Preliminary Results from Sediment Sampling of the R.V. Tansei-maru Cruise KT03-10 in the Eastern Marginal Part of the Japan Sea off Akita and Niigata Prefectures

メタデータ	言語: eng 出版者: 公開日: 2017-10-05 キーワード (Ja): キーワード (En): 作成者: Tsukawaki, Shinji, Ohtaka, Akifumi, Tanaka, Gengo, Watanabe, Masaharu, 塚脇, 真二, 大竹, 明史, 田中, 源吾, 渡辺, 正晴 メールアドレス: 所属:
URL	https://doi.org/10.24517/00029544

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 International License.

日本海域研究，第36号，69-81頁，2005

Preliminary Results from Sediment Sampling of the R. V. *Tansei-maru* Cruise KT03-10 in the Eastern Marginal Part of the Japan Sea off Akita and Niigata Prefectures

Shinji TSUKAWAKI[1], Akifumi OHTAKA[2], Gengo TANAKA[1]
and Masaharu WATANABE[3]

(Received October 29, 2004; Accepted November 21, 2004)

1. INTRODUCTION AND PURPOSE OF CRUISE

Marine geology and micropalaeontology were investigated in the eastern marginal part of the Japan Sea off Akita and Niigata Prefectures from the 14th to 20th of July 2003 during the R. V. *Tansei-maru* cruise KT03-10 as parts in a series on pursuing time-spatial distribution of depositional facies and spatial distribution of present micro-organisms in the Japan Sea. This article reports the results of sediment sampling and onboard observation of the samples, and biological materials for educational use during the cruise. Sedimentological and micropalaeontological analyses in the laboratory of them will be published elsewhere.

Many geological, geophysical and micropalaeontological studies have been made in the Japan Sea mainly by the Hydrographic Department, M.S.A., Japan (*e. g.* Iwabuchi, 1968), the Geological Survey of Japan / AIST (*e. g.* Arita and Okamura, 1989 ; Ikehara and Okamura, 1999, 2000), Ocean Research Institute, the University of Tokyo (*e. g.*, Kobayashi, ed., 1984), the DSDP / ODP (*e. g.* Ingle *et al.*, 1990) and others (*e. g.* Oba et al., 1991; Tsukawaki *et al.*, 2000, 2001, 2002). Taking these previous studies into account, piston coring and grab surface sampling sites were selected mainly in ; (1) the continental shelf off Honjo, Akita Prefecture to the lower slope of the Japan Basin through the Tobishima Basin and the Mogami Trough, (2) the Sado Basin off Niigata Prefecture, and (3) the Matsu Seamount of the Japan Sea, for the purposes of the following scientific searching ; (1) spatial distribution of bottom surface sediments, and micro- and macro-organisms in the above-stated areas, and (2) time-spatial distribution of depositional facies in the Tobishima Basin (Fig. 1).

2. SAMPLING METHODS

A six-metres-long stainless-steel pipe piston core sampler with a 600-kg weight and a 70-cm-long Nasu type pilot core sampler were utilized to obtain cored sediments in the Tobishima Basin, and an Okean type grab surface sampler without extra weights were used to obtain bottom surface sediments and benthic organisms during the cruise. The site survey was always carried out with a precise depth recorder (PDR) of the R. V. *Tansei-maru* in

[1] Division of Eco-Technology, Institute of Nature and Environmental Technology, Kanazawa University, c/o General Education Hall, Kanazawa University, Kakuma-machi, Kanazawa, 920-1192 Japan
[2] Department of Science, Faculty of Education, Hirosaki University, 1 Bunkyo-machi, Hirosaki, 036-8560 Japan
[3] Technical Support Office, Ocean Research Institute, University of Tokyo, 15-1 Minamidai 1-chome, Nakano-ku, Tokyo, 164-8639 Japan

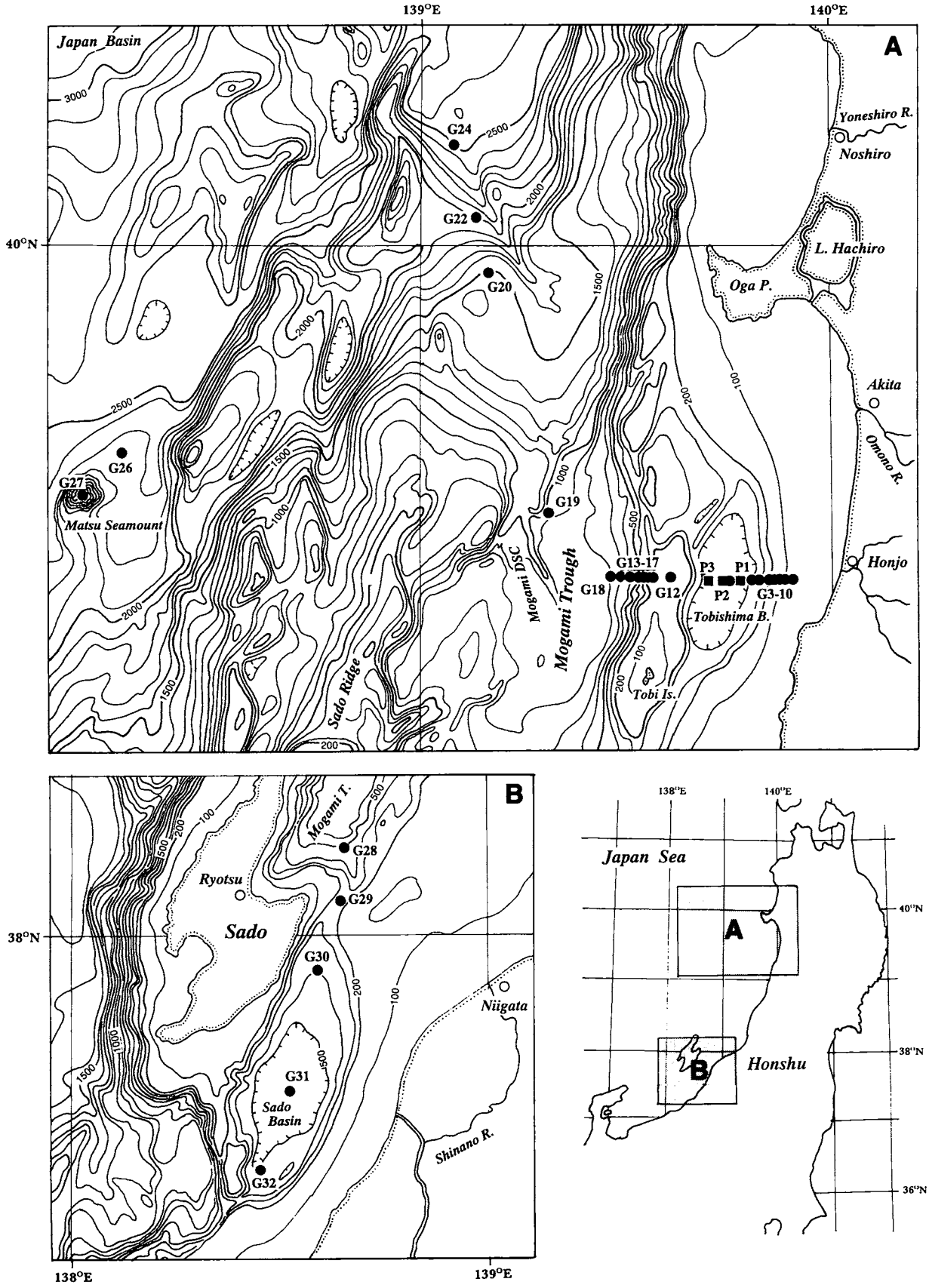


Fig. 1 : Submarine topography and sediment sampling sites of the studied areas in the eastern marginal part of the Japan Sea off Honjo, Akita Prefectures (A), and the Sado Basin off Niigata Prefecture (B) (solid circle: grab surface sampling site, solid square: both grab surface and piston coring site, based on Hydrographic Department, M. S. A., Japan, 1980).

order to get the topographic information of the sea floor.

3. TOPOGRAPHY OF THE SURVEY AREAS

The main surface sediment sampling line of the cruise in the eastern marginal part of the Japan Sea starts first to the westward from the continental shelf off Honjo at a water depth of 75 m, it cuts across the central part of the Tobishima Basin and a ridge north of Tobishima Island, then it turns to the north-northwestward in the Mogami Trough, one of the major sedimentary basin situated between Northeast Japan and the Sado Ridge, and it reaches to the southern marginal part of the Japan Basin through the continental slope (Fig. 1). The width of the continental shelf off Honjo is comparatively narrow about 14 km. The Tobishima Basin where three piston coring sites are also located is a small oval sedimentary basin, about 40 km x 17 km and the maximum depth of 447 m, situating northeast of Tobishima Island.

The Sado Basin is also a small oval sedimentary basin, about 64 km x 22 km, the maximum depth of 523 m, situating between Niigata Prefecture and Sado Island. A surface sediment survey line is located along the longitudinal axis of the basin from the south-southwest to the north-northeast. The Matsu Seamount, rising on the sea-floor about 2,300 m deep to the height of 915 m deep, is one of the conspicuous topographic highs in the southern part of the Japan Basin. Surface sampling sites were set up at both foot and peak of the seamount.

4. RESULTS OF SEDIMENT SAMPLINGS AND ONBOARD OBSERVATION OF SEDIMENTS

Three piston cored sediments from three sites of the Tobishima Basin, 20 grab surface sediments from 19 sites were successfully obtained from the eastern marginal part of the Japan Sea off Honjo to the Japan Basin, and six grab surface sediments from five sites in the Sado Basin and its environs, and three surface sediment from both foot and peak of the Matsu Seamount were recovered (Table 1).

4-1. Continental Shelf off Honjo to Southern Continental Slope of Japan Basin through Mogami Trough

Surface sediments of the inner continental shelf off Honjo in the eastern marginal part of the Japan Sea

Table 1 : Results of sampling on the R. V. Tansei-maru Cruise KT03-10 in the eastern marginal part of the Japan Sea off Honjo, Akita Prefecture, the Sado Basin and the Matsu Seamount (6-m PC: 6-m-long piston core sampler, Okean L: Okean grab sampler).

Station	Locality	Date (D/M/Y)	Sampler	Time Hit	Longitude (E)	Latitude (N)	Water Depth (m)	Recovery (%) or core length (cm)	Sediment Type
KT03-10 G-32	Sado Basin	14/07/03	Okean L	19:16	138 27.690	37 33.502	437	35%	olive grey homogeneous mud covered by thin reddish brown soft mud, a serpent star of the suface
KT03-10 G-31	Sado Basin	14/07/03	Okean L	20:42	138 31.931	37 42.973	535	35%	olive grey homogeneous mud covered by thin brownish red soft mud, bluish grey sticky mud in lower
KT03-10 G-30	Sado Basin	14/07/03	Okean L	22:19	138 35.857	37 55.924	394	30%	olive grey homogeneous mud covered by thin yellowish grey mud, bluish grey sticky mud in lower
KT03-10 G-29	Sado Basin	14/07/03	Okean L	23:30	138 38.911	38 03.935	264	5%	semi-consolidated brownish grey mud covered by thin brown soft mud, serpent stars on the surface
KT03-10 G-29'	Sado Basin	14/07/03	Okean L	23:45	138 38.808	38 03.853	260	10%	semi-consolidated brownish grey mud covered by fine- to medium-grained well-sorted sand, serpent stars
KT03-10 G-28	Sado Basin	15/07/03	Okean L	00:45	138 39.953	38 09.870	471	35%	olive grey homogeneous soft mud covered by thin brownish red soupy mud
KT03-10 PDR	Tobishima Basin	16/07/03	PDR	04:05	139 52.226	32 22.845	128	-	*start of PDR survey line*
KT03-10 PDR	Tobishima Basin	16/07/03	PDR	06:20	139 39.288	32.23.037	316	-	*end of PDR survey line*
KT03-10 P-1	Tobishima Basin	16/07/03	6-m PC	08:17	139 42.036	39 23.315	444	550 cms	olive grey homogeneous mud (cutting surfaces)
KT03-10 P-2	Tobishima Basin	16/07/03	6-m PC	09:52	139 44.980	39 23.234	453	540 cms	olive grey homogeneous mud (cutting surfaces)
KT03-10 P-3	Tobishima Basin	16/07/03	6-m PC	11:00	139 48.457	39 23.298	390	530 cms	olive grey homogeneous mud (cutting surfaces)
KT03-10 G-3	off Honjo	16/07/03	Okean L	11:59	139 54.860	39 23.125	75	75%	olive grey homogeneous muddy fine-grained sand covered by yellowish brown sandy soft mud
KT03-10 G-4	off Honjo	16/07/03	Okean L	12:34	139 52.616	39 23.055	102	40%	olive grey fine-grained sandy homogeneous mud covered by thin yellowish brown soft mud
KT03-10 G-5	off Honjo	16/07/03	Okean L	12:56	139 51.364	39 23.041	125	75%	olive grey fine-grained sandy homogeneous mud covered by yellowish to pinkish brown soft mud
KT03-10 G-6	off Honjo	16/07/03	Okean L	13:12	139 50.949	39 23.075	150	60%	olive grey fine-grained sandy homogeneous mud covered by yellowish to brownish red soft mud
KT03-10 G-7	off Honjo	16/07/03	Okean L	13:34	139 50.774	39 23.134	175	60%	olive grey homogeneous mud covered by yellowish to reddish brown soft mud
KT03-10 G-8	off Honjo	16/07/03	Okean L	13:51	139 50.652	39 23.128	202	100%	olive grey homogeneous mud covered by reddish brown soft mud
KT03-10 G-9	off Honjo	16/07/03	Okean L	14:15	139 50.176	39 22.995	253	50%	olive grey homogeneous mud covered by reddish brown soft mud, serpent stars on the surface
KT03-10 G-10	off Honjo	16/07/03	Okean L	14:44	139 49.229	39 23.021	354	50%	dark olive grey mottled sticky mud covered by yellowish brown soft mud
KT03-10 G-11	off Honjo	16/07/03	Okean L	15:38	139 45.558	39 22.995	451	40%	dark olive grey mottled sticky mud covered by reddish brown soft mud, fecal pellets on the surface
KT03-10 G-12	off Honjo	16/07/03	Okean L	16:40	139 36.151	39 22.990	134	0%	a little amount of mudstone gravels and a little amount of fine-grained sand
KT03-10 G-12'	off Honjo	16/07/03	Okean L	16:51	139 36.162	39 22.947	133	5%	semi-consolidated mudstone gravels and a little amount of fine-grained sand
KT03-10 G-13	off Honjo	16/07/03	Okean L	17:37	139 32.537	39 23.046	222	10%	dark grey fine- to medium-grained sand, serpent stars on the surface
KT03-10 G-14	off Honjo	16/07/03	Okean L	17:56	139 32.354	39 22.960	258	25%	dark grey fine- to medium-grained sand with a little amount of gravels, serpent stars on the surface
KT03-10 G-15	off Honjo	16/07/03	Okean L	18:19	139 31.931	39 22.932	351	50%	yellowish olive grey sandy mud covered by yellowish brown sticky soft mud, serpent stars on the surface
KT03-10 G-16	off Honjo	16/07/03	Okean L	18:53	139 31.032	39 23.004	500	100%	olive grey homogeneous mud covered by thin yellowish to reddish brown soft mud, fecal pellets
KT03-10 G-17	off Honjo	16/07/03	Okean L	19:38	139 28.843	39 22.995	751	25%	olive grey homogeneous mud covered by reddish brown soft mud
KT03-10 G-18	off Honjo	16/07/03	Okean L	21:14	139 17.982	39 29.897	946	90%	olive grey homogeneous mud covered by reddish brown soft mud
KT03-10 G-20	off Honjo	17/07/03	Okean L	01:31	139 11.362	39 49.617	1,500	50%	pale olive grey homogeneous compact mud covered by 1-cm thick reddish brown soft mud
KT03-10 G-22	off Honjo	17/07/03	Okean L	04:00	139 06.925	40 03.435	2,026	60%	dark olive grey homogeneous compact mud covered by 1-cm thick reddish brown soft mud
KT03-10 G-24	off Honjo	17/07/03	Okean L	06:18	139 04.386	40 10.742	2,532	20%	semi-comsolidated pale yellow mudstone gravels covered by 3-cms thick yellowish brown soft mud
KT03-10 G-26	foot of Matsu Smt	17/07/03	Okean L	15:17	138 13.914	39 35.015	2,292	30%	reddish brown homogeneous sticky mud, greyish olive in lower, tiny serpent stars on the surface
KT03-10 G-27	summit of Matsu Smt	17/07/03	Okean L	18:17	138 10.989	39 31.723	946	25%	pebble- to cobble-gravels-bearing olive brown muddy medium- to coarse-grained basaltic sand
KT03-10 G-27'	summit of Matsu Smt	17/07/03	Okean L	19:02	138 10.835	39 31.791	962	35%	pebble-gravels-bearing olive brown muddy medium- to coarse-grained basaltic sand

consist of muddy homogeneous olive grey fine-grained sand at the shallowest site G-3 at a water depth of 74 m (Plate 1, Fig. 1), and olive grey sandy homogeneous mud at the site G-4 at a water depth of 102 m. Thin, less than one-centimetre thick, yellowish brown soupy mud were recognised on the surface of both samples. On the other hand, the surface sediments of the outer continental shelf are composed of olive grey homogeneous sandy mud covered by thin yellowish brown soupy mud at the shallower two sites G-5 and -6 at water depths of 125 and 150 m respectively (Plate 1, Fig. 2), and olive grey homogeneous mud covered by yellowish or reddish brown soupy mud at the deeper two sites G-7 and -8 at water depths of 175 and 202 m, respectively (Plate 1, Fig. 3).

The surface sediment from the upper eastern slope of the Tobishima Basin at a water depth of 253 m is composed of olive grey homogeneous mud covered by reddish brown soft mud, but sediments at the site G-10 in the lower eastern slope at a water depth of 354 m and the site of G-11 in the basin plain at a water depth of 451 m consist of dark olive grey mottled and sticky mud covered by thin yellowish or reddish brown soupy mud (Plate 1, Fig. 4).

A little amount of fine-grained sand-bearing semi-consolidated mudstone gravels were recovered at the sites G-12 and -12' in the ridge north of Tobishima Island, about 134 m deep (Plate 1, Fig. 5), but dark grey fine- to medium-grained sand with a little amount granule- to pebble-gravels were obtained from the sites G-13 and -14 located on the western slope of the ridge as well as the eastern slope of the Mogami Trough at water depths of 222 and 258 m, respectively (Plate 1, Fig. 6). The sediments from the middle slope are composed of yellowish olive grey sandy mud covered by thin yellowish brown sticky soft mud at the sites G-15, 351 m deep (Plate 1, Fig. 7), and olive grey homogeneous mud covered by thin yellowish to reddish brown soft mud at the site of G-16, 500 m deep, respectively.

The surface sediments from the floor of the Mogami Trough at water depths of 751 m (G-17) and 946 m (G-18) are both composed of olive grey homogeneous mud covered by thin reddish brown soft mud (Plate 1, Fig. 8). On the other hand, the sediments from the deeper part of the trough as well as the southern continental slope of the Japan Basin at water depths of 1,500 m and 2,026 m both consist of pale olive grey (G-20) or dark olive grey (G-22) homogenous compact mud covered by thin reddish brown soft mud (Plate 2, Figs. 1 and 2). About three centimetres thick yellowish brown homogeneous mud with pale yellow semi-consolidated mudstone gravels was recovered from the deepest part of the survey line, 2,532 m (G-24) in the lower continental slope of the Japan Basin (Plate 2, Fig. 3).

Cored sediments KT03-10 P-1, -2, and -3, about 550 cm, 540 cm, and 530 cm long, obtained from the base-of-eastern slope, the central part and the base-of-western slope of the Tobishima Basin at water depths of 444 m, 453 m and 390 m, respectively are composed probably of dark olive grey homogeneous mud, judged from the horizontal cutting surfaces of the cored sediments.

4-2. Sado Basin

Along the longitudinal axis of the Sado Basin, surface sediments from the southern (G-32: 437 m deep), central (G-31: 535 m deep) and northern (G-30: 394 m deep) parts of the basin are composed mainly of olive grey homogeneous mud covered by thin reddish or yellowish brown soupy mud (Plate 2, Figs. 7 and 8). Bluish grey compact sticky mud, more than five centimetres thick, underlies the homogeneous mud at the sites G-31 and -30. On the other hand, sediments from the northern margin of the basin (G-29 and -29' : 264 m and 260 m deep) consist mainly of semi-consolidated brownish grey mud covered by thin brown soft mud (G-29) or fine- to medium-grained well-sorted sand (G-29'). Olive grey homogeneous mud covered by thin brownish red soupy mud was recovered from the site G-28 located in the southern marginal part of the Mogami Trough (Plate 2, Fig. 6).

4-3. Matsu Seamount

Two sampling sites were selected in the area of the Matsu Seamount. Surface sediments at the site G-26 at the foot of the seamount, 2,292 m deep, is composed of reddish brown homogeneous sticky mud (Plate 2, Fig. 4). Greyish olive brown sticky mud underlies the reddish brown mud. On the other hand, the site G-27 and -27' located at the peak of the seamount, 946 m and 962 m deep, basaltic pebble- to cobble-gravels-bearing olive brown muddy medium- to coarse-grained basaltic sand (Plate 2, Fig. 5).

5. BIOLOGICAL MATERIAL FOR SCIENCE EDUCATION

Various kinds of benthic animals were collected for the purpose of use for the undergraduate biological education in the Faculty of Education, Hirosaki University. The material was obtained from 25 sites at water depths of 75 m through 2,532 m in the three regions, area of the continental shelf to the basin plain through the continental slope off Honjo, the Matsu Seamount, and the Sado Basin. In each sites, single or double bottom samples were collected by the aid of an Okean grab sampler with 2,500 m^2 at base. Macrobenthos were directly collected from surface of the bottom sediments, and fixed in a 10 % formalin solution. Then the bottom sample was partly passed through screens with openings of 0.2 mm and 0.5 mm, the retained material was fixed in a 10 % formalin, and zoobenthos including meiofauna were sorted under a stereomicroscope. Occurrence of benthic animals in phylum, class or order levels was summarized in Table 2. Applied with the system by Margulis and Schwartz (1998), ten phyla of animals were recorded in the samples.

Echinoderms were the commonest among macrobenthos, of which brittle-stars (Ophiuroidea) were the most widely and the most abundantly found. The brittle-stars were mostly represented by ophimyxids, collected from bottoms at water depths of 75 m through 2,532 m. Several starfishes (Asteroidea) were collected from three sites of 175 to 500 m deep, one each schizasterid heart urchins (Echinoidea) was found from two bottoms off Honjo (175 and 202 m deep), and two molpadiid sea-cucumbers (Holothuroidea) were found in two sites (175 m deep off Honjo and 394 m deep in the Sado Basin). A single

Table 2 : Occurrences of benthic animals during the KT03-10 (+: occurrence for each taxon).

Phylum	off Honjo																			Matsy Sm.		Sado Basin			
Class \ Station No.	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G20	G22	G24	G26	G27	G29	G30	G31	G32
Order \ Depth (m)	75	102	125	150	175	202	253	354	451	134	222	258	351	500	751	946	1,500	2,026	2,532	2,292	946	264	394	535	437
Cnidaria																									
Hydorozoa																				+					
Nematoda	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Sipuncula		+						+		+		+				+						+			
Priapulida	+	+	+	+																					
Mollusca																									
Gastropoda																					+				
Bivalvia	+	+	+		+		+	+	+						+	+	+		+		+	+			
Annelida																									
Polychaeta	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Oligochaeta									+		+					+						+			
Chelicerata																									
Arachnida																									+
Crustacea																									
Malacostraca																									
Decapoda										+															
Amphipoda							+	+		+	+	+		+								+			
Cumacea									+					+		+									
Tanaidacea							+	+	+	+	+	+				+				+	+	+		+	+
Ostracoda									+	+											+		+	+	+
Copepoda																									
Cyclopoida	+	+				+			+				+												
Harpacticoida	+	+		+	+	+		+		+	+		+	+		+	+	+			+	+	+	+	+
Echinodermata																									
Asteroidea					+									+								+			
Ophiuroidea	+						+				+	+	+						+	+		+			+
Echinoidea					+	+																			
Holothuroidea					+																		+		
Craniata																									
Osteichthyes	+																								

gobiid fish (Craniata) was collected at single site off Honjo at a water depth of 75 m.

Bivalves, consisting of nuculanids, nuculiids and pectinids, were widely distributed, and were found from 13 sites, while gastropods were rare only from the top of the Matsu Seamount (G-27). Polychaetes were collected from all sites surveyed; they were abundant and included multiple families. Several oligochaetes, all of which were tubificids, were found in four sites with the depths of 222 m through 946 m. Sipunculans (Sipuncula) were less abundant, but widely distributed from the bottoms with the depths of 102 m through 946 m. Priapulids (Priapulida) were restricted in the inner to outer shelves off Honjo with the depths of 75 m through 150 m.

Crustaceans collected were composed of three classes (Malacostraca, Ostracoda, and Copepoda), including both macrofauna and meiofauna. Malacostracan decapods, amphipods, cumaceans and tanaidaceans were commonly collected in the three regions in the present survey, from the bottoms at water depths of 253 m through 946 m. Meiobenthic harpacticoids were abundant, found from 18 sites with various depths. Cyclopoids and ostracods were also found from multiple sites, but they were less abundant than harpacticoids.

Nemetodes (Nematoda) were the most abundant meiobenthos, found from all the 25 sites surveyed. Colonial hydroids (Cnidaria) were collected from the foot of the Matsu Seamount at a water depth of 2292 m.

The animal specimens collected in the present survey will be used as biological material in science education. In undergraduate education, marine biology, especially zoology, is usually focused in coastal or intertidal zones, and students hardly realize diversity of life in deep sea bottoms. Therefore, the present animal collection will be beneficial to biological education.

6. DISCUSSION

A number of marine geological studies has been made in the eastern marginal part of the Japan Sea (*e. g.* Ikehara and Okamura, 1999, 2000), and systematic surface sediment sampling in the sea which includes the area of the present study was carried out in these studies. However, their spatial grid-sampling bearing no relation with water-depths may be insufficient for sedimentological and micropalaeontological studies in the shallow-sea area, because it is well known that spatial distribution of benthic micro-organisms is in close association with both water-depth and bottom sediment types. Judging from the ocean current system in the Japan Sea off North Japan where the Tsushima Warm Current flows over the Japan Sea Proper Water along the coast, it is inferred that spatial distribution of benthic micro-organisms inhabiting in the area provides important information to understand the vertical water mass structure and its seasonal fluctuation in the area.

Although sediment sampling of the present study was carried out along only one line off Honjo to the Japan Basin in the eastern marginal part of the Japan Sea, and observation of the samples was short of a preliminary perception on their compositional features, a sufficient number of samples was recovered from various water-depths shallower than 200 m for further micropalaeon tological and sedimentological studies. Accordingly, the surface sediment samples obtained during, the cruise hold out a promising prospect for investigations of micro-organisms inhabiting in these areas.

7. CONCLUDING REMARKS

The preliminary results from sediment sampling on the R. V. *Tansei-maru* KT03-10 cruise in the eastern marginal part of the Japan Sea off Honjo, Akita Prefecture, the Sado Basin and the Matsu Seamount summarized as follows:

1. Surface sediments of the eastern marginal part of the Japan Sea off Honjo are composed generally of olive grey homogeneous muddy sand or sandy mud from the inner to the outer continental shelf (75 to 150 m), olive grey homogeneous mud from the outer continental shelf to the upper slope of the Tobishima Basin (175 to

253 m), dark olive grey sticky compact mud from the lower slope to the basin plain of the basin (354 and 451 m), semi-consolidated mudstone gravels in the ridge north of Tobishima Island (133 and 134 m), dark grey fine- to medium-grained sand in the upper slope of the Mogami Trough (222 and 258 m), yellowish olive grey sandy mud in the middle slope of the trough (351 m), olive grey homogeneous mud in the lower slope to the floor of the trough (500 to 946 m), and pale olive grey or dark olive grey homogeneous compact mud in the middle slope of the Japan Basin (1,500 and 2,026 m). Semi-consolidated mudstone gravels with yellowish brown soft mud was recovered from the deepest site on the survey line at the lower slope of the basin at a water depth of 2,532 m.

2. Surface sediments of the Sado Basin off Niigata Prefecture consist mainly of olive grey homogeneous mud, but semi-consolidated brownish grey mudstone was obtained from the northernmost marginal part of the basin at a water depth of 260 m. Sediment of the southern marginal part of the Mogami Trough to the north of the basin is composed of olive grey homogeneous soft mud..
3. Cored sediments P-1, -2 and -3, about 550, 540 and 530 cm long, respectively, recovered from the flat floor of the Tobishima Basin off Niigata at water depths of 444 m, 453 m and 390 m would be composed mainly of olive grey homogeneous mud.
4. Surface sediments recovered from the peak and foot of the Matsu Seamount are composed of basaltic pebble- to cobble-gravels with muddy medium- to coarse-grained sand and reddish brown homogeneous sticky mud, respectively.
5. The surface sediment samples collected with attention to the water-depths from the eastern marginal part of the Japan Sea off Honjo, Akita Prefecture during the cruise provide important material for micropalaeontological studies in these areas.
6. Various kinds of benthic animals collected for the purpose of use for the undergraduate biological education. Because in undergraduate education, marine biology is usually focused in coastal or intertidal zones, and students hardly realize diversity of life in deep ocean floor, the present animal collection will be beneficial to biological education in universities.

Acknowledgements: The authors express their sincere gratitude to Captain S. Fujita and all crews of the R. V. *Tansei-maru*, Ocean Research Institute, the University of Tokyo, for their help during cruise KT03-10. Thanks are also due to Professor T. Ura, Institute of Industrial Science, University of Tokyo, and all onboard scientists and technicians for their help during the cruises. They would like thank Professors K. Tamaki and H. Tokuyama, Ocean Research Institute, University of Tokyo for variable help for arranging the cruises.

REFERENCES

Arita, M. and Okamura, Y. eds., 1989: *Research on Submarine Geology of the Continental Shelf around Southwest Japan - around Noto Peninsula -*. Geol. Surv. Japan, 183p (in Japanese).

Hydrographic Department, M. S. A., Japan, 1979: *1: 1,000,000 Bathymetric Chart, no. 6312, Norheast Nippon*. Maritime Safety Agency, Tokyo.

Ikehara, K and Okamura, Y. eds., 1999: *Comprehensive Study on Environmental Changes in the Western Hokkaido Coastal Area and Study on Evaluation of Marine Active Faults, Preliminary Reports on Researches in the 1998 Fiscal Year*. Geol. Surv. Japan, 202p (in Japanese).

Ikehara, K and Okamura, Y. eds., 2000: *Comprehensive Study on Environmental Changes in the Western Hokkaido Coastal Area and Study on Evaluation of Marine Active Faults, Preliminary Reports on Researches in the 1999 Fiscal* Year. Geol. Surv. Japan, 211p (in Japanese).

Ingle, J. C., Jr., Suyehiro, K., von Breymann, M. T., *et al.*, 1990: *Proceedings of the Ocean Drilling Program, Initial Reports, 128*. College Station, Texas, USA (Ocean Drilling Program), 652p.

Iwabuchi, Y., 1968: Submarine geology of the southeastern part of the Japan Sea. *Contr., Inst. Geol. Paleontl., Tohoku Univ.*, **66**, 1-76 (in Japanese with

English abstract).

Kobayashi, K. ed., 1984: *Preliminary Report of the Hakuho Maru Cruise KH82-4, Geophysical and Geological Investigation of Seafloor around Ogasawara (Bonin) Islands, Amami Plateau and Southwestern Part of the Sea of Japan*. Ocean Res. Inst., Univ. Tokyo, 267p.

Margulis, L. and K. V. Schwartz, 1998: *Five Kingdoms: an illustrated guide to the phyla of life on Earth*, 3rd ed. Freeman, New York, 520p.

Oba, T., Kato, M., Kitazato, H., Koizumi, I., Omura, A., Sakai, T. and Takayama, T., 1991: Paleoenvironmental changes in the Japan Sea during the last 85,000 years. *Palaeocenography*, **6**, 499-518.

Tsukawaki, S., Ozawa, H., Domitsu, H., Kamiya, T., Kato, M. and Oda, M., 2000: Preliminary results from the R. V. *Tansei-maru* cruise KT98-17 leg 2 in the southwestern marginal part of the Japan Sea - sediments, benthic and planktonic foraminifers, and ostracodes -. *Bull. Japan Sea Res. Inst., Kanazawa Univ.*, **31**, 89-119.

Tsukawaki, S., Ozawa, H., Domitsu, H., Hirano, K., Maeda, T., Tomii, Y., Saito, S., Kamiya, T., Kato, M. and Oda, M., 2001: Preliminary results from the R. V. *Tansei-maru* cruise KT99-14 in the central and northeastern marginal parts of the Japan Sea - sediments, benthic and planktonic foraminifers, and ostracodes - (Part 1: surface sediments). *Bull. Japan Sea Res. Inst., Kanazawa Univ.*, **32**, 1-28.

Tsukawaki, S., Kuroda, J., Ozawa, H., Kamiya, T. and Kato, M., 2002: Onboard results from sediment samplings on the R. V. *Tansei-maru* cruises KT00-14 in the southwestern marginal part of the Japan Sea and KT00-17 in the northeastern marginal part of the East China Sea *Bull. Japan Sea Res. Inst., Kanazawa Univ.*, **33**, 43-56.

秋田沖ならびに新潟沖日本海における淡青丸KT03-10次航海の採泥結果

塚脇真二[1]・大高明史[2]・田中源吾[1]・渡辺正晴[3]

要　旨

2001年7月14日～20日に実施された日本海東縁部での海洋研究船淡青丸の研究航海KT03－10において、秋田県本庄市沖となる陸棚から飛島海盆、最上トラフ東側斜面、最上トラフ底をへて日本海盆大陸斜面に至る測線の19地点から20点の海底表層堆積物試料が、また、佐渡海盆ならびにその周辺海域から5点、そしてマツ海山山麓部ならびに山頂部から3点の海底表層試料がそれぞれ採取された．また、飛島海盆からは3本の海底堆積物柱状試料が得られた．

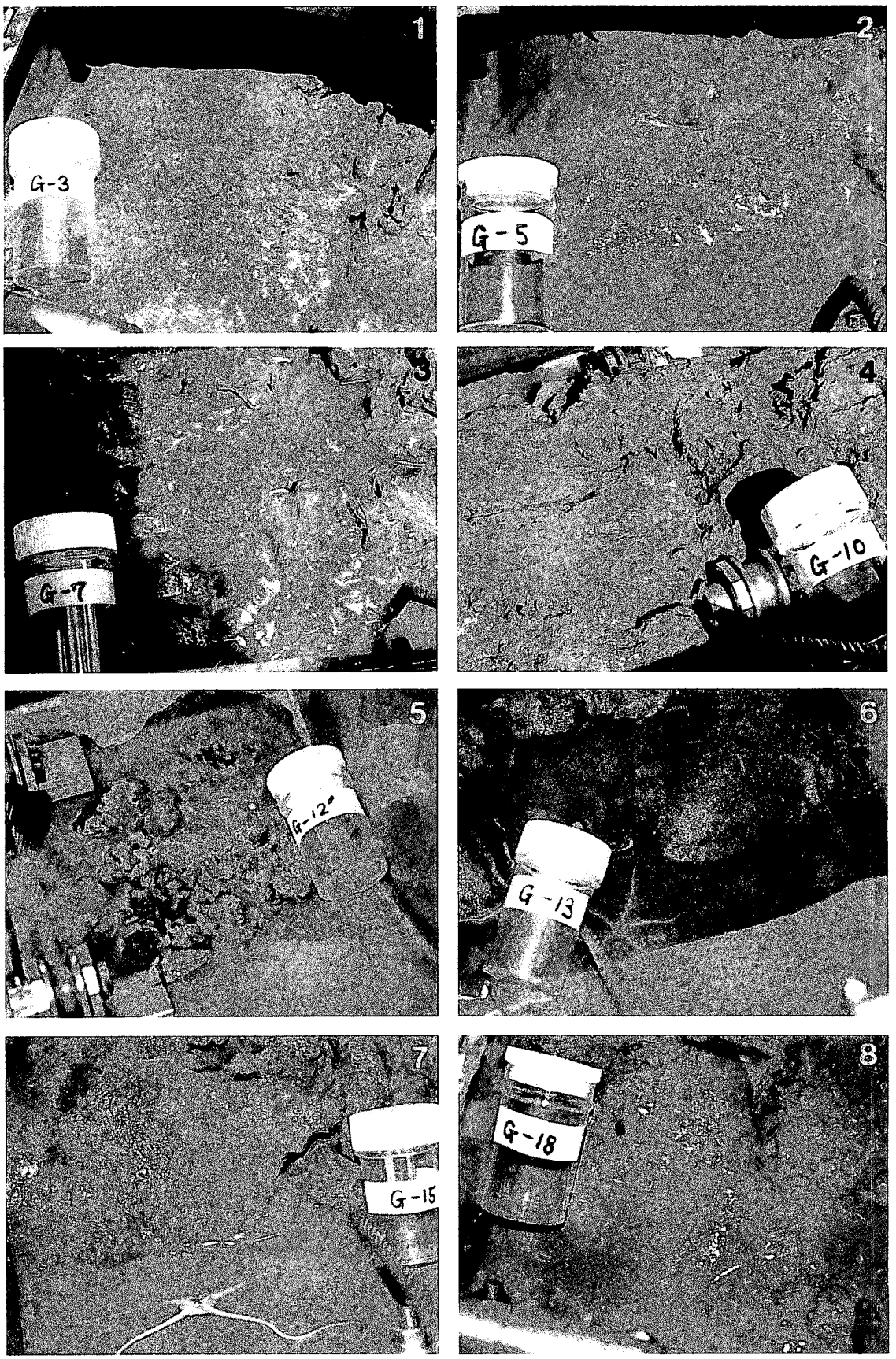
本庄市沖日本海東縁部の海底表層堆積物は、内～外部陸棚域では泥質砂あるいは砂質泥、外部陸棚～飛島海盆上部斜面域では均質な泥、同下部斜面～海盆底では均質で緻密な泥、飛島北方の海脚上では半固結の泥岩礫、最上トラフ東側斜面上部では細～中粒砂、斜面中部では砂質泥、同斜面下部からトラフ底では均質な泥、日本海盆南縁斜面では均質で緻密な泥、そして同斜面下部では半固結泥岩礫からそれぞれ構成される。飛島海盆から採取された3本の海底堆積物柱状試料は暗緑灰色の泥からなるものと切断面から判断される。

佐渡海盆底の海底表層堆積物は、同海盆の南部、中央部、そして北部では均質な泥から構成される。しかし、同海盆北端部では半固結の泥岩礫が採取された。また、同海盆北端部のやや北方にあって最上トラフ南端部となる地点からは、均質で軟弱な泥が採集された。一方、マツ海山山麓部からは赤褐色で均質な泥が、山頂部からは玄武岩質の中礫ならびに玄武岩質中～粗粒砂がそれぞれ回収された。

ほとんどの表層堆積物試料の表層から数多くの底生動物が採集された。これらの試料は大学理科教育における深海生物群集の教材としてきわめて有用なものといえる。

[1] 金沢大学自然計測応用研究センター　エコテクノロジー研究部門．〒920-1192　石川県金沢市角間町金沢大学総合教育棟
[2] 弘前大学教育学部理科教育研究室．〒036-8560　青森県弘前市文京町1
[3] 東京大学海洋研究所観測機器室．〒164-8639　東京都中野区南台1-15-1

Plate 1



Explanation of Plate 1

The grab surface sediments recovered from the sea floor of the eastern marginal part of the Japan Sea off Honjo, photographed immediate after the recovery (the sample bottle, 40 mm in diameter, gives scale).

fig. 1 : Olive grey homogeneous muddy fine-grained sand at the site G-3 of the inner shelf off Honjo, 75 m deep.

fig. 2 : Olive grey homogeneous sandy mud at the site G-5 of the outer shelf off Honjo, 125 m deep.

fig. 3 : Olive grey homogeneous mud at the site G-7 of the outer shelf off Honjo, 175 m deep. A serpent star presents on the surface.

fig. 4 : Dark olive grey mottled and sticky mud at the site G-10 of the lower eastern slope of the Tobishima Basin, 354 m deep.

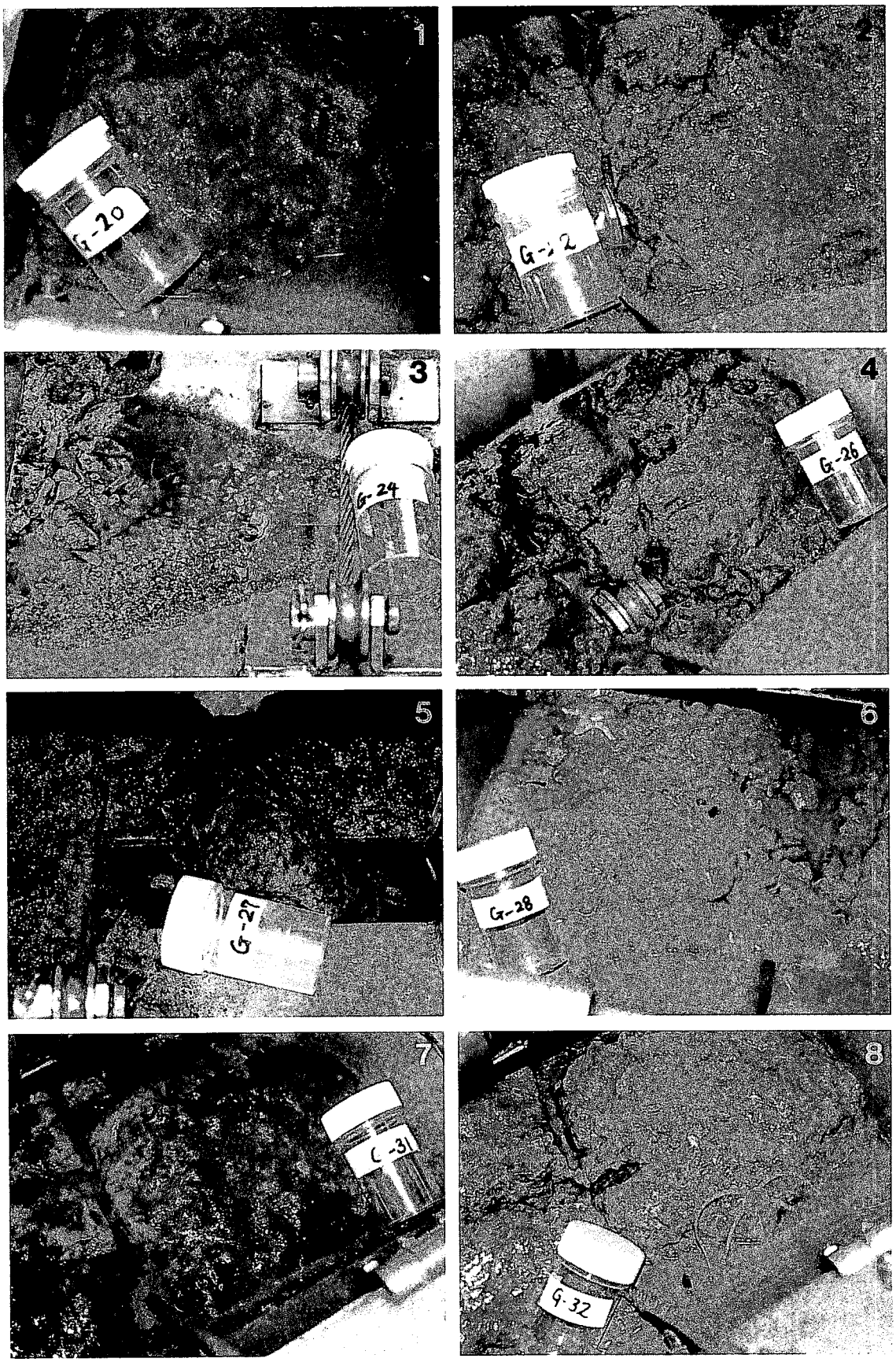
fig. 5 : Semi-consolidated mudstone gravels with a little amount of fine-grained sand at the site G-12' on the ridge north off Tobishima Island at a water depth of 133 m.

fig. 6 : Dark grey fine- to medium-grained sand at the site G-13 of the upper eastern slope of the Mogami Trough at a water depth of 222 m. A serpent star on the surface.

fig. 7 : Yellowish olive grey sandy mud at the site G-15 of the middle eastern slope of the Mogami Trough, 351 m deep. A serpent star on the surface.

fig. 8 : Olive grey homogeneous mud at the site G-18 of the base-of-slope of the eastern slope of the Mogami Trough, 946 m deep.

Plate 2



Explanation of Plate 2

The grab surface sediments recovered from the sea floor of the eastern marginal part of the Japan Sea off Honjo (figs. 1 to 3) and in the Sado Basin (figs. 4 to 6), and from the foot and summit of the Matsu Seamount (figs. 7 and 8), photographed immediate after the recovery (the sample bottle, 40 mm in diameter, gives scale).

fig. 1 : Pale olive grey homogeneous compact mud at the site G-20 of the upper southern slope of the Japan Basin, 1,500 m deep.

fig. 2 : Dark olive grey homogeneous compact mud at the site G-22 of the middle southern slope of the Japan Basin, 2,026 m deep..

fig. 3 : Semi-consolidated pale yellow mudstone gravels with yellowish brown soft mud at the deepest site on the survey line G-24 of the lower southern slope of the Japan Basin, 2,532 m deep.

fig. 4 : Reddish brown homogeneous soft mud at the site G-26 of the foot of the Matsu Seamount, 2,292 m deep.

fig. 5 : Pebble- to cobble-gravels with olive brown muddy medium- to coarse-grained sand at the site G-27 of the top of the Matsu Seamount at a water depth of 942 m.

fig. 6 : Olive grey homogeneous soft mud at the site G-28 of the southern marginal part of the Mogami Trough, 471 m deep.

fig. 7 : Olive grey homogeneous mud at the site G-31 of the central part of the Sado Basin, 535 m deep..

fig. 8 : Olive grey homogeneous mud at the site G-32 of the southern marginal part of the Sado Basin, 437 m deep.