

Supplementary Materials

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Supplementary Table S1. Newly generated sequences information used to construct *rbcl* phylogenetic tree

Species	Code	Sampling location and date	GenBank accession No.
<i>Chondrus nipponicus</i> Yendo	Cdrus002	Guryongpo, Pohang, Korea; Jul 5, 2020	OK085402
	Cdrus043	Tongyoung, Korea; Jul 21, 2020	OK085403
	Cdrus062	Nambu, Geoje, Korea; Jul 22, 2020	OK085404
	Cdrus211	Dolsan, Yeosu, Korea; Aug 19, 2020	OK085398
	Cdrus257	Yeongnam, Goheung, Korea; Aug 20, 2020	OK085397
	GIGAR034	Oryu, Gyeongju, Korea; Jul 20, 2012	OK085400
	GIGAR035	Chujado, Korea; Aug 17, 2012	OK085399
	GIGAR126	Hakodate, Japan; Feb 25, 2012	OK085401
	<i>Chondrus ocellatus</i> Holmes	Cdrus095	Nambu, Geoje, Korea; Jul 22, 2020
Cdrus172		Seongsan, Jeju, Korea; Aug 17, 2020	OK085406
Cdrus111		Hongpo, Geoje, Korea; Jul 22, 2020	OK085407
Cdrus399		Shimoda, Japan; May 14, 2021	OK085408
Cdrus402		Shimoda, Japan; May 14, 2021	OK085409
<i>Chondrus giganteus</i> Yendo	Cdrus008	Samjeong, Pohang, Korea; Jul 10, 2020	OK085391
	Cdrus039	Sanyang, Tongyeong, Korea; Jul 21, 2020	OK085392
	Cdrus079	Nambu, Geoje, Korea; Jul 22, 2020	OK085390
	Cdrus304	Nambu, Geoje, Korea; Nov 14, 2020	OK085395
	Cdrus317	Nambu, Geoje, Korea; Nov 14, 2020	OK085396
	GIGAR039	Enoshima, Japan; Apr 29, 2010	OK085394
	GIGAR119	Hakodate, Japan; Feb 25, 2012	OK085393

rbcl, ribulose 1,5-bisphosphate carboxylase oxygenase large subunit gene.

Supplementary Table S2. Distribution of COI-5P haplotypes in populations of *Chondrus nipponicus*

Haplo types	Korea																China								Japan					Total	GenBank accession No.			
	Jeju		West			South						East					China								Japan									
	JJ	SG	GE	TA	WS	WD	GH	GM	YS	TY	GJ	BK	GY	PH	YD	JB	UD	DH	GN	LS	XS	YC	DQ	DD	LI	ZD	GI	AJ	AM			HK	TM	MK
CN01	2	1	-	-	-	9	-	-	2	7	8	32	1	5	2	-	-	6	1	42	-	14	19	26	13	28	47	1	1	1	2	3	273	OK085367
CN02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-	-	-	-	-	-	-	-	-	-	23	KP690158
CN03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	OK085368	
CN04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	OK085369	
CN05	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	OK085370	
CN06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	OK085371	
CN07	-	-	-	-	-	-	-	-	1	2	-	-	-	-	5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	OK085372	
CN08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	KP690153	
CN09	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	KP690150	
CN10	21	2	1	25	6	12	11	9	4	3	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	96	OK085373	
CN11	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	OK085374	
CN12	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	OK085375	
CN13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	OK085376	
CN14	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	OK085377	
Total	24	3	1	25	6	24	11	11	6	11	10	33	1	5	2	5	1	9	4	43	23	14	19	26	13	28	47	1	1	1	2	3	413	

COI-5P, 5' end of the cytochrome oxidase subunit I; JJ, Jeju; SG, Seogwipo; GE, Gulupdo; TA, Taeon; WS, Wonsando; WD, Wando; GH, Goheung; GM, Geomundo; YS, Yeosu; TY, Tongyoung; GJ, Geoje; BK, Busan; GY, Gyeongju; PH, Pohang; YD, Youngduck; JB, Jukbyeon; UD, Ullengdo; DH, Donghae; GN, Gangneung; LS, Lvshun; XS, XiaoShi Island; YC, Chang Island; DQ, DaQing Island; DD, DouLuan Island; LI, Li Island; ZD, Zhu Island; GI, GouJi Island; AJ, Awaji Island; AM, Aomori; HK, Hakodate; TM, Tomari; MK, Mashike.

Supplementary Table S3. Distribution of COI-5P haplotypes in populations of *Chondrus ocellatus*

Haplo types	Korea																China		Japan								Total	GenBank accession No.			
	Jeju		West		South						East						YH	BD	SF	OK	AJ	SM	KT	MS	IB	TM			MK		
	JJ	SG	GE	TA	WD	GH	GM	YS	TY	GJ	BK	PH	UJ	JB	UD	DD														DH	
CO01	12	6	7	1	3	5	14	1	4	7	-	-	1	-	7	3	7	10	25	-	-	-	-	-	-	-	-	-	-	111	OK085378
CO02	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	OK085379	
CO03	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	OK085380		
CO04	-	-	1	-	-	-	-	-	-	-	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	4	OK085381		
CO05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	OK085382		
CO06	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	OK085383		
CO07	-	-	-	2	2	-	-	-	-	8	2	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	16	OK085384			
CO08	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	OK085385			
CO09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	OK085386			
CO10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37	12	-	1	19	1	1	-	71	OK104912		
CO11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	10	HM036064		
Total	13	9	8	4	6	5	14	1	5	7	11	2	1	1	8	3	7	10	25	37	12	10	1	19	1	1	1	5	225		

COI-5P, 5' end of the cytochrome oxidase subunit I; JJ, Jeju; SG, Seogwipo; GE, Gulupdo; TA, Taeon; WD, Wando; GH, Goheung; GM, Geomundo; YS, Yeosu; TY, Tongyoung; GJ, Geoje; BK, Busan; PH, Pohang; UJ, Uljin; JB, Jukbyeon; UD, Ullengdo; DD, Dokdo; DH, Donghae; YH, Yinghai beach in Qingdao; BD, BaDaGuan in Qingdao; SF, Shikanoshima; OK, Oki District; AJ, Awaji Island; SM, Shimoda; KT, Kotsubo; MS, Misaki; IB, Ibaragi; TM, Tomari; MK, Mashike.

Supplementary Table S4. Distribution of COI-5P haplotypes in populations of *Chondrus giganteus*

Haplo types	Korea			Japan			Total	GenBank accession No.
	South		East	EN	NG	AM		
	TY	GJ	PH					
CG01	10	55	37	-	29	4	135	OK085388
CG02	-	-	-	4	-	-	4	OK085389
Total	10	55	37	4	29	4	139	

COI-5P, 5' end of the cytochrome oxidase subunit I; TY, Tongyoung; GJ, Geoje; PH, Pohang; EN, Enoshima; NG, Niigata; AM, Aomori.