

I. OUTLINE OF THE RESEARCH CRUISE

Eiichi Honza

The marine geological and geophysical investigations in the northern margin of the Okinawa Trough and in the western margin of the 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 of marine geological investigation of the continental shelves and slopes around Japan, using the research vessel "Hakurei-Maru".

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

The survey covered the northern margins of the Okinawa Trough and Tunghai Shelf, Tsushima Strait, Tsushima Basin, the continental shelf and slope off the western San-in district and the Korean Continental Borderland (Fig. I-1). A detail survey was carried out in the continental shelf and slope around the Oki Islands (Fig. I-2).

Scientific staff aboard consisted of six scientists of the Geological Survey of Japan, two guest scientists from Hiroshima University, and eleven technical assistants who are undergraduate students from Tokyo Fisheries University (Table I-1).

The ship left the Port of Funabashi on the 19th of April, 1977 and surveyed the northern margin of the Okinawa Trough and Tunghai Shelf and Tsushima Strait for 12 days and entered the Port of Hakata on 30th of April. The ship left the Port of Hakata on 4th of May and surveyed the continental shelf and slope off the San-in District, Tsushima Basin and the Korean Continental Borderland for 11 days and entered the Port of Sakaiminato on the 14th of May. The ship left the Port of Sakaiminato on the 17th of May and surveyed the continental shelf and slope around the Oki Islands in detail (Table I-2).

Routine seismic and magnetic profiling were carried out with a Bolt type airgun and a proton magnetometer which were towed from the ship's stern. 3.5 kHz echo sounders and an board gravity meter were also used to obtain bottom and sub-bottom information. Refraction measurements were also carried out by sono-buoy. Dredge, rock coring and piston coring sites were selected to ascertain and correlate the seismic profiling results of the material which constituted the bottom (Table I-3). Several dredge and rock coring sites were selected for a lithological study of the highs and several sites for piston coring were selected to study the sedimentology of the basin.

The ship position was ascertained by use of NNSS, Loran C and Decca equipment. Decca stations on land do not cover the whole of the surveyed area but are available for the area around Kyushu Island. The ship covered a total distance of 7303.0 nautical miles during 40 days. The results of the stationary observations are summarized in Table I-4.

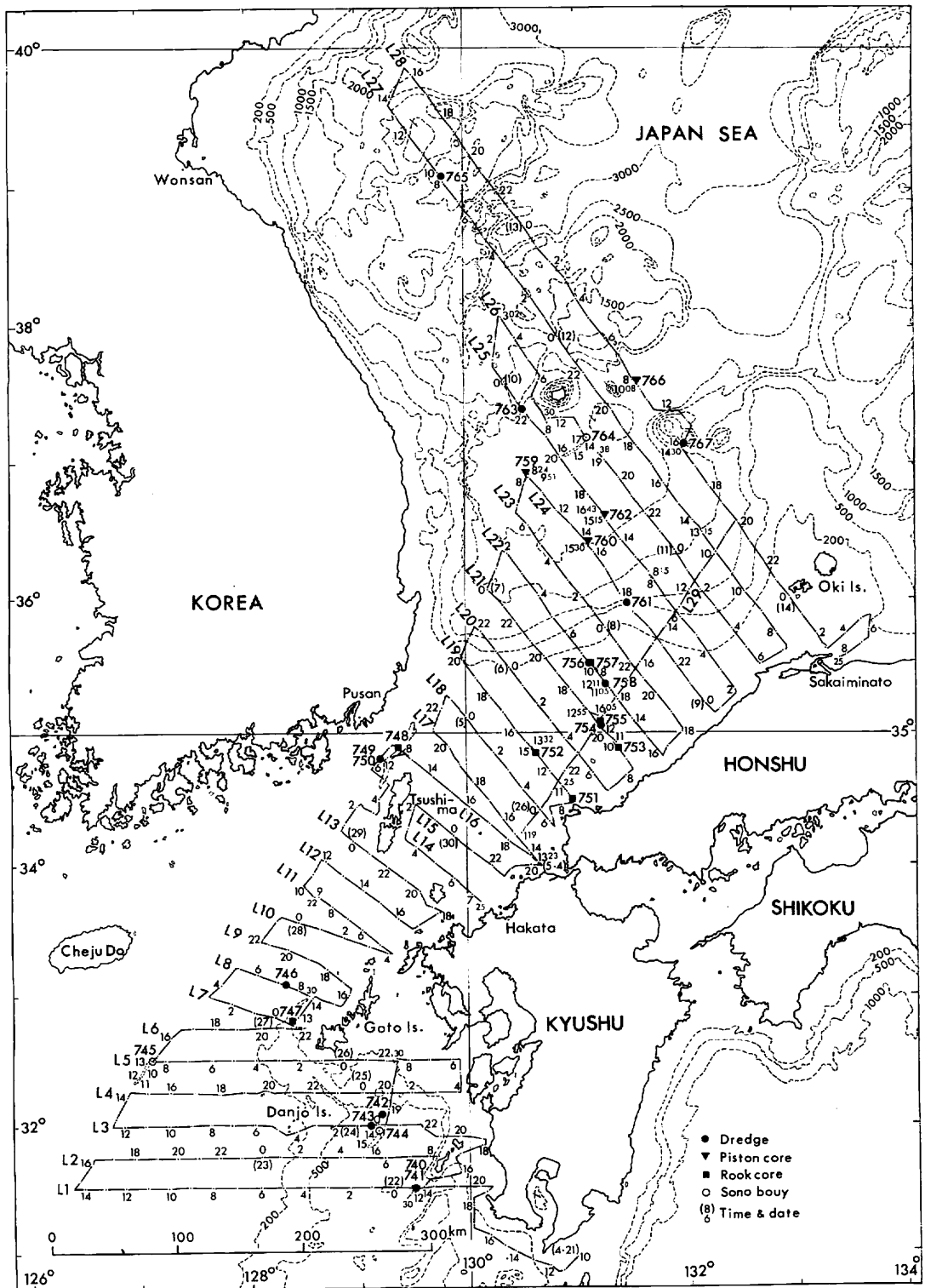


Fig. I-1 Surveyed area and track chart of the geological and geophysical surveys.

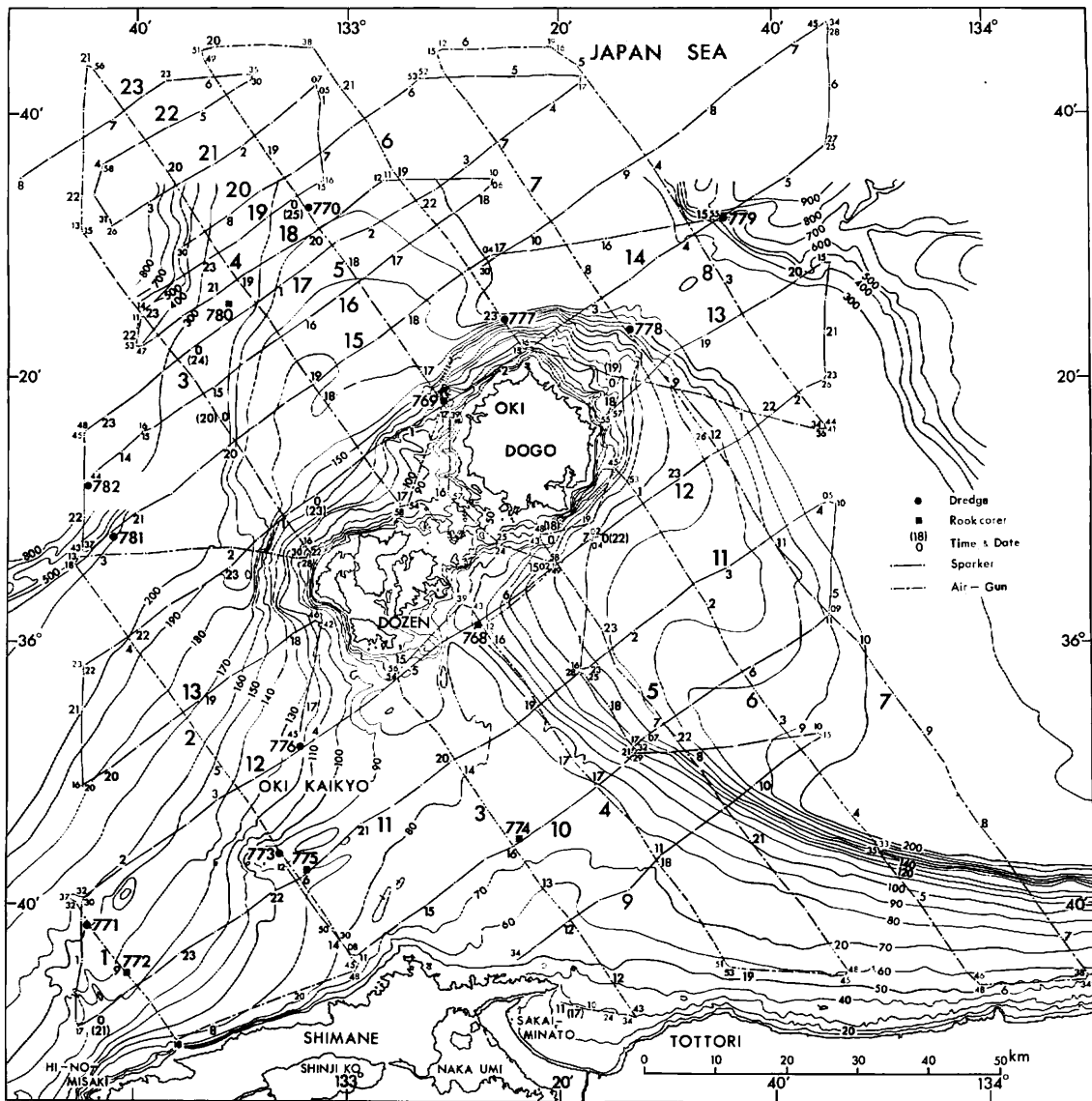


Fig. I-2 Detail survey in the offshore area of the Shimane and Oki Islands.

Table I-1 Scientific staff on board.

Name	Institute	Speciality
Eiichi HONZA	G.S.J.	chief scientist, geology
Kaichi ISHIBASHI	G.S.J.	geomorphology
Makoto YUASA	G.S.J.	lithology
Masato JOSHIMA	G.S.J.	geophysics
Kensaku TAMAKI	G.S.J.	structural geology
Fumitoshi MURAKAMI	G.S.J.	geophysics
**** Kazuo OKAMOTO	Hiroshima Univ.	paleontology
**** Michio KATO	Hiroshima Univ.	paleontology
Toshihiko MYOJIN	Tokyo Fisheries Univ.	technical assistance
* Saijiro HAYAKAWA	Tokyo Fisheries Univ.	technical assistance
* Yasukazu KAWAGUCHI	Tokyo Fisheries Univ.	technical assistance
* Masao WATANABE	Tokyo Fisheries Univ.	technical assistance
** Kikutaro OBATA	Tokyo Fisheries Univ.	technical assistance
** Hiroto TAKASE	Tokyo Fisheries Univ.	technical assistance
*** Yutaka SATO	Tokyo Fisheries Univ.	technical assistance
*** Hajime SATO	Tokyo Fisheries Univ.	technical assistance
*** Hidero WATANABE	Tokyo Fisheries Univ.	technical assistance
***** Kinki YAMAMURA	Tokyo Fisheries Univ.	technical assistance
***** Yasutoshi NINOMIYA	Tokyo Fisheries Univ.	technical assistance

- * Funabashi-Sakaiminato
 ** Funabashi-Hakata
 *** Hakata-Funabashi
 **** Hakata-Sakaiminato
 ***** Sakaiminato-Funabashi

Table I-2 Schedule of the cruise.

April 19th	Lv. the Port of Funabashi Geological and geophysical survey in the northern margin of the Okinawa Trough and in Tsushima Strait
April 30th	Ar. at the Port of Hakata
May 4th	Lv. the Port of Hakata Geological and geophysical survey in the western margin of the Japan Sea
May 14th	Ar. at the Port of Sakaiminato
May 17th	Lv. the Port of Sakaiminato Geological and geophysical survey around the Oki Islands
May 28th	Ar. at the Port of Funabashi

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
—Prospection of sedimentary surficial layers and surficial structure
Continuous seismic profiling survey by air-gun and sparker
—Prospecting of sedimentary layers and geological structure
Refraction measurement by sono-radio buoy
—Prospecting of sedimentary layers and geological structure
Magnetic survey by proton magnetometer
Gravity measurement 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

Table I-4 Results of stationary

Station No.	Sample No.	Date	Time*	Position**		Depth (m)**
				Latitude	Longitude	
740	P102	'77 April, 23	10: 32– 11: 13	31°29.0'N	129°28.8'E	771
741	SB1	ditto				
742	D213	April, 25	10: 16– 10: 38	32°15.7'N– 32°15.7'N	129°11.0'E– 129°11.0'E	216– 168
743	D214	ditto	12: 03– 12: 27	32°09.0'N– 32°09.7'N	129°05.1'E– 129°05.3'E	315– 390
744	SB2	ditto		31°56.9'N– 31°48.9'N	129°10.0'E– 129°03.4'E	
745	SB3	April, 26		32°30.0'N– 32°19.8'N	127°06.2'E– 126°56.2'E	
746	D215	April, 27	10: 09– 10: 25	33°04.9'N– 33°04.9'N	128°19.2'E– 128°19.4'E	151– 144
747	RC1	ditto	12: 04– 12: 26	32°47.5'N	128°22.6'E	200
748	RC2	April, 29	8: 59– 9: 21	34°52.7'N	129°22.0'E	219
749	D216	ditto	10: 18– 10: 35	34°47.7'N– 34°47.6'N	129°11.6'E– 129°11.4'E	126– 127
750	D217	ditto	10: 53– 11: 36	34°48.1'N– 34°47.8'N	129°12.0'E 129°12.0'E	134– 135
751	RC3	'77 May, 5	10: 14– 10: 26	34°29.3'N	130°56.7'E	91
752	RC4	ditto	14: 15– 14: 29	34°50.1'N	130°37.0'E	126
753	RC5	May, 6	10: 30– 10: 40	34°52.2'N	131°22.5'E	94
754	D218	ditto	13: 56– 14: 14	35°03.5'N– 35°03.6'N	131°13.3'E– 131°13.8'E	101– 100
755	RC6	ditto	15: 25– 15: 39	35°06.1'N	131°12.1'E	118

observations (compiled by M. YUASA).

Sampler	Area and topography	Samples	Remarks
Piston corer	Southwest of Koshiki Is.	Silt and sand (mieaceous).	Beut. 4 m barrel × 2
Sono-buoy			Failing.
Chain-bag type and cylinder type dredge	Southeast of Fukue Is., knoll.	Coarse shell sand, calcareous balls and beach sandstone.	Recent or latest Pleistocene.
ditto	ditto.	Medium shell sand, calcareous balls, pebble and rock fragments (metamorphic and siliceous rocks).	
Sono-buoy	East of Danjogunto, bottom of Danjo Basin.	Reverse course 31°48.5'N-31°54.0'N 129°03.5'E-129°11.3'E	
ditto	West of Fukue Is., continental shelf.	Reverse course 32°20.0'N-32°32.3'N 126°55.8'E-127°04.8'E	
Chain-bag type and cylinder type dredges.	West of Goto Islands.	Coarse sand, shell and shell fragments, and rock fragment (sandstone).	
Rock corer	ditto.	Fine-grained granitic rock fragments.	In situ.
ditto	Northwest of Tsushima Is.	185 cm length. Sandy silt. Coral and shell fragments at top.	
Chain-bag type and cylinder type dredges.	ditto.	Pebble and shell bearing medium sand.	May be derived from Korean Pen.
ditto	ditto.	Pebble and shell bearing medium sand. Pebble: granite, sandstone, qz-porphry, shale, rhyolite, slate, hornfels basic intermediate volcanic rock.	ditto
Rock corer	Continental shelf off Yamaguchi Pref.	Short core less than 0.9 meter. Upper part: shell fragment bearing coarse sand. Lower part: shell fragment bearing coarse and tufaceous sandstone.	Continued on the following sheet.
ditto	ditto.	Short core less than 0.35 meter. Upper part: shell fragment bearing sand. Lower part: shell and their fragments swarm.	
ditto	Continental shelf off Hagi.	100 cm core. brownish greenish grey medium sand and dark grey medium sand, both containing shell and shell fragments.	
Chain-bag type and cylinder type dredges.	Continental shelf northern off Hagi.	Shell fragment bearing sandstone, brownish sandstone and semi-consolidated sandstone. Cobblesand pebbles. Shell and shell fragment.	In situ sandstone.
Rock corer	ditto.	75 cm. Greyish fine sandstone and shell bearing sand.	

Table I-4

Station No.	Sample No.	Date	Time*	Position**		Depth (m)**
				Latitude	Longitude	
756	D219	May, 7	8: 47– 9: 11	35°31.0'N– 35°30.8'N	131°06.8'E– 131°07.0'E	152– 150
757	RC7	ditto	9: 24– 9: 36	35°30.9'N	131°08.0'E	139
758	D220	'77 May, 7	11: 42– 12: 04	35°21.4'N– 35°21.5'N	131°15.4'E– 131°15.3'E	106– 107
759	P103	May, 8	8: 40– 9: 41	36°55.8'N	130°33.7'E	2188
760	P104	ditto	14: 13– 15: 09	36°24.9'N	131°07.1'E	2025
761	D221	May, 9	10: 10– 10: 49	35°57.5'N– 35°57.7'N	131°27.6'E– 131°27.8'E	890– 820
762	P105	ditto	15: 29– 16: 26	36°37.1'N	131°16.0'E	2088
763	D222	May, 10	9: 22 10: 20	37°24.2'N– 37°24.6'N	130°31.2'E– 130°30.9'E	1571– 1520
764	SB4	ditto		37°10.9'N– 36°02.8'N	131°07.5'E– 130°54.7'E	
765	D223	May, 12	8: 34– 9: 41	39°05.3'N– 39°05.1'N	129°47.0'E– 129°47.4'E	1082– 962
766	P106	May, 13	8: 51– 9: 54	37°35.7'N	131°33.4'E	2444
767	D224	ditto	15: 04– 15: 35	37°08.1'N– 37°08.6'N	131°59.0'E– 131°59.1'E	522– 335
768	RC8	1977, May, 18	13: 48– 13: 58	36°01.3'N	133°12.1'E	100
769	RC9	May, 19	11: 38– 11: 52	36°18.2'N	133°09.8'E	107
769'	RC9'	ditto	15: 48– 16: 01	36°18.2'N	133°08.9'E	108
770	D225	ditto	13: 52– 14: 21	36°32.9'N– 36°32.9'N	132°56.2'E– 132°56.3'E	189– 185
771	D226	May, 20	10: 05– 10: 31	35°38.4'N– 35°38.7'N	132°35.6'E– 132°36.3'E	154– 151

(Continued)

Sampler	Area and topography	Samples	Remarks
Chain-bag type and cylinder type dredges	Continental shelf off Hamada.	Limestone (nodule?) and sandstone, both with green-colored surface. Sandstone.	Fossile bearing In situ.
Rock corer	ditto.	50 cm. Shell bearing sand.	Recent ?
Chain-bag type and cylinder type dredges	Continental shelf off Hamada.	Greenish grey medium-grained sandstone and dark greyish fine-grained sandstone. Boulder. Medium sand.	In situ sandstone.
Piston corer	Bottom of Tsushima Basin.	499 cm length, clay involving ash layers.	4 m barrel × 2. Inner tube system.
ditto	ditto.	545 cm length, clay with ash layers.	ditto.
Chain-bag type and cylinder type dredges	Continental slope off Hamada.	Greenish grey silty clay and pumice with greencolored surface.	Recent ?
Piston corer	Bottom off Tsushima Basin.	308 cm length, clay.	4 m barrel × 3, inner tube system.
Chain-bag type and cylinder type dredges	Slope off the high, west of Ullung-to.	Greyish and greenish brown silt (glutinous), pumice and pebble.	
Sono-buoy	Southeast of Ullung-to, bottom of Tsushima Basin.	Reverse course 37°03.2'N-37°09.4'N 130°54.2'E-131°06.5'E	
Chain-bag type and cylinder type dredges	Slope of Plateau off Wonsan.	Greenish and brownish grey silt. Cataclastic granite (green hornblende, biotite) and gneiss.	Probable near the outcrop.
Piston corer	Northwest of Takeshima, bottom of Tsushima Basin.	785 cm length, clay with pumice layers.	4 m barrel × 3.
Chain-bag type and cylinder type dredges	Southeast of Takeshima, slope of knoll.	Volcanic rocks, volcanic breccia, small amount of pebble, pumice and foraminifera bearing sand.	
Rock corer	South off Oki-dogen, continental shelf.	About 160 cm core, greenish grey medium sand containing shell and shell fragment.	Recent ?
ditto	Northwest off Oki-dogen, continental shelf.	Small amount sand and shell fragments.	Recent ?
ditto	ditto.	Rock fragments (fine-grained basalt?), pebble and sand.	Return to St. 769 after the dredge of D225.
Chain-bag type and cylinder type dredges	ditto.	Boulder of acidic volcanic rock (maximum size, 40 × 30.5 × 22.5 cm), rubble and red-colored coral.	
ditto	Northwest off Shimane Peninsula, continental shelf.	Medium sand, siltstone (maximum size, 11 × 9 × 4.5 cm), pebble and shell (fossil).	May be in situ silt stone.

Table I-4

Station No.	Sample No.	Date	Time*	Position**		Depth (m)**
				Latitude	Longitude	
772	RC10	ditto	11: 09– 11: 24	35°34.7'N	132°39.3'E	135
773	D227	ditto	12: 36– 12: 55	35°43.9'N– 35°43.8'N	132°53.5'E– 132°53.5'E	82– 81–
774	RC11	May, 22	13: 35– 13: 43	35°45.0'N	133°16.0'E	73
775	RC12	1977, May, 22	15: 05– 15: 14	35°42.7'N	133°56.1'E	90
776	D228	ditto	16: 20– 16: 35	35°52.00'N– 35°52.05'N	132°55.45'E– 132°55.55'E	114– 115
777	D229	May, 23	11: 16– 11: 40	36°24.4'N– 36°24.4'N	133°14.7'E 133°14.5'E	194– 192
778	D230	ditto	12: 42– 13: 03	36°23.7'N– 36°23.6'N	133°26.6'E– 133°26.2'E	176– 176
779	D231	ditto	14: 08– 14: 47	36°32.1'N– 36°32.0'N	133°35.5'E– 133°35.4'E	725– 625
780	RC13	May, 24	9: 45– 9: 59	36°15.6'N	132°48.7'E	196
781	D232	ditto	11: 02– 11: 38	36°07.9'N– 36°07.8'N	132°37.9'E– 132°38.2'E	457– 390
782	D233	1977, May, 24	12: 55– 13: 34	36°11.6'N– 36°11.8'N	132°35.4'E– 132°35.5'E	615– 590

* From "Lowered" to "Surfaced".

** "Hit" and "Lift off" for dredge, "Hit" for coring, "Throw" and "Turn" for sono-buoy.

(Continued)

Sampler	Area and topography	Samples	Remarks
Rock corer	ditto.	About 150 cm length core, Upper part: soft sand, Lower part: semi-consolidated siltstone and sandstone.	
Chain-bag type and cylinder	ditto.	Coarse shell sand and volcanic rock fragments (clpx-ol basalt).	
Rock corer	North off Shimane kninsula, continental shelf.	About 55 cm length core, Upper part: brownish very coarse sand Lower part: greyish very coarse sand containing high-temperature qz.	
Rock corer	North off Shimane kninsula, continental shelf.	About 130 cm length core, Upper part: coarse sand (loose) Middle part: alternation of very coarse sand and medium sand (biotite fragment bearing) Lower part: coarse sand containing high-temperature quartz.	
Chain-bag type and cylinder type dredges	ditto.	Shell and shell fragments bearing sand, and sandstone pebble.	
ditto	North off Okidogo, continental shelf.	Pebble (sandstone and volcanic rock), and granule bearing fine sand.	
ditto	Northeast off Okidogo, continental shelf.	Olive brown silt and pebble (sandstone, pumice and volcanic rock).	
ditto	Northeast off Okidogo, continental slope.	Brownish olive silt.	
Rock corer	Northwest off Okidozen, continental shelf.	About 110 cm length core, medium sand containing shell fragments. Upper part (25 cm length): brownish green, lower part dark grey.	
Chain-bag type and cylinder type dredges	Northwest off Okidozen, continental slope.	Softy claystone (grey-colored, brown-colored and greenish brown-colored layers), pebble (siltstone, sandstone and volcanic rock) and olive brown silt containing abundant foraminifera.	In situ claystone.
Chain-bag type and cylinder type dredges	Northwest off Okidozen, continental slope.	Brownish grey silt (slightly firm).	