

An Outline of “Research on Deep-sea Fauna of the Sea of Japan, 2009–2013”

Hiroshi Saito¹, Kazunori Hasegawa¹, Yoichi Kogure², Ikuko Yoshio²,
Yuji Ueda² and Toshihiko Fujita¹

¹ Department of Zoology, National Museum of Nature and Science,
4–1–1 Amakubo, Tsukuba-shi, Ibaraki, 305–0005 Japan
E-mail.: h-saito@kahaku.go.jp

² Japan Sea National Fisheries Research Institute, Fisheries Research Agency,
1–5939–22 Suido-cho, Chuou-ku, Niigata-shi, Niigata, 951–8121 Japan

Abstract: Investigations of deep-sea fauna were carried out in the Sea of Japan during the years from 2009 to 2013. An outline of the investigations is given, including characteristics of the study area and methods of collecting and preserving.

Key words: deep-sea, fauna, biodiversity, Sea of Japan.

Introduction

A series of a deep-sea research project entitled “Study on Deep-Sea Fauna and Conservation of Deep-Sea Ecosystem” conducted by The National Museum of Nature and Science reached the last term of the project. This project was started in 1993 with the purpose to describe the deep-sea fauna around Japan and to trace anthropogenic pollutants in deep-sea animals. In the first term of the project, investigations were carried out in Suruga Bay on the Pacific coast of central Japan from 1993 to 1996, following three investigations in Tosa Bay on the Pacific coast of Shikoku Island in 1997–2001, around Nansei Islands in southwestern Japan in 2002–2005, and on the Pacific coast of northern Japan in 2005 to 2008. The results were published in the National Science Museum Monographs (National Science Museum, 1997; Fujita *et al.*, 2001; Hasegawa *et al.*, 2005) and in the National Museum of Nature and Science Monographs (Fujita, 2008), which introduced one new family, two new genera, and 73 new species among more than 4800 species dealt in total of all papers. Investigations for the fifth, the last term of the project were conducted in the Sea of Japan from 2009 to 2013.

The researches for the fauna of the Sea of Japan started from the end of the eighteenth century and the beginning of the nineteenth centuries by European and Russian expeditions. Since then, various investigations in regard with the fauna and zoogeography were carried out in this sea. The history of investigations was reviewed by Nishimura (1965) and Adrianov and Lutaenko (2012). The attempt to elucidate the fauna of the Sea of Japan has been continued until now. There are some ongoing projects by Russian institutes and by Russian and German cooperative expedition among others (Adrianov and Lutaenko, 2012; Malyutina *et al.*, 2012). However, no comprehensive work for the deep-sea fauna has been available to date. In this research project, deep-sea fauna on the continental shelf and slope of the Sea of Japan, mainly off Honshu, the main Island of Japan were studied. In this introductory paper, participants, characteristics of the

study area, methods of sampling, treatment of samples are briefly described and illustrated.

Participants

The present research project was conducted during years 2009–2013 by the Department of Zoology, National Museum of Nature and Science in cooperation with the Japan Sea National Fisheries Research Institute, Fisheries Research Agency. The participants are: Toshihiko Fujita, Kazunori Hasegawa, Hironori Komatsu, Tsunemi Kubodera, Toshiaki Kuramochi, Keiichi Matsuura, Masanori Nakae, Hiroshi Namikawa, Hiroshi Saito, and Gento Shinohara (National Museum of Nature and Science); Yoichi Kogure, Yuji Ueda, Ikuko Yoshio (Japan Sea National Fisheries Research Institute, Fisheries Research Agency); Tadashi Akiyama (Okayama University); Yoshiaki Ishida (Suginami-ku, Tokyo); Takashi Okutani (Kawasaki-shi, Kanagawa).

Survey Area

The Sea of Japan is a marginal sea of the northwestern Pacific Ocean, which extending between the Asian continent, the Japanese Archipelago and Sakhalin Island, from north to south for more than 2200 km and has a maximum width of about 1000 km. There are neither large islands nor large bays in the sea. It is rather isolated, semi-enclosed sea, and communicates with the neighboring seas and the Pacific Ocean via four shallow and narrow Straits with sill depths in the deeper Tsushima and Tsugaru Straits of just 130 m (Gorbarenko and Southon, 2000). The sea has a surface area exceeding 1000000 km² and an average depth of 1350 m (Tada, 1994). It has three major basins: the Japan Basin, the largest, and deepest basin (3000–3700 m), in the north, the Yamato Basin (2000–2900 m) in the southeast, and the Tsushima Basin (1500–2500 m) in the southwest (Tada, 1994; Nakamura *et al.*, 2003). Surrounded by the three basins, Yamato Ridge raises about 2000 m high, with shallowest depth 236 m (Nakamura *et al.*, 2003).

At present, the Tsushima Current which is a branch of the warm water Kuroshio Current (Japan Current) is the only current flowing into the Sea of Japan (Tada, 1994). The sea currents circulate in the counterclockwise direction. The Tsushima Current enters into the Sea of Japan through Tsushima Strait and flows out through the Tsugaru and Soya Straits, supplying heat and salt to surface and intermediate waters in the southeast (Gorbarenko and Southon, 2000). The returning branches are composed of the Liman, North Korea and Central Japan Sea currents which bring fresh and cold water along the continental coast to the south. Underneath the warm water layer, cold water mass, lower than 1°C, called the Japan Sea Proper Water, is dominated about 85% of whole water mass of the Sea of Japan (Naganuma, 2000). Other than the low water temperature, this cold water mass is characterized by an extremely high dissolved oxygen (>210 µmol/kg), uniform salinity (34.1‰), and a short residence time (to 300 yr) (Gamo and Horibe, 1983). The mean water temperature throughout all layers in whole the Sea of Japan is 0.7°C. As such, this sea is known to be the second coldest sea in the world (Naganuma, 2000).

The deep-sea fauna of the Sea of Japan is characterized by the poorer diversity, lower endemism, and lack of oceanic deep-water fauna (Nishimura, 1983; Tyler, 2002). The formation of these features were explained by a mass extinction of the deep-sea organisms by the entrance of low salinity water, stratification in water column, fading of vertical mixture of water mass, which made dissolved oxygen depletion called hypoxia, during the last glacial period (Takayama, 1983; Oba, 1989). The present deep-sea fauna has been considered to be formed by re-entrance of animals from the neighboring area after the glacier period. On the other hand, recent researches

revealed a layer of the water depth from 100 to 400m did not become hypoxia and kept normal salinity, thus a part of the present faunules are survivors, which taking refuge in that zone (Amano, 2004; Itaki *et al.*, 2004: *vide* Kojima, 2007).

Sampling Methods

The samples were collected mainly by the following five research or training vessels: The T/V *Tanshu-maru* of Kasumi High School is 56.2m in length and 499 gross ton (Fig. 1A); the R/V *Tansei-maru*, of the Japan Agency for Marine-Earth Science and Technology is 51.2m in length and 610 gross tons (Fig. 2B); R/Vs *Soyo-maru* and *Mizuho-maru* of the Fisheries Research Agency are 67.5m in length and 892 gross ton, and 38.5m in length and 156 gross ton, respectively (Fig. 1C, D); R/V *Ryokuyo-maru* of Kyoto University is 16.5m in length and 18 gross ton (Fig. 1E). Benthic animals were obtained from depths of 53–2381m by means of an otter trawl, two types of beam trawls, three types of biological dredges, a sledge, and a baited trap operated by above five vessels. For comparisons, shallow water samples were collected at off Oki-dogo Island by the following two vessels: T/V *Galathea* of the Marine Biological Science Section, Shimane University is 12m in length; small boat *Pandion* of the same section is 8.2m in length.

Otter trawl

The samplings of a bottom otter trawl was carried out by the T/V *Tanshu-maru*. This otter trawl net, named “NT-4” has the mouth span of 18m between the tips of the side net, 6m in height, and whole net length of 53.9m. The stretched mesh size of the main part of the net was 50mm, that of the cod end is 20mm. Further information of the net is described and illustrated in Hirose *et al.* (2006). A total of 211 sampling stations were set between the isobaths 179 and 497m in offshore of the western Japan (Fig. 2, Appendix 1). The net was usually towed for 30 minutes on the bottom. The station data comprising with station numbers, dates, positions, depths and bottom temperatures are shown in Table 1.

Beam trawls

Five types of beam trawls were used in cruises of T/V *Tanshu-maru*, R/Vs *Tansei-maru*, *Soyo-maru*, *Mizuho-maru*, and *Ryokuyo-maru*. The beam trawl of T/V *Tanshu-maru*, which is called “Beni-Zuwai Type 1”, abbreviated as BZ-1 has 8.2m x 1m mouth opening, and composed of a pair of steel skids with 0.7m wide and 2m length, two beams, and 27.2m collecting net. The stretched mesh size of the main part of the net was 25mm, that of the cod end is 20mm. Detailed features of BZ-1 is described and illustrated in Hirose *et al.* (2006). In cruises of T/V *Tanshu-maru*, another beam trawl, called “Zuwai”, abbreviated as ZY was employed (Fig. 1F). This net has basically the same structure with BZ-1, but is equipped with righter steel frame. A total of 247 sampling stations were set between the isobaths 150 and 2308m (Fig. 3, Appendix 1).

During two cruises, KT-08-20 and KT-09-11 of the R/V *Tansei-maru*, the ORE-type beam trawl of 3m span was used (Fig. 1G). It bears a pair of steel skids held by a pair of 3m steel beams at their upper side, with a 10m-long double layered collecting net attached to the skids. The width and height of the fixed opening are 2.8m and 1m, respectively. The mesh size of the inner net is 4mm square at the cod end. The beam trawl was usually towed for 30 minutes on the bottom in each tow. A total of 44 sampling stations were set between the isobaths 152 and 1704m. (Fig. 4, Appendix 2).



Fig. 1. Research vessels and gears. A, T/V *Tanshu-maru*; B, R/V *Tansai-maru*; C, R/V *Soyo-maru*; D, R/V *Mizuho-maru*; E, R/V *Ryokuyo-maru*; F, beam trawl of T/V *Tanshu-maru*, "ZY"; G, 3 m ORE type beam trawl; H, beam trawl of R/V *Soyo-maru*; I, 1 m dredge; J, trap cages.

In cruises of R/V *Soyo-maru*, Sigsbee-Agassiz type beam trawl of 2m span was used (Fig. 1H). It bears a pair of steel skids held by a pair of 2m oak wood beams at anterior and posterior part of the skids. The steel skids are wider in bottom. The width and the height of the fixed opening are 2m and 0.8m, respectively. The mesh size of the net is 20mm throughout. One or two plankton nets with 0.5 mm and 1 mm mesh size were occasionally equipped in both beam trawl

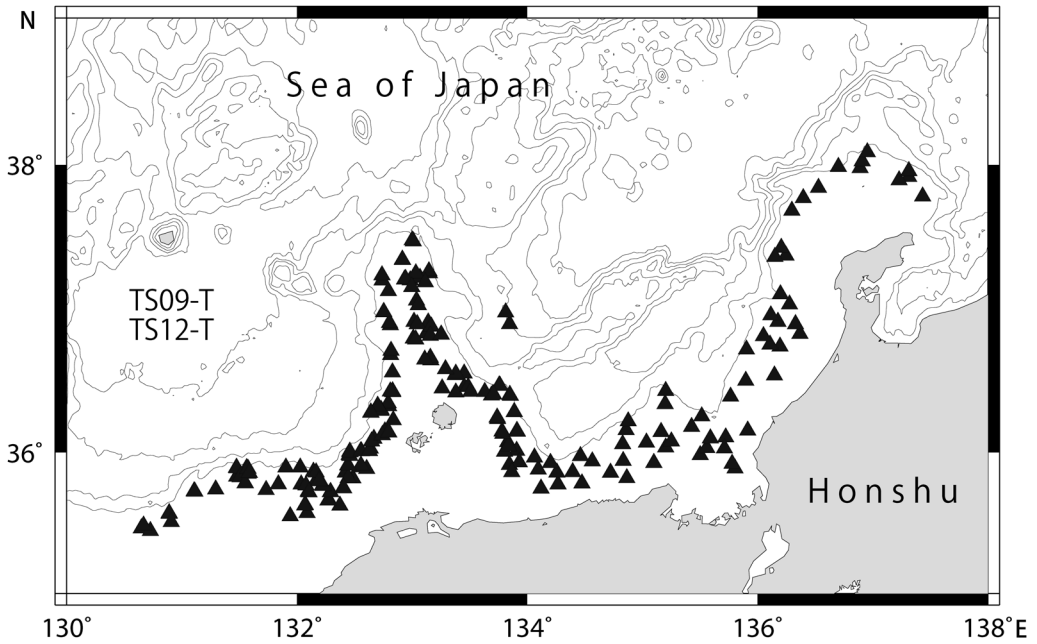


Fig. 2. Sampling sites for otter trawl net by T/V *Tanshu-maru*.

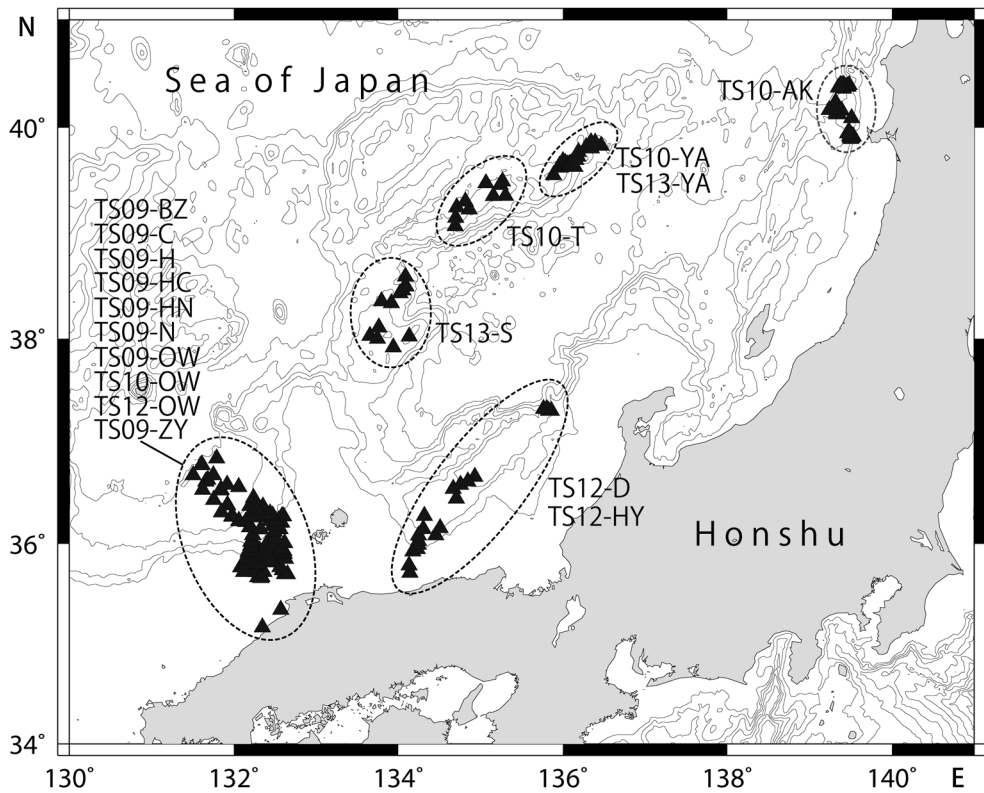


Fig. 3. Sampling sites for beam trawl net by T/V *Tanshu-maru*.

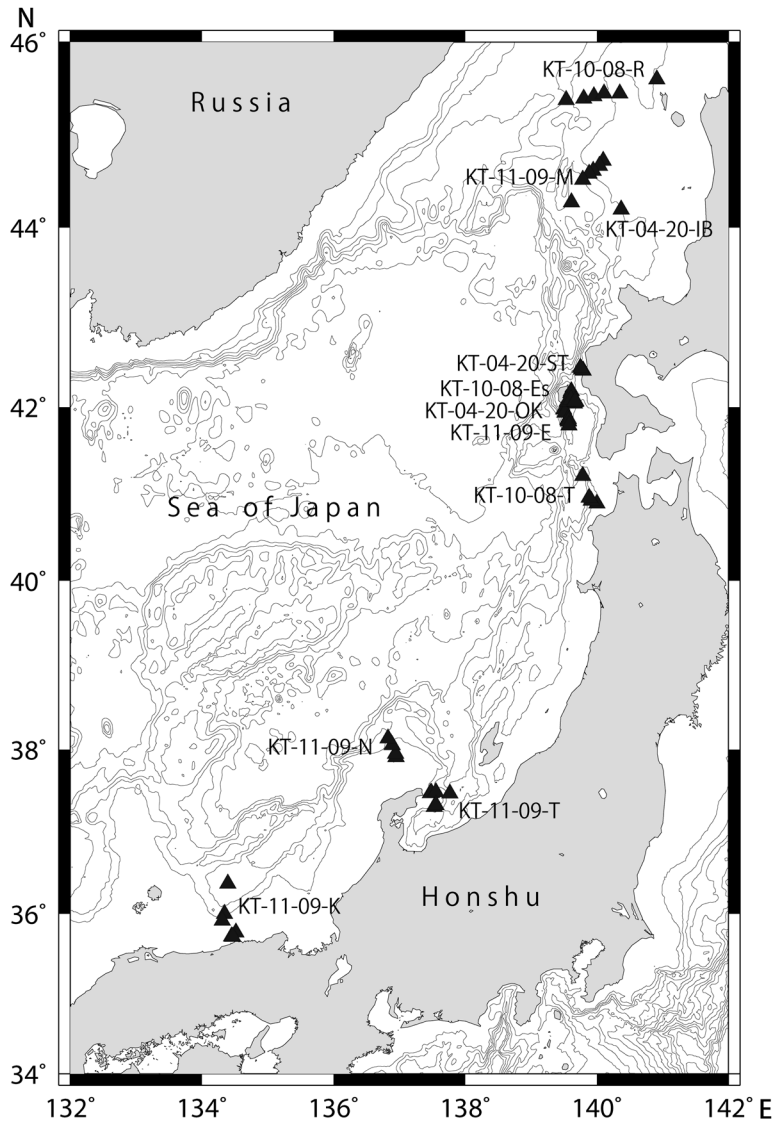


Fig. 4. Sampling sites by R/V *Tansei-maru*.

nets to obtain minute benthic animals. A total of 22 sampling stations were set between the isobaths 306 and 2367 m (Fig. 5, Appendix 3).

The beam trawl net of R/V *Mizuho-maru* is also Sigsbee-Agassiz type, with 2 m span and 0.5 m height of mouth opening. The net is 5 m long with 40 mm mesh size in main part, and 4 mm mesh size inner net in cod end. Following the beam trawl sampling, collecting of benthic samples by Smith-McIntyre grab sampler with 500 cm² grab area was carried out in each station. A total of 26 sampling stations were set between the isobaths 53 and 195 m (Fig. 6, Appendix 4).

The beam trawl net of R/V *Ryokuyo-maru* has rather flat profile, with 2 m span and 0.3 m height of mouth opening. It bears a pair of rather wide steel skids, 150 mm wide, held by three narrow beams and supported bars jointed with a truss structure. The net is 6 m long with mesh size 5 mm throughout. One or two plankton nets with 0.5 mm and 1 mm mesh size were equipped

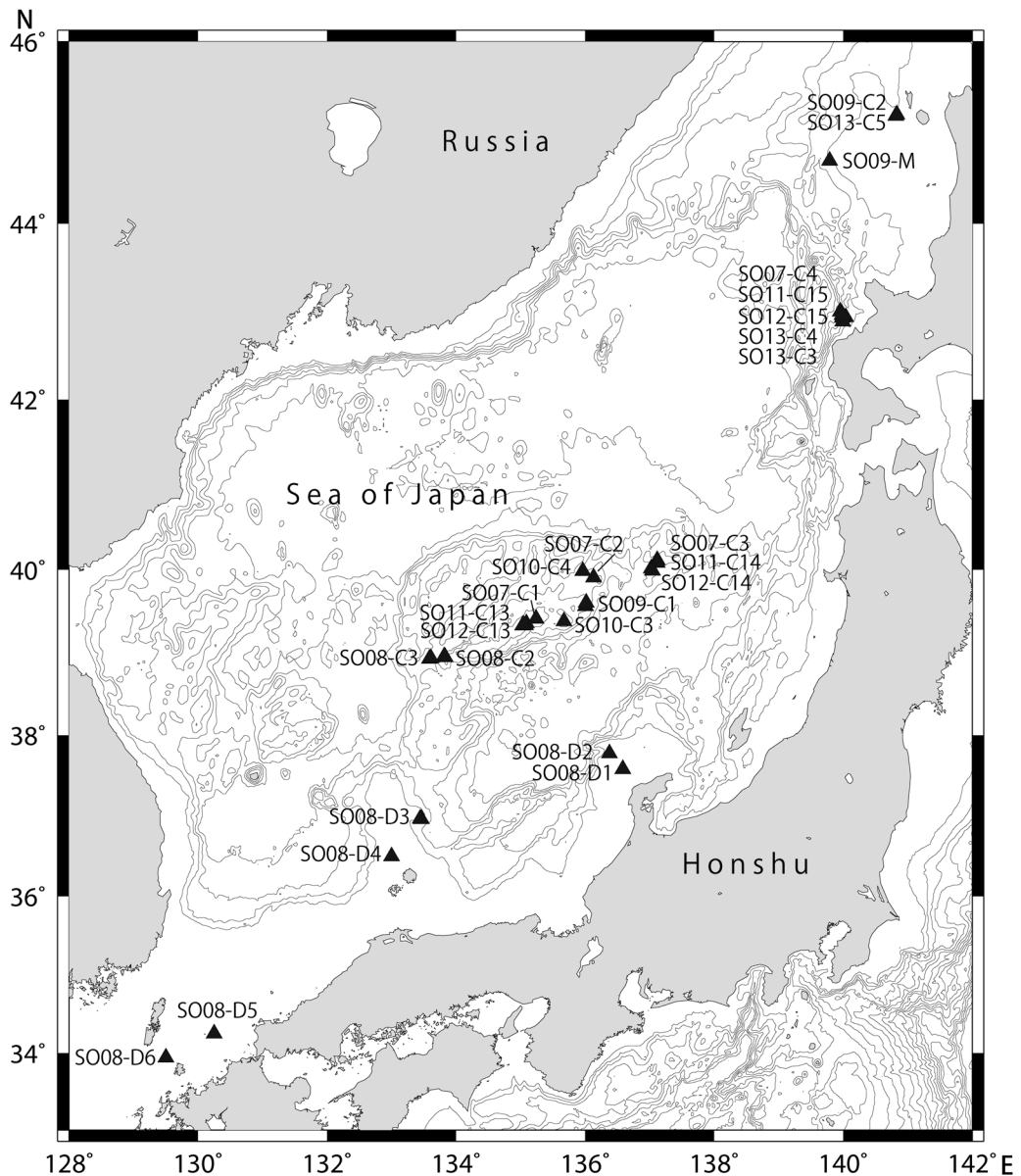


Fig. 5. Sampling sites by R/V *Soyo-maru*.

in the net for collection of minute benthic animals. A total of 4 sampling stations were set between the isobaths 70 and 106 m in offshore of the western Wakasa Bay (Fig. 6, Appendix 5).

Dredges

The ORI type biological dredge was used by R/Vs *Tansei-maru* (Fig. 11), *Soyo-maru*, *Mizuho-maru*, and *Ryokuyo-maru* (Appendices 2–5). The dredge is modified from a naturalist dredge, which has a rectangular steel frame. Two sizes of this type of dredge were used: 1 m in width, 0.3 m in height and 0.5 m in width, 0.15 m in height. Both have a double-layer collecting net about 1 m long. The outer net is strong, 20 mm in stretched mesh size. The inner net has a

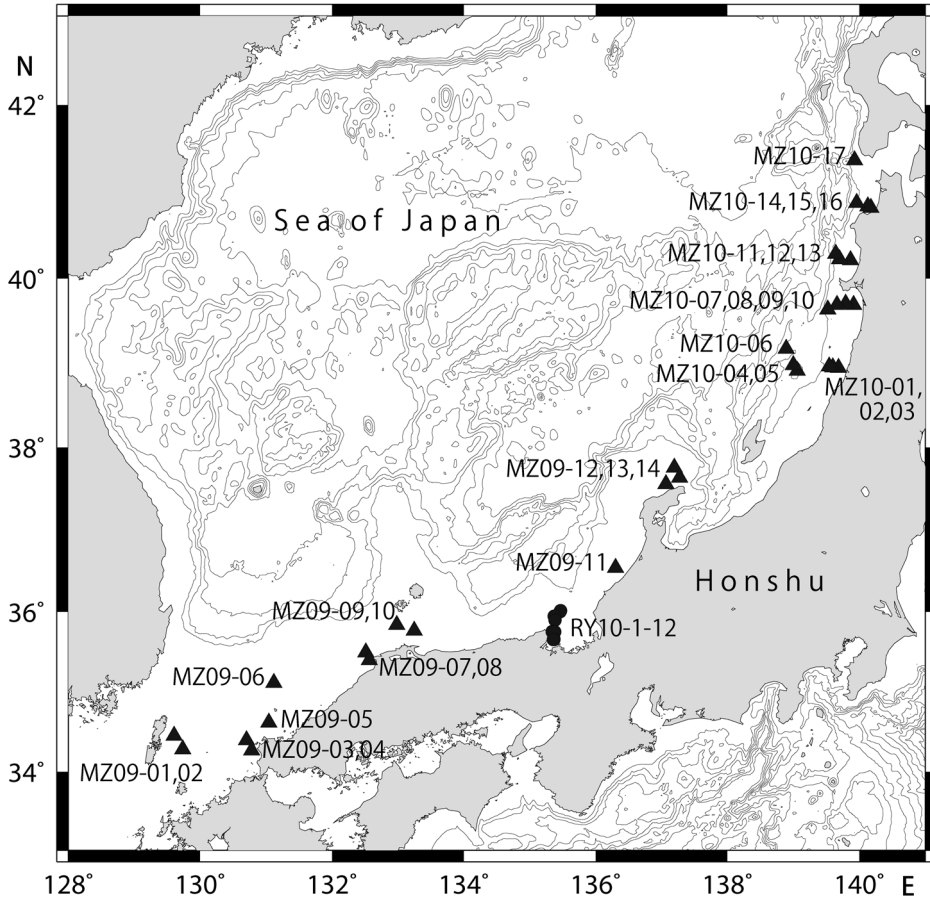


Fig. 6. Sampling sites by R/Vs *Mizuho-maru* and *Ryukuyo-maru*.

fine, 5 mm in square mesh size. A total of 28 sampling stations were set between the isobaths 67 m and 370 m (Figs. 4–6, Appendices 2–5).

Another type of dredge was employed for the collecting of shallow water benthos off Oki Dogo Island, at the depth from 26–39 m. It is a tetrahedron shaped dredge with 5 mm mesh stainless steel net which is operated by the T/V *Galathea*. In this area, a small Ockelmann type dredge, with 0.3 m wide, 0.15 m height mouth opening, 1 mm mesh net, was operated by a small boat, *Pandion* in shallower depths (Appendix 6).

Baited trap

The baited trap was operated by R/V *Soyo-maru* to collect mainly fishes and crabs (Fig. 1J). The shape is truncated cone, made with steel frame covered by 2 cm mesh net, and has three entrance holes on the side. The diameter is 1.7 m at bottom and 1.2 m at top, and the height is 1.2 m. Four plastic jars containing cut sardine as bait were placed in each cage. Five baited trap were linked together with ropes, and sunken 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. A total of 15 sampling stations were set between the isobaths 302 and 2381 m (Fig. 5, Appendix 3).

Sample Treatment and Depository

Samples collected by the T/V Tanshu-maru and R/Vs Soyo-Maru and Mizuho-maru

On the board of those research vessels, a few researchers worked in each cruise. The treatments of samples were as follows. Large organisms, sunken wood and rocks were sorted out. Fishes for collecting the parasitic animals were put aside in a cooler box filled with small cubic ice. A part of the remaining samples was fixed by *ca.* 10% neutral sea water formalin in plastic jars, and another part was passed through a 4 mm mesh sieve to remove mud or mucus, then roughly sorted. The sorted specimens were anesthetized and/or captured images if necessary, and fixed by *ca.* 10% neutral sea water formalin in plastic jars. Some large organisms, sunken wood, and rocks were occasionally packed in plastic bags and/or jars and frozen in -20°C freezer on board. Selected specimens or a part of those specimens were fixed in 99% ethanol for molecular analysis, and kept in a refrigerator.

Samples collected by the R/V Tansei-maru

On the board of R/V *Tansei-maru*, 11–12 researchers worked in each cruise. Samples collected by the beam trawl and dredge were spread out in large plastic boxes, and large organisms, sunken wood and rocks were roughly sorted out on board. The boxes were then filled with sea water, and minute suspended animals in the sea water were screened by a fine net with mesh size of 0.3 mm. The remaining samples in the boxes were screened with 5 mm and 2 mm mesh sieves. The screened samples were roughly sorted again in the laboratory aboard the vessel. These sorted samples as well as all other screened samples were distributed to the researchers in charge. In general those samples were anesthetized and/or captured images if necessary, fixed by 8–10% neutralized sea water formalin. Selected specimens or a part of those specimens were fixed in 99% ethanol for molecular analysis, and kept in a refrigerator.

Samples collected by the R/V Ryokuyo-maru

This research vessel needs to come back the laboratory port within a day. The sample treatment is almost as same as the procedures mentioned above, but the sorting, anesthetizing, image capturing and fixation were carried out in the laboratory on the land.

Depository of specimens

The majority of specimens obtained in this survey and used for taxonomic studies are deposited in NSMT, but some specimens are deposited in 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 the surveys, the following 10 original papers were contributed to the present volume. A total of 494 species were reported and one genus and 11 species were described as new to science. Cnidaria: 1) Namikawa described a species of hydrozoans from Toyama Bay. Platyhelminthes: 2) Kuramochi reported 21 species of parasitic digenean trematodes from deep-sea fishes. Mollusca: 3) Saito and Salvini-Plawen described one new species of solenogastres. 4) Okutani and Saito listed 29 species of bivalves and seven species of scaphopods. 5) Hasegawa described 11 species of rissoid gastropods, including seven new species. 6) Kubodera and Okutani described a new species and new genus of cephalopods. Arthropoda: 7) Akiyama reported 26

species of cumaceans, including two new species. 8) Komatsu reported 31 species of decapod crustaceans, including one undescribed species. Echinodermata: 9) Fujita, Ishida and Kogure reported 41 species of ophiuroids. Chordata: 10) Shinohara, Nakae, Kinoshita, Kojima and Matsuura listed 332 species of deep-sea fishes.

Acknowledgements

We wish to express our sincere thanks to the following persons for their kindest collaboration in the field work: captains and crews of the T/Vs *Tanshu-maru*, *Galathea*, R/Vs *Tansei-maru*, *Soyo-maru*, *Mizuho-maru*, and *Ryokuyo-maru*, and Dr. Yoshiaki Kai, Dr. Masahiro Ueno and staffs of Maizuru Fisheries Research Station, Kyoto University, and Dr. Yoshihiko Maruyama, Dr. Kohzoh Ohtsu, and staffs of Marine Biological Section, Shimane University.

References

- Adrianov, A. V. and K. A. Lutaenko, 2012. Biodiversity in the Sea of Japan: more than a century of Russian research. In: Sun, S., A. V. Adrianov, K. A. Lutaenko and X. Sun (eds.), *Marine Biodiversity and Ecosystem Dynamics of the North-Western Pacific Ocean*, pp. 1–13. Science Press, Beijing.
- Fujita, T. (ed.), 2009. Deep-sea Fauna and Pollutant off Pacific Coast of Northern Japan. *National Science Museum Monographs*, (39): 1–526.
- Fujita, T., H. Saito and M. Takeda (eds.), 2001. Deep-sea Fauna and Pollutant in Tosa Bay. *National Science Museum Monographs*, (20): 1–380.
- Gamo, T. and Y. Horibe, 1983. Abyssal circulation in the Japan Sea. *Journal of Oceanographic Society of Japan*, **39**: 220–230.
- Gorbarenko, S. A. and J. R. Southon, 2000. Detailed Japan Sea paleoceanography during the last 25kyr: constraints from AMS dating and $\delta^{18}\text{O}$ of planktonic foraminifera. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **156**: 177–193.
- Hasegawa, K., G. Shinohara and M. Takeda (eds.), 2005. Deep-sea Fauna and Pollutant in Nansei Islands. *National Science Museum Monographs*, (29): 1–476.
- Hirose, T., I. Yoshio, S. Shirai, T. Minami and K. Niu, 2006. Development of a large-sized dredge 'Beni-Zuwai Type-1' for deep sea bottom sampling. *Bulletin of the Fisheries Research Agency*, (17): 69–82. (In Japanese.)
- Kojima, S., K. Adachi and Y. Kodama, 2007. Formation of deep-sea fauna and changes of marine environment in the Japan Sea. *Fossils*, **82**: 67–71. (In Japanese.)
- Malyutina, M. V. and A. Brandt, 2012. Introduction to SoJaBio (Sea of Japan Biodiversity Studies). *Deep-Sea Research Part II*, **86–87**: 1–9.
- Naganuma, K., 2000. The Sea of Japan as the natural environment of marine organisms. *Bulletin of the Japan Sea National Fisheries Research Institute*, (50): 1–42. (In Japanese.)
- Nakamura, H., T. Segawa and J. Ogata, 2003. Prediction of sources of plastic containers washed up on the Japan Sea coast. *Technical Bulletin on Hydrography and Oceanography*, **21**: 80–89. (In Japanese.)
- National Science Museum (ed.), 1997. Deep-sea fauna and pollutant in Suruga Bay. *National Science Museum Monographs*, (12): 1–336.
- Nishimura, S., 1965. The zoogeographical aspects of the Japan Sea. Part I. *Publication from the Seto Marine Biological Laboratory*, **13**: 35–79.
- Nishimura, S., 1983. Okhotsk Sea, Japan Sea, East China Sea. In: Ketchum, B.H. (ed.), *Ecosystems of the World, 26. Estuaries and Enclosed Seas*, pp. 375–402. Elsevier, Amsterdam.
- Oba, T., 1989. Environmental changes of the Japan Sea during last 85 thousands years. *Kagaku*, **59**: 672–681. (In Japanese.)
- Tada, R., 1994. Paleoclimatographic evolution of the Japan Sea. *Paleogeography, Paleoclimatology, Paleoecology*, **108**: 487–508.
- Takayama, T., 1983. Quaternary marine paleoenvironment of the Sea of Japan based on the analysis of calcareous nannofossils. *Marine Science Monthly*, **152**: 85–89. (In Japanese.)
- Tyler, P. A., 2002. Deep-sea eukaryote ecology of the semi-isolated basins off Japan. *Journal of Oceanography*, **58**: 333–341.

Appendix 1. Sampling data of the *T/S Tanshu-maru* cruises. Abbreviations for sampling gears: OT, otter trawl; BZ and ZY, beam trawl.

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Bottom temp. (°C)
TS09-T001	9 May 2009	OT	35°43.56'N, 131°06.41'E	35°42.96'N, 131°04.81'E	227–224	1.18
TS09-T002	10 May 2009	OT	35°49.86'N, 131°28.63'E	35°50.10'N, 131°26.81'E	248–248	1.36
TS09-T003	10 May 2009	OT	35°47.01'N, 131°33.11'E	35°47.77'N, 131°31.52'E	228–229	1.11
TS09-T004	10 May 2009	OT	35°51.03'N, 131°34.58'E	35°51.09'N, 131°34.19'E	280–279	0.9
TS09-T006	9 May 2009	OT	35°53.59'N, 131°28.46'E	35°53.50'N, 131°26.62'E	342–329	1.15
TS09-T007	10 May 2009	OT	35°53.46'N, 131°33.78'E	35°53.32'N, 131°34.55'E	339–339	0.83
TS09-T008	11 May 2009	OT	35°37.75'N, 132°04.41'E	35°37.79'N, 132°06.24'E	208–208	2.29
TS09-T010	12 May 2009	OT	35°46.53'N, 132°02.23'E	35°46.28'N, 132°04.04'E	281–281	0.79
TS09-T011	9 May 2009	OT	35°27.85'N, 130°38.87'E	35°28.90'N, 130°40.18'E	208–211	3.33
TS09-T012	11 May 2009	OT	35°43.46'N, 132°05.83'E	35°43.34'N, 132°07.66'E	251–251	1.0
TS09-T013	9 May 2009	OT	35°34.34'N, 130°53.43'E	35°34.21'N, 130°51.75'E	225–223	2.63
TS09-T016	12 May 2009	OT	35°46.11'N, 132°13.33'E	35°46.42'N, 132°15.13'E	280–280	0.8
TS09-T017	12 May 2009	OT	35°39.83'N, 132°16.68'E	35°40.62'N, 132°18.22'E	209–211	1.95
TS09-T018	12 May 2009	OT	35°43.21'N, 132°17.38'E	35°44.03'N, 132°18.92'E	234–236	1.25
TS09-T020	13 May 2009	OT	35°45.09'N, 132°24.13'E	35°46.19'N, 132°25.36'E	215–215	2.27
TS09-T023	13 May 2009	OT	35°50.38'N, 132°23.92'E	35°50.70'N, 132°24.22'E	272–270	0.86
TS09-T025	13 May 2009	OT	35°49.09'N, 132°29.16'E	35°50.23'N, 132°31.15'E	230–230	1.46
TS09-T027	13 May 2009	OT	35°54.57'N, 132°26.46'E	35°55.88'N, 132°27.32'E	280–280	0.8
TS09-T029	12 May 2009	OT	35°48.05'N, 132°09.98'E	35°48.13'N, 132°11.82'E	321–321	0.72
TS09-T031	13 May 2009	OT	35°58.97'N, 132°27.18'E	36°00.07'N, 132°28.41'E	328–322	0.66
TS09-T032	11 May 2009	OT	35°53.68'N, 131°54.22'E	35°53.63'N, 131°52.99'E	417–408	0.66
TS09-T033	11 May 2009	OT	35°51.91'N, 132°08.59'E	35°51.75'N, 132°10.42'E	441–439	0.53
TS09-T034	14 May 2009	OT	35°53.75'N, 132°32.75'E	35°55.16'N, 132°33.35'E	210–210	1.88
TS09-T035	14 May 2009	OT	36°01.72'N, 132°38.20'E	36°00.47'N, 132°37.37'E	210–211	1.2
TS09-T036	15 May 2009	OT	36°05.85'N, 132°40.07'E	36°04.82'N, 132°38.73'E	230–234	1.42
TS09-T037	15 May 2009	OT	36°08.98'N, 132°45.82'E	36°07.92'N, 132°44.52'E	206–205	1.01
TS09-T038	16 May 2009	OT	36°17.98'N, 132°43.84'E	36°19.45'N, 132°44.22'E	269–269	0.69
TS09-T039	16 May 2009	OT	36°19.53'N, 132°47.79'E	36°21.00'N, 132°48.10'E	219–218	0.84
TS09-T040	16 May 2009	OT	36°25.88'N, 132°49.85'E	36°27.34'N, 132°50.27'E	209–208	7.38
TS09-T041	26 May 2009	OT	36°27.04'N, 133°15.62'E	36°28.10'N, 133°16.93'E	223–222	1.22
TS09-T042	26 May 2009	OT	36°27.62'N, 133°27.16'E	36°27.85'N, 133°29.00'E	252–255	0.94
TS09-T043	26 May 2009	OT	36°25.32'N, 133°22.74'E	36°25.16'N, 133°24.11'E	214–209	1.05
TS09-T044	27 May 2009	OT	36°24.07'N, 133°41.32'E	36°23.01'N, 133°42.64'E	221–220	1.3
TS09-T045	27 May 2009	OT	36°24.72'N, 133°42.12'E	36°23.79'N, 133°43.57'E	232–232	1.01
TS09-T046	1 June 2009	OT	36°14.15'N, 133°44.54'E	36°15.59'N, 133°44.03'E	208–208	1.23
TS09-T047	1 June 2009	OT	36°08.90'N, 133°46.83'E	36°07.75'N, 133°47.49'E	207–207	1.22
TS09-T048	1 June 2009	OT	36°04.44'N, 133°49.75'E	36°02.97'N, 133°50.06'E	211–212	1.37
TS09-T049	2 June 2009	OT	36°09.18'N, 133°54.64'E	36°07.75'N, 133°55.16'E	247–247	1.4
TS09-T050	2 June 2009	OT	36°00.76'N, 133°54.48'E	35°59.29'N, 133°54.81'E	231–231	1.19
TS09-T051	2 June 2009	OT	35°54.83'N, 133°50.71'E	35°53.33'N, 133°50.64'E	206–206	1.47
TS09-T052	2 June 2009	OT	35°55.89'N, 133°55.88'E	35°54.51'N, 133°56.60'E	230–231	1.41
TS09-T053	14 May 2009	OT	36°00.39'N, 132°27.55'E	36°01.37'N, 132°28.49'E	349–350	0.63
TS09-T054	15 May 2009	OT	36°19.75'N, 132°42.06'E	36°21.23'N, 132°42.38'E	318–322	0.7
TS09-T055	27 May 2009	OT	36°24.35'N, 133°50.95'E	36°23.02'N, 133°51.80'E	372–373	0.75
TS09-T056	1 June 2009	OT	36°17.05'N, 133°53.20'E	36°15.74'N, 133°53.96'E	358–352	0.95
TS09-T057	15 May 2009	OT	36°16.94'N, 132°38.50'E	36°18.42'N, 132°38.77'E	441–434	0.62
TS09-T058	27 May 2009	OT	36°28.32'N, 133°45.40'E	36°28.21'N, 133°47.24'E	429–450	0.71
TS09-T059	16 May 2009	OT	36°33.78'N, 132°49.76'E	36°35.28'N, 132°49.82'E	227–228	5.39
TS09-T060	16 May 2009	OT	36°41.06'N, 132°48.82'E	36°42.56'N, 132°48.84'E	248–249	1.71
TS09-T061	17 May 2009	OT	36°53.52'N, 132°48.65'E	36°55.02'N, 132°48.63'E	274–279	1.01
TS09-T062	24 May 2009	OT	36°54.92'N, 133°01.01'E	36°54.06'N, 133°02.54'E	280–279	0.86
TS09-T063	25 May 2009	OT	36°50.15'N, 133°07.44'E	36°49.40'N, 133°09.06'E	270–271	0.87
TS09-T064	25 May 2009	OT	36°47.96'N, 133°00.63'E	36°47.62'N, 133°02.44'E	230–230	1.71
TS09-T065	25 May 2009	OT	36°38.82'N, 133°09.79'E	36°37.64'N, 133°10.94'E	209–209	1.91
TS09-T066	26 May 2009	OT	36°32.63'N, 133°22.51'E	36°31.16'N, 133°22.89'E	241–242	1.08
TS09-T067	26 May 2009	OT	36°33.30'N, 133°27.14'E	36°34.80'N, 133°27.14'E	271–290	0.92
TS09-T068	20 May 2009	OT	36°58.89'N, 132°45.08'E	37°00.22'N, 132°44.90'E	333–339	0.76
TS09-T069	20 May 2009	OT	37°12.13'N, 132°44.40'E	37°13.61'N, 132°44.15'E	318–318	0.87
TS09-T070	20 May 2009	OT	37°07.71'N, 132°47.64'E	37°09.21'N, 132°47.62'E	308–309	0.85

Appendix 1. (continued)

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Bottom temp. (°C)
TS09-T071	20 May 2009	OT	37°12.57'N, 132°56.05'E	37°13.67'N, 132°54.78'E	321–320	0.79
TS09-T072	21 May 2009	OT	37°20.78'N, 132°54.93'E	37°21.77'N, 132°53.53'E	350–351	0.67
TS09-T073	21 May 2009	OT	37°15.09'N, 133°01.91'E	37°16.36'N, 133°00.90'E	360–359	0.68
TS09-T074	24 May 2009	OT	37°12.20'N, 132°59.02'E	37°10.92'N, 132°59.98'E	330–330	0.83
TS09-T075	24 May 2009	OT	37°13.25'N, 133°04.10'E	37°11.99'N, 133°05.11'E	363–362	0.66
TS09-T076	24 May 2009	OT	37°03.79'N, 133°02.28'E	37°02.39'N, 133°02.95'E	320–321	0.75
TS09-T077	24 May 2009	OT	36°54.61'N, 133°08.42'E	36°53.46'N, 133°09.63'E	320–321	0.85
TS09-T078	25 May 2009	OT	36°49.63'N, 133°15.16'E	36°48.52'N, 133°16.42'E	348–349	0.74
TS09-T079	21 May 2009	OT	37°28.39'N, 133°00.64'E	37°27.28'N, 133°01.99'E	429–430	0.61
TS09-T080	21 May 2009	OT	37°15.12'N, 133°09.03'E	37°16.57'N, 133°08.52'E	440–440	0.56
TS09-T081	22 May 2009	OT	35°52.79'N, 134°05.74'E	35°51.62'N, 134°06.89'E	288–287	NA
TS09-T082	22 May 2009	OT	35°44.75'N, 134°07.16'E	35°45.07'N, 134°08.95'E	238–240	NA
TS09-T083	22 May 2009	OT	35°46.54'N, 134°16.06'E	35°46.83'N, 134°17.86'E	250–248	NA
TS09-T084	23 May 2009	OT	35°46.97'N, 134°28.53'E	35°47.56'N, 134°30.22'E	220–220	2.68
TS09-T085	23 May 2009	OT	35°51.72'N, 134°23.66'E	35°52.47'N, 134°25.25'E	271–271	1.19
TS09-T086	3 June 2009	OT	35°56.27'N, 134°33.87'E	35°56.75'N, 134°35.41'E	275–274	1.35
TS09-T087	3 June 2009	OT	35°51.52'N, 134°43.40'E	35°51.67'N, 134°45.23'E	225–225	1.99
TS09-T088	3 June 2009	OT	35°49.20'N, 134°51.89'E	35°49.25'N, 134°52.56'E	200–200	4.16
TS09-T089	4 June 2009	OT	35°56.48'N, 134°49.97'E	35°56.54'N, 134°51.50'E	250–251	1.34
TS09-T090	4 June 2009	OT	36°03.54'N, 134°49.68'E	36°03.87'N, 134°51.48'E	279–280	1.21
TS09-T091	22 May 2009	OT	35°57.92'N, 134°3.74'E	35°56.66'N, 134°04.73'E	337–334	0.77
TS09-T092	23 May 2009	OT	35°51.53'N, 134°15.46'E	35°52.46'N, 134°16.89'E	352–353	0.59
TS09-T093	3 June 2009	OT	35°58.52'N, 134°27.70'E	35°58.98'N, 134°29.47'E	328–330	1.18
TS09-T094	4 June 2009	OT	36°09.47'N, 134°51.55'E	36°09.92'N, 134°53.09'E	331–330	0.74
TS09-T095	22 May 2009	OT	35°55.62'N, 134°12.13'E	35°54.90'N, 134°13.74'E	433–429	NA
TS09-T096	4 June 2009	OT	36°13.18'N, 134°52.63'E	36°14.14'N, 134°54.07'E	432–430	0.7
TS09-T097	5 June 2009	OT	36°04.26'N, 135°02.13'E	36°03.71'N, 135°03.85'E	286–286	1.1
TS09-T098	5 June 2009	OT	35°55.61'N, 135°05.94'E	35°55.96'N, 135°07.73'E	251–251	1.09
TS09-T099	5 June 2009	OT	36°02.18'N, 135°12.16'E	36°02.19'N, 135°14.01'E	283–284	1.0
TS09-T100	5 June 2009	OT	36°04.74'N, 135°15.12'E	36°05.10'N, 135°16.92'E	291–292	0.8
TS09-T101	31 May 2009	OT	35°58.93'N, 135°30.16'E	35°58.24'N, 135°31.82'E	251–250	1.29
TS09-T102	30 May 2009	OT	35°53.27'N, 135°48.27'E	35°53.02'N, 135°47.72'E	242–242	0.54
TS09-T103	31 May 2009	OT	36°01.94'N, 135°33.56'E	36°02.04'N, 135°35.40'E	280–280	1.03
TS09-T104	30 May 2009	OT	35°55.25'N, 135°46.77'E	35°55.22'N, 135°46.45'E	261–262	0.53
TS09-T105	31 May 2009	OT	36°06.43'N, 135°43.39'E	36°05.13'N, 135°42.46'E	292–291	0.46
TS09-T106	30 May 2009	OT	36°01.78'N, 135°42.77'E	36°01.22'N, 135°44.51'E	272–271	0.56
TS09-T107	30 May 2009	OT	36°09.30'N, 135°54.87'E	36°08.43'N, 135°54.91'E	202–201	3.05
TS09-T108	5 June 2009	OT	36°08.72'N, 135°09.71'E	36°08.67'N, 135°11.56'E	312–312	0.53
TS09-T109	6 June 2009	OT	36°20.50'N, 135°11.87'E	36°21.47'N, 135°10.46'E	386–386	0.44
TS09-T110	6 June 2009	OT	36°10.82'N, 135°25.63'E	36°11.33'N, 135°23.88'E	351–351	0.62
TS09-T111	31 May 2009	OT	36°06.03'N, 135°35.44'E	36°06.63'N, 135°37.13'E	336–338	0.57
TS09-T112	7 June 2009	OT	36°23.58'N, 135°45.97'E	36°24.93'N, 135°46.78'E	384–381	0.74
TS09-T113	7 June 2009	OT	36°30.28'N, 135°53.88'E	36°31.42'N, 135°55.09'E	325–326	0.62
TS09-T114	6 June 2009	OT	36°25.96'N, 135°12.10'E	36°26.67'N, 135°10.39'E	481–478	0.53
TS09-T115	6 June 2009	OT	36°15.29'N, 135°30.95'E	36°15.67'N, 135°29.16'E	451–452	0.31
TS09-T116	7 June 2009	OT	36°43.36'N, 135°54.23'E	36°42.03'N, 135°53.38'E	441–442	0.37
TS09-T117	7 June 2009	OT	36°32.51'N, 136°08.82'E	36°33.73'N, 136°09.53'E	230–230	1.8
TS09-T118	10 June 2009	OT	36°44.61'N, 136°11.69'E	36°45.51'N, 136°12.21'E	281–280	0.82
TS09-T119	10 June 2009	OT	36°49.89'N, 136°22.10'E	36°51.13'N, 136°22.70'E	222–220	2.6
TS09-T120	10 June 2009	OT	36°53.91'N, 136°19.80'E	36°54.61'N, 136°20.21'E	270–269	0.98
TS09-T121	12 June 2009	OT	37°22.45'N, 136°14.86'E	37°23.69'N, 136°15.90'E	210–205	4.1
TS09-T122	12 June 2009	OT	37°25.72'N, 136°12.37'E	37°27.21'N, 136°12.57'E	250–250	1.97
TS09-T123	12 June 2009	OT	37°41.05'N, 136°17.90'E	37°42.33'N, 136°18.89'E	260–259	1.76
TS09-T124	13 June 2009	OT	37°46.26'N, 136°23.84'E	37°47.29'N, 136°25.22'E	240–240	1.19
TS09-T125	10 June 2009	OT	36°45.41'N, 136°06.52'E	36°46.77'N, 136°07.47'E	368–371	0.56
TS09-T126	11 June 2009	OT	36°54.95'N, 136°10.61'E	36°56.25'N, 136°11.59'E	352–350	0.55
TS09-T127	11 June 2009	OT	37°02.14'N, 136°16.64'E	37°03.64'N, 136°16.75'E	345–343	0.59
TS09-T128	12 June 2009	OT	37°21.94'N, 136°09.02'E	37°23.42'N, 136°08.73'E	330–330	1.17
TS09-T129	10 June 2009	OT	36°48.99'N, 136°03.10'E	36°49.72'N, 136°04.29'E	422–421	0.51
TS09-T130	11 June 2009	OT	36°57.60'N, 136°06.89'E	36°59.18'N, 136°07.06'E	421–421	0.46

Appendix 1. (continued)

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Bottom temp. (°C)
TS09-T131	11 June 2009	OT	37°06.41'N, 136°11.94'E	37°07.38'N, 136°11.69'E	458–458	0.49
TS09-T132	13 June 2009	OT	37°50.55'N, 136°31.75'E	37°51.49'N, 136°33.23'E	216–221	4.5
TS09-T133	13 June 2009	OT	37°58.63'N, 136°53.44'E	37°58.55'N, 136°55.34'E	226–226	1.77
TS09-T134	14 June 2009	OT	37°55.02'N, 137°18.76'E	37°54.20'N, 137°20.34'E	262–261	4.57
TS09-T135	14 June 2009	OT	37°53.61'N, 137°13.79'E	37°53.21'N, 137°15.61'E	207–208	6.25
TS09-T136	14 June 2009	OT	37°46.94'N, 137°26.01'E	37°48.25'N, 137°24.99'E	227–219	5.48
TS09-T137	15 June 2009	OT	38°01.47'N, 136°54.54'E	38°01.85'N, 136°56.38'E	330–331	1.17
TS09-T138	14 June 2009	OT	37°57.40'N, 137°18.87'E	37°56.66'N, 137°20.52'E	323–322	0.99
TS09-T139	13 June 2009	OT	37°59.17'N, 136°42.15'E	38°00.12'N, 136°43.61'E	420–414	1.73
TS09-T140	15 June 2009	OT	38°05.15'N, 136°57.23'E	38°05.41'N, 136°59.10'E	129–436	0.71
TS09-T141	14 June 2009	OT	36°00.52'N, 132°33.20'E	36°01.75'N, 132°34.25'E	250–251	0.98
TS09-T142	1 June 2009	OT	36°00.38'N, 133°48.20'E	35°59.31'N, 133°48.98'E	201–203	1.87
TS09-T143	2 June 2009	OT	35°51.72'N, 133°51.92'E	35°53.01'N, 133°52.86'E	211–212	1.66
TS09-BZ200	29 June 2009	ZY	35°10.31'N, 132°20.85'E	35°10.44'N, 132°21.06'E	200–200	NA
TS09-BZ250	26 June 2009	ZY	35°44.53'N, 132°16.58'E	35°44.43'N, 132°16.25'E	250–251	NA
TS09-BZ300-1	29 June 2009	ZY	35°48.31'N, 132°15.79'E	35°48.03'N, 132°16.45'E	311–301	NA
TS09-BZ300-2	25 June 2009	ZY	35°47.95'N, 132°16.35'E	35°47.90'N, 132°16.14'E	302–302	NA
TS09-BZ350	26 June 2009	ZY	35°49.82'N, 132°15.69'E	35°49.76'N, 132°15.30'E	349–350	NA
TS09-BZ400	29 June 2009	ZY	35°50.88'N, 132°12.86'E	35°51.01'N, 132°13.27'E	400–402	NA
TS09-BZ450	29 June 2009	ZY	35°52.12'N, 132°12.96'E	35°52.08'N, 132°12.71'E	451–450	NA
TS09-BZ500	29 June 2009	ZY	35°52.93'N, 132°13.32'E	35°53.29'N, 132°13.99'E	493–506	NA
TS09-BZ550	29 June 2009	ZY	35°53.73'N, 132°12.66'E	35°53.70'N, 132°12.33'E	550–552	NA
TS09-BZ600	26 June 2009	ZY	35°54.43'N, 132°12.70'E	35°54.36'N, 132°12.30'E	612–605	NA
TS09-BZ650	26 June 2009	ZY	35°54.66'N, 132°10.95'E	35°54.61'N, 132°10.37'E	644–648	NA
TS09-C160	26 June 2009	ZY	35°55.09'N, 132°10.50'E	35°55.06'N, 132°09.80'E	697–710	NA
TS09-C160	30 June 2009	ZY	35°42.10'N, 132°36.85'E	35°42.53'N, 132°37.21'E	160–160	NA
TS09-C170	30 June 2009	ZY	35°44.42'N, 132°35.35'E	35°44.63'N, 132°35.57'E	171–171	NA
TS09-C180	30 June 2009	ZY	35°46.23'N, 132°33.64'E	35°46.55'N, 132°33.92'E	180–180	NA
TS09-C190	30 June 2009	ZY	35°20.84'N, 132°34.25'E	35°51.32'N, 132°34.56'E	191–191	NA
TS09-C210	1 July 2009	ZY	35°53.85'N, 132°32.84'E	35°53.36'N, 132°32.58'E	210–210	NA
TS09-C220	28 June 2009	ZY	35°50.62'N, 132°25.55'E	35°50.83'N, 132°25.71'E	251–251	NA
TS09-C250	28 June 2009	ZY	35°50.62'N, 132°25.55'E	35°50.83'N, 132°25.71'E	251–251	NA
TS09-C250	28 June 2009	ZY	35°49.25'N, 132°27.74'E	35°49.66'N, 132°28.18'E	221–221	NA
TS09-C300	28 June 2009	ZY	35°51.89'N, 132°23.02'E	35°52.06'N, 132°23.28'E	301–300	NA
TS09-C350	28 June 2009	ZY	35°52.76'N, 132°21.04'E	35°52.97'N, 132°21.30'E	350–350	NA
TS09-C400	28 June 2009	ZY	35°53.55'N, 132°20.01'E	35°53.96'N, 132°20.17'E	402–401	NA
TS09-C450	28 June 2009	ZY	35°54.87'N, 132°19.76'E	35°55.15'N, 132°20.05'E	455–455	NA
TS09-C500	28 June 2009	ZY	35°55.25'N, 132°19.05'E	35°55.66'N, 132°19.51'E	501–502	NA
TS09-C550	28 June 2009	ZY	35°56.12'N, 132°18.83'E	35°56.53'N, 132°19.39'E	554–550	NA
TS09-C600	4 July 2009	ZY	35°56.00'N, 132°17.77'E	35°56.40'N, 132°18.30'E	598–593	NA
TS09-C650	4 July 2009	ZY	35°56.18'N, 132°16.84'E	35°56.32'N, 132°17.07'E	648–651	NA
TS09-C700	4 July 2009	ZY	35°57.20'N, 132°17.12'E	35°57.41'N, 132°17.36'E	701–702	NA
TS09-H1	3 July 2009	ZY	35°55.74'N, 132°36.54'E	35°56.22'N, 132°36.92'E	196–196	NA
TS09-H2	3 July 2009	ZY	35°58.67'N, 132°33.72'E	35°59.15'N, 132°34.09'E	226–225	NA
TS09-H3	2 July 2009	ZY	35°52.47'N, 132°28.13'E	35°52.95'N, 132°28.54'E	240–240	NA
TS09-H4	2 July 2009	ZY	35°49.03'N, 132°23.85'E	35°49.48'N, 132°24.28'E	255–254	NA
TS09-HC150	30 June 2009	ZY	35°41.99'N, 132°39.08'E	35°42.37'N, 132°39.53'E	151–150	NA
TS09-HC280	30 June 2009	ZY	35°51.12'N, 132°23.96'E	35°51.58'N, 132°24.35'E	280–280	NA
TS09-HC330	30 June 2009	ZY	35°52.12'N, 132°21.08'E	35°52.39'N, 132°21.42'E	334–328	NA
TS09-HN230	2 July 2009	ZY	35°53.40'N, 132°30.18'E	35°53.94'N, 132°30.47'E	230–230	NA
TS09-N180	3 July 2009	ZY	35°51.08'N, 132°37.66'E	35°51.55'N, 132°38.10'E	180–180	NA
TS09-N190	3 July 2009	ZY	35°54.06'N, 132°36.80'E	35°54.53'N, 132°37.09'E	190–190	NA
TS09-N220	1 July 2009	ZY	35°55.18'N, 132°32.18'E	35°54.71'N, 132°31.90'E	220–220	NA
TS09-N250	1 July 2009	ZY	35°55.87'N, 132°29.97'E	35°55.36'N, 132°29.61'E	250–250	NA
TS09-N300	1 July 2009	ZY	35°57.93'N, 132°27.65'E	35°28.40'N, 132°28.05'E	300–300	NA
TS09-N350	1 July 2009	ZY	35°59.44'N, 132°26.69'E	35°58.98'N, 132°26.29'E	350–351	NA
TS09-N400	1 July 2009	ZY	36°00.43'N, 132°25.93'E	36°00.30'N, 132°25.79'E	398–398	NA
TS09-N450	4 July 2009	ZY	35°59.40'N, 132°23.59'E	35°56.68'N, 132°23.61'E	452–447	NA
TS09-ZY10-1	25 June 2009	ZY	35°46.22'N, 132°05.03'E	35°46.24'N, 132°04.89'E	284–284	NA
TS09-ZY10-2	2 July 2009	ZY	35°46.15'N, 132°04.99'E	35°46.25'N, 132°04.29'E	281–281	NA

Appendix 1. (continued)

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Bottom temp. (°C)
TS09-ZY12-1	25 June 2009	ZY	35°43.47'N, 132°07.28'E	35°43.68'N, 132°07.88'E	253–255	NA
TS09-ZY12-2	2 July 2009	ZY	35°43.34'N, 132°07.11'E	35°43.36'N, 132°06.42'E	251–250	NA
TS09-ZY14-1	4 July 2009	ZY	36°00.10'N, 132°32.53'E	36°00.59'N, 132°33.26'E	251–250	NA
TS09-ZY10-1	25 June 2009	ZY	35°46.22'N, 132°05.03'E	35°46.24'N, 132°04.89'E	284–284	NA
TS09-ZY16-1	25 June 2009	ZY	35°46.15'N, 132°13.90'E	35°46.13'N, 132°13.79'E	281–280	NA
TS09-ZY16-2	25 June 2009	ZY	35°46.79'N, 132°16.64'E	35°46.77'N, 132°16.58'E	281–281	NA
TS09-ZY16-3	2 July 2009	ZY	35°46.09'N, 132°13.31'E	35°46.19'N, 132°14.16'E	280–280	NA
TS09-ZY17	29 June 2009	ZY	35°40.16'N, 132°17.38'E	35°40.49'N, 132°18.03'E	210–210	NA
TS09-ZY18	29 June 2009	ZY	35°43.23'N, 132°16.32'E	35°43.10'N, 132°16.49'E	237–235	NA
TS09-ZY20	29 June 2009	ZY	35°43.33'N, 132°21.91'E	35°43.75'N, 132°22.46'E	215–215	NA
TS09-ZY23	2 July 2009	ZY	35°50.19'N, 132°23.83'E	35°50.66'N, 132°24.23'E	269–270	NA
TS09-ZY25	30 June 2009	ZY	35°49.80'N, 132°26.95'E	35°50.26'N, 132°27.41'E	230–230	NA
TS09-ZY27	1 July 2009	ZY	35°56.78'N, 132°28.05'E	35°56.35'N, 132°27.64'E	280–280	NA
TS09-ZY29-1	25 June 2009	ZY	35°48.05'N, 132°10.11'E	35°47.83'N, 132°09.66'E	322–318	NA
TS09-ZY29-2	2 July 2009	ZY	35°48.03'N, 132°09.43'E	35°48.03'N, 132°10.12'E	320–320	NA
TS09-ZY31	1 July 2009	ZY	35°59.27'N, 132°27.77'E	35°58.79'N, 132°27.36'E	319–320	NA
TS09-ZY33	29 June 2009	ZY	35°51.96'N, 132°09.33'E	35°52.25'N, 132°10.03'E	445–460	NA
TS09-ZY34	19 August 2009	ZY	35°57.17'N, 132°34.18'E	35°57.45'N, 132°34.33'E	211–211	NA
TS09-ZY35-1	3 July 2009	ZY	36°00.49'N, 132°37.07'E	36°01.00'N, 132°37.47'E	210–211	NA
TS09-ZY35-2	3 July 2009	ZY	36°00.42'N, 132°37.02'E	36°00.83'N, 132°37.34'E	210–210	NA
TS09-ZY53	4 July 2009	ZY	36°03.35'N, 132°30.59'E	36°03.73'N, 132°31.87'E	351–351	NA
TS09-OW01	19 August 2009	ZY	35°39.77'N, 132°19.75'E	35°39.89'N, 132°20.03'E	199–199	2.84
TS09-OW02	19 August 2009	ZY	35°48.19'N, 132°17.08'E	35°48.24'N, 132°17.31'E	301–301	0.85
TS09-OW03	19 August 2009	ZY	35°50.89'N, 132°12.97'E	35°50.93'N, 132°13.22'E	400–400	0.73
TS09-OW04	19 August 2009	ZY	35°53.37'N, 132°14.99'E	35°53.31'N, 132°14.73'E	500–499	0.53
TS09-OW05	19 August 2009	ZY	35°54.66'N, 132°14.63'E	35°54.58'N, 132°14.42'E	604–602	0.44
TS09-OW06	19 August 2009	ZY	35°55.30'N, 132°13.15'E	35°55.12'N, 132°12.66'E	701–696	0.38
TS09-OW07	24 August 2009	ZY	35°56.07'N, 132°10.83'E	35°55.97'N, 132°11.37'E	800–801	0.39
TS09-OW08	24 August 2009	ZY	35°57.96'N, 132°13.05'E	35°58.17'N, 132°13.53'E	897–908	0.36
TS09-OW09	24 August 2009	ZY	35°58.93'N, 132°12.28'E	35°59.06'N, 132°12.83'E	997–1001	0.35
TS09-OW10	24 August 2009	ZY	36°01.24'N, 132°12.43'E	36°01.21'N, 132°13.03'E	1100–1101	0.33
TS09-OW11	24 August 2009	ZY	36°05.30'N, 132°13.78'E	36°05.48'N, 132°14.31'E	1204–1204	0.31
TS09-OW12	23 August 2009	ZY	36°09.88'N, 132°11.48'E	36°10.12'N, 132°11.98'E	1299–1298	0.30
TS09-OW13	23 August 2009	ZY	36°13.06'N, 132°08.71'E	36°13.34'N, 132°09.21'E	1408–1396	0.29
TS09-OW14	23 August 2009	ZY	36°13.48'N, 132°03.53'E	36°13.93'N, 132°03.71'E	1496–1499	0.28
TS09-OW15	23 August 2009	ZY	36°16.14'N, 131°58.77'E	36°16.57'N, 131°59.01'E	1600–1597	0.28
TS09-OW16	20 August 2009	ZY	36°22.81'N, 131°55.21'E	36°23.17'N, 131°55.43'E	1697–1700	0.28
TS09-OW17	20 August 2009	ZY	36°31.52'N, 131°50.35'E	36°31.18'N, 131°50.10'E	1797–1797	0.27
TS09-OW18	20 August 2009	ZY	36°37.88'N, 131°40.95'E	36°37.60'N, 131°40.65'E	1895–1895	0.27
TS09-OW19	20 August 2009	ZY	36°46.60'N, 131°36.82'E	36°46.25'N, 131°36.37'E	1998–1998	0.28
TS09-OW20	21 August 2009	ZY	36°18.68'N, 131°50.96'E	36°18.93'N, 131°51.43'E	1700–1704	0.27
TS09-OW21	21 August 2009	ZY	36°26.06'N, 131°45.23'E	36°26.42'N, 131°45.58'E	1797–1797	0.27
TS09-OW22	21 August 2009	ZY	36°32.00'N, 131°37.26'E	36°32.33'N, 131°37.61'E	1898–1897	0.28
TS09-OW23	21 August 2009	ZY	36°40.55'N, 131°30.32'E	36°40.80'N, 131°30.74'E	1998–1996	0.28
TS09-OW24	22 August 2009	ZY	36°33.64'N, 132°03.57'E	36°33.89'N, 132°03.98'E	1700–1697	0.26
TS09-OW25	22 August 2009	ZY	36°35.03'N, 131°55.07'E	36°35.38'N, 131°55.38'E	1790–1795	0.27
TS09-OW26	22 August 2009	ZY	36°40.54'N, 131°45.09'E	36°40.54'N, 131°45.09'E	1895–1895	0.27
TS09-OW27	22 August 2009	ZY	36°50.37'N, 131°47.51'E	36°50.53'N, 131°47.95'E	1995–1994	0.27
TS09-OW28	26 August 2009	ZY	36°12.95'N, 132°34.97'E	36°12.16'N, 132°34.89'E	601–598	0.39
TS09-OW29	26 August 2009	ZY	36°12.48'N, 132°33.60'E	36°12.05'N, 132°33.52'E	697–702	0.38
TS09-OW30	26 August 2009	ZY	36°08.72'N, 132°33.77'E	36°08.48'N, 132°33.44'E	796–796	0.45
TS09-OW31	26 August 2009	ZY	36°07.19'N, 132°29.53'E	36°07.00'N, 132°29.06'E	888–900	0.36
TS09-OW32	25 August 2009	ZY	36°10.65'N, 132°28.19'E	36°10.22'N, 132°28.02'E	1008–1007	0.34
TS09-OW33	25 August 2009	ZY	36°13.58'N, 132°26.30'E	36°13.19'N, 132°26.53'E	1090–1082	0.31
TS09-OW34	25 August 2009	ZY	36°08.64'N, 132°19.53'E	36°08.85'N, 132°20.01'E	1200–1190	0.30
TS09-OW35	25 August 2009	ZY	36°15.66'N, 132°17.41'E	36°16.04'N, 132°17.78'E	1295–1295	0.29
TS09-OW36	25 August 2009	ZY	36°16.24'N, 132°11.40'E	36°16.48'N, 132°11.91'E	1400–1396	0.29
TS09-OW37	25 August 2009	ZY	36°22.52'N, 132°11.64'E	36°22.97'N, 132°11.79'E	1500–1497	0.28
TS09-OW38	26 August 2009	ZY	36°16.25'N, 132°36.27'E	36°15.76'N, 132°36.12'E	600–604	0.40
TS09-OW39	26 August 2009	ZY	36°16.45'N, 132°35.15'E	36°16.08'N, 132°35.02'E	702–704	0.36

Appendix 1. (continued)

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Bottom temp. (°C)
TS09-OW40	28 August 2009	ZY	36°14.04'N, 132°32.72'E	36°13.70'N, 132°32.44'E	795–800	0.42
TS09-OW41	28 August 2009	ZY	36°13.40'N, 132°30.78'E	36°13.66'N, 132°31.25'E	885–870	0.35
TS09-OW42	28 August 2009	ZY	36°16.76'N, 132°28.36'E	36°16.65'N, 132°27.86'E	1000–1015	0.33
TS09-OW43	27 August 2009	ZY	36°18.10'N, 132°26.43'E	36°17.72'N, 132°26.15'E	1097–1090	0.32
TS09-OW44	27 August 2009	ZY	36°17.34'N, 132°23.04'E	36°12.11'N, 132°22.70'E	1200–1197	0.30
TS09-OW45	27 August 2009	ZY	36°22.09'N, 132°21.22'E	36°22.44'N, 132°21.61'E	1295–1288	0.29
TS09-OW46	27 August 2009	ZY	36°20.51'N, 132°16.54'E	36°20.93'N, 132°16.81'E	1397–1397	0.28
TS09-OW47	27 August 2009	ZY	36°27.23'N, 132°14.29'E	36°27.71'N, 132°14.61'E	1504–1497	0.28
TS10-OW01	21 August 2010	BZ	35°40.31'N, 132°20.29'E	35°40.48'N, 132°20.66'E	201–201	0.98
TS10-OW02	21 August 2010	BZ	35°47.90'N, 132°16.03'E	35°47.99'N, 132°16.22'E	301–302	0.82
TS10-OW03	21 August 2010	BZ	35°50.84'N, 132°12.30'E	35°50.86'N, 132°12.67'E	399–400	0.54
TS10-OW04	21 August 2010	BZ	35°53.21'N, 132°13.76'E	35°53.29'N, 132°14.26'E	504–502	0.42
TS10-OW05	21 August 2010	BZ	35°54.63'N, 132°14.50'E	35°54.76'N, 132°15.03'E	605–602	0.41
TS10-OW06	21 August 2010	BZ	35°55.18'N, 132°12.63'E	35°55.30'N, 132°13.47'E	700–692	0.34
TS10-OW07	28 August 2010	BZ	35°55.98'N, 132°11.46'E	35°55.96'N, 132°12.13'E	803–787	0.28
TS10-OW08	28 August 2010	BZ	35°57.82'N, 132°12.74'E	35°58.08'N, 132°13.33'E	900–905	0.33
TS10-OW09	28 August 2010	BZ	35°59.00'N, 132°12.55'E	35°59.15'N, 132°13.20'E	1000–1011	0.28
TS10-OW10	28 August 2010	BZ	36°01.13'N, 132°13.71'E	36°01.06'N, 132°14.28'E	1104–1104	0.27
TS10-OW11	27 August 2010	BZ	36°05.21'N, 132°13.73'E	36°05.26'N, 132°14.43'E	1201–1197	0.28
TS10-OW12	27 August 2010	BZ	36°09.98'N, 132°11.67'E	36°10.26'N, 132°12.21'E	1296–1300	0.29
TS10-OW13	27 August 2010	BZ	36°13.23'N, 132°08.69'E	36°13.20'N, 132°09.29'E	1408–1394	0.27
TS10-OW14	27 August 2010	BZ	36°13.71'N, 132°03.63'E	36°14.14'N, 132°03.77'E	1494–1501	0.27
TS10-OW15	27 August 2010	BZ	36°16.56'N, 131°58.92'E	36°16.95'N, 131°59.21'E	1599–1597	0.26
TS10-OW16	26 August 2010	BZ	36°23.04'N, 131°55.39'E	36°23.38'N, 131°55.69'E	1698–1697	0.26
TS10-OW17	26 August 2010	BZ	36°31.99'N, 131°50.73'E	36°32.35'N, 131°51.00'E	1797–1800	0.27
TS10-OW18	26 August 2010	BZ	36°36.78'N, 131°39.63'E	36°37.18'N, 131°40.07'E	1895–1894	0.28
TS10-OW19	26 August 2010	BZ	36°46.68'N, 131°36.43'E	36°46.59'N, 131°35.92'E	2002–1999	0.28
TS10-T07	1 September 2010	BZ	39°09.17'N, 134°41.80'E	39°09.69'N, 134°41.54'E	399–398	1.34
TS10-T08	1 September 2010	BZ	39°15.15'N, 134°42.57'E	39°14.64'N, 134°42.45'E	445–449	1.01
TS10-T09	1 September 2010	BZ	39°13.97'N, 134°51.65'E	39°14.43'N, 134°51.85'E	358–354	2.03
TS10-T11	1 September 2010	BZ	39°18.42'N, 134°48.83'E	39°17.91'N, 134°48.74'E	461–460	1.06
TS10-T17	2 September 2010	BZ	39°27.75'N, 135°14.22'E	39°27.24'N, 135°14.01'E	384–379	1.29
TS10-T19	2 September 2010	BZ	39°29.79'N, 135°15.94'E	39°29.92'N, 135°16.60'E	400–400	1.18
TS10-T21	2 September 2010	BZ	39°21.60'N, 135°18.12'E	39°21.24'N, 135°17.60'E	349–350	1.53
TS10-T25	1 September 2010	BZ	39°28.75'N, 135°03.90'E	39°28.46'N, 135°03.38'E	378–381	1.20
TS10-T29	2 September 2010	BZ	39°21.53'N, 135°09.27'E	39°20.93'N, 135°08.54'E	320–325	2.10
TS10-T55	1 September 2010	BZ	39°04.45'N, 134°41.45'E	39°04.29'N, 134°40.90'E	316–328	1.77
TS10-YA05	29 August 2010	BZ	39°40.16'N, 136°01.81'E	39°40.57'N, 136°01.44'E	1002–1010	0.37
TS10-YA06	29 August 2010	BZ	39°39.40'N, 136°03.50'E	39°38.92'N, 136°03.73'E	1102–1091	0.35
TS10-YA07	30 August 2010	BZ	39°38.98'N, 136°04.56'E	39°38.98'N, 136°04.56'E	1200–1206	0.33
TS10-YA09	30 August 2010	BZ	39°39.56'N, 136°05.64'E	39°40.15'N, 136°05.42'E	1401–1400	0.30
TS10-YA11	31 August 2010	BZ	39°37.98'N, 136°08.67'E	39°37.48'N, 136°08.69'E	1605–1602	0.27
TS10-YA13	31 August 2010	BZ	39°43.68'N, 136°10.97'E	39°43.19'N, 136°11.05'E	1801–1799	0.28
TS10-YA15	31 August 2010	BZ	39°48.72'N, 136°20.60'E	39°48.28'N, 136°20.41'E	2004–2000	0.29
TS10-YA16	30 August 2010	BZ	39°51.83'N, 136°20.47'E	39°51.26'N, 136°20.46'E	2098–2106	NA
TS10-YA17	31 August 2010	BZ	39°51.59'N, 136°23.56'E	39°51.02'N, 136°23.78'E	2208–2198	NA
TS10-YA18	30 August 2010	BZ	39°49.89'N, 136°27.89'E	39°50.47'N, 136°27.84'E	2291–2289	NA
TS10-AK04	9 September 2010	BZ	39°55.05'N, 139°31.79'E	39°54.10'N, 139°31.40'E	492–592	0.48
TS10-AK05	9 September 2010	BZ	39°55.08'N, 139°31.30'E	39°54.04'N, 139°30.98'E	590–674	0.39
TS10-AK06	9 September 2010	BZ	39°54.22'N, 139°30.79'E	39°53.13'N, 139°30.78'E	697–754	0.34
TS10-AK07	9 September 2010	BZ	39°55.70'N, 139°30.48'E	39°55.17'N, 139°30.51'E	793–823	0.30
TS10-AK08	9 September 2010	BZ	39°53.63'N, 139°30.02'E	39°53.13'N, 139°30.12'E	885–915	0.31
TS10-AK09	6 September 2010	BZ	39°54.60'N, 139°29.46'E	39°54.16'N, 139°29.46'E	999–1006	0.33
TS10-AK10	6 September 2010	BZ	39°55.35'N, 139°29.15'E	39°54.83'N, 139°29.00'E	1104–1102	0.32
TS10-AK11	6 September 2010	BZ	40°05.37'N, 139°30.63'E	40°04.91'N, 139°30.85'E	1196–1185	0.30
TS10-AK12	6 September 2010	BZ	39°57.71'N, 139°28.79'E	39°57.24'N, 139°28.54'E	1296–1300	0.29
TS10-AK13	6 September 2010	BZ	39°56.85'N, 139°27.61'E	39°56.18'N, 139°27.40'E	1400–1405	0.25
TS10-AK14	7 September 2010	BZ	40°09.62'N, 139°23.32'E	40°09.22'N, 139°23.57'E	1510–1470	0.25
TS10-AK15	7 September 2010	BZ	40°07.57'N, 139°21.11'E	40°07.21'N, 139°21.50'E	1598–1567	0.26
TS10-AK16	7 September 2010	BZ	—	40°07.60'N, 139°20.37'E	— –1650	0.27

Appendix 1. (continued)

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Bottom temp. (°C)
TS10-AK17	7 September 2010	BZ	40°07.58'N, 139°19.66'E	40°07.34'N, 139°20.24'E	1728–1672	0.27
TS10-AK18	7 September 2010	BZ	40°08.49'N, 139°19.44'E	40°08.97'N, 139°19.73'E	1820–1780	0.27
TS10-AK19	8 September 2010	BZ	40°14.26'N, 139°18.90'E	40°13.87'N, 139°19.02'E	2006–2001	0.28
TS10-AK20	8 September 2010	BZ	40°12.45'N, 139°18.52'E	40°12.00'N, 139°18.44'E	2095–2085	NA
TS10-AK21	8 September 2010	BZ	40°10.71'N, 139°16.72'E	40°10.35'N, 139°16.33'E	2197–2197	NA
TS10-AK22	8 September 2010	BZ	40°09.94'N, 139°14.24'E	40°09.72'N, 139°13.87'E	2273–2305	NA
TS10-AK23	11 September 2010	BZ	40°23.88'N, 139°28.71'E	40°23.38'N, 139°28.92'E	1606–1590	0.26
TS10-AK24	11 September 2010	BZ	40°22.93'N, 139°27.93'E	40°22.46'N, 139°27.94'E	1703–1695	0.26
TS10-AK25	11 September 2010	BZ	40°23.00'N, 139°26.83'E	40°22.55'N, 139°26.72'E	1800–1780	0.27
TS10-AK26	11 September 2010	BZ	40°21.87'N, 139°24.57'E	40°21.54'N, 139°24.41'E	1870–1915	0.27
TS10-AK27	10 September 2010	BZ	40°23.99'N, 139°24.93'E	40°22.16'N, 139°22.85'E	1991–1988	0.28
TS10-AK28	10 September 2010	BZ	40°23.92'N, 139°23.60'E	40°23.53'N, 139°23.55'E	2032–1999	NA
TS10-AK29	10 September 2010	BZ	40°23.86'N, 139°22.39'E	40°23.78'N, 139°22.39'E	2201–2207	NA
TS10-AK30	10 September 2010	BZ	40°22.40'N, 139°20.81'E	40°22.07'N, 139°20.63'E	2302–2308	NA
TS12-T01	9 May 2012	OT	35°53.38'N, 131°28.68'E	35°53.37'N, 131°26.75'E	344–334	NA
TS12-T02	9 May 2012	OT	35°49.56'N, 131°30.35'E	35°49.80'N, 131°28.54'E	251–251	NA
TS12-T03	9 May 2012	OT	35°44.42'N, 131°17.68'E	35°44.10'N, 131°16.60'E	180–179	NA
TS12-T04	9 May 2012	OT	35°43.46'N, 131°06.77'E	35°44.03'N, 131°08.47'E	227–220	NA
TS12-T05	10 May 2012	OT	35°26.76'N, 130°43.63'E	35°26.50'N, 130°41.80'E	181–179	NA
TS12-T06	10 May 2012	OT	35°29.04'N, 130°40.05'E	35°27.96'N, 130°39.36'E	204–210	NA
TS12-T07	10 May 2012	OT	35°34.06'N, 130°53.38'E	35°33.92'N, 130°51.53'E	224–222	NA
TS12-T08	10 May 2012	OT	35°30.51'N, 130°54.48'E	35°29.88'N, 130°52.81'E	181–179	NA
TS12-T09	11 May 2012	OT	35°47.01'N, 131°32.99'E	35°45.74'N, 131°33.96'E	230–180	NA
TS12-T10	11 May 2012	OT	35°53.16'N, 131°34.48'E	35°52.87'N, 131°36.29'E	342–343	NA
TS12-T11	11 May 2012	OT	35°51.38'N, 131°35.20'E	35°49.98'N, 131°34.55'E	295–270	NA
TS12-T12	11 May 2012	OT	35°44.18'N, 131°43.95'E	35°43.68'N, 131°44.32'E	231–231	NA
TS12-T13	12 May 2012	OT	35°46.62'N, 131°50.29'E	35°46.77'N, 131°52.13'E	261–263	NA
TS12-T14	12 May 2012	OT	35°53.71'N, 132°01.73'E	35°53.93'N, 132°00.25'E	494–497	NA
TS12-T15	12 May 2012	OT	35°51.60'N, 132°09.95'E	35°51.74'N, 132°08.10'E	439–438	NA
TS12-T16	12 May 2012	OT	35°46.12'N, 132°04.65'E	35°46.32'N, 132°02.80'E	283–282	NA
TS12-T17	13 May 2012	OT	35°33.01'N, 131°56.49'E	35°33.59'N, 131°54.79'E	179–179	NA
TS12-T18	13 May 2012	OT	35°34.38'N, 132°05.28'E	35°34.40'N, 132°07.11'E	190–189	NA
TS12-T19	13 May 2012	OT	35°37.60'N, 132°04.04'E	35°37.60'N, 132°05.15'E	208–208	NA
TS12-T20	13 May 2012	OT	35°43.15'N, 132°06.31'E	35°43.11'N, 132°08.15'E	251–251	NA
TS12-T21	14 May 2012	OT	35°37.51'N, 132°22.35'E	35°38.19'N, 132°23.98'E	180–181	NA
TS12-T22	14 May 2012	OT	35°39.67'N, 132°16.18'E	35°40.41'N, 132°18.38'E	209–180	NA
TS12-T23	14 May 2012	OT	35°43.24'N, 132°17.61'E	35°43.86'N, 132°19.29'E	236–236	NA
TS12-T24	14 May 2012	OT	35°45.90'N, 132°13.54'E	35°46.27'N, 132°15.32'E	281–281	NA
TS12-T25	14 May 2012	OT	35°47.83'N, 132°11.47'E	35°47.80'N, 132°09.63'E	320–321	NA
TS12-T26	15 May 2012	OT	35°51.54'N, 132°25.20'E	35°52.79'N, 132°26.20'E	271–270	NA
TS12-T27	15 May 2012	OT	35°49.21'N, 132°26.68'E	35°50.52'N, 132°27.79'E	231–231	NA
TS12-T28	15 May 2012	OT	35°44.87'N, 132°24.33'E	35°46.01'N, 132°25.57'E	214–215	NA
TS12-T29	15 May 2012	OT	35°53.08'N, 132°36.33'E	35°54.17'N, 132°37.59'E	190–189	NA
TS12-T30	16 May 2012	OT	35°54.58'N, 132°33.33'E	35°56.00'N, 132°33.91'E	210–211	NA
TS12-T31	16 May 2012	OT	35°54.50'N, 132°26.64'E	35°55.82'N, 132°27.51'E	281–280	NA
TS12-T32	16 May 2012	OT	35°58.58'N, 132°27.55'E	35°59.82'N, 132°28.59'E	319–320	NA
TS12-T33	16 May 2012	OT	36°00.17'N, 132°27.67'E	36°01.37'N, 132°28.82'E	349–350	NA
TS12-T34	17 May 2012	OT	36°00.52'N, 132°33.54'E	36°01.67'N, 132°34.73'E	249–248	NA
TS12-T35	17 May 2012	OT	36°00.62'N, 132°37.77'E	36°01.89'N, 132°32.79'E	209–208	NA
TS12-T36	17 May 2012	OT	36°04.74'N, 132°38.88'E	36°05.76'N, 132°40.23'E	235–231	NA
TS12-T37	17 May 2012	OT	36°07.36'N, 132°44.42'E	36°08.53'N, 132°45.64'E	204–206	NA
TS12-T38	17 May 2012	OT	36°13.64'N, 132°50.15'E	36°15.19'N, 132°50.09'E	179–180	NA
TS12-T39	18 May 2012	OT	36°20.75'N, 132°47.55'E	36°22.09'N, 132°48.36'E	228–221	NA
TS12-T40	18 May 2012	OT	36°17.61'N, 132°43.78'E	36°14.05'N, 132°44.32'E	271–268	NA
TS12-T41	18 May 2012	OT	36°19.61'N, 132°42.21'E	36°21.06'N, 132°42.69'E	318–317	NA
TS12-T42	18 May 2012	OT	36°16.76'N, 132°38.49'E	36°18.25'N, 132°38.83'E	440–439	NA
TS12-T43	19 May 2012	OT	36°25.51'N, 132°49.92'E	36°26.97'N, 132°50.80'E	209–209	NA
TS12-T44	19 May 2012	OT	36°25.77'N, 132°48.65'E	36°27.20'N, 132°49.06'E	230–230	NA
TS12-T45	19 May 2012	OT	36°42.82'N, 132°49.02'E	36°44.32'N, 132°48.98'E	250–251	NA
TS12-T46	19 May 2012	OT	36°47.60'N, 133°01.83'E	36°47.53'N, 133°02.20'E	230–230	NA

Appendix 1. (continued)

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Bottom temp. (°C)
TS12-T47	22 May 2012	OT	36°54.48'N, 132°48.23'E	36°55.69'N, 132°49.32'E	282–281	NA
TS12-T48	22 May 2012	OT	36°59.00'N, 132°45.23'E	37°00.49'N, 132°45.30'E	335–337	NA
TS12-T49	22 May 2012	OT	37°08.46'N, 132°47.89'E	37°09.60'N, 132°47.80'E	311–311	NA
TS12-T50	22 May 2012	OT	37°14.29'N, 132°44.33'E	37°15.69'N, 132°44.69'E	320–320	NA
TS12-T51	23 May 2012	OT	37°20.64'N, 132°55.07'E	—	350–	NA
TS12-T52	23 May 2012	OT	37°28.85'N, 133°00.08'E	37°27.75'N, 133°01.36'E	430–430	NA
TS12-T53	23 May 2012	OT	37°15.98'N, 133°08.75'E	37°17.40'N, 133°08.14'E	439–441	NA
TS12-T54	23 May 2012	OT	37°15.10'N, 133°01.95'E	—	360–361	NA
TS12-T55	24 May 2012	OT	37°12.78'N, 132°56.56'E	37°13.91'N, 132°55.32'E	324–324	NA
TS12-T56	24 May 2012	OT	37°09.43'N, 132°59.85'E	37°10.32'N, 132°58.63'E	326–325	NA
TS12-T57	24 May 2012	OT	37°11.38'N, 133°06.87'E	37°12.59'N, 133°05.77'E	375–374	NA
TS12-T58	24 May 2012	OT	37°01.85'N, 133°03.21'E	37°03.26'N, 133°02.61'E	322–321	NA
TS12-T59	25 May 2012	OT	36°53.92'N, 133°02.66'E	36°54.82'N, 133°01.21'E	282–282	NA
TS12-T60	25 May 2012	OT	36°52.96'N, 133°09.97'E	36°54.15'N, 133°08.84'E	321–320	NA
TS12-T61	25 May 2012	OT	36°49.11'N, 133°09.50'E	36°48.28'N, 133°11.06'E	273–274	NA
TS12-T62	25 May 2012	OT	36°49.54'N, 133°15.22'E	36°48.43'N, 133°16.52'E	348–351	NA
TS12-T63	26 May 2012	OT	36°39.91'N, 133°09.50'E	36°38.96'N, 133°09.63'E	208–207	NA
TS12-T64	26 May 2012	OT	36°33.28'N, 133°22.76'E	36°30.83'N, 133°23.21'E	240–241	NA
TS12-T65	26 May 2012	OT	36°35.11'N, 133°17.42'E	36°33.74'N, 133°18.15'E	221–222	NA
TS12-T66	26 May 2012	OT	36°39.15'N, 133°06.61'E	36°37.96'N, 133°07.77'E	204–203	NA
TS12-T67	27 May 2012	OT	36°27.62'N, 133°29.22'E	36°27.55'N, 133°31.07'E	252–243	NA
TS12-T68	27 May 2012	OT	36°25.66'N, 133°30.54'E	36°26.27'N, 133°32.23'E	220–221	NA
TS12-T69	27 May 2012	OT	36°28.15'N, 133°45.80'E	36°27.89'N, 133°47.62'E	432–437	NA
TS12-T70	27 May 2012	OT	36°25.60'N, 133°37.85'E	36°24.99'N, 133°39.56'E	219–221	NA
TS12-T71	28 May 2012	OT	35°53.98'N, 133°50.81'E	35°52.48'N, 133°50.84'E	204–205	NA
TS12-T72	28 May 2012	OT	35°58.83'N, 133°48.74'E	36°00.28'N, 133°48.26'E	200–199	NA
TS12-T73	28 May 2012	OT	36°02.70'N, 133°50.19'E	36°03.31'N, 133°49.95'E	210–210	NA
TS12-T74	28 May 2012	OT	36°07.94'N, 133°47.31'E	36°09.32'N, 133°46.61'E	204–205	NA
TS12-T75	28 May 2012	OT	36°14.80'N, 133°44.30'E	36°13.36'N, 133°44.84'E	206–205	NA
TS12-T76	29 May 2012	OT	36°24.51'N, 133°42.40'E	36°23.66'N, 133°43.63'E	231–231	NA
TS12-T77	29 May 2012	OT	36°23.95'N, 133°51.23'E	36°22.87'N, 133°51.93'E	371–372	NA
TS12-T78	29 May 2012	OT	36°17.12'N, 133°53.22'E	36°16.49'N, 133°53.61'E	356–364	NA
TS12-T79	29 May 2012	OT	36°08.86'N, 133°54.86'E	36°07.41'N, 133°55.35'E	246–246	NA
TS12-D01	27 August 2012	BZ	36°05.08'N, 134°27.29'E	36°04.85'N, 134°26.72'E	870–874	NA
TS12-D02	27 August 2012	BZ	36°09.33'N, 134°30.42'E	36°09.03'N, 134°29.85'E	1027–1028	NA
TS12-D04	29 August 2012	BZ	36°26.78'N, 134°42.36'E	36°26.53'N, 134°41.85'E	1304–1304	NA
TS12-D05	29 August 2012	BZ	36°34.90'N, 134°45.34'E	36°35.36'N, 134°45.22'E	1498–1499	NA
TS12-D06	29 August 2012	BZ	36°39.57'N, 134°55.79'E	36°39.82'N, 134°55.32'E	1725–1720	NA
TS12-HY01	28 August 2012	BZ	35°42.93'N, 134°08.40'E	35°42.93'N, 134°8.66'E	199–198	NA
TS12-HY02	28 August 2012	BZ	35°47.22'N, 134°07.76'E	35°47.02'N, 134°7.12'E	302–296	NA
TS12-HY03	28 August 2012	BZ	35°55.52'N, 134°10.59'E	35°55.81'N, 134°10.15'E	404–406	NA
TS12-HY04	28 August 2012	BZ	35°56.99'N, 134°13.76'E	35°57.14'N, 134°13.14'E	501–499	NA
TS12-HY05	28 August 2012	BZ	35°59.51'N, 134°14.46'E	35°59.60'N, 134°13.82'E	600–599	NA
TS12-HY06	28 August 2012	BZ	36°01.80'N, 134°14.68'E	36°01.91'N, 134°14.04'E	701–699	NA
TS12-HY07	27 August 2012	BZ	36°04.97'N, 134°14.69'E	36°05.18'N, 134°15.02'E	905–901	NA
TS12-HY08	27 August 2012	BZ	36°08.76'N, 134°18.12'E	36°09.13'N, 134°17.63'E	1103–1106	NA
TS12-HY09	27 August 2012	BZ	36°16.58'N, 134°18.95'E	36°17.09'N, 134°18.83'E	1203–1203	NA
TS12-HY10	29 August 2012	BZ	36°32.55'N, 134°40.03'E	36°33.03'N, 134°39.96'E	1397–1399	NA
TS12-HY11	29 August 2012	BZ	36°36.89'N, 134°50.69'E	36°37.34'N, 134°50.55'E	1600–1600	NA
TS12-HY12	1 September 2012	BZ	37°18.24'N, 135°51.50'E	37°17.82'N, 135°51.11'E	1696–1681	NA
TS12-HY13	1 September 2012	BZ	37°18.23'N, 135°49.53'E	37°17.95'N, 135°49.01'E	1795–1797	NA
TS12-HY14	2 September 2012	BZ	37°19.19'N, 135°48.28'E	37°18.80'N, 135°37.83'E	1908–1892	NA
TS12-HY15	2 September 2012	BZ	37°19.31'N, 135°45.86'E	37°19.01'N, 135°45.48'E	2000–1988	NA
TS12-OW01	25 August 2012	BZ	35°40.45'N, 132°20.39'E	35°40.77'N, 132°20.94'E	200–201	NA
TS12-OW02	25 August 2012	BZ	35°48.08'N, 132°16.40'E	35°48.25'N, 132°17.08'E	301–301	NA
TS12-OW03	25 August 2012	BZ	35°51.02'N, 132°12.35'E	35°51.09'N, 132°13.02'E	405–405	NA
TS12-OW04	25 August 2012	BZ	35°53.15'N, 132°13.68'E	35°53.27'N, 132°14.32'E	500–500	NA
TS12-OW05	25 August 2012	BZ	35°54.72'N, 132°14.87'E	35°54.93'N, 132°15.49'E	602–599	NA
TS12-OW06	25 August 2012	BZ	35°55.10'N, 132°12.05'E	35°55.17'N, 132°12.71'E	704–700	NA
TS12-OW07	31 August 2012	BZ	35°56.05'N, 132°11.21'E	35°55.94'N, 132°11.90'E	807–798	NA

Appendix 1. (continued)

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Bottom temp. (°C)
TS12-OW08	31 August 2012	BZ	35°57.79'N, 132°12.79'E	35°57.99'N, 132°13.38'E	899–895	NA
TS12-OW09	31 August 2012	BZ	35°58.74'N, 132°13.49'E	35°58.97'N, 132°14.10'E	973–980	NA
TS12-OW10	31 August 2012	BZ	36°01.17'N, 132°13.62'E	36°01.31'N, 132°14.26'E	1103–1110	NA
TS12-OW11	30 August 2012	BZ	36°05.38'N, 132°13.7'E	36°05.67'N, 132°14.33'E	1205–1200	NA
TS12-OW12	30 August 2012	BZ	36°10.24'N, 132°12.04'E	36°10.53'N, 132°12.59'E	1296–1312	NA
TS12-OW13	30 August 2012	BZ	36°12.96'N, 132°08.87'E	36°13.16'N, 132°09.49'E	1392–1390	NA
TS12-OW14	30 August 2012	BZ	36°13.66'N, 132°03.60'E	36°13.17'N, 132°03.40'E	1493–1497	NA
TS12-OW15	30 August 2012	BZ	36°16.29'N, 131°58.42'E	36°15.80'N, 131°058.20'E	1604–1602	NA
TS12-OW16	26 August 2012	BZ	36°22.76'N, 131°55.14'E	36°22.36'N, 131°54.99'E	1694–1695	NA
TS12-OW17	26 August 2012	BZ	36°31.68'N, 131°50.27'E	36°32.01'N, 131°50.56'E	1797–1799	NA
TS12-OW18	26 August 2012	BZ	36°36.78'N, 131°39.53'E	36°37.05'N, 131°39.84'E	1894–1892	NA
TS12-OW19	26 August 2013	BZ	36°46.42'N, 131°36.45'E	36°46.03'N, 131°36.42'E	1997–1990	NA
TS13-S01	24 August 2013	BZ	38°01.30'N, 134°07.90'E	38°01.04'N, 134°07.38'E	414–428	1.0
TS13-S02	24 August 2013	BZ	38°00.00'N, 133°44.78'E	37°59.72'N, 133°44.78'E	525–526	0.69
TS13-S03	24 August 2013	BZ	37°55.03'N, 133°56.34'E	37°55.40'N, 133°56.34'E	597–603	0.55
TS13-S04	24 August 2013	BZ	38°01.68'N, 133°39.24'E	38°01.80'N, 133°39.24'E	784–780	0.44
TS13-S05	24 August 2013	BZ	38°06.46'N, 133°45.76'E	38°06.72'N, 133°45.76'E	857–855	0.42
TS13-S06	25 August 2013	BZ	38°21.56'N, 133°47.72'E	38°21.64'N, 133°48.37'E	947–932	0.38
TS13-S07	25 August 2013	BZ	38°20.46'N, 133°54.94'E	38°20.65'N, 133°55.07'E	986–997	0.4
TS13-S13	27 August 2013	BZ	38°26.12'N, 134°01.16'E	38°25.98'N, 134°00.56'E	1600–1500	0.25
TS13-S14	27 August 2013	BZ	38°35.69'N, 134°05.21'E	38°35.84'N, 134°05.74'E	1734–1747	0.25
TS13-S15	27 August 2013	BZ	38°27.79'N, 134°03.26'E	38°27.64'N, 134°03.84'E	1802–1807	0.25
TS13-S16	27 August 2013	BZ	38°30.02'N, 134°05.52'E	38°30.36'N, 134°05.06'E	1914–1912	0.25
TS13-YA01	28 August 2013	BZ	39°33.33'N, 135°53.13'E	39°33.60'N, 135°53.65'E	597–604	0.59
TS13-YA02	28 August 2013	BZ	39°37.59'N, 135°58.22'E	39°37.43'N, 135°58.83'E	702–708	0.38
TS13-YA03	28 August 2013	BZ	39°38.76'N, 135°57.66'E	39°38.65'N, 135°58.05'E	805–802	0.34
TS13-YA04	28 August 2013	BZ	39°41.30'N, 136°00.02'E	39°41.09'N, 136°00.28'E	906–880	0.33
TS13-YA05	28 August 2013	BZ	39°40.21'N, 136°01.80'E	39°39.78'N, 136°02.12'E	1008–1008	0.34
TS13-YA06	29 August 2013	BZ	39°39.05'N, 136°03.66'E	39°39.51'N, 136°03.44'E	1095–1104	0.34
TS13-YA07	29 August 2013	BZ	39°38.76'N, 136°04.65'E	39°39.22'N, 136°04.39'E	1201–1198	0.26
TS13-YA08	29 August 2013	BZ	39°39.60'N, 136°04.91'E	39°40.04'N, 136°04.65'E	1309–1296	0.26
TS13-YA09	29 August 2013	BZ	39°39.53'N, 136°05.69'E	39°39.97'N, 136°05.45'E	1405–1401	0.26
TS13-YA10	29 August 2013	BZ	39°40.26'N, 136°06.48'E	39°40.73'N, 136°06.35'E	1510–1512	0.25
TS13-YA11	30 August 2013	BZ	39°38.09'N, 136°08.66'E	39°37.61'N, 136°08.70'E	1607–1604	0.23
TS13-YA12	30 August 2013	BZ	39°41.88'N, 136°09.41'E	39°41.45'N, 136°09.69'E	1700–1680	0.25
TS13-YA13	30 August 2013	BZ	39°46.41'N, 136°11.31'E	39°46.31'N, 136°11.95'E	1803–1808	0.24
TS13-YA14	30 August 2013	BZ	39°49.20'N, 136°17.01'E	39°49.52'N, 136°07.49'E	1894–1914	0.24
TS13-YA15	31 August 2013	BZ	39°48.38'N, 136°20.55'E	39°47.94'N, 136°20.30'E	2005–2004	0.25
TS13-YA16	31 August 2013	BZ	39°51.61'N, 136°20.66'E	39°51.30'N, 136°20.29'E	2110–2104	NA

Appendix 2. Sampling data of the R/V *Tansei-maru* cruises, Abbreviations for sampling gears: BT, beam trawl; DG, dredge.

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Locality
KT-04-20-IB-1	17 Sept. 2004	BT	44°11.97'N, 140°22.22'E	44°10.88'N, 140°22.70'E	506–502	W of Rumoi
KT-04-20-OK-5	18 Sept. 2004	BT	42°10.81'N, 139°36.67'E	42°09.77'N, 139°36.38'E	589–592	Off Okushiri Id
KT-04-20-OK5-2	18 Sept. 2004	BT	42°09.57'N, 139°36.26'E	42°10.60'N, 139°36.66'E	583–594	Off Okushiri Id
KT-04-20-OK6-1	18 Sept. 2004	BT	42°03.43'N, 139°40.07'E	42°02.34'N, 139°39.51'E	802–800	Off Okushiri Id
KT-04-20-OK6-2	18 Sept. 2004	BT	42°02.42'N, 139°39.50'E	42°03.53'N, 139°40.13'E	800–799	Off Okushiri Id
KT-04-20-OK-3	17 Sept. 2004	1 m DG	41°58.38'N, 139°29.70'E	41°58.25'N, 139°29.47'E	67–69	Off Okushiri Id
KT-04-20-OK-1	17 Sept. 2004	1 m DG	41°56.17'N, 139°30.91'E	41°56.03'N, 139°31.01'E	102–101	Off Okushiri Id
KT-04-20-OK-2	17 Sept. 2004	1 m DG	41°51.24'N, 139°33.50'E	41°51.44'N, 139°33.30'E	208–167	Off Okushiri Id
KT-04-20-OK-4	17 Sept. 2004	1 m DG	41°50.86'N, 139°33.94'E	41°51.00'N, 139°33.55'E	350–251	Off Okushiri Id
KT-04-20-ST-1	18 Sept. 2004	1 m DG	42°24.76'N, 139°47.44'E	42°24.63'N, 139°47.40'E	85–85	Off Setana
KT-04-20-ST1-2	18 Sept. 2004	1 m DG	42°24.69'N, 139°47.42'E	42°24.51'N, 139°47.35'E	86–86	Off Setana
KT-04-20-ST-2	18 Sept. 2004	1 m DG	42°25.52'N, 139°45.90'E	42°25.34'N, 139°45.89'E	132–131	Off Setana
KT-04-20-ST2-2	18 Sept. 2004	1 m DG	42°25.37'N, 139°45.91'E	42°25.01'N, 139°46.10'E	130–122	Off Setana
KT-04-20-ST-3	18 Sept. 2004	1 m DG	42°26.58'N, 139°44.90'E	42°26.17'N, 139°44.04'E	366–321	Off Setana
KT-10-08-T1	21 May 2010	BT	40°53.90'N, 140°00.04'E	40°53.28'N, 139°58.62'E	350–315	W of Tsugaru St.
KT-10-08-T2	21 May 2010	BT	40°55.82'N, 139°54.84'E	40°53.96'N, 139°53.88'E	679–715	W of Tsugaru St.
KT-10-08-T3	21 May 2010	BT	40°57.96'N, 139°53.01'E	40°58.86'N, 139°52.87'E	851–839	W of Tsugaru St.
KT-10-08-T4	22 May 2010	BT	41°12.91'N, 139°47.05'E	41°10.68'N, 139°48.19'E	1584–1704	W of Tsugaru St.
KT-10-08-R6	23 May 2010	BT	45°23.03'N, 139°31.93'E	45°22.17'N, 139°28.35'E	1324–1440	Off Rebun Id
KT-10-08-R5	23 May 2010	BT	45°23.90'N, 139°47.95'E	45°22.24'N, 139°46.23'E	889–671	Off Rebun Id
KT-10-08-R4	23 May 2010	BT	45°25.45'N, 139°57.25'E	45°23.98'N, 139°57.27'E	710–742	Off Rebun Id
KT-10-08-R3	23 May 2010	BT	45°27.21'N, 140°06.48'E	45°26.09'N, 140°08.45'E	615–594	Off Rebun Id
KT-10-08-R2	23 May 2010	BT	45°27.25'N, 140°20.90'E	45°26.15'N, 140°21.94'E	402–393	Off Rebun Id
KT-10-08-R1	23 May 2010	BT	45°36.25'N, 140°54.73'E	45°35.66'N, 140°54.09'E	178–190	Off Rebun Id
KT-10-08-Es1	26 May 2010	BT	42°03.68'N, 139°32.89'E	42°05.09'N, 139°33.96'E	501–535	Off Okushiri Id
KT-10-08-Es2	26 May 2010	BT	42°05.07'N, 139°36.40'E	42°03.13'N, 139°36.76'E	670–671	Off Okushiri Id
KT-10-08-Es3	26 May 2010	BT	42°03.89'N, 139°40.79'E	42°01.72'N, 139°39.68'E	839–821	Off Okushiri Id
KT-11-09-M1	27 May 2011	BT	44°43.78'N, 140°05.79'E	44°43.12'N, 140°05.44'E	152–166	Musashi-tai Bank
KT-11-09-M2	28 May 2011	BT	44°40.48'N, 140°02.38'E	44°39.53'N, 140°02.83'E	198–206	Musashi-tai Bank
KT-11-09-M3	28 May 2011	BT	44°37.21'N, 139°56.68'E	44°36.29'N, 139°57.82'E	413–407	Musashi-tai Bank
KT-11-09-M4	28 May 2011	BT	44°35.38'N, 139°52.93'E	44°34.32'N, 139°53.70'E	608–627	Musashi-tai Bank
KT-11-09-M5	28 May 2011	BT	44°31.41'N, 139°47.13'E	44°29.91'N, 139°47.96'E	1035–1080	Musashi-tai Bank
KT-11-09-M6	28 May 2011	BT	44°16.68'N, 139°36.85'E	44°14.25'N, 139°37.25'E	1461–1421	Musashi-tai Bank
KT-11-09-E1	29 May 2011	BT	41°52.01'N, 139°33.90'E	41°52.94'N, 139°34.33'E	247–222	W of Esashi
KT-11-09-E2	29 May 2011	BT	41°50.26'N, 139°34.03'E	41°48.70'N, 139°34.18'E	388–538	W of Esashi
KT-11-09-E3	29 May 2011	BT	41°47.46'N, 139°34.49'E	41°48.96'N, 139°34.88'E	635–563	W of Esashi
KT-11-09-E4	29 May 2011	BT	42°03.91'N, 139°40.11'E	42°03.38'N, 139°39.98'E	787–802	W of Esashi
KT-11-09-T1	31 May 2011	BT	37°28.45'N, 137°28.15'E	37°29.16'N, 137°27.86'E	160–173	Toyama Bay
KT-11-09-T2	31 May 2011	BT	37°28.77'N, 137°29.07'E	37°29.53'N, 137°28.63'E	207–258	Toyama Bay
KT-11-09-T3	31 May 2011	BT	37°29.18'N, 137°33.25'E	37°29.35'N, 137°31.96'E	383–443	Toyama Bay
KT-11-09-T6	1 June 2011	BT	37°28.29'N, 137°45.89'E	37°26.70'N, 137°44.59'E	1488–1564	Toyama Bay
KT-11-09-T5	1 June 2011	BT	37°18.45'N, 137°31.77'E	37°18.66'N, 137°32.85'E	794–790	Toyama Bay
KT-11-09-T4	1 June 2011	BT	37°19.80'N, 137°33.38'E	37°20.02'N, 137°34.20'E	562–574	Toyama Bay
KT-11-09-N1	1 June 2011	BT	37°54.59'N, 136°56.92'E	37°54.51'N, 136°58.43'E	162–157	N of Noto Pen.
KT-11-09-N2	1 June 2011	BT	37°57.06'N, 136°56.60'E	37°57.04'N, 136°58.23'E	203–203	N of Noto Pen.
KT-11-09-N3	1 June 2011	BT	38°03.25'N, 136°53.39'E	38°03.82'N, 136°55.13'E	403–414	N of Noto Pen.
KT-11-09-N4	1 June 2011	BT	38°08.04'N, 136°49.64'E	38°09.00'N, 136°51.20'E	617–604	N of Noto Pen.
KT-11-09-K5	2 June 2011	BT	36°22.25'N, 134°23.61'E	36°20.18'N, 134°22.84'E	1290–1277	Off Kasumi
KT-11-09-K4	2 June 2011	BT	35°59.92'N, 134°20.58'E	35°59.61'N, 134°18.82'E	611–613	Off Kasumi
KT-11-09-K3	2 June 2011	BT	35°54.85'N, 134°18.60'E	35°55.17'N, 134°20.08'E	411–370	Off Kasumi
KT-11-09-K2	3 June 2011	BT	35°46.11'N, 134°30.94'E	35°46.57'N, 134°32.09'E	204–204	Off Kasumi
KT-11-09-K1(1)	3 June 2011	BT	35°43.26'N, 134°27.11'E	35°43.40'N, 134°27.55'E	164–166	Off Kasumi
KT-11-09-K1(2)	3 June 2011	BT	35°42.89'N, 134°28.04'E	35°43.11'N, 134°28.98'E	142–144	Off Kasumi

Appendix 3. Sampling data of the R/V *Soyo-maru* cruises. Abbreviations for sampling gears: BT, beam trawl; DR, dredge; TR, baited trap.

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Locality
SO07-C1-B	22 July 2007	BT	39°24.9'N, 135°14.3'E	39°24.9'N, 135°13.4'E	312–321	Yamato Ridge
SO07-C2-B	21 July 2007	BT	39°54.6'N, 136°07.8'E	39°56.4'N, 136°07.1'E	1360–1333	Yamato Ridge
SO07-C3-B	20 July 2007	BT	40°07.0'N, 137°07.0'E	40°05.6'N, 137°09.0'E	1757–1851	Yamato Ridge
SO07-C4-B1	25 July 2007	BT	43°00.4'N, 139°57.2'E	43°00.5'N, 139°59.4'E	1607–1280	off Iwanai
SO07-C4-B2	25 July 2007	BT	42°53.7'N, 139°59.4'E	42°54.3'N, 140°01.1'E	843–800	off Iwanai
SO08-C2	25–26 July 2008	TR	38°57.1'N, 133°49.9'E	38°57.9'N, 133°49.7'E	1020–1228	Yamato Ridge
SO08-C2-B	25–26 July 2008	BT	38°57.7'N, 133°49.0'E	38°59.5'N, 133°50.7'E	1341–1360	Yamato Ridge
SO08-C3	25–26 July 2008	TR	38°55.9'N, 133°35.1'E	38°57.9'N, 133°34.1'E	1788–1788	Yamato Ridge
SO08-C3-B	25 July 2008	BT	38°56.4'N, 133°36.5'E	38°58.6'N, 133°35.6'E	1768–1696	Yamato Ridge
SO08-D1	27 July 2008	DR	37°35.1'N, 136°35.0'E	37°35.3'N, 136°35.0'E	138–138	Noto Bank
SO08-D2	27 July 2008	DR	37°46.7'N, 136°22.5'E	37°46.8'N, 136°22.8'E	256–254	Noto Bank
SO08-D3-1	30 July 2008	DR	36°57.9'N, 133°27.6'E	36°58.2'N, 133°26.8'E	368–368	OkI Sanbanse Bank
SO08-D3-2	30 July 2008	DR	36°58.2'N, 133°26.7'E	36°58.1'N, 133°26.9'E	369–370	OkI Sanbanse Bank
SO08-D4	30 July 2008	DR	36°30.0'N, 133°00.0'E	36°29.8'N, 133°00.4'E	183–183	OkI Dogo Bank
SO08-D5	31 July 2008	DR	34°15.1'N, 130°15.0'E	34°15.0'N, 130°14.9'E	100–100	N of Fukuoka
SO08-D6	31 July 2008	DR	33°56.5'N, 129°30.2'E	33°55.9'N, 129°29.9'E	96–94	off Tsushima Is.
SO09-C1	23–24 July 2009	TR	39°34.0'N, 136°00.3'E	39°34.4'N, 136°00.7'E	673–689	Yamato Ridge
SO09-C1-B	23 July 2009	BT	39°36.4'N, 136°00.9'E	39°35.1'N, 136°00.5'E	730–693	Yamato Ridge
SO09-C2	4–5 August 2009	TR	45°11.6'N, 140°48.9'E	45°11.9'N, 140°48.1'E	467–461	Rishiri Trough
SO09-C2-B	4 August 2009	BT	45°12.5'N, 140°49.8'E	45°12.6'N, 140°48.8'E	473–473	Rishiri Trough
SO09-M-B	5 August 2009	BT	44°42.0'N, 139°47.3'E	44°41.5'N, 139°48.3'E	536–528	Musashi-tai Bank
SO10-C3	19–20 July 2010	TR	39°23.1'N, 135°40.2'E	39°22.9'N, 135°40.4'E	361–365	Yamato Ridge
SO10-C3-B	19 July 2010	BT	39°23.1'N, 135°40.2'E	39°23.9'N, 135°40.7'E	361–354	Yamato Ridge
SO10-C4	19–20 July 2010	TR	39°59.2'N, 135°57.8'E	39°59.2'N, 135°57.4'E	1371–1384	Yamato Ridge
SO10-C4-B	19 July 2010	BT	39°59.2'N, 135°57.8'E	39°59.0'N, 135°57.7'E	1371–1377	Yamato Ridge
SO11-C13	24–25 July 2011	TR	39°21.6'N, 135°05.3'E	39°21.5'N, 135°04.9'E	313–306	Yamato Ridge
SO11-C13-B	24 July 2011	BT	39°20.3'N, 135°04.4'E	39°20.8'N, 135°04.5'E	325–311	Yamato Ridge
SO11-C14	25–26 July 2011	TR	40°05.7'N, 137°06.1'E	40°05.5'N, 137°06.1'E	1807–1811	Yamato Ridge
SO11-C14-B	26 July 2011	BT	40°05.0'N, 137°07.0'E	40°06.7'N, 137°07.2'E	1834–1804	Yamato Ridge
SO11-C15	27–28 July 2011	TR	42°57.7'N, 139°59.7'E	42°57.9'N, 139°59.3'E	1303–1308	off Iwanai
SO11-C15-B	28 July 2011	BT	42°56.7'N, 140°02.3'E	42°56.1'N, 140°01.3'E	1006–1005	off Iwanai
SO12-C13	26–27 July 2012	TR	39°20.0'N, 135°01.9'E	39°20.0'N, 135°02.2'E	302–304	Yamato Ridge
SO12-C13-B	26 July 2012	BT	39°20.5'N, 135°02.8'E	39°20.0'N, 135°03.2'E	306–308	Yamato Ridge
SO12-C14	25–26 July 2012	TR	40°00.9'N, 137°01.4'E	40°01.8'N, 137°02.2'E	1962–1947	Yamato Ridge
SO12-C14-B	25 July 2012	BT	39°59.5'N, 137°02.5'E	39°59.2'N, 137°02.3'E	1895–1896	Yamato Ridge
SO12-C15	23–24 July 2012	TR	42°56.2'N, 139°59.1'E	42°56.6'N, 139°58.2'E	1140–1332	off Iwanai
SO12-C15-B1	23 July 2012	BT	42°58.2'N, 139°58.8'E	42°58.4'N, 139°58.5'E	1365–1437	off Iwanai
SO12-C15-B2	23 July 2012	BT	42°58.2'N, 139°58.7'E	42°58.5'N, 139°58.0'E	1376–1432	off Iwanai
SO13-C3	20–21 July 2013	TR	41°51.3'N, 139°20.1'E	41°50.4'N, 139°19.7'E	2381–2381	off Iwanai
SO13-C3-B	20 July 2013	BT	41°48.3'N, 139°19.2'E	41°47.5'N, 139°19.0'E	2365–2367	off Iwanai
SO13-C4	21–22 July 2013	TR	42°56.1'N, 139°59.0'E	42°57.3'N, 139°58.8'E	1132–1225	off Iwanai
SO13-C4-B	21 July 2013	BT	42°57.6'N, 139°59.7'E	42°58.6'N, 139°59.9'E	1280–1334	off Iwanai
SO13-C5	27–28 July 2013	TR	45°05.0'N, 140°30.0'E	45°05.2'N, 140°30.3'E	326–328	off Rebun
SO13-C5-B	27 July 2013	BT	45°05.4'N, 140°30.7'E	45°05.1'N, 140°31.3'E	331–332	off Rebun

Appendix 4. Sampling data of the R/V *Mizuho-maru* cruises. Abbreviations for sampling gears: BT, beam trawl; DG, dredge; SM, Smith-McIntyre grab sampler.

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Bottom temp (°C)
MZ09-01	13 June 2009	BT, SM	34°27.31'N, 129°36.28'E	34°26.98'N, 129°35.85'E	99–100	15.58
MZ09-02	13 June 2009	BT, SM	34°17.04'N, 129°44.12'E	34°17.48'N, 129°44.45'E	105–105	16.38
MZ09-03	14 June 2009	BT, SM	34°23.94'N, 130°42.22'E	34°24.27'N, 130°42.71'E	97–97	17.89
MZ09-04	14 June 2009	BT, SM	34°16.21'N, 130°46.88'E	34°16.00'N, 130°46.60'E	83–84	18.60
MZ09-05	14 June 2009	BT, SM	34°37.26'N, 131°02.47'E	34°37.61'N, 131°02.68'E	100–101	18.23
MZ09-06	14 June 2009	BT, SM	35°07.09'N, 131°07.10'E	35°07.38'N, 131°07.35'E	123–123	17.01
MZ09-07	15 June 2009	BT, SM	35°29.83'N, 132°30.77'E	35°30.17'N, 132°30.65'E	145–146	6.90
MZ09-08	15 June 2009	BT, SM	35°24.05'N, 132°33.99'E	35°24.30'N, 132°33.79'E	96–97	17.84
MZ09-09	16 June 2009	BT, SM	35°50.29'N, 132°59.00'E	35°50.31'N, 132°59.21'E	98–98	16.42
MZ09-10	16 June 2009	BT, SM	35°46.00'N, 133°14.88'E	35°45.96'N, 133°15.18'E	73–73	17.55
MZ09-11	17 June 2009	BT, SM	36°32.51'N, 136°18.12'E	36°32.58'N, 136°18.60'E	96–100	14.78
MZ09-12	18 June 2009	BT, SM	37°33.67'N, 137°03.89'E	37°33.81'N, 137°04.20'E	90–91	12.97
MZ09-13	18 June 2009	BT, SM	37°45.53'N, 137°11.52'E	37°45.41'N, 137°11.88'E	117–121	12.75
MZ09-14	18 June 2009	BT, SM	37°38.27'N, 137°16.34'E	37°38.54'N, 137°16.27'E	97–99	11.74
MZ10-01	19 Sept. 2010	BT	38°57.10'N, 139°41.10'E	38°56.98'N, 139°40.96'E	57–58	22.28
MZ10-02	19 Sept. 2010	BT	38°57.42'N, 139°35.84'E	38°57.19'N, 139°35.66'E	98–99	17.96
MZ10-03	19 Sept. 2010	BT	38°58.09'N, 139°32.51'E	38°58.35'N, 139°32.70'E	182–185	4.34
MZ10-04	20 Sept. 2010	0.5 m DG	38°55.01'N, 139°03.50'E	38°54.96'N, 139°03.44'E	160–161	10.04
MZ10-05	20 Sept. 2010	0.5 m DG	38°59.04'N, 138°59.93'E	38°59.03'N, 138°59.88'E	148–148	5.28
MZ10-06	20 Sept. 2010	0.5 m DG	39°10.61'N, 138°53.47'E	39°10.53'N, 138°53.51'E	168–170	5.42
MZ10-07	17 Sept. 2010	BT	39°41.67'N, 139°54.74'E	39°41.37'N, 139°54.76'E	61–61	25.77
MZ10-08	17 Sept. 2010	BT	39°42.53'N, 139°47.57'E	39°42.96'N, 139°47.27'E	99–99	15.69
MZ10-09	17 Sept. 2010	BT	39°41.59'N, 139°39.69'E	39°41.40'N, 139°39.94'E	192–195	8.71
MZ10-10	17 Sept. 2010	1 m DG	39°38.40'N, 139°31.20'E	39°38.43'N, 139°31.26'E	152–152	11.37
MZ10-11	15 Sept. 2010	BT	40°13.06'N, 139°51.91'E	40°12.84'N, 139°51.48'E	60–62	23.83
MZ10-12	15 Sept. 2010	BT	40°13.69'N, 139°41.96'E	40°14.17'N, 139°42.00'E	93–94	17.34
MZ10-13	15 Sept. 2010	BT	40°17.48'N, 139°38.49'E	40°17.98'N, 139°38.11'E	160–169	9.69
MZ10-14	16 Sept. 2010	BT	40°49.32'N, 140°10.52'E	40°49.58'N, 140°10.97'E	53–54	25.97
MZ10-15	16 Sept. 2010	BT	40°50.37'N, 140°07.73'E	40°50.60'N, 140°08.18'E	98–99	16.96
MZ10-16	16 Sept. 2010	BT	40°52.80'N, 139°57.61'E	40°52.69'N, 139°57.41'E	301–301	2.33
MZ10-17	16 Sept. 2010	1 m DG	41°22.25'N, 139°55.64'E	41°22.22'N, 139°55.77'E	124–126	8.06

Appendix 5. Sampling data of the R/V *Ryokuyo-maru* cruises. Abbreviations for sampling gears: BT, Beam trawl; DG, dredge; SG, sledge

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Locality
RY10-1	31 Aug. 2010	DG	36°00.09'N, 135°27.73'E	36°00.55'N, 135°27.81'E	263–269	E of Kyogasaki
RY10-2	31 Aug. 2010	DG	36°00.85'N, 135°28.10'E	36°01.35'N, 135°28.22'E	280–282	E of Kyogasaki
RY10-3	31 Aug. 2010	DG	35°56.53'N, 135°22.29'E	35°56.96'N, 135°23.00'E	240–252	E of Kyogasaki
RY10-4	31 Aug. 2010	DG	35°56.65'N, 135°22.45'E	35°56.94'N, 135°23.21'E	242–251	E of Kyogasaki
RY10-5	31 Aug. 2010	DG	35°53.85'N, 135°22.94'E	35°54.16'N, 135°23.65'E	200–198	E of Kyogasaki
RY10-6	31 Aug. 2010	DG	35°45.30'N, 135°20.46'E	35°44.95'N, 135°20.53'E	100–95.4	E of Kyogasaki
RY10-7	2 Sept. 2010	BT	35°39.88'N, 135°22.06'E	35°39.30'N, 135°22.19'E	70.0–70.6	E of Ine Port
RY10-8	2 Sept. 2010	BT	35°45.11'N, 135°20.43'E	35°45.2'N, 5 135°20.17'E	96.3–96.0	E of Kyogasaki
RY10-9	2 Sept. 2010	BT	35°45.08'N, 135°22.90'E	35°45.00'N, 135°22.60'E	106–104	E of Kyogasaki
RY10-10	2 Sept. 2010	BT	35°44.97'N, 135°22.40'E	35°44.88'N, 135°22.12'E	102–101	E of Kyogasaki
RY10-11	2 Sept. 2010	DG	35°39.15'N, 135°22.12'E	35°39.03'N, 135°21.86'E	69.8–69.0	E of Ine Port
RY10-12	2 Sept. 2010	SG	35°39.20'N, 135°21.47'E	35°39.25'N, 135°21.65'E	68.9–69.1	E of Ine Port

Appendix 6. Sampling data of the T/Vs *Bandion* and *Galathea* cruises. Abbreviations: B, *Bandion*; DG, 0.4 m dredge; G, *Galathea*; SG, 0.5 m sledge; TD, triangular dredge;

Stn. no.	Date	Gear	Position in	Position out	Depth (m)	Locality	Vessel
1	26 June 2012	SG	36°10.63'N, 133°16.68'E	36°10.60'N, 133°16.67'E	7.7	Off Oki Id	B
2	26 June 2012	SG	36°10.50'N, 133°16.49'E	36°10.46'N, 133°16.79'E	19–13	Off Oki Id	B
3	26 June 2012	SG	36°11.13'N, 133°16.78'E	36°11.07'N, 133°16.75'E	13	Off Oki Id	B
4	26 June 2012	DG	36°10.40'N, 133°16.83'E	36°10.47'N, 133°16.81'E	16.2–13	Off Oki Id	B
5	26 June 2012	TD	36°10.12'N, 133°16.85'E	36°10.15'N, 133°16.48'E	28	Off Oki Id	G
6	26 June 2012	TD	36°10.15'N, 133°16.96'E	36°10.11'N, 133°16.52'E	34	Off Oki Id	G
7	26 June 2012	TD	36°10.11'N, 133°17.85'E	36°10.03'N, 133°16.88'E	36	Off Oki Id	G
8	27 June 2012	TD	36°09.01'N, 133°14.25'E	36°09.07'N, 133°14.29'E	47	Off Oki Id	G
9	27 June 2012	TD	36°09.19'N, 133°14.19'E	36°09.19'N, 133°14.25'E	35	Off Oki Id	G
10	27 June 2012	TD	36°09.18'N, 133°14.21'E	36°09.27'N, 133°14.58'E	32–31	Off Oki Id	G
11	27 June 2012	TD	36°09.24'N, 133°14.46'E	36°09.33'N, 133°14.54'E	30	Off Oki Id	G
12	27 June 2012	TD	36°09.17'N, 133°14.50'E	36°09.15'N, 133°14.34'E	30–39	Off Oki Id	G
13	27 June 2012	TD	36°09.25'N, 133°14.60'E	36°09.26'N, 133°14.55'E	26	Off Oki Id	G
14	27 June 2012	TD	36°09.24'N, 133°15.07'E	36°09.25'N, 133°14.76'E	27–33	Off Oki Id	G