Supplementary Materials

Figure S1. Sampling sites of the non-rice region (A) and sea rice field (B) on the coastal beach of Jiaozhou Bay. Fresh topsoil samples (2-20 cm) were taken for three replicates from each region

Table S1. GenBank accession No. of the isolated proteinase-producing bacterial strains.

Bacterial strains	GenBank accession No.	Bacterial strains	GenBank accession No.
G2-7a	OQ651246	G2-12	OQ619104
G3-5	OQ619129	E1-3	OQ618953
G1-1	OQ619088	G1-5	OQ619092
G1-3b	OQ619111	E1-12b	OQ618963
G3-4b	OQ619130	E3-14	OQ618983
G3-4a	OQ619123	E1-14	OQ619010
G3-2	OQ619128	E2-1b	OQ619030
G1-10	OQ619118	E1-1a	OQ618950
E2-1	OQ618975	E2-10	OQ619029
E3-3	OQ619027	E1-5	OQ618955
E2-2	OQ619011	E1-23	OQ619028
E1-24	OQ618972	G1-17	OQ619113
G1-7	OQ619094	E2-4	OQ619002
E2-6	OQ618976	E3-12	OQ619025
E1-2	OQ618952	E1-21	OQ618970
E1-9	OQ618961	E1-7	OQ618958
E1-8	OQ618960	G1-2b	OQ619090

E3-15	OQ618984	E1-27	OQ618974
G1-3a	OQ619091	E3-9	OQ618981
E3-6	OQ619005	G2-4	OQ619119
G1-13	OQ619097	G3-13	OQ619116
G2-7b	OQ619114	E3-11	OQ618982
G1-8	OQ619095	E1-12a	OQ618962
E2-8	OQ618977	E1-1b	OQ618951
E1-4	OQ618954	G2-14	OQ619115
E3-13	OQ619003	E2-13	OQ619032
G2-15	OQ619105	E3-20b	OQ619031
E1-6	OQ618956	G1-11	OQ619096
G3-9	OQ619108	G2-11	OQ619103
E3-5	OQ618980	G2-10d	OQ619102
E1-19	OQ618969	E3-18	OQ618985
E1-22	OQ618971	E1-25	OQ618973
E1-13	OQ618964	G1-6	OQ619093
E1-22	OQ618971	E3-20c	OQ619001

Table S2. The potential proteolytic activity of the top 50 abundant genera of the sea rice soils.

No. of abundance	Genera	Representative proteinase-producing strain	Reference [1]
1	*Lysobacter*	*Lysobacter capsici* VKM B-2533T	[22]
2-5	*Thiobacillus*, *Antarcticibacterium*, *Sphingomonas*, *Salinimicrobium*	—[2]	
6	*Pontibacter*	*Pontibacter* spp.	[23]
7-20	*Gemmatimonas*, *Ellin6067*, *RB41*, *Gillisia*, *Zeaxanthinibacter*, *MND1*, *Erythrobacter*, *Intrasporangium*, *UTBCD1*, *Cesiribacter*, *Ilumatobacter*, *Ramlibacter*, *Sphingorhabdus*, *Azoarcus*	—	
21	***Arthrobacter***[3]	*Arthrobacter* sp. CW01	[24]
22-23	*Massilia*, *Brevundimonas*		
24	***Pseudomonas***	*Pseudomonas aeruginosa*	[25]

25	*Bryobacter*	—	
26	*Flavisolibacter*	—	
27-32	*Marmoricola, Haliangium, Nitrospira, BIyi10, Subgroup_10, Adhaeribacter*	—	
33	***Bacillus***	*Bacillus subtilis*	[26]
34-38	*Arenimonas, Subsaxibacter, Silicimonas, Gaiella, Anaeromyxobacter*	—	
39	***Streptomyces***	*Streptomyces* sp. M30	[27]
40-42	*Candidatus_Solibacter, Gallionella, Tropicimonas*	—	
43	***Planococcus***	*Planococcus* sp. CGMCC 8088	[28]
44-49	*Hoeflea, Aequorivita, Motiliproteus, Anaerolinea, Devosia, Blastocatella*	—	
50	***Nocardioides***	—	

[1] The genera has been previously reported with the proteinase-producing strains.

[2] Not reported.

[3] The genera in bold fonts were isolated as proteinase-producing bacteria in this research.

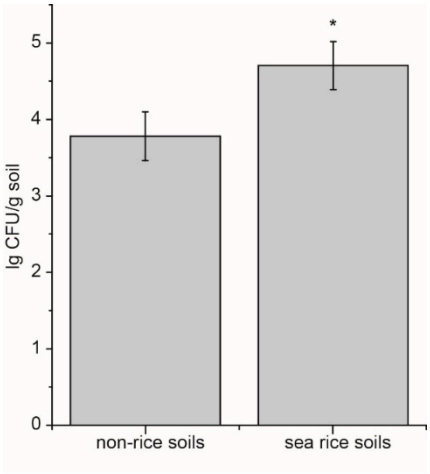

Figure S2. The number of proteinase-producing bacteria in sea rice soils and in none-rice soils estimated by the colony-counting method. The graph is a representative of at least three repeats. Black * indicates significance of differences between the reference and sea rice soils at $P < 0.05$.

Table S3. H/C ratio of the cultivable strains on protein substrate plates.

Genera	Strains	H/C ratio [1]		
		Milk Powder	Casein	Gelatin
Alkalihalobacillus	G2-7a	4.23	4.00	4.50
	G3-5	6.58	6.46	4.00
	G1-1	2.91	3.40	2.00

	G1-3b	2.50	1.85	1.73
	G3-4b	5.38	4.60	5.54
	G3-4a	4.54	5.91	3.45
	G3-2	5.40	7.45	6.08
	G1-10	2.92	2.43	2.23
	E2-1	3.90	4.00	5.55
	E3-3	3.00	2.93	3.38
	E2-2	3.64	2.83	2.73
Arthrobacter	E1-24	2.22	-	2.43
Bacillus	G1-7	3.13	4.17	2.63
	E2-6	4.36	5.17	4.78
	E1-2	3.06	3.00	4.15
	E1-9	4.11	3.07	5.78
	E1-8	3.36	3.71	2.60
	E3-15	4.67	2.67	4.25
Brevibacterium	G1-3a	1.44	2.06	2.20
	E3-6	2.26	1.80	4.63
	E1-3	1.77	1.53	-

(*to continue*)

Table S3. *Cont.*

Genera	Strains	H/C ratio		
		Milk Powder	Casein	Gelatin
Fictibacillus	E2-8	3.60	1.73	-
	G1-13	4.40	3.00	2.00
	G2-7b	2.33	3.17	3.40
	G1-8	2.86	3.13	3.20
Halobacillus	G2-12	3.50	2.50	1.32
	E3-11	3.78	1.78	-
Lysinibacillus	E1-4	3.50	2.32	2.89
Mesobacillus	E3-13	2.67	1.75	2.07
Metaplanococcus	E1-18	4.91	2.00	-
Nocardioides	G2-15	3.80	3.57	1.29
	E1-6	4.83	5.11	-
Oceanobacillus	G3-9	1.82	2.93	-
Paenibacillus	E3-5	2.09	2.24	2.88
Paenisporosarcina	E1-19	6.00	3.56	8.50
Paracoccus	E1-22	-	-	1.20
Planococcus	G1-5	3.20	3.00	-
	E1-12b	4.21	2.88	-
	E3-14	6.78	3.00	1.43
	E1-14	4.56	3.36	4.67
	E2-1b	5.20	4.00	2.45

	E1-1a	4.15	4.08	2.75
	E2-10	2.79	3.73	1.19
	E1-5	3.14	1.89	-
	E1-23	3.90	4.56	-
Priestia	G1-17	3.57	1.62	4.00
	E2-4	2.50	2.60	2.46
	E3-12	3.30	4.29	3.64
	E1-21	2.81	4.56	4.78
Priestia	E1-7	2.50	3.19	4.70
Pseudomonas	G1-2b	6.54	7.33	5.29
	E1-27	4.55	4.00	3.64
	E3-9	3.88	2.53	2.54
Rossellomorea	G2-4	2.75	2.79	2.78
	G1-6	3.46	3.44	2.77
	G3-13	1.30	1.34	1.67
	E1-13	4.90	4.18	-
	E1-12a	3.18	4.00	3.60
	E1-1b	2.62	4.36	5.82
Shigella	G2-14	1.73	1.45	2.28
	E2-13	2.17	2.64	4.00
	E3-20c	3.50	1.82	-
	E3-20b	3.33	-	2.63
	G1-11	-	-	1.45
Streptomyces	G2-11	2.75	1.93	2.19
	G2-10d	-	-	1.89
	E3-18	2.00	-	2.10
	E1-25	1.43	3.64	4.57

[1] Each data is a representative of at least three repeats.