

Supplementary Materials

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Supplementary Table S1. Sampling date of field samples during 2015–2018

Season	Sampling date			
	2015	2016	2017	2018
Spring	Apr 8–10	Mar 25–31	Mar 22–28	Mar 26–31
Summer	Jul 14–17	Jun 29–Jul 7	Jul 4–8	Jul 5–11
Autumn	Oct 14–17	Sep 27–Oct 9	Oct 13–24	Oct 10–19
Winter		Jan 11–15, Dec 12–19		Jan 23–Feb 2

Supplementary Table S2. List of aligned sequences of the internal transcribed spacer region of ribosomal DNA obtained from GenBank to develop the species-specific primers and probe of *Shimiella gracilenta*

Species name	Accession No.
<i>Shimiella gracilenta</i>	MN965778
<i>Asterodinium gracile</i>	LC438754
<i>Brachidinium capitatum</i>	HM066999
Dinophyceae sp.	FJ823536
Dinophyceae sp.	FJ823535
<i>Gertia stigmatica</i>	LC490696
<i>Gyrodinium dominans</i>	FN669510
<i>Gyrodinium jinhaense</i>	MH665396
<i>Karenia bicuneiformis</i>	HM807322
<i>Karenia brevis</i>	AF352827
<i>Karenia brevis</i>	AF352823
<i>Karenia longicanalis</i>	MF781065
<i>Karenia longicanalis</i>	FJ823566
<i>Karenia mikimotoi</i>	AF318224
<i>Karenia mikimotoi</i>	KU314866
<i>Karenia mikimotoi</i>	KF998563
<i>Karenia papilionacea</i>	FJ823565
<i>Karenia papilionacea</i>	KJ508367
<i>Karenia papilionacea</i>	MG738213
<i>Karenia selliformis</i>	HM067008
<i>Karenia</i> sp.	AF318225
<i>Karenia</i> sp.	MH781402
<i>Karenia</i> sp.	MH781401
Karenaceae sp.	MH781400
Karenaceae sp.	KJ508389
Karenaceae sp.	KJ858681
<i>Karlodinium armiger</i>	MG642758
<i>Karlodinium armiger</i>	AJ557024
<i>Karlodinium australe</i>	KJ670421
<i>Karlodinium australe</i>	KJ670420
<i>Karlodinium australe</i>	KJ670418
<i>Karlodinium digitatum</i>	MG738210
<i>Karlodinium micrum</i>	AY245692
<i>Karlodinium micrum</i>	AF352367
<i>Karlodinium</i> sp.	KX853202
<i>Karlodinium</i> sp.	FN357291
<i>Karlodinium veneficum</i>	KP639236
<i>Karlodinium veneficum</i>	EF036540
<i>Karlodinium veneficum</i>	KU314867
<i>Prorocentrum micans</i>	AF370879
<i>Prorocentrum minimum</i>	FJ823585
<i>Takayama acrotrocha</i>	HM067011
<i>Takayama helix</i>	MN961145
<i>Takayama helix</i>	MN961148
<i>Takayama</i> sp.	AM183261
<i>Takayama xiamenensis</i>	AY764179

Supplementary Table S3. List of species used to examine primer and probe specificity for *Shimiella gracilentia* and quantitative real-time polymerase chain reaction results

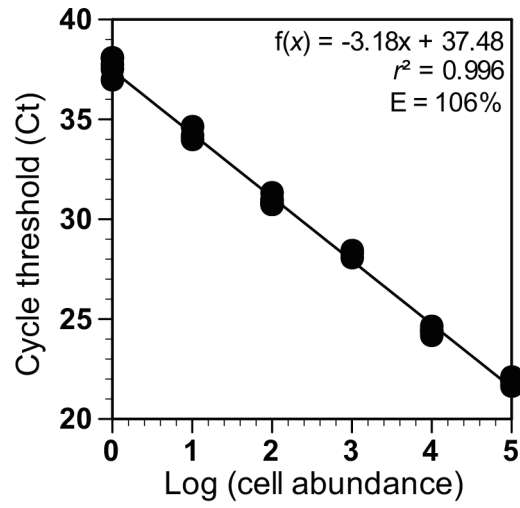
Taxon	Tested species	Strain name	Origin	Detection result
Dinoflagellate, Gymnodiniales	<i>Shimiella gracilentia</i>	SGJH1904	Jinhae, Korea	+
Dinoflagellate, Gymnodiniales	<i>Karenia bidigitata</i>	CAWD81	Fouveau Strait, New Zealand	-
Dinoflagellate, Gymnodiniales	<i>Karenia mikimotoi</i>	NIES-2411	Nagasaki, Japan	-
Dinoflagellate, Gymnodiniales	<i>Karlodinium ballantinum</i>	KBTY1708	Tongyoung, Korea	-
Dinoflagellate, Gymnodiniales	<i>Karlodinium veneficum</i>	KVJH1607	Jinhae, Korea	-
Dinoflagellate, Gymnodiniales	<i>Karenia papilionacea</i>	CAWD91	Hawkes Bay, New Zealand	-
Dinoflagellate, Gymnodiniales	<i>Takayama helix</i>	CCMP 3082	Tasmania, Australia	-
Dinoflagellate, Gymnodiniales	<i>Takayama tasmanica</i>	CAWD115	Glenhaven, New Zealand	-
Dinoflagellate, Gymnodiniales	<i>Gymnodinium aureolum</i>	GASH1201	Shiwha, Korea	-
Dinoflagellate, Gymnodiniales	<i>Gymnodinium smaydae</i>	GSSH1005	Shiwha, Korea	-
Dinoflagellate, Gymnodiniales	<i>Gyrodiniellum shiwhaense</i>	GSGJ1408	Geoje, Korea	-
Dinoflagellate, Gymnodiniales	<i>Gyrodinium dominans</i>	GDJK1907	Jeon-gok, Korea	-
Dinoflagellate, Gymnodiniales	<i>Gyrodinium jinhaense</i>	GSJH1710	Jinhae, Korea	-
Dinoflagellate, Gymnodiniales	<i>Gyrodinium moestrupii</i>	GMSMK0910	Saemangeum, Korea	-
Dinoflagellate, Gymnodiniales	<i>Margalefidinium polykrikoides</i>	CPWD1509	Wando, Korea	-
Dinoflagellate, Gymnodiniales	<i>Paragymnodinium shiwhaense</i>	PSSH0605-1	Shiwha, Korea	-
Dinoflagellate, Gymnodiniales	<i>Levanderina fissa</i>	K-1067	Gulf of Mexico, USA	-
Dinoflagellate, Amphidinales	<i>Amphidinium carterae</i>	SIO PY-1	USA	-
Dinoflagellate, Dinophysales	<i>Dinophysis caudata</i>	DCNH1308	Namhae, Korea	-
Dinoflagellate, Peridinales	<i>Heterocapsa steinii</i>	HTMS0806	Masan bay, Korea	-
Dinoflagellate, Suessiales	<i>Ansanella granifera</i>	AGSW10	Shiwha, Korea	-
Dinoflagellate, Suessiales	<i>Biecheleria cincta</i>	WCSH0906	Shiwha, Korea	-
Dinoflagellate, Suessiales	<i>Yihiella yeosuensis</i>	YYYS1405	Yeosu, Korea	-
Dinoflagellate, Thoracosphaerales	<i>Pfiesteria piscicida</i>	CCMP2091	North Carolina, USA	-
Dinoflagellate, Thoracosphaerales	<i>Scrippsiella acuminata</i>	STGP9909	Kunpho, Korea	-
Cryptophyte, Pyrenomonadales	<i>Teleaulax amphioxeia</i>	TSGS0202	Buan, Korea	-

+, detected; -, not detected.

Supplementary Table S4. Taxa and conditions for the isolation of the kleptoplastidic dinoflagellate *Shimiella gracilentia* SGJH1904 and experimental prey organisms used for experiment 1

Organisms	Strain name	Location	Time	T (°C)	S
<i>Shimiella gracilentia</i>	SGJH1904	Jinhae, Korea	Apr 2019	14.6	33.63
<i>Chrysochromulina</i> sp.	CSYS1905	Yeosu, Korea	May 2019	19.1	33.78
<i>Isochrysis galbana</i>	IG				
<i>Phaeocystis antarctica</i>	RCC4023	McMurdo Sound, Ross Sea			
<i>Teleaulax amphioxeia</i>	TSGS0202	Buan, Korea	Feb 2002	7.8	30.10
<i>Storeatula major</i>	SSSH1103	Shiwha, Korea	Mar 2011	4.3	19.10
<i>Rhodomonas salina</i>	RS				
<i>Pyramimonas</i> sp.	PSSH1204	Shiwha, Korea	Apr 2014		
<i>Dunaliella salina</i>	DSJH1710	Jinhae, Korea	Oct 2017	21.6	32.50
<i>Pseudopedinella elastica</i>	PEJH1904	Jinhae, Korea	Apr 2019	16.0	32.47
<i>Apedinella</i> sp.	ASGY1807	Kwangyang, Korea	Jul 2018	24.9	17.81
<i>Heterosigma akashiwo</i>	HAKS9905	Kunsan, Korea	May 1999	16.0	27.70
<i>Skeletonema costatum</i>	SCYS1801	Yeosu, Korea	Jan 2018	4.4	33.60
<i>Heterocapsa rotundata</i>	HRSH1201	Shiwha, Korea	Jan 2012	0.2	31.00
<i>Amphidinium carterae</i>	SIO PY-1		Oct 1985		
<i>Prorocentrum cordatum</i>	PMKS9906	Kunsan, Korea	Jun 1999	21.1	30.10
<i>Karlodinium veneficum</i>	KVJH1607	Jinhae, Korea	Jul 2016	22.6	30.73
<i>Heterocapsa steinii</i>	HTMS0806	Masan, Korea	Jun 2008	20.2	29.00
<i>Alexandrium minutum</i>	CCMP1888	Laguna Obidos, Portugal			
<i>Karenia mikimotoi</i>	NIES-2411	Nagasaki, Japan	Jun 2004		
<i>Scrippsiella acuminata</i>	STGP9909	Kunpho, Korea	Sep 1999		
<i>Effrenium voratum</i>	SvFL 1	Jeju, Korea	May 2008		
<i>Margalefidinium polykrikoides</i>	CPWD1509	Wando, Korea	Sep 2015	24.7	32.52
<i>Prorocentrum micans</i>	PMSH0910	Shiwha, Korea	Oct 2009	16.8	27.00
<i>Akashiwo sanguinea</i>	ASUSA	USA			
<i>Tripos furca</i>	TFDD1808	Geoje, Korea	Aug 2018	28.5	32.45
<i>Alexandrium fraterculus</i>	AFYS1309	Yeosu, Korea	Sep 2013	23.4	32.80
<i>Lingulodinium polyedra</i>	CCMP1931	California, USA	May 1998		
<i>Mesodinium rubrum</i>	MR-MAL01	Buan, Korea	May 2001	18.0	31.50

T, water temperature; S, salinity.



Supplementary Fig. S1. Standard curve determined by plotting the cycle threshold (Ct) as a function of log (cell abundance) of *Shimiella gracilentia*. E, amplification efficiency.