The following supplement accompanies the article

Spatial and temporal distribution patterns of acoustic backscatter in the New Zealand sector of the Southern Ocean

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Supplement

Acoustic transects by vessel

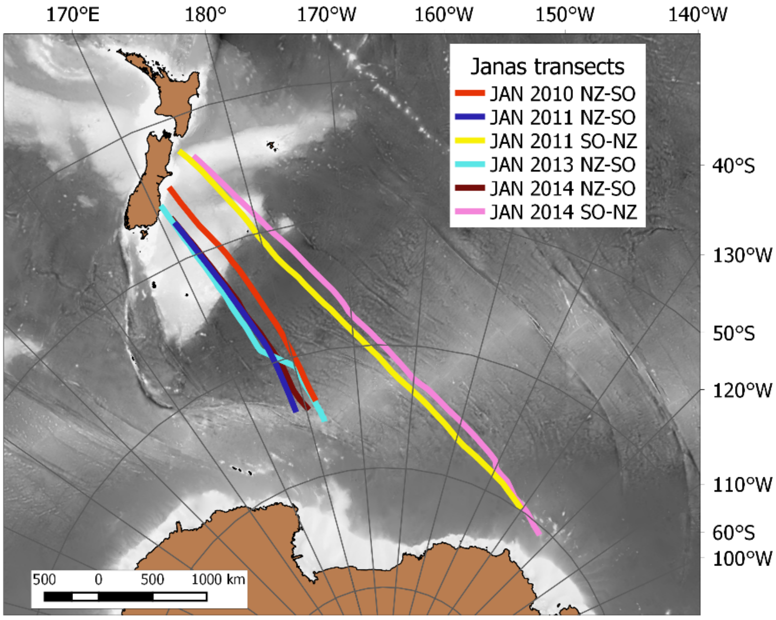

Fig. S1. Acoustic transects (n = 6) collected between 2010 and 2014 along the transit between New Zealand and the Southern Ocean by fishing vessel Janas.

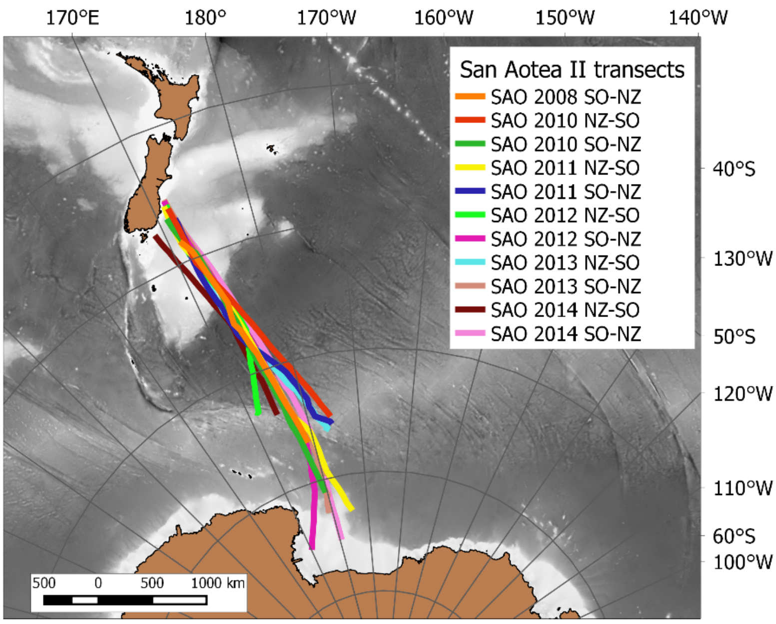

Fig. S2. Acoustic transects (n = 11) collected between 2008 and 2014 along the transit between New Zealand and the Southern Ocean by fishing vessel San Aotea II.

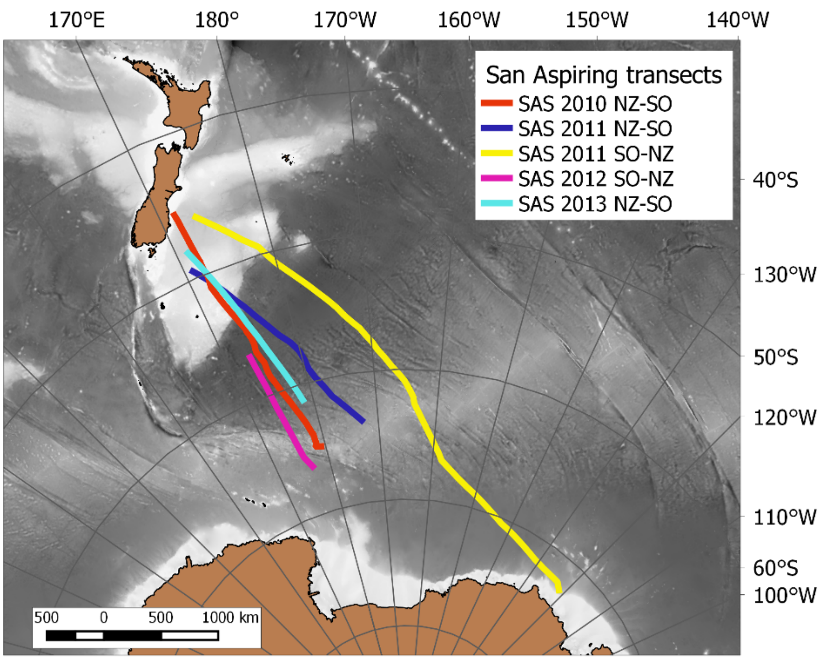

Fig. S3. Acoustic transects (n = 5) collected between 2010 and 2013 along the transit between New Zealand and the Southern Ocean by fishing vessel San Aspiring.

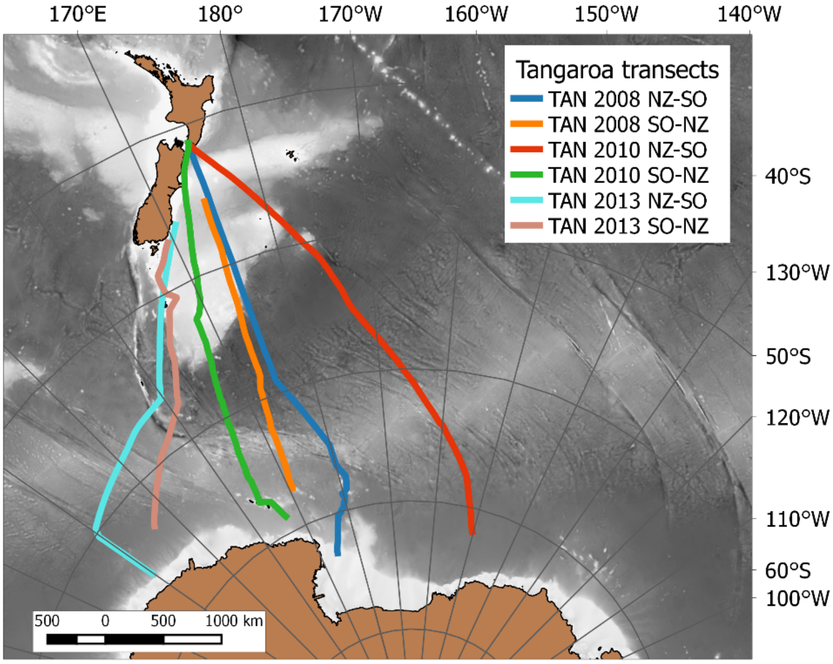

Fig. S4. Acoustic transects (n = 6) collected between 2008 and 2013 along the transit between New Zealand and the Southern Ocean by research vessel Tangaroa.

Acoustic transects split into three latitudinal regions to assist descriptive analysis. Regions were split to remove bottom depth effects on acoustic backscatter east and southeast of New Zealand, and overcome data limitation in the southernmost end of the area of study.

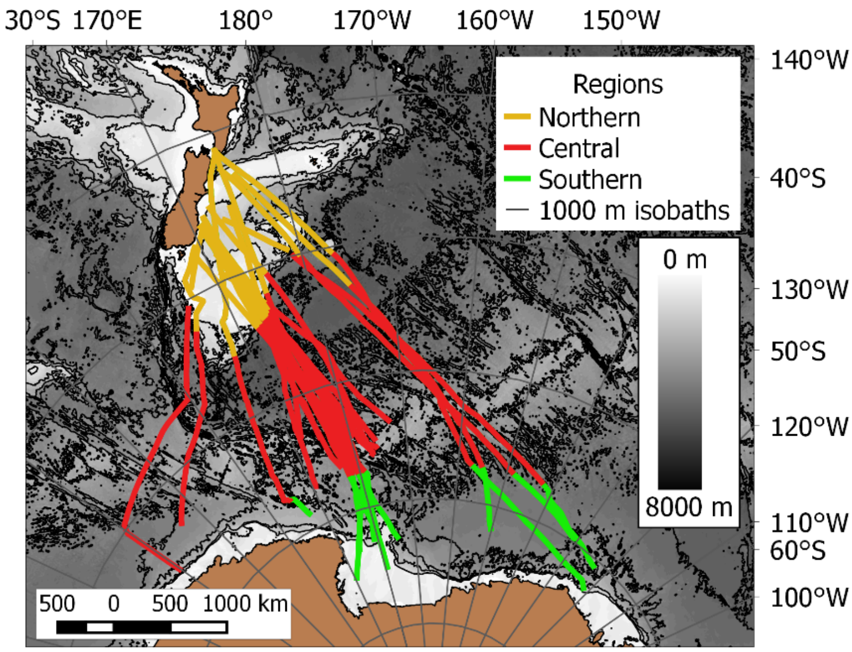

Fig. S5. Transects split into three latitudinal regions for spatial and temporal analysis: Northern region (dark yellow); Central region (red); Southern region (green).

Acoustic transect exemplifying the north-south decrease in acoustic backscatter.

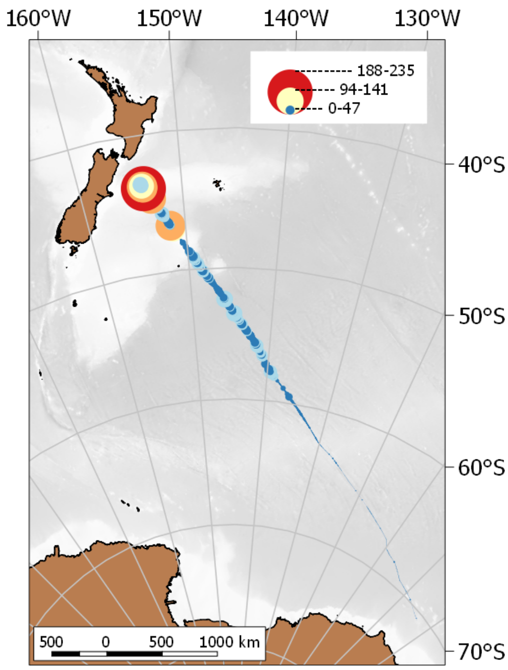

Fig. S6. Distribution of vertically summed acoustic backscatter (s_a) in m^2 km^{-2} per bin, collected at 38 kHz along the transit between the Southern Ocean (right) and New Zealand (SO-NZ) (left). Transect JAN 2014 SO-NZ. Bubbles represent 1 km bins.

Interannual variability of acoustic backscatter by pelagic zone for transects in the Central region

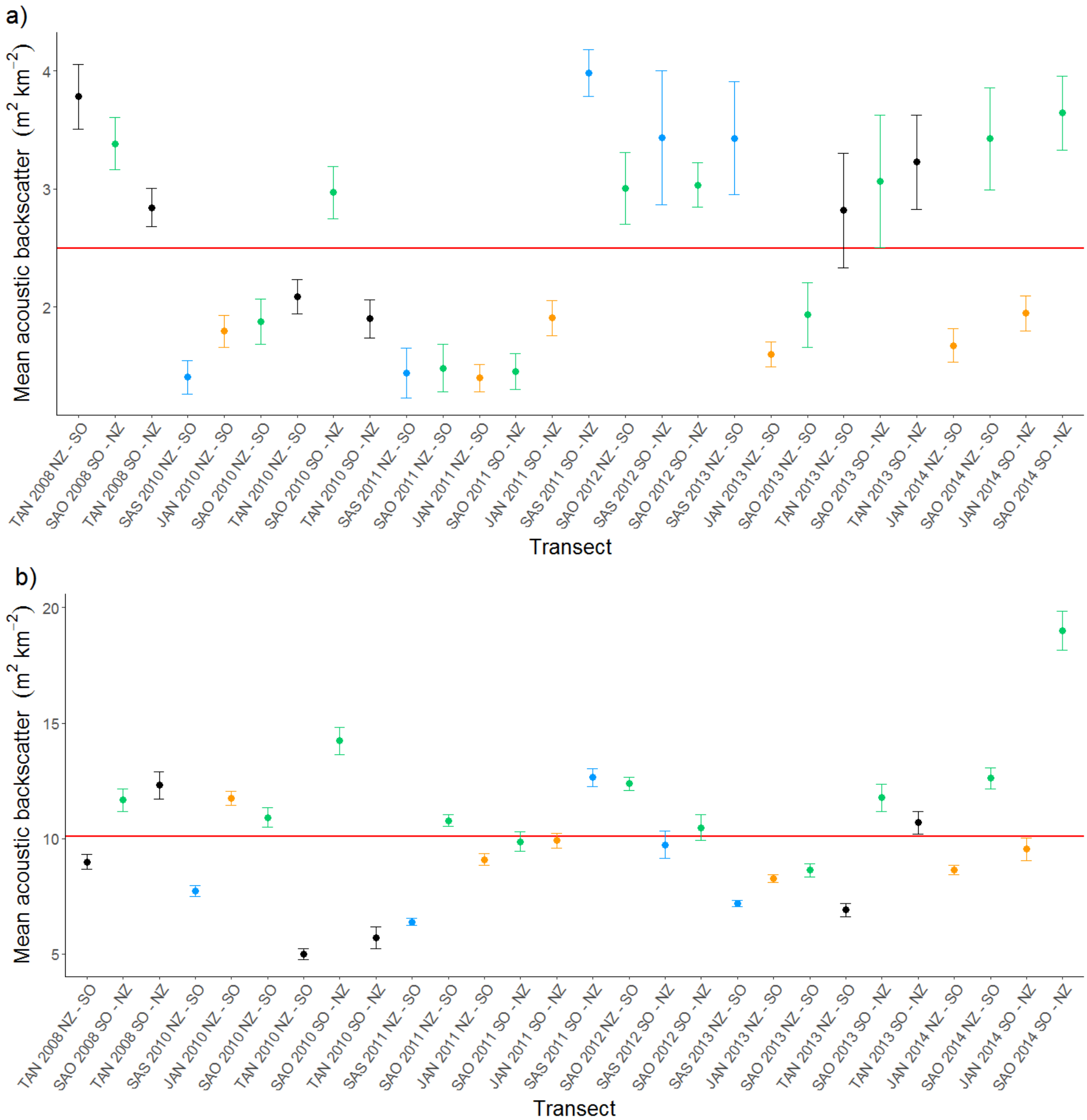

Fig. S7. Transect mean acoustic backscatter (m^2 km^{-2}) in the epi- (a) and mesopelagic (b) zones in the central region. Shown in chronological order (see transect collection dates in Table S1) by vessel: Janas (orange), San Aotea II (green), San Aspiring (blue) and Tangaroa (black). Whiskers represent two times the standard error of the mean, and the red line transects mean s_a (Epipelagic = 2.5 and mesopelagic = 10.1 m^2 km^{-2}).

Bootstrapping statistical tests

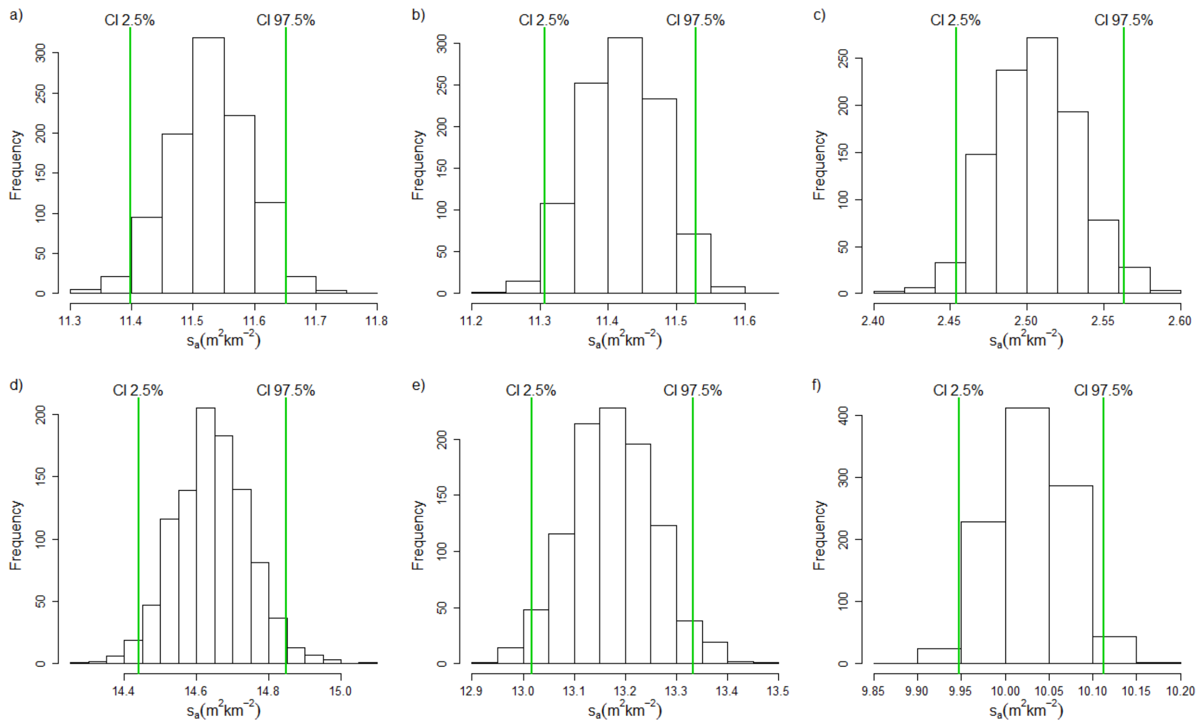

Fig. S8. Distribution of mean acoustic backscatter (s_a in m^2 km^{-2}) in the central region by day and night (a and d), spring and summer (b and e), and epi- and mesopelagic (c and f), generated by bootstrapping with 95% confidence intervals.

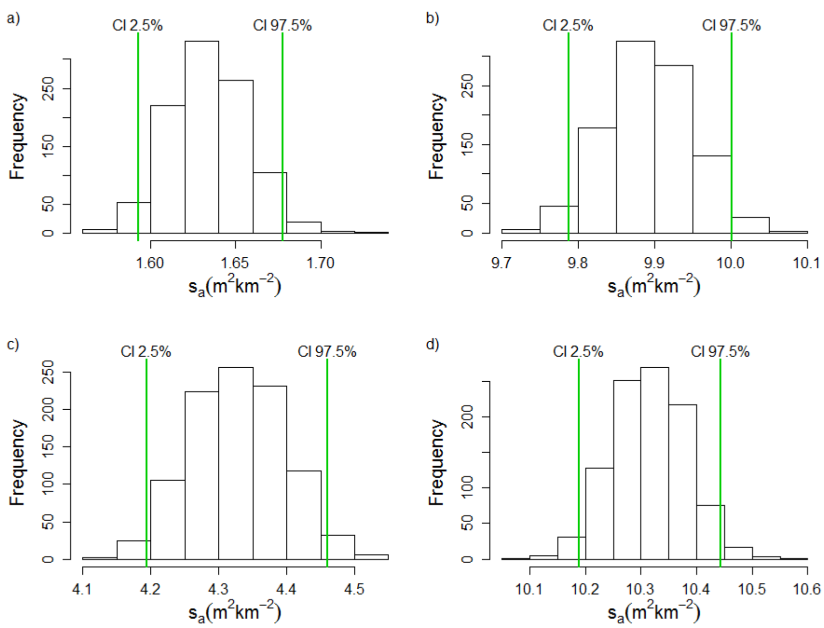

Fig. S9. Distribution of mean acoustic backscatter (s_a in m^2 km^{-2}) in the central region during the day and night in the epipelagic zone (a and c respectively), and mesopelagic (b and d respectively), generated by bootstrapping with 95% confidence intervals.

Vertical distribution of volume backscattering strength

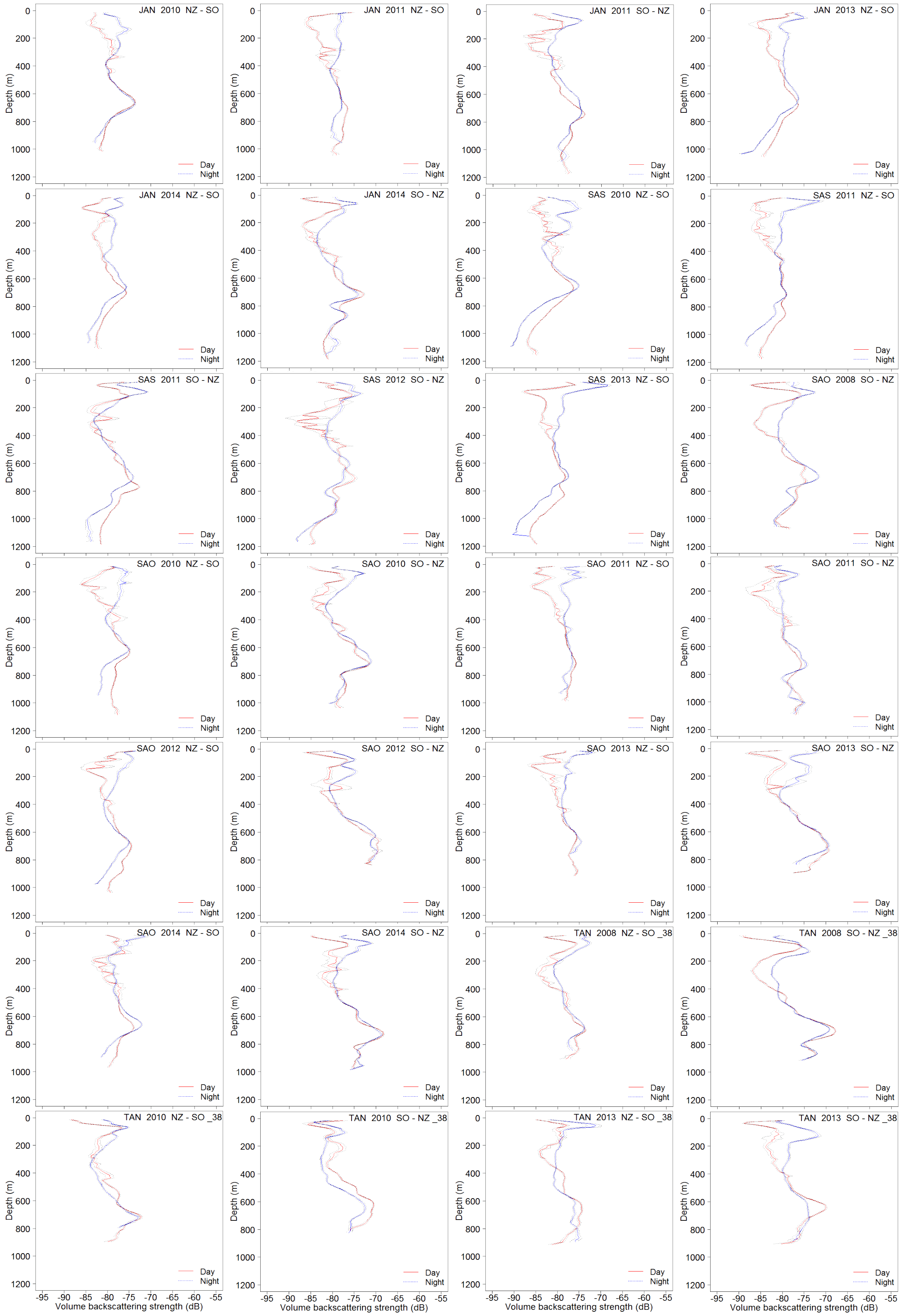

Fig. S10. Summary of vertical distribution (between the surface and 1200 metres) of volume backscattering strength (S_v in dB) in the Central region by vessel and chronological order. Red line indicates day (between sunrise and sunset), and blue line indicates night (between sunset and sunrise). Dotted grey lines indicate the 90th confidence intervals (t-student, 0.90). Panels correspond to individual transects.

Cubic smoothing spline fitted to vertical distribution of volume backscattering by day, night and season

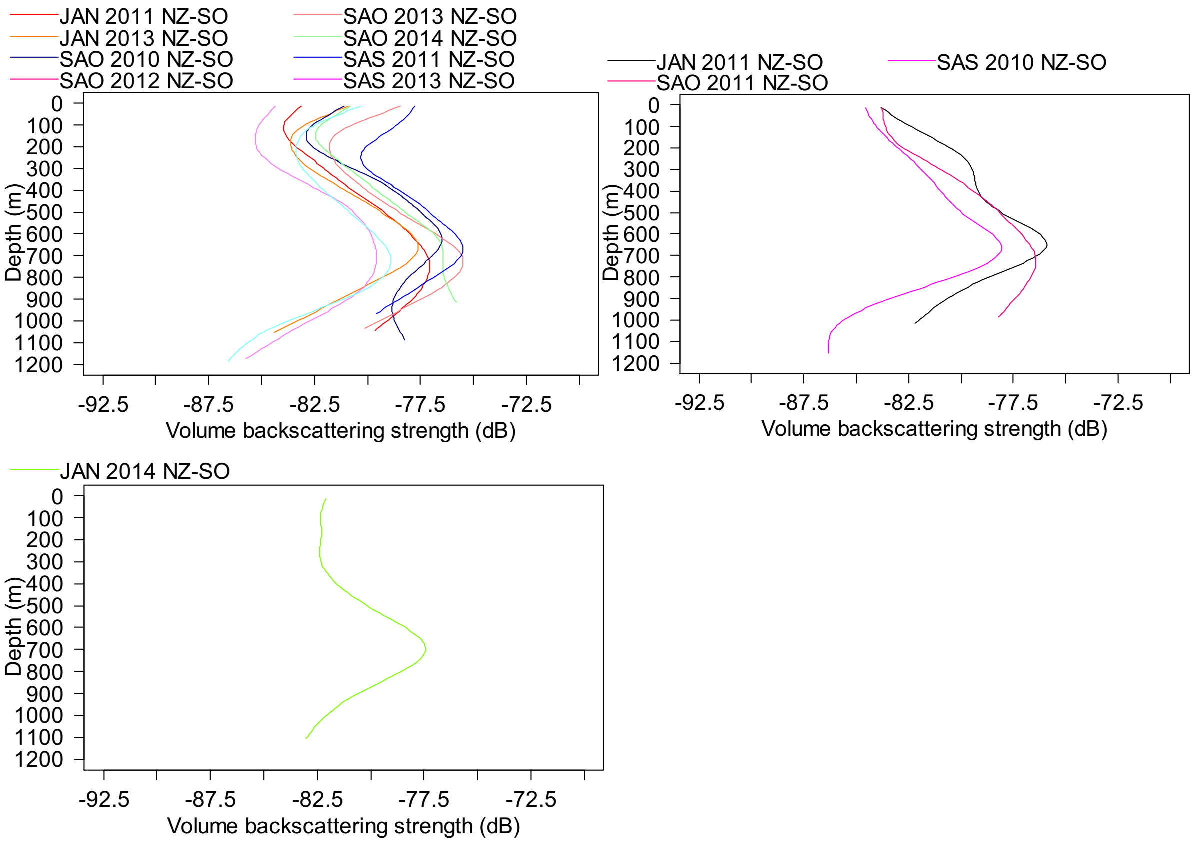

Fig. S11. Cubic splines smoothers fitted (CSS) to spring day vertical distribution (at 10 m resolution) of mean volume backscattering strength (S_v in dB) along the 38 kHz transects in the Central region. The grouping of the transects followed a subjective assessment of the shape of the CSS fitted to the backscatter profile.

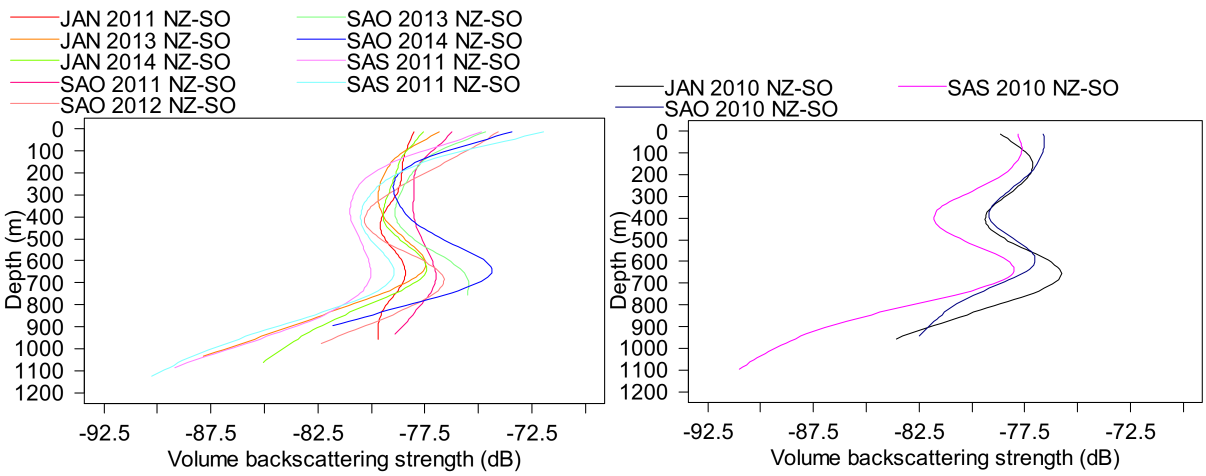

Fig. S12. Cubic splines smoothers fitted (CSS) to spring night vertical distribution of mean volume backscattering strength (S_v in dB) (at 10 m resolution) along the 38 kHz transects in the Central region. The grouping of the transects followed a subjective assessment of the shape of the CSS fitted to the backscatter profile.

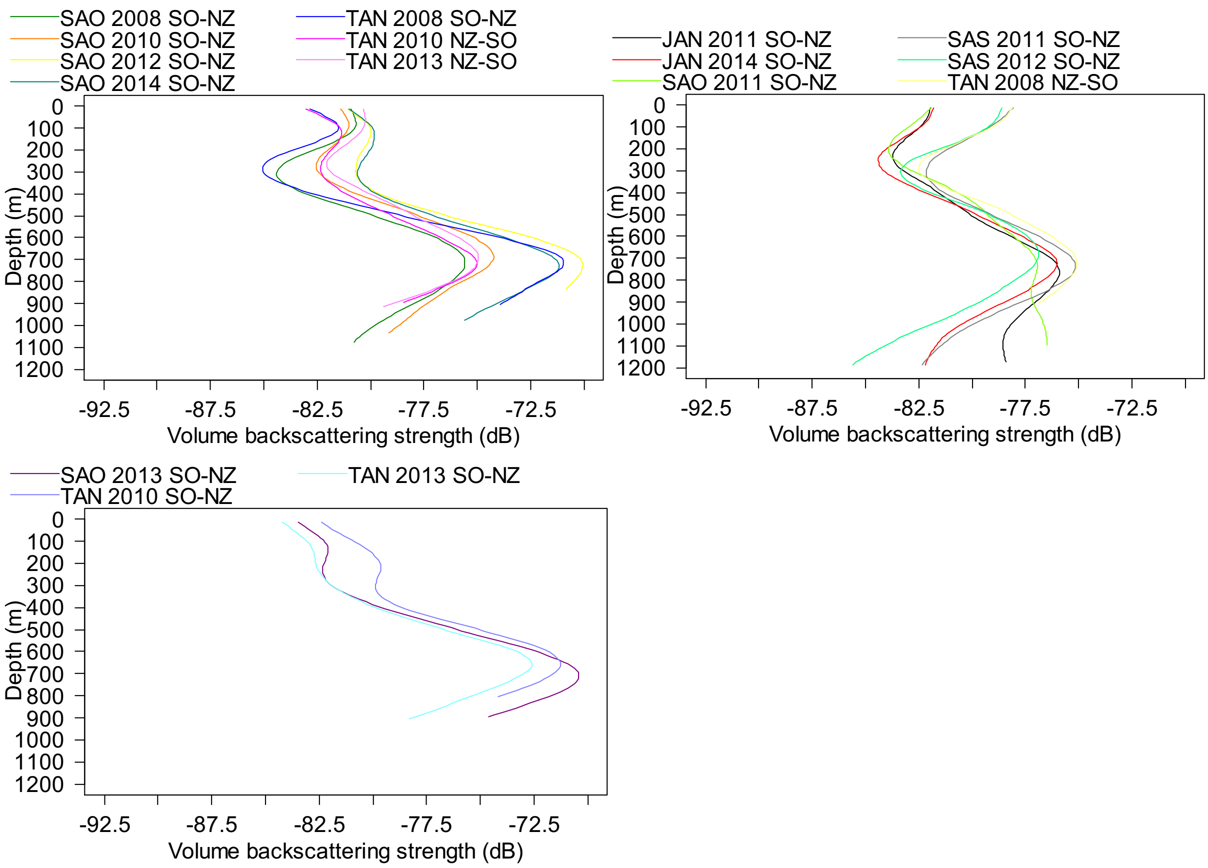

Fig. S13. Cubic splines smoothers (CSS) fitted to summer day vertical distribution of mean volume backscattering strength (S_v in dB) (at 10 m resolution) along the 38 kHz transects in the Central region. The grouping of the transects followed a subjective assessment of the shape of the CSS fitted to the backscatter profile.

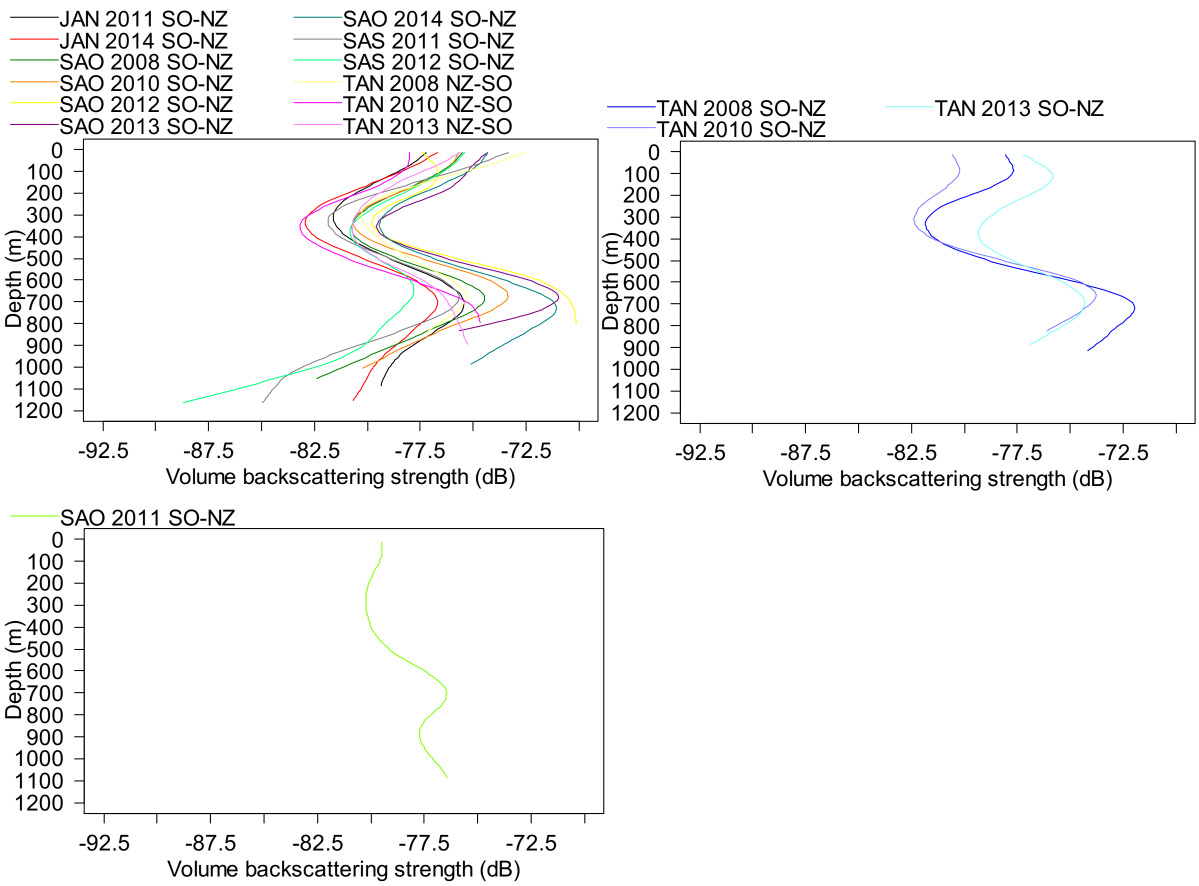

Fig. S14. Cubic splines smoothers (CSS) fitted to summer night vertical distribution of mean volume backscattering strength (S_v in dB) (at 10 m resolution) along the 38 kHz transects in the Central region. The grouping of the transects followed a subjective assessment of the shape of the CSS fitted to the backscatter profile.

Boosted regression trees

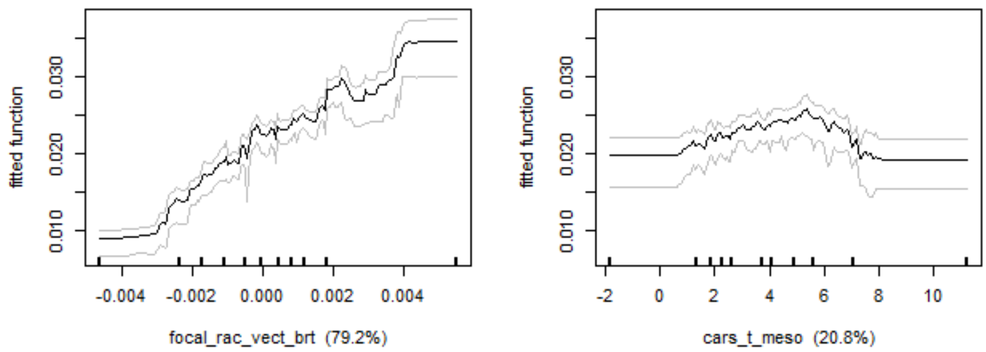

Fig. S15. Relationship between the cubic-transformed mean s_a and temperature (cars_t_meso, from regional hydrographic climatologies using the CSIRO Atlas of Regional Seas (CARS)) fitted by the boosted regression trees in the mesopelagic zone. Grey lines represent 95% confidence intervals. Focal_rac_vect_brt = residual autocorrelation covariate used in BRT for accounting for spatial autocorrelation.

Migration of organisms into the mesopelagic zone from deeper waters

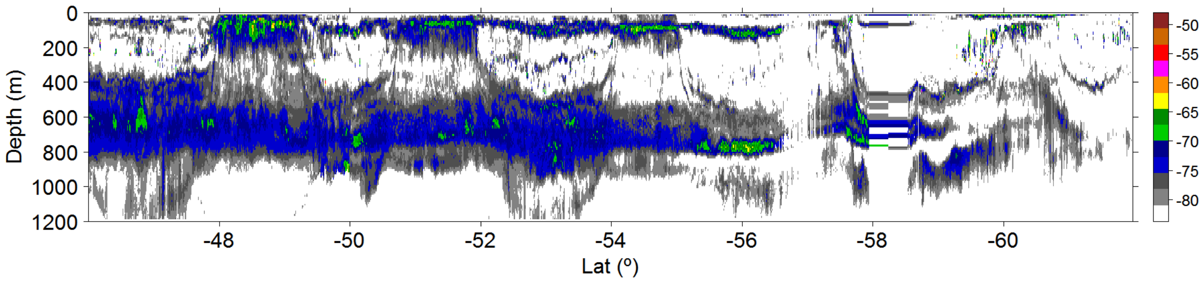

Fig. S16. Echogram of transects collected by vessels San Aspiring (SAS) in 2011 between New Zealand (NZ) and the Southern Ocean (SO) showing evidence of potential migration of organisms from deeper zones into and out of the mesopelagic zone. Each pixel represents mean volume backscattering strength (S_v) in decibels (dB) echo-integrated in 1 km long and 10 m depth bins. Echogram threshold -84 dB.

Table S1. Summary of the final set of transects analysed, including frequency used for its collection, the total number of bins (size = 1 km), date of start and end of data collection, mean acoustic backscatter (s_a), standard deviation (std. dev.), mean s_a in the epi and mesopelagic zones, and total s_a in $m^2\ km^{-2}$ (as the sum of all the bins vertically summed s_a), per transect. Vessels name key: JAN – Janas, SAO – San Aotea II, SAS – San Aspiring, and TAN – Tangaroa. The start and end location of the acoustic transect is also indicated in the transect name: NZ – New Zealand, and SO – Southern Ocean.

Transect name	**Frequency (kHz)**	**# of 1 km bins**	**Start date (dd/mm/yy)**	**Finish date (dd/mm/yy)**	**Mean s_a ($m^2\ km^{-2}$)**	**Std. dev.**	**Mean s_a epi. ($m^2\ km^{-2}$)**	**Mean s_a meso. ($m^2\ km^{-2}$)**	**Total s_a ($m^2\ km^{-2}$)**
JAN 2010 NZ-SO	38	2185	27/11/2009	04/12/2009	14.9	9.1	3.2	11.7	32583.6
JAN 2011 NZ-SO	38	1852	27/11/2010	02/12/2010	12.4	10.1	2.8	9.6	22962.8
JAN 2011 SO-NZ	38	4276	31/01/2011	12/02/2011	12.9	15.6	2.4	10.5	55171.3
JAN 2013 NZ-SO	38	2351	24/11/2012	01/12/2012	13.9	19.3	3.8	10.0	32604.4
JAN 2014 NZ-SO	38	1869	22/11/2013	28/11/2013	14.0	14.6	3.7	10.3	26137.0
JAN 2014 SO-NZ	38	4474	27/01/2014	09/02/2014	16.6	20.9	3.5	13.0	74104.0
SAO 2008 SO-NZ	38	1874	23/02/2008	29/02/2008	14.8	14.2	3.2	11.6	27706.9
SAO 2010 NZ-SO	38	2211	11/12/2009	17/12/2009	13.8	10.1	2.9	10.9	30430.6
SAO 2010 SO-NZ	38	2733	09/02/2010	16/02/2010	14.7	14.7	2.8	11.8	40047.6
SAO 2011 NZ-SO	38	2120	23/11/2010	29/11/2010	14.0	16.3	3.0	11.0	29594.2
SAO 2011 SO-NZ	38	2515	15/01/2011	23/01/2011	11.0	12.4	1.9	9.1	27566.4
SAO 2012 NZ-SO	38	1831	28/11/2011	03/12/2011	23.7	22.4	9.4	14.3	43377.0
SAO 2012 SO-NZ	38	3388	22/02/2012	02/03/2012	11.1	13.4	2.8	8.3	37513.1
SAO 2013 NZ-SO	38	2108	04/12/2012	10/12/2012	9.4	8.2	2.5	7.0	19859.6
SAO 2013 SO-NZ	38	3103	15/02/2013	21/02/2013	13.8	17.1	3.1	10.7	42671.8
SAO 2014 NZ-SO	38	1841	05/12/2013	10/12/2013	16.7	11.7	5.8	10.9	30815.4
SAO 2014 SO-NZ	38	3174	03/02/2014	11/02/2014	17.2	20.1	3.1	14.1	54564.5
SAS 2010 NZ-SO	38	2374	22/11/2009	26/11/2009	11.1	8.3	3.5	7.6	26329.8
SAS 2011 NZ-SO	38	1872	21/11/2010	26/11/2010	7.6	5.8	2.1	5.6	14292.8
SAS 2011 SO-NZ	38	3917	09/02/2011	19/02/2011	12.2	12.7	2.9	9.2	47724.9
SAS 2012 SO-NZ	38	1065	01/02/2012	04/02/2012	13.2	14.9	3.4	9.7	14006.4
SAS 2013 NZ-SO	38	1519	20/11/2012	24/11/2012	10.2	8.8	3.7	6.5	15537.7
TAN 2008 NZ-SO_38	38	3645	31/01/2008	09/02/2008	17.9	23.2	4.6	13.3	65261.2

Transect name	Frequency (kHz)	# of 1 km bins	Start date (dd/mm/yy)	Finish date (dd/mm/yy)	Mean s_a (m^2 km^{-2})	Std. dev.	Mean s_a epi. (m^2 km^{-2})	Mean s_a meso. (m^2 km^{-2})	Total s_a (m^2 km^{-2})
TAN 2008 NZ-SO_70	70	3645	31/01/2008	09/02/2008	13.2	17.3	3.2	10.0	48039.2
TAN 2008 SO-NZ_38	38	2428	14/03/2008	19/03/2008	20.0	13.6	3.7	16.2	48439.8
TAN 2008 SO-NZ_70	70	2428	14/03/2008	19/03/2008	10.7	10.3	1.8	8.9	25992.7
TAN 2010 NZ-SO_18	18	3952	02/02/2010	10/02/2010	15.6	29.9	6.4	9.1	9055.3
TAN 2010 NZ-SO_38	38	3952	02/02/2010	10/02/2010	12.9	22.4	3.5	9.4	61565.7
TAN 2010 NZ-SO_70	70	3952	02/02/2010	10/02/2010	6.0	12.1	2.2	3.8	5811.7
TAN 2010 NZ-SO_120	120	3952	02/02/2010	10/02/2010	2.3	6.7	1.7	0.6	51111.9
TAN 2010 NZ-SO_200	200	3952	02/02/2010	10/02/2010	1.5	2.8	1.5	> 0.1	23576.7
TAN 2010 SO-NZ_18	18	3299	07/03/2010	14/03/2010	17.0	34.0	7.5	9.5	8138.2
TAN 2010 SO-NZ_38	38	3299	07/03/2010	14/03/2010	10.6	16.2	3.4	7.2	55999.4
TAN 2010 SO-NZ_70	70	3299	07/03/2010	14/03/2010	4.3	8.4	2.3	1.9	5306.3
TAN 2010 SO-NZ_120	120	3299	07/03/2010	14/03/2010	2.5	5.5	1.9	0.6	34843.6
TAN 2010 SO-NZ_200	200	3299	07/03/2010	14/03/2010	1.6	5.4	1.6	> 0.1	14088.8
TAN 2013 NZ-SO_18	18	2915	04/02/2013	15/02/2013	25.2	99.0	10.4	14.8	13166.4
TAN 2013 NZ-SO_38	38	2915	04/02/2013	15/02/2013	12.4	20.4	4.0	8.4	73325.0
TAN 2013 NZ-SO_70	70	2915	04/02/2013	15/02/2013	5.5	17.5	3.8	1.8	5255.7
TAN 2013 NZ-SO_120	120	2915	04/02/2013	15/02/2013	4.5	13.5	3.4	1.1	36113.9
TAN 2013 NZ-SO_200	200	2915	04/02/2013	15/02/2013	1.8	5.9	1.7	0.1	16077.4
TAN 2013 SO-NZ_18	18	2419	04/03/2013	10/03/2013	19.8	37.7	6.5	13.4	7239.7
TAN 2013 SO-NZ_38	38	2419	04/03/2013	10/03/2013	12.6	17.9	2.7	9.9	47966.4
TAN 2013 SO-NZ_70	70	2419	04/03/2013	10/03/2013	3.9	9.1	2.6	1.3	2713.6
TAN 2013 SO-NZ_120	120	2419	04/03/2013	10/03/2013	3.0	7.1	2.4	0.6	30499.7
TAN 2013 SO-NZ_200	200	2419	04/03/2013	10/03/2013	1.1	2.8	1.1	> 0.1	9448.1

Table S2. Summary of 38 kHz transects by region and season of data collection available, number of transects, mean acoustic backscatter (s_a in $m^2\ km^{-2}$) and its standard deviation, and average number of bins (~ 1 km) as guide for transects' average section lengths within each latitudinal region.

Region	Season	# of transects	Transects	Mean s_a	Std. Dev	Ave. number of bins
Northern	Spring	12	JAN 2010 NZ-SO, JAN 2011 NZ-SO, JAN 2013 NZ-SO, JAN 2014 NZ-SO, SAO 2010 NZ-SO, SAO 2011 NZ-SO, SAO 2012 NZ-SO, SAO 2013 NZ-SO, SAO 2014 NZ-SO, SAS 2010 NZ-SO, SAS 2011 NZ-SO, SAS 2013 NZ-SO	16.7	6.5	688
	Summer	15	JAN 2011 SO-NZ, JAN 2014 SO-NZ, SAO 2008 SO-NZ, SAO 2010 SO-NZ, SAO 2011 SO-NZ, SAO 2012 SO-NZ, SAO 2013 SO-NZ, SAO 2014 SO-NZ, SAS 2011 SO-NZ, TAN 2008 NZ-SO, TAN 2008 SO-NZ, TAN 2010 NZ-SO, TAN 2010 SO-NZ, TAN 2013 NZ-SO, TAN 2013 SO-NZ	25.8	7.4	804
Central	Spring	12	Idem to Northern region.	11.6	2.5	1275
	Summer	16	Idem to Northern region plus transect SAS 2012 SO-NZ.	13.4	3.8	1676
Southern	Summer	11	JAN 2011 SO-NZ, JAN 2014 SO-NZ, SAO 2010 SO-NZ, SAO 2011 SO-NZ, SAO 2012 SO-NZ, SAO 2013 SO-NZ, SAO 2014 SO-NZ, SAS 2011 SO-NZ, TAN 2008 NZ-SO, TAN 2010 NZ-SO, TAN 2010 SO-NZ	0.8	0.3	695

Table S3. Summary of mean acoustic backscatter (s_a) in m^2 km^{-2} by transect sections within the Central region, detailed by pelagic zone, epi- and mesopelagic zones, and time of day (day/night). Epipelagic zone (< 200 m), mesopelagic zone (> 200 m); and day and night defined according to the civil twilight (day commences before the sunrise and finishes after the sunset, when the solar depression angle = 6º).

Transect	Mean s_a	Mean s_a day time	Mean s_a night time	Mean s_a epi zone	Mean s_a meso zone	Day mean s_a epi zone	Day mean s_a meso zone	Night mean s_a epi zone	Night mean s_a meso zone
JAN 2010 NZ-SO	13.5	12.8	15.4	1.8	11.7	1.1	11.7	3.5	11.8
JAN 2011 NZ-SO	10.5	10.3	11.2	1.4	9.1	1.0	9.3	2.7	8.5
JAN 2011 SO-NZ	11.8	10.5	14.4	1.9	9.9	1.3	9.2	3.0	11.3
JAN 2013 NZ-SO	9.9	9.3	11.7	1.6	8.3	1.2	8.1	2.9	8.7
JAN 2014 NZ-SO	10.3	9.6	12.2	1.7	8.6	1.3	8.3	2.8	9.4
JAN 2014 SO-NZ	11.5	11.4	11.6	2.0	9.5	1.5	10.0	3.1	8.5
SAO 2008 SO-NZ	15.0	11.7	19.1	3.4	11.7	2.3	9.4	4.7	14.4
SAO 2010 NZ-SO	12.8	12.4	13.9	1.9	10.9	1.2	11.3	4.1	9.8
SAO 2010 SO-NZ	17.2	15.2	20.7	3.0	14.2	1.8	13.3	4.9	15.8
SAO 2011 NZ-SO	12.2	11.4	15.2	1.5	10.8	0.8	10.6	3.8	11.4
SAO 2011 SO-NZ	11.3	10.7	12.8	1.5	9.9	1.1	9.6	2.2	10.6
SAO 2012 NZ-SO	15.4	15.2	15.7	3.0	12.4	1.9	13.3	5.4	10.3
SAO 2012 SO-NZ	13.5	11.5	16.5	3.0	10.5	2.1	9.5	4.5	12.0
SAO 2013 NZ-SO	10.6	9.8	13.5	1.9	8.6	1.3	8.5	4.4	9.1
SAO 2013 SO-NZ	14.8	12.3	19.7	3.1	11.8	1.3	11.0	6.5	13.2
SAO 2014 NZ-SO	16.0	15.0	19.2	3.4	12.6	2.9	12.1	5.0	14.2
SAO 2014 SO-NZ	22.6	21.2	25.6	3.6	19.0	2.2	18.9	6.5	19.1
SAS 2010 NZ-SO	9.1	8.5	11.2	1.4	7.7	0.8	7.7	3.3	7.9
SAS 2011 NZ-SO	7.8	7.1	10.3	1.4	6.4	0.6	6.4	4.0	6.2
SAS 2011 SO-NZ	16.6	16.2	17.5	4.0	12.6	2.9	13.3	6.1	11.4
SAS 2012 SO-NZ	13.2	12.8	14.1	3.4	9.7	2.9	9.9	4.6	9.5
SAS 2013 NZ-SO	10.6	8.5	14.8	3.4	7.2	1.5	7.1	7.3	7.5
TAN 2008 NZ-SO 38	12.8	11.2	16.4	3.8	9.0	2.7	8.5	6.2	10.2
TAN 2008 SO-NZ 38	15.1	14.0	16.6	2.8	12.3	2.1	12.0	3.8	12.7
TAN 2010 NZ-SO 38	7.1	6.9	7.3	2.1	5.0	1.7	5.2	2.9	4.5
TAN 2010 SO-NZ 38	7.6	8.5	6.6	1.9	5.7	1.8	6.7	2.0	4.6
TAN 2013 NZ-SO 38	9.7	8.9	11.1	2.8	6.9	2.0	6.9	4.2	7.0
TAN 2013 SO-NZ 38	13.9	13.0	15.1	3.2	10.7	1.1	12.0	6.1	9.0

Table S4. Trawls information by research voyage and region to where assigned. Trawl type: ID – Mark identification, OB – Oblique. N/A: not available.

Cruise	Region	Trawl	Lat (°S)	Lon (E or W)	Mean depth (m)	Bottom depth (m)	Date (D/M/Y)	Time start (hh: mm)	Time end (hh: mm)	Trawl duration (hh:mm)	Total catch weight (kg)	Total catch (#)	Trawl type	Speed (knots)	Surface temp. (°C)
TAN1502	Southern	47	69.2	178	52	N/A	14/02/15	13:05	13:24	0:19	2.4	291	ID	4.2	-1.2
	Southern	67	72.2	173.6	451	540	23/02/15	7:41	8:18	0:37	131.3	2622	ID	3.7	-1.4
	Southern	68	69.5	-175.3	61	4112	26/02/15	17:54	18:02	0:08	72.6	81100	ID	4.2	-1.7
	Southern	69	69.5	-175.3	265	4104	26/02/15	23:44	23:53	0:09	35.6	112	ID	2.8	-1.6
	Southern	72	69.5	-175.2	240	3752	28/02/15	23:13	23:45	0:32	44.4	236	ID	3.1	-1.7
	Southern	74	69.4	-175.1	221	4103	1/03/15	22:20	22:40	0:20	30.6	161	ID	3.1	-1.7
	Central	82	65.3	-179.1	164	3275	3/03/15	20:26	20:36	0:10	5.7	346	ID	3	-
	Central	86	64.4	-179.3	618	3240	4/03/15	6:39	7:09	0:30	1.6	245	ID	3.4	1.4
	Central	87	64.4	-179.3	397	2629	4/03/15	8:14	8:44	0:30	34.2	356	ID	3	1.3
TAN1116	Northern	2	43.1	174.8	324	430	3/11/11	8:58	10:18	1:20	36.1	15514	ID	3.7	12.5
	Northern	5	43.8	174.8	0-422	471	3/11/11	22:47	23:26	0:39	19.3	7475	OB	3.3	12.6
	Northern	7	43.6	174.4	100-500	555	4/11/11	4:55	5:27	0:32	6.6	3265	OB	3.3	-
	Northern	14	43.6	174.6	197	485	4/11/11	15:56	16:16	0:20	1.3	1018	ID	3.7	12.5
	Northern	15	43.5	174.6	50-450	466	5/11/11	0:17	0:42	0:25	8.3	4352	OB	3.2	-
	Northern	22	43.4	174.2	109	567	5/11/11	18:16	18:31	0:15	87.3	49031	ID	3	11.4
	Northern	27	43.4	174.2	50-520	570	6/11/11	0:43	1:12	0:29	16.6	9974	OB	3	11
	Northern	28	43.4	174.9	50-550	523	6/11/11	2:53	3:19	0:26	20.9	7799	OB	3.1	8.3
	Northern	37	43.6	174.2	70-448	502	6/11/11	20:16	20:43	0:27	14.6	2387	OB	3	12.5
	Northern	38	44	174.2	50-485	538	7/11/11	0:02	0:28	0:26	19.1	5362	OB	3	12.8
	Northern	39	44.2	173.9	50-510	574	7/11/11	2:47	319	21:13	117.6	298	OB	3.1	10.8
	Northern	42	44.8	173.7	445	966	7/11/11	15:29	15:44	0:15	4.1	702	ID	3.2	9.6
	Northern	47	44.8	173.7	50-982	1092	7/11/11	2:05	3:07	1:02	114.4	1009	OB	3	-
	Northern	53	44.7	173.3	270	912	8/11/11	18:11	18:47	0:36	2.8	860	ID	3.3	9.7
	Northern	54	44.7	173.4	100-810	888	8/11/11	20:08	21:02	0:54	6.0	765	OB	3	9.8
	Northern	55	44.8	174.1	50-825	825	9/11/11	0:22	1:06	0:44	11.0	826	OB	3.1	10.4
	Northern	56	44.9	174.3	50-965	1003	9/11/11	2:45	3:47	1:02	16.9	5655	OB	3.5	9.8
	Northern	60	44.7	173.7	400	890	9/11/11	13:44	14:20	0:36	32.0	20793	ID	3.5	9.7
	Northern	61	44.1	177.2	600	990	10/11/11	8:00	8:20	0:20	5.8	799	ID	3.4	10.2
	Northern	65	44.2	178.9	495	1033	11/11/11	1:15	2:16	1:01	7.8	1846	OB	3.1	-
	Northern	71	44.2	178.9	280	1014	11/11/11	12:59	13:20	0:21	5.3	2865	ID	3.5	11.3
	Northern	73	44.2	179.2	117	969	11/11/11	18:29	18:47	0:18	0.7	249	ID	4	11.5
	Northern	74	44.2	179.2	50-900	1138	11/11/11	20:10	21:19	1:09	6.7	627	OB	3	11.4
	Northern	75	44.1	178.7	50-850	931	12/11/11	0:22	1:22	1:00	2.5	422	OB	3.1	10.9
	Northern	76	44.1	178.3	50-901	942	12/11/11	3:40	4:43	1:03	9.3	1752	OB	3	10.7
TAN0802	Southern	19	73.2	174.2	185	N/A	10/02/08	1:44	2:14	0:30	217.8	14706	ID	3.3	-0.5
	Southern	33	74.6	169	75	445	12/02/08	2:41	3:07	0:26	4.2	2313	ID	4.3	-1.4

Cruise	Region	Trawl	Lat (ºS)	Lon (E or W)	Mean depth (m)	Bottom depth (m)	Date (D/M/Y)	Time start (hh: mm)	Time end (hh: mm)	Trawl duration (hh:mm)	Total catch weight (kg)	Total catch (#)	Trawl type	Speed (knots)	Surface temp. (°C)
	Southern	103	74.5	177.6	220	287	18/02/08	13:09	13:42	0:33	222.8	9120	ID	4.2	-1.3
	Southern	119	72.4	175.5	50-875	726	21/02/08	5:17	6:05	0:48	37.5	111	OB	2.8	-1.8
	Southern	131	72.1	175.7	50-1026	1676	22/02/08	3:37	4:30	0:53	49.3	86	OB	2.9	-1.8
	Southern	142	72	173.4	50-1012	N/A	23/02/08	7:45	8:36	0:51	30.4	229	OB	3	-1.6
	Southern	149	72	173.3	50-820	867	23/02/08	22:22	23:27	1:05	71.9	21	OB	2.2	-1.4
	Southern	174	71.3	174.8	50-1010	2271	26/02/08	9:22	10:13	0:51	80.8	675	OB	3	-1.7
	Southern	185	68.6	-178.4	50-901	3161	1/03/08	5:47	6:35	0:48	21.8	84	OB	3.1	-1.8
	Southern	193	68.3	-178.9	174	3203	2/03/08	8:10	8:35	0:25	5.3	144	ID	3.5	-1.8
	Southern	195	68.1	-179.3	50-800	1721	2/03/08	15:08	15:52	0:44	13.2	195	OB	4.1	-1.7
	Southern	227	67.6	-178.8	10-1000	3642	5/03/08	11:51	12:47	0:56	8.3	149	OB	3.5	-1.5
	Southern	240	67.4	-179.9	50-770	705	7/03/08	10:04	10:34	0:30	17.3	545	OB	2.9	-1.3
	Central	262	67	170.9	100-400	450	9/03/08	20:50	21:10	0:20	5.4	18	OB	3.5	-1.5
	Central	284	66.9	171.3	50-1023	3309	11/03/08	22:30	0:15	1:45	47.7	351	OB	3	-1.3
	Central	293	66.9	171.1	50-1032	1229	12/03/08	21:44	23:30	1:46	22.2	295	OB	3.1	-1.4
	Central	312	67	170.7	100-1087	1213	14/03/08	10:29	11:53	1:24	50.7	288	OB	3	-1.5

Table S5. Species sampled biologically from trawls used to characterise the species composition of the Northern region. Average weight across trawls estimated excluding tunicates (e.g., salps) and gelatinous (e.g., jellyfish).

Species	**Common name**	**Group**	**Average contribution by number (%) across trawls when present**	**Average contribution by weight (%) across trawls when present**	**Trawls Occurrence**
Apristurus spp.	Catshark	Fish	0.1	0.5	1
Agrostichthys parkeri	Ribbonfish	Fish	0.1	0.2	1
Argyropelecus hemigymnus	Common hatchetfish	Fish	0.1	0.01	2
Mesobius antipodum	Black javelinfish	Fish	0.2	0.01	1
Allocyttus niger	Black oreo	Fish	0.1	8.5	1
Coelorinchus oliverianus	Olivers rattail	Fish	0.3	0.02	1
Coryphaenoides subserrulatus	Four-rayed rattail	Fish	0.3	0.1	1
Trachipterus trachypterus	Dealfish	Fish	0.02	2	2
Diaphus spp.	Diaphus spp.	Fish	0.9	0.5	19
Electrona carlsbergi	Lanternfish	Fish	1.7	4.8	15
Etmopterus baxteri	Baxters lantern dogfish	Fish	0.2	0.03	6
Etmopterus lucifer	Lucifer dogfish	Fish	0.03	0.1	1
Gymnoscopelus microlampas	Lanternfish	Fish	0.3	0.6	3
Gymnoscopelus spp.	Lanternfish	Fish	0.4	0.1	3
Gymnoscopelus piabilis	Lanternfish	Fish	2.7	58.1	10
Macruronus novaezelandiae	Hoki	Fish	0.1	1.9	4
Lampanyctodes hectoris	Lampanyctodes hectoris	Fish	67.2	0.02	22
Lampanyctus spp.	Lampanyctus spp.	Fish	2.6	2.9	16
Lampichthys procerus	Lampichthys procerus	Fish	0.3	2	3
Maurolicus australis	Pearlside	Fish	10.7	0.1	24
Persparsia kopua	Persparsia kopua	Fish	1.2	0.5	11
Photichthys argenteus	Lighthouse fish	Fish	0.3	0.5	16
Protomyctophum spp.	Lanternfish	Fish	3	0.5	20
Squalus acanthias	Spiny dogfish	Fish	0.03	0.5	2
Brama australis	Southern rays bream	Fish	0.2	0.9	7
Seriolella punctata	Silver warehou	Fish	0.01	5.5	1
Symbolophorus boops	Lanternfish	Fish	1.5	3.6	14
Vinciguerria spp.	Bristlemouth	Fish	0.2	0.04	10

Table S6. Species sampled biologically from trawls used to characterise the species composition of the Central region. Average contribution in weight across trawls estimated excluding tunicates (e.g., salps) and gelatinous (e.g., jellyfish).

Species	**Common name**	**Group**	**Average contribution by number (%) across trawls when present**	**Average contribution by weight (%) across trawls when present**	**Trawls Occurrence**
Bathylagus antarcticus	Deep-sea smelt	Fish	12.5	13.8	3
Bathyteuthis abyssicola	Crown squid	Squid	0.9	1.6	3
Cynomacrunus piriei	Dogtooth granadier	Fish	0.8	2.1	2
Electrona carlsbergi	Lanternfish	Fish	9.7	5.9	4
Electrona antarctica	Lanternfish	Fish	34.3	14.4	6
Euphausia superba	Antarctic krill	Crustacean	30.8	1.6	3
Seleniolycus laevifasciatus	Eelpout	Fish	0.7	0.5	1
Galiteuthis glacialis	Glacial cranch squid	Squid	2.1	3.2	3
Gonatus antarcticus	Antarctic gonate squid	Squid	0.7	1.1	1
Gymnoscopelus bolini	Bolin's lanternfish	Fish	1	1.6	1
Gymnoscopelus hintonoides	False-midas lanternfish	Fish	0.8	1.1	2
Gymnoscopelus nicholsi	Nichol's lanternfish	Fish	4.4	14.4	6
Gymnoscopelus opisthopterus	Short-tail lanternfish	Fish	2	3.2	3
Gymnoscopelus piabilis	Lanternfish	Fish	1	1.6	1
Gymnoscopelus braueri	Lanternfish	Fish	9.1	5.9	4
Krefftichthys anderssoni	Lanternfish	Fish	5.6	0.5	1
Kali spp.	Swallower	Fish	0.3	0.5	1
Nannobrachium achirus	Cripplefin lanternfish	Fish	0.9	1.1	2
Mesonychoteuthis hamiltoni	Collossal squid	Squid	0.6	0.5	1
Mastigoteuthis psychropila	Squid	Squid	1.9	4.3	2
Notolepis coatsi	Antarctic jonasfish	Fish	3.5	3.7	5
Paradiplospinus gracilis	False frostfish	Fish	0.6	1.1	5
Protomyctophum spp.	Lanternfish	Fish	5.1	2.7	2
Pseudoicichthys australis	Ragfish	Fish	0.3	1.7	1
Serrivomer spp.	Sawtooth eel	Fish	0.3	1.6	1
Slosarczykovia circumantarctica	Squid	Squid	2.9	0.5	3
Undetermined spp.	Squid	Squid	1.4	2.1	1
Cyclothone microdon	Bristlemouth	Fish	8.4	2.1	4

Table S7. Species sampled biologically from trawls used to characterise the species composition of the Southern region. Average contribution in weight across trawls estimated excluding tunicates (e.g., salps) and gelatinous (e.g., jellyfish).

Species	**Common name**	**Group**	**Average contribution by number (%) across trawls when present**	**Average contribution by weight (%) across trawls when present**	**Trawls Occurrence**
Anotopterus pharao	Daggertooth	Fish	0.2	0.1	1
Pleuragramma antarctica	Antarctic silverfish	Fish	51.4	82	7
Bathylagus antarcticus	Deep-sea smelt	Fish	15.7	0.8	9
Bathyteuthis abyssicola	Crown squid	Squid	3.1	0.01	1
Benthalbella elongata	Pearleye	Fish	0.4	0.01	1
Bathydraco scotiae	Antarctic dragonfish	Fish	0.2	0.01	1
Borostomias antarcticus	Stareater	Fish	1.2	0.01	1
Cryodraco atkinsoni	Crocodile icefish	Fish	0.04	0.1	1
Cryodraco myersi	Crocodile icefish	Fish	0.04	0.04	1
Cynomacrunus piriei	Dogtooth granadier	Fish	1.2	0.01	1
Electrona carlsbergi	Lanternfish	Fish	35.1	0.4	6
Electrona antarctica	Lanternfish	Fish	21.5	0.3	12
Euphausia crystallorophias	Crystall krill	Crustacean	53.1	0.4	2
Euphausia superba	Antarctic krill	Crustacean	60.4	10.9	3
Galiteuthis glacialis	Glacial cranch squid	Squid	1.4	0.1	5
Gymnoscopelus bolini	Bolin's lanternfish	Fish	8.8	0.1	8
Gymnoscopelus fraseri	Fraser's lanternfish	Fish	1.2	0.01	1
Gymnoscopelus hintonoides	False-midas lanternfish	Fish	1.7	0.1	6
Gymnoscopelus microlampas	Lanternfish	Fish	1.2	0.01	1
Gymnoscopelus spp.	Lanternfish	Fish	1.2	0.2	1
Gymnoscopelus nicholsi	Nichol's lanternfish	Fish	4.1	0.3	10
Gymnoscopelus opisthopterus	Short-tail lanternfish	Fish	5.7	0.4	5
Gymnoscopelus braueri	Brauer's lanternfish	Fish	8.8	0.2	8
Neopagetopsis ionah	Crocodile icefish	Fish	12.9	1.7	5
Kondakovia longimana	Longarm octopus squid	Squid	0.7	0.5	1
Nannobrachium achirus	Cripplefin lanternfish	Fish	0.5	0.1	4
Mesonychoteuthis hamiltoni	Collossal squid	Squid	0.9	0.01	1
Notolepis coatsi	Antarctic jonasfish	Fish	8	0.2	10
Lepidonotothen kempi	Striped-eyed rockcod	Fish	18.4	0.2	1
Nototheniidae	Antarctic rock cod	Fish	0.4	0.01	1
-	Octopod	Octopus	0.2	0.03	2
Paradiplospinus gracilis	False frostfish	Fish	0.5	0.01	1
Psychroteuthis glacialis	Glacial squid	Squid	1.5	0.2	2
Cryodraco hamatus	Crocodile icefish	Fish	0.2	0.3	1
Cyclothone microdon	Bristlemouth	Fish	12.9	0.1	5