradation, soil moisture) were recorded in 269 plots in 2017-2018 during the LIFE Peat Restore project. Additionally, vegetation data together with environmental parameters were used for indirect GHG emission assessment applying the recently developed GEST (*Greenhouse Gas Emission Sites Types*) approach.

Figure 1. Location of study sites in Latvia: (a) Madiešēnu Mire, (b) Engure Lake, (c) Baltezers Mire; in Lithuania: (d) Plinkšiai, (e) Aukštumala, (f) Sachara, (g) Püščia, (h) Amalva peatlands.

Table 1. Spearman's rank correlation between total number of bryophytes per plot and different measured variables in all studied sample plots.

Variable	p-value	r_s
Cover (%)		
Bryophytes	<0.001	0.53
Bare peat	<0.001	-0.45
Grasses	<0.001	0.24
Litter	0.019	-0.14
Trees and shrubs	0.123	0.09
Number of species		
Herbs, bryophytes and liches	<0.001	0.53
Sphagnum species	<0.001	0.48
Herbs	<0.001	0.28
Lichens	0.023	0.14
Trees and shrubs	0.852	0.01

RESULTS & CONCLUSIONS

In all sites, 382 species were recorded, from them 85 bryophyte species (10 liverworts and 75 mosses, including 19 *Sphagnum* species). Highest species richness was found in abandoned peat mining area of **Püščia Peatland (g)** in Lithuania (figure 2). Species richness was explained by high diversity of man-made habitats like old ditches and rewetted peat fields that are surrounded by shrubberies. From Latvian sites, the largest species number was recorded in **Baltezers Mire (c)** where transition mire is surrounded by bog woodland and oligotrophic Western taiga, and also in **Madiešēnu Mire (a)** raised bog. These habitats provide high number of niches and suitable microclimate for bryophytes. On the contrary, relatively homogenous alkaline fen near **Engure Lake (b)** suits mostly for specialist species, hence the comparatively small species richness on this site. The lowest species richness was found in **Aukštumala Peatland (e)** post-mined field which is only 10 ha in size. **Plinkšiai (d)** and **Amalva (h)** are also very monotonous areas left after peat mining. **Sachara Peatland (f)** stands out from other sites by highest number of Sphagnum species that are common in old, prolonged peat cutting pits that are now filled with water.

Overall, the bryophyte species richness showed moderate positive correlation with total species richness (r_s=0.53, p<0.001), weak correlation with moisture (r_s=0.34, p<0.001) and herb cover/species richness (r_s=0.24, p<0.001; r_s=0.28, p<0.001, respectively). Bryophyte species richness was best explained by total number of species per plot, bare peat and bryophyte species cover and was site-specific (table 1).

Species composition significantly differed between degraded and near-natural sample plots of study sites (figure 3). From all recorded bryophytes, 24 species were related to one of four previously defined degradation classes using indicator-species analysis (table 2).

The results suggest that bryophytes can be used as indicators to assess the degradation of peatlands. Besides, the site habitat diversity plays important role.

Table 2. List of bryophyte species with statistically significant (p<0.05) indicator value recorded in project sites regarding their degradation level. Presence/absence (+/-) of species in sample plots is shown.

	Degradation			
	0	**1**	**2**	**3**
Campylium stellatum	35.1	+	+	+
Drepanocladus revolvens	56.2	-	-	-
Fissidens adianthoides	15.4	+	+	-
Scorpidium scorpioides	47.1	+	+	-
Sphagnum teres	7.4	-	-	+
Bryum neodamense	-	33.3	-	-
Cephalozia bicuspidata	+	11.7	+	-
Dicranum sp.	-	27.3	-	+
Hylocomium splendens	-	43.4	+	+
Hypnum cupressiforme	-	9.5	-	-
Lophocolea heterophylla	-	19.9	+	+
Plagiomnium affine	-	22	+	-
Riccardia multifida	+	13.2	+	-
Blasia pusilla	-	+	9.1	-
Drepanocladus sp.	-	-	12.5	-
Pleurozium schreberi	+	+	23.1	+
Sphagnum angustifolium	+	-	14.8	+
Campylopus introflexus	-	-	-	9.8
Pohlia nutans	-	-	-	8.7
Polytrichum commune	+	+	+	22.1
Polytrichum juniperinum	-	-	-	7.6
Polytrichum longisetum	-	-	+	11.3
Polytrichum strictum	-	-	+	26.2
Sphagnum sp.	-	-	-	5.4

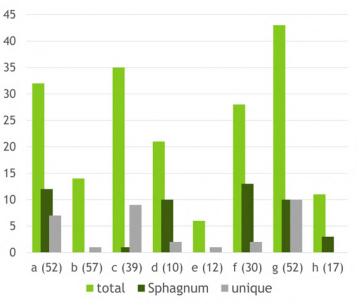

Figure 2. Bryophyte species richness in study sites. Number of sample plots per site is given in brackets.

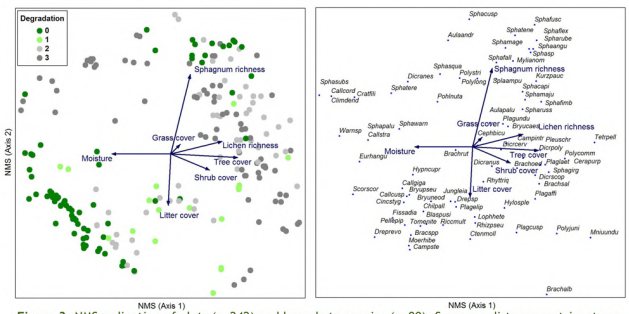

Figure 3. NMS ordination of plots (n=242) and bryophyte species (n=80). Sorensen distance matrix, stress values: Axis1 = 79.8 (p=0.004), Axis2 = 76.3 (p=0.004).


(a) Madiešēnu


(b) Engure


(c) Baltezers


(d) Plinkšiai


(e) Aukštumala


(f) Sachara


(g) Püščia


(h) Amalva

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