Title of the manuscript: Temporal and vertical changes in biological communities within snowpacks during melting season in Northern Japan

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This file includes nine supplementary figures. The legends are below, and all figures are on the next page.

Supplementary Figure S1: Temporal changes in (a) chlorophyll *a*, (b) tardigrades, and (c) rotifers in snow core samples. %: Percentage of chlorophyll *a* concentration and population density of each layer in the entire snowpack.

Supplementary Figure S2: Concentrations of chemical solutes excluding nutrients in rainwater. The results from samples collected tree-free area and tree-covered area are shown by white and gray bars, respectively.

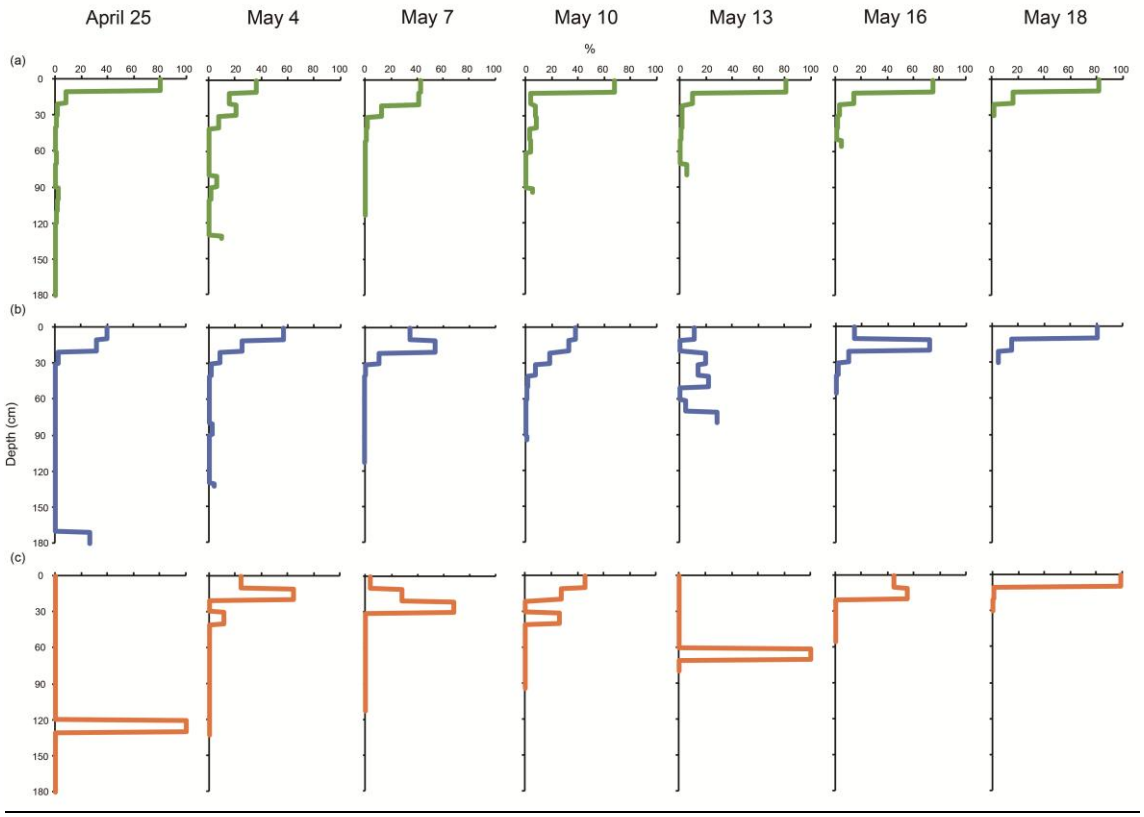
Supplementary Figure S3: Concentrations of chemical solutes excluding nutrients in the elution experiments.

Supplementary Figure S4: CCA diagram of correlations between microbes and chemical solutes after the appearance of the algal-blooming snow.

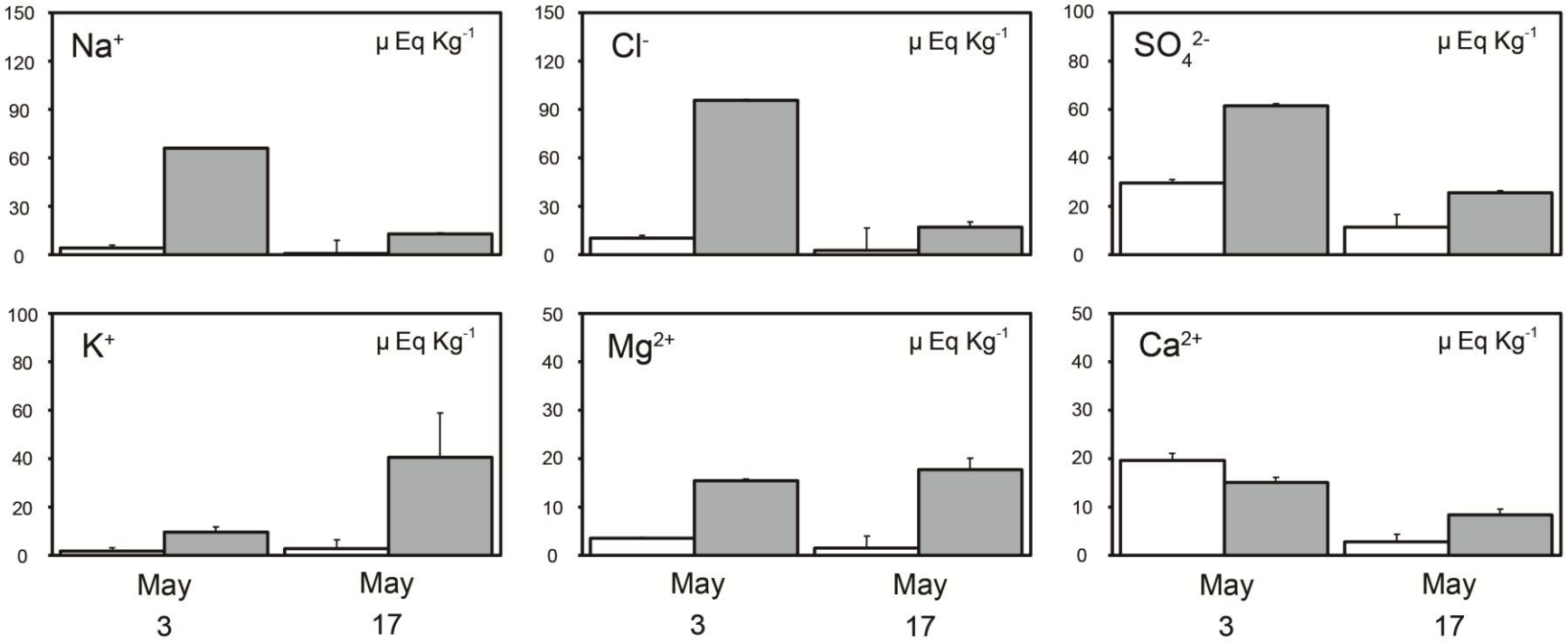
Supplementary Figure S5: Correlation between cell concentrations and population densities of microbes, concentrations of chemical solutes, and dry weights of insoluble particulates in (a) the snow surface and (b) the snow pit. Significant differences ($p < 0.01$) are indicated by asterisks.

Supplementary Table S1: Results of the t-test for differences in cell concentrations and population densities of microbes, concentrations of chemical solutes, and dry weights of insoluble particulates between algal-blooming snow and adjacent snow. The results for both the snow surface and the snow pit are shown. Significant differences ($p < 0.05$) are highlighted in bold.

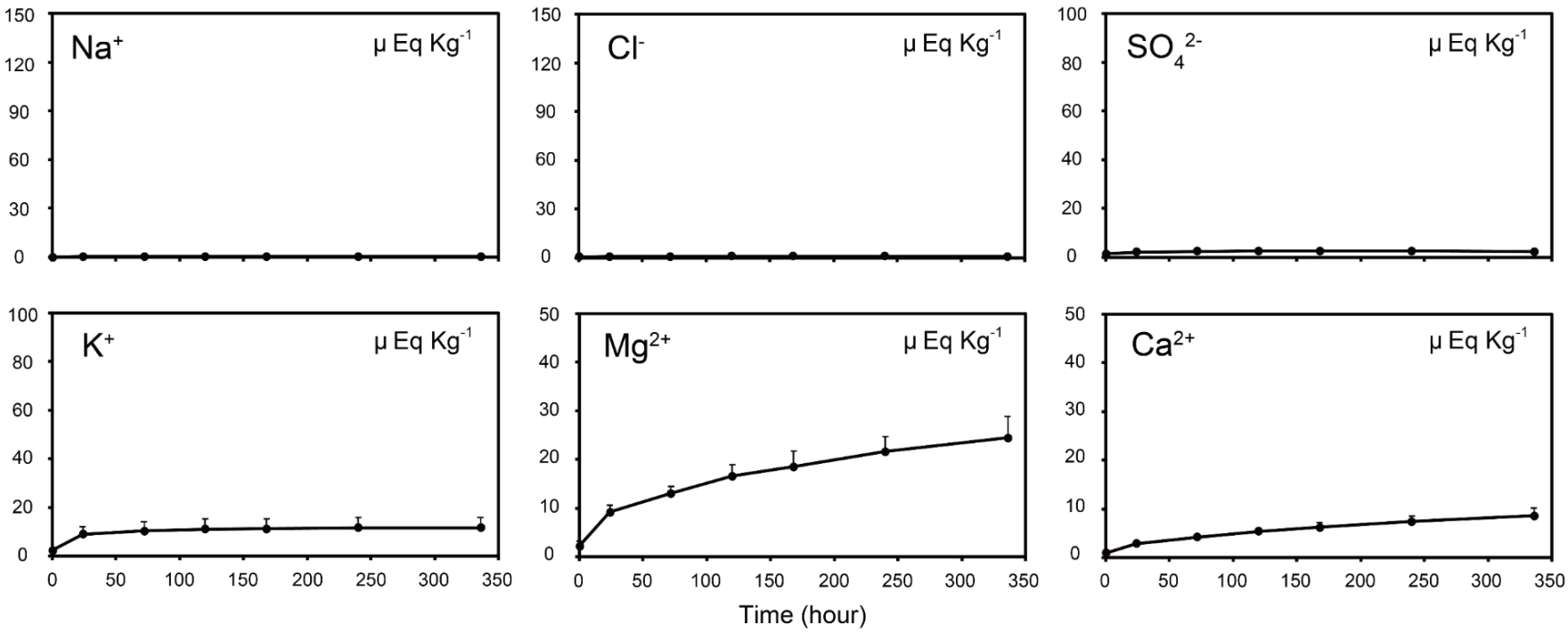
Supplementary Table S2: Results of the t-test for differences in concentrations of chemical solutes in the rainwater samples. Significant differences ($p < 0.05$) are highlighted in bold.



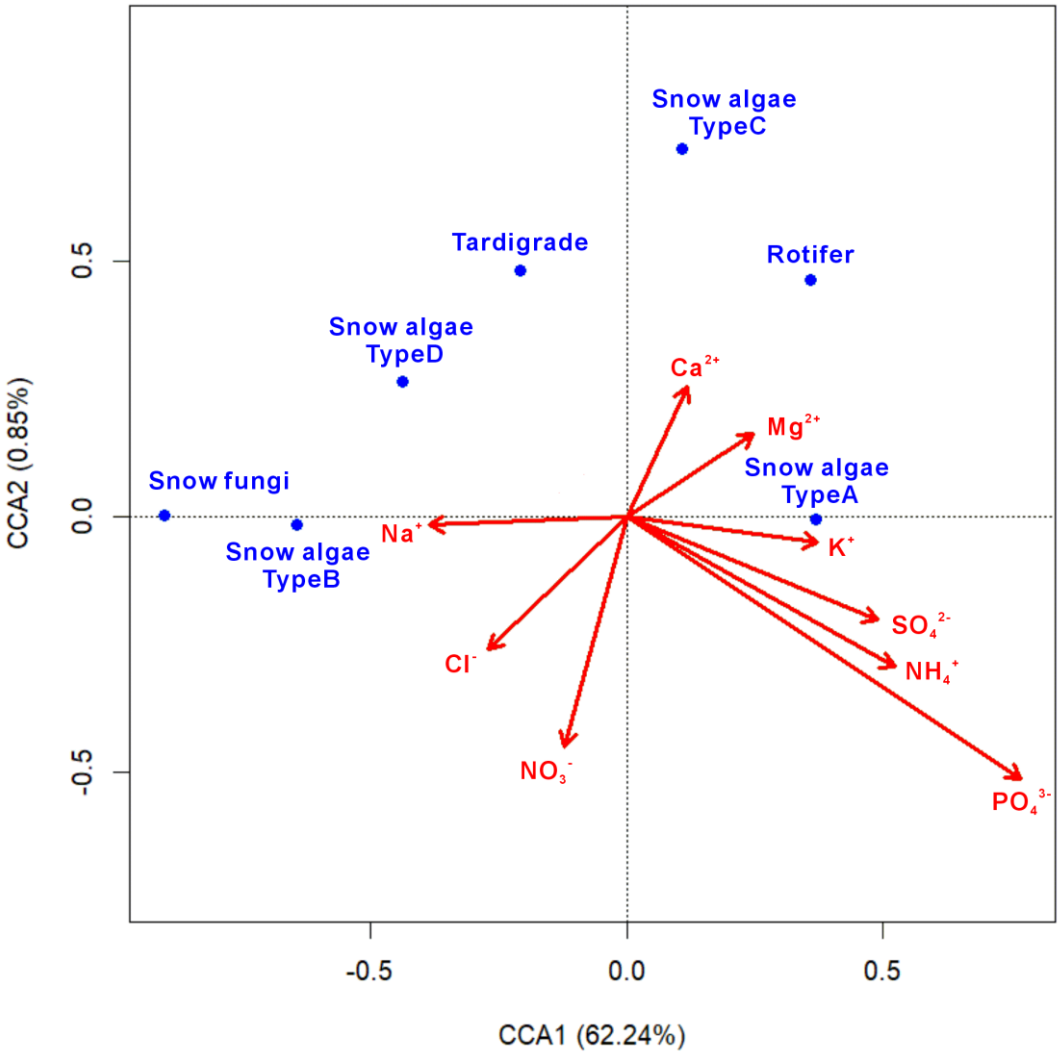
Supplementary Figure S1: Temporal changes in (a) chlorophyll *a*, (b) tardigrades, and (c) rotifers in snow core samples. %: Percentage of chlorophyll *a* concentration and population density of each layer in the entire snow-pack.



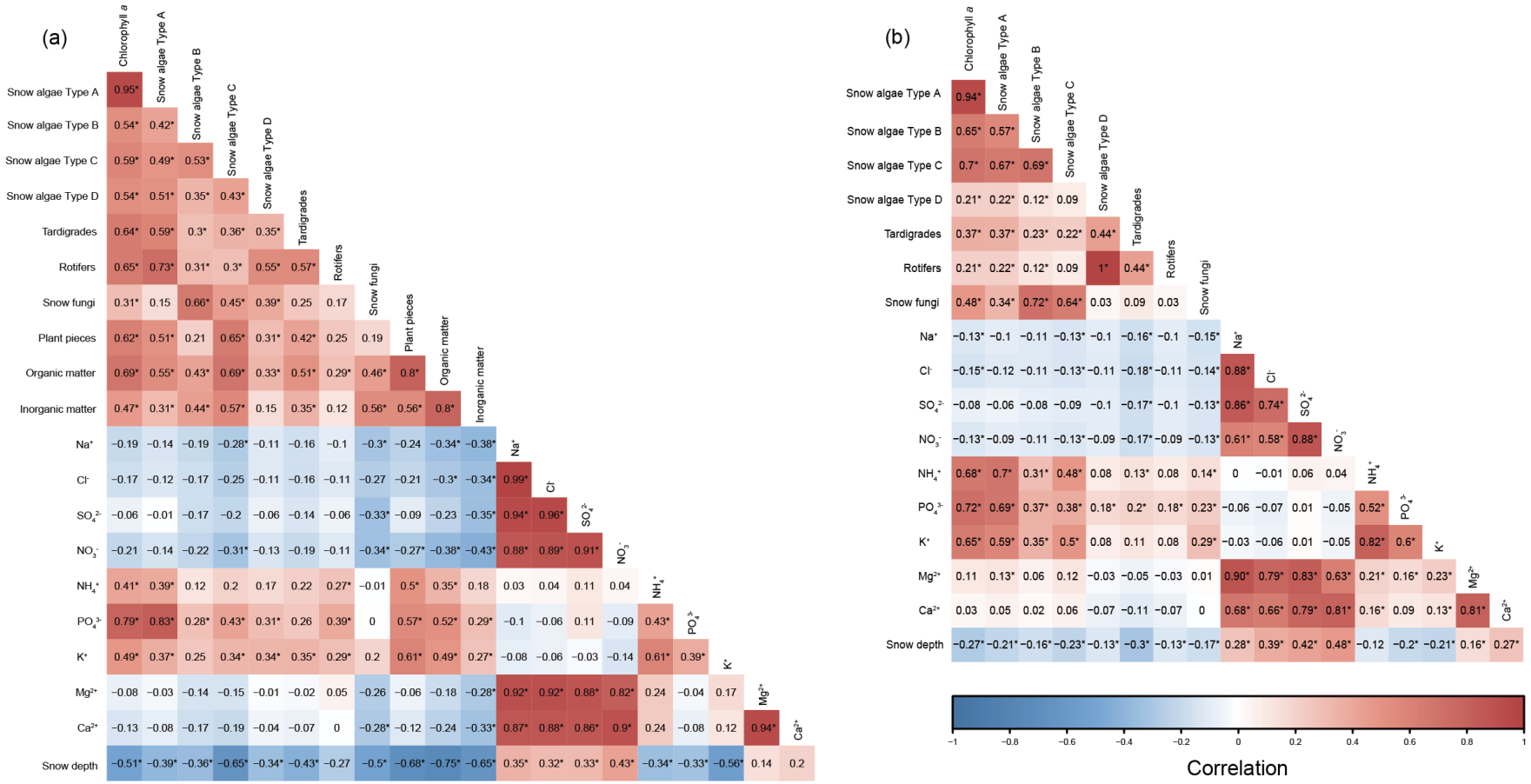
Supplementary Figure S2: Concentrations of chemical solutes excluding nutrients in rainwater. The results from samples collected tree-free area and tree-covered area are shown by white and gray bars, respectively.



Supplementary Figure S3: Concentrations of chemical solutes excluding nutrients in the elution experiments.



Supplementary Figure S4: CCA diagram of correlations between microbes and chemical solutes after the appearance of the algal-blooming snow.



Supplementary Figure S5: Correlation between cell concentrations and population densities of microbes, concentrations of chemical solutes, and dry weights of insoluble particulates in (a) the snow surface and (b) the snow pit. Significant differences ($p < 0.01$) are indicated by asterisks.

	Surface (layer I)		In the snow pit (layers I-V)	
	t	p	t	p
Chlorophyll *a*	-4.002	**0.000**	-1.395	0.164
Snow algae Type A	-2.725	**0.010**	-1.466	0.144
Snow algae Type B	-3.679	**0.001**	0.293	0.770
Snow algae Type C	-3.122	**0.003**	0.012	0.990
Snow algae Type D	-1.521	0.138	0.427	0.670
Tardigrades	-2.556	**0.015**	-1.207	0.228
Rotifers	-1.771	0.085	-0.318	0.751
Snow fungi	-2.497	**0.016**	0.697	0.487
Na^+	-0.703	0.485	1.463	0.144
Cl^-	-0.918	0.363	1.567	0.118
SO_4^{2-}	-0.903	0.371	2.453	**0.015**
NO_3^-	1.362	0.179	3.468	**0.001**
NH_4^+	-1.674	0.103	-0.930	0.353
PO_4^{3-}	-1.764	0.086	-0.759	0.449
K^+	-2.550	**0.015**	-1.792	0.074
Mg^{2+}	-0.973	0.335	-0.315	0.753
Ca^{2+}	-0.418	0.678	-0.272	0.786
Plant litter	-2.833	**0.007**		
Organic matter	-4.336	**0.000**		
Inorganic matter	-3.758	**0.000**		
Organic matter %	-1.738	0.088		

Table S1. Results of the t-test for differences in cell concentrations and population densities of microbes, concentrations of chemical solutes, and dry weights of insoluble particulates between algal-blooming snow and adjacent snow. The results for both the snow surface and the snow pit are shown. Significant differences ($p < 0.05$) are highlighted in bold.

	Tree-free and tree-covered areas on May 13		Tree-free and tree-covered areas on May 17		May 13 and 17 at tree-free area		May 13 and 17 at tree-covered area	
	t	p	t	p	t	p	t	p
Na^+	-8.717	**0.012**	-6.335	0.021	5.552	**0.023**	7.877	**0.012**
Cl^-	-2.713	0.065	1.864	0.198	17.886	**0.000**	7.619	**0.008**
SO_4^{2-}	-1.126	0.377	-3.683	0.066	1.000	0.423	-1.167	0.315
NO_3^-	-8.117	**0.010**	-15.404	**0.000**	15.405	**0.000**	9.350	**0.009**
NH_4^+	-10.720	**0.006**	-34.111	**0.000**	2.479	0.130	9.422	**0.011**
PO_4^{3-}	-1.257	0.307	-1.827	0.142	-0.420	0.697	0.245	0.825
K^+	-3.032	0.069	-2.893	0.098	-0.628	0.571	-2.352	0.135
Mg^{2+}	-7.120	**0.018**	-3.506	0.070	3.688	**0.048**	-0.466	0.679
Ca^{2+}	3.155	0.035	-4.842	**0.009**	13.458	**0.000**	4.995	**0.009**

Table S2. Results of the t-test for differences in concentrations of chemical solutes in the rainwater samples. Significant differences ($p < 0.05$) are highlighted in bold.