

## Supplementary Materials

### **L-Cysteine synthase enhanced sulfide biotransformation in subtropical marine mangrove sediments as revealed by metagenomics analysis**

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**Supplementary Table S1.** Functional gene abundances.

Gene	RS1	RS2	RS3	NRS1	NRS2	NRS3	NMS1	NMS2	NMS3
<i>hdrA</i>	9296.6	6430.1	7483.2	10067.	10136.	10055.	7450.0	8143.3	8859.1
	3	6	0	70	89	02	7	9	3
<i>atsA</i>	5258.0	5077.1	4154.0	4772.8	4607.0	5284.6	5202.7	4722.9	4674.0
	4	2	5	7	8	8	2	0	7
<i>dmdB</i>	3684.9	3260.9	3345.6	3698.1	4105.4	4236.9	3878.7	3963.0	4100.4
	1	1	3	7	8	9	5	7	5
<i>dmsA</i>	2876.9	2386.9	2986.5	2677.0	2632.5	2982.9	2328.3	2314.5	2649.8
	6	6	9	3	3	0	9	0	5
<i>cysC</i>	2387.0	2321.6	2102.7	2378.2	2384.6	2425.6	2329.9	2461.9	2378.2
	2	5	4	6	4	2	4	0	8
<i>hdrD</i>	1932.8	1342.2	1715.2	1950.0	1954.9	1949.6	1357.4	1413.9	1665.7
	5	8	0	9	8	7	7	8	3
<i>tusA</i>	1902.3	1793.8	1770.7	1815.2	1763.8	1988.6	1754.3	1841.0	1773.1
	1	4	2	5	3	1	2	3	6
<i>cysE</i>	1842.0	1918.5	1862.4	1871.1	1915.6	1908.4	1852.1	1956.5	1860.3
	7	5	9	6	3	3	3	8	7
<i>ttrB</i>	1415.7	1398.9	1552.7	1375.8	1433.0	1508.6	1145.2	1213.5	1307.0
	9	5	7	1	7	7	3	0	0
<i>cysK</i>	1297.3	1338.9	1181.0	1148.5	1320.6	1392.0	1562.5	1589.6	1320.4
	9	1	8	8	7	6	4	2	2
<i>slcC</i>	1254.0	1157.8	1056.3	1286.8	1262.9	1308.3	1436.1	1388.1	1262.0
	5	9	6	0	9	8	2	7	3
<i>xsc</i>	1253.7	1195.0	1176.9	1263.6	1250.1	1277.7	1247.2	1428.7	1159.3
	7	0	4	5	0	9	4	2	5
<i>sat</i>	1221.6	1185.4	1302.4	1140.4	1121.9	1279.8	1369.7	1288.0	1303.2
	5	2	3	6	7	4	5	9	9
<i>cysN</i>	1166.1	1306.2	1104.0	1222.9	1349.4	1225.3	1372.9	1491.6	1302.4
	0	4	3	3	5	1	6	6	6
<i>cysQ</i>	1128.3	1180.1	1019.2	997.92	1036.1	1200.0	1095.6	1059.7	1068.2
	3	5	5		9	5	5	3	7
<i>glpE</i>	973.60	963.74	824.45	978.54	920.98	983.41	951.43	956.04	886.82
<i>ssuD</i>	965.61	1050.5	847.14	846.68	740.63	1018.3	1130.6	1152.4	839.07
		1				4	0	4	
<i>cysJ</i>	802.26	802.75	831.86	742.84	805.82	794.77	783.59	842.88	818.14

<i>tauD</i>	796.79	837.99	799.26	692.15	796.44	841.20	881.77	837.33	843.33
<i>nrnA</i>	781.83	610.89	799.94	820.70	956.30	801.13	628.13	695.50	836.54
<i>dsrK</i>	774.30	708.07	616.90	809.42	845.70	942.23	573.50	754.62	767.06
<i>metB</i>	747.04	659.75	613.80	714.15	833.35	695.00	1030.5	947.59	802.95
							0		
<i>aprA</i>	722.93	600.10	540.46	737.23	583.28	743.12	437.70	476.07	595.25
<i>ddhA</i>	670.98	506.85	742.03	710.56	724.91	754.57	513.70	593.00	609.93
<i>pspE</i>	597.58	625.72	446.81	516.48	548.51	524.83	468.20	488.23	604.07
<i>dmdC</i>	543.99	432.74	450.12	424.09	557.01	499.09	557.84	524.47	530.16
<i>dmdA</i>	535.69	505.59	425.93	462.19	627.46	536.04	886.58	803.75	668.32
<i>cysH</i>	530.74	429.74	504.71	477.38	539.81	521.36	507.08	463.13	443.30
<i>hdrC</i>	514.34	369.63	386.27	633.34	579.95	476.12	360.05	419.71	475.83
<i>dsrP</i>	448.29	367.68	526.30	473.36	428.09	419.95	266.21	338.10	372.60
<i>sir</i>	421.90	588.58	392.43	357.97	373.20	411.36	381.04	390.37	423.38
<i>fccB</i>	400.68	458.92	398.21	303.43	358.44	416.68	370.11	354.17	332.34
<i>asrB</i>	390.76	323.98	373.38	512.60	474.48	469.77	361.94	337.26	386.63
<i>otr</i>	387.53	282.05	233.13	354.24	371.34	442.30	305.91	352.62	367.31
<i>msmA</i>	385.34	416.92	319.81	274.15	261.10	301.52	426.14	358.34	309.67
<i>soxB</i>	381.57	509.57	374.19	321.80	285.65	345.65	400.48	405.12	387.75
<i>psrA</i>	366.84	275.21	386.80	426.07	382.77	376.53	274.39	327.96	321.33
<i>dsrB</i>	362.75	254.47	276.02	372.36	359.21	367.98	202.01	265.93	331.01
<i>dmdD</i>	356.56	238.42	224.75	410.30	464.24	379.21	378.55	406.95	414.61
<i>ssuC</i>	350.29	413.97	427.90	290.24	359.36	385.93	422.94	458.47	398.09
<i>SUOX</i>	314.18	314.19	267.07	419.92	287.81	276.19	329.20	249.23	317.24
<i>dsrF</i>	313.35	446.91	258.78	285.03	228.77	296.94	344.99	328.43	319.36
<i>ssuA</i>	312.98	334.83	364.51	349.98	321.84	330.15	334.90	344.93	348.01
<i>sseA</i>	299.09	433.70	296.41	211.87	291.57	263.71	356.45	303.53	261.23
<i>dsrM</i>	293.80	240.93	240.35	286.19	226.13	260.56	171.73	151.50	189.07
<i>asrC</i>	291.07	193.71	391.66	334.32	343.92	340.15	173.52	227.78	308.13
<i>MET3</i>	287.25	316.40	196.65	288.70	270.44	304.70	302.71	320.92	281.24
<i>dsrA</i>	285.79	291.53	313.44	304.72	242.39	307.60	203.73	244.25	258.19
<i>hdrE</i>	254.30	99.61	168.96	305.08	278.47	248.63	155.53	157.86	234.37
<i>ETHE1</i>	230.98	274.49	200.26	194.76	211.52	256.70	213.49	228.21	223.16
<i>sqr</i>	230.02	184.73	131.45	196.43	171.66	187.36	227.76	228.81	205.87
<i>dsrN</i>	226.69	191.23	304.58	287.16	297.03	226.27	184.37	211.27	293.07
<i>sorA</i>	214.20	176.83	143.40	175.01	236.07	235.99	284.99	277.67	257.49
<i>asrA</i>	208.76	144.89	162.31	232.07	176.79	159.12	130.46	181.14	164.60
<i>dddD</i>	198.50	190.67	167.86	236.52	219.00	225.97	202.46	196.29	165.34
<i>MET10</i>	195.03	194.54	165.19	161.44	144.56	167.12	145.32	170.01	156.72

<i>cysI</i>	191.07	148.69	152.34	123.31	155.55	147.63	179.66	145.82	158.39
<i>fccA</i>	186.13	454.07	218.92	129.96	144.30	161.27	237.92	201.90	231.41
<i>mtsA</i>	185.64	132.08	107.51	148.83	166.68	175.87	169.86	141.74	205.42
<i>hdrB</i>	182.37	161.43	134.99	138.21	130.24	153.37	227.38	193.25	209.72
<i>cysNC</i>	181.77	330.38	162.21	160.30	204.10	208.27	271.07	258.53	222.76
<i>ttrA</i>	178.79	123.58	131.96	189.50	207.93	176.95	256.09	220.22	201.31
<i>mtsB</i>	173.87	144.13	224.14	206.21	201.41	274.83	123.15	159.09	173.75
<i>cuyA</i>	164.15	203.07	92.64	133.69	189.16	162.83	252.26	273.43	223.04
<i>comE</i>	160.21	183.63	195.43	160.07	174.76	175.08	270.35	238.57	199.25
<i>hydA</i>	146.08	110.38	112.05	193.37	157.30	195.59	123.30	133.11	172.33
<i>npsr</i>	144.52	164.93	162.11	165.35	150.09	188.84	138.50	134.93	124.18
<i>tsdB</i>	144.10	220.79	135.96	89.62	93.25	112.26	135.64	116.22	167.33
<i>phsB</i>	142.79	111.70	112.37	182.76	193.88	147.15	99.89	87.66	98.60
<i>dddP</i>	136.56	122.11	194.17	194.60	152.71	188.52	179.97	150.85	175.17
<i>phsA</i>	136.25	71.81	79.09	161.93	205.39	208.91	185.60	220.75	225.10
<i>cysD</i>	133.96	185.17	126.32	152.22	153.92	136.44	208.69	205.09	175.84
<i>aprB</i>	133.65	170.23	104.25	151.58	156.94	146.11	117.16	73.23	168.78
<i>dsrO</i>	132.90	146.85	134.83	138.42	98.31	153.04	97.05	123.27	137.41
<i>dsoF</i>	124.97	114.51	85.02	79.43	80.85	105.07	75.21	98.10	87.90
<i>dmsB</i>	124.80	142.83	127.11	119.74	183.34	157.34	102.14	145.29	153.66
<i>MET5</i>	122.56	155.75	139.11	152.85	113.40	112.68	187.76	153.14	195.94
<i>hydD</i>	118.71	112.64	68.45	87.91	91.61	98.46	71.96	59.02	47.10
<i>dsrC</i>	111.58	86.32	111.19	105.34	78.18	134.71	93.25	72.74	86.25
<i>mccB</i>	111.19	127.99	86.13	124.94	153.14	88.14	140.82	152.67	146.61
<i>MET17</i>	110.93	100.28	101.86	126.35	153.23	141.32	132.74	91.19	92.88
<i>suyB</i>	109.44	99.17	102.37	124.40	152.73	139.52	181.18	146.92	164.44
<i>soxY</i>	104.26	138.76	84.32	108.96	78.59	94.57	135.81	156.76	128.85
<i>phsC</i>	103.56	95.31	63.87	82.19	84.49	102.17	84.89	82.12	68.94
<i>soxA</i>	96.85	154.81	92.42	113.22	115.16	146.65	151.86	141.05	132.13
<i>shyC</i>	91.73	83.35	53.29	56.40	62.31	70.82	49.13	57.76	51.89
<i>aprM</i>	91.18	138.60	45.36	48.10	70.42	45.28	75.97	69.40	68.51
<i>mddA</i>	81.16	80.97	58.49	90.01	92.62	83.80	88.80	106.80	117.81
<i>sorB</i>	77.45	153.46	92.91	58.53	78.15	58.18	165.92	111.82	103.60
<i>dsrJ</i>	75.44	108.19	120.37	89.99	113.16	90.57	63.88	81.42	97.84
<i>soxX</i>	75.08	71.82	39.30	91.34	45.70	68.45	83.87	74.61	90.08
<i>soxD</i>	74.82	94.77	78.58	75.74	81.68	75.55	116.79	118.55	57.80
<i>sdo</i>	74.41	125.96	103.32	121.49	117.57	119.01	174.36	129.40	198.65
<i>psrC</i>	68.01	25.27	41.18	33.26	21.85	61.57	43.52	55.05	62.94
<i>apt</i>	67.39	121.13	60.40	42.95	63.74	77.34	66.09	49.72	86.18

<i>soxV</i>	64.83	77.82	99.09	60.76	48.68	41.70	90.07	81.74	50.91
<i>ssuE</i>	62.03	99.99	108.39	101.55	144.25	80.10	67.43	118.44	60.01
<i>ttrC</i>	58.88	65.75	78.13	91.55	80.42	73.44	86.37	108.43	83.22
<i>soxI</i>	55.06	81.97	24.69	63.54	51.87	61.78	48.56	67.85	59.22
<i>suyA</i>	52.32	20.23	4.39	36.58	41.37	51.76	47.86	47.55	26.08
<i>soxZ</i>	51.24	102.52	65.46	55.18	91.98	55.65	89.09	60.14	75.27
<i>dmsC</i>	50.96	57.64	28.00	51.65	76.64	59.50	58.13	48.51	73.07
<i>SoeA</i>	48.96	84.16	27.49	22.48	46.89	47.66	28.22	52.74	48.55
<i>comC</i>	48.38	26.20	42.56	73.45	35.60	56.08	33.29	53.58	28.04
<i>MET22</i>	44.58	96.17	37.28	46.32	29.29	44.92	43.42	30.61	50.65
<i>slcD</i>	37.34	39.58	42.32	44.75	33.07	28.44	75.77	57.41	48.37
<i>msuD</i>	35.87	35.38	16.70	26.28	51.75	28.06	42.74	29.50	29.61
<i>tmoC</i>	34.57	17.25	5.63	9.38	45.77	7.69	8.74	15.25	41.60
<i>comD</i>	34.28	22.88	16.53	37.90	44.57	40.72	39.54	62.48	25.30
<i>sreA</i>	33.19	6.73	51.47	31.32	16.04	23.14	15.12	14.98	31.60
<i>SoxC</i>	32.27	57.85	37.90	44.27	64.80	50.44	68.15	70.87	51.45
<i>soeC</i>	30.81	38.05	17.17	8.55	18.54	29.90	19.90	16.05	12.29
<i>SoeB</i>	29.66	3.49	6.90	1.84	16.77	8.29	4.20	3.86	9.47
<i>dsrE</i>	27.86	29.52	33.40	38.53	18.92	22.78	25.82	42.13	19.78
<i>psrB</i>	24.02	18.72	20.35	30.35	22.95	12.53	29.62	25.79	22.10
<i>hydG</i>	23.67	43.90	23.81	19.32	11.89	49.20	20.80	45.25	42.61
<i>SELENB</i>	19.55	11.70	15.59	6.72	8.81	17.63	22.12	38.25	11.35
<i>PI</i>									
<i>Tmm</i>	18.76	13.41	5.04	7.00	14.83	13.94	28.38	18.60	29.12
<i>doxD</i>	17.87	4.46	6.98	18.96	16.20	20.89	25.13	19.49	21.91
<i>rhd</i>	14.54	0.00	4.77	15.72	0.00	15.79	2.13	6.58	18.15
<i>soxW</i>	13.88	2.72	7.58	15.98	20.49	22.51	16.79	14.79	27.73
<i>fsr</i>	13.86	5.04	6.90	13.60	8.85	27.28	2.96	4.15	15.94
<i>dsrH</i>	13.22	36.24	28.33	10.40	10.73	19.56	37.33	12.42	7.12
<i>dddQ</i>	9.72	4.41	0.00	5.45	5.78	7.62	7.04	1.22	6.41
<i>HINT4</i>	9.60	20.09	14.98	9.46	5.44	29.13	2.20	10.66	6.36
<i>dsoD</i>	9.44	0.60	7.01	3.51	4.67	8.14	4.57	6.91	14.49
<i>tmoF</i>	9.33	21.89	11.85	20.35	14.48	11.55	20.37	26.07	47.37
<i>SOX</i>	8.60	0.00	0.00	0.00	9.68	5.35	0.00	3.89	11.96
<i>tsdA</i>	8.24	33.85	20.09	22.66	2.20	17.69	28.10	24.60	21.95
<i>dmoB</i>	7.53	27.62	4.70	28.85	12.80	10.32	19.53	6.62	14.88
<i>dmoA</i>	6.86	0.00	0.00	0.00	0.00	0.00	0.00	4.27	0.00
<i>ddhB</i>	6.86	13.72	3.13	12.14	19.51	24.56	28.82	28.26	29.11
<i>sirA</i>	6.83	9.51	7.85	4.79	11.17	3.39	12.10	9.19	7.62

<i>dddL</i>	6.12	1.75	9.51	0.00	2.24	0.00	12.45	10.99	0.00
<i>sor</i>	3.36	0.00	0.00	3.90	6.81	4.18	11.92	4.06	7.57
<i>SAL</i>	3.18	0.00	0.00	4.69	0.00	0.00	0.00	0.00	0.00
<i>shyB</i>	3.15	1.20	1.57	6.58	3.85	1.62	0.00	0.98	2.82
<i>ygaP</i>	3.13	12.99	1.39	0.00	7.29	0.00	2.56	0.00	0.00
<i>SQOR</i>	2.39	0.91	2.82	0.78	0.00	0.73	1.48	0.00	2.14
<i>dddW</i>	2.05	9.20	0.00	5.90	8.96	29.88	0.00	1.63	0.00
<i>qmoA</i>	1.24	0.00	1.96	1.22	3.02	4.04	0.00	2.32	0.00
<i>ddhC</i>	1.07	3.66	0.95	0.00	1.24	0.00	1.42	4.29	0.00
<i>soxS</i>	0.00	0.00	0.00	10.90	4.49	1.69	1.72	0.00	0.00
<i>dsoB</i>	0.00	5.07	2.25	4.15	2.91	5.60	5.50	4.93	0.76
<i>hdrF</i>	0.00	0.00	6.79	1.88	0.00	2.89	8.37	0.00	2.01
<i>TST</i>	0.00	0.00	0.00	0.00	5.63	0.00	0.00	8.83	5.09
<i>MPST</i>	0.00	2.14	1.66	0.00	0.00	6.86	0.00	0.00	3.36
<i>dsrD</i>	0.00	0.00	0.00	19.08	0.00	0.00	0.00	0.00	0.00
<i>APA1_2</i>	0.00	0.00	1.70	0.00	4.75	0.00	8.63	8.16	2.10
<i>sorT</i>	0.00	0.00	1.57	0.00	0.00	1.46	5.96	1.65	4.75

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**Supplementary Table S2.** Impact of sediment properties on dissimilating sulfate reduction gene families.

Gene	PH	salinity	ORP	AS	NO <sub>3</sub> <sup>-</sup>	NH <sub>4</sub> <sup>+</sup>	Fe	TOC	TN	TP	Sulfides
<i>sat</i>	0.15	0.13	0.30	-0.56	0.55	0.56	-0.45	-0.16	-0.24	-0.01	-0.59
<i>cysN</i>	0.76*	0.78*	0.24	-0.68*	0.06	0.30	-0.82**	-0.74*	-0.67*	-0.44	-0.09
<i>cysQ</i>	0.17	-0.25	0.05	-0.14	0.48	0.42	0.03	0.22	0.23	0.12	0.13
<i>cysJ</i>	-0.24	0.21	0.68*	-0.07	-0.28	-0.10	-0.37	0.09	0.14	0.47	-0.42
<i>nrnA</i>	-0.47	-0.07	-0.27	0.18	-0.42	-0.72*	0.32	-0.10	-0.12	-0.25	-0.26
<i>dsrK</i>	0.00	-0.20	-0.55	-0.08	-0.18	-0.55	0.36	-0.11	-0.13	-0.34	0.10
<i>aprA</i>	-0.24	-0.71*	-0.59	0.36	-0.17	-0.53	0.75*	0.32	0.29	-0.06	0.34
<i>cysH</i>	-0.56	0.24	-0.28	0.03	0.33	0.02	0.24	0.15	0.03	-0.25	-0.58
<i>dsrP</i>	-0.83**	-0.58	-0.34	.767*	-0.48	-0.72*	0.86**	0.66	0.63	0.45	0.16
<i>sir</i>	0.15	-0.37	0.40	0.34	-0.08	0.20	0.03	0.38	0.50	0.57	0.62
<i>asrB</i>	-0.18	-0.14	-0.81**	0.07	-0.02	-0.44	0.53	-0.11	-0.19	-0.51	0.06
<i>dsrB</i>	-0.29	-0.42	-0.51	0.22	-0.39	-0.76*	0.56	0.04	0.02	-0.25	0.05
<i>dsrM</i>	-0.52	-0.69*	-0.48	0.68*	-0.15	-0.40	0.88**	0.63	0.60	0.21	0.39
<i>asrC</i>	-0.74*	-0.41	-0.39	0.43	-0.36	-0.72*	0.67	0.33	0.26	0.13	-0.15
<i>MET3</i>	0.84**	0.25	-0.09	-0.56	0.24	0.31	-0.41	-0.49	-0.44	-0.47	0.24
<i>dsrA</i>	-0.56	-0.85**	-0.43	0.69*	-0.30	-0.54	0.92**	0.76*	0.74*	0.57	0.48
<i>dsrN</i>	-0.52	-0.25	-0.16	0.38	-0.57	-0.74*	0.37	0.04	0.04	0.04	-0.08
<i>asrA</i>	-0.14	-0.25	-0.44	0.29	-0.57	-0.74*	0.45	0.04	0.03	-0.17	0.19
<i>cysI</i>	-0.10	0.17	0.58	-0.17	0.31	0.42	-0.39	-0.02	-0.03	-0.05	-0.60
<i>cysNC</i>	0.62	0.30	0.45	-0.29	0.26	0.62	-0.57	-0.20	-0.09	0.10	0.30
<i>cysD</i>	0.85**	0.61	0.37	-0.62	0.21	0.56	-0.85**	-0.64	-0.57	-0.30	0.03
<i>aprB</i>	0.10	-0.46	-0.10	0.26	-0.11	-0.17	0.25	-0.03	0.04	-0.12	0.48
<i>dsrO</i>	-0.13	-0.87**	-0.28	0.33	-0.19	-0.37	0.61	0.49	0.50	0.45	0.49
<i>dsrC</i>	-0.47	-0.62	-0.59	0.20	0.42	-0.02	.730*	0.53	0.39	0.10	-0.06
<i>aprM</i>	0.30	-0.02	0.58	0.22	-0.10	0.31	-0.27	0.14	0.28	0.33	0.48
<i>dsrJ</i>	-0.57	-0.30	0.09	0.67	-0.51	-0.48	0.43	0.46	0.52	0.59	0.34

<i>MET22</i>	0.26	-0.48	0.20	0.34	0.00	0.24	0.12	0.32	0.43	0.43	0.77*
<i>HINT4</i>	-0.25	-0.53	-0.39	0.24	0.18	-0.07	0.59	0.58	0.55	0.43	0.35
<i>SAL</i>	-0.03	-0.37	-0.48	0.31	-0.27	-0.40	0.49	0.11	0.09	-0.19	0.32
<i>qmoA</i>	-0.44	0.13	-0.52	-0.03	0.06	-0.34	0.39	0.17	0.08	-0.08	-0.27
<i>dsrD</i>	0.15	-0.25	-.690*	0.20	-0.21	-0.34	0.45	-0.06	-0.08	-0.27	0.51

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\* p < 0.05, \*\* p < 0.01.



**Supplementary Table S3.** Sediment properties in mangrove samples and nonmangrove samples.

Properties	MS (mean)	MS (std)	NMS (mean)	NMS (std)	p-values	Mean (all samples)
pH	6.76	0.17	7.03	0.02	0.049	6.89
Salinity (ppt)	29.17	0.37	29.67	0.47	0.170	29.42
ORP	-207.83	81.85	-141.67	23.23	0.265	-174.75
AS (mg/kg)	2301.95	376.26	1383.66	130.34	0.008	1842.81
NO <sub>3</sub> <sup>-</sup> (mg/kg)	1.18	0.82	1.60	1.58	0.664	1.39
NH <sub>4</sub> <sup>+</sup> (mg/kg)	15.09	3.39	20.00	9.01	0.334	17.55
Fe (mg/kg)	96.11	12.52	54.20	4.25	0.002	75.16
TOC (mg/g)	11.62	3.73	3.93	1.07	0.018	7.78
TN (mg/g)	0.77	0.26	0.26	0.06	0.021	0.52
TP (mg/g)	0.15	0.06	0.10	0.02	0.272	0.13
Sulfides (mg/g)	0.09	0.05	0.05	0.01	0.230	0.07

Std: standard deviation; p-values: Student's t test of p-values.

**Supplementary Table S4.** Sediment properties in rhizosphere samples and nonrhizosphere samples.

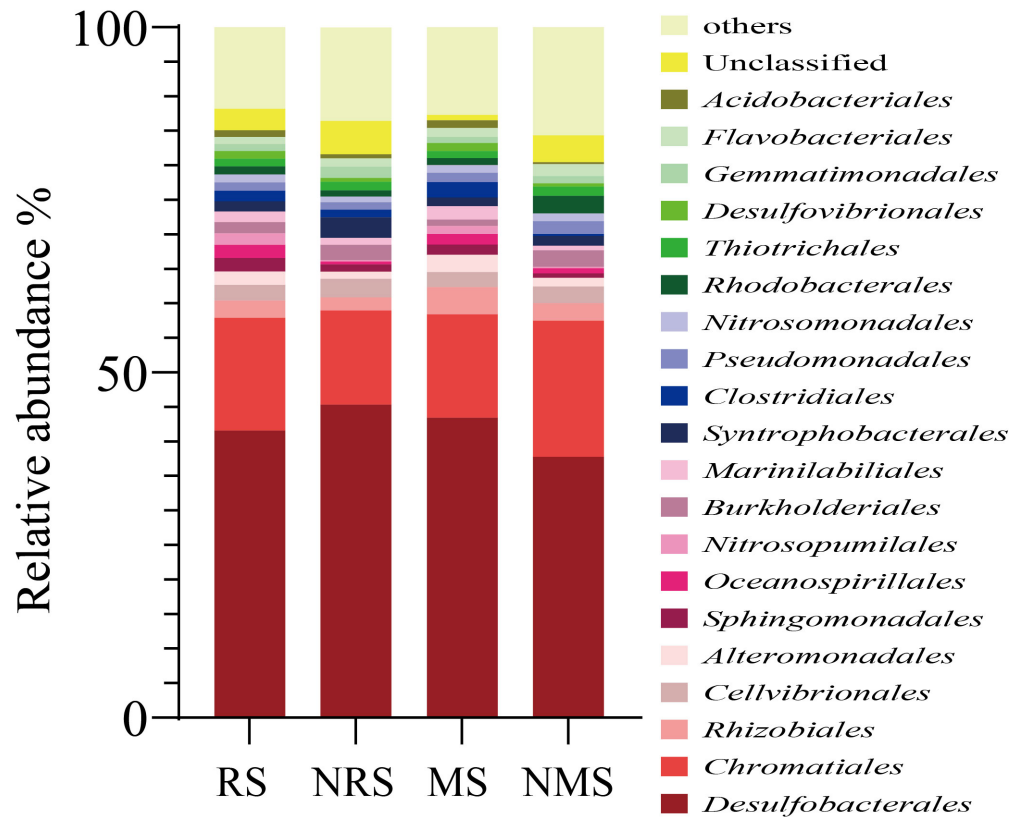
Properties	RS (mean)	RS (std)	NRS (mean)	NRS (std)	p-values
pH	6.69	0.21	6.82	0.08	0.476
Salinity (ppt)	29.00	0.00	29.33	0.47	0.374
ORP	-142.33	13.91	-273.33	68.01	0.056
AS (mg/kg)	2583.36	188.85	2020.55	298.51	0.087
NO <sub>3</sub> <sup>-</sup> (mg/kg)	0.95	0.08	1.42	1.11	0.582
NH <sub>4</sub> <sup>+</sup> (mg/kg)	16.37	3.19	13.81	3.10	0.461
Fe (mg/kg)	94.74	8.83	97.48	15.22	0.836
TOC (mg/g)	14.78	2.08	8.45	1.85	0.032
TN (mg/g)	1.01	0.12	0.53	0.07	0.008
TP (mg/g)	0.21	0.04	0.10	0.01	0.024
Sulfides (mg/g)	0.09	0.06	0.09	0.04	0.901

Std: standard deviation; p-values: Student's t test of p-values.

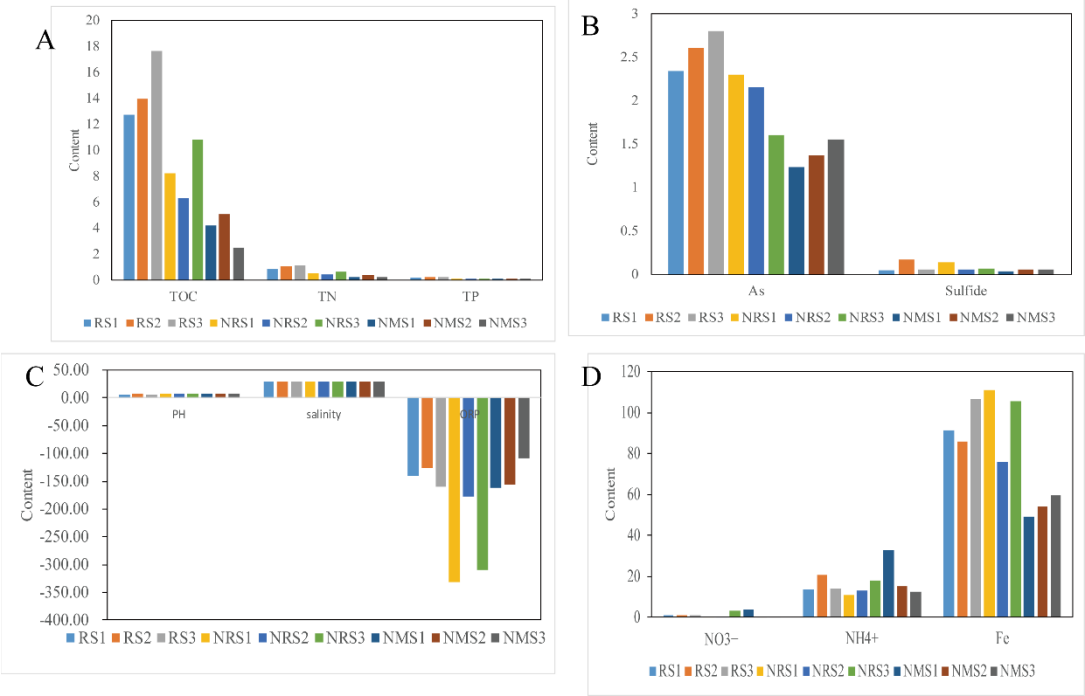
**Supplementary Table S5.** Partial Mantel test to evaluate the relative importance of sediments variables in determining microbial communities and the distribution of sulfur genes in subtropical mangrove ecosystem.

	Functional genes		microorganism community	
	<i>r</i> M	<i>P</i> -value	<i>r</i> M	<i>P</i> -value
TP	0.632	0.008	0.577	0.007
TN	0.519	0.011	0.492	0.013
AS	0.440	0.016	0.409	0.019
TOC	0.384	0.032	0.448	0.026
PH	0.305	0.113	0.559	0.008
NH <sub>4</sub> <sup>+</sup>	0.237	0.210	0.193	0.234
Sulfide	0.230	0.073	0.185	0.224
Fe	0.211	0.104	0.313	0.031
NO <sub>3</sub> <sup>-</sup>	-0.039	0.446	-0.092	0.487
salinity	-0.062	0.571	-0.157	0.667
OPR	-0.062	0.549	-0.157	0.657

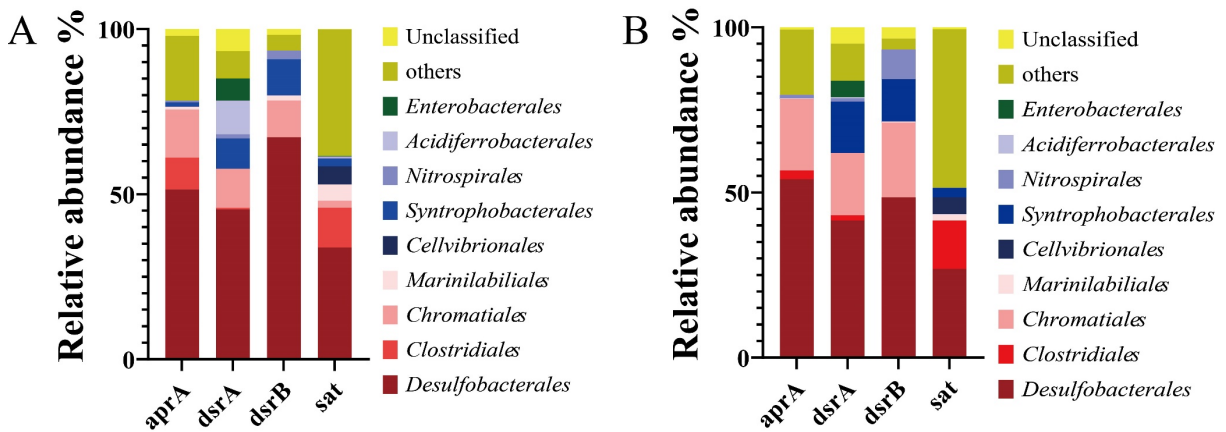
**Supplementary Figure S1.** The 20 dominant dissimilatory sulfate-reduction genes taxonomy order level are shown with their relative abundances.



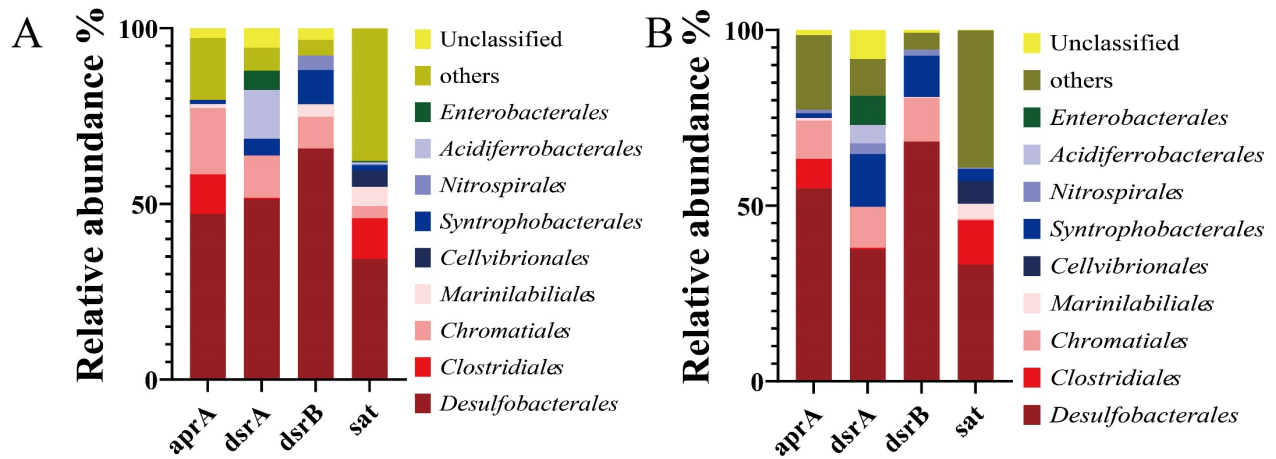
**Supplementary Figure S2.** Sediment properties. (A) TOC (mg/kg), TN (mg/kg), and TP (mg/kg). (B) Contents (mg/kg) of AS and sulfide. (C) pH, salinity, and ORP. (D) Contents (mg/g) of  $\text{NH}_4^+$ ,  $\text{NO}_3^-$ , and Fe.



**Supplementary Figure S3.** Taxonomic classification of key functional genes retrieved from the samples. A) The key genes enriched in the MS; B) The key genes enriched in the NMS.



**Supplementary Figure S4.** Taxonomic classification of key functional genes retrieved from the samples. A) The key genes enriched in the RS; B) The key genes enriched in the NRS.



**Supplementary Figure S5.** Taxonomic classification of key functional genes retrieved from the samples. A) *cysK*; B) *cysE*; C) *sqr*.

