Supplemental Material

The Expansion Route of Ryegrasses (*Lolium* spp.) into Sandy Coasts in Japan

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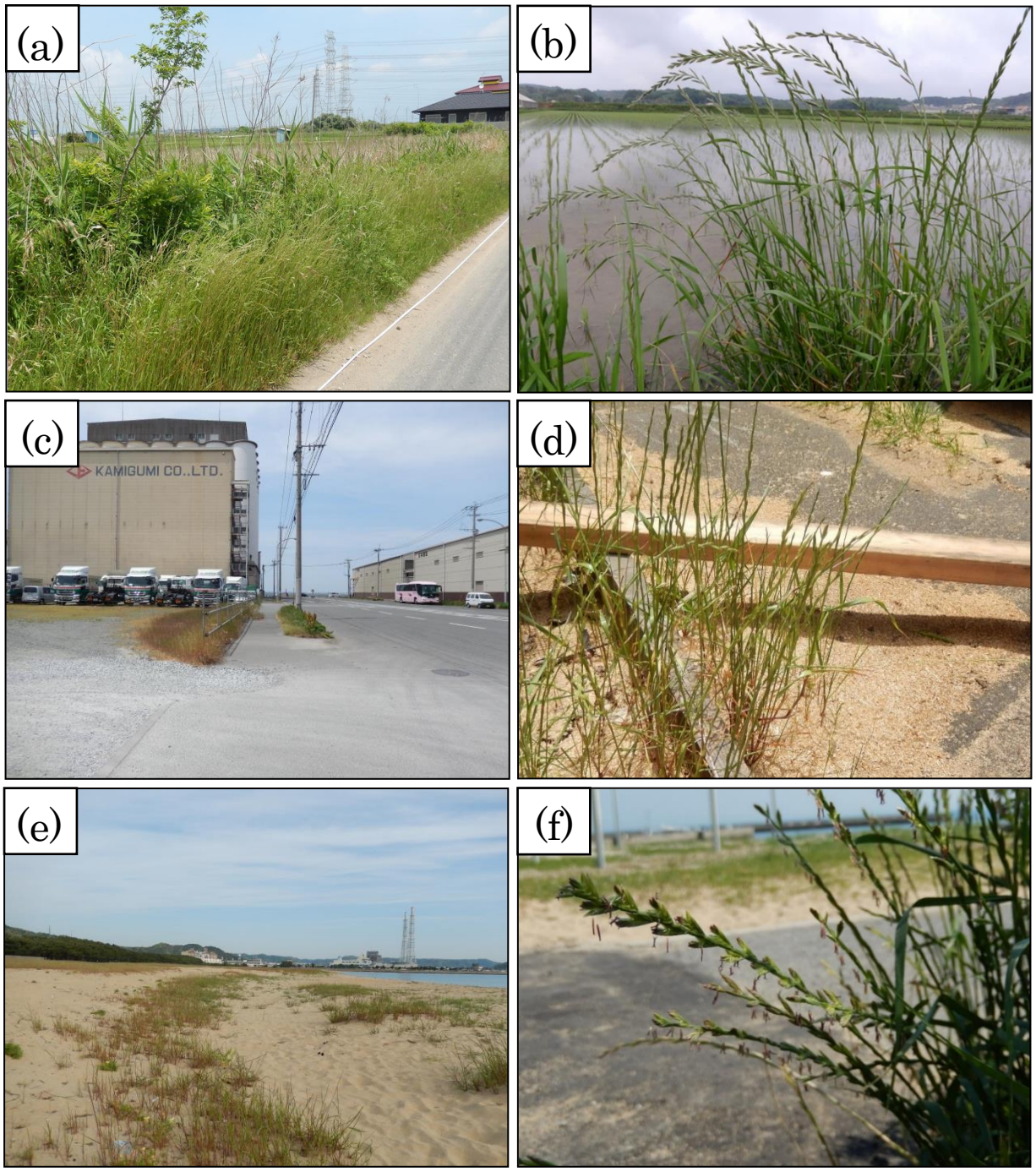

Figure S1. (a, b) *Lolium* species grown in paddy lavee in croplands, which are estimated to be derived from cultivars. (c, d) *Lolium* species grown from spilled wheat grain in seaports. (e, f) *Lolium* species are dominant in some sandy coasts in Japan.

Table S1. Summary of 10 morphological characteristics of *Lolium* species

Habitat	Population	n ※		Rachis length (mm)			Rachis width (mm)			Spikelet width (mm)			Spikelet no.			Spikelet length (mm)		
Cropland	KM	30	(30)	179.43	± 10.42		1.35	± 0.09		9.52	± 0.70		18.17	± 0.93		13.24	± 0.57	
	KSM	30	(30)	195.69	± 8.18		1.41	± 0.06		9.67	± 0.55		19.87	± 0.81		13.72	± 0.47	
	HM	30	(30)	174.45	± 7.77		1.23	± 0.05		8.95	± 0.63		18.60	± 0.89		13.04	± 0.54	
	All	**90**	(90)	183.19	± 5.15	**a**	1.33	± 0.04	**a**	9.38	± 0.36	**a**	18.88	± 0.51	**a**	13.33	± 0.30	**a**
Seaport	KPI	30	(30)	197.79	± 7.70		1.63	± 0.08		9.67	± 0.59		17.13	± 0.63		15.36	± 0.64	
	KSPI	30	(28)	190.08	± 8.08		1.88	± 0.07		7.66	± 0.55		20.97	± 0.91		15.28	± 0.68	
	HPI	30	(28)	170.29	± 7.66		1.51	± 0.06		7.01	± 0.47		16.70	± 0.63		13.56	± 0.46	
	All	**90**	(86)	186.06	± 4.63	**a**	1.67	± 0.04	**b**	8.12	± 0.33	**ab**	18.27	± 0.46	**ab**	14.74	± 0.35	**b**
Sandy coast	SI	30	(27)	159.57	± 13.15		1.44	± 0.11		7.20	± 0.57		16.37	± 1.06		13.05	± 0.69	
	KSI	30	(27)	161.16	± 10.95		1.36	± 0.08		8.44	± 0.70		15.83	± 0.85		12.66	± 0.48	
	NNI	30	(30)	182.50	± 9.18		1.47	± 0.08		5.47	± 0.67		16.17	± 0.66		12.55	± 0.58	
	All	**90**	(84)	167.74	± 6.50	**a**	1.42	± 0.05	**a**	7.04	± 0.39	**b**	16.12	± 0.50	**b**	12.75	± 0.34	**a**
Habitat	Population	n ※		Glume length (mm)			Floret no.			Floret length (mm)			Anther length (mm)			Awn density		
Cropland	KM	30	(30)	6.60	± 0.31		7.80	± 0.48		6.18	± 0.14		3.16	± 0.08		2.87	± 0.08	
	KSM	30	(30)	7.14	± 0.22		8.97	± 0.38		6.47	± 0.12		3.28	± 0.07		2.77	± 0.10	
	HM	30	(30)	6.57	± 0.25		8.40	± 0.38		6.12	± 0.11		3.20	± 0.08		2.73	± 0.13	
	All	**90**	(90)	6.77	± 0.15	**a**	8.39	± 0.24	**a**	6.26	± 0.07	**a**	3.22	± 0.04	**a**	2.79	± 0.06	**a**
Seaport	KPI	30	(30)	10.80	± 0.35		7.03	± 0.39		7.75	± 0.17		3.57	± 0.13		2.27	± 0.17	
	KSPI	30	(28)	9.33	± 0.41		8.33	± 0.42		7.00	± 0.19		3.61	± 0.08		1.53	± 0.16	
	HPI	30	(28)	9.54	± 0.39		6.73	± 0.28		6.97	± 0.13		3.52	± 0.08		1.73	± 0.18	
	All	**90**	(86)	9.89	± 0.23	**b**	7.37	± 0.22	**a**	7.24	± 0.10	**b**	3.57	± 0.06	**b**	1.84	± 0.10	**b**
Sandy coast	SI	30	(27)	9.73	± 0.45		5.43	± 0.42		7.08	± 0.16		3.61	± 0.14		1.67	± 0.15	
	KSI	30	(27)	9.44	± 0.49		6.17	± 0.30		7.32	± 0.19		3.43	± 0.10		1.77	± 0.16	
	NNI	30	(30)	10.63	± 0.45		5.07	± 0.31		7.03	± 0.13		3.42	± 0.07		1.87	± 0.18	
	All	**90**	(84)	9.93	± 0.27	**b**	5.56	± 0.21	**b**	7.14	± 0.09	**b**	3.49	± 0.06	**b**	1.77	± 0.09	**b**

Data are presented as average ± standard error. Different letters (a, b) next to each characteristic indicate significant ($P < 0.05$) differences between pairs of habitats by Tukey's HSD test. ※The numbers in parentheses indicate the number of samples measured for anther length.

Table S2. Population pairwise F_{ST} estimated by microsatellite data

	KSM	HM	KPI	KSPI	HPI	SI	KSI	NNI
KM	0.024	0.012	**0.104**	**0.034**	**0.047**	**0.042**	**0.057**	**0.042**
KSM		**0.009**	**0.140**	**0.082**	**0.084**	**0.090**	**0.093**	**0.093**
HM			**0.108**	**0.064**	**0.076**	**0.075**	**0.084**	**0.082**
KPI				**0.055**	**0.059**	**0.082**	**0.066**	**0.077**
KSPI					**0.015**	**0.011**	0.014	0.003
HPI						**0.029**	0.022	**0.022**
SI							**0.031**	0.009
KSI								**0.023**

Bold font denotes cases with significant genetic differentiation after Bonferroni correction at $P < 0.05$.