

**Plankton sampling by the training vessel *Umitaka-maru* in the Indian sector of  
the Southern Ocean in the austral summer of 2011/2012**

Hisae SAKURAI<sup>1</sup>, Kazuo AMAKASU<sup>2</sup>, Kaori UCHIYAMA<sup>2</sup>,  
Nobue KASAMATSU-TAKASAWA<sup>2</sup>, Hazuki WATANABE<sup>2</sup>, Atsushi ONO<sup>2</sup>, Ryoji TODA<sup>2</sup>,  
Masato MOTEKI<sup>1,2</sup>, Takashi ISHIMARU<sup>2</sup>, Kunio T. TAKAHASHI<sup>1,3</sup>, Takahiro IIDA<sup>1,3,4</sup>,  
Ryosuke MAKABE<sup>1,3</sup>, Tsuneo ODATE<sup>1,3</sup> and Atsushi TANIMURA<sup>1,3,\*</sup>

<sup>1</sup> National Institute of Polar Research, Research, Organization of Information and Systems,  
10-3 Midori-cho, Tachikawa, Tokyo 190-8518.

<sup>2</sup> Tokyo University of Marine Science and Technology, 4-5-7 Konan, Minato-ku, Tokyo 108-8477.

<sup>3</sup> Department of Polar Science, School of Multidisciplinary Sciences, SOKENDAI (The Graduate  
University for Advanced Studies), 10-3 Midori-cho, Tachikawa, Tokyo 190-8518.

<sup>4</sup> Present address: Graduate School of Fisheries Sciences, Hokkaido University,  
3-1-1 Minato-cho, Hakodate, Hokkaido 041-8611.

\*Corresponding author. E-mail: [tanimura.atsushi@nipr.ac.jp](mailto:tanimura.atsushi@nipr.ac.jp)

## **1. Introduction**

The training vessel (T/V) *Umitaka-maru* II of the Tokyo University of Fisheries (currently Tokyo University of Marine Science and Technology [TUMSAT]) participated in the first Japanese Antarctic Research Expedition (JARE-1) as the ship associated with the icebreaker *Soya*. Research voyages for marine science in the Southern Ocean have been intermittently taken over by T/V *Umitaka-maru* III and IV (the present ship). After many years of a collaborative relationship, the National Institute of Polar Research (NIPR) and TUMSAT signed a comprehensive cooperation agreement on 9 February 2009.

With the start of the six-year plan for JARE phase VIII by NIPR (2010–2015) came the three-year (2010–2012) TUMSAT-NIPR joint program on “Studies on plankton community structure and environment parameters in the Southern Ocean.” This program focused on the spatio-temporal

variation in plankton distribution in the Southern Ocean ecosystem as one of the JARE projects (Project no. AP-25; Prof. Takashi Ishimaru, TUMSAT, principal investigator).

The present report describes the data from the second year research cruise conducted by T/V *Umitaka-maru* IV under the mission of the AP-25 project. This report contains information about the samples collected using four kinds of plankton nets—the Intelligent Operative Net Sampling System (IONESS), Rectangular Midwater Trawl (RMT), Ocean Research Institute (ORI) net, and twin North Pacific (NORPAC) standard net—along longitude 140°E off Wilkes Land, Antarctica, during the cruise period between 27 December 2011 and 1 February 2012.

## 2. Cruise number

Data covered in this report were obtained from the 15th *Kaiyodai* (abbreviated Japanese name for TUMSAT) Antarctic Research Expedition (*KARE-15*) cruise by T/V *Umitaka-maru*, which was conducted as part of the 53rd Japanese Antarctic Research Expedition (*JARE-53*) program. This cruise also served as a leg of the long-distance voyage for the Advanced Course of Marine Science and Technology of TUMSAT (voyage number UM-11-07).

## 3. Sampling protocol

### (1) IONESS

The IONESS is a multiple-net opening and closing zooplankton sampler (Kitamura *et al.*, 2001). IONESS was equipped with nine nets with 335- $\mu$ m mesh for catching meso- to macro-zooplankton.

IONESS was deployed from the stern of vessel and towed obliquely over predetermined depth intervals. Each of the nets was opened and closed sequentially by commands transmitted from an onboard deck unit through an armored cable to an underwater unit. A deployment consisted of the oblique down-cast from the surface to the maximum depth; the opening and closing sequences through specific depth strata occurred during the up-cast.

Although there was a flow-meter (Tsurumi-Seiki Kosakusho Co., Ltd., Yokohama, Japan) mounted outside the net-mouth opening to estimate towing distance, it was not used during this cruise because of a problem with the reliability of the flow-meter rotation due to rough sea conditions. In the

present report, therefore, the volumes of water filtered ( $V$ , m<sup>3</sup>) by each net were estimated with the following equation, assuming filtration efficiencies of 100%:

$$V = D \times A, \quad (1)$$

where  $D$  and  $A$  are towing distance (m) and mean working filtration area (m<sup>2</sup>), respectively.  $D$  was calculated as:

$$D = \sqrt{D_h^2 + D_v^2}, \quad (2)$$

where  $D_h$  (m) and  $D_v$  (m) are the horizontal distance (towing time [s] multiplied by the ship speed [1.0 m s<sup>-1</sup>]) and vertical distance, respectively.  $A$  was calculated as:

$$A = a \times \sin(\pi \times R/180), \quad (3)$$

where  $a$  is the mouth area of the net (1.44 m<sup>2</sup> [1.44 m high  $\times$  1.0 m wide]) and  $R$  is the mean frame angle during each net tow, calculated using the frame angle recorded every 2 s. Depth, temperature and salinity were also measured by a conductivity-temperature-depth (CTD) probe (ICTD, Falmouth Scientific, Inc., Cataumet, MA, USA) mounted on the net frame. CTD data were recorded in real-time by an onboard computer.

Four stations were occupied along 140°E for IONESS samplings ([Fig. 1](#)). Detailed sampling information for the 15 successful IONESS tows is given in [Table 1](#).

## (2) RMT 1+8

The RMT 1+8 is a multiple-net opening and closing zooplankton sampler (Baker *et al.*, 1973). An RMT 1+8 consists of two rectangular net systems that open and close simultaneously: an RMT-8 (mouth area, 8 m<sup>2</sup>; mesh size, 4.5 mm) and an RMT-1 (mouth area, 1 m<sup>2</sup>; mesh size, 335  $\mu$ m).

The RMT 1+8 was operated in a manner similar to the IONESS; it was deployed from the stern of the vessel and towed obliquely with the nets sampling over predetermined depth intervals. The nets were opened and closed sequentially by commands transmitted from the surface deck unit through a single conducting cable to the underwater unit.

Generally, two series of oblique samplings were conducted at each station: a shallow cast down to 200 m depth and a deep cast below 200 m. A full set of samples could usually be collected within 6 h.

The RMT 1+8 was equipped with a calibrated flow-meter (Tsurumi-Seiki Kosakusho Co., Ltd.). The volume of water filtered was calculated according to the formula in the RMT 1+8 instruction manual as a function of the mouth area of the net perpendicular to the axis of flow and the towing distance indicated by the flow-meter. The average trawling speed was approximately  $1.0 \text{ m s}^{-1}$ . Depth, temperature and salinity were also measured by a conductivity-temperature-depth (CTD) probe (MicroCAT, Sea-Bird Electronics, Inc., Bellevue, WA, USA), which was mounted on the release gear immediately above the net. CTD data were recorded in real-time by an onboard computer.

Four stations were occupied along  $140^\circ\text{E}$  for RMT 1+8 samplings ([Fig. 2](#)). Detailed sampling information is given in [Table 2](#).

### (3) ORI net

An ORI net, made of nylon bolting cloth with a  $335\text{-}\mu\text{m}$  mesh and a mouth ring diameter of 1.6 m, was used for catching meso-to macro-zooplankton (Omori, 1965). The net was deployed off the starboard side of the vessel and towed along the sea surface horizontally at a rate of ca.  $1 \text{ m s}^{-1}$ . The sampling depth is estimated to have been 0–2 m. The towing time was set to 7–10 minutes according to the degree of mesh clogging by phytoplankton. The volume of water filtered was estimated using a calibrated flow-meter (RIGO Co., Ltd., Tokyo, Japan) mounted on the mouth of the net.

ORI net sampling was conducted at three stations along  $140^\circ\text{E}$  ([Fig. 3](#)). At each station, eight surface tows were performed. Details of the 24 samples are given in [Table 3](#).

(4) NORPAC net

A twin NORPAC standard net, with one net made of nylon bolting cloth with a 335- $\mu\text{m}$  mesh and the other with 100- $\mu\text{m}$  mesh, was used for catching micro- to meso-zooplankton (Motoda, 1957). The net was hauled vertically at a speed of about 1 m s<sup>-1</sup> from an approximate depth of 150 m. The maximum depth reached was estimated from the wire angle and length of wire paid out. The volume of water filtered through each net was estimated using a calibrated flow-meter (RIGO Co., Ltd., Tokyo, Japan) mounted at the center of the mouth ring of each net.

NORPAC net samplings were conducted at six stations along 140°E ([Fig. 4](#)). Sampling information is given in [Table 4](#).

(5) Zooplankton sample processing

All zooplankton samples were immediately preserved in 5% borate-buffered formalin seawater on board and stored in a cool, dark place on the ship.

#### 4. Data policy

The purpose of this data report is to provide information about the collection of zooplankton samples for scientists and students researching Antarctic ecosystems and zooplankton. This report should also make interested researchers aware of the opportunity to use these samples to quantitatively describe zooplankton distribution and biomass in the Southern Ocean. All underlying physical data collected with the CTD and the samples are available for scientific use. We expect the information in this report, in combination with the available samples and environmental data set, to be utilized in various future studies.

Permission to use the data and the preserved samples for publication or presentation should be obtained in writing. Inquiries about details of the data record should be addressed to one of the following:

Tsuneo Odate, Professor

National Institute of Polar Research

10–3 Midori-cho, Tachikawa,

Masato Moteki, Associate Professor

Tokyo University of Marine Science and Technology

4–5–7 Konan, Minato-ku,

Tokyo 190-8518, Japan

Phone: +81-42-512-0735

Facsimile: +81-42-528-3492

E-mail: odate@nipr.ac.jp

Tokyo 108-8477, Japan

Phone: +81-35-463-0527

Facsimile: +81-35-463-0523

E-mail: masato@kaiyodai.ac.jp

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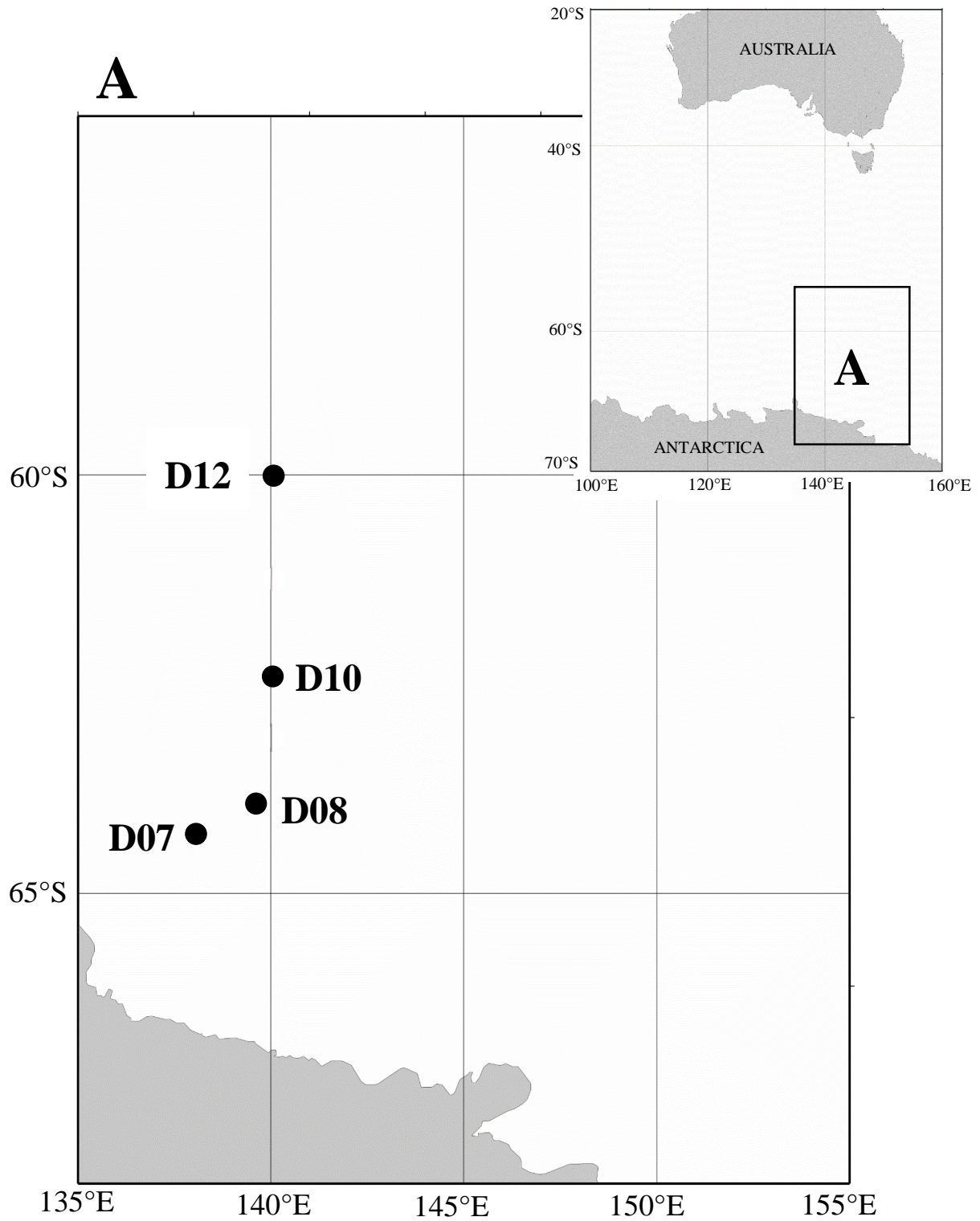


Fig. 1. Stations sampled with IONESS opening/closing multiple-net systems on board the training vessel *Umitaka-maru* in the Indian sector of the Southern Ocean, January 2012.

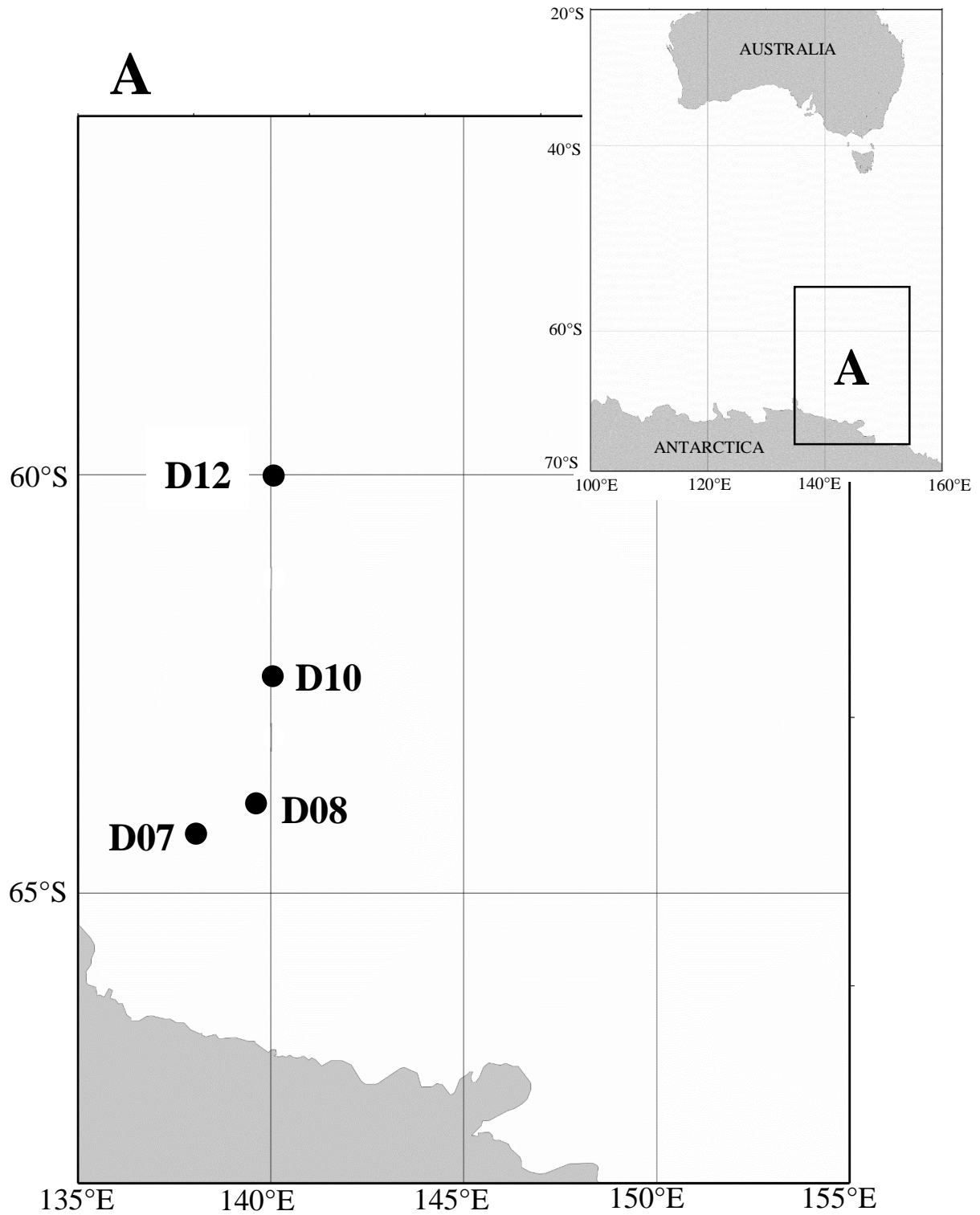


Fig. 2. Stations sampled with RMT 1+8 opening/closing multiple-net systems on board the training vessel *Umitaka-maru* in the Indian sector of the Southern Ocean, January 2012.



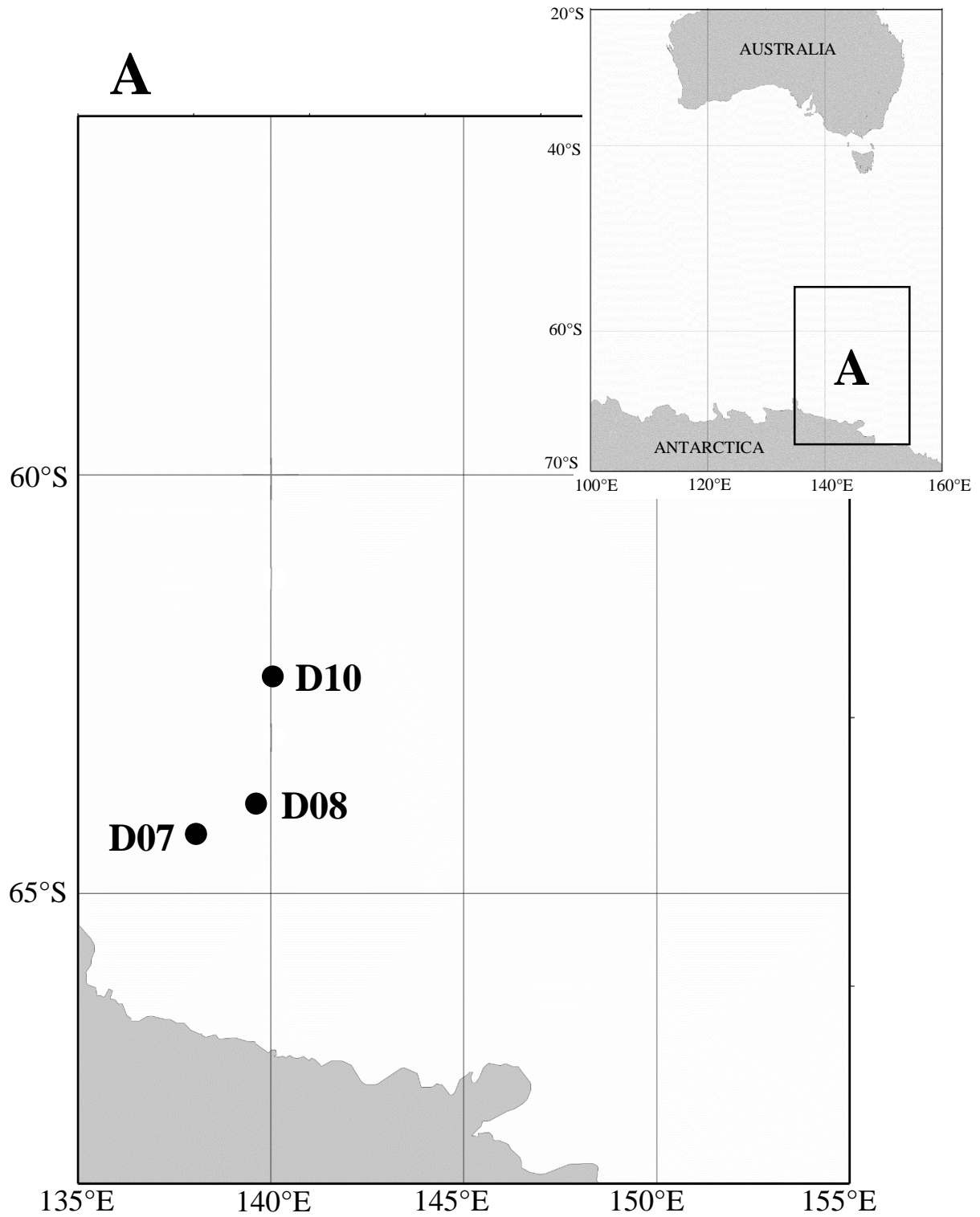


Fig. 3. Stations sampled with an ORI net by surface towing from the training vessel *Umitaka-maru* in the Indian sector of the Southern Ocean, January 2012.

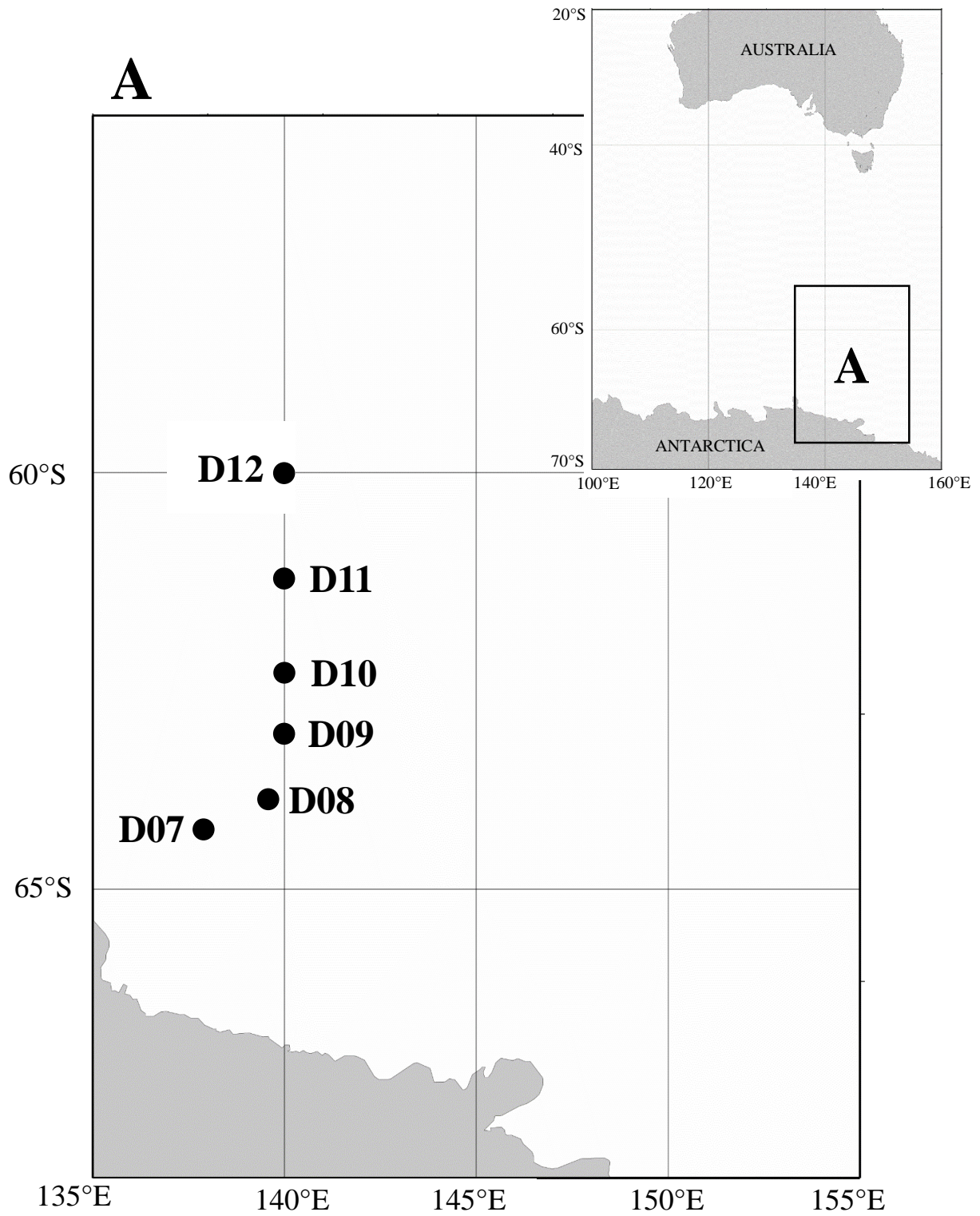


Fig. 4. Stations sampled with a twin NORPAC standard net on board the training vessel *Umitaka-maru* in the Indian sector of the Southern Ocean, January 2012.

Table 1. Sampling data of an IONESS along the 140°E transect in the Southern Ocean in January 2012. (1 of 2)

Stn.	Tow	Position		Date (yyyy/mm/dd) & Time (UTC) <sup>a</sup>		Bottom depth (m)	Net no. <sup>b</sup>	Sampling depth interval (m)	Volume filtered (m <sup>3</sup> )		
		Start	Finish	Start	Finish						
D10	1	62 ° 30.38 ' S	62 ° 29.05 ' S	2012/01/18 02:02	2012/01/18 03:23	3948	1	3-40	423		
		140 ° 1.36 ' E	139 ° 56.52 ' E				2	40-80	795		
							3	80-120	714		
							4	120-160	586		
							5	160-200	702		
							6	200-250	791		
							7	250-300	925		
							8	300-400	1176		
							D	0-400			
			2	62 ° 30.28 ' S	62 ° 28.96 ' S		2012/01/18 11:48	2012/01/18 13:08	3953	1	3-40
140 ° 1.10 ' E	139 ° 55.79 ' E					2	40-80	612			
						3	80-120	635			
						4	120-160	508			
						5	160-200	712			
						6	200-250	789			
						7	250-300	978			
						8	300-400	1038			
						D	0-400				
	3			62 ° 29.99 ' S	62 ° 31.54 ' S	2012/01/18 14:48	2012/01/19 00:48	3948		1	3-40
		140 ° 0.08 ' E	140 ° 5.57 ' E			2	40-80		696		
						3	80-120		866		
						4	120-160		953		
						5	160-200		870		
						6	200-250		925		
						7	250-300		726		
						8	300-400		951		
						D	0-400				
			4	62 ° 30.81 ' S	62 ° 29.93 ' S	2012/01/18 17:39	2012/01/18 18:43		3943	1	3-40
140 ° 2.95 ' E	139 ° 59.39 ' E					2	40-80	438			
						3	80-120	603			
						4	120-160	556			
						5	160-200	611			
						6	200-250	714			
						7	250-300	613			
						8	300-400	889			
						D	0-400				
D08	1			63 ° 58.24 ' S	64 ° 0.30 ' S	2012/01/20 01:40	2012/01/20 03:01	3696		1	3-40
		139 ° 40.77 ' E	139 ° 44.57 ' E			2	40-80		770		
						3	80-120		711		
						4	120-160		642		
						5	160-200		644		
						6	200-250		664		
						7	250-300		576		
						8	300-400		1142		
						D	0-400				
	2	64 ° 5.67 ' S	64 ° 2.59 ' S	2012/01/20 11:23	2012/01/20 12:33	3651	1	3-40	479		
		139 ° 30.92 ' E	139 ° 31.48 ' E				2	40-80	524		
							3	80-120	536		
							4	120-160	571		
							5	160-200	492		
							6	200-250	587		
							7	250-300	528		
							8	300-400	868		
							D	0-400			
	3	64 ° 5.23 ' S	64 ° 7.52 ' S	2012/01/20 13:59	2012/01/20 15:04	3599	1	3-40	537		
		139 ° 30.90 ' E	139 ° 30.59 ' E				2	40-80	616		
							3	80-120	587		
							4	120-160	619		
							5	160-200	545		
							6	200-250	678		
							7	250-300	631		
							8	300-400	746		
							D	0-400			
	4	64 ° 5.18 ' S	64 ° 8.65 ' S	2012/01/20 16:58	2012/01/20 18:28	3651	1	3-40	740		
		139 ° 30.98 ' E	139 ° 30.43 ' E				2	40-80	776		
							3	80-120	763		
							4	120-160	671		
							5	160-200	645		
							6	200-250	738		
							7	250-300	868		
							8	300-400	984		
							D	0-400			

<sup>a</sup>Ship mean time = UTC+10 h<sup>b</sup>Mesh size, 335 µm; D, down-tow<sup>c</sup>Target trawl

Table 1. Continued. (2 of 2)

Stn.	Tow	Position		Date (yyyy/mm/dd) & Time (UTC) <sup>a</sup>		Bottom depth (m)	Net no. <sup>b</sup>	Sampling depth interval (m)	Volume filtered (m <sup>3</sup> )
		Start	Finish	Start	Finish				
D07	1	64 ° 21.01 ' S	64 ° 21.04 ' S	2012/01/21 03:34	2012/01/21 04:46	3213	1	3-40	490
		137 ° 42.09 ' E	137 ° 35.68 ' E				2	40-80	528
							3	80-120	497
							4	120-160	561
							5	160-200	551
							6	200-250	755
							7	250-300	699
							8	300-400	838
							D	0-400	
			2				64 ° 21.10 ' S	64 ° 20.95 ' S	2012/01/21 11:07
137 ° 41.46 ' E	137 ° 48.90 ' E			2	40-80	479			
				3	80-120	474			
				4	120-160	655			
				5	160-200	620			
				6	200-250	746			
				7	250-300	631			
				8	300-400	1011			
				D	0-400				
	3			64 ° 20.75 ' S	64 ° 20.94 ' S	2012/01/21 13:59	2012/01/21 15:03	3215	
		138 ° 0.83 ' E	137 ° 55.33 ' E	2	40-80				450
				3	80-120				533
				4	120-160				520
				5	160-200				509
				6	200-250				684
				7	250-300				584
				8	300-400				744
				D	0-400				
			4	64 ° 21.07 ' S	64 ° 20.96 ' S				2012/01/21 16:54
137 ° 58.23 ' E	138 ° 4.04 ' E			2	40-80	546			
				3	80-120	551			
				4	120-160	556			
				5	160-200	650			
				6	200-250	789			
				7	250-300	737			
				8	300-400	819			
				D	0-400				
D12	1			59 ° 59.00 ' S	59 ° 56.24 ' S	2012/01/26 13:40	2012/01/26 14:55	4454	
		140 ° 0.37 ' E	139 ° 59.17 ' E	2	5-10				492
				3	10-15				591
				4	15-20				561
				5	20-25				597
				6	25-50				673
				7	50-75				901
				8	75-100				723
				D	0-100				
			2 <sup>c</sup>	59 ° 58.42 ' S	59 ° 57.18 ' S				2012/01/26 20:19
139 ° 58.70 ' E	140 ° 3.17 ' E			2	17-31	492			
				3	31-60	839			
				4	60-66	586			
				5	66-86	764			
				6	86-91	441			
				7	91-122	652			
				8	122-240	1124			
				D	0-240				
	3			59 ° 59.54 ' S	59 ° 57.18 ' S	2012/01/27 01:15	2012/01/27 02:24	4476	
		140 ° 0.60 ' E	139 ° 59.70 ' E	2	5-10				587
				3	10-15				578
				4	15-20				553
				5	20-25				509
				6	25-50				637
				7	50-75				672
				8	75-100				575
				D	0-100				

<sup>a</sup>Ship mean time = UTC+10 h<sup>b</sup>Mesh size, 335 µm; D, down-tow<sup>c</sup>Target trawl

Table 2. Sampling data of a RMT 1+8 along the 140°E transect in the Southern Ocean in January 2012.

Stn.	Position		Date(yyyy/mm/dd) & Time (UTC) <sup>a</sup>		Bottom depth (m)	Net No. <sup>b</sup>	Sampling depth interval (m)	Volume filtered (m <sup>3</sup> )
	Start	Finish	Start	Finish				
D10	62 ° 29.46 ' S	62 ° 29.95 ' S	2012/01/18 04:34	2012/01/18 08:42	3877-3981	1-1	0-50	451
	139 ° 58.07 ' E	139 ° 59.77 ' E				8-1	0-50	5655
						1-2	50-100	708
						8-2	50-100	8887
						1-3	100-200	773
						8-3	100-200	9694
						1-4	200-500	837
						8-4	200-500	10502
						1-5	500-1000	1288
						8-5	500-1000	16157
				1-6	1000-2000	2125		
				8-6	1000-2000	26660		
D08	63 ° 59.48 ' S	63 ° 59.33 ' S	2012/01/20 04:05	2012/01/20 08:26	3677-3705	1-1	0-50	451
	139 ° 43.08 ' E	139 ° 38.95 ' E				8-1	0-50	5655
						1-2	50-100	644
						8-2	50-100	8079
						1-3	100-200	966
						8-3	100-200	12118
						1-4	200-500	1095
						8-4	200-500	13734
						1-5	500-1000	1546
						8-5	500-1000	19389
				1-6	1000-2000	1868		
				8-6	1000-2000	23428		
D07	64 ° 21.17 ' S	64 ° 21.65 ' S	2012/01/21 21:23	2012/01/22 01:33	3262-3284	1-1	0-50	644
	138 ° 1.65 ' E	138 ° 12.22 ' E				8-1	0-50	8079
						1-2	50-100	580
						8-2	50-100	7271
						1-3	100-200	773
						8-3	100-200	9694
						1-4	200-500	1481
						8-4	200-500	18581
						1-5	500-1000	1546
						8-5	500-1000	19389
				1-6	1000-2000	2189		
				8-6	1000-2000	27467		
D12 <sup>c</sup>	59 ° 57.55 ' S	59 ° 58.57 ' S	2012/01/26 22:38	2012/01/26 23:31	4472	8-1	150-200	11310
	140 ° 1.99 ' E	139 ° 58.16 ' E				8-2	200-250	10502
						8-3	250-300	5655

<sup>a</sup>Ship mean time = UTC+10 h<sup>b</sup>Mesh size, RMT1(1m<sup>2</sup>): 335µm, RMT8(8m<sup>2</sup>): 4.5mm<sup>c</sup>Target trawl

Table 3. Sampling data of an ORI net by surface tows along the 140°E transect in the Southern Ocean in January 2012.

Stn.	No.	Position		Date (yyyy/mm/dd) & Time (UTC) <sup>a</sup>		Flow meter		Volume filtered (m <sup>3</sup> ) <sup>b</sup>
		Start	Finish	Start	Finish	ID. no.	Revolutions	
D10	1	62 ° 30.60 ' S	62 ° 30.40 ' S	2012/01/18 01:47	2012/01/18 01:58	3318	6765	1217
		140 ° 2.37 ' E	140 ° 1.43 ' E					
	2	62 ° 29.43 ' S	62 ° 29.23 ' S	2012/01/18 03:02	2012/01/18 03:12	3318	5049	
		139 ° 58.00 ' E	139 ° 57.25 ' E					
	3	62 ° 30.62 ' S	62 ° 30.41 ' S	2012/01/18 11:28	2012/01/18 11:39	3318	5605	
		140 ° 2.44 ' E	140 ° 1.60 ' E					
	4	62 ° 29.57 ' S	62 ° 29.31 ' S	2012/01/18 12:33	2012/01/18 12:43	3318	5050	
		139 ° 58.25 ' E	139 ° 57.30 ' E					
5	62 ° 29.51 ' S	62 ° 29.93 ' S	2012/01/18 14:28	2012/01/18 14:43	3318	7750		
	139 ° 58.18 ' E	139 ° 59.82 ' E						
6	62 ° 30.98 ' S	62 ° 31.18 ' S	2012/01/18 15:51	2012/01/18 15:58	3318	3669		
	140 ° 3.77 ' E	140 ° 4.42 ' E						
7	62 ° 31.11 ' S	62 ° 30.99 ' S	2012/01/18 17:20	2012/01/18 17:26	3318	16814		
	140 ° 4.20 ' E	140 ° 3.65 ' E						
8	62 ° 30.13 ' S	62 ° 30.00 ' S	2012/01/18 18:26	2012/01/18 18:36	3318	6080		
	140 ° 0.40 ' E	139 ° 59.79 ' E						
D08	1	63 ° 57.74 ' S	63 ° 58.00 ' S	2012/01/20 01:21	2012/01/20 01:29	3318	6692	1203
		139 ° 39.69 ' E	139 ° 40.21 ' E					
	2	63 ° 59.49 ' S	63 ° 59.74 ' S	2012/01/20 02:30	2012/01/20 02:39	3318	7180	
		139 ° 43.08 ' E	139 ° 43.56 ' E					
	3	64 ° 7.57 ' S	64 ° 7.09 ' S	2012/01/20 10:40	2012/01/20 10:50	3318	6990	
		139 ° 30.41 ' E	139 ° 30.54 ' E					
	4	64 ° 4.12 ' S	64 ° 3.66 ' S	2012/01/20 12:01	2012/01/20 12:11	3318	6515	
		139 ° 31.20 ' E	139 ° 31.25 ' E					
5	64 ° 4.55 ' S	64 ° 4.94 ' S	2012/01/20 13:40	2012/01/20 13:50	3318	7055		
	139 ° 30.98 ' E	139 ° 30.92 ' E						
6	64 ° 6.96 ' S	64 ° 7.34 ' S	2012/01/20 14:51	2012/01/20 15:01	3318	6610		
	139 ° 30.68 ' E	139 ° 30.61 ' E						
7	64 ° 4.43 ' S	64 ° 4.79 ' S	2012/01/20 16:38	2012/01/20 16:48	3318	7208		
	139 ° 31.19 ' E	139 ° 31.08 ' E						
8	64 ° 7.39 ' S	64 ° 7.80 ' S	2012/01/20 17:58	2012/01/20 18:08	3318	13820		
	139 ° 30.51 ' E	139 ° 30.48 ' E						
D07	1	64 ° 21.02 ' S	64 ° 21.02 ' S	2012/01/21 03:09	2012/01/21 03:19	3318	5958	1071
		137 ° 44.45 ' E	137 ° 43.54 ' E					
	2	64 ° 21.05 ' S	64 ° 21.06 ' S	2012/01/21 04:20	2012/01/21 04:30	3318	5123	
		137 ° 38.21 ' E	137 ° 37.31 ' E					
	3	64 ° 21.05 ' S	64 ° 21.09 ' S	2012/01/21 10:45	2012/01/21 10:55	3318	5782	
		137 ° 39.35 ' E	137 ° 40.40 ' E					
	4	64 ° 20.97 ' S	64 ° 20.95 ' S	2012/01/21 11:41	2012/01/21 11:51	3318	6378	
		137 ° 44.45 ' E	137 ° 45.58 ' E					
5	64 ° 20.73 ' S	64 ° 20.70 ' S	2012/01/21 13:38	2012/01/21 13:48	3318	9955		
	138 ° 2.95 ' E	138 ° 1.87 ' E						
6	64 ° 20.84 ' S	64 ° 20.88 ' S	2012/01/21 14:31	2012/01/21 14:41	3318	7986		
	137 ° 58.14 ' E	137 ° 57.20 ' E						
7	64 ° 21.25 ' S	64 ° 21.13 ' S	2012/01/21 16:34	2012/01/21 16:44	3318	4629		
	137 ° 56.44 ' E	137 ° 57.39 ' E						
8	64 ° 21.03 ' S	64 ° 21.01 ' S	2012/01/21 17:36	2012/01/21 17:46	3318	6228		
	138 ° 1.49 ' E	138 ° 2.40 ' E						

<sup>a</sup>Ship mean time = UTC+10 h

<sup>b</sup>Mesh size, 335 µm

Table 4. Sampling data of a twin NORPAC standard net along the 140°E transect in the Southern Ocean in January 2012.

No.	Stn.	Position		Date (yyyy/mm/dd) & Time (UTC) <sup>a</sup>		Wire length (m)	Wire angle (°)	Estimated depth of haul (m)	Flow meter		Volume filtered (m <sup>3</sup> )	Mesh size (µm)	Remarks
		Start	Finish	Start	Finish				ID. no.	Revolutions			
1	D12	59 ° 58.00 ' S	59 ° 58.00 ' S	2012/01/17 01:01	2012/01/17 01:11	151	5	150	3616	1925	28.43	100	
		139 ° 59.97 ' E	139 ° 59.99 ' E						3231	2059		25.95	
2	D11	61 ° 20.00 ' S	61 ° 19.99 ' S	2012/01/17 13:54	2012/01/17 14:04	150	0	150	3616	1720	25.40	100	
		140 ° 0.02 ' E	140 ° 0.02 ' E						3231	1910		24.07	
3	D10	62 ° 30.00 ' S	62 ° 30.01 ' S	2012/01/18 19:40	2012/01/18 19:55	157	17	150	3616	1938	28.62	100	
		140 ° 0.02 ' E	140 ° 0.05 ' E						3231	2218		27.95	
4	D09	63 ° 15.02 ' S	63 ° 15.06 ' S	2012/01/19 05:49	2012/01/19 06:03	153	12	150	3616	1742	25.72	100	
		140 ° 0.26 ' E	140 ° 0.28 ' E						3231	2626		33.09	
5	D08	63 ° 58.58 ' S	63 ° 58.54 ' S	2012/01/20 15:13	2012/01/20 15:27	151	5	150	3616	2768	40.88	100	
		139 ° 45.87 ' E	139 ° 45.68 ' E						3231	3201		40.34	
6	D07	64 ° 21.05 ' S	64 ° 21.04 ' S	2012/01/22 04:01	2012/01/22 04:10	150	4	150	3616	1472	21.74	100	
		137 ° 41.63 ' E	137 ° 41.66 ' E						3231	1569		19.77	

<sup>a</sup>Ship mean time = UTC+10 h