

Outline of “Research on Deep-sea Fauna and Pollutants off Pacific Coast of Northern Japan”

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Abstract: Investigations of deep-sea fauna and anthropogenic pollutants were carried out off the Pacific coast of northern Honshu, Japan during the years 2005 to 2008. An outline of the investigations is given, including characteristics of the study area and methods of collecting and preserving specimens.

Key words: deep-sea fauna, biodiversity, pollutant, Japan.

Introduction

The National Museum of Nature and Science (formerly National Science Museum), Tokyo has been conducting a research project entitled “Study on Deep-Sea Fauna and Conservation of Deep-Sea Ecosystem” since 1993. The purpose of the project is to elucidate the deep-sea fauna around Japan and to trace anthropogenic pollutants in deep-sea animals. The investigations have been carried out in selected areas, and for four years in each area as one term of the project. Previous investigations were carried out in Suruga Bay on the Pacific coast of central Japan in 1993-1996, in Tosa Bay on the Pacific coast of Shikoku Island in 1997-2001, and around Nansei Islands in southwestern Japan in 2002-2005. The results were published in the National Science Museum Monographs (National Science Museum, 1997; Fujita *et al.*, 2001; Hasegawa *et al.*, 2005). Investigations for the fourth term of the project were conducted in the Pacific coast of northern Japan from 2005 to 2008.

The study area is dominated by the cold Oyashio Current, and also affected by the warm Kuroshio Current. This hydrographical environment of the present study area is different from previous ones in this project; the previous three areas are strongly affected by the warm Kuroshio Current. Taxonomic or faunistic surveys in this area were started around the beginning of the last century. Because this area is one of the most important fishing grounds in Japan, the fauna and ecology of fishery resources including pelagic and benthic fishes and crustaceans in this area have been frequently studied by the domestic fisheries research institutions (Kawai, 1955; Okutani and Chinzei, 1976). Those surveys including ones with research vessels such as United States *Albatross*, Russian *Vitjaz*, Japanese *Soyo-maru*, *Hakuho-maru*, and *Tansei-maru* resulted in many papers on deep-sea organisms. However, no comprehensive work for the deep-sea fauna in this area has been available to date. In this research project, deep-sea fauna and anthropogenic pollutants on the continental shelf and slope of the Pacific coast of northern Japan, mainly off Honshu, the main Island of Japan were studied. In this introductory paper, participants, characteristics of the study

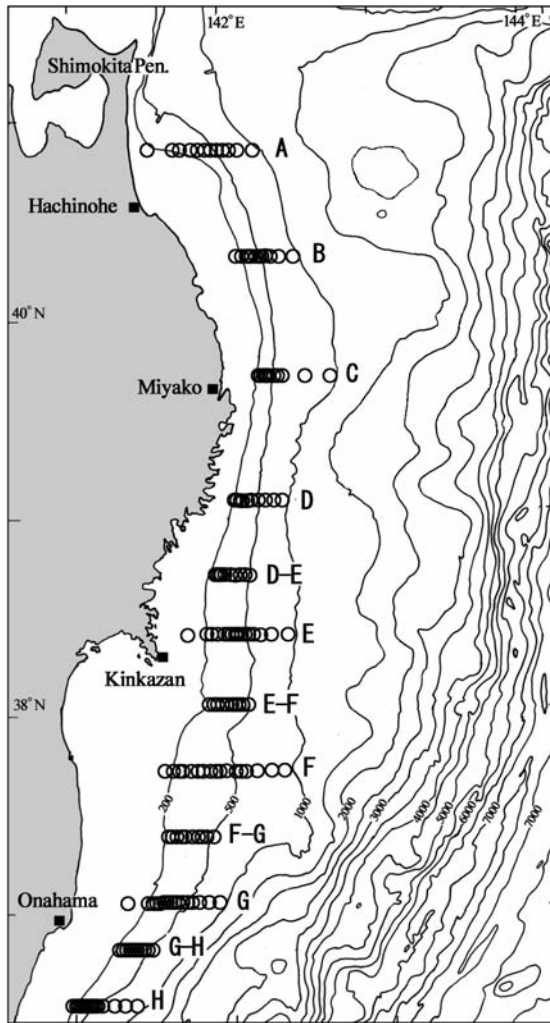


Fig. 1. Survey area and sampling plan of otter trawl stations on 12 transect lines by R/V *Wakataka-maru*.

area, methods of sampling, and treatment of samples are described.

Participants

The present research project was conducted during years 2005–2008 by the Department of Zoology, National Museum of Nature and Science in cooperation with the Tohoku National Fisheries Research Institute, Fisheries Research Agency, and the Department of Environmental Conservation, Ehime University, as well as several taxonomists in various institutions. The participants are: Toshihiko Fujita, Takuma Haga, Kazunori Hasegawa, Minoru Imajima, Utako Iwasaki, Masanori Okanishi, Tsunemi Kubodera, Toshiaki Kuramochi, Keiichi Matsuura, Hiroshi Namikawa, Hiroshi Saito, Gento Shinohara, and Yohko Takata (National Museum of Nature and Science); Kunihiro Fujiwara, Tsutomu Hattori, Masaki Ito, and Yoji Narimatsu (Tohoku National Fisheries Research Institute, Fisheries Research Agency); Tomohiko Isobe, Koji Ohmori, Tomoko Oshihoi, Karri Ramu, Shin Takahashi, and Shinsuke Tanabe (Ehime University); Tadashi Akiyama (Okayama University); Andrey A. Balanov (Russian Academy of Sciences); Kouki Fukuoka (Seikai Na-

tional Fisheries Research Institute, Fisheries Research Agency); Kouichi Kawaguchi (deceased, University of Tokyo); Tomoyuki Komai (Natural History Museum and Institute, Chiba); Masatoshi Moku (National Fisheries University); Koichiro Nakamura (Musashino-shi, Tokyo); Takashi Okutani (Japan Agency for Marine-Earth Science and Technology); Ko Tomikawa (Hiroshima University); Takeo Yamauchi (Toyama Institute of Health).

Survey Area

The main survey area is located between 36° N and 41° N, and the bathymetric range is from 150 m to 3000 m, along the Pacific coast of northern Honshu, Japan (Fig. 1). The ocean floor of this area is quite simple, and isobaths in general run parallel with coast line, and neither large submarine canyons nor large banks are present. The continental shelf is rather narrow; the shelf break lies about 10-30 km from the shoreline, although it lies further, about 50 km off Sendai Bay. The continental slope is gentle to the depth of 1500 m, and then rapidly drops to the Japan Trench, attaining 8300 m. The characteristic feature of the shelf slope area is the presence of various sizes of flat areas, which are scattered throughout the survey area (Iwabuchi, 1985).

This area is bounded by the warm Kuroshio Current and cold Oyashio Current creating complicated water mass distributions and is termed "perturbed area" or the "Kuroshio and Oyashio confluence zone" (Hanawa and Mitsudera, 1987), or the "Kuroshio-Oyashio transition area" (Yasuda, 2003). The heat brought by the Kuroshio Current and the rich nutrient brought by the Oyashio Current make this area productive and one of the most important fishing area in Japan (Yasuda, 2003). The Kuroshio mainly comes from southward, but also from the Tsugaru Strait. The main branch of the Kuroshio, the warm Tsushima Current, flowing northward in the Sea of Japan enters into the studied area through the Tsugaru Strait. This complicated mixed system exists mainly in the surface and subsurface layers, and shows temporal variability. However, the bottom water on the continental shelf slope is dominated by the cold water of the Oyashio origin, or sub-arctic deep water, with a temperature generally lower than 5°C. The hydrographic structure and variability in this area is reviewed by Yasuda (2003). During the periods of the present survey by R/V *Wakataka-maru*, the bottom temperature varied from 4°C to 13°C in the water shallower than 400 m while, 3°C to 5°C in 400-900 m in most stations (Appendix 1).

Sampling Methods

Three research vessels were employed in this study. The R/V *Wakataka-maru* of Fisheries Research Agency is 57.7 m in length and 692 gross ton (Fig. 2A), the R/V *Tansei-maru* of the Japan Agency for Marine-Earth Science and Technology is 51.2 m in length and 610 gross tons (Fig. 2B), and R/V *Soyo-maru* of the Fisheries Research Agency is 67.5 m in length and 892 gross ton (Fig. 2C). Benthic animals were obtained from depths of 150-2560 m using an otter trawl, two types of beam trawls, a biological dredge, and a baited trap.

Otter trawl

A bottom otter trawl was carried out by the R/V *Wakataka-maru*. The dimensions of the otter trawl net were 41.8 m in length, 7.8 m in width and 3-4 m in height at the mouth, with a span of 22 m between the tips of the side net, which was opened by 2.1 m x 0.9 m rectangular otter boards (Fig. 2D). The stretched mesh size of the main part of the net was 60 mm, with the finer mesh of 8 mm equipped as an outer cover net at the cod end. The ground rope was equipped with steel weights and gum bobbins of 120-150 mm in diameter. A total of 150 sampling stations were set on the 12 latitudinal transect lines (Fig. 1). Occasionally deeper stations at 1200 and 1500 m were set

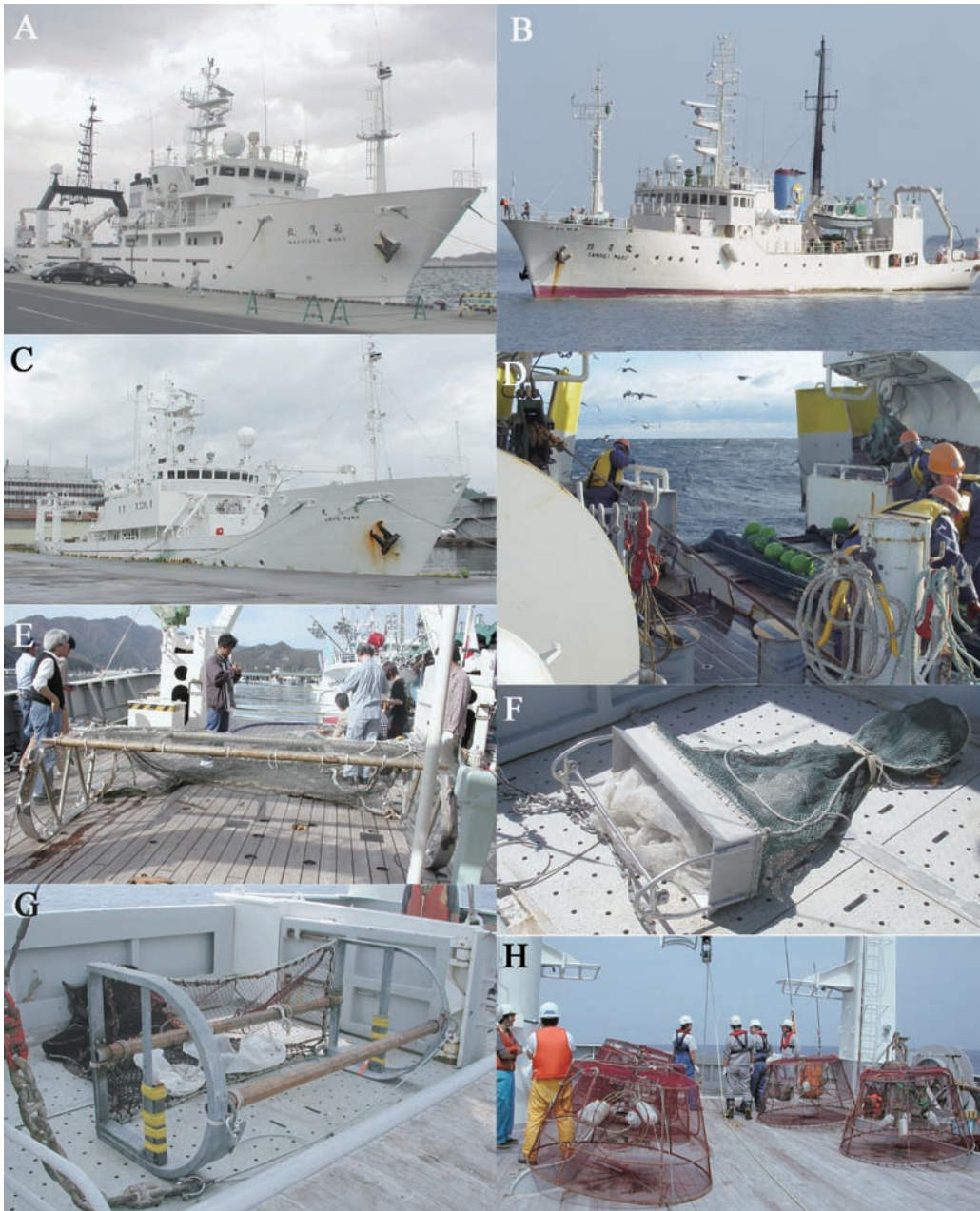


Fig. 2. Research vessels and gear. A, R/V *Wakataka-maru*; B, R/V *Tansei-maru*; C, R/V *Soyo-maru*; D, otter trawl operation on R/V *Wakataka-maru*; E, 3 m beam trawl; F, 1 m dredge; G, 2 m beam trawl; H, baited traps.

on the lines. The net was usually towed for 30 minutes on the bottom. The dates, gear, positions, depths and bottom temperatures for all stations are shown in Fig. 3 and Appendix 1.

Beam trawls

Two types of beam trawls were used during the cruises of R/Vs *Tansei-maru* and *Soyo-maru*. During two cruises, KT-07-29 and KT-08-27, of *Tansei-maru*, the ORE-type beam trawl of 3 m span was used (Fig. 4, Appendix 2). This trawl bears a pair of steel skids held by a pair of 3 m steel

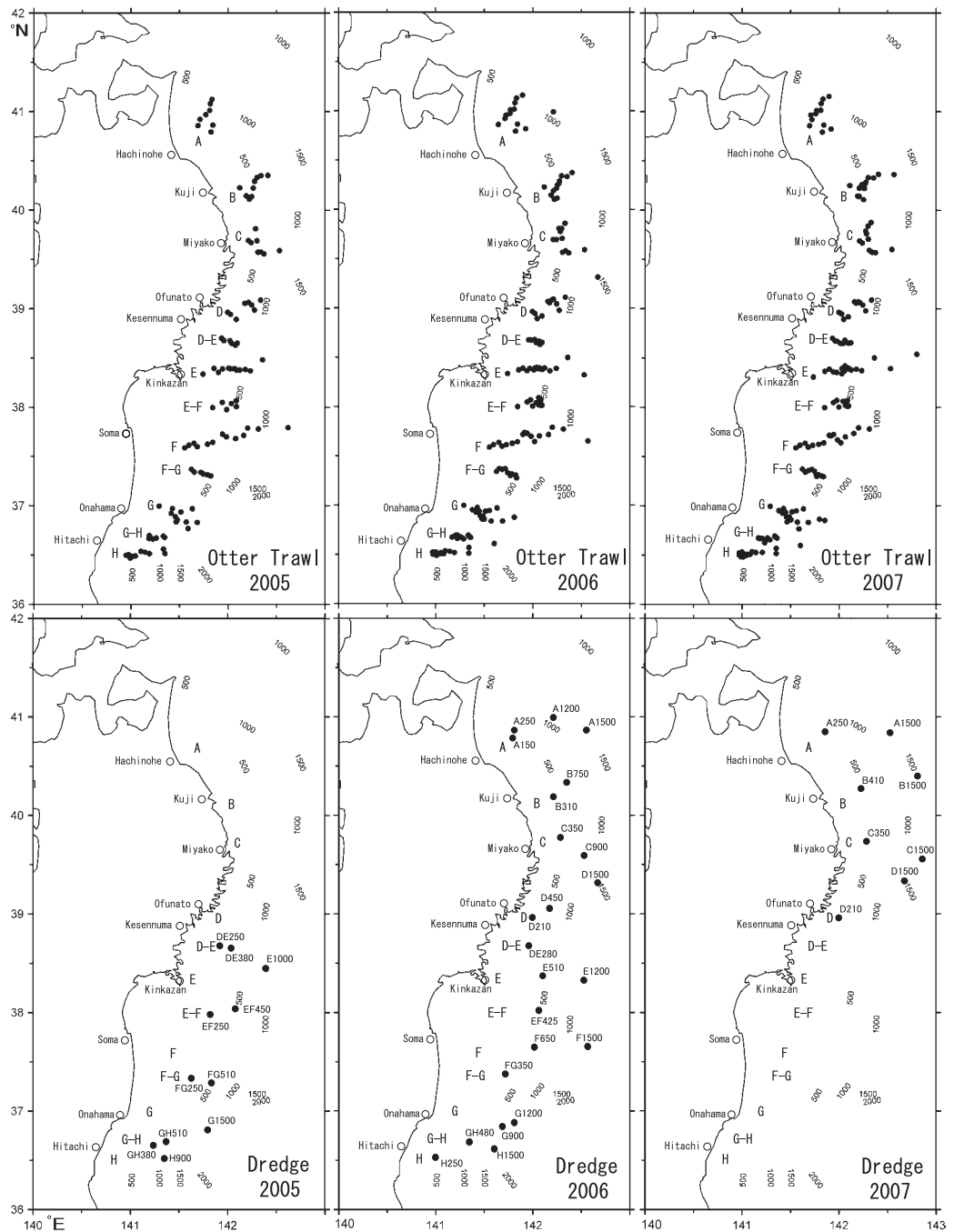


Fig. 3. Sampling sites by R/V *Wakataka-maru*.

beams at their upper side, with a 10 m-long double layered collecting net attached to the skirts (Fig. 2E). The width and height of the fixed opening were 2.8 m and 1 m, respectively. The mesh size of the inner net was 4 mm square at the cod end. The beam trawl was usually towed for 30 minutes on the bottom in each tow. During cruises of R/V *Soyo-maru*, a Sigsbee-Agassiz type beam trawl of 2 m span was used (Fig. 4, Appendix 3). This trawl bears a pair of steel skirts held by a pair of

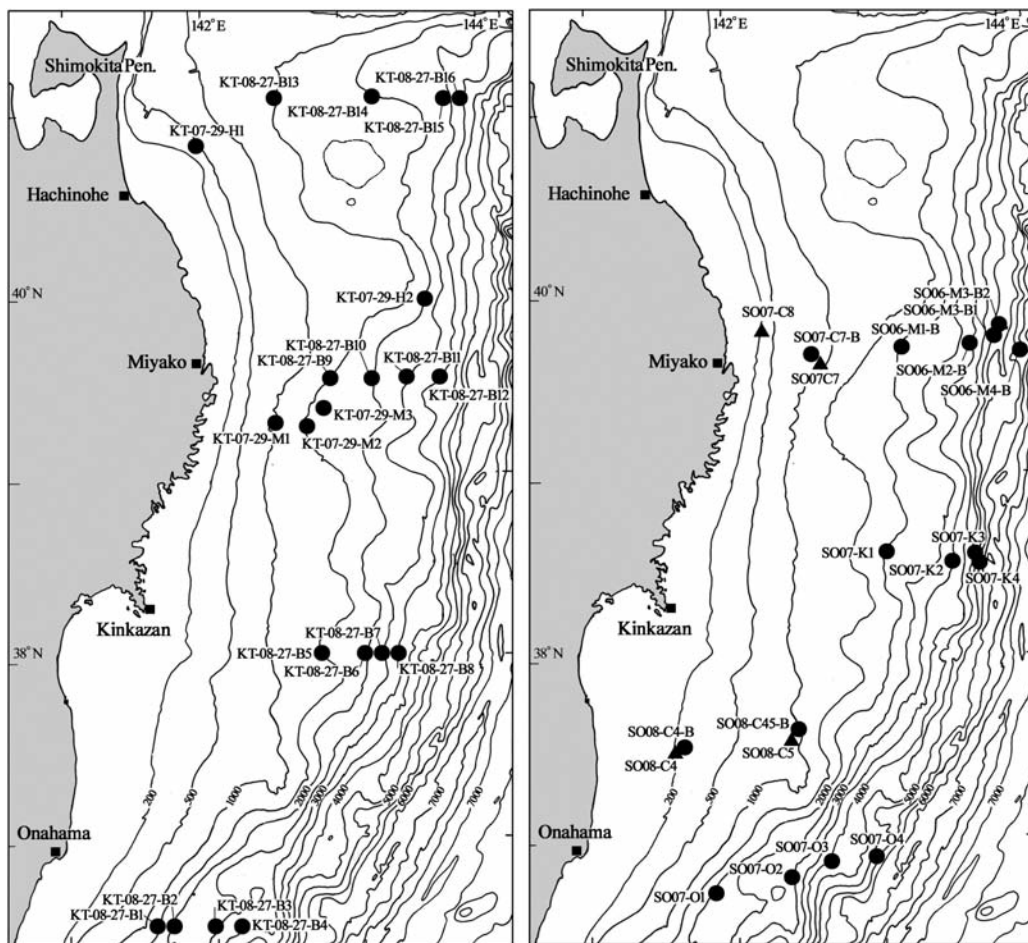


Fig. 4. Sampling sites by R/Vs *Tansei-maru* (left) and *Soyo-maru* (right).

2 m oak wood beams at anterior and posterior parts of the skids (Fig. 2G) and the steel skids are wider in bottom. The width and the height of the fixed opening were 2 m and 0.8 m, respectively. The mesh size of the net was 2 cm throughout. One or two plankton nets with 0.25 mm and 0.5 mm mesh size were occasionally equipped in both beam trawl nets to obtain minute benthic animals.

Dredge

The ORI type biological dredge was used by R/V *Wakataka-maru* (Appendix 1). The dredge was modified from a naturalist dredge (Fig. 2F). The mouth opening was a rectangular steel frame of the following dimensions: 1 m in width, 0.2 m in height and 0.15 m in depth. It had a double-layer collecting net about 1 m long. The outer net is strong, 2 cm in stretched mesh size. The inner net had a fine, 5 mm in square mesh size.

Baited trap

The baited trap was operated by R/V *Soyo-maru* to collect mainly fishes and crabs (Appendix 3). The shape of the trap was truncated cone, made with a steel frame covered by 2 cm mesh net, with three entrance holes on the side (Fig. 2H). The diameter was 1.7 m at bottom and 1.2 m at top, and the height was 1.2 m. Four plastic jars containing cut sardines as bait were placed in each cage. Five baited trap were linked together with ropes, and sunk with anchor weight. A radio buoy was

used to detect the position of the traps. The traps were left for one night on the sea bottom.

Sample Treatment and Depository of Specimens

Contents from each sampling gear were roughly sorted on board. Mesh sieves were used to remove animals from bottom sediments. To collect minute and easily suspended animals, sediment samples were suspended in sea water and screened using a fine net with a mesh size of 0.25 mm. Invertebrates were sorted and fixed by 8-10% neutralized sea water formalin or directly immersed in 99% ethanol depending on taxa and study purposes. Most fish samples as well as specimens used for chemical analysis of pollutants were frozen at -20°C freezer.

The majority of specimens obtained in this survey and used for taxonomic studies are deposited in the National Museum of Nature and Science, but some specimens are deposited with the other institutions of the participants listed above, and these are indicated in papers in this volume.

Summary of the Results

As a result of surveys, the following 17 original papers were contributed to the present volume. In total, 1327 species were reported and one family, two genera and 21 species were described as new to science. Anthropogenic pollutants were analyzed in fish specimens. **Cnidaria:** 1) Namikawa listed 20 species of hydrozoans. **Platyhelminthes:** 2) Kuramochi reported 32 species of parasitic digenean trematodes from deep-sea fishes. **Annelida:** 3) Imajima recorded 243 polychaetous annelids, including one new family and 14 new species. **Mollusca:** 4) Okutani *et al.* listed 89 species of bivalves and 6 species of scaphopods. 5) Hasegawa reported 177 species of gastropods. 6) Kubodera confirmed occurrences of 84 species of cephalopods. **Arthropoda:** 7) Fukuoka recorded 37 species of lophogastrids and mysids including one new genus and six new species. 8) Tomikawa and Komatsu reported one new species and two rare species of deep-sea amphipods. 9) Yamauchi reported four cymothoid isopods including one new species. 10) Akiyama reported 27 species of cumaceans, including one new species. 11) Komai and Komatsu reported 64 species of dendrobranchiate and caridean shrimps and polychelid lobsters, including two new species. 12) Komatsu and Komai reported 26 species of reptantian decapod crustaceans, including one new species. 13) Nakamura listed nine species of pycnogonids. **Echinodermata:** 14) Fujita *et al.* reported 10 species of ophiuroids of the genus *Ophiura*. **Chordata:** 15) Balanov *et al.* listed 142 species of mesopelagic fishes. 16) Shinohara *et al.* listed 496 species of deep-sea fishes. **Anthropogenic pollutants:** 17) Takahashi *et al.* analyzed persistent organohalogen compounds contained in deep-sea fishes.

Acknowledgements

We wish to express our sincere thanks to the crews of the R/Vs *Wakataka-maru*, *Tansei-maru*, and *Soyo-maru* for their collaboration in the field work. For the R/V *Soyo-maru* cruises, Drs. Masayuki Minakawa, Takami Morita and Ken Fujimoto of the National Research Institute of Fisheries Science, Fisheries Research Agency, kindly gave us the opportunities for the sampling during their cruise for the Marine Environmental Radioactivity Research. Thanks are also due to Dr. Yugo Shimizu of the Tohoku National Fisheries Research Institute, Fisheries Research Agency, for valuable information on hydrographic structure of the survey area and Dr. Chris Harvey-Clark, University of British Columbia, for review of the manuscript.

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Appendix 1. List of stations by R/V *Wakataka-maru*. Abbreviations: OT, otter trawl, DG, dredge.

Station	Date	Gear	Position in	Position out	Depth (m)	Temp. (°C)
WA05-A150	8 Oct. 2005	OT	40°47.6'N, 141°49.5'E	40°46.7'N, 141°51.4'E	154-148	10.0
WA05-A210	9 Oct. 2005	OT	40°51.5'N, 141°41.4'E	40°51.2'N, 141°40.0'E	210-198	10.4
WA05-A250	8 Oct. 2005	OT	40°51.8'N, 141°50.6'E	40°50.5'N, 141°52.0'E	274-259	4.4
WA05-A310	9 Oct. 2005	OT	40°49.1'N, 141°55.5'E	40°49.4'N, 141°55.0'E	308-303	3.2
WA05-A350	8 Oct. 2005	OT	40°55.3'N, 141°42.7'E	40°55.3'N, 141°44.3'E	358-363	2.5
WA05-A410	8 Oct. 2005	OT	40°57.3'N, 141°43.3'E	40°58.0'N, 141°42.5'E	409-418	2.9
WA05-A450	8 Oct. 2005	OT	40°58.2'N, 141°46.3'E	40°58.5'N, 141°45.8'E	466-470	3.2
WA05-A510	7 Oct. 2005	OT	41°00.5'N, 141°46.3'E	41°00.1'N, 141°46.9'E	510-510	3.3
WA05-A550	7 Oct. 2005	OT	41°00.8'N, 141°48.8'E	41°00.2'N, 141°49.4'E	551-548	3.3
WA05-A650	7 Oct. 2005	OT	41°04.8'N, 141°49.0'E	41°04.5'N, 141°49.2'E	663-662	3.2
WA05-A750	7 Oct. 2005	OT	41°07.4'N, 141°50.1'E	41°07.2'N, 141°50.2'E	748-745	3.3
WA05-B150	10 Oct. 2005	OT	40°13.6'N, 142°07.2'E	40°15.0'N, 142°06.6'E	156-154	5.2
WA05-B210	10 Oct. 2005	OT	40°08.7'N, 142°11.3'E	40°10.2'N, 142°11.1'E	211-218	3.8
WA05-B250	10 Oct. 2005	OT	40°06.7'N, 142°13.2'E	40°08.1'N, 142°12.6'E	261-255	3.1
WA05-B310	10 Oct. 2005	OT	40°11.8'N, 142°12.6'E	40°13.4'N, 142°12.4'E	306-311	3.0
WA05-B350	11 Oct. 2005	OT	40°08.3'N, 142°14.6'E	40°06.7'N, 142°15.0'E	354-350	3.2
WA05-B410	11 Oct. 2005	OT	40°14.8'N, 142°14.2'E	40°13.1'N, 142°14.6'E	415-407	3.7
WA05-B450	6 Oct. 2005	OT	40°13.4'N, 142°15.6'E	40°14.9'N, 142°15.3'E	459-461	3.2
WA05-B510	11 Oct. 2005	OT	40°16.0'N, 142°15.9'E	40°17.0'N, 142°15.7'E	506-509	3.1
WA05-B550	6 Oct. 2005	OT	40°17.6'N, 142°16.4'E	40°18.5'N, 142°16.3'E	551-560	3.3
WA05-B650	6 Oct. 2005	OT	40°19.9'N, 142°18.0'E	40°20.9'N, 142°17.6'E	645-643	3.3
WA05-B750	6 Oct. 2005	OT	40°21.1'N, 142°20.5'E	40°20.0'N, 142°21.2'E	750-760	3.1
WA05-B900	6 Oct. 2005	OT	40°21.2'N, 142°24.6'E	40°21.7'N, 142°24.3'E	917-910	2.9
WA05-C210	12 Oct. 2005	OT	39°41.5'N, 142°12.7'E	39°43.2'N, 142°12.9'E	211-209	5.8
WA05-C250	12 Oct. 2005	OT	39°40.2'N, 142°14.3'E	39°41.7'N, 142°14.5'E	255-253	3.7
WA05-C310	12 Oct. 2005	OT	39°45.3'N, 142°16.1'E	39°47.0'N, 142°16.4'E	302-313	3.8
WA05-C350	11 Oct. 2005	OT	39°48.7'N, 142°17.1'E	39°47.1'N, 142°17.0'E	356-357	2.8
WA05-C410	12 Oct. 2005	OT	39°48.5'N, 142°17.9'E	39°50.1'N, 142°17.9'E	412-410	3.1
WA05-C450	12 Oct. 2005	OT	39°41.4'N, 142°17.9'E	39°42.4'N, 142°18.1'E	462-466	3.6
WA05-C510	11 Oct. 2005	OT	39°52.4'N, 142°19.9'E	39°51.3'N, 142°20.0'E	519-520	3.2
WA05-C550	13 Oct. 2005	OT	39°34.4'N, 142°18.5'E	39°35.4'N, 142°18.6'E	560-558	3.3
WA05-C650	13 Oct. 2005	OT	39°34.5'N, 142°20.3'E	39°35.6'N, 142°20.4'E	661-651	3.3
WA05-C750	13 Oct. 2005	OT	39°33.3'N, 142°22.3'E	39°34.1'N, 142°22.5'E	750-749	3.3

Appendix 1. (Continued)

Station	Date	Gear	Position in	Position out	Depth (m)	Temp. (°C)
WA05-C900	13 Oct. 2005	OT	39°35.3'N, 142°31.9'E	39°35.9'N, 142°32.6'E	893-900	3.0
WA05-D210	16 Oct. 2005	OT	38°57.8'N, 141°59.8'E	38°59.1'N, 142°00.6'E	212-214	10.5
WA05-D250	16 Oct. 2005	OT	38°56.6'N, 142°01.5'E	38°55.1'N, 142°00.9'E	254-252	7.4
WA05-D310	16 Oct. 2005	OT	38°53.8'N, 142°02.8'E	38°55.4'N, 142°03.5'E	303-308	4.7
WA05-D350	15 Oct. 2005	OT	38°53.5'N, 142°05.1'E	38°55.0'N, 142°05.7'E	350-354	4.1
WA05-D410	14 Oct. 2005	OT	39°04.2'N, 142°09.5'E	39°05.9'N, 142°09.9'E	405-408	3.8
WA05-D450	15 Oct. 2005	OT	39°03.2'N, 142°10.4'E	39°01.6'N, 142°10.5'E	452-464	3.8
WA05-D510	14 Oct. 2005	OT	39°04.0'N, 142°11.6'E	39°05.1'N, 142°11.9'E	499-508	4.0
WA05-D550	15 Oct. 2005	OT	39°03.9'N, 142°12.8'E	39°05.0'N, 142°12.7'E	560-544	3.8
WA05-D650	14 Oct. 2005	OT	39°02.2'N, 142°14.7'E	39°03.2'N, 142°14.9'E	642-655	3.8
WA05-D750-1	15 Oct. 2005	OT	38°59.3'N, 142°16.5'E	38°58.3'N, 142°16.3'E	746-748	3.7
WA05-D750-2	16 Oct. 2005	OT	38°59.1'N, 142°16.4'E	38°58.2'N, 142°16.2'E	741-742	-
WA05-D900	14 Oct. 2005	OT	39°05.3'N, 142°20.1'E	39°06.0'N, 142°20.2'E	899-907	3.0
WA05-DE250	19 Nov. 2005	OT	38°42.1'N, 141°56.0'E	38°40.5'N, 141°55.4'E	252-251	6.4
WA05-DE250D	19 Nov. 2005	DG	38°40.6'N, 141°55.3'E	38°40.2'N, 141°55.2'E	249-249	-
WA05-DE280	19 Nov. 2005	OT	38°40.5'N, 141°57.5'E	38°42.1'N, 141°58.0'E	281-282	5.4
WA05-DE310	19 Nov. 2005	OT	38°40.2'N, 141°58.9'E	38°41.8'N, 141°59.5'E	306-309	4.3
WA05-DE350	20 Nov. 2005	OT	38°40.6'N, 142°01.2'E	38°38.9'N, 142°00.9'E	347-345	3.1
WA05-DE380	19 Nov. 2005	OT	38°38.9'N, 142°02.3'E	38°40.5'N, 142°02.4'E	376-377	3.2
WA05-DE380D	19 Nov. 2005	DG	38°39.1'N, 142°02.2'E	38°38.6'N, 142°02.1'E	375-373	-
WA05-DE410	20 Nov. 2005	OT	38°39.3'N, 142°03.4'E	38°40.9'N, 142°03.5'E	407-404	3.3
WA05-DE425	20 Nov. 2005	OT	38°39.7'N, 142°03.9'E	38°41.3'N, 142°04.3'E	421-423	3.3
WA05-DE450	20 Nov. 2005	OT	38°37.7'N, 142°04.5'E	38°39.3'N, 142°04.8'E	451-447	3.3
WA05-DE480	21 Nov. 2005	OT	38°39.0'N, 142°05.8'E	38°40.6'N, 142°06.1'E	473-477	3.3
WA05-DE510	21 Nov. 2005	OT	38°39.0'N, 142°07.3'E	38°37.9'N, 142°07.2'E	511-511	3.4
WA05-E150	19 Oct. 2005	OT	38°20.1'N, 141°44.5'E	38°18.5'N, 141°44.1'E	154-151	12.8
WA05-E210	19 Oct. 2005	OT	38°23.6'N, 141°51.4'E	38°22.1'N, 141°51.2'E	210-208	9.4
WA05-E250	18 Oct. 2005	OT	38°21.2'N, 141°54.1'E	38°23.0'N, 141°53.9'E	244-242	7.7
WA05-E280	18 Oct. 2005	OT	38°23.4'N, 141°56.6'E	38°21.8'N, 141°56.4'E	279-275	6.4
WA05-E310	18 Oct. 2005	OT	38°21.4'N, 141°58.5'E	38°23.1'N, 141°58.2'E	308-304	5.1
WA05-E350	18 Oct. 2005	OT	38°23.8'N, 142°00.3'E	38°22.2'N, 142°00.7'E	349-349	4.0
WA05-E380	18 Oct. 2005	OT	38°23.4'N, 142°01.6'E	38°21.9'N, 142°02.5'E	378-384	4.1
WA05-E410	25 Oct. 2005	OT	38°23.7'N, 142°02.6'E	38°22.1'N, 142°03.3'E	407-409	3.3
WA05-E425	25 Oct. 2005	OT	38°24.1'N, 142°03.0'E	38°00.2'N, 142°02.6'E	424-425	3.9
WA05-E450	25 Oct. 2005	OT	38°23.6'N, 142°04.0'E	38°25.2'N, 142°03.7'E	448-452	3.9
WA05-E480	25 Oct. 2005	OT	38°22.6'N, 142°05.3'E	38°20.9'N, 142°06.0'E	482-483	3.9
WA05-E510	25 Oct. 2005	OT	38°22.5'N, 142°06.3'E	38°23.6'N, 142°05.8'E	514-505	3.8
WA05-E550	26 Oct. 2005	OT	38°22.6'N, 142°07.3'E	38°23.6'N, 142°07.5'E	545-561	3.9
WA05-E650	26 Oct. 2005	OT	38°23.0'N, 142°10.7'E	38°21.8'N, 142°10.6'E	658-657	3.6
WA05-E750	26 Oct. 2005	OT	38°22.1'N, 142°13.9'E	38°23.1'N, 142°14.5'E	753-758	3.4
WA05-E900	26 Oct. 2005	OT	38°28.9'N, 142°21.4'E	38°29.7'N, 142°21.6'E	900-904	3.1
WA05-E1000D-1	26 Oct. 2005	DG	38°26.7'N, 142°23.8'E	38°26.4'N, 142°23.7'E	1005-1004	-
WA05-E1000D-1	26 Oct. 2005	DG	38°27.1'N, 142°23.8'E	38°26.4'N, 142°23.7'E	1004-1004	-
WA05-EF250	17 Nov. 2005	OT	37°59.8'N, 141°50.5'E	38°01.0'N, 141°51.7'E	252-251	7.9
WA05-EF250D	17 Nov. 2005	DG	37°58.7'N, 141°49.3'E	37°59.0'N, 141°49.4'E	259-253	-
WA05-EF280	17 Nov. 2005	OT	38°02.9'N, 141°56.4'E	38°04.4'N, 141°56.0'E	285-278	4.4
WA05-EF310	17 Nov. 2005	OT	38°02.5'N, 141°59.4'E	38°04.0'N, 141°58.7'E	317-314	3.7
WA05-EF350	17 Nov. 2005	OT	37°58.5'N, 141°59.1'E	38°00.1'N, 141°59.8'E	358-359	3.7
WA05-EF380	17 Nov. 2005	OT	38°02.3'N, 142°02.1'E	38°03.7'N, 142°02.4'E	382-376	3.6
WA05-EF410	18 Nov. 2005	OT	37°43.1'N, 141°53.9'E	38°05.0'N, 142°03.7'E	412-411	3.7
WA05-EF425	18 Nov. 2005	OT	37°44.3'N, 141°54.8'E	38°01.2'N, 142°03.8'E	433-418	3.6
WA05-EF450	18 Nov. 2005	OT	38°04.0'N, 142°05.1'E	38°02.2'N, 142°04.9'E	454-454	3.7
WA05-EF450D	18 Nov. 2005	DG	38°02.2'N, 142°04.8'E	38°02.6'N, 142°04.9'E	452-454	-
WA05-EF480	16 Nov. 2005	OT	38°00.4'N, 142°05.2'E	37°58.9'N, 142°04.1'E	487-486	3.7

Appendix 1. (Continued)

Station	Date	Gear	Position in	Position out	Depth (m)	Temp. (°C)
WA05-EF510	16 Nov. 2005	OT	38°00.8'N, 142°05.7'E	38°01.7'N, 142°06.3'E	505-514	3.7
WA05-F150	17 Oct. 2005	OT	37°35.3'N, 141°33.2'E	37°36.7'N, 141°33.8'E	153-163	9.9
WA05-F210	17 Oct. 2005	OT	37°36.9'N, 141°35.8'E	37°38.4'N, 141°36.1'E	212-212	6.5
WA05-F250	17 Oct. 2005	OT	37°38.0'N, 141°39.0'E	37°36.3'N, 141°38.7'E	255-255	5.6
WA05-F280	17 Oct. 2005	OT	37°35.9'N, 141°41.0'E	37°37.6'N, 141°40.8'E	278-282	4.3
WA05-F350	4 Nov. 2005	OT	37°37.5'N, 141°47.3'E	37°39.2'N, 141°47.4'E	355-351	3.9
WA05-F380	4 Nov. 2005	OT	37°38.6'N, 141°50.6'E	37°40.3'N, 141°50.7'E	387-379	3.5
WA05-F410	4 Nov. 2005	OT	37°43.1'N, 141°53.9'E	37°44.8'N, 141°53.5'E	411-411	4.0
WA05-F425	27 Oct. 2005	OT	37°44.3'N, 141°54.8'E	37°42.5'N, 141°55.0'E	424-424	4.1
WA05-F450	27 Oct. 2005	OT	37°43.6'N, 141°56.6'E	37°45.3'N, 141°56.4'E	449-449	4.2
WA05-F480	27 Oct. 2005	OT	37°41.9'N, 141°59.0'E	37°40.2'N, 141°59.0'E	484-480	4.4
WA05-F510	27 Oct. 2005	OT	37°39.4'N, 142°01.2'E	37°38.2'N, 142°01.1'E	508-506	4.3
WA05-F550	27 Oct. 2005	OT	37°41.0'N, 142°04.7'E	37°42.0'N, 142°04.0'E	551-546	4.2
WA05-F650	28 Oct. 2005	OT	37°42.8'N, 142°09.7'E	37°43.9'N, 142°09.2'E	652-649	3.8
WA05-F750	28 Oct. 2005	OT	37°47.4'N, 142°12.2'E	37°48.4'N, 142°11.8'E	749-744	3.5
WA05-F900	28 Oct. 2005	OT	37°46.7'N, 142°18.8'E	37°45.7'N, 142°19.1'E	900-904	3.3
WA05-F1200	28 Oct. 2005	OT	37°47.6'N, 142°37.1'E	37°47.4'N, 142°37.2'E	1196-1196	2.7
WA05-FG250	14 Nov. 2005	OT	37°22.2'N, 141°37.4'E	37°20.4'N, 141°37.6'E	251-254	8.7
WA05-FG250D	14 Nov. 2005	DG	37°19.9'N, 141°37.7'E	37°20.0'N, 141°37.4'E	255-253	-
WA05-FG280	15 Nov. 2005	OT	37°20.5'N, 141°39.2'E	37°22.1'N, 141°39.2'E	276-279	6.9
WA05-FG310	15 Nov. 2005	OT	37°21.5'N, 141°41.2'E	37°19.7'N, 141°41.2'E	311-312	5.8
WA05-FG350	14 Nov. 2005	OT	37°20.3'N, 141°43.2'E	37°22.0'N, 141°43.1'E	352-346	5.2
WA05-FG380	15 Nov. 2005	OT	37°19.5'N, 141°44.6'E	37°21.1'N, 141°44.8'E	383-383	4.3
WA05-FG410	14 Nov. 2005	OT	37°18.9'N, 141°45.8'E	37°17.3'N, 141°45.5'E	411-410	4.2
WA05-FG425	15 Nov. 2005	OT	37°19.6'N, 141°46.5'E	37°17.9'N, 141°46.2'E	426-426	4.0
WA05-FG450	14 Nov. 2005	OT	37°18.8'N, 141°47.2'E	37°20.5'N, 141°47.5'E	450-446	3.9
WA05-FG480	14 Nov. 2005	OT	37°18.1'N, 141°49.4'E	37°16.5'N, 141°48.9'E	480-480	3.8
WA05-FG510	15 Nov. 2005	OT	37°17.7'N, 141°50.3'E	37°16.5'N, 141°50.0'E	513-511	3.8
WA05-FG510D	15 Nov. 2005	DG	37°16.9'N, 141°50.0'E	37°17.3'N, 141°50.2'E	516-515	-
WA05-G150	29 Oct. 2005	OT	36°59.8'N, 141°17.4'E	37°01.3'N, 141°17.8'E	151-150	11.1
WA05-G210	29 Oct. 2005	OT	36°58.3'N, 141°25.6'E	36°57.0'N, 141°24.8'E	211-210	8.0
WA05-G250	29 Oct. 2005	OT	36°58.3'N, 141°25.6'E	36°57.0'N, 141°24.8'E	251-255	5.9
WA05-G280	29 Oct. 2005	OT	36°55.4'N, 141°24.9'E	36°54.0'N, 141°24.2'E	277-279	4.9
WA05-G310	29 Oct. 2005	OT	36°56.3'N, 141°26.9'E	36°54.6'N, 141°26.5'E	299-314	4.7
WA05-G350	3 Nov. 2005	OT	36°56.3'N, 141°30.9'E	36°58.0'N, 141°31.5'E	373-356	4.0
WA05-G380	3 Nov. 2005	OT	36°53.4'N, 141°27.4'E	36°54.6'N, 141°28.9'E	384-376	4.1
WA05-G410	3 Nov. 2005	OT	36°56.8'N, 141°33.3'E	36°58.1'N, 141°34.4'E	411-411	4.0
WA05-G425	9 Nov. 2005	OT	36°53.2'N, 141°29.2'E	36°52.1'N, 141°27.7'E	427-418	4.0
WA05-G450	9 Nov. 2005	OT	36°51.6'N, 141°28.7'E	36°52.8'N, 141°30.0'E	454-448	4.0
WA05-G480	3 Nov. 2005	OT	36°50.2'N, 141°27.9'E	36°51.3'N, 141°29.2'E	481-484	4.2
WA05-G510	9 Nov. 2005	OT	36°51.6'N, 141°30.3'E	36°52.4'N, 141°31.4'E	507-509	4.0
WA05-G550	3 Nov. 2005	OT	36°58.2'N, 141°37.9'E	36°59.1'N, 141°38.6'E	560-557	3.8
WA05-G650	9 Nov. 2005	OT	36°50.2'N, 141°34.2'E	36°50.9'N, 141°35.2'E	644-650	3.7
WA05-G750	10 Nov. 2005	OT	36°46.2'N, 141°35.4'E	36°45.6'N, 141°34.8'E	750-750	3.4
WA05-G900	10 Nov. 2005	OT	36°49.9'N, 141°41.0'E	36°49.3'N, 141°40.5'E	901-901	3.2
WA05-G1500D	10 Nov. 2005	DG	36°48.4'N, 141°47.7'E	36°48.6'N, 141°48.2'E	1498	2.4
WA05-GH250	11 Nov. 2005	OT	36°41.9'N, 141°11.4'E	36°40.5'N, 141°10.2'E	251-249	7.6
WA05-GH280	11 Nov. 2005	OT	36°40.1'N, 141°11.1'E	36°41.5'N, 141°12.3'E	278-278	8.0
WA05-GH310	11 Nov. 2005	OT	36°40.3'N, 141°12.4'E	36°41.7'N, 141°13.6'E	308-309	5.3
WA05-GH350	11 Nov. 2005	OT	36°39.7'N, 141°13.5'E	36°41.0'N, 141°15.0'E	344-351	4.3
WA05-GH380	12 Nov. 2005	OT	36°40.4'N, 141°15.6'E	36°39.0'N, 141°14.5'E	376-381	4.2
WA05-GH380D	12 Nov. 2005	DG	36°39.0'N, 141°14.3'E	36°39.3'N, 141°14.6'E	378-373	-
WA05-GH410	13 Nov. 2005	OT	36°37.5'N, 141°14.0'E	36°38.3'N, 141°15.7'E	417-413	4.1
WA05-GH425	13 Nov. 2005	OT	36°39.5'N, 141°17.3'E	36°40.9'N, 141°18.3'E	425-422	4.0

Appendix 1. (Continued)

Station	Date	Gear	Position in	Position out	Depth (m)	Temp. (°C)
WA05-GH450	13 Nov. 2005	OT	36°41.6'N, 141°20.1'E	36°40.2'N, 141°19.0'E	454-452	4.1
WA05-GH480	13 Nov. 2005	OT	36°40.8'N, 141°20.8'E	36°42.3'N, 141°21.6'E	482-479	4.1
WA05-GH510	11 Nov. 2005	OT	36°40.3'N, 141°21.6'E	36°41.3'N, 141°22.2'E	509-511	4.1
WA05-GH510D	11 Nov. 2005	DG	36°41.1'N, 141°22.0'E	36°40.9'N, 141°21.9'E	512-508	-
WA05-H150	30 Oct. 2005	OT	36°29.9'N, 140°57.0'E	36°31.3'N, 140°58.1'E	154-156	10.9
WA05-H210	30 Oct. 2005	OT	36°30.1'N, 140°58.4'E	36°31.5'N, 140°59.3'E	213-204	7.1
WA05-H250	30 Oct. 2005	OT	36°30.0'N, 140°58.9'E	36°31.4'N, 140°60.0'E	246-244	5.7
WA05-H280	30 Oct. 2005	OT	36°29.4'N, 140°59.1'E	36°30.8'N, 141°00.2'E	277-281	4.6
WA05-H310	30 Oct. 2005	OT	36°29.0'N, 140°59.5'E	36°30.5'N, 141°00.4'E	311-306	4.5
WA05-H350	31 Oct. 2005	OT	36°28.1'N, 140°59.6'E	36°29.2'N, 141°00.3'E	352-352	4.5
WA05-H380	1 Nov. 2005	OT	36°29.1'N, 141°00.8'E	36°30.0'N, 141°01.7'E	380-384	4.0
WA05-H410	1 Nov. 2005	OT	36°31.0'N, 141°03.1'E	36°32.0'N, 141°04.0'E	411-410	4.1
WA05-H425	31 Oct. 2005	OT	36°31.4'N, 141°03.9'E	36°30.5'N, 141°02.9'E	431-423	4.1
WA05-H450	31 Oct. 2005	OT	36°29.5'N, 141°02.7'E	36°30.3'N, 141°03.6'E	450-457	4.1
WA05-H480	1 Nov. 2005	OT	36°32.3'N, 141°06.2'E	36°33.1'N, 141°07.3'E	481-476	4.1
WA05-H510	31 Oct. 2005	OT	36°30.6'N, 141°05.2'E	36°31.4'N, 141°06.1'E	507-510	4.1
WA05-H550	1 Nov. 2005	OT	36°31.8'N, 141°08.7'E	36°32.5'N, 141°09.6'E	563-558	4.1
WA05-H650	2 Nov. 2005	OT	36°30.8'N, 141°11.5'E	36°31.6'N, 141°12.6'E	661-647	3.7
WA05-H750	2 Nov. 2005	OT	36°33.6'N, 141°20.1'E	36°34.1'N, 141°21.2'E	748-758	3.5
WA05-H900	2 Nov. 2005	OT	36°30.9'N, 141°21.0'E	36°30.4'N, 141°20.3'E	900-899	3.2
WA05-H900D	2 Nov. 2005	DG	36°30.9'N, 141°21.0'E	36°31.1'N, 141°21.3'E	904-893	-
WA06-A150	9 Oct. 2006	OT	40°47.6'N, 141°49.4'E	40°46.9'N, 141°51.1'E	155-149	13.7
WA06-A150D	9 Oct. 2006	DG	40°46.5'N, 141°51.9'E	40°46.5'N, 141°52.2'E	146-147	-
WA06-A210	9 Oct. 2006	OT	40°51.6'N, 141°38.8'E	40°51.5'N, 141°41.0'E	214-211	11.2
WA06-A250	10 Oct. 2006	OT	40°51.8'N, 141°50.6'E	40°50.9'N, 141°51.4'E	274-260	5.5
WA06-A250D	10 Oct. 2006	DG	40°51.4'N, 141°50.9'E	40°51.3'N, 141°51.1'E	267-266	-
WA06-A310	6 Oct. 2006	OT	40°49.0'N, 141°55.5'E	40°49.9'N, 141°54.0'E	306-298	2.8
WA06-A310E	6 Oct. 2006	OT	40°49.8'N, 141°54.3'E	40°49.2'N, 141°55.2'E	302-308	-
WA06-A350	11 Oct. 2006	OT	40°55.3'N, 141°42.9'E	40°55.3'N, 141°43.8'E	360-364	3.6
WA06-A410	11 Oct. 2006	OT	40°57.3'N, 141°43.5'E	40°57.8'N, 141°43.0'E	409-421	2.7
WA06-A450	10 Oct. 2006	OT	40°58.3'N, 141°45.9'E	40°58.9'N, 141°45.4'E	466-474	2.9
WA06-A510	10 Oct. 2006	OT	41°00.5'N, 141°46.2'E	41°00.0'N, 141°46.9'E	511-510	3.0
WA06-A550	11 Oct. 2006	OT	41°00.9'N, 141°48.5'E	41°00.7'N, 141°48.8'E	553-550	2.9
WA06-A650	11 Oct. 2006	OT	41°04.8'N, 141°49.0'E	41°04.6'N, 141°49.2'E	663-662	3.3
WA06-A750	11 Oct. 2006	OT	41°07.8'N, 141°50.0'E	41°07.5'N, 141°50.1'E	751-749	3.2
WA06-A900	12 Oct. 2006	OT	41°09.5'N, 141°53.7'E	41°09.2'N, 141°53.8'E	883-882	2.9
WA06-A1200	12 Oct. 2006	OT	40°56.0'N, 142°15.7'E	40°55.8'N, 142°16.1'E	1182-1188	-
WA06-A1200D	12 Oct. 2006	DG	40°59.3'N, 142°12.7'E	40°58.9'N, 142°12.9'E	1202-1201	-
WA06-A1500D	12 Oct. 2006	DG	40°52.0'N, 142°33.4'E	40°51.6'N, 142°33.8'E	1513-1512	-
WA06-B150	14 Oct. 2006	OT	40°13.6'N, 142°07.1'E	40°15.1'N, 142°06.6'E	153-151	13.7
WA06-B210	15 Oct. 2006	OT	40°08.6'N, 142°11.4'E	40°10.2'N, 142°11.0'E	209-215	8.4
WA06-B250	14 Oct. 2006	OT	40°06.1'N, 142°13.4'E	40°07.7'N, 142°12.8'E	254-253	4.1
WA06-B310	14 Oct. 2006	OT	40°11.3'N, 142°12.8'E	40°13.1'N, 142°12.4'E	304-308	3.4
WA06-B310D	14 Oct. 2006	DG	40°09.9'N, 142°13.2'E	40°10.0'N, 142°13.2'E	305-305	-
WA06-B350	15 Oct. 2006	OT	40°06.8'N, 142°15.0'E	40°08.3'N, 142°14.6'E	348-353	3.0
WA06-B410	14 Oct. 2006	OT	40°12.8'N, 142°14.7'E	40°14.4'N, 142°14.3'E	406-408	2.7
WA06-B450	13 Oct. 2006	OT	40°14.9'N, 142°15.3'E	40°13.3'N, 142°16.1'E	461-475	2.8
WA06-B510	14 Oct. 2006	OT	40°15.6'N, 142°16.1'E	40°16.9'N, 142°15.7'E	508-510	3.1
WA06-B550	13 Oct. 2006	OT	40°17.2'N, 142°16.5'E	40°18.3'N, 142°16.3'E	547-556	3.1
WA06-B650	13 Oct. 2006	OT	40°20.4'N, 142°17.8'E	40°19.4'N, 142°18.4'E	644-654	3.3
WA06-B750	13 Oct. 2006	OT	40°19.9'N, 142°21.2'E	40°20.5'N, 142°20.9'E	758-755	3.3
WA06-B750D	13 Oct. 2006	DG	40°21.8'N, 142°20.2'E	40°22.1'N, 142°20.0'E	750-747	-
WA06-B900	13 Oct. 2006	OT	40°22.4'N, 142°24.3'E	40°22.1'N, 142°24.3'E	910-908	2.5
WA06-C210	16 Oct. 2006	OT	39°41.6'N, 142°12.7'E	39°43.2'N, 142°12.9'E	209-207	10.7

Appendix 1. (Continued)

Station	Date	Gear	Position in	Position out	Depth (m)	Temp. (°C)
WA06-C250	16 Oct. 2006	OT	39°41.6'N, 142°14.5'E	39°39.9'N, 142°14.2'E	253-252	3.3
WA06-C310	16 Oct. 2006	OT	39°48.3'N, 142°16.3'E	39°46.9'N, 142°16.2'E	303-298	3.0
WA06-C350	15 Oct. 2006	OT	39°46.5'N, 142°17.0'E	39°48.1'N, 142°17.0'E	362-355	2.7
WA06-C350D	15 Oct. 2006	DG	39°48.9'N, 142°17.1'E	39°49.0'N, 142°17.2'E	357-364	-
WA06-C410	15 Oct. 2006	OT	39°48.3'N, 142°17.8'E	39°49.9'N, 142°18.0'E	407-411	2.6
WA06-C450	16 Oct. 2006	OT	39°42.3'N, 142°18.2'E	39°40.7'N, 142°17.7'E	482-454	3.0
WA06-C510	15 Oct. 2006	OT	39°51.5'N, 142°19.9'E	39°52.6'N, 142°19.9'E	514-514	3.1
WA06-C550	5 Oct. 2006	OT	39°33.8'N, 142°18.5'E	39°35.0'N, 142°18.5'E	ND-558	3.5
WA06-C650	5 Oct. 2006	OT	39°34.6'N, 142°20.3'E	39°35.6'N, 142°20.4'E	663-649	3.5
WA06-C750	5 Oct. 2006	OT	39°33.5'N, 142°22.3'E	39°34.2'N, 142°22.5'E	750-749	3.3
WA06-C900	5 Oct. 2006	OT	39°35.4'N, 142°32.0'E	39°36.1'N, 142°32.8'E	893-909	2.8
WA06-C900D	5 Oct. 2006	DG	39°35.8'N, 142°32.1'E	39°36.1'N, 142°32.3'E	891-893	-
WA06-D210	19 Oct. 2006	OT	38°57.7'N, 141°59.8'E	38°59.2'N, 142°00.5'E	211-213	10.7
WA06-D210D	19 Oct. 2006	DG	38°56.4'N, 141°59.3'E	38°56.2'N, 141°59.2'E	213-214	-
WA06-D250	19 Oct. 2006	OT	38°56.5'N, 142°01.4'E	38°54.9'N, 142°00.9'E	251-254	3.9
WA06-D310	19 Oct. 2006	OT	38°53.4'N, 142°02.7'E	38°55.0'N, 142°03.7'E	302-317	3.3
WA06-D350	19 Oct. 2006	OT	38°55.0'N, 142°05.7'E	38°53.5'N, 142°05.1'E	355-352	3.6
WA06-D410	18 Oct. 2006	OT	39°03.9'N, 142°09.4'E	39°05.5'N, 142°09.7'E	410-410	3.1
WA06-D450	18 Oct. 2006	OT	39°03.1'N, 142°10.5'E	39°01.5'N, 142°10.4'E	453-455	3.6
WA06-D450D	17 Oct. 2006	DG	39°02.4'N, 142°10.5'E	39°02.7'N, 142°10.6'E	460-460	-
WA06-D510	18 Oct. 2006	OT	39°05.0'N, 142°11.9'E	39°03.7'N, 142°11.8'E	509-514	3.3
WA06-D550	18 Oct. 2006	OT	39°05.3'N, 142°12.8'E	39°04.1'N, 142°12.7'E	548-551	3.2
WA06-D650	18 Oct. 2006	OT	39°02.4'N, 142°14.8'E	39°03.6'N, 142°14.9'E	646-663	3.2
WA06-D750	17 Oct. 2006	OT	38°58.5'N, 142°16.3'E	38°59.3'N, 142°16.5'E	749-745	3.1
WA06-D900	17 Oct. 2006	OT	39°06.5'N, 142°20.2'E	39°05.8'N, 142°20.2'E	909-ND	2.9
WA06-D1500	17 Oct. 2006	OT	39°12.1'N, 142°42.1'E	39°11.9'N, 142°42.2'E	1492-1509	-
WA06-D1500D	17 Oct. 2006	DG	39°18.7'N, 142°40.2'E	39°18.0'N, 142°40.1'E	1521-1518	-
WA06-DE280	23 Nov. 2006	OT	38°40.5'N, 141°57.4'E	38°42.2'N, 141°58.0'E	282-283	3.4
WA06-DE280D	23 Nov. 2006	DG	38°42.9'N, 141°58.3'E	38°43.1'N, 141°58.4'E	284-285	-
WA06-DE310	24 Nov. 2006	OT	38°40.4'N, 141°59.0'E	38°41.7'N, 141°59.8'E	306-315	3.4
WA06-DE350	23 Nov. 2006	OT	38°40.7'N, 142°01.3'E	38°38.8'N, 142°00.9'E	347-345	3.2
WA06-DE380	23 Nov. 2006	OT	38°38.7'N, 142°02.2'E	38°40.4'N, 142°02.4'E	376-378	3.2
WA06-DE410	24 Nov. 2006	OT	38°39.3'N, 142°03.4'E	38°40.9'N, 142°03.7'E	408-408	3.1
WA06-DE425	23 Nov. 2006	OT	38°39.6'N, 142°03.9'E	38°40.9'N, 142°04.3'E	421-424	3.2
WA06-DE450	24 Nov. 2006	OT	38°37.7'N, 142°04.5'E	38°39.2'N, 142°04.7'E	450-446	3.2
WA06-DE480	23 Nov. 2006	OT	38°38.9'N, 142°05.7'E	38°39.8'N, 142°05.9'E	476-476	3.4
WA06-E150	5 Nov. 2006	OT	38°20.0'N, 141°44.5'E	38°18.2'N, 141°44.1'E	154-151	13.0
WA06-E210	5 Nov. 2006	OT	38°22.2'N, 141°51.3'E	38°24.0'N, 141°51.6'E	209-212	9.1
WA06-E250	5 Nov. 2006	OT	38°23.3'N, 141°53.9'E	38°21.6'N, 141°54.1'E	242-244	-
WA06-E280	4 Nov. 2006	OT	38°21.8'N, 141°56.4'E	38°23.6'N, 141°56.6'E	275-275	4.2
WA06-E310	4 Nov. 2006	OT	38°23.2'N, 141°58.2'E	38°21.5'N, 141°58.4'E	305-309	3.6
WA06-E350	4 Nov. 2006	OT	38°22.2'N, 142°00.7'E	38°24.0'N, 142°00.3'E	349-350	3.5
WA06-E380	4 Nov. 2006	OT	38°23.4'N, 142°01.6'E	38°21.9'N, 142°02.3'E	377-382	3.3
WA06-E410	3 Nov. 2006	OT	38°23.7'N, 142°02.6'E	38°22.1'N, 142°03.3'E	406-409	3.3
WA06-E425	4 Nov. 2006	OT	38°24.2'N, 142°03.0'E	38°24.9'N, 142°02.7'E	423-423	3.4
WA06-E450	3 Nov. 2006	OT	38°23.5'N, 142°04.0'E	38°25.2'N, 142°03.6'E	448-451	3.6
WA06-E480	3 Nov. 2006	OT	38°22.7'N, 142°05.2'E	38°21.2'N, 142°05.9'E	480-484	3.4
WA06-E510	3 Nov. 2006	OT	38°22.6'N, 142°06.3'E	38°23.9'N, 142°05.7'E	514-506	3.4
WA06-E510D	3 Nov. 2006	DG	38°23.8'N, 142°05.6'E	38°24.1'N, 142°05.4'E	503-498	-
WA06-E550	3 Nov. 2006	OT	38°23.4'N, 142°07.3'E	38°22.3'N, 142°07.3'E	553-545	3.4
WA06-E650	2 Nov. 2006	OT	38°21.7'N, 142°10.6'E	38°22.9'N, 142°10.7'E	656-660	9.6
WA06-E750	2 Nov. 2006	OT	38°23.1'N, 142°14.5'E	38°22.4'N, 142°14.1'E	758-756	3.2
WA06-E900	2 Nov. 2006	OT	38°29.8'N, 142°21.6'E	38°29.1'N, 142°21.5'E	905-908	2.8
WA06-E1200	2 Nov. 2006	OT	38°23.4'N, 142°31.8'E	38°23.8'N, 142°31.9'E	1202-1206	-

Appendix 1. (Continued)

Station	Date	Gear	Position in	Position out	Depth (m)	Temp. (°C)
WA06-E1200D	2 Nov. 2006	DG	38°19.3'N, 142°31.7'E	38°19.4'N, 142°31.7'E	1214-1213	-
WA06-EF250	21 Nov. 2006	OT	37°59.9'N, 141°50.3'E	38°01.3'N, 141°51.9'E	250-250	8.5
WA06-EF280	21 Nov. 2006	OT	38°02.7'N, 141°56.5'E	38°04.5'N, 141°56.0'E	283-277	9.6
WA06-EF310	21 Nov. 2006	OT	38°04.0'N, 141°58.7'E	38°02.5'N, 141°59.3'E	313-313	8.6
WA06-EF350	22 Nov. 2006	OT	38°00.2'N, 141°59.9'E	37°58.7'N, 141°59.3'E	356-357	8.1
WA06-EF380	22 Nov. 2006	OT	38°02.3'N, 142°02.1'E	38°04.0'N, 142°02.5'E	378-373	4.1
WA06-EF410	22 Nov. 2006	OT	38°05.3'N, 142°03.7'E	38°03.6'N, 142°03.7'E	410-409	3.9
WA06-EF425	21 Nov. 2006	OT	38°00.9'N, 142°03.8'E	38°02.7'N, 142°04.1'E	414-431	3.9
WA06-EF425D	21 Nov. 2006	DG	38°03.3'N, 142°04.0'E	38°03.1'N, 142°04.1'E	420-424	-
WA06-EF450	22 Nov. 2006	OT	38°04.0'N, 142°05.1'E	38°02.6'N, 142°05.0'E	450-453	3.8
WA06-EF480	22 Nov. 2006	OT	38°00.5'N, 142°05.2'E	37°59.2'N, 142°04.3'E	486-482	3.9
WA06-EF510	22 Nov. 2006	OT	38°00.7'N, 142°05.8'E	38°01.7'N, 142°06.6'E	504-531	3.5
WA06-F150	29 Oct. 2006	OT	37°35.3'N, 141°33.2'E	37°36.7'N, 141°33.9'E	150-165	13.7
WA06-F210	29 Oct. 2006	OT	37°36.9'N, 141°35.9'E	37°38.2'N, 141°36.1'E	213-213	6.5
WA06-F250	29 Oct. 2006	OT	37°38.1'N, 141°39.1'E	37°36.4'N, 141°38.8'E	257-256	5.7
WA06-F280	29 Oct. 2006	OT	37°35.7'N, 141°41.0'E	37°37.5'N, 141°40.9'E	277-284	4.9
WA06-F310	29 Oct. 2006	OT	37°36.8'N, 141°43.7'E	37°36.1'N, 141°43.6'E	313-309	4.1
WA06-F350	30 Oct. 2006	OT	37°37.6'N, 141°47.3'E	37°39.2'N, 141°47.4'E	353-350	3.9
WA06-F380	30 Oct. 2006	OT	37°38.5'N, 141°50.5'E	37°40.1'N, 141°50.6'E	386-379	3.8
WA06-F410	30 Oct. 2006	OT	37°43.0'N, 141°53.9'E	37°44.6'N, 141°53.6'E	411-411	3.3
WA06-F425	30 Oct. 2006	OT	37°44.0'N, 141°54.8'E	37°42.3'N, 141°55.1'E	425-424	3.4
WA06-F450	30 Oct. 2006	OT	37°43.6'N, 141°56.6'E	37°45.2'N, 141°56.4'E	450-450	3.4
WA06-F480	31 Oct. 2006	OT	37°41.7'N, 141°59.0'E	37°39.9'N, 141°59.0'E	483-478	3.6
WA06-F510	31 Oct. 2006	OT	37°38.6'N, 142°01.1'E	37°39.8'N, 142°01.4'E	503-511	3.8
WA06-F550	31 Oct. 2006	OT	37°42.1'N, 142°04.1'E	37°40.9'N, 142°04.7'E	546-551	3.7
WA06-F650	31 Oct. 2006	OT	37°42.9'N, 142°09.7'E	37°44.0'N, 142°09.1'E	654-651	3.7
WA06-F650D	31 Oct. 2006	OT	37°44.9'N, 142°08.5'E	37°45.2'N, 142°08.4'E	647-641	-
WA06-F750	1 Nov. 2006	OT	37°47.3'N, 142°12.2'E	37°48.1'N, 142°12.0'E	749-747	3.4
WA06-F900	1 Nov. 2006	OT	37°46.2'N, 142°18.9'E	37°45.7'N, 142°19.1'E	904-909	3.0
WA06-F1500	1 Nov. 2006	OT	37°36.3'N, 142°33.6'E	37°36.0'N, 142°33.5'E	1515-1513	-
WA06-F1500D-1	1 Nov. 2006	DG	37°34.6'N, 142°33.5'E	37°35.0'N, 142°33.5'E	1511-1508	-
WA06-F1500D-1	1 Nov. 2006	DG	37°38.9'N, 142°34.1'E	37°39.4'N, 142°34.3'E	1466-1471	-
WA06-FG250	19 Nov. 2006	OT	37°20.4'N, 141°37.6'E	37°21.9'N, 141°37.5'E	255-252	6.8
WA06-FG280	19 Nov. 2006	OT	37°22.1'N, 141°39.3'E	37°20.4'N, 141°39.1'E	278-277	5.6
WA06-FG310	19 Nov. 2006	OT	37°21.6'N, 141°41.2'E	37°19.8'N, 141°41.2'E	312-313	4.8
WA06-FG350	19 Nov. 2006	OT	37°22.2'N, 141°43.1'E	37°20.4'N, 141°43.1'E	346-351	5.0
WA06-FG350D	19 Nov. 2006	OT	37°22.8'N, 141°43.2'E	37°23.2'N, 141°43.2'E	346-346	-
WA06-FG380	19 Nov. 2006	OT	37°19.5'N, 141°44.6'E	37°21.1'N, 141°44.8'E	382-382	4.7
WA06-FG410	10 Nov. 2006	OT	37°18.8'N, 141°45.8'E	37°17.1'N, 141°45.5'E	410-410	4.2
WA06-FG425	10 Nov. 2006	OT	37°17.8'N, 141°46.2'E	37°19.5'N, 141°46.6'E	426-425	4.2
WA06-FG450	10 Nov. 2006	OT	37°18.8'N, 141°47.2'E	37°20.5'N, 141°47.5'E	449-444	4.0
WA06-FG480	10 Nov. 2006	OT	37°18.2'N, 141°49.5'E	37°16.5'N, 141°48.8'E	480-477	3.8
WA06-FG510	10 Nov. 2006	OT	37°16.5'N, 141°50.0'E	37°17.6'N, 141°50.2'E	511-512	3.8
WA06-G150	26 Oct. 2006	OT	36°59.8'N, 141°17.4'E	37°01.4'N, 141°17.9'E	151-150	12.3
WA06-G210	26 Oct. 2006	OT	36°57.0'N, 141°22.7'E	36°58.4'N, 141°23.8'E	210-208	8.9
WA06-G250	26 Oct. 2006	OT	36°58.4'N, 141°25.7'E	36°57.0'N, 141°24.8'E	251-252	6.9
WA06-G280	26 Oct. 2006	OT	36°55.5'N, 141°24.9'E	36°54.0'N, 141°24.2'E	276-279	5.3
WA06-G310	26 Oct. 2006	OT	36°56.2'N, 141°26.9'E	36°54.8'N, 141°26.5'E	301-315	4.8
WA06-G350	27 Oct. 2006	OT	36°56.2'N, 141°30.8'E	36°57.9'N, 141°31.5'E	373-355	5.0
WA06-G380	27 Oct. 2006	OT	36°53.4'N, 141°27.4'E	36°54.5'N, 141°28.9'E	384-377	4.7
WA06-G410	27 Oct. 2006	OT	36°56.6'N, 141°33.2'E	36°58.1'N, 141°34.4'E	414-411	4.7
WA06-G425	27 Oct. 2006	OT	36°53.2'N, 141°29.2'E	36°52.1'N, 141°27.6'E	428-420	5.0
WA06-G450	27 Oct. 2006	OT	36°51.5'N, 141°28.6'E	36°52.7'N, 141°30.0'E	454-454	4.6
WA06-G480	28 Oct. 2006	OT	36°51.2'N, 141°29.2'E	36°50.0'N, 141°27.7'E	481-483	4.5

Appendix 1. (Continued)

Station	Date	Gear	Position in	Position out	Depth (m)	Temp. (°C)
WA06-G510	28 Oct. 2006	OT	36°51.4'N, 141°30.1'E	36°52.1'N, 141°31.2'E	508-508	4.4
WA06-G550	28 Oct. 2006	OT	36°58.1'N, 141°38.0'E	36°59.2'N, 141°38.8'E	558-554	4.2
WA06-G650	28 Oct. 2006	OT	36°50.2'N, 141°34.3'E	36°50.9'N, 141°35.2'E	648-648	3.8
WA06-G750	15 Nov. 2006	OT	36°46.3'N, 141°35.5'E	36°46.4'N, 141°35.7'E	753-754	3.6
WA06-G900	11 Nov. 2006	OT	36°50.2'N, 141°41.3'E	36°49.4'N, 141°40.7'E	907-910	3.2
WA06-G900D	11 Nov. 2006	DG	36°47.5'N, 141°39.4'E	36°47.3'N, 141°39.1'E	925-920	-
WA06-G1200	11 Nov. 2006	OT	36°51.8'N, 141°48.0'E	36°51.3'N, 141°47.6'E	1207-1200	-
WA06-G1200	11 Nov. 2006	OT	36°51.8'N, 141°48.0'E	36°51.3'N, 141°47.6'E	1207-1200	-
WA06-G1200D	11 Nov. 2006	DG	36°52.6'N, 141°48.6'E	36°52.3'N, 141°48.2'E	1201-1182	-
WA06-GH250	17 Nov. 2006	OT	36°40.5'N, 141°10.2'E	36°41.9'N, 141°11.4'E	249-250	8.3
WA06-GH280	17 Nov. 2006	OT	36°41.5'N, 141°12.3'E	36°40.0'N, 141°11.0'E	278-278	6.9
WA06-GH310	16 Nov. 2006	OT	36°41.6'N, 141°13.5'E	36°40.1'N, 141°12.2'E	309-308	4.9
WA06-GH350	16 Nov. 2006	OT	36°39.6'N, 141°13.4'E	36°40.8'N, 141°14.8'E	345-352	4.6
WA06-GH380	16 Nov. 2006	OT	36°40.4'N, 141°15.6'E	36°38.9'N, 141°14.5'E	377-381	4.7
WA06-GH410	17 Nov. 2006	OT	36°37.6'N, 141°13.8'E	—	410	4.5
WA06-GH425	18 Nov. 2006	OT	36°39.4'N, 141°17.3'E	36°40.9'N, 141°18.3'E	425-422	4.7
WA06-GH450	16 Nov. 2006	OT	36°41.6'N, 141°20.1'E	36°40.3'N, 141°19.0'E	453-450	4.5
WA06-GH480	18 Nov. 2006	OT	36°40.7'N, 141°20.8'E	36°42.2'N, 141°21.6'E	481-478	4.3
WA06-GH480D	18 Nov. 2006	DG	36°40.0'N, 141°20.3'E	36°39.8'N, 141°20.0'E	483-478	-
WA06-GH510	16 Nov. 2006	OT	36°40.3'N, 141°21.6'E	36°41.2'N, 141°22.2'E	509-510	4.3
WA06-H150	12 Nov. 2006	OT	36°31.3'N, 140°58.2'E	36°29.9'N, 140°57.1'E	157-154	12.8
WA06-H210	13 Nov. 2006	OT	36°30.0'N, 140°58.4'E	36°31.4'N, 140°59.0'E	213-193	11.8
WA06-H250	12 Nov. 2006	OT	36°31.4'N, 140°59.9'E	36°29.8'N, 140°58.8'E	243-246	8.5
WA06-H250D	12 Nov. 2006	OT	36°30.9'N, 140°59.6'E	36°31.1'N, 140°59.8'E	248-248	-
WA06-H280	13 Nov. 2006	OT	36°30.8'N, 141°00.2'E	36°29.4'N, 140°59.1'E	282-279	5.9
WA06-H310	12 Nov. 2006	OT	36°30.6'N, 141°00.6'E	36°29.1'N, 140°59.5'E	309-310	5.5
WA06-H350	12 Nov. 2006	OT	36°29.3'N, 141°00.4'E	36°27.8'N, 140°59.5'E	353-353	5.0
WA06-H380	12 Nov. 2006	OT	36°30.1'N, 141°01.8'E	36°28.7'N, 141°00.6'E	385-378	4.8
WA06-H410	13 Nov. 2006	OT	36°30.9'N, 141°03.1'E	36°32.3'N, 141°04.3'E	413-407	4.3
WA06-H425	13 Nov. 2006	OT	36°30.6'N, 141°03.0'E	36°31.9'N, 141°04.3'E	422-430	4.2
WA06-H450	13 Nov. 2006	OT	36°30.4'N, 141°03.6'E	36°29.0'N, 141°02.3'E	456-447	3.8
WA06-H480	13 Nov. 2006	OT	36°32.1'N, 141°06.0'E	36°32.7'N, 141°06.9'E	481-480	4.2
WA06-H510	14 Nov. 2006	OT	36°30.3'N, 141°04.9'E	36°31.1'N, 141°05.9'E	508-510	3.9
WA06-H550	14 Nov. 2006	OT	36°31.8'N, 141°08.7'E	36°32.6'N, 141°09.8'E	561-557	4.1
WA06-H650	14 Nov. 2006	OT	36°31.0'N, 141°11.7'E	36°31.7'N, 141°12.7'E	659-646	3.8
WA06-H750	14 Nov. 2006	OT	36°34.1'N, 141°20.5'E	36°34.6'N, 141°21.3'E	736-732	3.6
WA06-H900	14 Nov. 2006	OT	36°30.6'N, 141°20.5'E	36°31.2'N, 141°21.1'E	896-894	3.1
WA06-H1500	15 Nov. 2006	OT	36°36.1'N, 141°36.1'E	36°35.9'N, 141°36.1'E	1478-1475	-
WA06-H1500D	15 Nov. 2006	DG	36°36.5'N, 141°36.2'E	36°36.7'N, 141°36.1'E	1470-1450	-
WA07-A150	7 Oct. 2007	OT	40°47.5'N, 141°49.6'E	40°46.8'N, 141°51.3'E	154-146	15.2
WA07-A210	7 Oct. 2007	OT	40°51.4'N, 141°41.8'E	40°51.7'N, 141°39.8'E	207-215	7.2
WA07-A250	6 Oct. 2007	OT	40°51.8'N, 141°50.6'E	40°50.5'N, 141°51.9'E	273-258	5.4
WA07-A250D	6 Oct. 2007	DG	40°51.0'N, 141°51.2'E	40°50.9'N, 141°51.5'E	258-258	-
WA07-A310	6 Oct. 2007	OT	40°49.4'N, 141°55.0'E	40°50.6'N, 141°53.5'E	306-309	3.6
WA07-A350	7 Oct. 2007	OT	40°55.3'N, 141°43.2'E	40°55.2'N, 141°44.7'E	360-359	-
WA07-A410	9 Oct. 2007	OT	40°57.9'N, 141°42.5'E	40°57.5'N, 141°43.3'E	412-415	3.4
WA07-A450	9 Oct. 2007	OT	40°58.7'N, 141°45.6'E	40°58.3'N, 141°46.1'E	471-468	3.4
WA07-A510	9 Oct. 2007	OT	41°00.6'N, 141°46.1'E	41°00.4'N, 141°46.4'E	510-512	3.3
WA07-A550	9 Oct. 2007	OT	41°00.9'N, 141°48.7'E	41°00.6'N, 141°49.0'E	550-551	3.3
WA07-A650	10 Oct. 2007	OT	41°04.9'N, 141°48.9'E	41°04.5'N, 141°49.2'E	662-661	3.3
WA07-A750	10 Oct. 2007	OT	41°07.6'N, 141°50.0'E	41°07.4'N, 141°50.1'E	748-747	3.1
WA07-A900	10 Oct. 2007	OT	41°09.3'N, 141°53.8'E	41°09.0'N, 141°53.8'E	882-881	2.9
WA07-A1500D	11 Oct. 2007	DG	40°50.5'N, 142°31.5'E	40°50.2'N, 142°31.1'E	1402-1377	-
WA07-B150	14 Oct. 2007	OT	40°15.0'N, 142°06.6'E	40°13.3'N, 142°07.4'E	153-156	9.8

Appendix 1. (Continued)

Station	Date	Gear	Position in	Position out	Depth (m)	Temp. (°C)
WA07-B210	13 Oct. 2007	OT	40°08.6'N, 142°11.4'E	40°10.1'N, 142°11.1'E	208-214	5.7
WA07-B250	13 Oct. 2007	OT	40°08.5'N, 142°12.4'E	40°06.8'N, 142°13.2'E	249-258	4.3
WA07-B310	13 Oct. 2007	OT	40°13.4'N, 142°12.4'E	40°11.7'N, 142°12.8'E	309-307	3.5
WA07-B350	13 Oct. 2007	OT	40°06.4'N, 142°15.1'E	40°08.2'N, 142°14.6'E	350-352	3.4
WA07-B410	13 Oct. 2007	OT	40°15.4'N, 142°14.1'E	40°13.7'N, 142°14.6'E	420-412	3.4
WA07-B410D	13 Oct. 2007	DG	40°16.9'N, 142°13.5'E	40°17.1'N, 142°13.5'E	416-416	-
WA07-B450	12 Oct. 2007	OT	40°13.2'N, 142°15.7'E	40°14.7'N, 142°15.4'E	454-459	3.5
WA07-B510	12 Oct. 2007	OT	40°16.0'N, 142°16.0'E	40°17.3'N, 142°15.6'E	510-509	3.4
WA07-B550	12 Oct. 2007	OT	40°16.9'N, 142°16.6'E	40°18.0'N, 142°16.5'E	544-555	3.4
WA07-B650	11 Oct. 2007	OT	40°19.8'N, 142°18.0'E	40°20.6'N, 142°17.7'E	644-640	3.3
WA07-B750	11 Oct. 2007	OT	40°19.7'N, 142°21.3'E	40°20.1'N, 142°20.9'E	759-749	3.3
WA07-B900	11 Oct. 2007	OT	40°21.8'N, 142°24.3'E	40°21.5'N, 142°24.4'E	898-900	3.1
WA07-B1200	12 Oct. 2007	OT	40°21.6'N, 142°33.9'E	40°21.8'N, 142°33.8'E	1208-1200	-
WA07-B1500D	12 Oct. 2007	DG	40°23.9'N, 142°48.5'E	40°23.9'N, 142°48.2'E	1511-1514	-
WA07-C210	15 Oct. 2007	OT	39°41.3'N, 142°12.6'E	39°43.1'N, 142°12.9'E	211-208	7.7
WA07-C250	15 Oct. 2007	OT	39°40.0'N, 142°14.3'E	39°41.7'N, 142°14.5'E	254-252	5.6
WA07-C310	14 Oct. 2007	OT	39°47.3'N, 142°16.4'E	39°45.6'N, 142°16.0'E	318-294	3.9
WA07-C350	15 Oct. 2007	OT	39°45.7'N, 142°16.9'E	39°47.4'N, 142°17.0'E	358-358	3.9
WA07-C350D	15 Oct. 2007	DG	39°44.2'N, 142°16.9'E	39°44.4'N, 142°16.9'E	355-354	-
WA07-C410	14 Oct. 2007	OT	39°50.3'N, 142°17.9'E	39°48.5'N, 142°17.9'E	409-415	3.7
WA07-C450	17 Oct. 2007	OT	39°42.3'N, 142°18.0'E	39°40.6'N, 142°17.7'E	467-458	3.7
WA07-C510	14 Oct. 2007	OT	39°52.5'N, 142°19.8'E	39°51.2'N, 142°20.0'E	511-521	3.5
WA07-C550	16 Oct. 2007	OT	39°35.5'N, 142°18.6'E	39°34.2'N, 142°18.5'E	552-559	3.6
WA07-C650	16 Oct. 2007	OT	39°34.3'N, 142°20.3'E	39°35.5'N, 142°20.3'E	659-644	3.4
WA07-C750	16 Oct. 2007	OT	39°34.1'N, 142°22.5'E	39°33.5'N, 142°22.3'E	748-749	3.4
WA07-C900	16 Oct. 2007	OT	39°36.1'N, 142°32.7'E	39°35.9'N, 142°32.5'E	900-893	3.1
WA07-C1500D	16 Oct. 2007	DG	39°33.4'N, 142°51.3'E	39°33.6'N, 142°53.3'E	1499-1480	-
WA07-D210	18 Oct. 2007	OT	38°57.8'N, 141°59.9'E	38°59.2'N, 142°00.6'E	212-214	8.8
WA07-D210D	18 Oct. 2007	DG	38°57.4'N, 141°59.7'E	38°57.7'N, 141°59.9'E	213-213	-
WA07-D250	18 Oct. 2007	OT	38°56.8'N, 142°01.6'E	38°55.1'N, 142°01.0'E	253-254	6.7
WA07-D310	18 Oct. 2007	OT	38°53.5'N, 142°02.8'E	38°55.0'N, 142°03.3'E	303-307	4.6
WA07-D350	18 Oct. 2007	OT	38°55.1'N, 142°05.7'E	38°53.5'N, 142°05.2'E	354-351	5.0
WA07-D410	17 Oct. 2007	OT	39°04.2'N, 142°09.5'E	39°06.0'N, 142°09.8'E	406-406	4.1
WA07-D450	17 Oct. 2007	OT	39°03.4'N, 142°10.4'E	39°01.5'N, 142°10.5'E	448-463	3.7
WA07-D510	17 Oct. 2007	OT	39°04.2'N, 142°11.8'E	39°05.3'N, 142°12.0'E	505-513	3.6
WA07-D550	5 Oct. 2007	OT	39°03.7'N, 142°12.8'E	39°04.9'N, 142°12.7'E	556-545	3.6
WA07-D650	5 Oct. 2007	OT	39°02.3'N, 142°14.7'E	39°03.3'N, 142°14.9'E	640-661	3.6
WA07-D750	5 Oct. 2007	OT	38°58.7'N, 142°16.4'E	38°59.5'N, 142°16.6'E	754-751	3.4
WA07-D900	5 Oct. 2007	OT	39°05.3'N, 142°20.0'E	39°06.0'N, 142°20.1'E	898-905	3.2
WA07-D1500D	17 Oct. 2007	DG	39°20.2'N, 142°40.1'E	39°20.5'N, 142°40.3'E	1505-1489	-
WA07-DE250	23 Nov. 2007	OT	38°41.9'N, 141°55.9'E	38°40.5'N, 141°55.5'E	251-252	11.0
WA07-DE280	23 Nov. 2007	OT	38°40.4'N, 141°57.4'E	38°42.1'N, 141°58.1'E	280-282	8.6
WA07-DE310	23 Nov. 2007	OT	38°40.2'N, 141°58.9'E	38°41.8'N, 141°59.5'E	306-308	7.0
WA07-DE350	23 Nov. 2007	OT	38°38.9'N, 142°00.9'E	38°40.6'N, 142°01.3'E	344-346	7.4
WA07-DE380	23 Nov. 2007	OT	38°38.8'N, 142°02.3'E	38°39.6'N, 142°02.3'E	373-374	5.6
WA07-DE410	24 Nov. 2007	OT	38°40.8'N, 142°03.6'E	38°39.1'N, 142°03.4'E	403-406	4.8
WA07-DE425	24 Nov. 2007	OT	38°39.8'N, 142°03.9'E	38°41.6'N, 142°04.5'E	418-422	4.4
WA07-DE450	24 Nov. 2007	OT	38°39.4'N, 142°04.8'E	38°37.8'N, 142°04.5'E	444-448	4.2
WA07-DE480	24 Nov. 2007	OT	38°39.1'N, 142°05.8'E	38°40.8'N, 142°06.2'E	472-477	4.1
WA07-DE510	24 Nov. 2007	OT	38°39.2'N, 142°07.3'E	38°38.9'N, 142°07.2'E	510-508	3.9
WA07-E150	23 Oct. 2007	OT	38°18.5'N, 141°44.1'E	38°20.0'N, 141°44.5'E	150-154	12.6
WA07-E210	23 Oct. 2007	OT	38°21.8'N, 141°51.2'E	38°23.3'N, 141°51.4'E	207-210	10.9
WA07-E250	23 Oct. 2007	OT	38°23.2'N, 141°53.9'E	38°21.3'N, 141°54.1'E	241-244	10.1
WA07-E280	23 Oct. 2007	OT	38°21.5'N, 141°56.4'E	38°23.4'N, 141°56.8'E	275-280	9.9

Appendix 1. (Continued)

Station	Date	Gear	Position in	Position out	Depth (m)	Temp. (°C)
WA07-E310	24 Oct. 2007	OT	38°21.2'N, 141°58.5'E	38°22.9'N, 141°58.2'E	306-303	6.1
WA07-E350	24 Oct. 2007	OT	38°20.4'N, 142°01.7'E	38°22.0'N, 142°01.0'E	351-351	5.6
WA07-E380	30 Oct. 2007	OT	38°23.5'N, 142°01.6'E	38°22.0'N, 142°02.4'E	377-382	4.1
WA07-E410	24 Oct. 2007	OT	38°22.1'N, 142°03.3'E	38°23.8'N, 142°02.6'E	408-406	4.0
WA07-E425	5 Nov. 2007	OT	38°24.2'N, 142°03.0'E	38°25.9'N, 142°02.6'E	422-424	4.3
WA07-E450	5 Nov. 2007	OT	38°25.2'N, 142°03.6'E	38°23.5'N, 142°04.0'E	450-445	4.3
WA07-E480	27 Oct. 2007	OT	38°23.5'N, 142°04.9'E	38°22.9'N, 142°05.2'E	475-478	-
WA07-E510	25 Oct. 2007	OT	38°23.8'N, 142°05.8'E	38°22.7'N, 142°06.1'E	506-506	4.0
WA07-E550	25 Oct. 2007	OT	38°22.7'N, 142°07.4'E	38°23.9'N, 142°07.2'E	549-549	3.5
WA07-E650	25 Oct. 2007	OT	38°23.2'N, 142°10.7'E	38°22.1'N, 142°10.6'E	656-656	3.6
WA07-E750	25 Oct. 2007	OT	38°22.2'N, 142°14.0'E	38°23.1'N, 142°14.4'E	753-754	3.7
WA07-E900	26 Oct. 2007	OT	38°30.0'N, 142°21.7'E	38°29.5'N, 142°21.5'E	900-896	3.0
WA07-E1200	26 Oct. 2007	OT	38°23.5'N, 142°31.8'E	38°24.1'N, 142°31.8'E	1198-1204	-
WA07-E1500	26 Oct. 2007	OT	38°32.2'N, 142°48.0'E	38°34.7'N, 142°48.0'E	1499-1502	-
WA07-EF250	22 Nov. 2007	OT	37°59.8'N, 141°51.1'E	38°01.1'N, 141°51.8'E	250-252	7.0
WA07-EF280	22 Nov. 2007	OT	38°02.9'N, 141°56.5'E	38°04.5'N, 141°56.1'E	282-277	8.6
WA07-EF310	22 Nov. 2007	OT	38°04.2'N, 141°58.6'E	38°02.6'N, 141°59.4'E	310-314	7.0
WA07-EF350	25 Nov. 2007	OT	38°00.1'N, 141°59.9'E	37°58.7'N, 141°59.2'E	356-353	7.4
WA07-EF380	22 Nov. 2007	OT	38°03.6'N, 142°02.4'E	38°02.1'N, 142°02.1'E	372-381	5.9
WA07-EF410	21 Nov. 2007	OT	38°03.4'N, 142°03.7'E	38°05.7'N, 142°04.2'E	408-407	5.3
WA07-EF425	21 Nov. 2007	OT	38°01.2'N, 142°03.8'E	38°03.0'N, 142°04.2'E	414-430	4.4
WA07-EF450	21 Nov. 2007	OT	38°04.0'N, 142°05.1'E	38°02.6'N, 142°04.9'E	452-451	4.7
WA07-EF480	21 Nov. 2007	OT	38°00.4'N, 142°05.2'E	37°59.1'N, 142°04.2'E	485-480	4.5
WA07-EF510	21 Nov. 2007	OT	38°00.8'N, 142°05.8'E	38°01.9'N, 142°06.5'E	504-520	4.3
WA07-F150	29 Oct. 2007	OT	37°35.3'N, 141°33.3'E	37°36.9'N, 141°33.9'E	153-163	13.4
WA07-F210	29 Oct. 2007	OT	37°36.9'N, 141°35.9'E	37°38.6'N, 141°36.1'E	213-211	11.3
WA07-F250	29 Oct. 2007	OT	37°38.1'N, 141°39.0'E	37°36.5'N, 141°38.8'E	256-254	-
WA07-F280	29 Oct. 2007	OT	37°35.7'N, 141°41.0'E	37°37.5'N, 141°40.8'E	277-282	4.6
WA07-F310	30 Oct. 2007	OT	37°36.8'N, 141°43.7'E	37°35.1'N, 141°43.6'E	313-306	4.3
WA07-F350	30 Oct. 2007	OT	37°37.4'N, 141°47.4'E	37°39.1'N, 141°47.3'E	356-352	4.1
WA07-F380	30 Oct. 2007	OT	37°38.3'N, 141°50.5'E	37°40.0'N, 141°50.6'E	388-380	4.3
WA07-F410	30 Oct. 2007	OT	37°42.9'N, 141°53.9'E	37°44.6'N, 141°53.6'E	412-411	3.8
WA07-F425	4 Nov. 2007	OT	37°42.6'N, 141°05.0'E	37°44.2'N, 141°54.9'E	426-426	4.1
WA07-F450	4 Nov. 2007	OT	37°43.5'N, 141°56.6'E	37°45.1'N, 141°56.4'E	451-450	4.7
WA07-F480	4 Nov. 2007	OT	37°40.2'N, 141°59.0'E	37°41.7'N, 141°59.0'E	480-485	3.9
WA07-F510	4 Nov. 2007	OT	37°38.3'N, 142°01.1'E	37°39.4'N, 142°01.2'E	506-508	4.0
WA07-F550	10 Nov. 2007	OT	37°42.0'N, 142°03.9'E	37°41.0'N, 142°04.8'E	546-550	4.1
WA07-F650	10 Nov. 2007	OT	37°44.0'N, 142°09.1'E	37°43.1'N, 142°09.6'E	648-647	4.0
WA07-F750	10 Nov. 2007	OT	37°47.4'N, 142°12.0'E	37°48.2'N, 142°11.6'E	745-736	3.8
WA07-F900	10 Nov. 2007	OT	37°46.7'N, 142°18.7'E	37°46.1'N, 142°18.9'E	896-898	3.3
WA07-FG250	19 Nov. 2007	OT	37°22.3'N, 141°37.3'E	37°20.6'N, 141°37.6'E	251-255	7.5
WA07-FG280	20 Nov. 2007	OT	37°20.5'N, 141°39.2'E	37°22.2'N, 141°39.2'E	277-278	6.3
WA07-FG310	19 Nov. 2007	OT	37°21.5'N, 141°41.2'E	37°19.8'N, 141°41.2'E	313-314	5.0
WA07-FG350	20 Nov. 2007	OT	37°22.2'N, 141°43.1'E	37°20.5'N, 141°43.2'E	346-352	4.6
WA07-FG380	19 Nov. 2007	OT	37°21.1'N, 141°44.8'E	37°19.5'N, 141°44.7'E	382-383	4.6
WA07-FG410	20 Nov. 2007	OT	37°18.9'N, 141°45.9'E	37°17.6'N, 141°45.6'E	414-412	4.4
WA07-FG425	19 Nov. 2007	OT	37°17.9'N, 141°46.3'E	37°19.4'N, 141°46.5'E	427-427	4.2
WA07-FG450	20 Nov. 2007	OT	37°18.9'N, 141°47.2'E	37°20.0'N, 141°47.4'E	453-449	4.2
WA07-FG480	19 Nov. 2007	OT	37°18.1'N, 141°49.4'E	37°17.0'N, 141°49.0'E	480-480	4.2
WA07-FG510	20 Nov. 2007	OT	37°17.8'N, 141°50.3'E	37°16.7'N, 141°50.0'E	513-514	4.2
WA07-G150	2 Nov. 2007	OT	36°59.6'N, 141°17.4'E	37°00.5'N, 141°17.7'E	151-151	12.9
WA07-G210	2 Nov. 2007	OT	36°57.0'N, 141°22.7'E	36°58.3'N, 141°23.8'E	210-209	10.7
WA07-G250	3 Nov. 2007	OT	36°58.4'N, 141°25.7'E	36°56.9'N, 141°24.8'E	249-252	8.9
WA07-G280	3 Nov. 2007	OT	36°55.5'N, 141°24.9'E	36°53.9'N, 141°24.1'E	275-278	6.5

Appendix 1. (Continued)

Station	Date	Gear	Position in	Position out	Depth (m)	Temp. (°C)
WA07-G310	2 Nov. 2007	OT	36°56.1'N, 141°26.9'E	36°54.4'N, 141°26.4'E	303-315	4.9
WA07-G350	3 Nov. 2007	OT	36°56.3'N, 141°30.9'E	36°57.5'N, 141°31.3'E	371-358	4.4
WA07-G380	2 Nov. 2007	OT	36°53.3'N, 141°27.4'E	36°54.5'N, 141°28.8'E	385-376	4.4
WA07-G410	3 Nov. 2007	OT	36°56.9'N, 141°33.5'E	36°57.8'N, 141°34.2'E	410-411	4.3
WA07-G425	11 Nov. 2007	OT	36°53.2'N, 141°29.2'E	36°52.1'N, 141°27.7'E	429-419	4.2
WA07-G450	11 Nov. 2007	OT	36°51.5'N, 141°28.6'E	36°52.7'N, 141°30.3'E	457-462	4.2
WA07-G480	12 Nov. 2007	OT	36°50.2'N, 141°27.9'E	36°51.3'N, 141°29.4'E	481-484	4.1
WA07-G510	11 Nov. 2007	OT	36°51.5'N, 141°30.3'E	36°52.2'N, 141°31.2'E	508-513	4.2
WA07-G550	11 Nov. 2007	OT	36°58.2'N, 141°38.0'E	36°59.2'N, 141°38.7'E	560-554	-
WA07-G650	12 Nov. 2007	OT	36°50.1'N, 141°34.2'E	36°50.9'N, 141°35.1'E	649-652	3.9
WA07-G750	12 Nov. 2007	OT	36°46.0'N, 141°35.2'E	36°45.6'N, 141°34.7'E	757-752	3.8
WA07-G900	31 Oct. 2007	OT	36°49.9'N, 141°41.0'E	36°49.4'N, 141°40.5'E	903-894	3.3
WA07-G1200	31 Oct. 2007	OT	36°51.8'N, 141°47.9'E	36°51.4'N, 141°47.6'E	1202-1202	-
WA07-G1500	31 Oct. 2007	OT	36°51.1'N, 141°51.1'E	36°51.4'N, 141°51.6'E	1514-1513	-
WA07-GH250	17 Nov. 2007	OT	36°40.4'N, 141°10.1'E	36°41.7'N, 141°11.3'E	251-252	7.9
WA07-GH280	17 Nov. 2007	OT	36°40.1'N, 141°11.1'E	36°41.4'N, 141°12.3'E	281-280	5.0
WA07-GH310	17 Nov. 2007	OT	36°40.2'N, 141°12.3'E	36°34.6'N, 141°13.5'E	308-309	5.5
WA07-GH350	16 Nov. 2007	OT	36°39.6'N, 141°13.5'E	36°40.9'N, 141°14.8'E	346-351	5.1
WA07-GH380	17 Nov. 2007	OT	36°40.4'N, 141°15.6'E	36°39.0'N, 141°14.5'E	377-381	4.8
WA07-GH410	17 Nov. 2007	OT	36°37.5'N, 141°14.0'E	36°38.3'N, 141°15.6'E	418-415	-
WA07-GH425	16 Nov. 2007	OT	36°39.2'N, 141°17.2'E	36°40.6'N, 141°18.1'E	427-424	-
WA07-GH450	18 Nov. 2007	OT	36°41.6'N, 141°20.1'E	36°40.1'N, 141°19.0'E	455-451	-
WA07-GH480	18 Nov. 2007	OT	36°40.9'N, 141°20.8'E	36°42.4'N, 141°21.6'E	482-477	4.4
WA07-GH510	18 Nov. 2007	OT	36°40.4'N, 141°21.6'E	36°41.4'N, 141°22.2'E	510-511	4.3
WA07-H150	13 Nov. 2007	OT	36°31.3'N, 140°58.2'E	36°29.9'N, 140°57.1'E	158-158	14.0
WA07-H210	14 Nov. 2007	OT	36°30.1'N, 140°58.4'E	36°31.3'N, 140°59.3'E	213-206	9.5
WA07-H250	14 Nov. 2007	OT	36°31.9'N, 140°59.9'E	36°29.8'N, 140°58.7'E	245-245	6.2
WA07-H280	13 Nov. 2007	OT	36°31.0'N, 141°00.3'E	36°29.4'N, 140°59.1'E	279-279	7.0
WA07-H310	14 Nov. 2007	OT	36°28.9'N, 140°59.4'E	36°30.3'N, 141°00.3'E	310-306	5.2
WA07-H350	13 Nov. 2007	OT	36°29.2'N, 141°00.4'E	36°27.7'N, 140°59.3'E	352-347	5.3
WA07-H380	13 Nov. 2007	OT	36°28.9'N, 141°00.7'E	36°30.1'N, 141°01.7'E	377-383	5.0
WA07-H410	16 Nov. 2007	OT	36°30.5'N, 141°02.6'E	36°31.3'N, 141°03.4'E	413-413	4.4
WA07-H425	15 Nov. 2007	OT	36°30.2'N, 141°02.7'E	36°31.1'N, 141°03.5'E	424-428	4.4
WA07-H450	14 Nov. 2007	OT	36°29.8'N, 141°02.5'E	36°30.4'N, 141°03.7'E	449-462	4.3
WA07-H480	16 Nov. 2007	OT	36°32.2'N, 141°06.1'E	36°32.9'N, 141°07.2'E	482-480	4.2
WA07-H510	15 Nov. 2007	OT	36°30.5'N, 141°05.1'E	36°31.2'N, 141°05.9'E	505-510	4.3
WA07-H550	15 Nov. 2007	OT	36°31.6'N, 141°08.5'E	36°32.3'N, 141°09.4'E	563-565	4.2
WA07-H650	15 Nov. 2007	OT	36°31.6'N, 141°12.6'E	36°30.9'N, 141°11.5'E	646-658	4.1
WA07-H750	1 Nov. 2007	OT	36°34.1'N, 141°21.2'E	36°33.7'N, 141°20.3'E	756-747	3.7
WA07-H900	1 Nov. 2007	OT	36°30.9'N, 141°21.1'E	36°30.6'N, 141°20.5'E	901-899	3.2
WA07-H1500	1 Nov. 2007	OT	36°35.8'N, 141°36.0'E	36°36.1'N, 141°35.9'E	1473-1433	-

Appendix 2. List of Stations by R/V *Tansei-maru*. Abbreviation: BT, 3 m ORE beam trawl.

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Locality
KT-07-29-M1	5 Nov. 2007	BT	39°17.9'N, 142°28.4'E	39°16.8'N, 142°27.4'E	1039-1041	off Miyako
KT-07-29-M2	5 Nov. 2007	BT	39°16.2'N, 142°41.1'E	39°18.6'N, 142°43.7'E	1528-1603	off Miyako
KT-07-29-M3-1	5 Nov. 2007	BT	39°20.0'N, 142°51.0'E	39°21.8'N, 142°51.9'E	1728-1719	off Miyako
KT-07-29-M3-2	6 Nov. 2007	BT	39°20.2'N, 142°51.4'E	39°19.2'N, 142°49.2'E	1737-1709	off Miyako
KT-07-29-K1	7 Nov. 2007	BT	42°35.0'N, 144°48.0'E	42°34.7'N, 144°49.9'E	1028-1075	off Kushiro
KT-07-29-K2	7 Nov. 2007	BT	42°30.3'N, 144°50.5'E	42°30.6'N, 144°52.2'E	1535-1543	off Kushiro
KT-07-29-K3	7 Nov. 2007	BT	42°27.6'N, 144°57.4'E	42°27.6'N, 144°59.4'E	2037-2025	off Kushiro
KT-07-29-E3	7 Nov. 2007	BT	41°39.1'N, 144°07.5'E	41°37.2'N, 144°07.6'E	1997-2043	off Erimo-misaki
KT-07-29-E1	7 Nov. 2007	BT	41°43.0'N, 143°56.7'E	41°44.5'N, 143°56.5'E	1031-1008	off Erimo-misaki
KT-07-29-H2	8 Nov. 2007	BT	40°00.0'N, 143°31.4'E	41°00.8'N, 143°30.2'E	2055-2032	off Hachinohe
KT-07-29-H1	8 Nov. 2007	BT	40°48.7'N, 142°00.1'E	40°47.4'N, 142°00.5'E	497-454	off Hachinohe
KT-07-29-M3-3	8 Nov. 2007	BT	39°20.1'N, 142°51.2'E	39°19.2'N, 142°49.1'E	1733-1695	off Miyako
KT-08-27-B1	19 Oct. 2008	BT	36°49.0'N, 141°49.0'E	36°49.0'N, 141°49.0'E	1500-1500	off Kuji-gawa
KT-08-27-B2	20 Oct. 2008	BT	36°49.0'N, 141°54.5'E	36°49.0'N, 141°54.5'E	2000-2000	off Kuji-gawa
KT-08-27-B3	20 Oct. 2008	BT	36°49.0'N, 142°00.0'E	36°49.0'N, 142°00.0'E	2500-2500	off Kuji-gawa
KT-08-27-B4	21 Oct. 2008	BT	36°49.0'N, 142°23.0'E	36°49.0'N, 142°23.0'E	3000-3000	off Kuji-gawa
KT-08-27-B5	21 Oct. 2008	BT	38°28.0'N, 142°53.5'E	38°28.0'N, 142°53.5'E	1500-1500	off Kinkazan
KT-08-27-B6	22 Oct. 2008	BT	38°28.0'N, 143°03.0'E	38°28.0'N, 143°03.0'E	2000-2000	off Kinkazan
KT-08-27-B7	22 Oct. 2008	BT	38°28.0'N, 143°21.0'E	38°28.0'N, 143°21.0'E	2500-2500	off Kinkazan
KT-08-27-B8	22 Oct. 2008	BT	38°28.0'N, 143°31.5'E	38°28.0'N, 143°31.5'E	3000-3000	off Kinkazan
KT-08-27-B9	23 Oct. 2008	BT	39°34.0'N, 142°54.0'E	39°34.0'N, 142°54.0'E	1500-1500	off Miyako
KT-08-27-B10	23 Oct. 2008	BT	39°34.0'N, 143°09.5'E	39°34.0'N, 143°09.5'E	2000-2000	off Miyako
KT-08-27-B11	23 Oct. 2008	BT	39°34.0'N, 143°27.0'E	39°34.0'N, 143°27.0'E	2500-2500	off Miyako
KT-08-27-B12	24 Oct. 2008	BT	39°34.0'N, 143°41.0'E	39°34.0'N, 143°41.0'E	3000-3000	off Miyako
KT-08-27-B13	24 Oct. 2008	BT	41°04.5'N, 142°32.5'E	41°04.5'N, 142°32.5'E	1500-1500	off Shimokita Pen.
KT-08-27-B14	24 Oct. 2008	BT	41°04.5'N, 143°19.0'E	41°04.5'N, 143°19.0'E	2000-2000	off Shimokita Pen.
KT-08-27-B15	25 Oct. 2008	BT	41°04.5'N, 143°47.0'E	41°04.5'N, 143°47.0'E	2500-2500	off Shimokita Pen.
KT-08-27-B16	25 Oct. 2008	BT	41°04.5'N, 143°52.0'E	41°04.5'N, 143°52.0'E	3000-3000	off Shimokita Pen.

Appendix 3. List of stations by R/V *Soyo-maru*. Abbreviations: BT, beam trawl; TR, baited trap

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Locality
SO06-M1-B	16 Jul. 2006	BT	39°42.3'N, 143°12.5'E	39°42.3'N, 143°12.5'E	2050-2049	off Miyako
SO06-M2-B	16 Jul. 2006	BT	39°43.7'N, 143°43.0'E	39°44.0'N, 143°42.7'E	2932-2872	off Miyako
SO06-M3-B1	17 Jul. 2006	BT	39°45.0'N, 143°52.2'E	39°44.7'N, 143°52.1'E	3950-3975	off Miyako
SO06-M3-B2	17 Jul. 2006	BN	39°48.6'N, 143°56.3'E	39°48.3'N, 143°56.3'E	4245-4206	off Miyako
SO06-M4-B	17 Jul. 2006	BT	39°40.6'N, 144°02.4'E	39°39.8'N, 144°02.9'E	5078-5161	off Miyako
SO07-C6-B	1 Aug. 2007	BT	42°04.6'N, 146°16.9'E	42°05.9'N, 146°17.0'E	5670-5670	off Kushiro
SO07-C7-B	5 Aug. 2007	BT	39°40.0'N, 142°34.0'E	39°40.0'N, 142°33.9'E	816-820	off Miyako
SO07-K1	6 Aug. 2007	BT	38°34.5'N, 143°04.2'E	38°33.2'N, 143°04.1'E	2043-2081	off Kinkazan
SO07-K2	6 Aug. 2007	BT	38°31.2'N, 143°33.6'E	38°31.1'N, 143°34.2'E	2968-3032	off Kinkazan
SO07-K3	6-7 Aug. 2007	BT	38°33.7'N, 143°41.2'E	38°33.2'N, 143°41.5'E	4105-4181	off Kinkazan
SO07-K4	7 Aug. 2007	BT	38°30.4'N, 143°43.6'E	38°31.5'N, 143°44.7'E	4953-5175	off Kinkazan
SO07-O4	7 Aug. 2007	BT	36°54.0'N, 142°56.6'E	36°55.5'N, 142°57.3'E	5219-5268	off Onahama
SO07-O3	7-8 Aug. 2007	BT	36°53.4'N, 142°37.0'E	36°53.6'N, 142°36.8'E	4094-4128	off Onahama
SO07-O2	8 Aug. 2007	BT	36°48.3'N, 142°22.3'E	36°48.7'N, 142°22.1'E	2948-2991	off Onahama
SO07-O1	8 Aug. 2007	BT	36°43.9'N, 141°49.1'E	36°44.0'N, 141°48.9'E	2020-2024	off Onahama
SO07-C6	1-2 Aug. 2007	TR	42°07.4'N, 146°13.0'E	42°08.2'N, 146°15.2'E	5680-5676	off Kushiro
SO07-C7	5-6 Aug. 2007	TR	39°36.1'N, 142°33.9'E	39°35.9'N, 142°34.0'E	945-935	off Miyako
SO07-C8	5-6 Aug. 2007	TR	39°41.0'N, 142°12.9'E	39°40.8'N, 142°13.1'E	214-216	off Miyako
SO08-C4-B	21 Jul. 2008	BT	37°30.9'N, 141°34.9'E	37°31.0'N, 141°34.7'E	211-212	off Iwaki
SO08-C5-B	21 Jul. 2008	BT	37°36.0'N, 142°23.7'E	37°36.5'N, 142°23.5'E	910-912	off Iwaki
SO08-C4	21-22 Jul. 2008	TR	37°30.1'N, 141°34.8'E	37°30.0'N, 141°35.0'E	212-214	off Iwaki
SO08-C5	21-22 Jul. 2008	TR	37°33.5'N, 142°22.9'E	37°34.0'N, 142°22.1'E	880-855	off Iwaki