

**Plankton sampling on board *Shirase* in 1997–2001**  
**— NORPAC standard net samples —**

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Every austral summer (December–March), plankton samplings have been carried out in the Indian Ocean sector of the Southern Ocean as a part of the routine marine biology surveys of the Japanese Antarctic Research Expeditions (JARE). The samplings were conducted on board the icebreaker *Fuji* during JARE-14~24 (1972–1983) as reported by Fukuchi and Tanimura (1981) and Watanabe *et al.* (1984). The icebreaker *Shirase* was launched in 1983 and the samplings have been continued. Details of sampling information and data of wet weight of plankton samples in JARE-25~37 (1983–1996) have been published (Takahashi *et al.*, 1997). Several kinds of plankton nets were used on board the icebreaker *Shirase* and vertical hauls by NORPAC standard net (North Pacific standard net) have been routinely and frequently carried out. This report presents the data records of the NORPAC standard net vertical hauls during JARE-38~42 (1997–2001).

A twin NORPAC standard net, made of nylon bolting cloth NGG 54 (0.33 mm mesh openings) and NXX 13 (0.11 mm mesh openings), was used at all sampling stations. The net was hauled vertically at a speed *ca.* 1 m/s, mostly from a depth of 150 m. All samples obtained were preserved in 5–10% buffered formalin sea water immediately on board. The volumes of water filtered through each net were estimated from a flow-meter which was mounted at the center of the mouth ring of each net. However, it was estimated by assuming 100% efficiency of the net when the flow-meter data were not available, *i.e.* when a flow-meter did not work properly because of some trouble, or flow-meter calibration data were not available. Sampling stations during 1997–2001 (JARE-38~42) are shown in Figs. 1–5, and the data are listed in Tables 1–5.

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Samplings during each cruise were carried out by the following members who participated in JARE and acknowledgments are given to these persons listed below.

JARE (Year)	Name of members	Affiliations *
JARE-38 (1996/97)	T. Odate	Hokkaido University
JARE-39 (1997/98)	A. Ishikawa	Mie University
	N. Washiyama	Ryokuseisha Corporation
JARE-40 (1998/99)	J. Nishikawa	Tokyo University of Fisheries
	S. Kudoh	National Institute of Polar Research
	K. Watanabe	National Institute of Polar Research
JARE-41 (1999/2000)	H. Umeda	The Graduate University for Advanced Studies
	C. Hamada	Nichiyu Giken Kogyo Co., LTD.
	Y. Tsuchiya	Tsukuba University
JARE-42 (2000/01)	S. Ban	Hokkaido University
	W. Okoshi	Tohoku University
	T. Hirawake	National Institute of Polar Research

\*Affiliations are as of the year they were on board.

Before using the data for publication or presentation, please request permission in writing. Inquiries about details of the data record should be addressed to:

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### References

- Fukuchi, M. and Tanimura, A. (1981): Plankton samplings on board Fuji in 1972-1980. JARE Data Rep., **60** (Mar. Biol. 1), 27 p.
- Watanabe, K., Nakajima, Y., Ino, Y., Sasaki, H. and Fukuchi, M. (1984): Plankton samplings on board Fuji in 1980-1983. JARE Data Rep., **90** (Mar. Biol. 5), 11 p.
- Takahashi, K., Tanimura, A. and Fukuchi, M. (1997): Plankton sampling on board Shirase in 1983-1996 -NORPAC standard net samples-. JARE Data Rep., **224** (Mar. Biol. 28), 35 p.

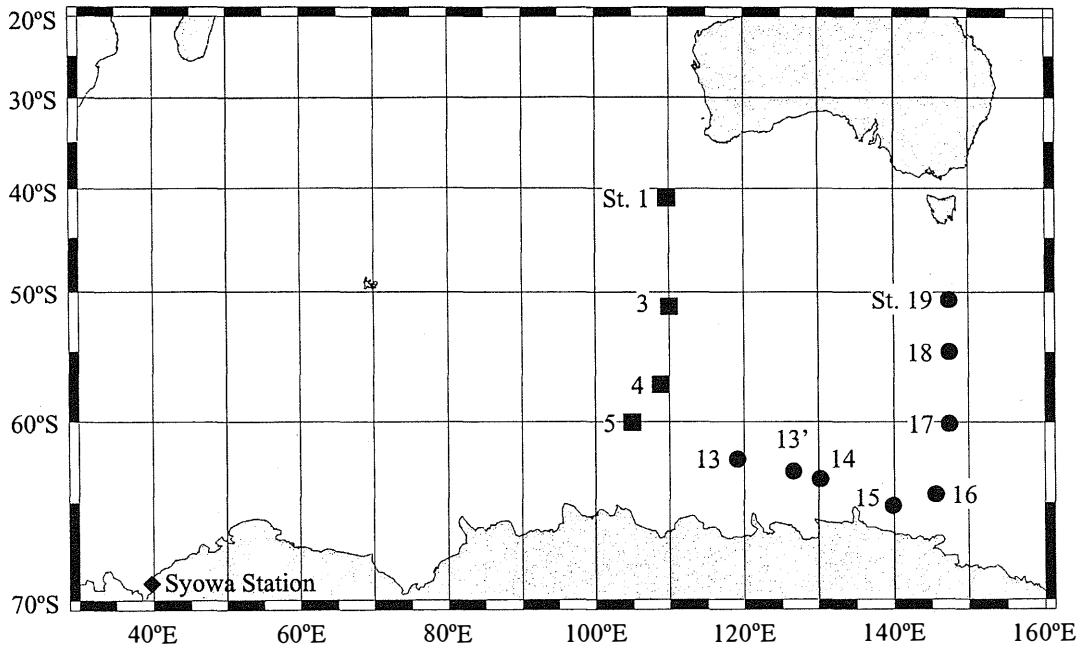


Fig. 1. Sampling stations during JARE-38 in 1996/1997. ■: December, ●: March.

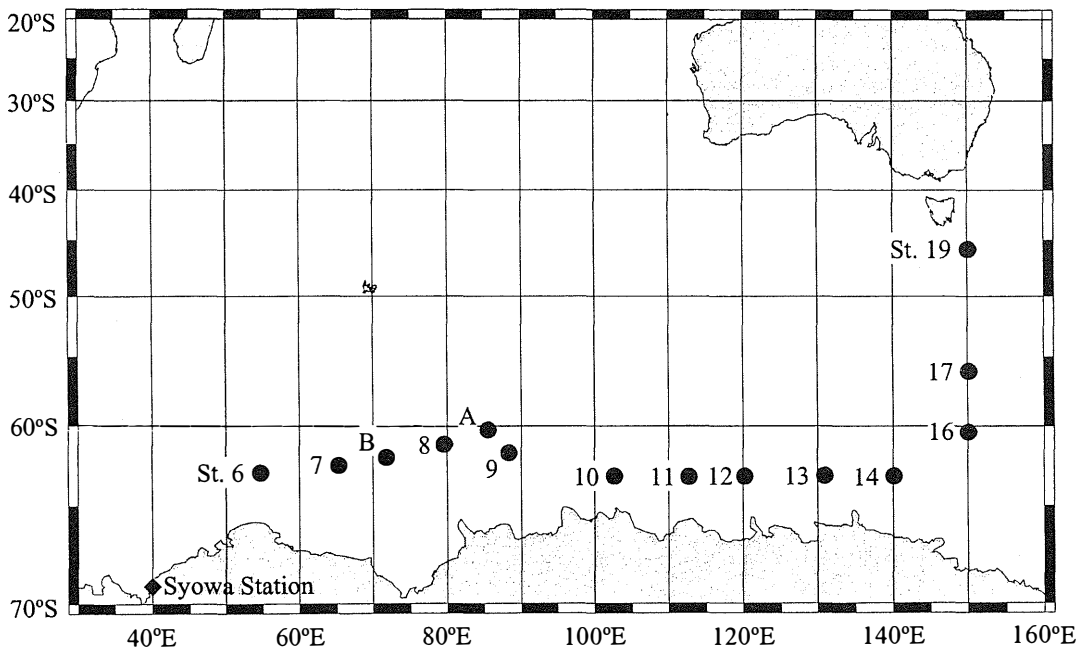


Fig. 2. Sampling stations during JARE-39 in March 1998.

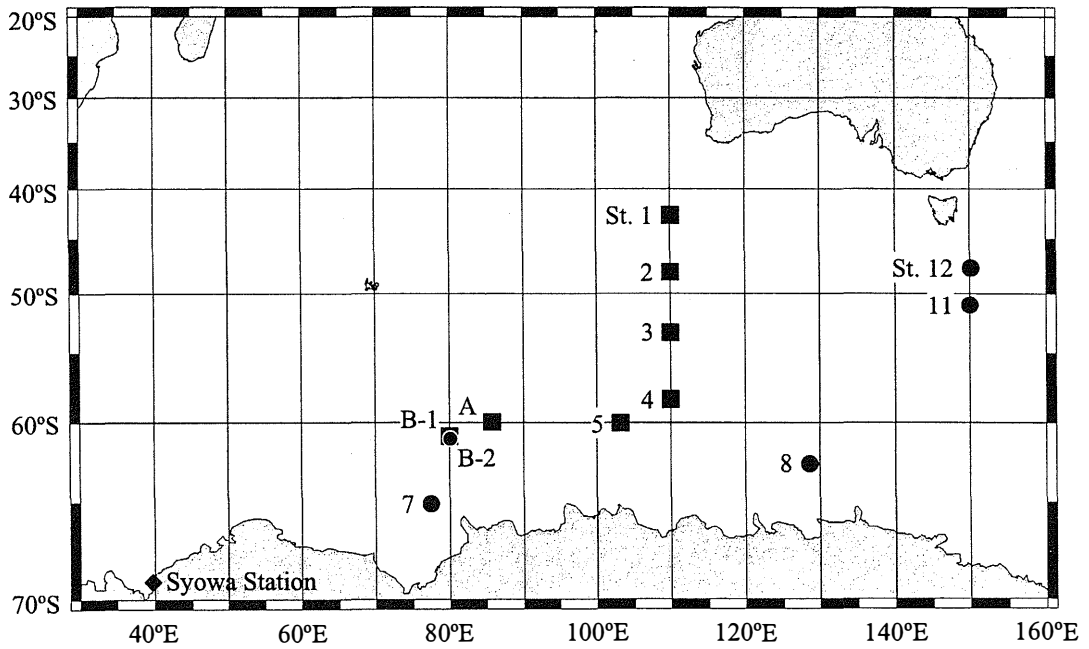


Fig. 3. Sampling stations during JARE-40 in 1998/1999. ■: December, ●: March.

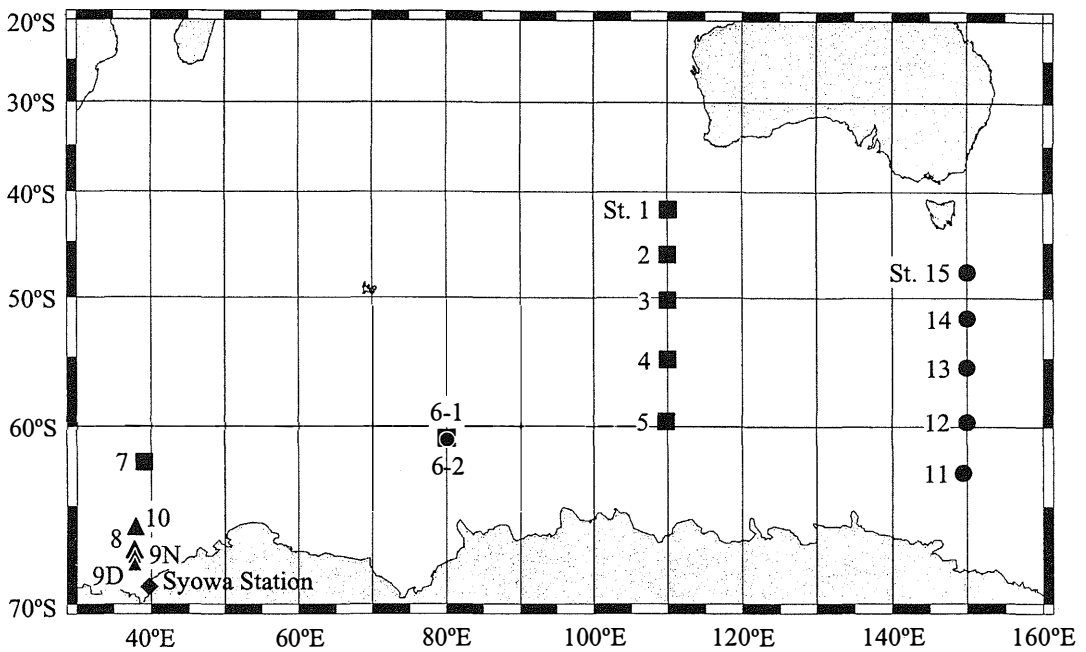


Fig. 4. Sampling stations during JARE-41 in 1999/2000. ■: December, ▲: February, ●: March.

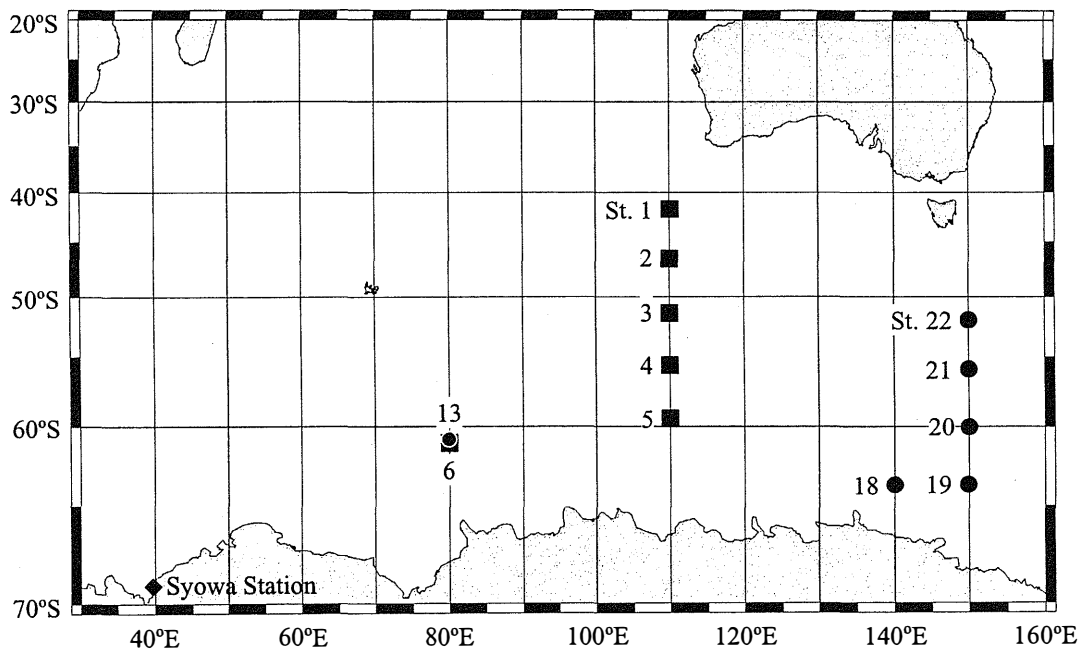


Fig. 5. Sampling stations during JARE-42 in 2000/2001. ■: December, ●: March.

Table 1. Data on plankton collected by vertical hauls with NORPAC twin standard net in the JARE-38 cruise of the *Shirase* to the Indian sector of the Southern Ocean, December 1996 - March 1997. Samplings were carried out by T. Odate.

Stn. No.	Position	Ship's time		Length of wire (m)	Angle of wire (°)	Estimated depth of haul (m)	Flow-meter		Estimated volume of water filtered (m <sup>3</sup> )	Wet weight of sample in a haul (mg)	Wet weight of sample per m <sup>3</sup> (mg)	Mesh size (µm)	Sample No.
		(LMT)					No.	Revolutions					
		Date	time										
1	41°56'S 109°58'E	Dec. 5	1226	202	42	150	2469	4518	36.14	767	21.2	330	38N001
							2473	4060	34.51	2742	79.5	110	38N002
3	52°19'S 110°02'E	Dec. 8	1212	181	34	150	2469	3608	28.86	5000	173.2	330	38N003
							2473	3405	28.94	10846	374.7	110	38N004
4	57°28'S 108°13'E	Dec. 9	1206	181	34	150	2469	3052	24.42	3547	145.3	330	38N005
							2473	2668	22.68	9368	413.1	110	38N006
5	60°05'S 105°52'E	Dec. 10	0837	171	34	150	2469	2935	23.48	2253	96.0	330	38N007
							2473	2781	23.64	4440	187.8	110	38N008
13	63°30'S 118°50'E	Mar. 7	1228	181	34	150	2469	2780	22.24	12964	582.9	330	38N009
							2473	2508	21.32	26267	1232.1	110	38N010
13'	63°50'S 126°42'E	Mar. 8	1306	150	3	150	2469	2508	20.06	2396	119.4	330	38N011
							2473	2257	19.18	8733	455.2	110	38N012
14	64°04'S 130°36'E	Mar. 9	1300	160	28	150	2469	2889	23.11	7947	343.8	330	38N013
							2473	2052	17.44	20471	1173.7	110	38N014
15	65°00'S 140°06'E	Mar. 11	1303	180	44	150	2469	3178	25.42	887	34.9	330	38N015
							2473	3042	25.86	2222	85.9	110	38N016
16	64°58'S 146°58'E	Mar. 12	1308	157	24	150	2469	2569	20.55	1640	79.8	330	38N017
							2473	2227	18.93	7387	390.2	110	38N018

Table 1. Continued.

Stn. No.	Position	Ship's time (LMT)		Length of wire (m)	Angle of wire (°)	Estimated depth of haul (m)	Flow-meter		Estimated volume of water filtered (m <sup>3</sup> )	Wet weight of sample in a haul (mg)	Wet weight of sample per m <sup>3</sup> (mg)	Mesh size (μm)	Sample No.
		Date	time				No.	Revolutions					
17	60°35'S 147°09'E	Mar. 14	1304	152	14	150	2469	2198	17.58	4013	228.2	330	38N019
							2473	2088	17.75	10537	593.7	110	38N020
17	60°35'S 147°09'E	Mar. 14	1336	153	16	150	2469	2182	17.46	5129	293.8	330	38N021
							2473	2050	17.43	9368	537.6	110	38N022
18	55°47'S 147°02'E	Mar. 16	1305	162	30	150	2469	3300	26.40	—	—	—	—
							2473	4640	39.44	—	—	—	—
19	51°30'S 147°00'E	Mar. 17	1401	181	34	150	2469	4205	33.64	5529	164.4	330	38N023
							2473	4093	34.79	7529	216.4	110	38N024

Table 2. Data on plankton collected by vertical hauls with NORPAC twin standard net in the JARE-39 cruise of the *Shirase* to the Indian sector of the Southern Ocean, March 1998. Samplings were carried out by A. Ishikawa and N. Washiyama.

Stn. No.	Position	Ship's time		Length of wire (m)	Angle of wire (°)	Estimated depth of haul (m)	Flow-meter		Estimated volume of water filtered (m <sup>3</sup> )	Wet weight of sample in a haul (mg)	Wet weight of sample per m <sup>3</sup> (mg)	Mesh size (µm)	Sample No.
		(LMT)					No.	Revolutions					
		Date	time										
6	63°28'S 54°19'E	Mar. 1	1326	185	36	150	2473	2920	43.38	3996	92.1	330	39St.6GG54
							2469	2983	43.59	17348	398.0	110	39St.6XX13
7	62°53'S 65°35'E	Mar. 2	1331	150	6	150	2473	1900	28.23	355	12.6	330	39St.7GG54
							2469	1776	25.95	380	14.6	110	39St.7XX13
B	62°35'S 72°09'E	Mar. 3	1425	150	25	150	2473	2086	30.99	3947	127.4	330	39St.BGG54
							2469	2054	30.02	—	—	110	—
8	61°18'S 79°59'E	Mar. 4	0825	181	34	150	2473	3654	54.28	11072	204.0	330	39St.8GG54
							2469	3712	54.24	—	—	110	—
A	59°56'S 85°29'E	Mar. 5	0823	177	32	150	2473	2622	38.95	4897	125.7	330	39St.AGG54
							2469	1749	25.56	26857	1050.8	110	39St.AXX13
9	62°54'S 88°54'E	Mar. 6	1314	151	8	150	2473	1710	25.40	3092	121.7	330	39St.9GG54
							2469	1631	23.83	10925	458.4	110	39St.9XX13
10	63°27'S 103°01'E	Mar. 8	1312	209	44	150	2473	1244	18.48	—	—	330	—
							2469	2295	33.54	264	7.9	110	39St.10XX13
11	63°29'S 113°21'E	Mar. 9	1319	190	38	150	2473	4418	65.63	—	—	330	—
							2469	3722	54.39	22407	412.0	110	39St.11XX13
12	63°30'S 120°21'E	Mar. 10	1312	167	26	150	2473	2698	40.08	4702	117.3	330	39St.12GG54
							2469	2165	31.64	34794	1099.8	110	39St.12XX13



Table 2. Continued.

Stn. No.	Position	Ship's time (LMT)		Length of wire (m)	Angle of wire (°)	Estimated depth of haul (m)	Flow-meter		Estimated volume of water filtered (m <sup>3</sup> )	Wet weight of sample in a haul (mg)	Wet weight of sample per m <sup>3</sup> (mg)	Mesh size (μm)	Sample No.
		Date	time				No.	Revolutions					
13	63°29'S 131°04'E	Mar. 11	1320	151	8	150	2473	3529	52.43	3197	61.0	330	39St.13GG54
							2469	—	—	—	—	110	—
14	63°31'S 140°05'E	Mar. 12	1325	233	50	150	2473	7086	105.27	6264	59.5	330	39St.14GG54
							2469	6963	101.75	12012	118.1	110	39St.14XX13
16	60°57'S 149°59'E	Mar. 14	1313	202	42	150	2473	3795	56.38	3468	61.5	330	39St.16GG54
							2469	3668	53.60	5325	99.3	110	39St.16XX13
17	56°25'S 150°00'E	Mar. 15	1333	196	40	150	2473	4057	60.27	2372	39.4	330	39St.17GG54
							2469	3718	54.33	956	17.6	110	39St.17XX13
19	45°56'S 150°00'E	Mar. 17	1310	216	46	150	2473	5286	78.53	25705	327.3	330	39St.19GG54
							2469	5322	77.77	33124	425.9	110	39St.19XX13

Table 3. Data on plankton collected by vertical hauls with NORPAC twin standard net in the JARE-40 cruise of the *Shirase* to the Indian sector of the Southern Ocean, December 1998 - March 1999. Samplings were carried out by J. Nishikawa, S. Kudoh and K. Watanabe.

Stn. No.	Position	Ship's time (LMT)		Length of wire (m)	Angle of wire (°)	Estimated depth of haul (m)	Flow-meter		Estimated volume of water filtered (m <sup>3</sup> )	Wet weight of sample in a haul (mg)	Wet weight of sample per m <sup>3</sup> (mg)	Mesh size (µm)	Sample No.
		Date	time				No.	Revolutions					
1	43°32'S 110°00'E	Dec. 5	1425	209	44	150	1234	4360	69.31	5187	74.8	330	40N001G
			1434				1526	4133	65.70	5025	76.5	110	40N001X
2	47°43'S 110°01'E	Dec. 6	1436	164	24	150	1234	3341	53.11	1962	36.9	330	40N002G
			1443				1526	2210	35.13	11284	321.2	110	40N002X
3	52°55'S 110°01'E	Dec. 7	1416	185	36	150	1234	3748	59.58	—	—	330	—
			1425				1526	3619	57.53	34872	606.2	110	40N003X
4	58°01'S 110°01'E	Dec. 8	1428	209	43	150	1234	2809	44.65	2796	62.6	330	40N004G
			1438				1526	3039	48.31	4427	91.6	110	40N004X
5	59°59'S 103°54'E	Dec. 9	0835	162	22	150	1234	1990	31.63	1080	34.2	330	40N005G
			0842				1526	1909	30.35	3380	111.4	110	40N005X
A	59°59'S 86°00'E	Dec. 10	1810	213	45	150	1234	4732	75.22	5948	79.1	330	40N006G
			1820				1526	2963	47.10	14437	306.5	110	40N006X
B-1	61°18'S 80°03'E	Dec. 11	1015	187	37	150	1234	4170	66.29	88520	1335.4	330	40N007G
			1024				1526	2715	43.16	1893	43.9	110	40N007X
7	65°14'S 77°25'E	Mar. 1	0943	160	20	150	1234	2306	36.66	2137	58.3	330	40N008G
			0952				1526	2788	44.32	3206	72.3	110	40N008X
B-2	61°18'S 80°04'E	Mar. 4	1601	153	12	150	1234	1881	29.90	—	—	330	—
			1609				1526	1812	28.80	3830	133.0	110	40N009X

Table 3. Continued.

Stn. No.	Position	Ship's time (LMT)		Length of wire (m)	Angle of wire (°)	Estimated depth of haul (m)	Flow-meter		Estimated volume of water filtered (m <sup>3</sup> )	Wet weight of sample in a haul (mg)	Wet weight of sample per m <sup>3</sup> (mg)	Mesh size (µm)	Sample No.
		Date	time				No.	Revolutions					
8	62°56'S 128°17'E	Mar. 9	1337	177	32	150	1234	3232	51.38	3089	60.1	330	40N010G
			1341				1526	2823	44.88	6163	214.0	110	40N0010X
11	51°56'S 150°09'E	Mar. 16	1430	300	60	150	1844	7884	125.33	6316	50.4	330	40N013X
			1445				1834	8432	134.04	3392	75.6	110	40N013G
12	47°49'S 150°09'E	Mar. 17	1416	283	58	150	1844	(3)7165	113.90	6507	57.1	330	40N014X
			1430				1835	7031	103.03	1649	16.0	110	40N014G

Table 4. Data on plankton collected by vertical hauls with NORPAC twin standard net in the JARE-41 cruise of the *Shirase* to the Indian sector of the Southern Ocean, December 1999 - March 2000. Samplings were carried out by H. Umeda, C. Hamada and Y. Tsuchiya.

Stn. No.	Position	Ship's time (LMT)		Length of wire (m)	Angle of wire (°)	Estimated depth of haul (m)	Flow-meter		Estimated volume of water filtered (m <sup>3</sup> )	Wet weight of sample in a haul (mg)	Wet weight of sample per m <sup>3</sup> (mg)	Mesh size (µm)	Sample No.
		Date	time				No.	Revolutions					
1	42°05'S 110°00'E	Dec. 5	1448	170	28	150	2469	3634	53.99	17738	328.55	330	41N001
							2471	3043	31.48	1401	44.49	110	41N002
2	46°21'S 110°00'E	Dec. 6	1418	181	35	150	2469	2800	41.60	8783	211.15	330	41N003
							2471	1860	19.24	7565	393.15	110	41N004
3	50°31'S 109°58'E	Dec. 7	1427	181	34	150	2469	3640	54.08	77077	1425.35	330	41N005
							2471	3851	39.84	83870	2105.30	110	41N006
4	55°04'S 109°59'E	Dec. 8	1419	177	32	150	2469	4050	60.17	3884	64.55	330	41N007
							2471	3851	39.84	12206	306.39	110	41N008
5	59°44'S 109°53'E	Dec. 9	1439	178	34	150	2469	2260	33.57	2514	74.89	330	41N009
							2471	3851	39.84	2144	53.83	110	41N010
6-1	61°21'S 80°02'E	Dec. 13	1149	174	30	150	2469	1884	27.99	—	—	330	—
							2471	1720	17.79	36942	2076.21	110	41N012
7	62°20'S 39°00'E	Dec. 17	1147	152	8	150	2469	1586	23.56	—	—	330	—
							2471	1126	11.65	7142	613.17	110	41N014
7	62°20'S 39°00'E	Dec. 17	1012	1000	1	1000	2473	10481	155.71	—	—	330	—
							2470	10492	110.82	—	—	110	—
7	62°20'S 39°00'E	Dec. 17	1120	500	0	500	2470	5452	57.59	3095	53.74	330	41N016A
							2473	5250	77.99	—	—	110	—

Table 4. Continued.

Stn. No.	Position	Ship's time (LMT)		Length of wire (m)	Angle of wire (°)	Estimated depth of haul (m)	Flow-meter		Estimated volume of water filtered (m <sup>3</sup> )	Wet weight of sample in a haul (mg)	Wet weight of sample per m <sup>3</sup> (mg)	Mesh size (μm)	Sample No.
		Date	time				No.	Revolutions					
8	67°27'S 38°58'E	Feb. 17	1503	186	40	150	2471	2730	28.24	—	—	330	—
							2469	1793	26.64	4339	162.90	110	41N018
8		Feb. 17	1520	1700	55	1000	2470	10565	111.59	23269	208.52	330	41N019A
							2473	9523	141.47	—	—	110	—
8		Feb. 17	1634	860	55	500	2470	3665	38.71	5937	153.36	330	41N020A
							2473	3855	57.27	—	—	110	—
9N	66°36'S 38°56'E	Feb. 17	2337	2000	60	1000	2470	5430	57.35	5261	91.72	330	41N023A
							2473	12690	188.52	—	—	110	—
9N		Feb. 18	102	860	55	500	2470	6168	65.15	19310	296.39	330	41N024A
							2473	6116	90.86	—	—	110	—
9N		Feb. 18	149	195	41	150	2471	3368	34.84	3972	114.00	330	41N022
							2469	3660	54.37	7692	141.46	110	41N023
9D	66°38'S 38°52'E	Feb. 18	1108	165	25	150	2471	2286	23.65	2944	124.51	330	41N025
							2469	1695	25.18	4052	160.91	110	41N026
9D		Feb. 18	1126	670	42	500	2470	6648	70.22	1739	24.77	330	41N027A
							2473	5762	85.60	2971	34.71	110	41N027B
10	65°48'S 38°58'E	Feb. 18	1727	580	30	500	2470	7206	76.11	10656	140.00	330	41N028A
							2473	7588	112.73	4384	38.89	110	41N028B

Table 4. Continued.

Stn. No.	Position	Ship's time (LMT)		Length of wire (m)	Angle of wire (°)	Estimated depth of haul (m)	Flow-meter		Estimated volume of water filtered (m <sup>3</sup> )	Wet weight of sample in a haul (mg)	Wet weight of sample per m <sup>3</sup> (mg)	Mesh size (μm)	Sample No.
		Date	time				No.	Revolutions					
10	65°48'S 38°58'E	Feb. 18	1757	159	18	150	2471	2775	28.71	6298	219.40	330	41N029
							2469	1463	21.73	7803	359.01	110	41N030
6-2	61°19'S 80°01'E	Mar. 2	1136	153	10	150	2469	2399	35.64	10017	281.06	330	41N031
							2473	1992	29.59	13654	461.38	110	41N032
11	63°00'S 149°57'E	Mar. 12	1403	181	25	150	2473	2665	39.59	8288	209.34	330	41N033
							2469	2798	41.57	6468	155.61	110	41N034
12	59°39'S 149°58'E	Mar. 13	1406	226	47	150	2469	4740	70.42	13074	185.67	330	41N035
							2473	2665	39.59	4304	108.71	110	41N036
13	56°36'S 150°01'E	Mar. 14	1424	202	41	150	2469	3365	49.99	1732	34.65	330	41N037
							2473	3111	46.22	5486	118.69	110	41N038
14	52°18'S 150°01'E	Mar. 15	1428	252	48	150	2469	4157	61.76	2859	46.30	330	41N039
							2473	4643	68.98	1331	19.29	110	41N040
15	47°39'S 150°02'E	Mar. 16	1417	190	39	150	2469	3615	53.70	2687	50.02	330	41N041
							2473	3587	53.29	1310	24.59	110	41N042

Table 5. Data on plankton collected by vertical hauls with NORPAC twin standard net in the JARE-42 cruise of the *Shirase* to the Indian sector of the Southern Ocean, December 2000 - March 2001. Samplings were carried out by S. Ban, W. Okoshi and T. Hirawake.

Stn. No.	Position	Ship's time (LMT)		Length of wire (m)	Angle of wire (°)	Estimated depth of haul (m)	Flow-meter		Estimated volume of water filtered (m <sup>3</sup> )	Wet weight of sample in a haul (mg)	Wet weight of sample per m <sup>3</sup> (mg)	Mesh size (µm)	Sample No.
		Date	time				No.	Revolutions					
1	41°29'S 110°00'E	Dec. 5	1435	233	50	150	—	—	—	—	—	330	—
							—	—	—	—	110	—	
2	46°40'S 110°04'E	Dec. 6	1404	283	58	150	2470	6062	64.03	4180	65.3	330	st2G
							2473	4230	62.84	1738	27.7	110	st2X
3	51°33'S 110°04'E	Dec. 7	1405	202	42	150	2470	2778	29.34	2195	74.8	330	st3G
							2473	2369	35.19	4062	115.4	110	st3X
4	55°53'S 110°02'E	Dec. 8	1359	196	40	150	2470	2455	25.93	1520	58.6	330	st4G
							2473	2647	39.32	1252	31.8	110	st4X
5	59°16'S 110°01'E	Dec. 9	0921	0	0	150	2470	1812	19.14	929	48.6	330	st5G
							2473	1706	25.34	2033	80.2	110	st5X
6	61°20'S 79°59'E	Dec. 12	1117	216	46	150	2470	4048	42.76	6659	155.7	330	st6G
							2473	3034	45.07	18115	401.9	110	st6X
13	61°18'S 80°00'E	Mar. 4	1210	170	28	150	2473	2540	37.73	4269	113.1	330	st13G
							2470	2433	25.70	25300	984.5	110	st13X
18	64°01'S 140°04'E	Mar. 11	1401	190	38	150	2473	2200	32.68	1411	43.2	330	st18G
							2470	2070	21.86	3341	152.8	110	st18X
19	63°58'S 150°05'E	Mar. 13	1405	244	52	150	2473	3815	56.68	8196	144.6	330	st19G
							2470	3485	36.81	9622	261.4	110	st19X

Table 5. Continued.

Stn. No.	Position	Ship's time (LMT)		Length of wire (m)	Angle of wire (°)	Estimated depth of haul (m)	Flow-meter		Estimated volume of water filtered (m <sup>3</sup> )	Wet weight of sample in a haul (mg)	Wet weight of sample per m <sup>3</sup> (mg)	Mesh size (µm)	Sample No.
		Date	time				No.	Revolutions					
20	60°08'S 150°04'E	Mar. 14	0142	190	38	150	2473	2648	39.34	3751	95.3	330	st20G
							2470	2090	22.08	6985	316.4	110	st20X
21	56°33'S 150°05'E	Mar. 15	1412	233	50	150	2473	4903	72.84	10047	137.9	330	st21G
							2470	3618	38.21	5138	134.4	110	st21X
22	51°53'S 150°06'E	Mar. 16	1414	160	20	150	2473	2108	31.32	233	7.4	330	st22G
							2470	1973	20.84	525	25.2	110	st22X