

**Plankton sampling by the training vessel *Umitaka-maru* in the Indian sector of
the Southern Ocean in the austral summer of 2016**

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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) in 1956–1957 as the ship associated with the icebreaker *Soya*. Since then voyages for marine science research 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 second half of the six-year plan for JARE phase VIII (2010–2015) by NIPR, the new three-year (2013–2015) TUMSAT-NIPR joint program on “Studies on plankton community structure and environment parameters in the Southern Ocean.” was established. 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-46; Associate Prof. Masato Moteki, TUMSAT, principal investigator).

The present report describes the data from the third and last research cruise conducted by T/V

Umitaka-maru IV under the mission of project AP-46. This report contains information about the samples that were collected using two kinds of plankton nets—an Ocean Research Institute (ORI) net and a twin North Pacific (NORPAC) standard net—along longitude 110°E off Wilkes Land, Antarctica, during the cruise period between 16 January 2016 and 6 February 2016.

2. Cruise number

Data covered in this report were obtained from the 19th *Kaiyodai* (abbreviated Japanese name for TUMSAT) Antarctic Research Expedition (*KARE*-19) cruise by T/V *Umitaka-maru*, which was conducted as a part of the 57th Japanese Antarctic Research Expedition (*JARE*-57) program. This cruise also served as a leg of the long-distance voyage of the Advanced Course of Marine Science and Technology of TUMSAT (voyage number UM-15-08).

3. Sampling protocols

3.1 ORI net

Macro-zooplankton were collected using an ORI net made of nylon bolting cloth with a 500- μ m mesh and a mouth ring diameter of 1.6 m (Omori, 1965). The ORI net-sampling was carried out by oblique tow in the upper 200 m of the water column; the net was launched from the stern of the ship. Wire was paid out until the net reached a depth of about 200 m, keeping the wire angle at approximately 60° and the wire length at about 400 m. After reaching the depth of about 200 m, the net was retrieved at approximately 0.5 m s⁻¹ while the ship moved forward at 1 m s⁻¹.

The depth reached by the net was measured by a temperature-depth logger (Compact-TD model ATD-HR, JFE Advantech Co., Ltd., Nishinomiya Japan; www.jfe-advantech.co.jp/eng/ocean/compact/compact-td.html) mounted in the mouth of the net. The volume of water filtered was estimated by using a digital mechanical flowmeter (#2030R; General Oceanics, Inc., Miami, Florida, USA) mounted in the mouth of the net.

Six stations were occupied along the 110°E transect for oblique sampling with the ORI net ([Fig. 1](#)). Detailed sampling information is given in [Table 1](#).

3.2 NORPAC net

Micro- to meso-zooplankton were collected using a twin NORPAC standard net with one net made of nylon bolting cloth with a 335- μm mesh and the other with 100- μm mesh (Motoda, 1957). The diameter of the net mouth rings was 45 cm. The net was hauled vertically at a speed of about 1 m s⁻¹ 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 (#5571-B; Rigo Co., Ltd., Tokyo, Japan) mounted at the center of the mouth ring of each net.

NORPAC net samplings were conducted at seven stations along the 110°E transect ([Fig. 2](#)). Detailed sampling information is given in [Table 2](#).

3.3 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 the zooplankton distribution and biomass in the Southern Ocean. All underlying physical data 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:

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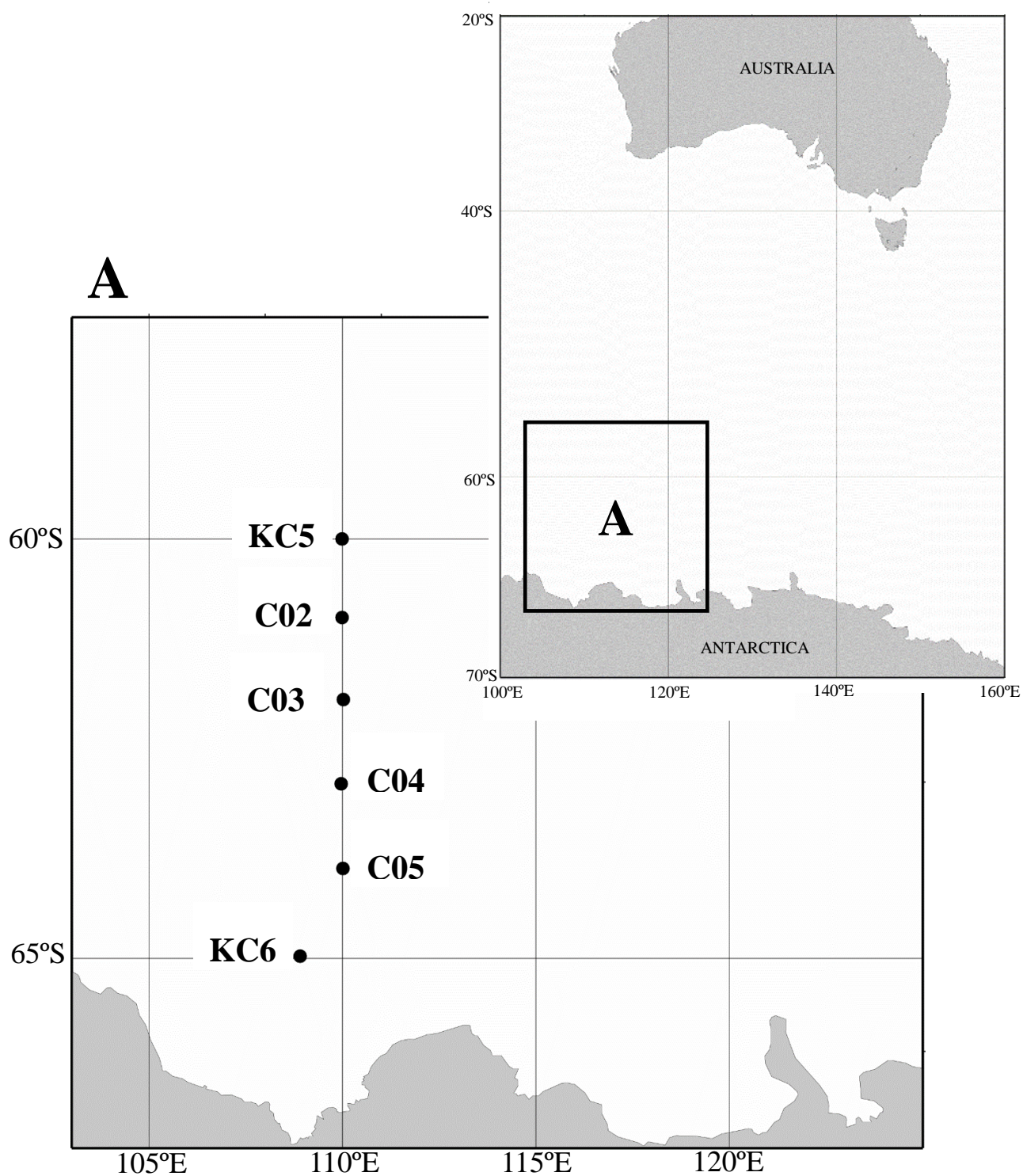


Fig. 1. Stations sampled by oblique hauls with an ORI net on board the training vessel *Umitaka-maru* in the Indian sector of the Southern Ocean, January 2016.

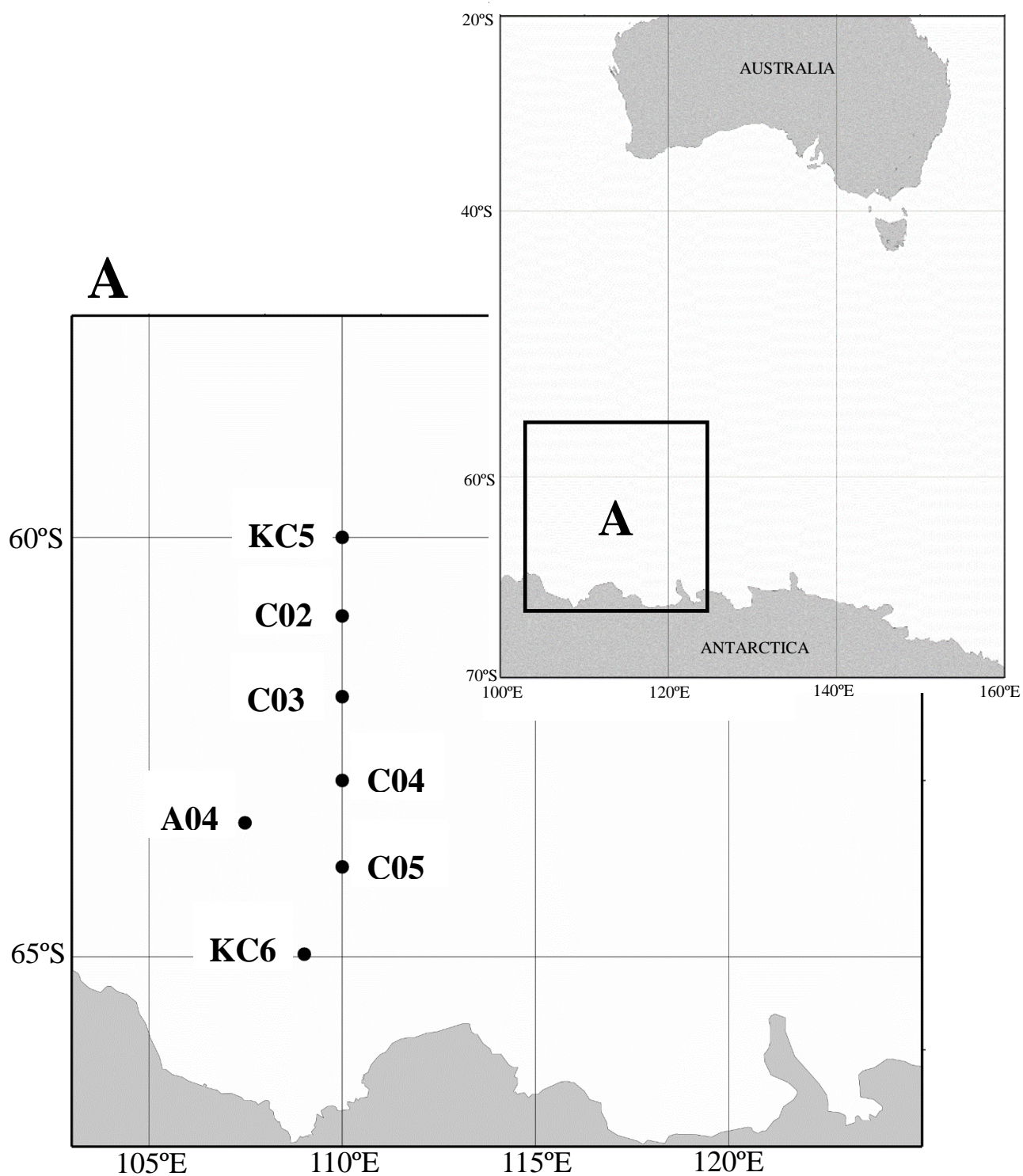


Fig. 2. Stations sampled by vertical hauls with a twin NORPAC standard net on board the training vessel *Umitaka-maru* in the Indian sector of the Southern Ocean, January 2016.

Table 1. Sampling data for oblique tows with an ORI net along the 110°E transect in the Southern Ocean in January 2016.

Stn.	No.	Position		Date (yyyy/mm/dd) & Time (UTC) ^a		Maximum depth reached (m) ^b	G.O. ^c Flowmeter revolutions	Volume filtered (m ³) ^d	Remarks
		Start	Finish	Start	Finish				
KC5	1	60 ° 00.06 ' S	59 ° 59.84 ' S	2016/01/23 15:15	2016/01/23 15:50	182	26700	1442	
		109 ° 59.46 ' E	109 ° 56.75 ' E						
C02	2	60 ° 59.96 ' S	60 ° 59.17 ' S	2016/01/24 03:33	2016/01/24 04:17	219	75833	4095	
		109 ° 59.59 ' E	109 ° 56.63 ' E						
C03	3	62 ° 00.76 ' S	61 ° 59.68 ' S	2016/01/25 00:29	2016/01/25 01:02	192	71450	3859	
		110 ° 01.10 ' E	109 ° 59.80 ' E						
C04	4	63 ° 01.33 ' S	63 ° 00.05 ' S	2016/01/25 12:31	2016/01/25 13:12	168	81482	4400	
		109 ° 58.13 ' E	109 ° 59.92 ' E						
C05	5	64 ° 00.08 ' S	64 ° 00.64 ' S	2016/01/26 17:19	2016/01/26 18:04	231	32041	1730	
		110 ° 00.30 ' E	110 ° 03.64 ' E						
KC6	6	64 ° 58.55 ' S	64 ° 58.60 ' S	2016/01/27 08:04	2016/01/27 08:35	199	41376	2234	
		108 ° 54.57 ' E	108 ° 57.43 ' E						

^aShip mean time = UTC + 8 h

^bCompact-TD model ATD-HR; JFE Advantech Co.Ltd., Nishinomiya Japan

^cPart Number: 2030R; General Oceanics Inc.; Miami, Florida, USA

^dMesh size, 500 µm

Table 2. Sampling data for vertical tows with a twin NORPAC standard net along the 110°E transect in the Southern Ocean in January 2016.

No.	Stn.	Position		Date (yyyy/mm/dd) & Time (UTC) ^a		Wire length (m)	Wire angle (°)	Estimated depth of haul (m)	Flow meter ^b		Volume filtered (m ³)	Mesh size (μm)	Remarks
		Start	Finish	Start	Finish				ID no.	Revolutions			
1	KC5	60 ° 0.03 ' S	60 ° 0.03 ' S	2016/01/23 11:59	2016/01/23 12:09	202	8	200	2471	3067	44.09	100	
		110 ° 0.11 ' E	110 ° 0.10 ' E						3231	2683	33.81	335	
2	C02	61 ° 0.02 ' S	61 ° 0.02 ' S	2016/01/24 01:34	2016/01/24 01:43	206	14	200	2471	3052	43.87	100	
		110 ° 0.07 ' E	110 ° 0.11 ' E						3231	3060	38.56	335	
3	C03	62 ° 0.02 ' S	62 ° 0.03 ' S	2016/01/25 03:52	2016/01/25 04:00	202	9	200	2471	2206	31.71	100	
		110 ° 0.05 ' E	110 ° 0.07 ' E						3231	2255	28.42	335	
4	C04	63 ° 0.02 ' S	63 ° 0.03 ' S	2016/01/25 14:39	2016/01/25 15:32	200	3	200	2471	2218	31.89	100	
		109 ° 59.71 ' E	109 ° 59.72 ' E						3231	2230	28.10	335	
5	C05	63 ° 59.99 ' S	63 ° 59.99 ' S	2016/01/26 14:38	2016/01/26 14:47	201	5	200	2471	1683	24.19	100	
		109 ° 59.91 ' E	109 ° 59.92 ' E						3231	1841	23.20	335	
6	KC6	64 ° 58.37 ' S	64 ° 58.39 ' S	2016/01/27 06:13	2016/01/27 06:22	203	10	200	2471	2786	40.05	100	
		109 ° 0.89 ' E	109 ° 1.07 ' E						3231	2730	34.40	335	
7	A04	63 ° 29.56 ' S	63 ° 29.58 ' S	2016/01/30 00:13	2016/01/30 00:22	202	9	200	2471	2420	34.79	100	
		107 ° 28.84 ' E	107 ° 28.86 ' E						3231	2505	31.57	335	

^aShip mean time = UTC + 8 h

^bPart Number: 5571-B; Rigo Co., Ltd., Tokyo Japan