

I. OUTLINE OF THE RESEARCH CRUISE

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The marine geological and geophysical investigations in the western margin of Okhotsk Sea and northern margin of Japan Sea are based on the marine geological research project of the Geological Survey of Japan. The project is a part of the five years program for the marine geological investigation of the continental shelves and slopes around Japan, using the geological research vessel, "Hakureimaru".

This cruise report is mainly concerned with the results of on-board observations by the scientific staff and also, in part, the results of analyses obtained after the cruise.

The survey covered the continental shelves and slopes of the Okhotsk Sea and the Japan Sea around Hokkaido, the Kuril Basin, the southern Tartary Trough and the northern margin of the Japan Basin (Fig. I-1).

Scientific staff aboard consisted of six scientists of the Geological Survey of Japan, and eight technical assistants who are under-graduate and post-graduate students from various universities ((Table I-1).

The ship left the Port of Funabashi on the 14th of June and surveyed the northern Japan Sea and the Okhotsk Sea for 12 days and entered the Port of Otaru on 25th of June. The ship left the Port of Otaru on 27th of June and surveyed the Okhotsk Sea and the northern Japan Sea for 13 days (Table I-2).

Routine seismic and magnetic profiling were carried out with a Bolt type air gun and a proton magnetometer which were towed from the ship's stern. 3.5 kHz and 12 kHz echo sounders and an on-board gravity meter were also used to obtain bottom and subbottom information. Refraction measurements were also carried out by sonobuoy. Dredge, rock coring and piston coring sites were selected to ascertain and cor-

Table I-1 Scientific staff on board.

Name	Institute	Speciality
Eiichi HONZA	G.S.J.	chief scientist, geology
Kouji ONODERA	G.S.J.	geomorphology
Teruki MIYAZAKI	G.S.J.	geophysics
Makoto YUASA	G.S.J.	lithology
Kensaku TAMAKI	G.S.J.	structural geology
Kiyokazu NISHIMURA	G.S.J.	geophysics
*Hiroshi KITAZATO	Tokyo Univ.	technical assistance
*Yasuo IKEDA	Hokkaido Univ.	technical assistance
**Nobuyuki HONDA	Tohoku Univ.	technical assistance
Toshihiko MYOJIN	Tokyo Fisheries Univ.	technical assistance
Yoshikazu SHIRANE	Tokyo Fisheries Univ.	technical assistance
Masaru YAMAGUCHI	Tokyo Fisheries Univ.	technical assistance
Eiichi KOYAMA	Tokyo Fisheries Univ.	technical assistance
Yuzo TADA	Tokyo Fisheries Univ.	technical assistance

* Funabashi-Otaru

** Otaru-Niigata

Table I-2 Schedule of the cruise.

June 14th	Lv. the Port of Funabashi Geological and geophysical survey in the northern Japan and Okhotsk Sea off Hokkaido
June 25th	Ar. at the Port of Otaru
June 27th	Lv. the Port of Otaru Geological and geophysical survey in the northern Japan and Okhotsk Sea off Hokkaido
July 9th	Ar. at the Port of Niigata

Table I-3 Observation methods.

Cruising and positioning by NNSS, Loran C and Decca	
<i>Geophysical methods</i>	
Bathymetric survey by 12 kHz PDR	
—Prospecting of bottom topography	
Subbottom profiling by 3.5 kHz PDR	
—Prospecting of sedimentary surficial layers and surficial structure	
Continuous seismic profiling survey by air gun and sparker	
—Prospecting of sedimentary layers and geological structure	
Refraction measurements by sono-radio buoy	
—Prospecting of sedimentary layers and geological structure	
Magnetic survey by proton magnetometer	
Gravity measurements by on-board gravimeter	
—Auxiliary consideration of general geological structure	
Surficial current measurement by GEK	
—Reference for dredge operation	
<i>Geological methods</i>	
Bottom sampling by chain-bag and cylinder dredges	
—Sampling of sediments and rocks	
Bottom sampling by rock corer	
—Sampling of sediments and rocks	
Bottom sampling by piston corer with 6 m core-barrel	
—Observation of vertical sequence of surficial sedimentary columns	

relate the seismic profiling results of the material which constituted the bottom (Table I-3). A few dredge sites were selected for a lithological study of the seamounts and highs, and several sites for piston coring were selected to study the sedimentology of the basins and troughs.

The ship position was ascertained by use of NNSS, Loran C and Decca equipment. The ship covered a total distance of 5466.6 nautical miles during 26 days. The results of the stationary observations are summarized in Table I-4.

Table I-4 Results of stationary

Station No.	Sample No.	Date	Time	Position*		Depth (m)	Sampler
				Latitude	Longitude		
783	RC14	1977, June, 18	8:09 ~ 8:26	45°29.7'N ~ 45°29.8'N	143°43.8'E ~ 144°49.7'E	200 ~ 891	Rock corer ditto
784	D234	ditto	13:43 ~ 14:47	45°30.0'N ~ 45°30.0'N	144°55.5'E ~ 144°55.1'E	1450 ~ 1355	Chain-bag type and cylinder type dredges
785	D235	ditto	15:11 ~ 15:53	45°29.9'N ~ 45°29.8'N	144°49.8'E ~ 144°49.7'E	894 ~ 891	ditto
786	P107	June, 19	11:19 ~ 12:52	46°15.6'N ~ 46°22.4'N	146°03.8'E ~ 146°20.4'E	3320	Piston-corer Sono-buoy
787	SB5	ditto	12:59 ~ 16:07	46°16.0'N ~ 46°22.4'N	146°04.3'E ~ 146°20.4'E		
788	D236	June, 20	8:08 ~ 9:28	46°48.5'N ~ 46°48.7'N	144°11.3'E ~ 144°11.3'E	1950 ~ 1870	Chain-bag type and cylinder type dredges
789	D237	ditto	9:53 ~ 11:02	46°50.3'N ~ 46°50.3'N	144°10.4'E ~ 144°10.4'E	2150 ~ 2000	ditto
790	D238	1977, June, 20	15:01 ~ 16:11	46°21.5'N ~ 46°19.8'N	144°08.4'E ~ 144°06.0'E	2000 ~ 1940	Chain-bag type and cylinder type dredges
791	P108	June, 21	12:13 ~ 13:35	45°30.7'N ~ 45°30.7'N	145°08.3'E ~ 144°58.0'E	3114 ~ 2380	Piston corer Chain-bag type and cylinder type dredges
792	D239	ditto	14:21 ~ 16:15	45°30.5'N ~ 45°30.5'N ~ 45°30.7'N ~ 45°30.9'N	144°58.6'E ~ 144°58.1'E ~ 144°58.0'E ~ 144°58.0'E	2800 ~ 2560 ~ 2380 ~ 2400	Chain-bag type and cylinder type dredges

observations (compiled by M. YUASA).

Area and topography	Samples	Remarks
Shelf edge off Esashi, the sea of Okhotsk.	About 80 cm length. Upper part (0-25 cm): greenish grey silt (sand-bearing). Mid. part (25-70 cm): grey sand (granule-pebble-bearing). Lower Part (70-80 cm): silt stone.	In situ.
East flank of seamount on the continental slope, off Esashi.	Sand-bearing light brownish grey silt, greenish grey siltstone (max. size, 20×15×12), light brownish siltstone (max-size, 21×18×7) and pebble (red chert, green rock etc.).	In situ.
The summit of the above seamount.	Reddish brown sand (fine-medium grain) and pebble (max. size 6×4×2).	
Bottom of Kuril Basin, northwest off Etorohu Is.	695 cm length, clay (flow-in more than a half).	4 m×3.
ditto.	Reverse coarse 46°23.0'N~46°17.3'N 146°20.1'E~146°05.4'E.	
Southern slope of seamount, off Mys Svobodnyy, Sakhalin.	Olive brown silty clay, small rock fragments of blueish green-colored siltstone and pebble (volcanic rocks, granitic rock, chert and pumice).	
Northern slope of the above seamount.	Olive-brown silty clay and pebble (siliceous shale, chert and metamorphic rock).	
Continental slope eastern off Mys Lebenorna, Sakhalin.	Greyish olive silty clay.	
Northnorth-east off Abashiri, western part of Kuril Basin.	400 cm length core.	4 m×2.
East off Esashi, lower slope of the high.	Greyish olive silt and purplish brown silt. Rock fragments (dark brown colored siltstone, and greenish colored volcanic rock, may be green rock) and pebble (pumice, acidic volcanic rock, sandstone andesite shale).	Twice trial.

Table I-4

Station No.	Sample No.	Date	Time	Position*		Depth (m)	Sampler
				Latitude	Longitude		
793	D240	June, 22	7:55	44°30.5'N	144°14.8'E	275	ditto
			~ 8:26	~ 44°30.4'N	~ 144°14.3'E	~ 178	
794	D241	ditto	9:05	44°30.5'N	144°08.5'E	216	ditto
			~ 9:38	~ 44°30.5'N	~ 144°08.9'E	~ 145	
795	RC15	ditto	10:21 ~ 10:33	44°30.3'N	144°13.0'E	145	Rock corer
796	RC16	June, 23	15:30 ~ 15:40	44°39.9'N	143°30.2'E	135	ditto
797	RC17	ditto	16:00 ~ 16:11	44°42.5'N	143°31.0'E	145	ditto
798	D242	1977, June, 24	8:25	44°53.5'N	144°15.8'E	268	Chain-bag type and cylinder type dredges
			~ 8:57	~ 44°53.5'N	~ 144°15.8'E	~ 190	
799	RC18	ditto	9:18 ~ 9:33	44°53.8'N	144°18.3'E	153	Rock corer
800	D243	June, 28	9:19	45°45.1'N	140°24.5'E	485	Chain-bag type and cylinder type dredges
			~ 9:49	~ 45°45.0'N	~ 140°24.7'E	~ 497	
801	D244	ditto	12:57	45°45.4'N	141°01.2'E	338	ditto
			~ 13:17	~ 45°45.4'N	~ 141°01.2'E	~ 300	
802	P109	June, 29	10:53 ~ 11:27	45°15.4'N	144°07.0'E	930	Piston corer
803	SB6	ditto	11:34	45°15.4'N	144°07.4'E	940	Sono-buoy
			~ 15:31	~ 45°29.6'N	~ 144°08.5'E	~ 974	
804	D245	June, 30	8:51	45°25.8'N	140°27.5'E	290	Chain-bag type and cylinder type dredges
			~ 9:08	~ 45°25.9'N	~ 140°27.8'E	~ 275	

(Continued)

Area and topography	Samples	Remarks
East off Monbetsu, east slope of Kitami-Yamato Bank.	Granule and sand bearing silt, sand bearing silt (slightly glutinous), rock fragments (fossil bearing conglomerate and siltstone), pebble and boulder.	
ditto, west slope of the above Bank.	Sand bearing silt (slightly glutinous) and pebble (many amounts of siliceous siltstone).	
ditto, flat top of the above.	Siltstone.	In situ.
ditto, continental shelf.	Granule and pebble bearing sand	
ditto.	About 130 cm length core, 0-30 greyish sand 30-45 brownish olive sand 45-Bo sand bearing olive brown silt.	
East off Monbetsu, slope of a small knoll.	Fine sand bearing olive brown silt pebble and rubble (sandstone, siltstone, conglomerate, granitic rock, etc.).	
ditto, northern flat top of Kitami-Yamato Bank.	Dark greyish brown siltstone.	In situ.
Northwest off Rebun Is. eastside slope of Tatar Trough.	Olive grey silty sand, hy-aug andesite (in situ?), and pebble (sandstone, andesite, diabase, siliceous rock, siltstone, volcanic breccia and pumice).	
Western part of Soya Strait, slope of continental shelf edge.	Olive brown silty sand, greyish-colored and laminated sandstone (in situ), rubble (granitic rock and sandstone), and pebble (qz-diorite, qz-porphyry, and siliceous siltstone).	In situ.
East off Monbetsu, 1000 m-depth flat.	610 cm length.	4 m × 2.
ditto.	Reverse course 45°29.7'N ~ 45°15.7'N 144°08.1'E ~ 144°09.5'E	
West off Rebun Is. western slope of Rebun Bank.	Dark greyish brown fine sand, pebble (volcanic rock, pumice and sandstone), and small angular fragment of siliceous rock.	

Table I-4

Station No.	Sample No.	Date	Time	Position*		Depth (m)	Sampler
				Latitude	Longitude		
805	D246	1977, June, 30	15:14	45°21.3'N	139°40.7'E	870	Chain-bag type and cylinder type dredges
			~ 16:17	~ 45°21.4'N	~ 139°40.8'E	~ 725	
806	SB7	July, 1	6:58	45°00.7'N	138°23.0'E		Sono-buoy
			~ 10:42	~ 45°12.3'N	~ 138°34.1'E		
807	PI10	ditto	10:48 ~ 11:45	45°01.6'N	138°23.7'E	2145	Piston corer
808	D247	ditto	14:51	45°00.0'N	138°51.5'E	1765	Chain-bag type and cylinder type dredges
			~ 15:49	~ 45°00.1'N	~ 138°52.0'E	~ 1690	
809	D248	July, 2	9:30	44°45.0'N	140°37.5'E	156	Chain-bag type and cylinder type dredges
			~ 9:54	~ 44°45.1'N	~ 140°37.0'E	~ 150	
810	D249	ditto	13:21	44°45.2'N	140°06.6'E	135	ditto
			~ 13:37	~ 44°45.2'N	~ 140°06.5'E	~ 139	
811	D250	ditto	13:59	44°44.7'N	140°08.8'E	114	ditto
			~ 14:14	~ 44°44.7'N	~ 140°09.0'E	~ 111	
812	D251	1977, July, 3	13:03	44°30.2'N	139°18.7'E	1215	Chain-bag type and cylinder type dredges
			~ 14:05	~ 44°30.6'N	~ 139°19.5'E	~ 1160	
813	D252	ditto	15:55	44°30.1'N	139°33.8'E	698	ditto
			~ 16:45	~ 44°30.4'N	~ 139°33.6'E	~ 600	
814	RC19	ditto	16:56 ~ 17:17	44°30.1'N	139°32.3'E	437	Rock corer
815	D253	July, 4	10:38	44°30.2'N	140°43.5'E	137	Chain-bag type and cylinder type dredges
			~ 10:58	~ 44°30.3'N	~ 140°43.9'E	~ 129	
816	RC20	ditto	11:17 ~ 11:29	44°30.0'N	140°45.5'E	141	Rock corer

(Continued)

Area and topography	Samples	Remarks
West off Rebun Is. eastern slope of Tatar Trough.	Foraminifera and fine sand grain bearing reddish dark brown silt and greyish green silt, andesitic rock fragment, and pebble (granitic rock and pumice).	
Tatar Trough.	Reverse Course 45°12.2'N~45°02.1'N 138°33.6'E~138°23.5'E.	
ditto.	650 cm length, clay.	4 m × 2.
West off Musashi Bank, slope.	Dark reddish brown silty clay (surface), light brownish grey silty clay, rock fragment (green-colored tuff breccia) pebble (acid volcanic and plutonic rocks, and metamorphic rock?).	Continued on the following sheet.
Southwest off Rishiri Is., slope near the top of "Tengu no hana".	Medium sand, boulder (angular, max. size, 25 × 23 × 13 cm, dacite, welded tuff, glassy andesite, altered andesite etc.) and pebble (slate and rhyolite).	
Musashi Bank, slope near the top.	Shell fragment bearing sand, boulder (angular, max. size, 16 × 14 × 7 cm, dacite, altered andesite) pebble (dacite).	
ditto.	Shell fragment bearing sand, rubble (acid volcanic rock) and pebble (acid volcanic rock and green-colored volcanic rock).	
Northwest off Syakotan Pen., lower slope of Okujiri Ridge.	Fine sand grain (volcanic?) bearing dark reddish brown silty clay, greenish grey silty clay, rock fragment (diorite) and pebble (mudstone and altered andesite).	
ditto, upper slope of the Ridge.	Dark brownish sandy silt, greyish green silt (glutinous), pebble-bearing sandstone (in situ), siltstone (may be in situ) and pebble.	In situ.
ditto, top of the Ridge.	Pebble bearing sand and sandstone.	3.lt.
West off Haboro, Teuri Bank.	Ill sorted silty sand containing granule, pebble and foraminifera, angular cobble (sandstone and volcanic conglomerate).	Volcanic cg. may be near the out crop.
ditto.	About 20 cm length, ill sorted sand containing granule and pebble.	

Table I-4

Station No.	Sample No.	Date	Time	Position*		Depth (m)	Sampler
				Latitude	Longitude		
817	D254	ditto	13:00	44°21.8'N	140°38.7'E	136	Chain-bag type and cylinder type dredges
			~ 13:18	~ 44°21.7'N	~ 140°38.5'E	~ 134	
818	RC21	ditto	14:49	44°07.8'N	140°55.6'E	208	Rock corer
			~ 15:02				
819	D255	1977, July, 4	15:18	44°08.5'N	140°54.5'E	225	Chain-bag type and cylinder type dredges
			~ 15:58	~ 44°08.6'N	~ 140°54.0'E	~ 146	
820	D256	July, 5	15:32	43°59.7'N	138°01.6'E	2034	ditto
			~ 16:53	~ 43°59.4'N	~ 138°03.2'E	~ 1800	
821	D257	July, 6	13:33	43°45.3'N	140°11.2'E	785	ditto
			~ 14:08	~ 43°45.0'N	~ 140°10.9'E	~ 725	
822	D258	ditto	15:35	44°00.4'N	140°03.2'E	663	ditto
			~ 16:18	~ 44°00.5'N	~ 140°03.4'E	~ 525	
823	P111	July, 7	14:18	43°44.2'N	137°46.8'E	3658	Piston corer
			~ 15:42				
824	D259	ditto	16:13	43°44.7'N	137°39.2'E	3573	Chain-bag type and cylinder type dredges
			~ 18:08	~ 43°44.6'N	~ 137°38.4'E	~ 3383	

* Positions represent from "Hit" to "Lift off".

(Continued)

Area and topography	Samples	Remarks
West off Haboro, "Tengu no ago"	Ill sorted sand containing granule and foraminifera, subangular or angular boulder (max. size, 22 × 17 × 11 cm, siliceous shale (in situ), acid volcanic rock, sandstone and andesite).	In situ.
ditto, Otaru Bank.	About 200 cm length core, sand.	
West off Haboro, Otaru Bank.	Ill sorted sand containing granule and foraminifera, boulder (max. size, 28 × 17 × 17 cm, sandstone, siliceous siltstone, hornblende dacite, pumiceous sandstone) and cobble (altered andesite).	
Vitiaz Rise, slope.	Dark brown silt containing minor sand and foraminifera, pale greenish grey silt (sand-bearing, glutinous and semi-consolidated), and pebble (mostly acid volcanic rocks and minor granitic rock, sandstone and chert).	
Northwest off Shakotan Pen., slope of Kamui knoll.	Dark grey sandy silt, tuff breccia (in situ), and minor pebble (propyrite).	In situ.
ditto, slope of Shakotan Bank.	Dark grey sandy silt, pumice-bearing siltstone (in situ), sandstone (in situ) volcanic rock fragment and minor pebble.	In situ.
Northern edge of Japan Basin.	611 cm length, silt with sand layers.	4 m × 2.
ditto, slope of seamount	Dark brown silt, light brown silt, and dark reddish brown silt.	