

III. 3.5 kHz ECHO SOUNDER PROFILING SURVEY

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Introduction

A subbottom profiling survey for investigating the structure of surficial sediments was carried out continuously throughout the cruise by the 3.5 kHz subbottom profiler.

The subbottom profiling system is composed of nine 3.5 kHz transducers (Type TR75A) installed within the sonar dome beneath the bow bottom, a transceiver (Model PTR 105A), a correlation echo sounder processor (CESP-II), a precision depth digitizer (Model PDD 200A) and universal graphic recorder (UGR 196B), which were manufactured by Raytheon Co. The Signals were recorded on the graphic recorder at a 2-sec sweep rate.

Five acoustic patterns were observed in general, i.e. transparent layers, well stratified layers, densely stratified layers, semi-opaque layers including stratification and opaque layers. The distribution of these patterns is shown in Fig. III-1.

Results

In the Okhotsk Sea, the transparent layer is distributed in many parts of the continental shelf and the Kuril Basin. The stratified layer is well developed in the continental slope in the depth range of 500–1500 m.

The opaque layer is distributed in the whole area of the Musashi Bank, and the acoustic penetration of the layer is weak. The surficial sediments may be thin on the Musashi Bank (C in Fig. III-2-(3)). The stratified layer is distributed around the bank (B in Fig. III-2-(3)).

(1) Continental slope of Sikote-Alin and Tartary Trough

The opaque layer with deep penetration is distributed in the continental slope of Sikote-Alin (A in Fig. III-2-(2)). There is no distribution of the stratified layer in contrast with the continental slope off Hokkaido.

In the central region of the Tartary Trough, the semi-opaque layer including stratification is distributed, although it is partly overlain by the transparent layer (B in Fig. III-2-(2)). The layer gradually changes to the opaque layer with deep acoustic penetration southwards. Referring to the results of the piston cored sample (P110) in the area, the opaque pattern (Fig. III-3-(4)) might be due to the presence of patched sediments.

The well stratified layer is distributed in the eastern margin. The sedimentary structure is different from that in the east side slope of the Tartary Trough.

(2) Vicinity of the Okushiri Ridge and the northern part of the Japan Basin

The opaque layer is distributed on the Okushiri Ridge and in the region north of it. The piston cored sample P111 was taken at the southwestern foot of the Vityaz Rise. According to the 3.5 kHz profiling records (Fig. III-3-(5)), a very thin transparent layer is overlain by the opaque layer with weak acoustic penetration.

In the northern part of the Japan Basin, the semi-opaque layer including stratifica-

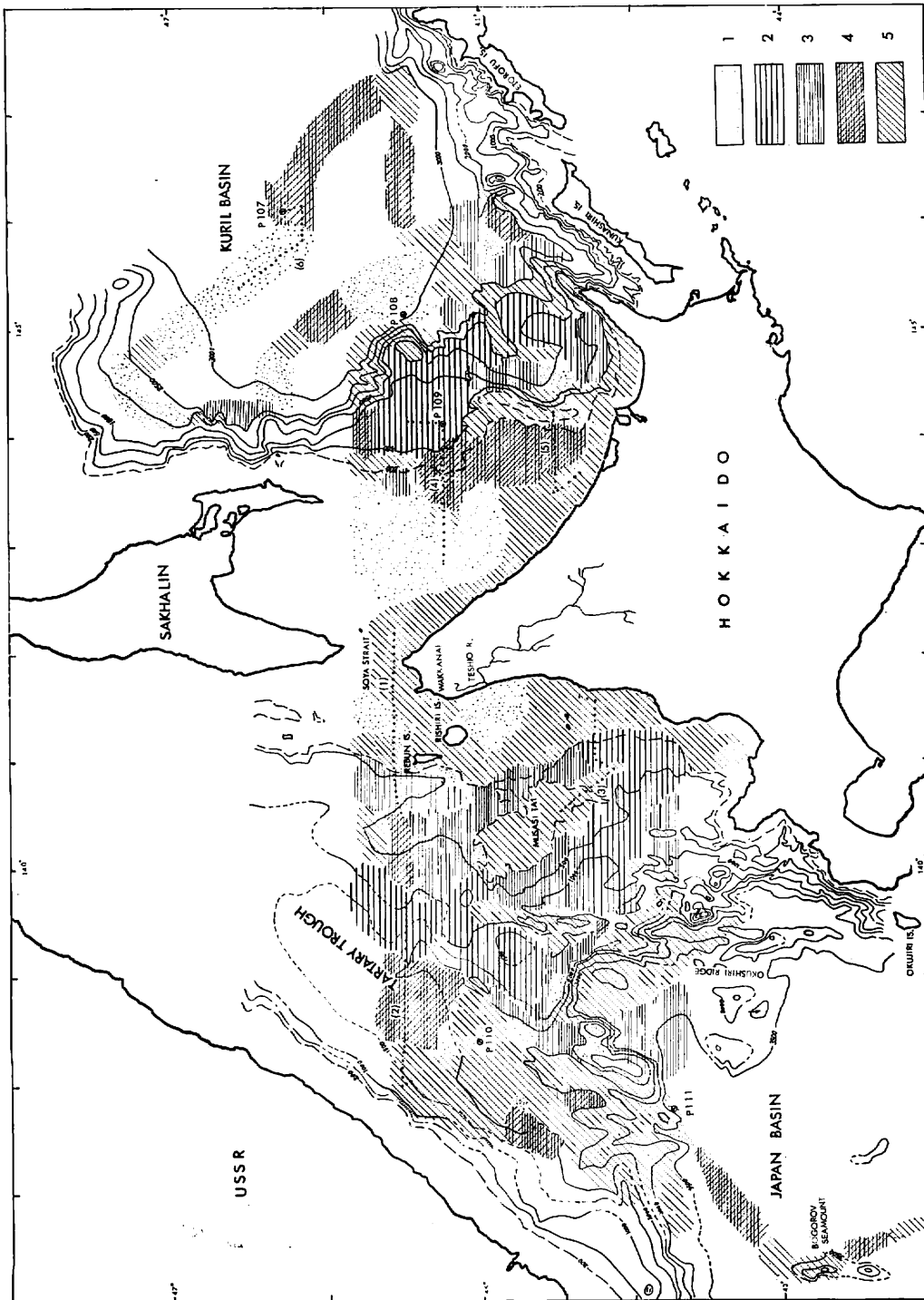
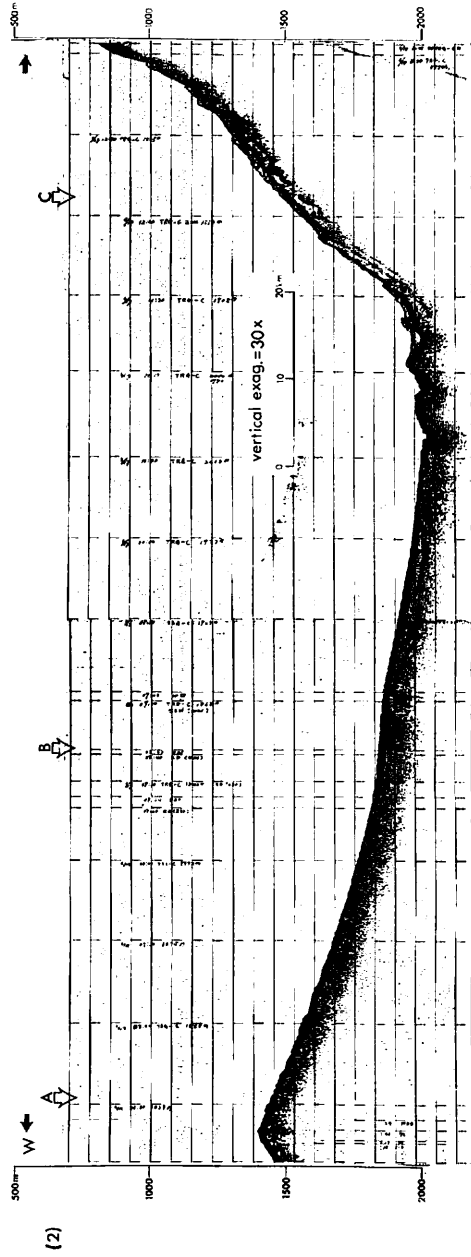
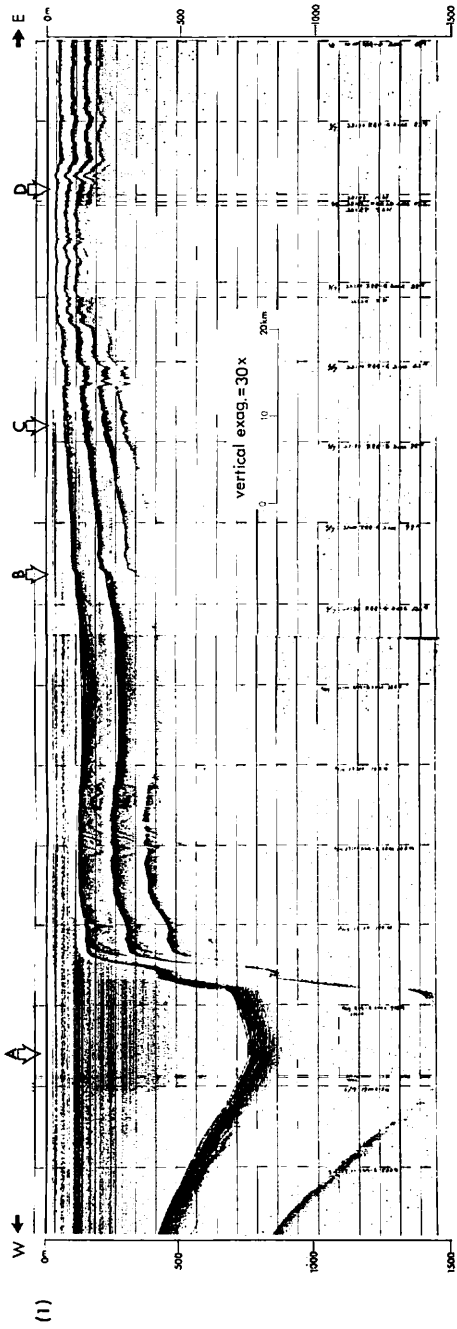
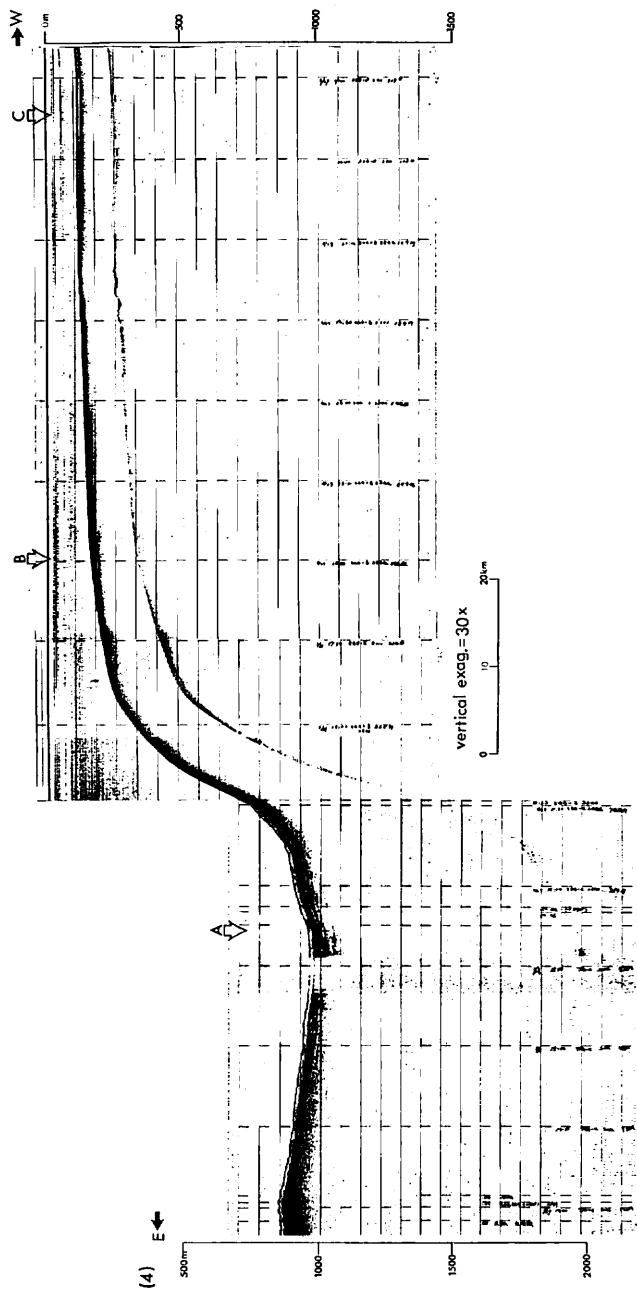
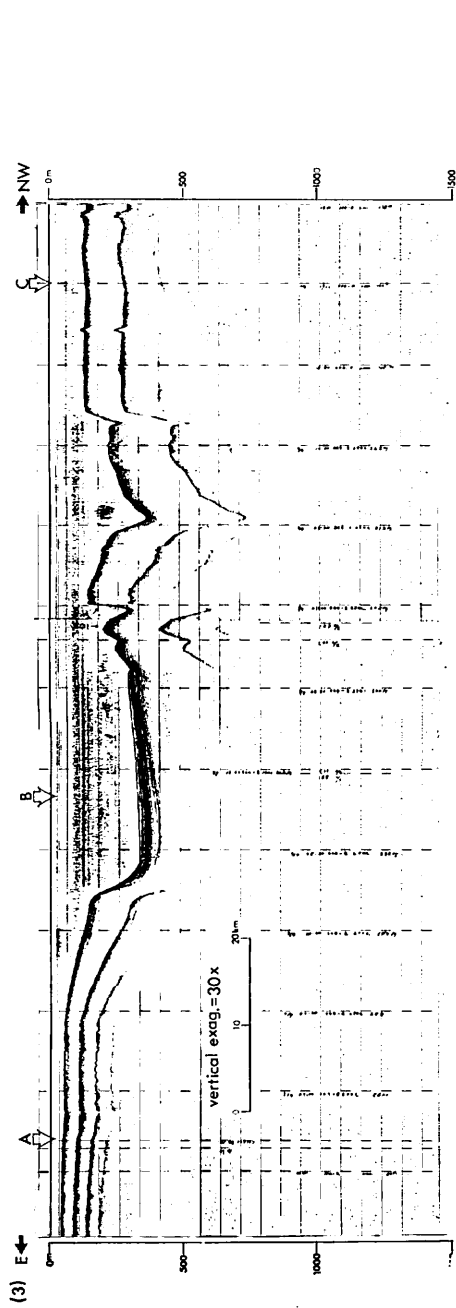
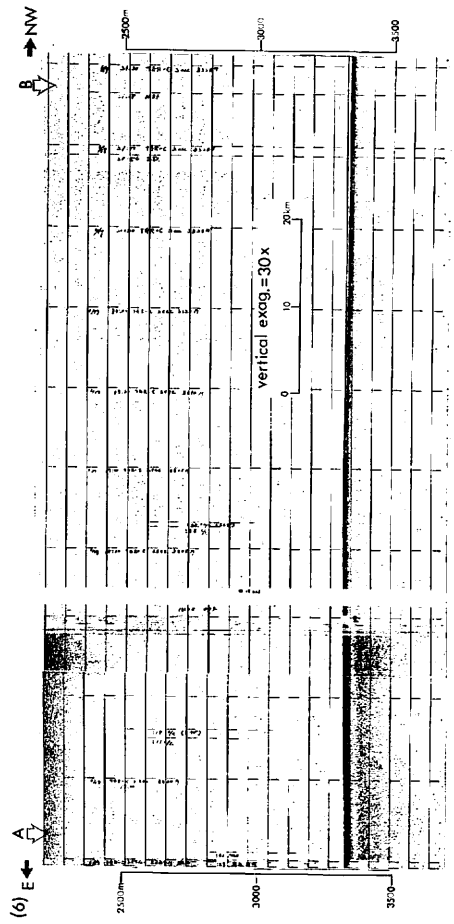
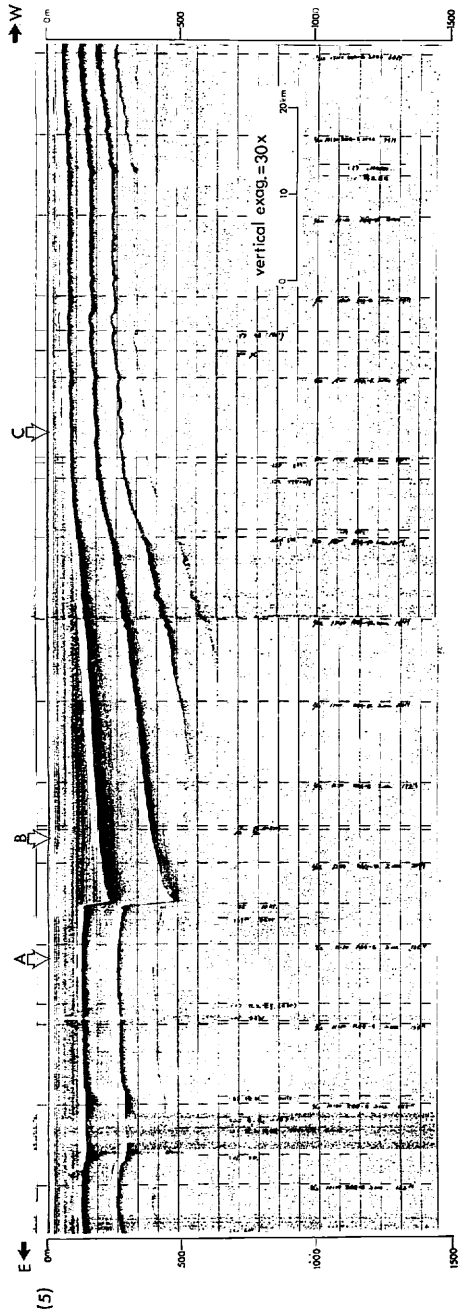


Fig. III-1 A distribution map of acoustic patterns by 3.5 kHz echo sounder. 1: transparent layer, 2: well stratified layer, 3: densely stratified layer, 4: semi-opaque layer including stratification, 5: opaque layer.

Fig. III-2-(1)~(6) Profiles by 3.5 kHz echo sounder.







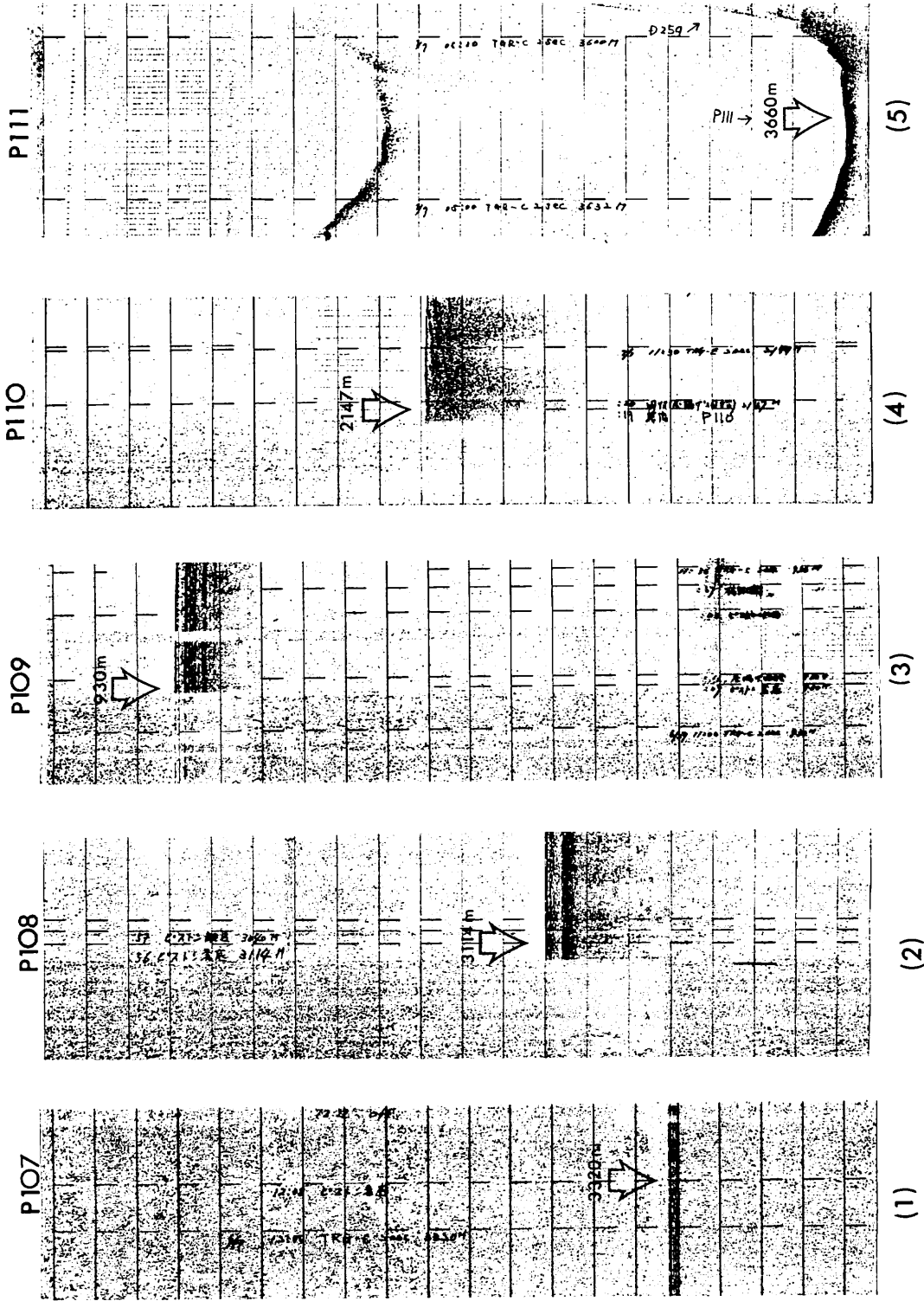


Fig. III-3-(1)~(5) Profiles by 3.5 kHz echo sounder in the sites of piston corings.

tion is widely distributed, and the opaque pattern is observed on the Bogorov seamount.

(3) *Continental shelf and slope off the east coast of Hokkaido*

The opaque pattern with weak acoustic penetration is distributed in the Soya Strait (D in Fig. III-2-(1)). There may be the exposure of basement rock, because the strong tidal current of 1-3 kt is recognized in this strait (Maritime Safety Agency, 1971).

In the continental shelf off Kitami, the transparent layer is widely distributed (C in Fig. III-2-(4)). Maximum thickness of the transparent layer is approximately 20 m.

In the vicinity of the shelf edge, the semi-opaque layer including stratification is distributed (B in Fig. III-2-(4)). This layer continues to the area off Monbetsu along the shelf edge (B in Fig. III-2-(5)).

The opaque layer with weak acoustic penetration is distributed along the coast (C in Fig. III-2-(5)). The opaque layer is distributed on the Kitami-Yamato Bank (A in Fig. III-2-(5)).

The well stratified layer is widely distributed on the continental slope (A in Fig. III-2-(4)). The typical distribution of the layer is observed in the gentle slope between depths of 500-1500 m, and the layer develops well on the slope at a depth of about 1000 m as shown in Fig. III-2-(4); K3. The layers between stratifications are relatively transparent, and approximately 15 m thick the uppermost layer is also transparent. The 3.5 kHz record at P109 is shown in Fig. III-3-(3). According to the sampling data of P109, the whole core is composed of yellowish brown clay, and there seems to be no horizon which causes acoustic reflection. The stratified layer is similar to that of the continental slope in the Japan Sea, and it is formed by falling sedimentation including volcanic ashes.

The steep slope shows a distribution of the opaque layer.

(4) *Kuril Basin*

The semi-opaque layer including stratification is distributed in the southeastern part of the Kuril Basin off Etorofu Island (A in Fig. III-2-(6)). The transparent layer 10 m thick is distributed in the basin off Sakhalin, and it is underlain by the semi-opaque layer including stratification. Sampling results at P107 imply that the stratification in the semi-opaque layer in the basin may be correlated to the tuff layer.

The transparent layer including a small opaque part is observed at P108 (Fig. III-3-(2)), and the sampling result by piston corer shows yellowish brown clay including pumice, scoria and thin layers. The opaque part in the transparent layer may correspond to pumice, scoria and thin layers.

Reference Cited

MARITIME SAFETY AGENCY (1975) *Current charts in the adjacent seas of Nippon*. 2nd series 1955-1964, no. 6041.