

Title: Niche partitioning of methane-oxidizing bacteria along the
oxygen-methane counter gradient of stratified lakes

Running title: Methanotrophs in the oxygen-methane counter gradient

Magdalena J. Mayr^{1,2}, Matthias Zimmermann^{1,2}, Carole Guggenheim², Andreas Brand^{1,2}, Helmut Bürgmann¹

¹Department of Surface Waters—Research and Management, Eawag, Swiss Federal Institute of Aquatic Science and Technology, Kastanienbaum, Switzerland

²Institute of Biogeochemistry and Pollutant Dynamics, Department of Environmental Systems Science, ETH Zurich, Swiss Federal Institute of Technology, Zurich, Switzerland

*Corresponding author: Magdalena J. Mayr, Seestrasse 79, 6047 Kastanienbaum, +41 58 765 2142, magdalena.mayr@eawag.ch

Supplementary Table 1 Summary of environmental parameters measured in Rotsee, Greifensee, Lake Zug and Lake Lugano in 2015 for each depth. Measurements below the limit of quantification (LOQ) were indicated by "<" and the value of the LOQ. LOQ of methane is the equivalent dissolved concentration of the lowest calibration concentration; LOQ of ammonium is equivalent to the lowest calibration concentration; LOQ of nitrite and nitrate was derived from the FIA instrument baseline. In case of oxygen the limit of detection is given (<20 nmol L⁻¹). NA are missing values. T = Temperature, NPOC = non-purgeable organic carbon.

Rotsee									Greifensee								
depth (m)	T (°C)	Methane ($\mu\text{mol L}^{-1}$)	Ammonium ($\mu\text{mol L}^{-1}$)	Nitrite ($\mu\text{mol L}^{-1}$)	Nitrate ($\mu\text{mol L}^{-1}$)	Sulfate ($\mu\text{mol L}^{-1}$)	NPOC ($\mu\text{mol L}^{-1}$)	Oxygen ($\mu\text{mol L}^{-1}$)	depth (m)	T (°C)	Methane ($\mu\text{mol L}^{-1}$)	Ammonium ($\mu\text{mol L}^{-1}$)	Nitrite ($\mu\text{mol L}^{-1}$)	Nitrate ($\mu\text{mol L}^{-1}$)	Sulfate ($\mu\text{mol L}^{-1}$)	NPOC (mg L^{-1})	Oxygen ($\mu\text{mol L}^{-1}$)
8.00	10.93	1.0	2	<0.4	<4	120	3	390.43	6.5	18.48	<0.05	12	4	55	125	3	47.32
8.25	10.90	1.1	<0.5	<0.4	<4	121	NA	390.09	6.9	18.00	<0.05	12	6	51	124	3	2.00
8.50	10.70	<0.05	<0.5	<0.4	<4	121	NA	343.87	7.3	16.61	0.7	10	7	50	123	3	<0.02
8.75	10.08	0.1	<0.5	<0.4	<4	122	NA	306.52	7.7	15.29	1.0	8	6	49	121	3	<0.02
9.00	9.87	0.6	3	<0.4	<4	121	2	282.80	8.1	14.28	3.7	7	5	49	122	3	<0.02
9.25	9.61	2.1	18	<0.4	<4	124	3	261.89	8.5	13.32	3.5	5	4	53	121	3	<0.02
9.50	9.76	7.2	20	<0.4	<4	125	3	241.02	8.9	12.55	7.8	5	3	51	121	3	<0.02
9.75	9.62	41.7	63	<0.4	<4	120	3	39.85	9.3	11.37	9.4	6	3	51	121	3	<0.02
10.00	9.21	113.1	77	<0.4	<4	105	3	4.88	9.7	10.39	8.3	3	3	54	121	3	<0.02
10.25	8.40	122.9	84	<0.4	<4	100	2	0.13	10.1	9.80	8.4	4	3	57	121	3	<0.02
10.50	8.44	129.4	88	<0.4	<4	100	2	0.41	10.5	9.12	5.5	3	3	61	122	3	<0.02
10.75	7.65	154.4	93	<0.4	<4	91	3	0.38	10.9	8.61	6.3	4	2	60	122	3	<0.02
11.00	7.71	141.7	84	<0.4	<4	94	3	0.03	11.3	8.32	7.2	2	3	62	122	3	<0.02
11.25	7.42	160.2	85	<0.4	<4	97	3	0.03	11.7	7.97	12.5	4	3	60	123	3	<0.02
11.50	7.47	182.4	NA	NA	NA	NA	3	0.03	12.1	7.65	11.5	2	3	61	121	NA	<0.02
11.75	7.35	199.2	NA	NA	NA	NA	2	0.03	12.5	7.37	11.1	2	3	62	122	3	<0.02
12.00	7.30	207.1	NA	NA	NA	NA	2	0.03	12.9	7.26	14.3	4	3	62	122	3	<0.02
12.25	7.27	227.7	NA	NA	NA	NA	2	0.06	13.3	7.15	13.3	6	3	66	122	3	<0.02
									13.7	7.12	14.2	<0.5	3	67	122	3	<0.02

Lake Zug									Lake Lugano								
depth (m)	T (°C)	Methane ($\mu\text{mol L}^{-1}$)	Ammonium ($\mu\text{mol L}^{-1}$)	Nitrite ($\mu\text{mol L}^{-1}$)	Nitrate ($\mu\text{mol L}^{-1}$)	Sulfate ($\mu\text{mol L}^{-1}$)	NPOC (mg L^{-1})	Oxygen ($\mu\text{mol L}^{-1}$)	depth (m)	T (°C)	Methane ($\mu\text{mol L}^{-1}$)	Ammonium ($\mu\text{mol L}^{-1}$)	Nitrite ($\mu\text{mol L}^{-1}$)	Nitrate ($\mu\text{mol L}^{-1}$)	Sulfate ($\mu\text{mol L}^{-1}$)	NPOC (mg L^{-1})	Oxygen ($\mu\text{mol L}^{-1}$)
100	4.65	<0.05	1	<0.4	22	55	2	37.03	63	6.08	0.3	<0.5	NA	26	117	2	102.04
102	4.64	<0.05	1	<0.4	21	56	2	32.41	71	5.99	0.4	<0.5	NA	22	113	2	55.88
104	4.64	<0.05	1	<0.4	21	55	2	23.85	79	5.93	0.3	<0.5	NA	17	116	2	23.72