

Title

Pristine populations of habitat-forming gorgonian species on the Antarctic continental shelf

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Supplementary Table S1 – Gorgonian presence and spatial distribution in the northern subarea. Occurrence (frequency of occurrence in the set of sampling units) is given for each transect and species; abundance (number of colonies) and maximum density of each species is given for each transect.

Supplementary Table S2 – Size structure characteristics of the studied gorgonians species: colony height, skewness and kurtosis. Asterisks indicate the degree of significance.

Supplementary Table S3 – SIMPER analysis: (a) Species that cumulatively contribute to 90% of the average similarities within the regions (Aver. Sim), (b) Species that contribute cumulatively to 90% of the average dissimilarities between the regions (Aver. Diss).

Supplementary Table S4 – Summary of gorgonian data reported from previous ROV observations from different continental shelves. Data shows maximum abundance, mean density and maximum height.

Supplementary Table S5 – ROV deployments during PS82 (ANT XXIX/9).

Supplementary Table S6 – Remarks on the identification of gorgonian species.

Supplementary Figure S1 – Images of studied species collected with Agassiz trawl. a) Isididae, b) *Thouarella variabilis*, c) *Thouarella* sp.1, d) *Thouarella* sp.2, e) *Dasystenella acanthina*, f) *Fannyella rossii*, g) *Fannyella spinosa*, h) Unbranched, i) *Ainigmaptilon* sp. Scale Bar: 4 cm.

Supplementary Figure S2 – Studied species images from ROV videos. a) Isididae, b) *Thouarella variabilis*, c) *Thouarella* sp.1, d) *Thouarella* sp.2, e) *Dasystenella acanthina*, f) *Fannyella rossii*, g) *Fannyella spinosa*, h) Unbranched, i) *Ainigmaptilon* sp. Scale Bar: 4 cm. All photos taken from video material. © Claudio Richter, AWI, Germany.

Supplementary Table S1

Station	Sampling Units			Species	Sampling units per species		Colonies		Mean density \pm SD	Max density
	Number	with gorgonians	(%)		Number	(%)	Number	(%)	(colonies \cdot m ⁻²)	(colonies \cdot m ⁻²)
128	348	234	(67.2)	<i>Ainigmaptilon</i> sp.	2	(0.6)	2	(0.4)	1 \pm 0	1
				<i>Dasystenella acanthina</i>	33	(9.5)	42	(8.1)	1.3 \pm 0.5	3
				<i>Fannyella rossii</i>	50	(14.4)	56	(10.9)	1.1 \pm 0.4	3
				<i>Thouarella</i> sp.1	50	(14.4)	63	(12.2)	1.3 \pm 0.5	3
				<i>Thouarella</i> sp.2	91	(26.1)	119	(23.1)	1.3 \pm 0.6	4
				<i>Thouarella variabilis</i>	102	(29.3)	160	(31.0)	1.3 \pm 1.0	6
				Unbranched	4	(1.1)	4	(0.8)	1 \pm 0	1
				Isididae	54	(15.5)	70	(13.6)	1.3 \pm 0.6	4
136	336	249	(74.1)	<i>Ainigmaptilon</i> sp.	4	(1.2)	4	(0.6)	1 \pm 0	1
				<i>Dasystenella acanthina</i>	23	(6.8)	27	(4.0)	1.2 \pm 0.4	2
				<i>Fannyella rossii</i>	62	(18.5)	88	(13.0)	1.4 \pm 0.7	4
				<i>Fannyella spinosa</i>	3	(0.9)	4	(0.6)	1.3 \pm 0.6	2
				<i>Thouarella</i> sp.1	74	(22.0)	105	(15.5)	1.4 \pm 1.0	7
				<i>Thouarella</i> sp.2	65	(19.3)	86	(12.7)	1.3 \pm 0.6	4
				<i>Thouarella variabilis</i>	14	(4.2)	20	(2.9)	1.4 \pm 0.7	3
				Unbranched	10	(3.0)	10	(1.5)	1 \pm 0	1
				Isididae	181	(53.9)	334	(49.3)	1.8 \pm 1.5	13
170	354	147	(41.5)	<i>Ainigmaptilon</i> sp.	4	(1.1)	4	(1.9)	1 \pm 0	1
				<i>Dasystenella acanthina</i>	31	(8.8)	37	(17.8)	1.2 \pm 0.5	3
				<i>Fannyella rossii</i>	17	(4.8)	18	(8.7)	1.1 \pm 0.2	2
				<i>Thouarella</i> sp.1	15	(4.2)	16	(7.7)	1.1 \pm 0.3	2
				<i>Thouarella</i> sp.2	18	(5.1)	18	(8.7)	1 \pm 0	1
				<i>Thouarella variabilis</i>	9	(2.5)	9	(4.3)	1 \pm 0	1
				Unbranched	52	(14.7)	59	(28.4)	1.1 \pm 0.5	4
				Isididae	42	(11.9)	47	(22.6)	1.1 \pm 0.3	2
49	204	138	(67.7)	<i>Ainigmaptilon</i> sp.	1	(0.5)	1	(0.2)	1 \pm 0	1
				<i>Dasystenella acanthina</i>	4	(2.0)	4	(0.8)	1 \pm 0	1
				<i>Fannyella rossii</i>	30	(14.7)	49	(9.6)	1.6 \pm 0.9	4
				<i>Fannyella spinosa</i>	3	(1.5)	4	(0.8)	1.3 \pm 0.6	2
				<i>Thouarella</i> sp.1	88	(43.1)	157	(30.8)	1.8 \pm 1.3	7
				<i>Thouarella</i> sp.2	18	(8.8)	23	(4.5)	1.3 \pm 0.5	2
				<i>Thouarella variabilis</i>	7	(3.4)	19	(3.7)	2.7 \pm 1.8	5
				Unbranched	25	(12.3)	183	(36.0)	7.3 \pm 11.5	47
				Isididae	39	(19.1)	69	(13.6)	1.8 \pm 1	5
81	200	139	(69.5)	<i>Ainigmaptilon</i> sp.	5	(2.5)	6	(1.4)	1.2 \pm 0.4	2
				<i>Dasystenella acanthina</i>	37	(18.5)	68	(16.0)	1.8 \pm 1	4
				<i>Fannyella rossii</i>	15	(7.5)	26	(6.1)	1.7 \pm 1.1	4
				<i>Fannyella spinosa</i>	2	(1.0)	2	(0.5)	1 \pm 0	1
				<i>Thouarella</i> sp.1	35	(17.5)	50	(11.7)	1.4 \pm 0.7	4
				<i>Thouarella</i> sp.2	72	(36.0)	137	(32.2)	1.9 \pm 1.1	5
				<i>Thouarella variabilis</i>	81	(40.5)	135	(31.7)	1.7 \pm 1.2	8
				Unbranched	1	(0.5)	1	(0.2)	1 \pm 0	1
				Isididae	1	(0.5)	1	(0.2)	1 \pm 0	1
86	394	276	(70.1)	<i>Ainigmaptilon</i> sp.	3	(0.8)	3	(0.4)	1 \pm 0	1
				<i>Dasystenella acanthina</i>	11	(2.8)	11	(1.4)	1 \pm 0	1
				<i>Fannyella rossii</i>	150	(38.1)	257	(31.7)	1.7 \pm 1	6
				<i>Fannyella spinosa</i>	12	(3.0)	12	(1.5)	1 \pm 0	1
				<i>Thouarella</i> sp.1	107	(27.2)	206	(25.4)	1.9 \pm 1.7	10
				<i>Thouarella</i> sp.2	126	(32.0)	189	(23.3)	1.5 \pm 0.8	5
				<i>Thouarella variabilis</i>	70	(17.8)	95	(11.7)	1.4 \pm 0.9	7
				Unbranched	17	(4.3)	23	(2.8)	1.4 \pm 1.2	6
				Isididae	11	(2.8)	14	(1.7)	1.3 \pm 0.5	2

Supplementary Table S2

	stn.	n	Height (cm)			Skewness			Kurtosis		
			Media	SD	Max	Skew	P-value	Sig.	Kurt	P-value	Sig.
<i>Isididae</i>	49	64	10.61	4.1	30.5	1.929	<0.001	***	9.806	<0.001	***
	128	70	7.4	1.8	12.5	0.324	0.2366		3.568	0.2089	
	136	332	11.0	3.9	29.8	1.195	<0.001	***	4.903	<0.001	***
	170	47	7.5	2.1	15.5	1.472	<0.001	***	6.090	0.0033	**
<i>Thouarella sp. 1</i>	49	135	9.9	3.5	19.3	0.347	0.09166		2.578	0.3059	
	81	50	5.3	1.7	10.8	0.857	0.01247	*	4.002	0.0989	
	86	203	5.4	1.5	10.8	0.786	<0.001	***	3.915	0.0250	*
	128	63	6.3	1.7	12.5	0.406	0.1611		3.753	0.1454	
	136	104	5.9	1.8	14.0	1.144	<0.001	***	5.958	<0.001	***
<i>Thouarella sp. 2</i>	81	127	8.0	3.0	17.7	1.007	<0.001	***	4.013	0.0397	*
	86	182	6.3	2.3	15.5	1.428	<0.001	***	5.892	<0.001	***
	128	117	7.2	1.8	13.5	0.298	0.1722		3.260	0.3916	
	136	83	7.1	2.5	17.2	1.383	<0.001	***	5.485	<0.001	***
<i>Thouarella variabilis</i>	81	130	9.3	3.1	21.8	1.344	<0.001	***	5.760	<0.001	***
	86	92	9.1	3.3	24.5	1.365	<0.001	***	6.642	<0.001	***
	128	160	10.2	2.5	18.3	0.996	<0.001	***	4.320	0.0093	**
<i>Dasystemella acanthina</i>	81	54	11.8	5.7	39.9	2.306	<0.001	***	12.236	<0.001	***
	128	37	11.8	3.4	19.4	0.511	0.1601		2.625	0.8733	
	170	34	11.0	9.8	54.6	0.624	0.1019		2.366	0.5046	
<i>Fannyella rossii</i>	49	42	1.2	11.4	46.5	0.680	0.0557		2.452	0.5467	
	86	251	10.7	6.1	39.9	1.389	<0.001	***	4.106	<0.001	***
	128	56	9.8	3.0	20.1	1.132	<0.001	***	4.308	0.0506	
	136	85	8.8	2.3	16.1	0.442	0.08439		3.182	0.4882	
Unbranched	49	79	54.6	21.8	111.9	0.016	0.948		2.580	0.5107	
	170	59	16.7	9.2	40.7	0.935	0.004157	**	3.104	0.5665	

Supplementary Table S3

a) Similarity			
Species	Sim /SD	Contribution%	Cum. Contribution%
Group South (Aver. Sim=65%)			
<i>Thouarella</i> sp.1	3.7	25.1	25.1
<i>Thouarella</i> sp.2	2.6	22.6	47.7
<i>Fannyella rossii</i>	2.8	18	65.8
<i>Thouarella variabilis</i>	1,9	16.6	82.4
Isididae	0.9	4.8	87.2
<i>Dasystenella acanthina</i>	0.9	4.7	91.9
Group North (Aver. Sim=65%)			
Isididae	2.4	22.4	22.4
<i>Thouarella</i> sp.2	2.1	17	39.5
<i>Dasystenella acanthina</i>	2.9	15.6	55.1
<i>Fannyella rossii</i>	2.7	15.1	70.2
<i>Thouarella</i> sp.1	1.8	13.3	83.5
<i>Thouarella variabilis</i>	1.1	9.9	93.4
b) Dissimilarity			
Species	Diss /SD	Contribution%	Cum. Contribution%
Groups South & North (Aver. Diss=43%)			
Isididae	1.4	16.6	16.6
<i>Thouarella</i> sp.1	1.2	15.2	31.8
<i>Thouarella variabilis</i>	1.4	13.8	45.7
<i>Thouarella</i> sp.2	1.3	12.6	58.3
<i>Fannyella rossii</i>	1.1	11.9	70.2
Unbranched	0.7	10.8	81
<i>Dasystenella acanthine</i>	1.5	9	90
<i>Fannyella spinosa</i>	1.1	6.6	96.5

Supplementary Table S4

Species	Max density (ind./m ²)	Mean density (ind./m ²)	Maximum size (cm)	Study area	Depth (m)	Reference
<i>Acanella arbuscula</i>	4.7			Canada (Gully Canyon)	404-540	Mortensen and Buhl-Mortensen 2005
<i>Acanthogorgia armata</i>	1.99			Canada (Gully Canyon)	231-364	Mortensen and Buhl-Mortensen 2004
<i>Acanthogorgia armata</i>	0.5			Canada (Gully Canyon)	346-493	Mortensen and Buhl-Mortensen 2005
<i>Acanthogorgia hirsuta</i>		0.04 ± 0.2		Tirreanean Sea	200 - 250	Bo et al. 2013
<i>Acanthogorgia hirsuta</i>	5	1.0 ± 1.0		Western Mediterranean (Menorca channel)	100 - 180	Grinyó et al. 2016
<i>Bebrace mollis</i>	3	1.2 ± 0.3		Western Mediterranean (Menorca channel)	180 - 340	Grinyó et al. 2016
<i>Callogorgia verticillata</i>	2	0.4 ± 0.07		Tirrenian Sea	200 - 250	Bo et al. 2013
<i>Callogorgia verticillata</i>	5	1.0 ± 0.9	115.3	Western Mediterranean (Menorca channel)	100 - 180	Grinyó et al. 2016
<i>Corallium lauense</i>		0.33 ± 0.63	20.3	Hawaii	350 - 500	Parrish 2007
<i>Corallium secundum</i>		0.56 ± 0.65	17.9	Hawaii	350 - 500	Parrish 2007
<i>Eunicella cavolonii</i>	24	2.9 ± 2.7	50.4	Western Mediterranean (Menorca channel)	100 - 180	Grinyó et al. 2016
<i>Keratoisis ornata</i>	0.54			Canada (Gully Canyon)	396-509	Mortensen and Buhl-Mortensen 2005
<i>Keratoisisi</i> sp.		0.05 ± 0.1		Bering Sea	466 - 533	Miller et al. 2012
<i>Paragorgia arborea</i>	0.49			Canada (Gully Canyon)	>235	Mortensen and Buhl-Mortensen 2004
<i>Paragorgia arborea</i>	0.6		180	Canada (Gully Canyon)	341 - 495	Mortensen and Buhl-Mortensen 2005
<i>Paramuricea macrospina</i>	9	1.5 ± 1.7	55.6	Western Mediterranean (Menorca channel)	100 - 180	Grinyó et al. 2016
<i>Plumarella</i> spp.		0.72 ± 0.4		Bering Sea	237-356	Miller et al. 2012
<i>Plumarella</i> spp.	5.3	0.46		Bering Sea	300 - 349	Stone et al. 2006
<i>Primnoa pacifica</i>	15.3			Gulf of Alaska	69 - 306	Stone et al. 2014
<i>Primnoa resedaeformis</i>	5.3		86	Canada (Gully Canyon)	388 - 516	Mortensen and Buhl-Mortensen 2005
<i>Radicipes gracilis</i>	4.43			Canada (Gully Canyon)	404 - 535	Mortensen and Buhl-Mortensen 2005
<i>Swiftia pacifica</i>		0.08 ± 0.01		Bering Sea	351 - 530	Miller et al. 2012
<i>Swiftia pallida</i>	14	1.6 ± 2.8	17.4	Western Mediterranean	180 - 340	Grinyó et al. 2016

				(Menorca channel)		
<i>Viminella flagellum</i>	60			Western Mediterranea (Italian Coast)	90-200	Angiolillo et al 2014
<i>Viminella flagellum</i>		0.08 ± 0.3		Tirreanean Sea	200 - 250	Bo et al. 2013
<i>Viminella flagellum</i>	26	3.2 ± 5.4	148.3	Western Mediterranean (Menorca channel)	180 - 360	Grinyó et al. 2016
<i>Ainigmaptilon antarcticum</i>	1.16	0.17 ± 0.31		Weddell Sea	142-363	Orejas et al. 2002
<i>Ainigmaptilon antarcticum</i>	0.7			Weddell Sea	100 - 283	Gutt et al. 2003
<i>Ainigmaptilon sp.</i>	2	1.2 ± 0.4	55.1	Weddell Sea	284 - 361	This study
<i>Arntzia sp.</i>	0,6			Weddell Sea	100 - 283	Gutt et al. 2003
<i>Dasystenella acanthina</i>	4	1.8 ± 1	54.6	Weddell Sea	284 – 361	This study
<i>Fannyella rossii</i>	6	1.7 ± 1	46.5	Weddell Sea	284 – 361	This study
<i>Fannyella rossii</i>			21	Ross Sea	324	Martinez-Dios et al. 2016
<i>Fannyella spinosa</i>	2	1.3 ± 0.6	19.3	Weddell Sea	284 – 361	This study
Isididae		0.03		Ross sea	341 - 555	Clark and Bowden 2015
Isididae	13	1.8 ± 1.5	30.5	Weddell Sea	284 – 361	This study
<i>Primnoella antarctica</i>	1.5			Weddell Sea	100 - 283	Gutt et al. 2003
Primnoidae		0.29		Ross sea	341 - 555	Clark and Bowden 2015
<i>Primnoisis spp.</i>	4,7			Weddell Sea	100 - 283	Gutt et al. 2003
<i>Thouarella sp.</i>		0.2		Ross sea	341 - 555	Clark and Bowden 2015
<i>Thouarella sp. 1</i>	10	1.9 ± 1.7	19.3	Weddell Sea	284 – 361	This study
<i>Thouarella sp. 2</i>	5	1.5 ± 0.8	17.7	Weddell Sea	284 – 361	This study
<i>Thouarella variabilis</i>	8	1.7 ± 1.2	24.5	Weddell Sea	284 - 361	This study
<i>Thouarella/Dasystenella</i>	0.7			Weddell Sea	100 - 283	Gutt et al. 2003
Unbranched	47	7.3 ± 11.5	111.9	Weddell Sea	284 – 361	This study

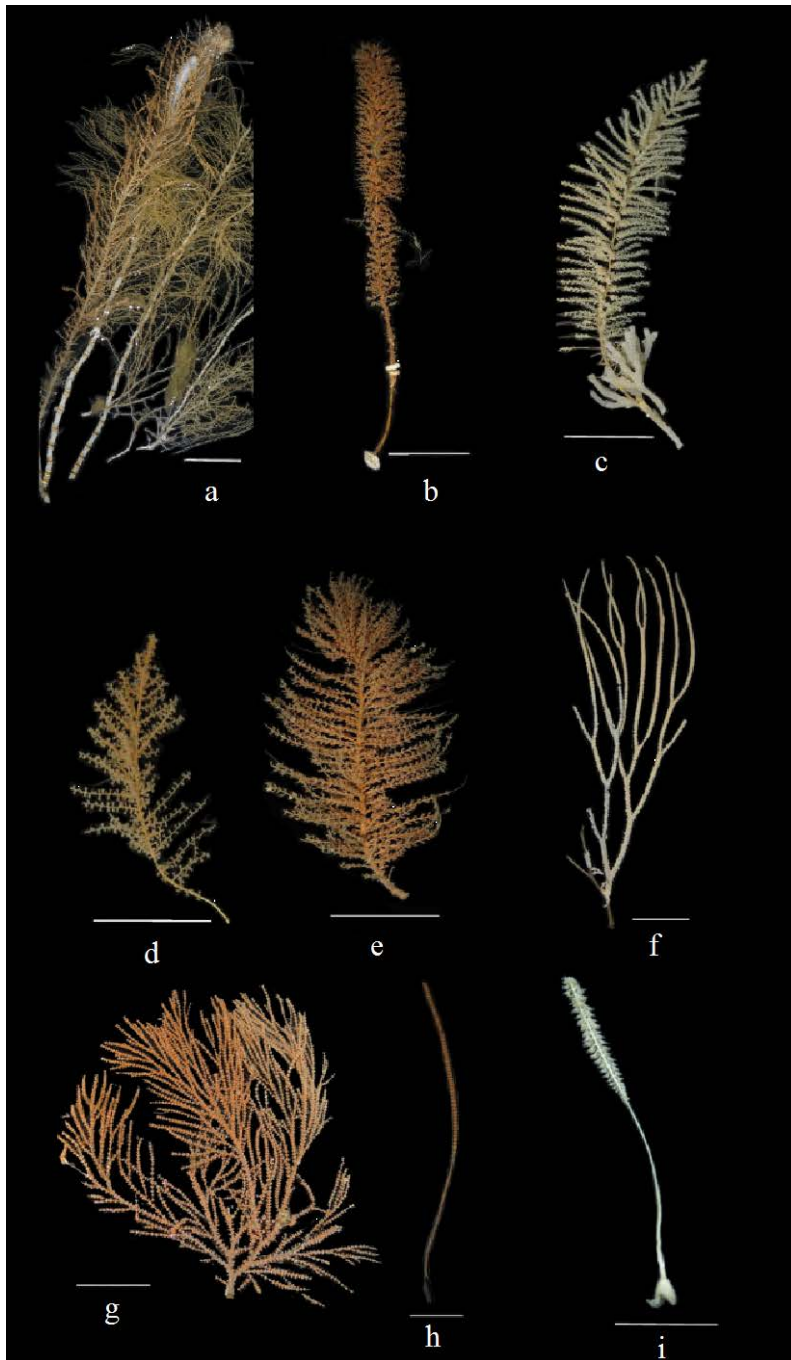
Supplementary Table S5

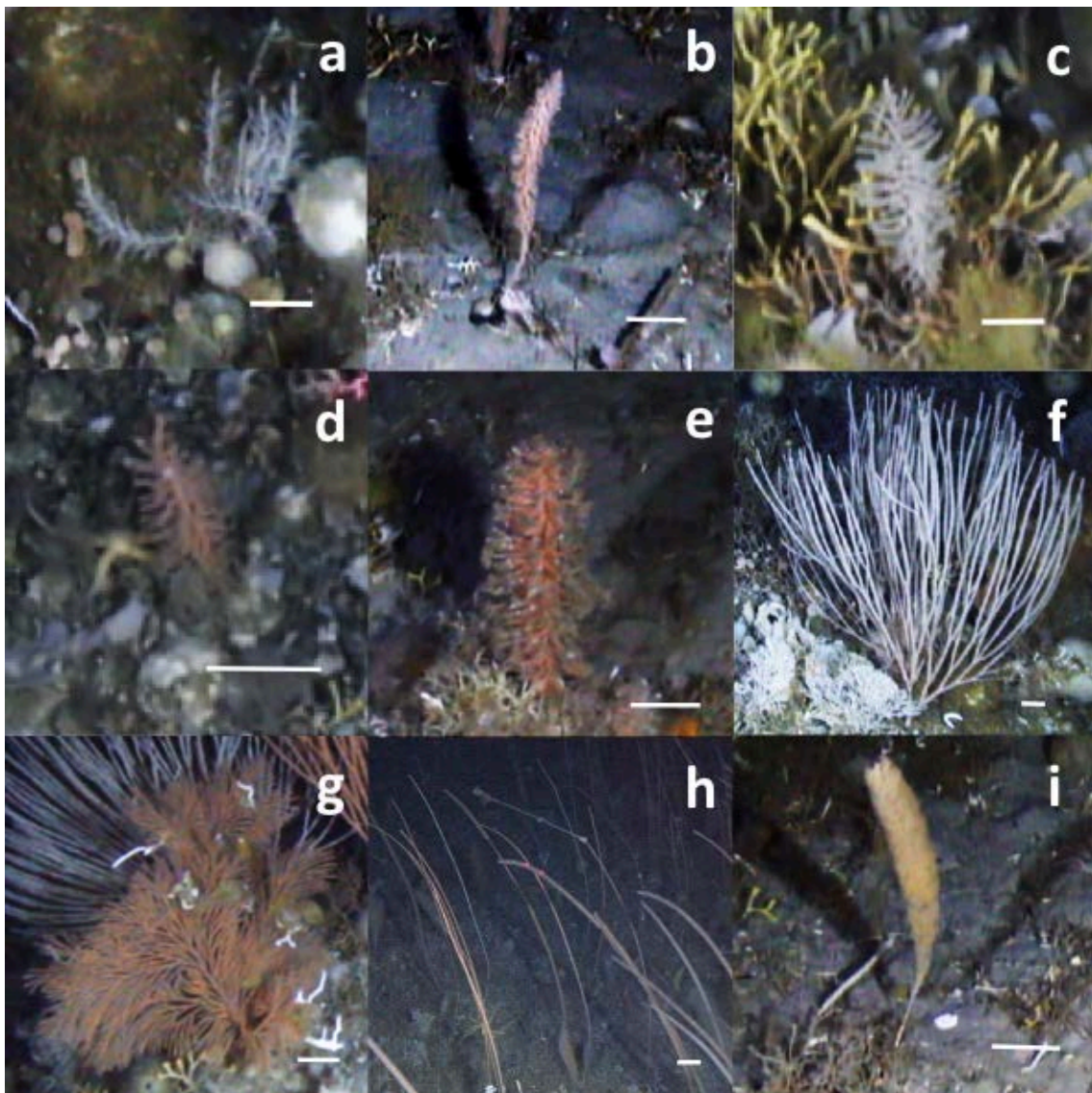
Station	Latitude (S)	Longitude (W)	Total length (m)	Depth (m)	Area N/S (North/South)	Data
170	74° 53.89'	26° 38.10'	1176	295	N	https://doi.org/10.1594/PANGAEA.879526
136	75° 19.99'	27° 32.40'	1118	350	N	https://doi.org/10.1594/PANGAEA.879525
128	75° 29.99'	27° 27.17'	1156	292	N	https://doi.org/10.1594/PANGAEA.879524
49	76° 19.15'	29° 01.94'	679	251	S	https://doi.org/10.1594/PANGAEA.879289
86	76° 57.41'	32° 59.11'	1310	284	S	https://doi.org/10.1594/PANGAEA.879523
81	77° 04.82'	33° 39.02'	665	361	S	https://doi.org/10.1594/PANGAEA.879522

Supplementary Table S6

Morphotype	Species	Remarks
<p>Unbranched morphogroup:</p> <p>Colonies are flagelliform; species included in this morphotype also have polyps distributed in whorls along the main stem of the colony.</p>	<i>Onogorgia nodosa</i> (Molander, 1929)	Species allocated to several genera until Cairns and Bayer (2009) proposed the new genus <i>Onogorgia</i> ¹⁰¹ . This genus includes specimens with ascus body wall scales, a feature observable only under the microscope, making their identification rather difficult.
	<i>Arntzia gracilis</i> (Molander, 1929)	Originally described as <i>Primnoella gracilis</i> , this species was assigned to the new Antarctic genus <i>Arntzia</i> ¹⁰² due to significant differences with the closest genera, <i>Primnoella</i> and <i>Ainigmaptilon</i> . <i>Arntzia gracilis</i> is the only species included in the genus and it is easily recognizable. Its main features are the disposition of polyps in whorls which are fused basally, slender polyps with body sclerites aligned with the opercular ones, and, sometimes, not well-differentiated from body scales below, as they have a translucent appearance.
	<i>Armadillogorgia</i> Bayer, 1980	Two species are included in this genus <i>A. cyathella</i> Bayer, 1980 and <i>A. albertoi</i> Cerino and Lauretta, 2013. These authors conclude that specimens from this genus are not abundant; however, we cannot dismiss the possibility of having some specimens in our video footage, mainly because their general appearance can be confused with the other unbranched species. Upon closer inspection, their polyps lack opercular and marginal scales and have two perfect rows of more than forty sickle-like sclerites in the abaxial side.
	<i>Primnoella</i> Gray, 1858	Very controversial genus, for which different genera have been proposed since Bayer (1996) ¹⁰³ . It differs from other unbranched species mainly in its sclerite properties such as disposition, size, ornamentations and their absence in the adaxial side, as well as the presence of non-fused polyps ^{104,105} .
Grouped bamboo corals in the Family <i>Isididae</i> .		Family easily recognizable by their whitish, yellow-pale axis color and conspicuous white calcareous internodes alternating with dark proteinaceous nodes.

Supplementary Figure S1





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