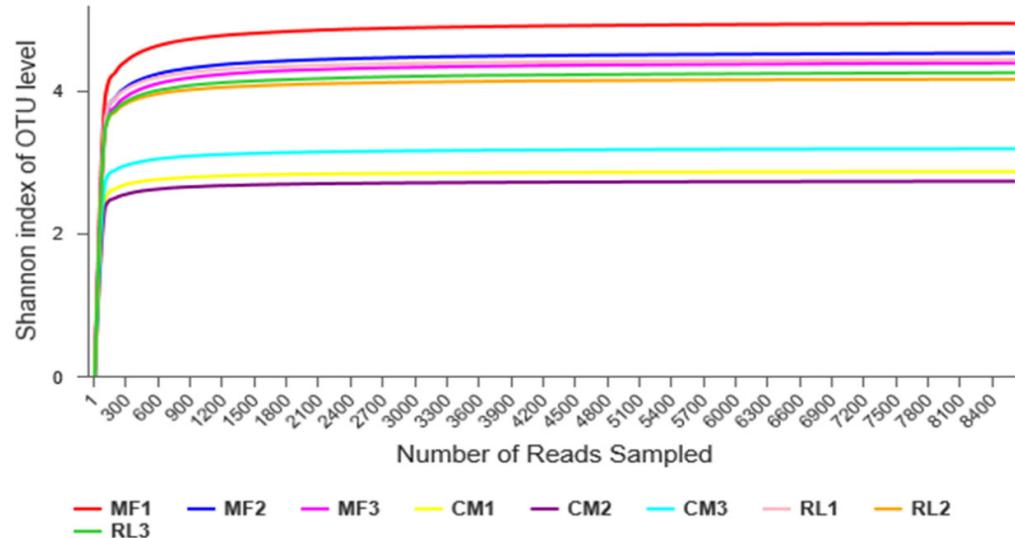


Supplementary Material

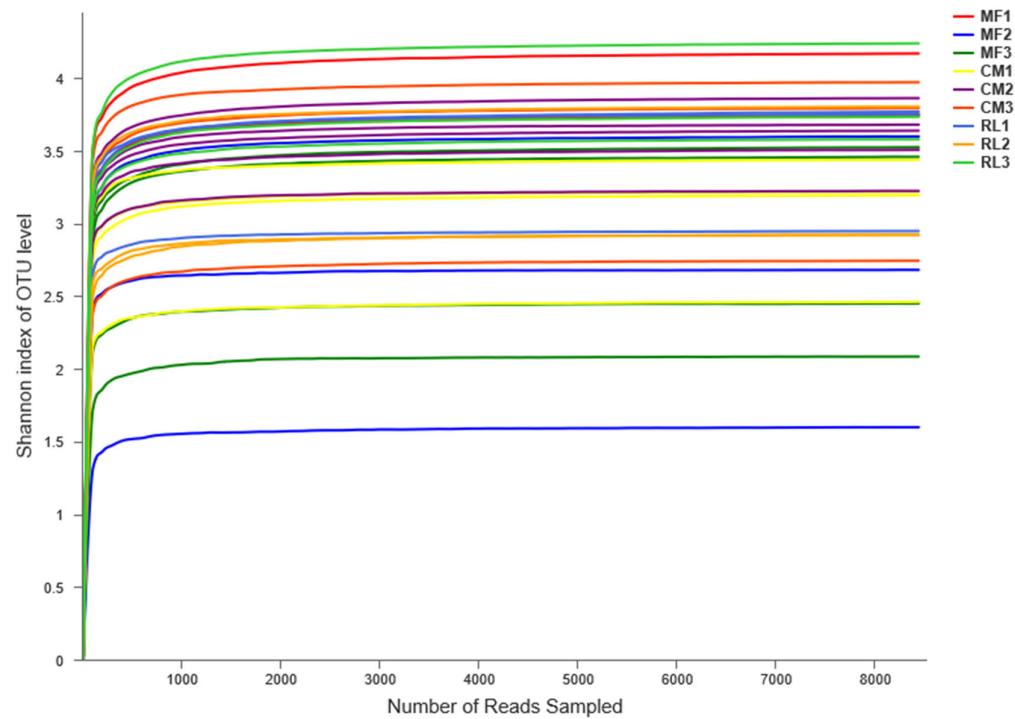
1. Supplementary Figure

1.1. Rarefaction for *mcrA* and *pmoA*

The curve tends to be flat, indicating that the amount of sequencing data is large enough to reflect the most of information about the sampling soil microbial communities.



(A)

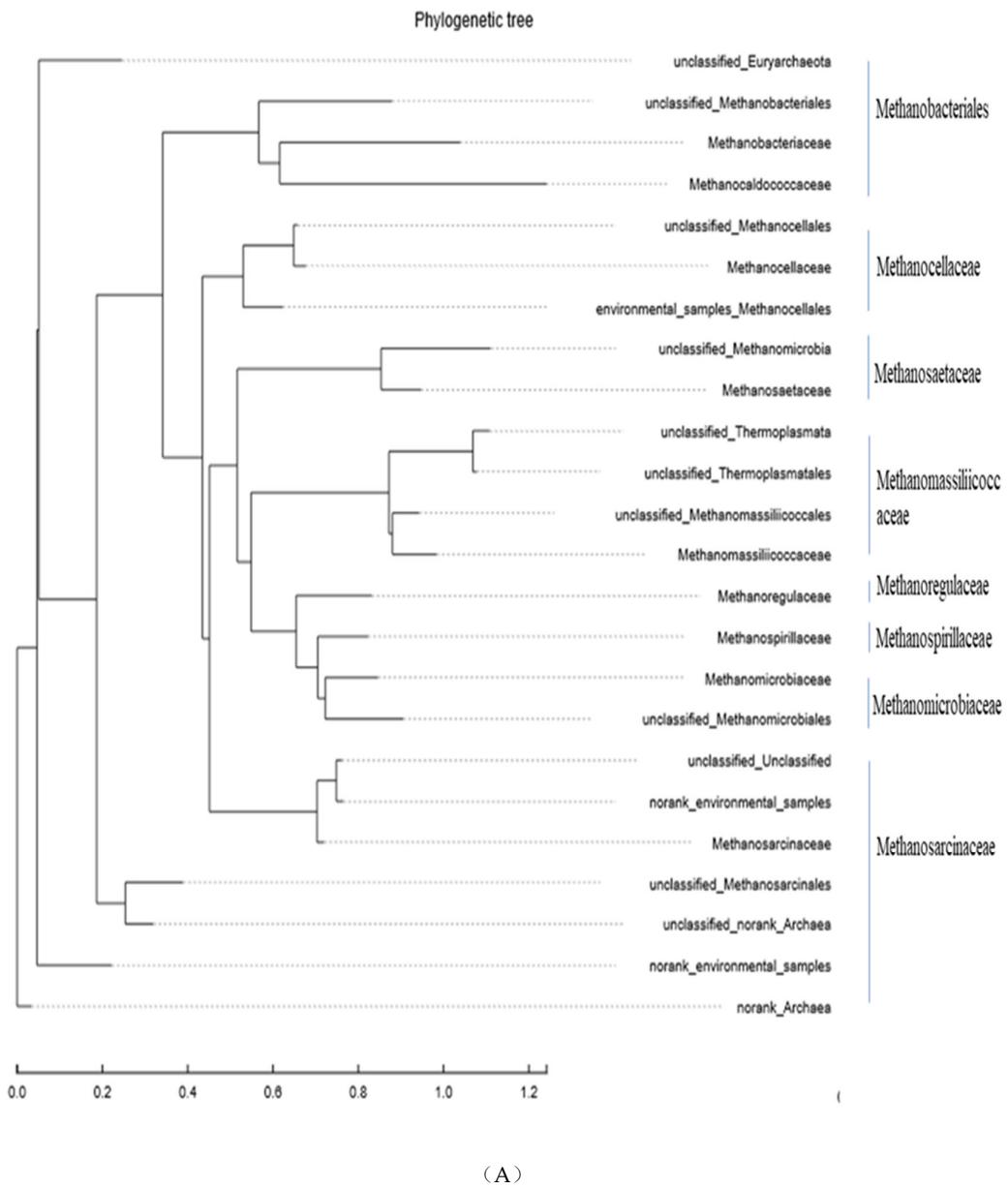


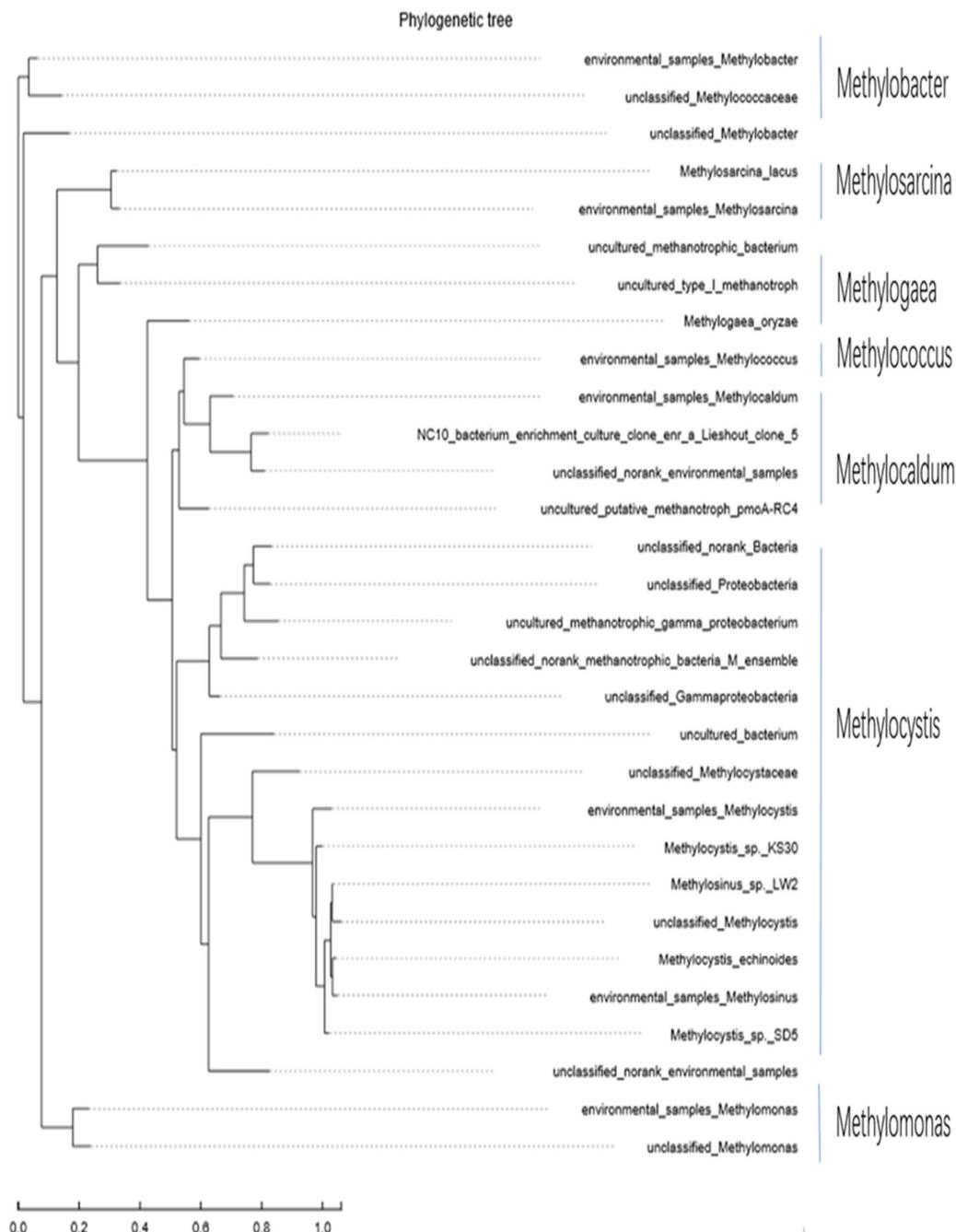
(B)

Supplementary Figure 1: Rarefaction curve for *mcrA*(A) and *pmoA*(B) sequences clustered at 97% similarity across the three site and soil depths in the Dongting floodplain. Site abbreviations: MF: mudflat, CM: Carex meadow, RL: reed land. 1, 2 and 3 represent three depth: 0-10cm, 10-20cm, 20-30cm, respectively.

1.2. Phylogenetic Analysis of Methanogens and Methanotrophs

Methanogen groups detected in the phylogenetic analysis of the community included Methanosaetaceae, Methanobacteriaceae, Methanoregulaceae, Methanospirillaceae, Methanomassiliicoccaceae, Methanocellaceae, and Methanomicrobiaceae families (Supplementary Fig. 2A). Methanotroph groups detected in the phylogenetic analysis of the community included the Methylobacter, Methylosarcina, Methylogaea, Methylococcus, Methylocaldum, Methylocystis, Methylosinus, and Methylomonas genera (Supplementary Fig 2B).





(B)

Supplementary Figure 2: The phylogenetic trees of methanogens (A) and methanotrophs (B) were constructed by FastTree using approximately-maximum-likelihood method on the basis of the *mcrA* and *pmoA* sequences in the soils of three sites in the Dongting floodplain. The number of bootstrap replicates and sequences is 1000 and 144257, respectively.

2. Supplementary Table

2.1. Diversity and Richness of Methanogens and Methanotrophs

Supplementary Table 1 Richness and Diversity Indices of Methanogen (*mcrA*) and Methanotroph (*pmoA*) at Different Soil Depths in the Dongting Lake Floodplain.

Genes	Sampling site	Depth (cm)	Retrieved sequences amount	OTU	ACE estimation	Chao1 richness estimation	Good's coverage (%)	Shannon index
<i>mcrA</i>	MF	0–10	13483	468	615.45	632.64	98.91	5.00
		10–20	17053	446	619.92	622.00	99.35	4.59
		20–30	15732	455	643.92	644.75	99.09	4.46
		Average	15422	456	626.43	633.13	99.11	4.68
	CM	0–10	17203	383	613.56	593.03	98.62	4.45
		10–20	15202	318	489.37	499.49	99.10	4.20
		20–30	16135	390	649.74	641.84	99.39	4.39
		Average	16180	363	584.22	578.12	99.03	4.35
<i>pmoA</i>	RL	0–10	14034	170	248.82	247.43	99.71	2.87
		10–20	12480	173	264.00	246.43	99.64	2.76
		20–30	22935	214	304.42	304.42	99.69	3.23
		Average	16483	186	272.41	266.09	99.68	2.95
	MF	0–10	13295	265	340.24	341.19	99.20	3.88
		10–20	14000	134	155.16	152.06	99.76	2.62
		20–30	17025	189	226.70	223.30	99.53	2.87
		Average	14773	196	240.70	238.85	99.49	3.12
<i>pmoA</i>	CM	0–10	12995	220	294.62	293.51	99.23	3.48
		10–20	13297	212	278.80	272.04	99.30	3.21
		20–30	13812	258	303.13	297.81	99.31	3.67
		Average	13368	230	292.18	287.78	99.28	3.45
	RL	0–10	18713	170	230.46	232.81	99.39	3.07
		10–20	12601	214	312.84	308.75	99.25	3.67
		20–30	12674	192	235.20	241.81	99.50	3.50
		Average	14662	192	259.50	261.12	99.38	3.41

Site abbreviations: MF: mudflat, CM: *Carex* meadow, RL: reed land.

2.2. Soil Physicochemical Properties

Soil C (SOC, DOC, TC, and MBC) and N (TN and MBN) content in the surface layer (0–10-cm depth) were significantly higher than those in the deep layers (10–20-cm and 20–30-cm depth) in both CM and RL ($P < 0.01$, Table S2). However, SOC, DOC, TC, and TN in MF were significantly higher in the 20–30-cm soil layer than in the 0–10-cm and 10–20-cm soil layers. MBC and MBN in MF was higher in the 0–10-cm soil layer than in the 10–20-cm and 20–30-cm soil layers ($P < 0.01$, Table S2). Soil pH and SWC significantly increased with increasing soil depth. Soil TC, TN, and SOC were highest in CM and lowest in MF. However, the contents of NO_3^- and NH_4^+ were significantly higher in MF and RL than in CM. SWC was significantly higher in MF and CM than in RL ($P < 0.01$, Table S2).

Supplementary Table 2. Physicochemical Properties of Soils at Each Sampling Site on November 10, 2016, in the Dongting Lake Foodplain.

Sampling site	Dept h (cm)	Elevation (m)	WTD (m)	SWC (%)	MBC (mg kg ⁻¹)	MBN (mg kg ⁻¹)	DOC (mg kg ⁻¹)	SOC (%)	pH	NH ₄ ⁺ (mg kg ⁻¹)	NO ₃ ⁻ (mg kg ⁻¹)	TC (%)	TN (%)		
MF	0–10	23	0.8	23.50 ± 2.84b	42.70 ± 3.44a	10.95 ± 0.45a	27.76 ± 1.66b	5.53 ± 1.17b	7.78 ± 0.06a	0.73 ± 0.09a	6.75 ± 3.04a	15.41 ± 1.05a	0.49 ± 0.06b		
				30.08 ± 0.50a	23.13 ± 2.98b	5.28 ± 0.20b	25.67 ± 1.08b	8.39 ± 0.25a	7.90 ± 0.04a	11.47 ± 6.15a	1.91 ± 0.66a	16.40 ± 0.39a	0.76 ± 0.01b		
	10–20			32.22 ± 0.67a	16.34 ± 2.01b	5.13 ± 0.12b	44.99 ± 1.66a	8.53 ± 0.22a	7.98 ± 0.05a	6.77 ± 1.75a	2.13 ± 0.72a	15.47 ± 0.33a	0.81 ± 0.01a		
				28.60 ± 1.35a	28.44 ± 3.20b	7.83 ± 0.92b	33.06 ± 2.17b	7.78 ± 0.37b	7.89 ± 0.04a	6.83 ± 2.50a	3.31 ± 1.03a	15.79 ± 0.34b	0.70 ± 0.04b		
	20–30			33.20 ± 2.95a	304.98 ± 32.41a	63.22 ± 8.64a	41.78 ± 1.91a	26.99 ± 1.14a	7.51 ± 0.07c	3.60 ± 0.80a	3.39 ± 1.62a	30.67 ± 1.63a	2.48 ± 0.19a		
				24.32 ± 1.63b	52.84 ± 4.62b	6.44 ± 0.68b	22.59 ± 1.89c	7.74 ± 0.35b	8.02 ± 0.02b	1.30 ± 0.14b	1.24 ± 0.56a	15.66 ± 0.70b	0.63 ± 0.09b		
CM	10–20	24	1	27.17 ± 2.23b	25.16 ± 1.20b	10.61 ± 0.84b	37.06 ± 0.76b	9.29 ± 0.32b	8.07 ± 0.10a	1.02 ± 0.47b	0.93 ± 0.43a	15.34 ± 0.94b	0.77 ± 0.11b		
				28.23 ± 1.59a	102.33 ± 26.5a	24.61 ± 6.69a	34.13 ± 1.97ab	14.13 ± 1.97a	7.86 ± 0.07a	2.06 ± 0.47b	1.94 ± 0.67b	19.83 ± 1.99a	1.21 ± 0.23a		
	20–30			22.86 ± 0.93a	190.57 ± 5.56a	44.48 ± 3.22a	48.39 ± 1.50a	13.41 ± 0.58a	7.92 ± 0.042b	9.38 ± 1.87a	10.13 ± 2.95a	20.24 ± 0.78a	1.28 ± 0.11a		
				20.00 ± 2.43a	72.07 ± 3.05b	13.04 ± 1.48b	35.83 ± 0.75b	8.47 ± 0.27b	8.03 ± 0.04ab	4.88 ± 0.02a	3.95 ± 2.45a	17.23 ± 0.37b	0.84 ± 0.01b		
RL	10–20	25	2	20.42 ± 0.77a	55.51 ± 4.24c	14.96 ± 1.74b	34.44 ± 0.40b	8.24 ± 0.20b	8.05 ± 0.04a	7.71 ± 1.81a	3.27 ± 0.59a	17.19 ± 0.24b	0.79 ± 0.02b		
				21.10 ± 0.87b	104.03 ± 12.44a	25.47 ± 3.60a	38.79 ± 1.32a	9.83 ± 0.52b	8.00 ± 0.03a	7.32 ± 1.00a	5.78 ± 1.56a	18.14 ± 0.48ab	0.96 ± 0.07ab		
	Average														

Different lowercase letters in the same column within each sampling site indicate significant differences ($P < 0.05$) among the three soil layers; different lowercase letters between three averages in the same column indicate significant differences ($P < 0.05$) among the three types of sampling sites. Site abbreviations: MF: mudflat,

CM: *Carex* meadow, RL: reed land. WTD: water table depth; SWC: soil water content; MBC: microbial biomass carbon; MBN: microbial biomass nitrogen; DOC: dissolved organic carbon; SOC: soil organic carbon; NH_4^+ : ammonium; NO_3^- : nitrate; TC: total carbon; TN: total nitrogen

