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Supplement of

Ecophysiological characterization of early successional biological soil crusts in heavily human-impacted areas

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Supplement tables

Table S1: Statistical significance of organization level, temperature and interaction of those effects on NP of C-/G-BSC$_{all}$, C-/G-BSC$_{dom}$, and C-/G-BSC$_{soil}$

Effect	df	F	p
N. commune			
Organization level	2	38.06	0.000
Temperature	3	9.41	0.000
Organization level * Temperature	6	5.03	0.000
Z. ericetorum			
Organization level	2	53.61	0.000
Temperature	3	1.64	0.198
Organization level * Temperature	6	1.81	0.125

Table S2: P-values of a Tukey post-hoc test for NP depending on organization level (on top) and temperature (below) in a C-BSC.

Organization level	BSC	Soil	*N. commune*
BSC		0.089	0.000
Soil	0.089		0.000
N. commune	0.000	0.000	

Temperature	7 °C	12 °C	17 °C	25 °C
7 °C		0.946	0.079	0.000
12 °C	0.946		0.240	0.001
17 °C	0.079	0.240		0.099
25 °C	0.000	0.001	0.099	

Table S3: P-values of a Tukey post-hoc test for NP depending on organization level in a G-BSC.

Organization level	BSC	Soil	*Z. ericetorum*
BSC		0.026	0.000
Soil	0.026		0.000
Z. ericetorum	0.000	0.000	

Table S4: Statistical analysis of upper limits of optimum water content of both BSC-Systems and their respective separate organisms. Shown are p-values of the Tukey post-hoc test.

	C-BSC$_{all}$	**G-BSC$_{all}$**	**C-BSC$_{soil}$**	**G-BSC$_{soil}$**	**C-BSC$_{dom}$**	**G-BSC$_{dom}$**
C-BSC$_{all}$		0.82	0.65	0.14	0.00	0.02
G-BSC$_{all}$	0.82		0.11	0.86	0.00	0.00
C-BSC$_{soil}$	0.65	0.11		0.00	0.15	0.38
G-BSC$_{soil}$	0.14	0.86	0.00		0.00	0.00
C-BSC$_{dom}$	0.00	0.00	0.15	0.00		1.00
G-BSC$_{dom}$	0.02	0.00	0.38	0.00	1.00	

Table S.5: Statistical analysis of lower limits of optimum water content of both BSC-Systems and their respective separate organisms. Shown are p-values of the Tukey post-hoc test.

	C-BSC$_{all}$	**G-BSC$_{all}$**	**C-BSC$_{soil}$**	**G-BSC$_{soil}$**	**C-BSC$_{dom}$**	**G-BSC$_{dom}$**
C-BSC$_{all}$		0.94	0.52	0.39	0.04	0.06
G-BSC$_{all}$	0.94		0.14	0.95	0.01	0.01
C-BSC$_{soil}$	0.52	0.14		0.01	0.81	0.79
G-BSC$_{soil}$	0.39	0.95	0.01		0.00	0.00
C-BSC$_{dom}$	0.04	0.01	0.81	0.00		1.00
G-BSC$_{dom}$	0.06	0.01	0.79	0.00	1.00	

Table S6: Mean values of maximum respiration rate per area of soil of both study sites. Sample size is n=3 in both cases.

	Parking Lot	Standard deviation	Mehlinger Heide	Standard deviation
Max. respiration before autoclaving [µmol/ m²s]	-0.23	0.20	-0.43	0.24
Max. respiration after autoclaving [µmol/ m²s]	-0.06	0.01	-0.09	0.01

Table S7: Statistical significance of organization level, temperature and interaction of those effects on DP of C-/G-BSC$_{all}$, C-/G-BSC$_{dom}$, and C-/G-BSC$_{soil}$

Effect	df	F	p
N. commune			
Organization level	2	0.14	0.872
Temperature	3	6.27	0.001
Organization level * Temperature	6	0.12	0.993
Z. ericetorum			
Organization level	2	1.01	0.376
Temperature	3	2.92	0.047
Organization level * Temperature	6	0.63	0.705

Table S8: P-values of a Tukey post-hoc test for DP depending on temperature in a C-BSC.

Temperature	7 °C	12 °C	17 °C	25 °C
7 °C		0.994	0.815	0.001
12 °C	0.994		0.926	0.002
17 °C	0.815	0.926		0.011
25 °C	0.001	0.002	0.011	

Table S9: P-values of a Tukey post-hoc test for NP depending on temperature in a G-BSC.

Temperature	7 °C	12 °C	17 °C	25 °C
7 °C		0.408	0.079	0.041
12 °C	0.408		0.803	0.638
17 °C	0.079	0.803		0.992
25 °C	0.041	0.638	0.992	

Table S10: Chlorophyll content per area in *N. commune* and *Z. ericetorum* samples without soil.

Sample	Chlorophyll content per insolated area [mg/cm²]
***N. commune* S1**	0.23
***N. commune* S2**	0.10
***N. commune* S3**	0.49
***N. commune* S4**	1.48
***N. commune* S5**	0.17
***N. commune* S6**	0.36
***Z. ericetorum* S1**	18.13
***Z. ericetorum* S2**	1.11
***Z. ericetorum* S3**	15.79
***Z. ericetorum* S4**	2.68

Supplement figures

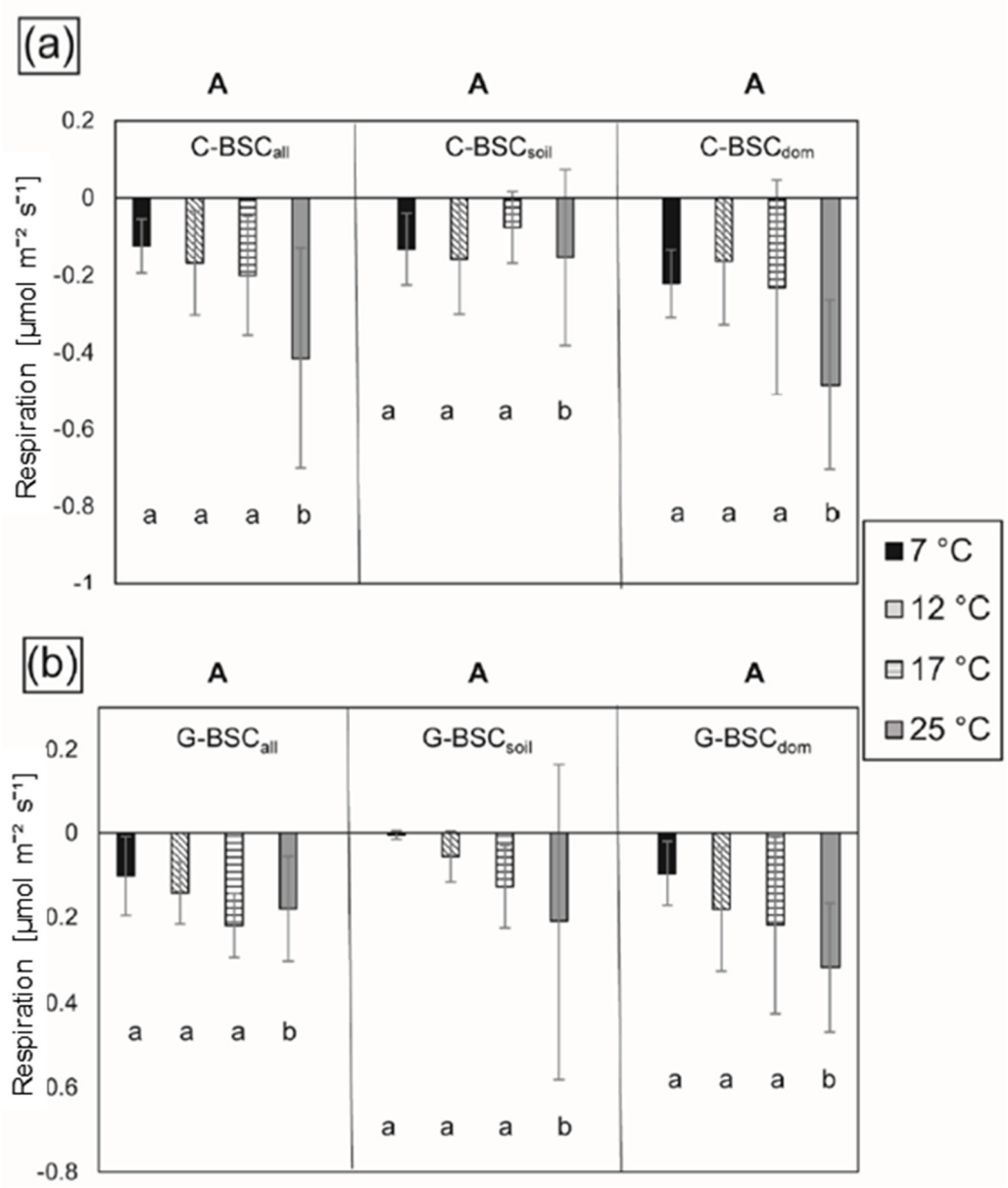

Figure S1: Temperature dependent dark respiration per area in (a) *N. commune* and b) *Z. ericetorum* (dominated BSCs, as well as separated organism and soil. Capital letters describe significant differences in organization level between BSC, organism and soil, whereas lower case letters compare temperature differences in one of the groups only. Sample size: n=6 for *N. commune,* n=4 for *Z. ericetorum*.

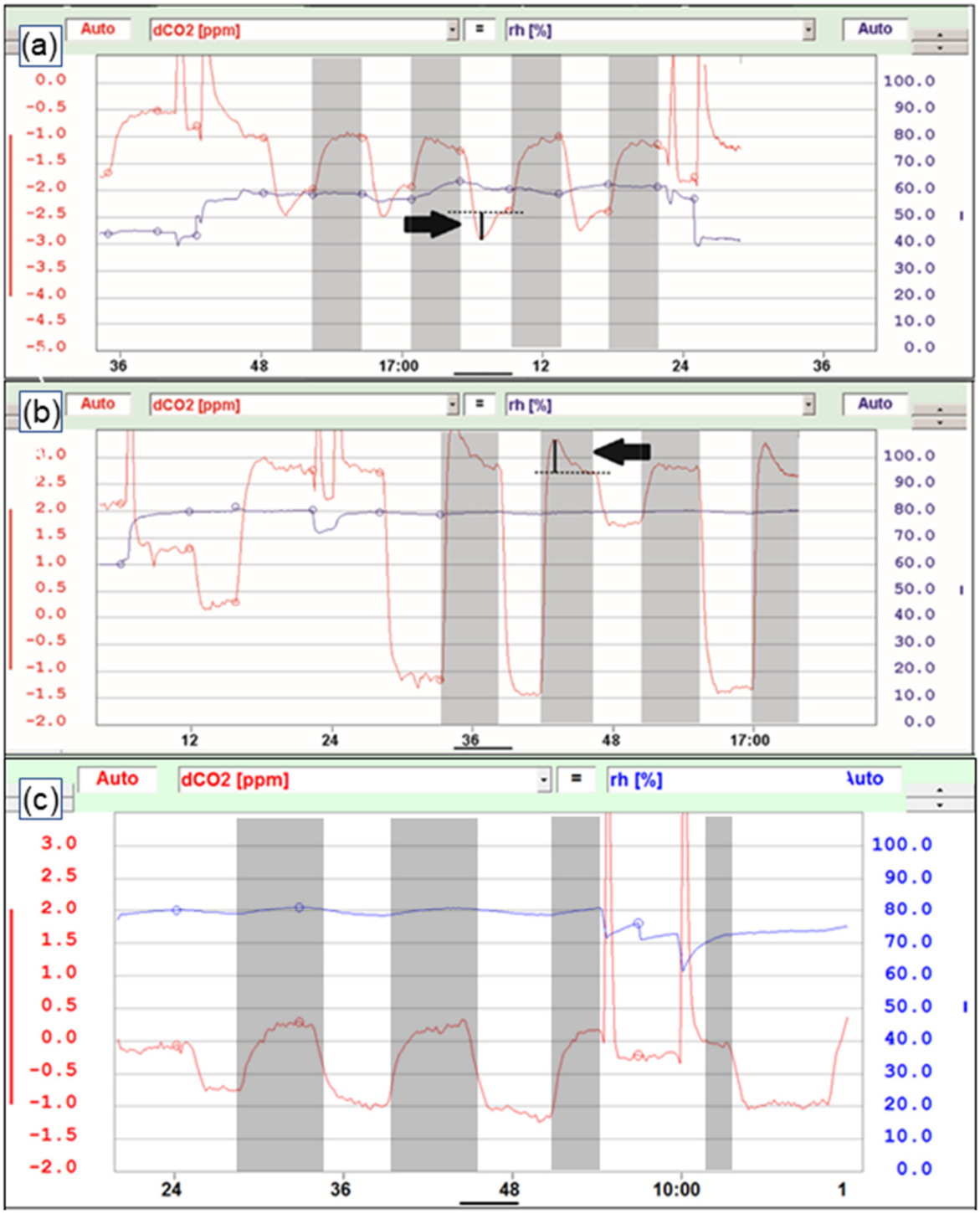

Figure S2: CO_2 exchange pattern of *N. commune* and *Z. ericetorum* (c) at 7 °C with optimal water content. The blue line represents relative humidity at the moment of measurement in percent, while the red line represents the difference of CO_2 between reference

and sampling gas in the GFS 3000 in ppm. Abscise is the time in minutes. Grey underlay represents light being turned off. The black arrow marks one example of a sudden increase of CO_2 uptake as soon as the light was turned on (a), or release as soon as the light was shut off (b). The dotted line indicates the normal gas exchange pattern without a CCM being active in a light-dark-cycle. Here, after a sudden drop (light being turned on) or increase (light being turned off), the red line should flatten immediatley and result in a straight line, as can be seen in the pattern of *Z. ericetorum* (c). When a CCM is present, this is not the case: the solid line in (a) and (b) represents a CCM being active. Here, the uptake of CO_2 is much higher than the normal NP answer would be, while the line flattens itself only after a couple of minutes.