Table S1. Species list and abundance (individuals/m^3) of the mesozooplankton of the eleven stations (B004 to B44) in the Ross Sea region Marine Protected Area (RSR MPA).

	B04	B11	B16	B18	B26	B29	B33	B35	B38	B41	B44
Cnidaria indet.										0.09	
Siphonophore 1		0.21	1.32		0.06	1.26	0.33	0.09	1.26	1.02	
Siphonophore 2	0.27	0.24		0.21	0.42	0.51	0.18	0.24	0.48	0.24	0.06
Siphonophore 3	0.03										
Hydrozoa indet.		0.06				0.18	0.09		0.03		0.06
Sagitta sp.	3.81	0.03			0.03	0.27		0.12	0.57	0.9	0.06
Limacina rangii		0.06	1.23	0.51	0.21	0.66	0.6	0.45	0.12	0.06	0.09
Clione antarctica	0.06	0.03	0.12			0.03	0.18	0.06	0.09	0.03	
Polychaeta larvae	0.99	0.09	0.09		0.06	0.09	0.6	0.15	0.45	1.56	0.21
Crustaceans nauplius	0.87					0.06			0.48	0.03	1.56
Cirriped nauplius	0.24				0.03	0.15	0.03			40.8	0.15
Ostracoda indet.	1.47	0.03			0.09	0.75	0.66	0.3		1.32	0.12
Calanoides acutus	10.47	2.07	7.02	0.54	0.75	5.1	8.4	4.98	2.94	2.22	0.66
Calanus propinquus	0.51	0.03	0.15		0.03	0.03	0.12		0.06		
Ctenocalanus citer	0.72		0.03			0.09	0.03	0.12	0.18	0.18	0.09
Haloptilus oxycephalus											
Metridia gerlachei	14.16	0.3	13.86	0.12	1.92	14.31	8.64	9.6	11.16	3.54	6.15
Microcalanus pygmaeus	0.09									0.03	
Oithona spp.	49.2	0.06			0.42	0.21	0.03	0.09	0.15	1.41	7.02
Triconia antarctica	45.36	0.03					0.03	0.18		0.09	2.94

Paraeuchaeta antarctica	7.62	0.99	1.92	0.33	3.36	3.72	2.04		2.64	2.22	0.69
Racovitzanus antarcticus	0.27				0.03	0.03	0.03			0.39	
Rhincalanus gigas	0.27										
Copepoda indet.	0.03									0.03	
Euphausia egg	0.03				0.03				0.06	0.45	1.23
Euphausia nauplius										0.06	
Euphausia metanauplius					0.03						
Euphausia calyptopis	0.15					0.54	2.46	4.86	1.8	0.24	0.12
Euphausia furcilia	0.09		0.21	0.33			0.03	0.06	0.06	0.06	0.03
Euphausia crystallorophias		0.09	0.15		1.71	0.24		0.06	0.3		0.21
Thysanoessa sp.	0.06										
Hyperiella dilatata	0.15	0.03	0.15	0.18	0.12	0.09	0.09	0.06	0.09		
Pseudorchomene plebs			0.06	0.06	0.06	0.03		0.06	0.09	0.06	0.15
Mysidae indet.	0.03										
Appendicularia indet.	2.22					0.66	0.48	0.09	1.08	2.88	2.85
Salp thompsoni			0.03								
Fish larvae		0.45		0.66				0.03			
Abundance (inds./m³)	139.17	4.80	26.34	2.94	9.36	29.01	25.05	21.60	24.09	59.91	24.45
No. of taxon	26	17	14	9	18	22	20	19	21	25	20

Table S2. Species list and abundance (individuals/m³) of the mesozooplankton of the eleven stations (B046 to B80) in the Ross Sea region Marine Protected Area (RSR MPA).

	B46	B50	B52	B55	B57	B61	B67	B69	B71	B77	B80
Cnidaria indet.										0.09	
Siphonophore 1		0.21	1.32		0.06	1.26	0.33	0.09	1.26	1.02	
Siphonophore 2	0.27	0.24		0.21	0.42	0.51	0.18	0.24	0.48	0.24	0.06
Siphonophore 3	0.03										
Hydrozoa indet.		0.06				0.18	0.09		0.03		0.06
Sagitta sp.	3.81	0.03			0.03	0.27		0.12	0.57	0.9	0.06
Limacina rangii		0.06	1.23	0.51	0.21	0.66	0.6	0.45	0.12	0.06	0.09
Clione antarctica	0.06	0.03	0.12			0.03	0.18	0.06	0.09	0.03	
Polychaeta larvae	0.99	0.09	0.09		0.06	0.09	0.6	0.15	0.45	1.56	0.21
Crustaceans nauplius	0.87					0.06			0.48	0.03	1.56
Cirriped nauplius	0.24				0.03	0.15	0.03			40.8	0.15
Ostracoda indet.	1.47	0.03			0.09	0.75	0.66	0.3		1.32	0.12
Calanoides acutus	10.47	2.07	7.02	0.54	0.75	5.1	8.4	4.98	2.94	2.22	0.66
Calanus propinquus	0.51	0.03	0.15		0.03	0.03	0.12		0.06		
Ctenocalanus citer	0.72		0.03			0.09	0.03	0.12	0.18	0.18	0.09
Haloptilus oxycephalus											
Metridia gerlachei	14.16	0.3	13.86	0.12	1.92	14.31	8.64	9.6	11.16	3.54	6.15
Microcalanus pygmaeus	0.09									0.03	
Oithona spp.	49.2	0.06			0.42	0.21	0.03	0.09	0.15	1.41	7.02

Triconia antarctica	45.36	0.03					0.03	0.18		0.09	2.94
Paraeuchaeta antarctica	7.62	0.99	1.92	0.33	3.36	3.72	2.04		2.64	2.22	0.69
Racovitzanus antarcticus	0.27				0.03	0.03	0.03			0.39	
Rhincalanus gigas	0.27										
Copepoda indet.	0.03									0.03	
Euphausia egg	0.03				0.03				0.06	0.45	1.23
Euphausia nauplius									0.06		
Euphausia metanauplius					0.03						
Euphausia calyptopis	0.15					0.54	2.46	4.86	1.8	0.24	0.12
Euphausia furcilia	0.09		0.21	0.33			0.03	0.06	0.06	0.06	0.03
Euphausia crystallorophias		0.09	0.15		1.71	0.24		0.06	0.3		0.21
Thysanoessa sp.	0.06										
Hyperiella dilatata	0.15	0.03	0.15	0.18	0.12	0.09	0.09	0.06	0.09		
Pseudorchomene plebs			0.06	0.06	0.06	0.03		0.06	0.09	0.06	0.15
Mysidae indet.	0.03										
Appendicularia indet.	2.22					0.66	0.48	0.09	1.08	2.88	2.85
Salp thompsoni			0.03								
Fish larvae		0.45		0.66			0.03				
Abundance (inds./m³)	6.63	17.28	30.72	52.65	23.55	38.25	31.20	75.51	57.24	49.53	26.34
No. of taxon	26	17	14	9	18	22	20	19	21	25	20

Table S3. SIMPER analysis results showing species that contribute to the group similarity, respectively.

Group A (average similarity: 52.23)	Av. Abund.	Av. sim.	Contrib.%	Cum.%
Calanoides acutus	1.01	11.01	21.08	21.08
Paraeuchaeta antarctica	1.13	9.89	18.93	40.02
Siphonophore 2	0.53	6.66	12.76	52.77
Metridia gerlachei	0.76	5.75	11.01	63.79
Limacina rangii	0.47	4.48	8.57	72.36
Group B (average similarity: 67.07)	**Av. Abund.**	**Av. sim.**	**Contrib.%**	**Cum.%**
Metridia gerlachei	5.03	16.82	25.09	25.09
Calanoides acutus	2.85	8.85	13.20	38.28
Ostracoda indet.	1.83	6.49	9.68	47.96
Sagitta sp.	1.71	6.29	9.38	57.34
Calanus propinquus	1.34	4.38	6.54	63.88
Paraeuchaeta antarctica	1.47	3.77	5.62	69.50
Polychaeta larvae	0.94	3.72	5.54	75.04
Group C (average similarity: 57.75)	**Av. Abund.**	**Av. sim.**	**Contrib.%**	**Cum.%**
Metridia gerlachei	2.30	13.02	22.55	22.55
Appendicularia indet.	1.38	6.83	11.83	34.38
Paraeuchaeta antarctica	1.11	6.35	11.00	45.38
Calanoides acutus	0.96	5.28	9.14	54.53
Oithona spp.	1.23	3.66	6.33	60.86
Polychaeta larvae	0.65	2.99	5.17	66.03
Ostracoda indet.	0.65	2.90	5.02	71.05
Group D (average similarity: 64.92)	**Av. Abund.**	**Av. sim.**	**Contrib.%**	**Cum.%**
Metridia gerlachei	3.47	17.96	27.66	27.66
Calanoides acutus	2.33	12.37	19.05	46.71
Euphausia calypopis	2.08	7.92	12.19	58.91
Limacina rangii	1.04	4.56	7.03	65.93
Paraeuchaeta antarctica	0.86	3.03	4.67	70.60

Table S4. SIMPER analysis results representing species that contribute to the dissimilarity between each group.

Groups A & B (average dissimilarity: 69.26)	A Av. Abund.	B Av. Abund.	Av. Diss.	Contrib. %	Cum.%
Metridia gerlachei	0.76	5.03	14.12	20.38	20.38
Calanoides acutus	1.01	2.85	5.79	8.36	28.74
Ostracoda indet.	0.16	1.83	5.69	8.22	36.97
Sagitta sp.	0.12	1.71	5.09	7.36	44.32
Triconia antarctica	0.30	2.01	4.56	6.58	50.90

Groups A & C (average dissimilarity: 60.35)	A Av. Abund.	C Av. Abund.	Av. Diss.	Contrib. %	Cum.%
Metridia gerlachei	0.76	2.30	7.42	12.29	12.29
Appendicularia indet.	0.00	1.38	6.06	10.04	22.33
Cirriped nauplius	0.06	1.8.	5.99	9.93	32.26
Oithona spp.	0.30	1.23	4.32	7.16	39.42
Triconia antarctica	0.06	0.71	3.00	4.97	44.38
Fish larvae	0.49	0.00	2.50	4.15	48.53
Euphausia calyptopis	0.00	0.49	2.33	3.86	52.39

Groups A & D (average dissimilarity: 59.09)	A Av. Abund.	D Av. Abund.	Av. Diss.	Contrib. %	Cum.%
Metridia gelachei	0.76	3.47	12.23	20.70	20.70
Euphausia calyptopis	0.00	2.08	9.15	15.49	36.20
Calanoides acutus	1.01	2.33	5.96	10.08	46.28
Paraeuchaeta antarctica	1.13	1.13	3.09	5.23	51.50

Groups B & C (average dissimilarity: 52.96)	B Av. Abund.	C Av. Abund.	Av. Diss.	Contrib. %	Cum.%
Metridia gerlachei	5.03	2.30	7.18	13.55	13.55
Calanoides acutus	2.85	0.96	4.86	9.17	22.72
Oithona spp.	2.01	1.23	4.71	8.89	31.61
Triconia antarctica	1.89	0.71	4.18	7.89	39.50
Cirriped nauplius	0.12	1.80	3.84	7.26	46.75
Calanus propinquus	1.31	0.12	3.30	6.23	52.98

Groups B & D (average dissimilarity: 50.05)	B Av. Abund.	D Av. Abund.	Av. Diss.	Contrib. %	Cum.%
Euphausia calyptopis	0.14	2.08	5.00	10.00	10.00
Metridia gerlachei	5.03	3.47	4.84	9.66	19.66
Ostracoda indet.	1.83	0.32	4.00	7.99	27.65
Oithona spp.	2.01	0.27	3.81	7.61	35.25
Triconia antarctica	1.89	0.12	3.75	7.49	42.74
Sagitta sp.	1.71	0.48	3.05	6.10	48.83
Calanus propinquus	1.34	0.24	2.97	5.93	54.77

Groups C & D (average dissimilarity: 49.23)	C Av. Abund.	D Av. Abund.	Av. Diss.	Contrib. %	Cum.%
Euphausia calyptopis	0.49	2.08	5.56	11.30	11.30
Calanoides acutus	0.96	2.33	4.73	9.61	20.91
Metridia gerlachei	2.30	3.47	4.65	9.45	30.37

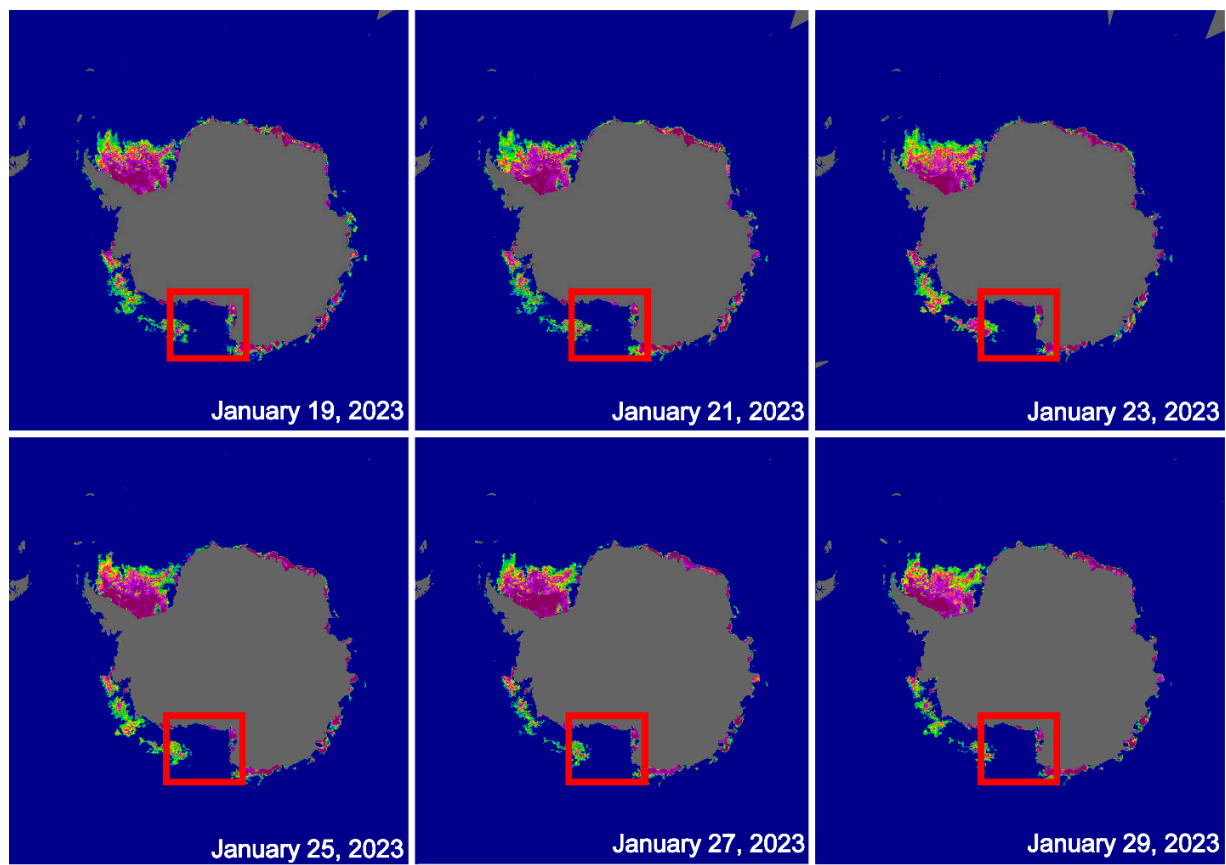|					
Cirriped nauplius	1.80	0.09	4.60	9.34	39.70
Oithona spp.	1.23	0.27	3.26	6.62	46.33
Limacina rangii	0.18	1.04	2.95	5.59	52.32

Figure S1. Sea ice concentration from January 19, 2023 to January 29, 2023 derived from AMSR-E/AMSR2.