# 10. SITE 274

The Shipboard Scientific Party[1]

## SITE DATA

**Date Occupied:** 16 February 1973

**Date Departed:** 19 February 1973

**Position:** 68°59.81′S; 173°25.64′E

**Water Depth:** 3305 corrected meters (echo sounding)

**Water Depth (adopted):** 3326 meters (drill pipe from rig floor)

**Total Penetration:** 421 meters

**Number of Cores:** 45

**Total Section Cored:** 421 meters

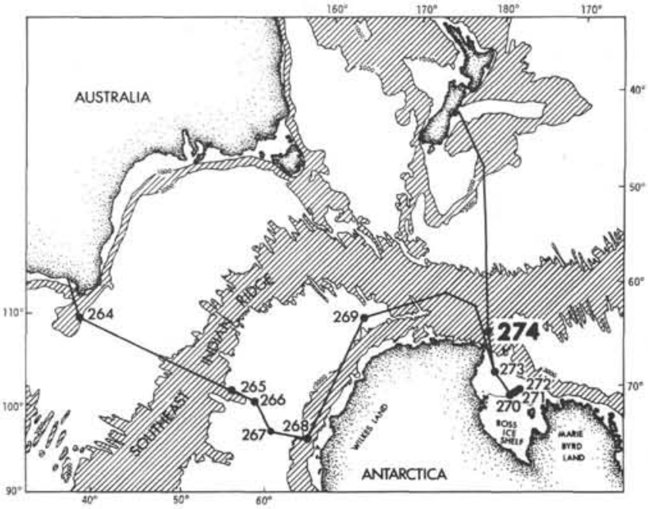
**Total Section Recovered:** 279.1 meters

**Percentage Core Recovery:** 66%

**Oldest Sediment Cored:**
Depth below sea floor: 408.5 meters
Lithology: Silicified siltstone
Age: Early Oligocene or older

**Basement:**
Depth below sea floor: 0.50 sec (reflection time)
Depth below sea floor: 408.5 meters (drilled)
Average velocity to basement: 1.63 km/sec
Lithology: Finely crystalline basalt

**Principal Results:** A largely terrigenous sedimentary sequence about 415 meters thick and ranging in age from Quaternary to (?)early Oligocene overlies basalt at this site. Ice-rafted clasts occur in strata at least as old as early Miocene/late Oligocene, and possible early Oligocene. Abundant diatoms occur in the top of the sequence and small quantities of nannofossils near the base; their age distribution overlaps the early Miocene-late Eocene section. This biogenic facies change may represent the same, possibly ecologically significant, transition as is seen at Sites 265, 266, 267, and 268, although the microfossils recovered are less abundant at Site 274 than elsewhere. Silt does not occur as discrete beds in strata younger than late Miocene, and this may result from formation of a major graben structure which served as a sediment trap between the site and the continent. Sedimentation rates during Miocene time (2-10 m/m.y.) are much slower than the rates for before and after the Miocene. The estimated age of the oldest sediments is in reasonable agreement with that estimated from magnetic lineation data.



## BACKGROUND

Site 274 (Figure 1) lies about 250 km north-northeast of Cape Adare in a water depth of about 3300 meters. This site was originally designated as a contingency site. Following the completion of Site 273, heavy pack ice was found to extend about 50-100 miles to the west of a proposed site on the Iselin Plateau. A moderately severe storm prevented a helicopter reconnaissance of the regional ice conditions and the proposed Iselin Plateau site was abandoned in favor of Site 274.

The site lies along the lower continental rise within an area suggested by magnetic lineations to be early Oligocene/late Eocene in age. A relatively thin (<500 m) sequence of sediments overlies a strong reflecting horizon interpreted as oceanic basement (layer 2) on the basis of its acoustic character. The site lies near the Antarctic continental margin and thus, if the area is underlain by oceanic crust, it should be at least as old as late Eocene, as inferred from regional studies of Weissel and Hayes (1972) and the *Glomar Challenger* profile (Figure 2). The total sediment thickness therefore would be expected to be considerably thicker, comparable to other localities along the Wilkes Land continental rise in areas of similar crustal age. A spectacular graben structure with relief of several hundred meters, and first recognized by Houtz and Meijer (1970), lies to the southwest of the site and probably served as an effective

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Figure 1. *Location of Site 274 and regional bathymetry. Contours in meters (corrected). Solid line indicates location of* Eltanin *52 seismic profile shown in Figure 2.*

barrier to the downslope transport of terrigenous material, thus accounting for the thin total sediment cover. The sediments overlying basement are relatively transparent and appear to conformably drape the basement relief. Discontinuous reflectors can be mapped over a few tens of kilometers, and the drilled site was selected where a strong reflector lies about 0.1 sec or 100 meters above the basement, and about 10 km to the north of the originally proposed site.

The objectives at this site were to investigate the nature and cause of the thin sediment cover, to sample and date the basement horizon, to study effects of glaciation at a point distal to the Ross ice shelf, and to study the biostratigraphy, in part to aid in the interpretation of early Leg 28 sites.

## OPERATIONS

Site 274 was approached on a heading of 335° during the late evening of 15 February. A tentative site was chosen and marked with a spar buoy. The ship continued on a course of 335° for about 3 miles to extend the seismic profile beyond the area of the site. The towed gear was retrieved, the ship reversed course (Williamson Turn) and proceeded to the site using the PDR depth as a guide (the spar buoy was not sighted). The beacon was dropped at 0119 in 3305 meters of water (PDR corrected). Positioning in automatic mode was attained by 0300 hr.

Two sonobuoy stations were attempted. The first was aborted because of the negligible drift of the sonobuoy and the need for the ship to maneuver occasionally while positioning. The second attempt was successful, and several subbottom reflectors appearing on the profiler records (at about 0.1, 0.2, 0.4, and 0.5 sec) were more sharply defined by the sonobuoy record and an additional reflector at 0.3 sec was observed.

Hole 274 was spudded in at 1100 on 16 February and was cored continuously to a depth of 421 meters. A total of 43 cores was taken in sediments, penetrating 408.5 meters and recovering 275.5 meters (see Table 1).

No operational problems were encountered with the positioning system until 2015 on 17 February when a momentary AC power failure caused the ship to drift off of the beacon by ~60 meters. During the evening of the 17th and early morning of the 18th winds increased to 40-50 mph and positioning on the beacon became difficult, in part due to temporary losses of acoustic signals. Drilling and coring were terminated at about 0015 on 18 February after cutting 3 meters for Core 45. The drill string and bottom-hole assembly were brought clear of the mud line by 0200 hr and Core 45 was retrieved.

The bit was brought on deck at 1250 on 18 February and the ship got underway on a course of 185° at 1400 hr. At 1514 hr course was reversed and the geophysical gear streamed. An underway geophysical profile was obtained across the site area along a bearing of 008°, but because of high following seas the profiler record was extremely noisy. Although the beacon was not heard on the site crossing, a satellite fix at 1556 hr indicated that the ship would have passed about 0.4 km to the west of the beacon at 1600 hr.

## LITHOLOGY

A largely terrigenous, clay-rich sedimentary sequence about 415 meters thick overlies basalt at Site 274. The sequence is highly varied and is subdivided into five lithostratigraphic units on the basis of color, ratio of biogenic to clastic components, presence of silt layers, chert, or manganese nodules (Table 2). Deformation due to drilling is unusually intense throughout most of the hole, making recognition of stratification and sedimentary structures very difficult. Detailed studies of the sediments are described by Frakes and Piper and Brisco, this volume).

### Unit 1

Unit 1 consists mostly of greenish-gray, with some light olive-gray, diatom-rich silty clay. Color layering, generally with sharp contacts, is especially prominent in Cores 2 and 5. Diatoms, the chief biogenic material, are highly variable in amount and range from a few percent near the top to as much as 60% near the base of the unit. Diatom content shows little relation to color. Other fossils include radiolarians and sponge spicules, which range from trace amounts to several percent, and silicoflagellates occur locally in trace amounts.

Detrital materials are of two principal, highly dissimilar, types: (1) clay, mixed with less abundant silt, making up the main component of the sediments; and (2) granules and pebbles, occasionally facetted, making up several percent scattered through the entire unit. Sand is virtually absent; there is rare evidence of size sorting in thin silt laminae. Pebble lithologies are varied, and include granite, gneiss, argillite, quartzite, graywacke, basalt, and rare claystone. A few quartz sand grains show overgrowths formed prior to deposition. Biotite is a common trace constituent, and heavy minerals include hornblende, pyroxene, opaque minerals, garnet, zircon, epidote, and tourmaline. Traces of volcanic glass occur sporadically.

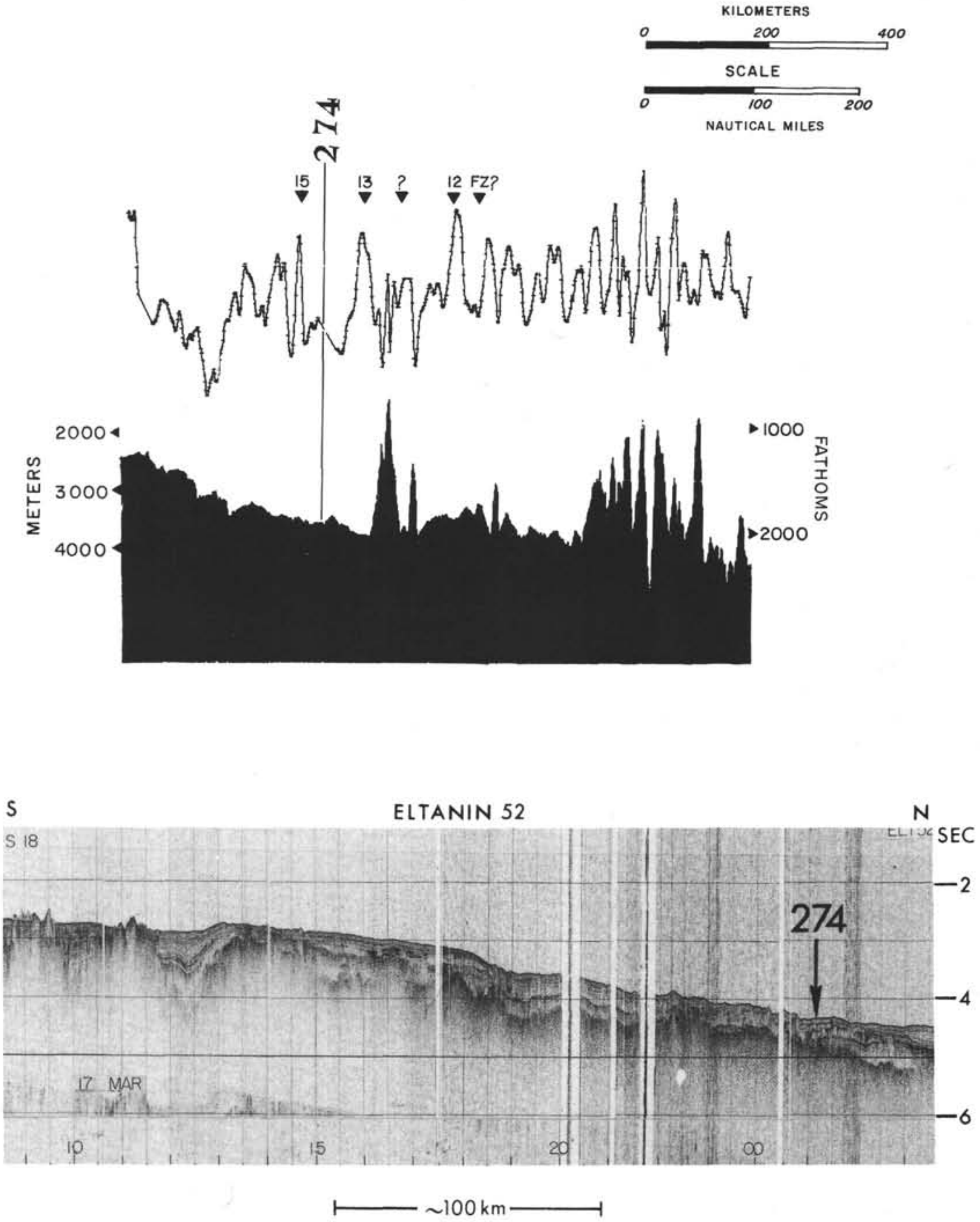

Figure 2. *(Upper) Bathymetric and magnetics profile across Site 274. (Lower)* Eltanin *52 acoustic reflection profile across Site 274. Vertical scale in seconds of two-way reflection time. For location of profiles see Figure 1.*

### Unit 2

Unit 2, a diatom detrital silty clay, is characterized by its color (moderate yellowish-brown), which contrasts conspicuously with the olive and greenish-grays of overlying and underlying units. The upper contact is not exposed, and must occur between Cores 9 and 10. Near the base of Core 13, the unit grades into greenish-gray diatom-rich clays of Unit 3. Sand and coarser detritus is more abundant (up to about 30%) than in Unit 3. The unit differs additionally from Units 1 and 3 in its virtual absence of bedding or color layering, and in having a generally uniform and higher diatom content. The major mineralogic difference is the abundance in Unit 2 of ferromanganese oxides. Ferromanganese nodules and ferromanganese-coated pebbles and granules, some of which locally are cemented together by the oxides, occur in minor but conspicuous amounts throughout the unit.

**TABLE 1**
**Coring Summary, Site 274**

| Core | Date (Feb. 1973) | Time | Depth From Drill Floor (m) | Depth Below Sea Floor (m) | Length Cored (m) | Length Recovered (m) | Recovery (%) |
|---|---|---|---|---|---|---|---|
| 1 | 16 | 1210 | 3326.0-3335.5 | 0.0-9.5 | 9.5 | 7.9 | 83 |
| 2 | 16 | 1315 | 3335.5-3345.0 | 9.5-19.0 | 9.5 | 7.6 | 80 |
| 3 | 16 | 1423 | 3345.0-3354.5 | 19.0-28.5 | 9.5 | 8.7 | 92 |
| 4 | 16 | 1526 | 3354.5-3364.0 | 28.5-38.0 | 9.5 | 3.0 | 32 |
| 5 | 16 | 1633 | 3364.0-3373.5 | 38.0-47.5 | 9.5 | 3.5 | 37 |
| 6 | 16 | 1745 | 3373.5-3383.0 | 47.5-57.0 | 9.5 | 9.5 | 100 |
| 7 | 16 | 1847 | 3383.0-3392.5 | 57.0-66.5 | 9.5 | 3.0 | 32 |
| 8 | 16 | 1950 | 3392.5-3402.0 | 66.5-76.0 | 9.5 | cc | – |
| 9 | 16 | 2050 | 3402.0-3411.5 | 76.0-85.5 | 9.5 | 8.9 | 94 |
| 10 | 16 | 2158 | 3411.5-3421.0 | 85.5-95.0 | 9.5 | 8.5 | 89 |
| 11 | 16 | 2310 | 3421.0-3430.5 | 95.0-104.5 | 9.5 | 4.9 | 52 |
| 12 | 17 | 0015 | 3430.5-3440.0 | 104.5-114.0 | 9.5 | 8.1 | 85 |
| 13 | 17 | 0135 | 3440.0-3449.5 | 114.0-123.5 | 9.5 | 8.6 | 91 |
| 14 | 17 | 0240 | 3449.5-3459.0 | 123.5-133.0 | 9.5 | 9.5 | 100 |
| 15 | 17 | 0405 | 3459.0-3468.5 | 133.0-142.5 | 9.5 | 9.5+ | 100+ |
| 16 | 17 | 0530 | 3468.5-3478.0 | 142.5-152.0 | 9.5 | 4.6 | 49 |
| 17 | 17 | 0638 | 3478.0-3487.5 | 152.0-161.5 | 9.5 | 3.3 | 35 |
| 18 | 17 | 0805 | 3487.5-3497.0 | 161.5-171.0 | 9.5 | 7.0 | 74 |
| 19 | 17 | 0935 | 3497.0-3506.5 | 171.0-180.5 | 9.5 | 8.2 | 86 |
| 20 | 17 | 1041 | 3506.5-3516.0 | 180.5-190.0 | 9.5 | 9.5 | 100 |
| 21 | 17 | 1140 | 3516.0-3525.5 | 190.0-199.5 | 9.5 | 9.5 | 100 |
| 22 | 17 | 1255 | 3525.5-3535.0 | 199.5-209.0 | 9.5 | 7.2 | 76 |
| 23 | 17 | 1417 | 3535.0-3544.5 | 209.0-218.5 | 9.5 | 9.5 | 100 |
| 24 | 17 | 1532 | 3544.5-3554.0 | 218.5-228.0 | 9.5 | 7.5 | 79 |
| 25 | 17 | 1642 | 3554.0-3563.5 | 228.0-237.5 | 9.5 | 9.0 | 95 |
| 26 | 17 | 1800 | 3563.5-3573.0 | 237.5-247.0 | 9.5 | 9.2 | 97 |
| 27 | 17 | 1916 | 3573.0-3582.5 | 247.0-256.5 | 9.5 | 5.7 | 60 |
| 28 | 17 | 2040 | 3582.5-3592.0 | 256.5-266.0 | 9.5 | 9.5 | 100 |
| 29 | 17 | 2158 | 3592.0-3601.5 | 266.0-275.5 | 9.5 | 3.7 | 39 |
| 30 | 17 | 2311 | 3601.5-3611.0 | 275.5-285.0 | 9.5 | 9.5 | 100 |
| 31 | 18 | 0025 | 3611.0-3620.5 | 285.0-294.5 | 9.5 | 9.5 | 100 |
| 32 | 18 | 0135 | 3620.5-3630.0 | 294.5-304.0 | 9.5 | 9.5 | 100 |
| 33 | 18 | 0250 | 3630.0-3639.5 | 304.0-313.5 | 9.5 | 9.5 | 100 |
| 34 | 18 | 0410 | 3639.5-3649.0 | 313.5-323.0 | 9.5 | 9.5 | 100 |
| 35 | 18 | 0600 | 3649.0-3658.5 | 323.0-332.5 | 9.5 | 1.6 | 17 |
| 36 | 18 | 0820 | 3658.5-3668.0 | 332.5-342.0 | 9.5 | 2.3 | 25 |
| 37 | 18 | 1000 | 3668.0-3677.5 | 342.0-351.5 | 9.5 | 1.5 | 16 |
| 38 | 18 | 1140 | 3677.5-3687.0 | 351.5-361.0 | 9.5 | 1.8 | 19 |
| 39 | 18 | 1337 | 3687.0-3696.5 | 361.0-370.5 | 9.5 | 2.7 | 29 |
| 40 | 18 | 1535 | 3696.5-3706.0 | 370.5-380.0 | 9.5 | 1.0 | 10 |
| 41 | 18 | 1715 | 3706.0-3715.5 | 380.0-389.5 | 9.5 | 3.3 | 35 |
| 42 | 18 | 1847 | 3715.5-3725.0 | 389.5-399.0 | 9.5 | 4.0 | 42 |
| 43 | 18 | 2048 | 3725.0-3734.5 | 399.0-408.5 | 9.5 | 5.2 | 55 |
| 44 | 18 | 2245 | 3734.5-3744.0 | 408.5-418.0 | 9.5 | 1.9 | 20 |
| 45 | 19 | 0300 | 3744.0-3747.0 | 418.0-421.0 | 3.0 | 1.7 | 57 |
| Total | | | | | 421.0 | 279.1 | 66 |

They are described in more detail in Chapter 25. The heavy mineral suite is similar to that of Unit 1, and there is a concentration of opaques, many of which are ferromanganese micronodules. Traces of volcanic glass also occur in Unit 2. A varied suite of pebbles and granules in this unit is similar to that of Unit 1.

### Unit 3

Unit 3 consists of diatom-rich detrital silty clay and claystone; in both, colors vary from olive-gray to dark greenish-gray. Silt bodies occur throughout the unit, ranging from minor lenses and disrupted laminae in the upper one-half to layers as much as 20 cm and commonly between 2 and 10 cm thick in the lower half. At 47-49 cm in Core 18, Section 3, a silt bed shows size grading from a sharp basal contact upward into clay-rich sediments above. Fine sand makes up a bed 3.3 meters thick at the top of Core 18. The unit appears to lack pebbles and granules such as those in Units 1 and 2, but there is no obvious difference in the quartz/feldspar ratio as determined by X-ray diffraction. Traces of volcanic glass occur sporadically, particularly in silt and sand beds.

The upper contact of Unit 3 is the gradational color change seen in the lower 50 cm of Core 13. The lower contact was not recovered, but occurs near the base of Core 19 as indicated by mixed lithologies of Units 3 and 4 in the core catcher. The lower half of the unit contains much claystone interlayered with clay. The claystone, at a subbottom depth of 152 meters, is the highest semilithified material in the hole, and it probably corresponds to an important acoustic reflector in the region.

TABLE 2
Lithologic Units, Site 274

| Unit | Lithology | Subbottom Depth (m) | Unit Thickness (m) | Age |
|---|---|---|---|---|
| 1 | Diatom-rich silty clay with pebbles | 0.0-85.5 | 85.5 | Quaternary to early Pliocene |
| 2 | Diatom detrital silty clay with pebbles and manganese nodules | 85.5-123.0 | 37.5 | Early Pliocene to late Miocene |
| 3 | Diatom-rich silty clay | 123.0-180.5 | 57.5 | Early to middle Miocene |
| 4 | Diatom-detrital silty clay and minor silty clay diatom ooze Mostly stiff, non-bedded | 180.5-328.0 | 147.5 | Possibly early Miocene to early Oligocene |
| 5 | Silty claystone, locally chert-bearing, bedded | 328.0-415.0 | 87.0 | Late Eocene to early Oligocene (near the top) |
| 6 | Basalt | 415.0-421.0 | 6.0+ | Late Eocene |

### Unit 4

Unit 4 is the thickest in the sequence, and is characterized by its uniformity and unusually high degree of drilling deformation. The unit throughout is rich in diatoms and varies from predominantly diatom detrital silty clay to silty clay diatom ooze. Principal colors are olive-gray to light olive-gray, commonly with streaks of dark olive-gray. Vertical color streaking through much of the unit, and the common occurrence of drilling breccia near core tops, indicate that much drilling deformation has occurred. The rare undisturbed sections of core show very indistinct bedding, but some are prominently mottled. The dark olive-gray color often seen as streaks in deformed sections of core appears to form a rim to larger mottles. The sediments are semilithified in places in Core 20 but elsewhere are stiff or locally in breccia soft to soupy. Concentrations of pebbles occur near the top of many cores, which is generally drilling breccia, including Cores 21, 22, 23, 24, 25, 26, 27, 29, 30, 31, and 34, but rarely below the upper few tens of centimeters except in other areas of breccia. None of the semilithified parts of Core 20 contains pebbles except between the core and the liner, although some soupy areas with pebbles are directly over and underlain by semilithified sediment. Pebble lithologies are similar to those described for Unit 1, except for the occurrence of a few ferromanganese-coated pebbles at the tops of Cores 22, 24, and 31.

Diatoms are the chief biogenic constituents, generally present in amounts on the order of 25% to 50%. Others include usually trace amounts of sponge spicules, silicoflagellates, and calcareous nannofossils. The latter were found in Cores 18, 19, 21, 22, 24, and 25 (in amounts up to several percent in certain layers in Cores 21 and 24). Carbonate abundance in excess of 15% is associated with nannofossil concentration in Core 24. In places, diatoms associated with unusually large amounts, several percent or more, of opaque minerals appear to be either selectively coated or possibly in part replaced by them. Most cores in the lower half of the unit contained abundant $CO_2$. The organic carbon content, which is quite high throughout the hole, is particularly high (0.5%) in this unit and in the underlying Unit 5.

### Unit 5

Unit 5, as semilithified to lithified silty claystone, contrasts with Unit 4 in its sharp decrease to only trace amounts of diatoms which occur along with traces of rads, sponges, forams, and plant debris, the last two in the lower half of the unit. Porcellaneous chert is a common constituent in the upper half, and its appearance correlates with a marked drop in core recovery. The unit probably corresponds to the important acoustic reflector between that of Unit 3 and the basalt. Olive-gray color predominates and grades into dark olive-gray to olive-black where claystone grades into chert. The unit locally shows indistinct color layering and slight mottling, but appears to be free of silt layers. Features that may be burrows occur at several places. The lowest, in Core 43, Section 2, is filled or replaced by coarsely crystalline pyrite. The montmorillonite content of Unit 5 is rather higher than in the upper part of the hole.

Effects of drilling deformation are pronounced in Core 43, Section 4, the lowest sediment core above basalt. Thin horizontal layers of darker clay, a millimeter or two thick, superficially resemble bedding laminae that can be traced laterally to core margins. There, however, they merge with similar-appearing clay packed the length of the section between the core and liner. Such layering is interpreted, therefore, as likely being the result of sediment injection under extreme pressures. In addition, semilithified parts of Core 43 are fractured and locally brecciated.

### Unit 6

Basalt, which comprises Unit 6, and for which only 3.6 meters were recovered, is dense, apparently holocrystalline in general, and nonporphyritic. It is medium gray in color where fresh, but in many places is cut irregularly by white to green or bluish-green veinlets of calcite and chlorite (?). Vesicles are scarce, predominating in the lower part of Core 45 where they are partly filled by calcite and zeolites (?). Basalt breccia with a carbonate- and chlorite(?)-rich matrix occurs locally in Core 45. The origin of the breccia is uncertain. The contact with Unit 5 was not recovered.

### Interpretation

The sediments at Site 274 form a thick, terrigenous, marine sequence on the lower continental rise of Antarctica. The absence of sand or silt layers in the silty clays of Units 1 and 2 suggests that the graben-like structure upslope has been an effective barrier to coarse-sediment transport since the start of deposition of Unit 2. The units are virtually free of sand, but contain scattered granules and pebbles of highly varied lithologies including igneous, sedimentary and metamorphic rocks that occur along the northern Victoria Land coast. The clasts, interpreted as ice rafted, began to accumulate near the beginning of deposition of Unit 2.

The abundance of manganese nodules and pebble coatings in Unit 2 and the yellowish-brown colors of the sediments indicate slow sedimentation under oxidizing conditions, but it is not known how these conditions relate to the tectonic and glacial history of the region.

The presence of several silt beds and laminae, at least one of which shows turbidite characteristics, and of a 3.3-meter-thick sand bed in Unit 3 indicates that upslope barriers were not operative during deposition of most of the unit.

Ice-rafted pebbles and granules appear to be restricted to Units 1 and 2, but pebbles of similar lithologies occur principally in deformed parts of cores through much of Unit 4. Generally close association with drilling breccia, and the occurrence of several manganese-coated pebbles similar to those of Unit 2, suggest that these coarse materials are downhole contaminants from higher units rather than ice rafted and deposited at the time Unit 4 was accumulating.

Site 274 is located near the late Tertiary to Quaternary, mostly basaltic, volcanic centers of Cape Adare and the Balleney Islands. Although volcanic contributions to the sediments are recognized in the form of glass shards and possibly some of the silt-size plagioclase and pyroxenes, they are surprisingly small in volume. No evidence of major eruptions was seen, such as the occurrence of ash beds, which suggests that eruptive activity was not of an explosive character in these nearby regions.

## PHYSICAL PROPERTIES

Sonic-velocity and GRAPE wet-bulk density measurements were made on nearly all cores from this site. Several additional wet-bulk density measurements and porosity values were obtained from syringe samples. Representative data are plotted in Figure 4. Since much of the recovered sediment appears to display considerable drilling deformation and because no corrections have been applied for varying diameters, the plotted GRAPE density values should be considered as minimal. They plot consistently lower by about 0.2 to 0.3 g/cc than do corresponding values of bulk density determined from syringe samples. The sonic-velocity measurements were made on split and unsplit core sections for soft to stiff sediments and on chunks of stiff, semilithified, and lithified sediment. For the latter measurement, plotted values are those obtained parallel to the core axis and normal to the bedding.

Downhole variations in density and velocity show a smooth though not linear increase with depth from the surface to about 180 meters subbottom where both decrease rather abruptly at the lithologic boundary between Units 3 (diatom-rich silty claystone) and 4 (diatom detrital silty clay). Throughout Unit 4 (180-325 m subbottom), density remains nearly constant at about 1.35-1.40 g/cc (GRAPE nominal) while sonic velocity shows a very gradual increase. Both velocity and density increase sharply at the boundary between lithologic Units 4 and 5 (silty claystone with some chert), and again between Units 5 and 6 (basalt). These abrupt changes clearly correspond with subbottom reflectors observed on the seismic profiler and sonobuoy records at 0.39 and 0.50 sec (two-way travel time). Calculated two-way travel times from the downhole velocity measurements are 0.416 and 0.50, respectively.

Several other subbottom reflectors are observed at about 0.11 to 0.14, 0.18 to 0.19, and 0.29 to 0.31 sec (two-way travel time). The first of these should lie between about 80 and 110 meters subbottom, based on calculated travel times. This corresponds with the top half of Unit 2, a diatom detrital silty clay, in which there is no clear indication of substantial density and/or velocity changes. The second clearly correlates with the bottom part of Unit 3A and/or top of unit 3B (calculated travel time is 0.19 to 0.20) while the third appears to correlate with a zone of lithification in Core 24 at about 225 meters subbottom and 0.28 to 0.29 sec calculated two-way travel time.

Results of routine analyses of interstitial water are shown in Figure 3. The site has the lowest *p*H and highest alkalinity values recorded during Leg 28. *p*H decreases gradually downhole from around 7.5 near the surface to a low of 6.45 just above basement. Alkalinity gradually increases from 3.32 meq/kg at 8 meters subbottom to around 50 meq/kg just above basement. Both *p*H and alkalinity values are consistent with the presence of carbon dioxide gas (but no hydrocarbons) through most of the hole, giving slightly acid waters and very high bicarbonate ion concentrations.

Salinity shows a slight and irregular increase downhole from around 35.5 ‰ near the surface to around 37.5 ‰ near the bottom of the hole.

## BIOSTRATIGRAPHIC SUMMARY

The section penetrated at Site 274 contains foraminifera, radiolarians, diatoms, and nannofossils, although diatoms are by far the dominant fossil present.

Foraminifera occur sparsely—in Core 21, where a probably penecontemporaneously reworked assemblage of mid-Oligocene planktonics was recovered (*Globigerina angiporoides* and *G. labiacrassata*); and in Cores 36, 38, 39, and 41, which contain benthonic assem-

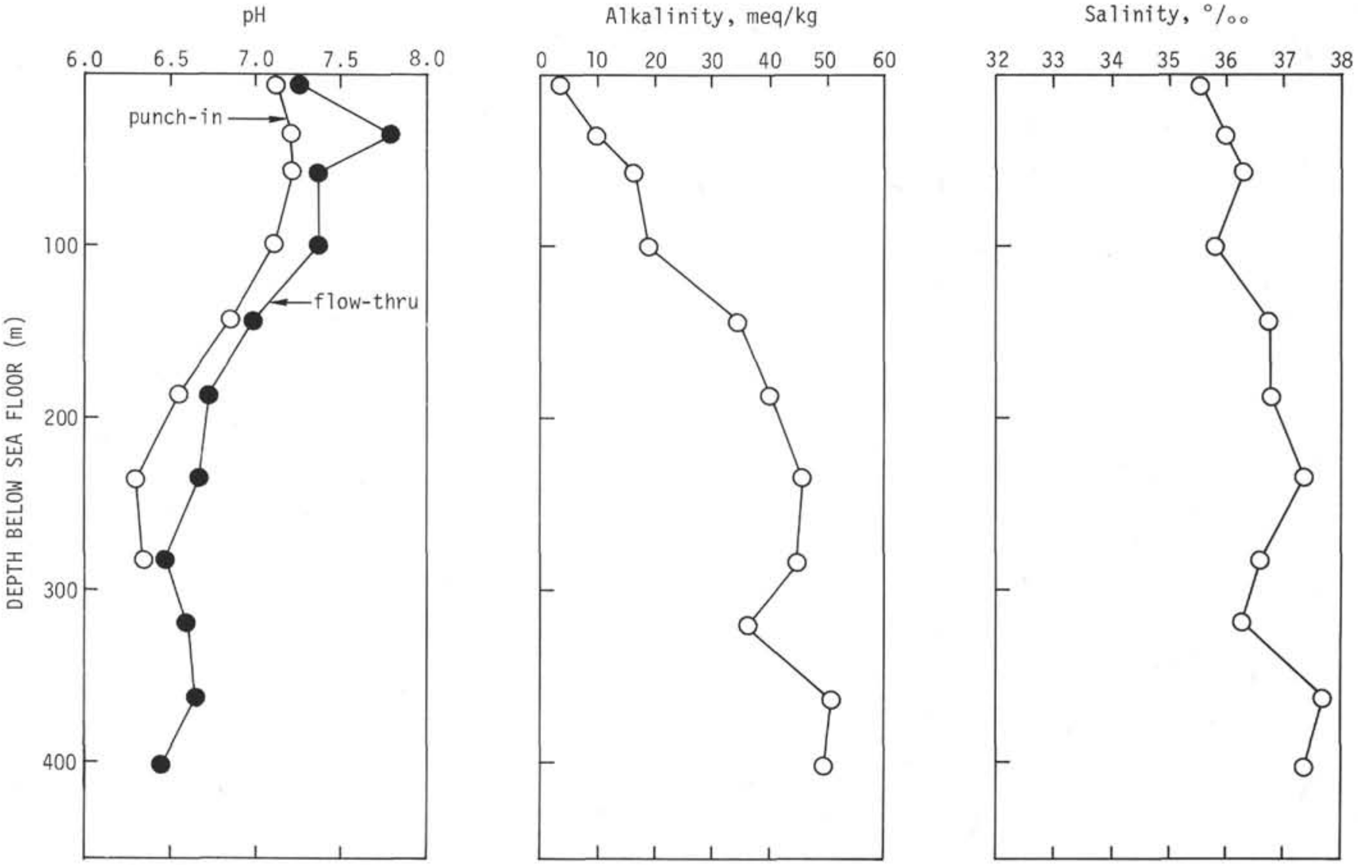

Figure 3. *Shipboard measurements of* pH, *alkalinity, and salinity in sediment pore waters at Site 274.*

blages of early to late Eocene age. In addition, possible casts of *Globotruncana* and/or *Rugoglobigerina*, of Maestrichtian age, were found in Core 43, making the base of the section of possible Late Cretaceous age.

Nannofossils occur only in isolated horizons in the interval of Cores 24-28, but only in Core 21 was the assemblage sufficient for an age determination (*Chiastomolithus altus* assemblage, late Oligocene).

Both radiolarians and diatoms indicate the presence of a continuous late Miocene to Recent section in Cores 12 through 1. Diatoms down through Core 19 are of Miocene age and below this, through Core 34, of Oligocene age (Core 34 may be as old as late Eocene). Below this level, the section is barren of diatoms. Radiolarians are present below Core 12, but are sparse and, because of lengthy sample preparation, remain at this time unanalyzed.

### Foraminifera

Thirteen samples were examined and seven of these were found to contain a microfauna. Samples found to be barren are 9, CC; 11, CC; 19, CC; 22, CC; 34, CC; and 37, CC. Samples 36-2; 38-2; 39, CC; 41, CC; 41-2, CC; 43-3; and 43, CC contain the following taxa: Rhizamminidae, *Cyclamminina* sp., *Reophax* sp., ?*Trochammina* sp., *Ammodiscus* sp. (coarse grained), *Placopsilinella* sp. (attached to Rhizamminidae), and *Schenckiella* (or Martinottiella) cf. *levis* (Finlay).

Foraminifera are uncommon and poorly preserved. The most diagnostic taxon present is *Schenckiella* cf. *levis* (Finlay). In New Zealand this species ranges from early to late Eocene. A somewhat similar taxon, *Martinottiella communis* d'Orbigny, ranges from early Eocene to Recent. *Schenckiella* cf. *levis* was found in 36-2 and 41-2. According to the New Zealand record, the age of 41-2 could be as old as early Eocene. However, it should be noted that Loeblich and Tappan (1964) give the range of *Martinottiella* (=*Schenckiella* is a junior synonym according to those authors) as beginning in the Paleocene.

Samples from the lowermost sedimentary core (43-3, 43, CC) contain internal casts of what appear to be *Globotruncana* and perhaps *Rugoglobigerina*. The possible globotruncanid resembles the Maestrichtian *G. contusa*. It is possible then, that sediments from just above the basalt are latest Cretaceous in age.

Tests of planktonic foraminifera were found in two samples of Core 21, in Sections 1 and 3, in an otherwise barren, diatom-radiolarian facies. The assemblage is of mid-Oligocene age and includes the two species *Globigerina angiporoides* and *G. labiacrassata* Jenkins. There is some indication that this assemblage may be reworked, though the age discrepancy between the introduced and host sediments does not appear to be great, and penecontemporaneous redeposition is suggested. The evidence for reworking is: (a) the assemblages come from a sediment which is lithologically distinct from the basic sedimentary facies at the site; (b) one of the tests contains a bright red, oxidized filling, indicative of oxidizing conditions in the source beds, in contrast to the generally reduced nature of the host sediments. The source beds were probably on the continental slope, or on the shelf.

The limited diversity of the assemblage may reflect size sorting, but is more probably a function of the high latitude of the site. Dissolution does not seem to be a factor since the tests are well preserved.

### Nannofossils

Nannofossils were present only in isolated horizons and burrows in a short section (Cores 21 to 28) of Site 274. Poor assemblages were present in Samples 21-1, 93 cm; 21-3, 70 cm; 21-3, 100 cm; 27-4, 104 cm. The best assemblages were in Samples 21-1, 93 cm and 21-3, 70 cm; and these were dominated by *Chiastomolithus altus* suggesting an Oligocene age. Other species present in low numbers were: *Coccolithus pelagicus*, *Dictyococcites scrippsae*, and a small *Reticulofenestra* sp.

### Radiolaria

Radiolaria are few and well preserved in Cores 1-4; common and well-preserved in Cores 5-11 and 20-34; and rare and moderately preserved in Cores 12-19 and 35-42.

Radiolarian zones represented are: Cores 7-11, the *Helotholus vema* Zone; Core 12, the *Theocalyptra bicornis spongothorax* Zone. Cores 13-19 contain low abundance of radiolarian assemblages which indicate Miocene age.

On the basis of the presence of *Cyrtocapsella isopera*, Cores 15-19 are of middle to early Miocene age. In Cores 20-34, radiolarian assemblages are of uniform species composition throughout the entire section. One horizon (Sample 21-1, 93 cm) has been dated by calcareous nannofossils as late Oligocene in age. However, based on the foraminiferal dating (Core 21 as middle Oligocene in age) and on the comparison of the radiolarian assemblages of Core 20 from this site and Core 18 from Site 277 (Leg 29), it is concluded that Core 20 is middle or early Oligocene in age. Therefore, there may be a hiatus between Cores 20 and 19 with the late or middle to late Oligocene sequence missing.

Cores 35-42 have the same, but less diversified radiolarian assemblages than Cores 20-34. The age of this interval is uncertain.

No reworked older Radiolaria were observed at this site.

### Diatoms

Sediments from this site contain diatoms in generally good abundance, with some localized areas of paucity. The preservational state of the diatoms ranges from fair (Cores 1-19) to excellent (Cores 20-34). Cores 1 through 6 contain an abundant reworked Miocene and Oligocene flora in a somewhat inverted sequence. The origin of this reworking apparently dates from the upper Gilbert/Gauss paleomagnetic epochs when Miocene and Oligocene sediments were eroded from the Ross Sea. After a chert layer was encountered in Core 35, the remainder of the site was barren of diatoms.

Cores 1 through Sample 4, CC contain a portion of the *Rhizosolenia barboi/Nitzschia kerguelensis* Zone. Cores 5, 6 through 8, CC contain the *Coscinodiscus kolbei/Rhizosolenia barboi* Zone. Sample 9-2, 90 cm through Core 9 contains a portion of the *Nitzschia praeinterfrigidaria* Zone. Samples 10-1, 40 cm through 10, CC contains a portion of the *Denticula hustedtii* Zone. Evidence of the *Denticula hustedtii/Denticula lauta* Zone was found only at 11-1, 140 cm. The *Denticula antarctica/Coscinodiscus lewisianus* Zone cannot be separated from the *Denticula antarctica* Zone because *Coscinodiscus lewisianus* was not found at this site. These two zones occur between 13-1, 90 cm and 15, CC. The *Pyxilla prolungata* Zone is contained in Cores 20 through 34. Below Core 34, this site is barren of diatoms.

### Silicoflagellates

Silicoflagellates are generally scarce and rather poorly preserved in the upper 60 meters of the section (down to Core 7-2), more common and better preserved at 75 to 102 meters (between 9-1 and 11-4), then again rare to few with varying degrees of preservation from 105 to 180 meters (between 12-1 and 19-6), and common to abundant and well preserved from 180 to 323 meters (between 20-1 and 34-6). Cores 1 through 6 contain reworked Eocene, Oligocene, and Miocene silicoflagellates. Reworked silicoflagellates appear to be more numerous and older (Eocene? and Oligocene) in Cores 1 and 2.

The base of the *Distephanus speculum* Zone A is not recognized but should occur in the unrecovered sediment interval at 32 to 39 meters, the base of the *Distephanus speculum* Zone B is at 85 to 86.5 meters (between 9-6, 142 cm and 10-1, 90 cm), and the base of the *Distephanus boliviensis* Zone is at 93.5 to 94 meters (between 10-6, 42 cm and 10-6, 90 cm). The *Dictyocha aspera* var. *pygmaea/Dictyocha fibula* var. *pumila* Zone is not recognized, but may be represented in the unrecovered sediment of Core 11, Section 1. A portion of the *Dictyocha pseudofibula* Zone occurs at 96.5 to 101 meters (between 11-1 and 11-4); however, the base of this zone and the entire *Mesocena diodon* Zone is absent but may be present in the unrecovered sediment from 101 to 105.5 meters (between 11-4 and 12-1, 92 cm). The base of the *Mesocena circulus* Zone occurs at 112.5 to 113 meters (between 12-6, 42 cm and 12-6, 90 cm). Sediments from 114 to 180.5 meters are unzoned because of the insufficient occurrence of diagnostic silicoflagellates.

A lower Oligocene silicoflagellate-bearing section, thus far unrecorded in deep-sea sediments, is present from 180.5 meters to 323 meters (between 20-1 and 34-6). The entire 143-meter sequence of the lower Oligocene *Dictyocha deflandrei* Zone has a fairly homogeneous assemblage throughout, but is divisible into two subzones, the *Dictyocha frenguellii* Subzone from 180.5 to 304 meters (between 20-1, 30 cm and 32-6, 32 cm) and the *Mesocena apiculata* Subzone from 304 to 323 meters (between 33-1, 30 cm and 34-6, 32 cm).

## Palynology

Thirty-one samples, from all five sedimentary units, were examined for pollen. Recovery of palynomorphs was poor in all but the basal unit, due probably to extreme dilution of the organic-walled fossils by terrigenous and biogenic detritus (notably diatoms).

### Unit 1

None of the three samples examined yielded palynomorphs, although fine woody debris was common.

### Unit 2

Barren, possibly to oxidation during deposition.

### Unit 3

Two of five samples examined from this unit yielded pollen and dinoflagellates, though not in great abundance. The palynomorphs are interpreted as being chiefly recycled, occurring only in the coarser intervals; in a silty clay in Core 15, and in a fine silt in Core 18. Pollen includes a dominance of Paleogene forms, mostly *Nothofagus*, the Permian types *Protohaploxypinus* and *Acanthotriletes*, and the Jurassic-Early Cretaceous form *Classopollis torosus*. Dinoflagellates include *Spinidinium aperturum* and *Deflandrea macmurdoensis*, which seem more likely to be recycled from Eocene deposits than to represent an extension of the range of these species into the Miocene.

### Unit 4

Although 13 samples from this diatom-rich unit were examined, only those from the very top and from the base were productive. Cores 22 and 23 contained abundant acritarchs, notably a small species of the long-ranging genus *Leiofusa*. *Aiora fenestrata*, *Areosphaeridium diktyoplokus*, *Spinidinium aperturum*, *Deflandrea asymmetrica*, and *Thalassiphora* cf. *pelagica* also occur; there is little independent evidence for recycling in these samples, and some of the species involved are extremely delicate, so it appears that this occurrence represents an extension of the range of these dominantly Eocene forms into the Oligocene.

### Unit 5

Samples from eight of the nine cores examined from this interval yielded rich dinoflagellate assemblages; only Core 35 was barren. The dinoflagellate suite is similar in composition to that known from erratics at Black Island and Minna Bluff (Wilson, 1967) and from sequences in southern South America (see Archangelsky, 1969) although a few forms are known from European, notably German, sequences as well. Stratigraphically, the most significant forms include *Areosphaeridium diktyoplokus* (Klumpp), *Leptodinium dispertitum* Cookson, *Aiora fenestrata* Deflandre and Cookson, *Deflandrea* cf. *D. oebisfeldensis* Alberti, *D.* cf. *D. granulata* Menendez, *D. macmurdoensis* Wilson, *D. asymmetrica* Wilson, *Turbiosphaera filosa* (Wilson), *Spinidinium aperturum* Wilson, and *Thalassiphora pelagica* (Eisenack). Consideration of the ranges of those species known from Europe (*A. diktyoplokus*) and Australia (*L. dispertitum*), and comparison with South American assemblages, suggest a late Eocene age for this unit, although knowledge of the total ranges of the species involved is insufficient to preclude an early Oligocene age.

Pollen and spores are extremely rare, due probably to the distance from shore of this site. A few grains of *Nothofagidites* (both *fusca* and *brassi* types) occur, together with rare *Proteacidites* cf. *P. minimus*, and some podocarpaceous pollen. None of this suggests anything warmer than a cool temperate vegetation.

## SUMMARY AND CONCLUSIONS

Site 274, on the lower continental rise in 3326 meters of water, lies about 250 km north-northeast of Cape Adare, in close proximity to the Ross Sea shelf. The sediment column is anomalously thin (408 m) as compared to other lower rise sites, and the age of the oceanic basement has been estimated at 38-40 m.y. (Figure 2) from sea-floor magnetic anomalies. This age is possibly in agreement with the age of the oldest dated sediments ($\sim$37.5 m.y. in Core 34), although extrapolation of the sedimentation rate below Core 34 implies an age of about 42 m.y. for the oldest sediments at the site in Core 43.

Site 274 is positioned about 50 km to the northeast and 1200 meters below the northeastern flank of a major graben which intersects the continental rise between Cape Adare and Iselin Bank (Houtz and Meijer, 1970; Houtz and Davey, 1973; Hayes and Davey, this volume). It appears that this structure has only recently served to inhibit downslope sediment transport from the continent by serving as a trap, inasmuch as beds and laminae of silt and coarser materials are not observed in the sedimentary sequence above the top of Core 15. A middle Miocene age is accordingly likely for the development of the graben as an effective barrier to downslope sediment transport. Some of the block faulting seen in seismic profiles of the western Ross Sea shelf may be related to the structure seen near Site 274. These also may have originated, or been active, during the inferred middle Miocene period of block faulting on the continental rise.

From a biostratigraphic point of view, Site 274 is one of the more significant holes on Leg 28. Diatoms recovered here belong both to the pelagic facies distinguished at sites farther west and northwest and to the shelf flora recognized in the Ross Sea, and time relationships of the two could thus be worked out. Additionally, climatically significant silicoflagellates are well represented in the upper portion of Site 274.

The relatively attenuated sequence of sediments at Site 274 primarily reflects slow rates of accumulation of fine clastics, but is also partly a function of two periods of submarine erosion. A prominent unconformity occurs between Cores 19 and 20, where probable early Miocene overlies middle to lower Oligocene strata, and another unconformity probably lies between Cores 11 and 12 although it is placed with less assurance because of extensive reworking of microfossils above Core 12. However, the balance of paleontological evidence sug-

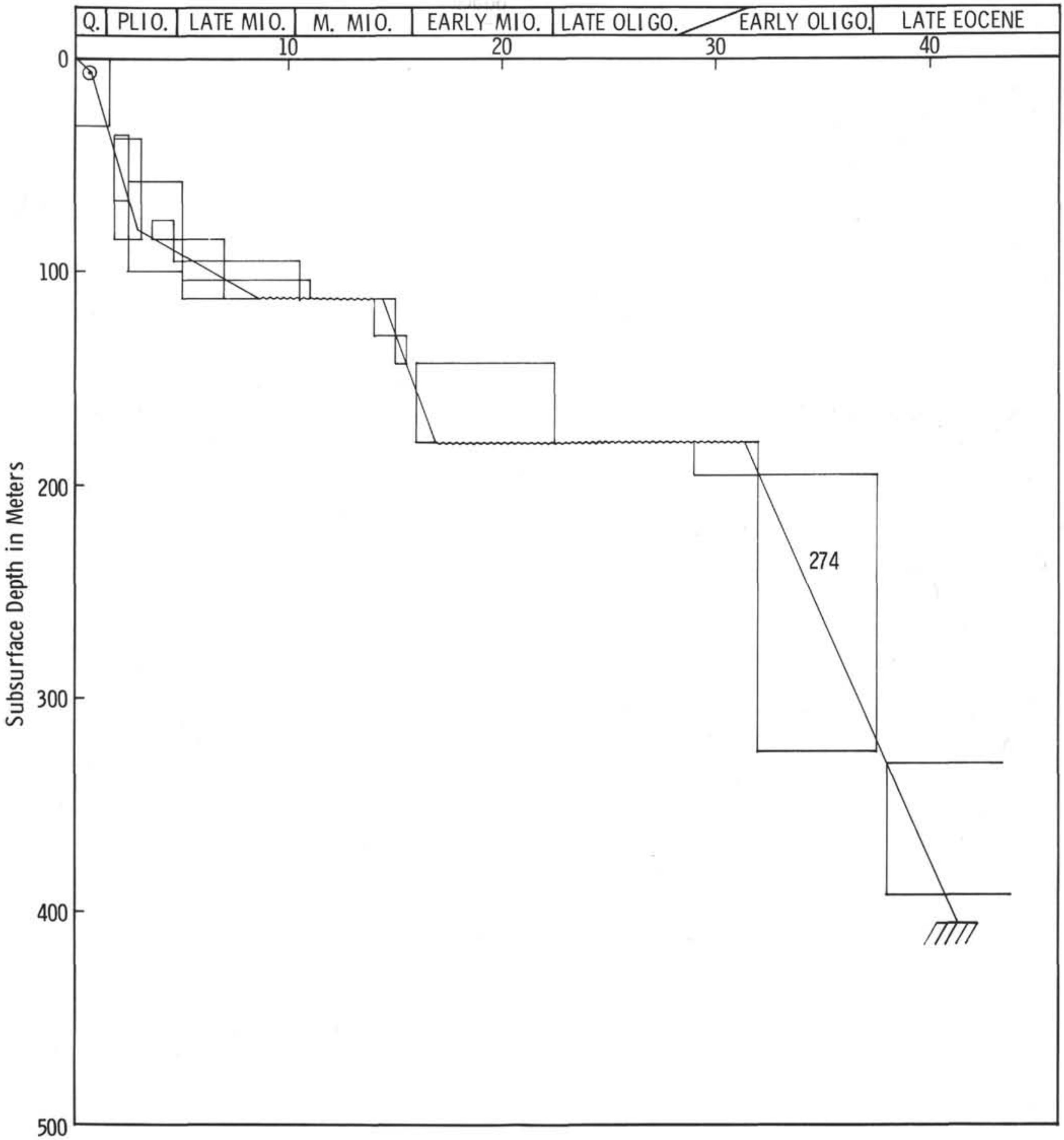

Figure 3. *Age vs. depth at Site 274.*

gests that Pliocene sediments occur in Core 11 and middle Miocene strata constitute Core 12. The Oligocene-Miocene hiatus coincides approximately in timing with other unconformities known from near Antarctica (Site 267 and Kerguelen Plateau) and in and around Australia and New Zealand (Brown et al., 1968; Carter and Landis, 1972; Kennett et al., 1972).

The probable coincidence of the older unconformity with late Oligocene initiation of sea-level glaciation in the Ross Sea suggests that erosion at Site 274 resulted from greatly increased bottom current activity due to Antarctic bottom water formation near the base of an ice shelf. Erosion seems to have begun abruptly and ceased abruptly. However, the late Miocene hiatus is associated with a 35-meter-thick sequence of reworked sediments containing abundant ferromanganese nodules and micronodules (Frakes, this volume) which accumulated at less than 3 m/m.y. This later sediment deposition is more typical of Neogene "slowdown" unconformities in the Antarctic and subantarctic regions (Watkins and Kennett, 1972; Fillon, 1972).

Rates of accumulation at Site 274 are fairly well established above Core 14, where biostratigraphic control is quite good. Below this level, however, only three significant stratigraphic boundaries can be drawn at present: the transition between lower Miocene and middle Miocene between Cores 15 and 16; the ?lower Miocene-middle Oligocene hiatus between Cores 19 and 20, and the Oligocene-Eocene boundary in Core 34. These suggest that Paleogene sedimentation proceeded at an average rate of about 18 m/m.y. until probably the late Oligocene, when intensive erosion stripped the section down to the middle Oligocene deposits. Accumulation resumed in the ?early Miocene at a rate of about 11 m/m.y. and this was in turn succeeded by an interval of remarkably slow deposition (less than 3 m/m.y.) culminating in active erosion probably during the late Miocene. Pliocene and younger sediments accumulated at rates varying from 20 to 33 m/m.y.

Downhole, density and sonic velocity show a smooth though not linear increase with depth to about 180 meters subbottom where both decrease rather abruptly at the lithologic boundary between Units 3 (diatom-rich silty claystone) and 4 (diatom detrital silty clay). Throughout Unit 4 (180-325 m subbottom), density remains nearly constant at about 1.35-1.40 g/cc (GRAPE nominal) while sonic velocity shows a very gradual increase. Both velocity and density increase sharply at the boundary between lithologic Units 4 and 5 (silty claystone with some chert), and again between Units 5 and 6 (basalt). These abrupt changes clearly correspond with subbottom reflectors observed on the seismic profiler and sonobuoy records at 0.39 and 0.50 sec (two-way travel time).

Other subbottom reflectors are observed at about 0.18-0.19 and 0.29-0.31 sec (two-way travel time). The first of these clearly correlates with the topmost abundant claystones in the lower part of Unit 3, while the second appears to correlate with a zone of lithification in Core 24 at about 225 meters subbottom.

The history of sedimentation for the region offshore from northern Victoria Land is well displayed by the post-middle Eocene sequence at Site 274. Against the background of normal hemipelagic accumulation at this continental rise locality, ice rafting has played a significant part, particularly since the middle Miocene. Analysis of sand grain abundance (Piper and Brisco, this volume; Frakes, this volume) indicates that rafting may have occurred during the early Oligocene; additionally, pebbles and granules are observed in the early Oligocene section, although many obviously have fallen from higher horizons to the bottom of the hole. Early Miocene/late Oligocene ice rafting seems reasonably well established. Calcareous nannofossils occur in very limited abundance and only in the early Oligocene sequence, while diatoms range down to the top of the Eocene. Any diatoms originally present below this level may have been destroyed during chertification of the Eocene section. As at other sites, Site 274 data suggest somewhat warmer surface water early in the Cenozoic followed by cooling, in this case within the middle Oligocene.

Kaolinite occurs in the $>2$ $\mu$m fraction of middle Oligocene and younger sediments. The implications are that a period of deep weathering, probably resulting from warm and wet climatic conditions, took place on the continent before the middle Oligocene; that this material began to reach offshore sites opposite northern Victoria Land in the middle Oligocene; and that these soil materials are still being derived from the source area.

The cherts at the top of the late Eocene sequence occur entirely within a detrital sequence, and the presence of quartz and clay hinder determination of their mode of origin (Piper and Brisco, this volume).

Site 274, located near the late Cenozoic volcanic centers of Cape Adare and the Balleney Islands, displays little evidence of volcanic contribution to the sediment. Glass shards and silt-sized plagioclase and pyroxenes are the only possible volcanic components present, and they are small in volume. No evidence of explosive volcanism, such as ash beds, has been observed, suggesting that prevailing winds must have diverted any such debris elsewhere.

The holocrystalline and nonporphyritic basalt at the bottom of the hole also contains amygdules, vesicles, and breccia, and its mode of origin is thus interpreted with difficulty. The basalt may have formed as a lava flow or it may represent a post-basement sill.

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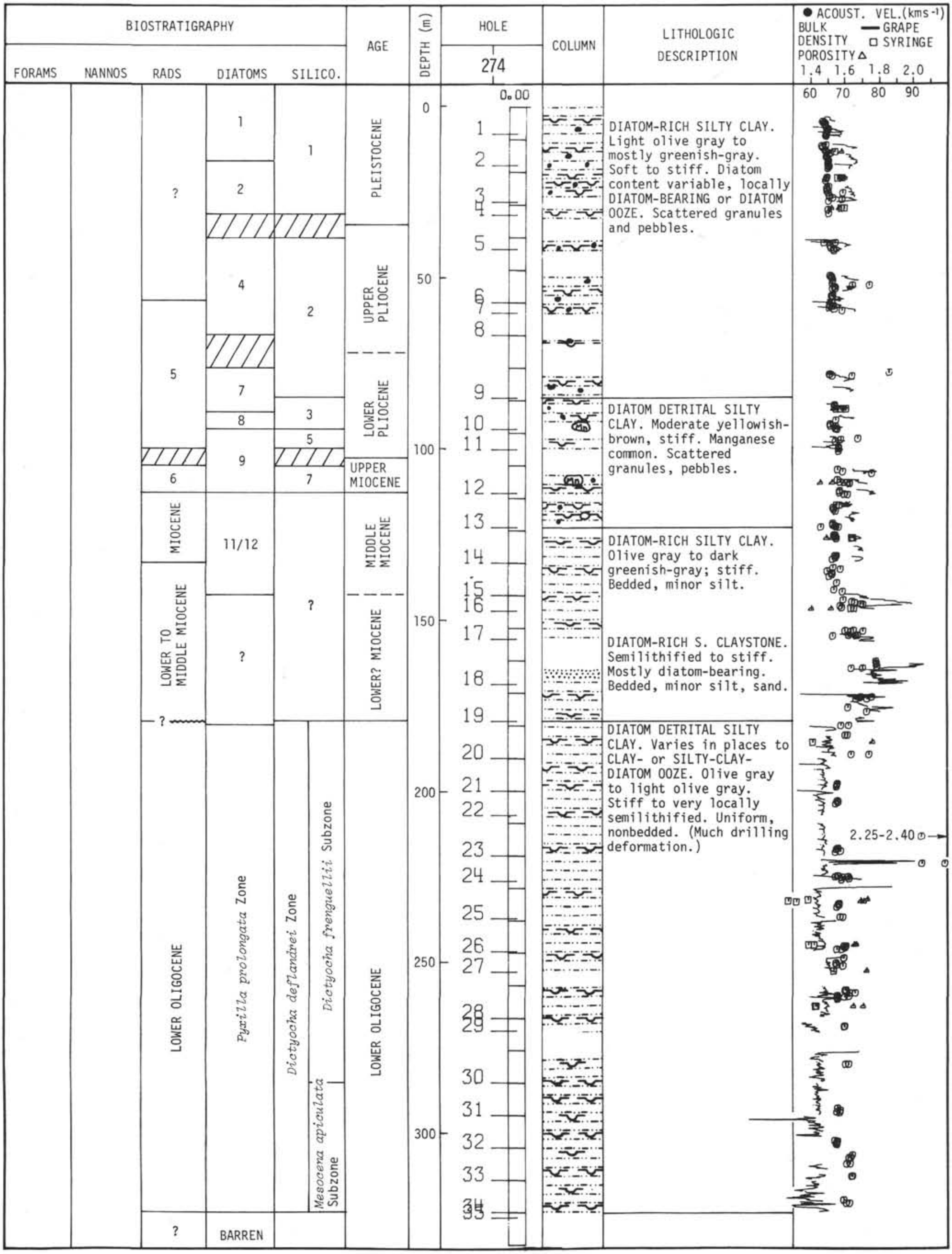


DIATOM-RICH SILTY CLAY. Light olive gray to mostly greenish-gray. Soft to stiff. Diatom content variable, locally DIATOM-BEARING or DIATOM OOZE. Scattered granules and pebbles.

DIATOM DETRITAL SILTY CLAY. Moderate yellowish-brown, stiff. Manganese common. Scattered granules, pebbles.

DIATOM-RICH SILTY CLAY. Olive gray to dark greenish-gray; stiff. Bedded, minor silt.

DIATOM-RICH S. CLAYSTONE. Semilithified to stiff. Mostly diatom-bearing. Bedded, minor silt, sand.

DIATOM DETRITAL SILTY CLAY. Varies in places to CLAY- or SILTY-CLAY-DIATOM OOZE. Olive gray to light olive gray. Stiff to very locally semilithified. Uniform, nonbedded. (Much drilling deformation.)

Figure 5. *Graphic hole summary, Site 274.*

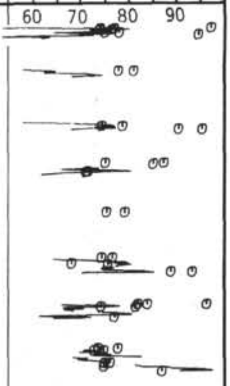
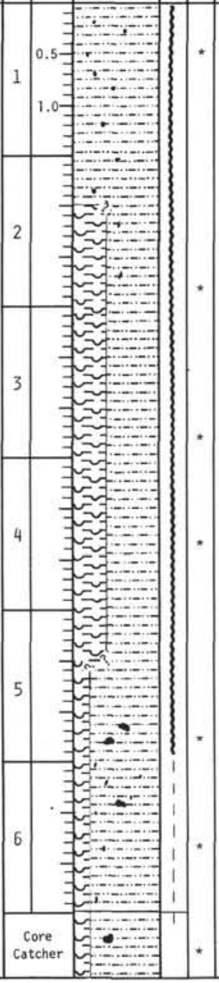
| BIOSTRATIGRAPHY | AGE | DEPTH (m) | HOLE 274 | COLUMN | LITHOLOGIC DESCRIPTION | ● ACOUST. VEL.(kms-1) BULK DENSITY — GRAPE □ SYRINGE POROSITY △ 1.4 1.6 1.8 2.0 |
|---|---|---|---|---|---|---|
|  |  | 350<br>400 | 36<br>37<br>38<br>39<br>40<br>41<br>42<br>43<br>44<br>45 |  | SILTY CLAYSTONE with CHERT in upper part. Olive gray. Semilithified to lithified. Locally bedded, mottled. Minor pyrite near base.<br>BASALT. Medium-gray, dense, nonporphyritic, locally vesicular to amygdaloidal. Cut irregularly by white to green veins of calcite and chlorite, breccia in places. |  |

Figure 5. *(Continued).*

Site 274 Hole Core 1 Cored Interval: 0-9.5 m (recovery 7.9 m, 83%)

AGE | ZONE | FOSSIL CHARACTER: FOSSIL, ABUND., PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION

PLIOCENE/QUATERNARY



Light olive gray (5Y 6/1), sloppy to soupy, DIATOM DETRITAL SILTY CLAY; locally diatom-bearing to diatom-rich, locally soft to stiff near base. A few granules scattered at least through Secs. 1, 2, 5, and 6; several pebbles in Secs. 5 and 6.

Sec. 1 (53 cm):
TR sand
32% silt
66% clay
1- 2% heavy minerals
5- 6% diatoms
TR radiolarians
1- 2% sponge spicules
TR silicoflagellates

Sec. 2 (130 cm):
TR sand
21% silt 70%
88% clay
1- 2% heavy minerals
TR micronodules
30% diatoms
TR radiolarians
1% sponge spicules

Sec. 3 (127 cm):
0% sand
22% silt 70%
88% clay
TR heavy minerals
26% diatoms
TR radiolarians
1- 2% sponge spicules

Sec. 4 (80 cm):
TR sand
24% silt 65%
75% clay
TR heavy minerals
30% diatoms
TR radiolarians
1- 2% sponge spicules

Sec. 5 (125 cm):
TR sand
26% silt 80%
72% clay
5% heavy minerals
TR micronodules
15% diatoms
TR radiolarians
1- 2% sponge spicules

Sec. 6 (75 cm):
TR sand
40% silt 75%
58% clay
TR heavy minerals
20% diatoms
TR radiolarians
2- 3% sponge spicules
TR silicoflagellates

Bulk X-ray (5.7 m):

| | |
|---|---|
| Amorph. | - 54.3% |
| Ident. | - 45.7% |
| Quar. | - 28.1% |
| K-Fe. | - 15.3% |
| Plag. | - 18.1% |
| Mica | - 29.8% |
| Chlo. | - 2.5% |
| Mont. | - 4.8% |
| Amph. | - 1.4% |

Becomes stiff at 90 cm.

Sec. CC
TR sand
37% silt 80%
63% clay
2% heavy minerals
10-12% diatoms
3% sponge spicules

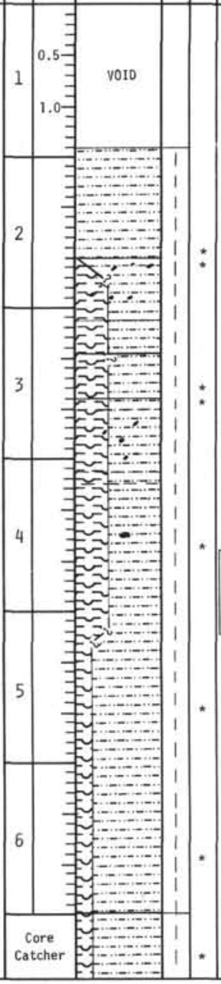
Light olive gray
DIATOM-RICH SILTY CLAY

---

Site 274 Hole Core 2 Cored Interval: 9.5-19 m (recovery 7.6 m, 80%)

AGE | ZONE | FOSSIL CHARACTER: FOSSIL, ABUND., PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION

PLIOCENE/QUATERNARY



Note color change from Core 1. No contact seen.

Dark greenish gray (5GY 4/1), soft to stiff, DIATOM-BEARING DETRITAL SILTY CLAY.

Sec. 2 (96 cm):
TR sand
40% silt 90%
58% clay
TR heavy minerals
TR carbonate unspec.
5- 6% diatoms
1- 2% radiolarians

Sec. 2 (109 cm):
1- 2% sand
33% silt 92%
64% clay
1% heavy minerals
TR carbonate unspec.
5- 6% diatoms
1- 2% sponge spicules

color contact

Greenish gray (5GY 5/1), stiff
DIATOM DETRITAL SILTY CLAY

color contact

overgrowths on quartz

Dark greenish gray (5GY 4/1)
color contact
Greenish gray (5G 6/1)
color contact
Dark greenish gray (5GY 4/1)
color contact

Greenish gray (5G 6/1)

color contact
Dark greenish gray (5G 4/1)
color contact
Greenish gray (5G 6/1)

Sec. 3 (86 cm):
TR sand
25% silt 60%
75% clay
1% heavy minerals
35% diatoms
TR radiolarians
2- 3% sponge spicules

Sec. 3 (87 cm):
TR sand
30% silt 60%
68% clay
1- 2% heavy minerals
TR- 1% carbonate unspec.
40% diatoms
TR sponge spicules

Bulk X-ray (13.2 m):

| | | | |
|---|---|---|---|
| Amorph. | - 53.9% | Kaol. | - 1.6% |
| Ident. | - 46.1% | Mica | - 30.8% |
| Quar. | - 30.1% | Chlo. | - 3.0% |
| K-Fe. | - 11.3% | Mont. | - 3.8% |
| Plag. | - 19.5% | | |

DIATOM-RICH DETRITAL SILTY CLAY

Sec. 4 (90 cm):
TR sand
20% silt 70%
78% clay
TR heavy minerals
TR carbonate unspec.
25% diatoms
TR radiolarians
TR sponge spicules

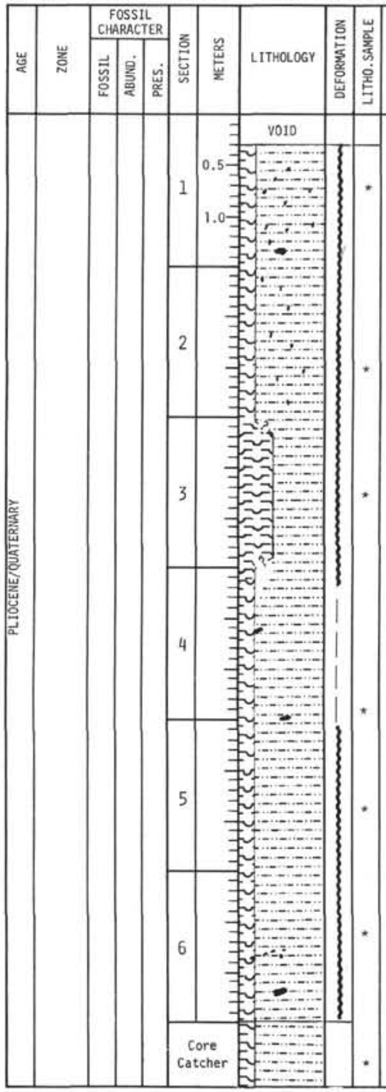
Sec. 5 (94 cm):
TR sand
45% silt 75%
53% clay
1- 2% heavy minerals
20% diatoms
2- 3% sponge spicules
TR silicoflagellates

Sec. 6 (90 cm):
TR sand
20% silt 80%
80% clay
TR heavy minerals
TR carbonate unspec.
15% diatoms
1- 2% sponge spicules
TR silicoflagellates

Sec. CC
0% sand
45% silt
55% clay
TR heavy minerals
TR micronodules
15% diatoms
TR radiolarians
1- 2% sponge spicules
TR silicoflagellates

Explanatory notes in Chapter 1

Site 274 Hole Core 3 Cored Interval: 19-28.5 m (recovery 8.7 m, 92%)



LITHOLOGIC DESCRIPTION

Sec. 1 (79 cm):
TR sand
35% silt 85%
63% clay
TR heavy minerals
TR volcanic glass
10-12% diatoms
1- 2% radiolarians
TR silicoflagellates

Greenish gray (5G 5/1), stiff, DIATOM-RICH SILTY CLAY, locally containing granules and pebbles.

Sec. 2 (100 cm):
1- 2% sand
20% silt 75%
78% clay
heavy minerals
24% diatoms
TR radiolarians
1- 2% sponge spicules

Locally, as at 3-81, becomes DIATOM DETRITAL SILTY CLAY.

Sec. 3 (80 cm):
0% sand
54% silt 65%
46% clay
TR heavy minerals
TR carbonate unspec.
30% diatoms
TR radiolarians
3- 4% sponge spicules
TR silicoflagellates

Sec. 4 (142 cm):
TR sand
20% silt 75%
78% clay
heavy minerals
15-20% diatoms
TR radiolarians
1- 2% sponge spicules

Greenish gray (5G 6/1)

Sec. 5 (90 cm):
0% sand
25% silt 85%
75% clay
heavy minerals
TR glauconite
10-12% diatoms
2- 3% sponge spicules
TR silicoflagellates

Sec. 6 (60 cm):
TR sand
35% silt 85%
63% clay
1- 2% heavy minerals
TR carbonate unspec.
10-12% diatoms
1- 2% sponge spicules

Sec. CC
TR sand
30% silt 50%
70% clay
heavy minerals
45% diatoms
TR radiolarians
TR carbonate unspec.
4% sponge spicules

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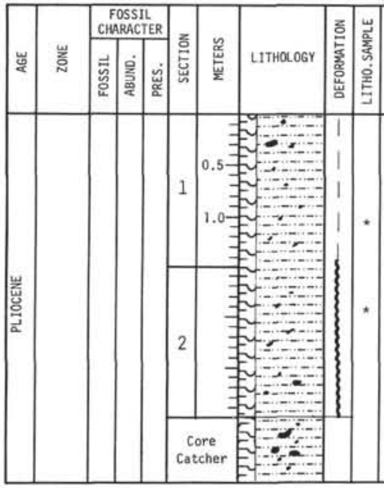
Site 274 Hole Core 4 Cored Interval: 28.5-38 (recovery 3.0 m, 32%)



LITHOLOGIC DESCRIPTION

DIATOM-RICH DETRITAL SILTY CLAY. Same lithology as Core 3. A few scattered granules and pebbles.

Sec. 1 (100 cm):
TR sand
18% silt 80%
81% clay
TR heavy minerals
15% diatoms
TR radiolarians
TR- 1% sponge spicules

Sec. 2 (35 cm):
TR sand
25% silt 80%
73% clay
TR heavy minerals
15% diatoms
TR radiolarians
1- 2% sponge spicules

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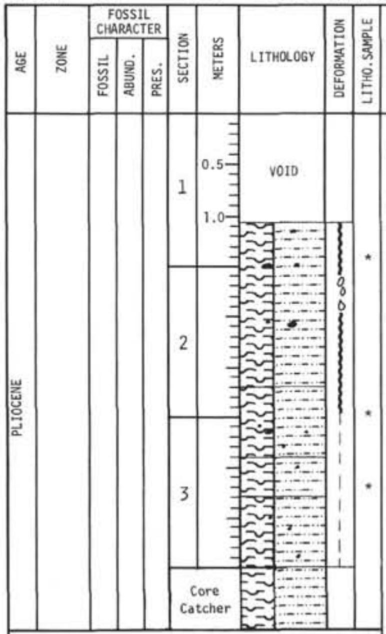
Site 274 Hole Core 5 Cored Interval: 38-47.5 m (recovery 3.5 m, 37%)



LITHOLOGIC DESCRIPTION

DIATOM DETRITAL SILTY CLAY. Same lithology as Core 4. Scattered granules and pebbles.

Sec. 1 (137 cm):
0% sand
18% silt 35%
82% clay (mottle)
TR heavy minerals
65% diatoms
TR sponge spicules

Sec. 2 (140 cm):
0% sand
12% silt 60%
88% clay
TR heavy minerals
35% diatoms
1- 2% sponge spicules
TR silicoflagellates

color contact
Light olive gray (5Y 6/1)
DIATOM DETRITAL CLAY to SILTY CLAY, stiff.

color contact
Greenish gray (5GY 6/1), same lithology.

color contact
Light olive gray (5Y 6/1)
DIATOM DETRITAL SILTY CLAY.

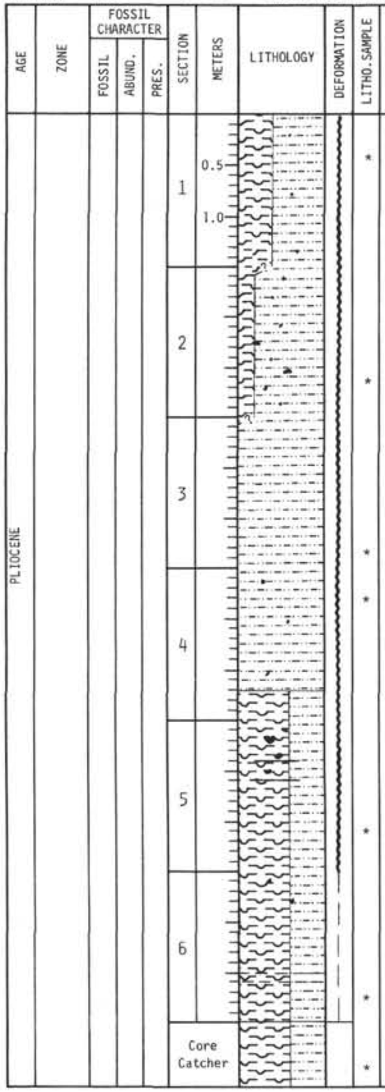
Sec. 3 (65 cm):
TR sand
25% silt 60%
73% clay
TR heavy minerals
35% diatoms
TR sponge spicules
TR silicoflagellates

Sec. CC
TR sand
20% silt 70%
78% clay
TR heavy minerals
24% diatoms
TR radiolarians
1- 2% sponge spicules

Bulk X-ray (42.3 m):
Amorph. - 67.0%
Ident. - 33.0%
Quar. - 28.3%
K-Fe. - 11.2%
Plag. - 21.2%
Mica - 35.2%
Chlo. - 2.3%
Mont. - 1.9%

Explanatory notes in Chapter 1

Site 274 Hole Core 6 Cored Interval: 47.5-57 m (recovery 9.5, 100%)



LITHOLOGIC DESCRIPTION

Note color change from Core 5 (no contact seen).
DIATOM DETRITAL SILTY CLAY greenish gray (5G 6/1), stiff.

| Sec. 1 (40 cm): | Sec. 2 (114 cm): |
|---|---|
| TR sand | TR sand |
| 25% silt 55% | 20% silt 75% |
| 64% clay | 78% clay |
| TR heavy minerals | TR heavy minerals |
| 40% diatoms | 20% diatoms |
| TR radiolarians | TR radiolarians |
| 2- 3% sponge spicules | TR- 1% sponge spicules |

? color contact ? ? (not seen)

DIATOM-BEARING DETRITAL SILTY CLAY dark greenish gray (5G 4/1), stiff.

| Sec. 3 (131 cm): | | Sec. 4 (25 cm): |
|---|---|---|
| TR sand | 92% olive | TR sand |
| 82% silt | green | 22% silt 94% |
| 16% clay | patches | 86% clay |
| 1- 2% heavy minerals | | 2- 3% heavy minerals |
| TR volcanic glass | | 4- 5% diatoms |
| 5- 6% diatoms | | TR sponge spicules |
| 1- 2% sponge spicules | | |

color contact

DETRITAL SILTY CLAY TO CLAYEY DIATOM OOZE greenish gray (5G 6/1 to 5GY 6/1), stiff.

| Sec. 5 (100 cm): | Sec. 6 (127 cm): |
|---|---|
| 0% sand | 0% sand |
| 25% silt 40% | 10% silt 43% |
| 75% clay | 90% clay |
| TR heavy minerals | TR heavy minerals |
| 55% diatoms | 55% diatoms |
| 1- 2% sponge spicules | 1- 2% sponge spicules |
| TR silicoflagellates | |

100-111 cm - color change light olive gray (5Y 6/1). Greenish gray (5GY 6/1).

| Bulk X-ray (50.3 m): | | Sec. CC: |
|---|---|---|
| Amorph. | - 60.6% | TR sand |
| Ident. | - 39.4% | 32% silt 55% |
| Quar. | - 28.6% | 65% clay |
| K-Fe. | - 12.6% | TR heavy minerals |
| Plag. | - 21.9% | 40% diatoms |
| Mica | - 33.1% | TR radiolarians |
| Chlo. | - 2.0% | 1- 2% sponge spicules |
| Mont. | - 1.8% | TR silicoflagellates |

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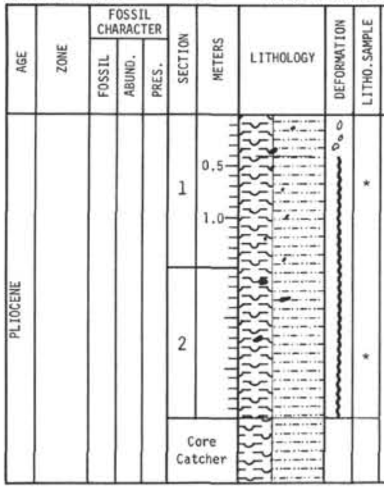
Site 274 Hole Core 7 Cored Interval: 57-66.5 m (recovery 3.0 m, 32%)



LITHOLOGIC DESCRIPTION

Greenish gray (5G 6/1), stiff DIATOM DETRITAL SILTY CLAY.

| Sec. 1 (70 cm): | Sec. 2 (80 cm): |
|---|---|
| 0% sand | TR sand |
| 33% silt 45% | 22% silt 65% |
| 67% clay | 76% clay |
| TR heavy minerals | 1- 2% heavy minerals |
| 50% diatoms | 30% diatoms |
| TR radiolarians | TR radiolarians |
| 1- 2% sponge spicules | 1- 2% sponge spicules |
| | TR silicoflagellates |

Sec. CC:
TR sand
33% silt 75%
64% clay
1- 2% heavy minerals
20% diatoms
1- 2% sponge spicules

DIATOM-RICH DETRITAL SILTY CLAY (5G 6/1).

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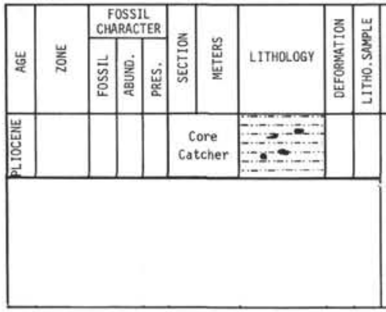
Site 274 Hole Core 8 Cored Interval: 66.5-76 m (recovery 0 m, 0%)



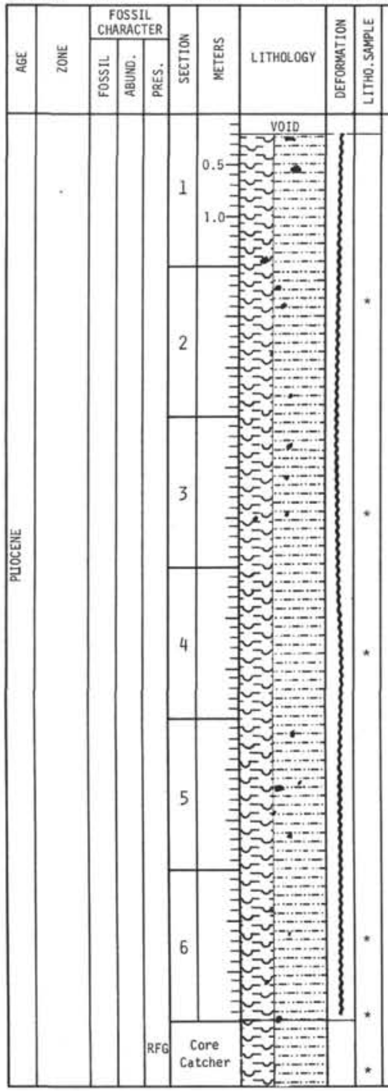
LITHOLOGIC DESCRIPTION

DIATOM DETRITAL SILTY CLAY, greenish gray (5GY 6/1), numerous pebbles.

Sec. CC:
1- 3% sand
33% silt 60%
63% clay
TR heavy minerals
TR glauconite
35% diatoms
TR radiolarians
TR sponge spicules

Explanatory notes in Chapter 1

Site 274 Hole Core 9 Cored Interval: 76-85.5 m (recovery 8.9 m, 94%)



LITHOLOGIC DESCRIPTION

DIATOM DETRITAL SILTY CLAY. Varying locally, indistinctly, to SILT-RICH, DIATOM DETRITAL CLAY greenish gray (5G 6/1), stiff much vertical streakiness.

Sec. 1 (105 cm):
0% sand
20% silt 53%
78% clay
TR heavy minerals
45% diatoms
TR radiolarians
1- 2% sponge spicules

Sec. 2 (37 cm):
TR sand
25% silt 72%
72% clay
TR heavy minerals
45% diatoms
TR radiolarians
1- 2% sponge spicules

Sec. 3 (95 cm):
TR sand
16% silt 82%
82% clay
TR heavy minerals
TR volcanic glass
TR carbonate unspec.
35% diatoms
TR radiolarians
2% sponge spicules

Sec. 4 (80 cm):
0% sand
25% silt 60%
75% clay
TR heavy minerals
TR carbonate unspec.
35% diatoms
TR sponge spicules
TR silicoflagellates

Vertically streaked, mixed greenish gray (5G 6/1) and light olive gray (5Y 6/1).

Sec. 6 (64 cm):
0% sand minor
25% silt lithology
75% clay patch
TR heavy minerals
TR carbonate unspec.
60% diatoms

Sec. 6 (140 cm):
TR sand
28% silt 55%
70% clay
TR heavy minerals
45% diatoms
TR radiolarians
TR silicoflagellates

Local patches of DETRITAL SILTY CLAY DIATOM OOZE.

Sec. CC:
1- 3% sand
16% silt 65%
81% clay
TR heavy minerals
TR carbonate unspec.
30% diatoms
TR radiolarians
1- 2% sponge spicules

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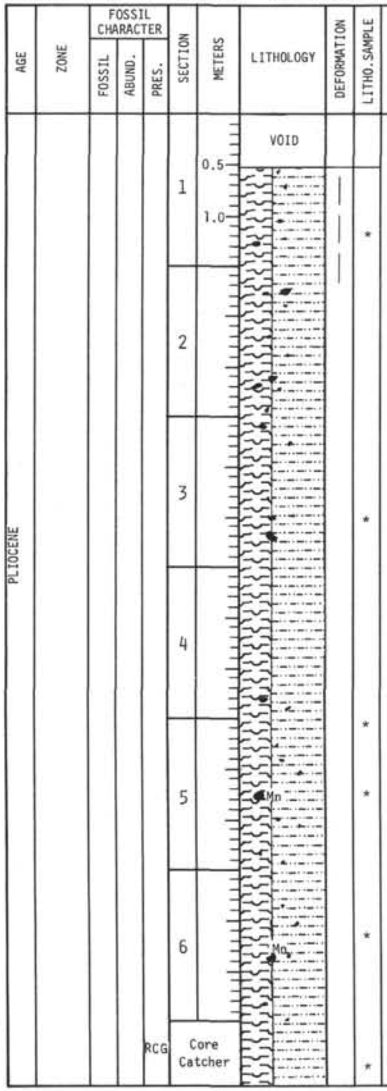
Site 274 Hole Core 10 Cored Interval: 85.5-95 m (recovery 8.5 m, 89%)



LITHOLOGIC DESCRIPTION

Sec. 1 (106 cm):
0% sand
20% silt 45%
80% clay
TR heavy minerals
50% diatoms
1- 2% radiolarians
TR silicoflagellates

DIATOM-DETRITAL SILTY CLAY to locally SILT-RICH, DIATOM DETRITAL CLAY and DETRITAL SILTY CLAY DIATOM OOZE. Moderate yellowish brown (10YR 5/4), stiff. Locally contains granules and pebbles.

Bulk X-ray (89.4 m):
Amorph. - 69.1%
Ident. - 30.9%
Quar. - 30.7%
K-Fe. - 10.5%
Plag. - 22.1%
Mica - 30.3%
Chlo. - 1.5%
Mont. - 4.8%

Sec. 3 (82 cm):
0% sand
25% silt 45%
75% clay
TR heavy minerals
50% diatoms
~2% radiolarians
~2% sponge spicules
TR silicoflagellates

Sec. 4 (142 cm):
2% sand
38% silt 58%
60% clay
TR heavy minerals
35% diatoms
~2% radiolarians
~2% sponge spicules
TR silicoflagellates

Sec. 5 (51 cm):
TR sand
20% silt 75%
78% clay
TR heavy minerals
TR carbonate unspec.
24% diatoms
TR radiolarians
1- 2% sponge spicules

Note: Mn nodule.

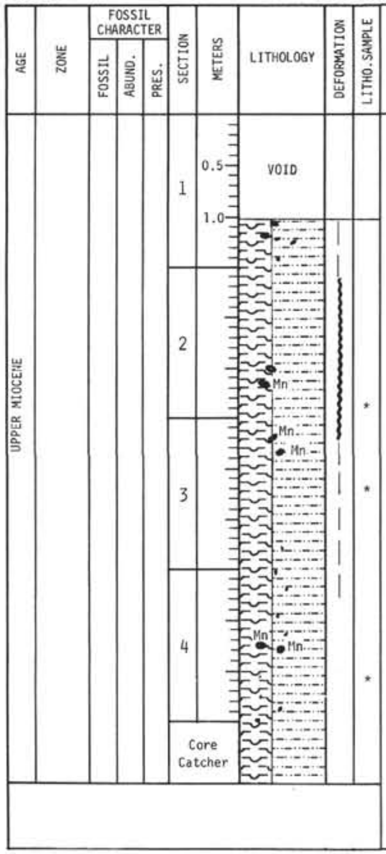
Sec. 6 (42 cm):
TR sand
33% silt 60%
65% clay
2- 3% heavy minerals
35% diatoms
TR radiolarians
~2% sponge spicules
TR silicoflagellates

Note: Mn nodule.

Sec. CC:
0% sand
10% silt 40%
90% clay
TR heavy minerals
55% diatoms
TR radiolarians
2- 3% sponge spicules
TR silicoflagellates

Explanatory notes in Chapter 1

Site 274 Hole Core 11 Cored Interval: 95-104.5 m (recovery 4.9 m, 52%)



LITHOLOGIC DESCRIPTION

DIATOM-DETRITAL SILTY CLAY (similar lithology to Core 10), stiff. Locally faint, vertical streakiness.

Sec. 2 (80 cm):
TR sand
36% silt 70%
62% clay
TR heavy minerals
TR volcanic glass
30% diatoms
~2% radiolarians
2- 3% sponge spicules
TR silicoflagellates

Sec. 3 (60 cm):
TR sand
20% silt 65%
78% clay
TR heavy minerals
30% diatoms
~2% radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 3 (120-145 cm) becomes soft to soupy.

Sec. 4 (100 cm):
1- 2% sand
33% silt 60%
63% clay
TR heavy minerals
35% diatoms
3- 4% radiolarians
~2% sponge spicules
TR silicoflagellates

RAD-BEARING DIATOM DETRITAL SILTY CLAY

Sec. CC:
TR sand
25% silt 60%
73% clay
TR heavy minerals
35% diatoms
2- 4% radiolarians
~2% sponge spicules
TR silicoflagellates

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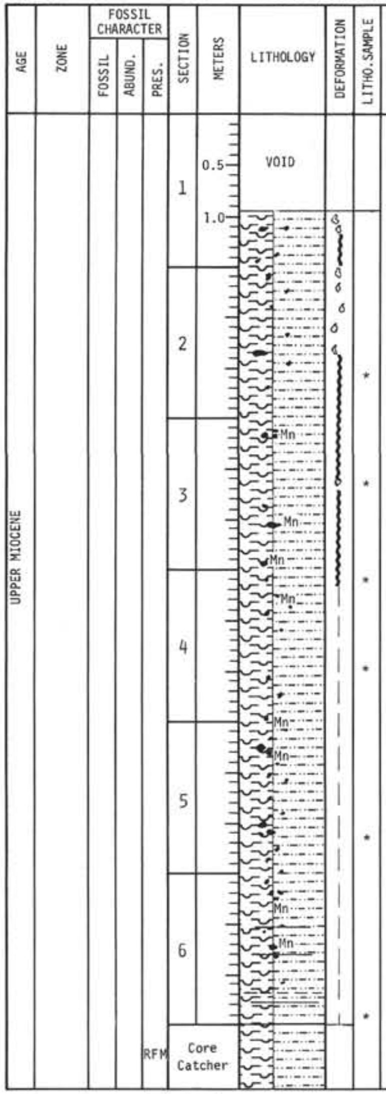
Site 274 Hole Core 12 Cored Interval: 104.5-114 m (recovery 8.1 m, 85%)



LITHOLOGIC DESCRIPTION

DIATOM-DETRITAL SILTY CLAY (similar lithology to Core 11). Medium yellow brown (10YR 6/4), stiff.

Sec. 2 (110 cm):
1- 2% sand
38% silt 70%
70% clay
TR heavy minerals
25% diatoms
TR radiolarians
TR sponge spicules
(overgrowths on <quartz)

Sec. 3 (62 cm):
TR sand
40% silt 60%
58% clay
1- 2% heavy minerals
35% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 3 (150 cm): Fe-rich patch (5-7% FeO).

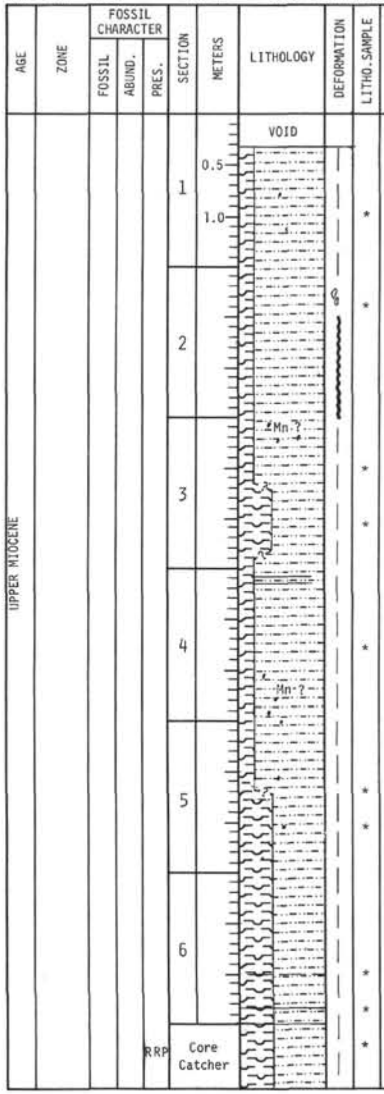
Sec. 4 (90 cm):
TR sand
33% silt 76%
65% clay
1- 2% heavy minerals
20% diatoms
TR radiolarians
TR sponge spicules

Sec. 5 (100 cm):
2- 3% sand
47% silt 65%
50% clay
1- 2% heavy minerals
32% diatoms
TR radiolarians
TR sponge spicules

Sec. 6 (130 cm):
1- 2% sand
35% silt 70%
63% clay
1- 2% heavy minerals
25% diatoms
TR radiolarians
TR sponge spicules

Explanatory notes in Chapter 1

Site 274 Hole Core 13 Cored Interval: 114-123.5 m (recovery 8.6 m, 91%)



LITHOLOGIC DESCRIPTION

DIATOM-RICH DETRITAL SILTY CLAY, medium yellowish brown (10YR 6/4), stiff.

Sec. 1 (100 cm):
TR sand
30% silt 85%
68% clay
TR heavy minerals
15% diatoms
TR radiolarians
TR sponge spicules

Sec. 2 (31 cm):
TR sand 85% (minor
77% silt lithology)+silt
21% clay lenses
3- 4% heavy minerals
TR volcanic glass
14% diatoms
1% sponge spicules

Sec. 3 (33 cm):
0% sand 84%
48% silt (yellowish
52% clay patch)
~2% heavy minerals
15% diatoms
TR radiolarians
TR sponge spicules

Sec. 3 (95 cm):
0% sand
32% silt 64%
68% clay
~1% heavy minerals
TR carbonate unspec.
30% diatoms
TR radiolarians
TR sponge spicules

Bulk X-ray (122.6 m):

| | |
|---|---|
| Amorph. | - 58.5% |
| Ident. | - 41.5% |
| Quar. | - 32.7% |
| K-Fe. | - 11.4% |
| Plag. | - 21.9% |
| Mica | - 28.3% |
| Chlo. | - 0.7% |
| Mont. | - 3.6% |
| Amph. | - 1.2% |

Bulk X-ray (116.6 m):

| | |
|---|---|
| Amorph. | - 56.4% |
| Ident. | - 43.6% |
| Quar. | - 30.7% |
| K-Fe. | - 11.6% |
| Plag. | - 21.6% |
| Mica | - 30.9% |
| Chlo. | - 1.2% |
| Mont. | - 2.9% |
| Amph. | - 1.1% |

locally, DIATOM DETRITAL SILTY CLAY

Sec. 4 (76 cm):
0% sand
20% silt 80%
80% clay
TR heavy minerals
15% diatoms
TR radiolarians
TR sponge spicules

Sec. 5 (61 cm):
0% sand
20% silt 75%
80% clay
TR heavy minerals
15-20% diatoms
TR sponge spicules

Sec. 5 (91 cm):
0% sand
21% silt 70%
79% clay
TR heavy minerals
TR carbonate unspec.
25% diatoms
TR sponge spicules

Sec. 6 (80 cm):
TR sand
20% silt
78% clay
TR heavy minerals
25% diatoms
TR radiolarians

Sec. 6 (122 cm):
0% sand
8% silt
92% clay
TR heavy minerals
30% diatoms
TR sponge spicules

Sec. 6 (140 cm):
0% sand
21% silt 70%
79% clay
TR heavy minerals
~2% carbonate unspec.
20-25% diatoms
TR radiolarians

color contact
DIATOM DETRITAL CLAY, greenish gray (5G 6/1), stiff.

color contact
DIATOM-RICH DETRITAL SILTY CLAY
color contact
dark olive gray (5Y 3/1)

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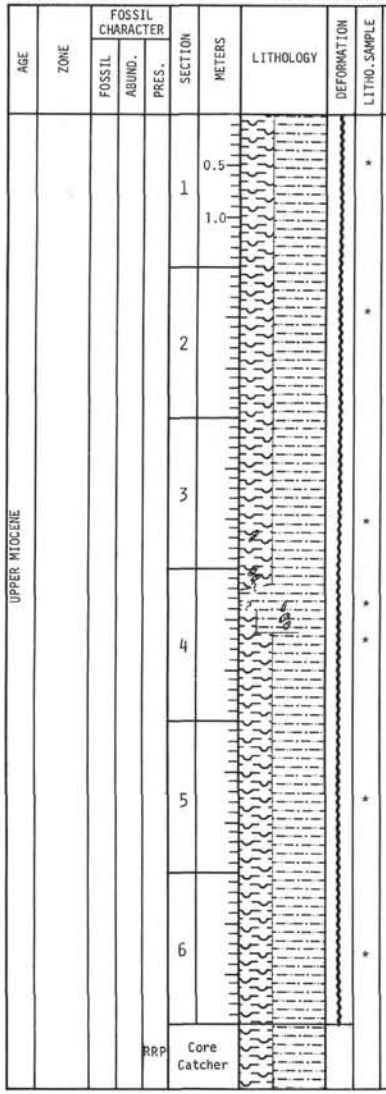
Site 274 Hole Core 14 Cored Interval: 123.5-133 m (recovery 9.5 m, 100%)



LITHOLOGIC DESCRIPTION

DIATOM DETRITAL SILTY CLAY, olive gray (5Y 4/1) with streaks, medium dark gray (N4), stiff. No pebbles or granules seen.
--grades into: dark greenish gray (5GY 4/1) which predominates below.

Bulk X-ray (125.9 m):

| | |
|---|---|
| Amorph. | - 60.7% |
| Ident. | - 39.3% |
| Quar. | - 32.0% |
| K-Fe. | - 9.2% |
| Plag. | - 22.9% |
| Mica | - 30.2% |
| Chlo. | - 3.5% |
| Mont. | - 1.1% |
| Amph. | - 1.0% |

Sec. 1 (58 cm):
0% sand
22% silt 62%
78% clay
~6% heavy minerals
2% carbonate unspec.
25-30% diatoms
TR sponge spicules

Sec. 2 (45 cm):
0% sand
25% silt 64%
75% clay
~2% heavy minerals
~2% carbonate unspec.
33% diatoms
TR radiolarians
TR sponge spicules

silt-rich lenses =
disrupted silt bed?

Sec. 3 (98 cm):
TR sand
25% silt 60%
75% clay
1- 2% heavy minerals
2% carbonate unspec.
35% diatoms
TR sponge spicules

DIATOM BEARING to DIATOM RICH SILT (lens and lamina)

Sec. 4 (32 cm):
0% sand
88% silt 75%
12% clay
2- 3% heavy minerals
TR carbonate unspec.
5- 7% diatoms
TR sponge spicules

Silt lamina at 62 cm underlain by black lamina - see smear slide ↓

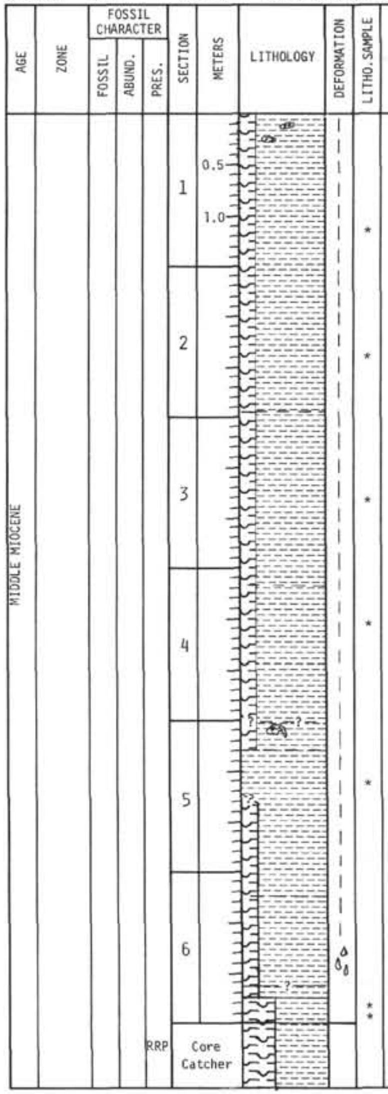
Sec. 4 (62 cm):
0% sand (minor
80% silt ?lithology)
20% clay 85%
25% heavy minerals
TR carbonate unspec.
10-15% diatoms
TR sponge spicules

Sec. 5 (70 cm):
0% sand
27% silt 68%
73% clay
~2% heavy minerals
~2% carbonate unspec.
25-30% diatoms
TR sponge spicules

Sec. 6 (72 cm):
0% sand
20% silt 62%
80% clay
~2% heavy minerals
~2% carbonate unspec.
35% diatoms
TR sponge spicules

Explanatory notes in Chapter 1

Site 274 Hole Core 15 Cored Interval: 133-142.5 m (recovery 9.5 m, 100%)



LITHOLOGIC DESCRIPTION

Silty lenses

Sec. 1 (117 cm):
0% sand
20% silt 75%
80% clay
TR heavy minerals
~2% carbonate unspec.
20-25% diatoms
TR radiolarians
TR sponge spicules

Locally, DIATOM-RICH DETRITAL SILTY CLAY

color contact
Dark greenish gray (5GY 4/1)

DIATOM-RICH DETRITAL CLAY

color contact
Olive gray (5Y 4/1), stiff to locally semilithified (5% or less of Sec. 4).

Locally DIATOM-RICH CLAYEY SILT.

silt lens
color contact? not seen
Dark greenish gray (5GY 4/1)
color contact
Olive gray (5Y 4/1)

DIATOM BEARING to DIATOM RICH DETRITAL CLAY, locally with silt lenses as at 58 cm, 125-147.

color contact
Dark greenish gray (5GY 4/1)

color contact ?
Greenish gray (5G 6/1)
color contact
Olive gray (5Y 4/1)

DIATOM DETRITAL CLAY

Gradational slight color change from Core 14. DIATOM-RICH DETRITAL CLAY. Olive gray (5Y 4/1), stiff to stiffer.

Sec. 2 (88 cm):
TR sand
43% silt 70%
55% clay
1% heavy minerals
TR carbonate unspec.
20-25% diatoms
TR radiolarians
TR sponge spicules

Sec. 3 (78 cm):
0% sand
12% silt 80%
88% clay
TR heavy minerals
TR carbonate unspec.
15% diatoms
TR radiolarians (rare min.)
TR sponge spicules

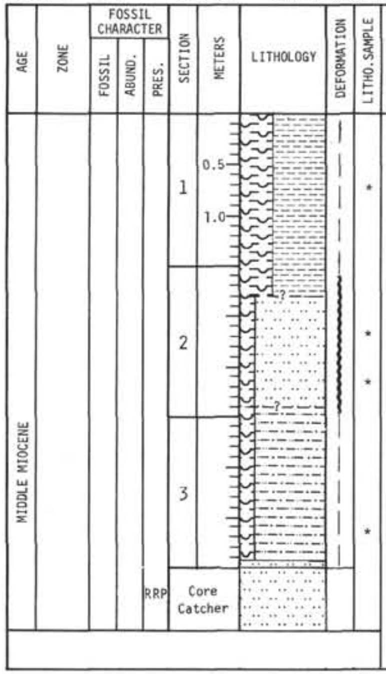
Sec. 4 (51 cm):
TR sand
53% silt 88%
45% clay
~2% heavy minerals
TR carbonate unspec.
10-12% diatoms (rare min.)
TR sponge spicules

Sec. 5 (58 cm):
TR sand
88% silt 90%
10% clay
~2% heavy minerals
TR volcanic glass
5- 6% diatoms
TR radiolarians
TR sponge spicules

Sec. 6 (122 cm):
0% sand
15% silt
85% clay
TR heavy minerals
20-25% diatoms
1% sponge spicules

Sec. 6 (127 cm):
0% sand
10% silt 66%
90% clay
TR heavy minerals
~2% carbonate unspec.
TR foraminifera
25-30% diatoms
TR sponge spicules
TR silicoflagellates

Site 274 Hole Core 16 Cored Interval: 142.5-152 m (recovery 4.6 m, 49%)



LITHOLOGIC DESCRIPTION

DIATOM-DETRITAL CLAY. Olive gray (5Y 4/1), stiff to rare, patches semilithified.

grain-size? contact

DIATOM-RICH CLAYEY SILT (no color change).

grain-size? contact

DIATOM-RICH SILTY CLAY (no color change).

Sec. 3 (102 cm):
TR sand
21% silt 70%
78% clay
TR heavy minerals
2% carbonate unspec.
24% diatoms
TR radiolarians
TR silicoflagellates

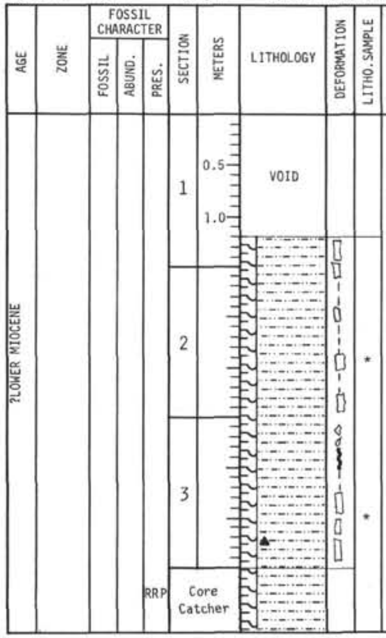
Sec. 1 (72 cm):
0% sand
9% silt 66%
91% clay
TR heavy minerals
TR carbonate unspec.
30% diatoms (rare min.)
TR radiolarians
TR sponge spicules

Sec. 2 (67 cm):
0% sand
80% silt 80%
20% clay
1- 2% heavy minerals
TR volcanic glass
TR glauconite
10-12% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates
TR dinoflagellates

Sec. 2 (112 cm):
1- 2% sand
73% silt
25% clay
2- 3% heavy minerals
TR volcanic glass
TR glauconite
15% diatoms

Dark gray, SILT-RICH layer at base.

Site 274 Hole Core 17 Cored Interval: 152-161.5 m (recovery 3.3 m, 35%)



LITHOLOGIC DESCRIPTION

DIATOM-RICH SILTY CLAY AND CLAYSTONE. Olive gray (5Y 4/1), stiff to semi-lithified.

| Bulk X-ray (154.3 m): | |
|---|---|
| Amorph. | - 57.1% |
| Ident. | - 42.9% |
| Quar. | - 29.4% |
| K-Fe. | - 8.4% |
| Plag. | - 21.5% |
| Mica | - 35.2% |
| Chlo. | - 4.2% |
| Amph. | - 1.3% |

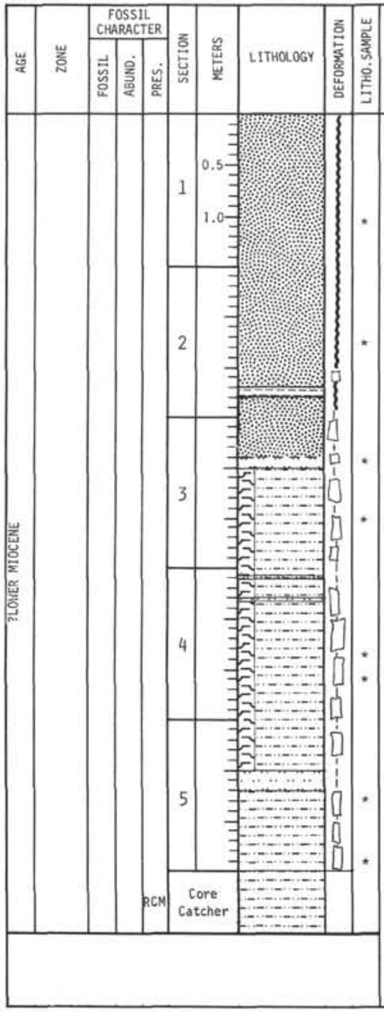
CHERTY CLAYSTONE lump at 130 cm.

Sec. 2 (84 cm):
0% sand
27% silt 75%
73% clay
~2% heavy minerals
~2% carbonate unspec.
20% diatoms
1- 2% sponge spicules

Sec. 3 (90 cm):
0% sand
28% silt 70%
72% clay
1- 2% heavy minerals
~2% carbonate unspec.
24% diatoms (rare min.)
TR radiolarians
TR sponge spicules (rare min.)

Explanatory notes in Chapter 1

Site 274 Hole Core 18 Cored Interval: 161.5-171 m (recovery 7.0 m, 24%)



LITHOLOGIC DESCRIPTION

FINE SAND, dark olive
gray (5Y 3/1). Sand
angular, mostly quartz
~1/2 feldspar.

Sec. 1 (100 cm):
80% sand
20% silt 98%
TR clay
15% heavy minerals
~1% volcanic glass
TR glauconite
1- 2% diatoms

FINE SAND
contact
CLAYSTONE, olive gray (5Y 4/1)
contact
FINE SAND

----silt (graded bed)

DIATOM-BEARING SILTY CLAY
AND CLAYSTONE with DIATOM-
BEARING SILT BEDS

Clay and silt rich beds both
olive gray (5Y 4/1) to olive
black (5Y 3/1), stiff to
semi-lithified.
silty bed 2-3 cm thick
silty bed, 1 cm thick

Locally DIATOM-RICH as at
85-93 cm.

Sec. 4 (85 cm):
± Same as 93 cm
of Sec. 4.

DIATOM-BEARING SILT,
olive gray (5Y 4/1).

DIATOM-BEARING SILTY CLAY
AND CLAYSTONE, dark greenish
gray (5GY 4/1).

Sec. 5 (128 cm):
TR sand
90% silt 94%
8% clay
~5% heavy minerals
TR volcanic glass
<5% diatoms
TR sponge spicules

Sec. 2 (75 cm):
75% sand
20% silt 98%
TR clay
~10% heavy minerals
TR volcanic glass
TR diatoms
TR sponge spicules

Sec. 3 (38 cm): 90% (smear
3- 4% sand slides suggest
90% silt no size grading
5- 6% clay of silt bed)
TR volcanic glass
8-10% diatoms
TR radiolarians
TR sponge spicules (rare
min.)

Sec. 3 (88 cm):
0% sand
10% silt 80%
90% clay
TR heavy minerals
TR volcanic glass
TR carbonate unspec.
TR calcareous nannoplankton
15% diatoms
TR sponge spicules

Sec. 4 (93 cm):
0% sand
25% silt 80%
75% clay
TR heavy minerals
TR carbonate unspec.
TR calcareous nannoplankton
15-20% diatoms
TR sponge spicules

Sec. 5 (67 cm):
TR sand 94%
90% sand (well sorted)
TR clay
10% heavy minerals
TR glauconite
<5% diatoms
TR silicoflagellates

Sec. CC:
3- 4% sand
33% silt 75%
63% clay
TR heavy minerals
3- 5% carbonate unspec.
15% diatoms
TR sponge spicules

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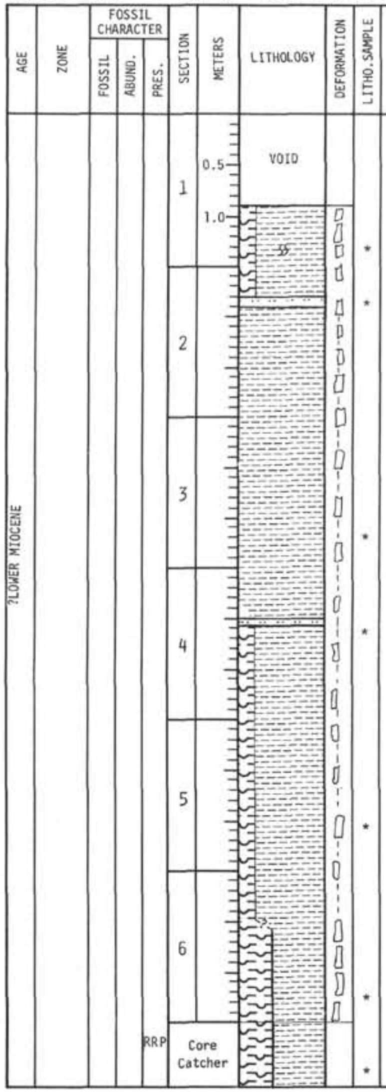
Site 274 Hole Core 19 Cored Interval: 171-180.5 m (recovery 8.2 m, 86%)



LITHOLOGIC DESCRIPTION

DIATOM-BEARING CLAYSTONE, olive black (5Y 2/1), semi-lithified in Sec. 1. Olive gray (5Y 4/1), semi-lithified to stiff, interlayered CLAYSTONE and SILT in Secs. 2-4.

--silt-filled burrow at
at 122 cm

possibly graded bed
of silt

Sec. 3 (92 cm)
0% sand
13% silt 90%
87% clay
TR heavy minerals
TR carbonate unspec.
5-10% diatoms
TR sponge spicules

Locally becomes DIATOM
DETRITAL CLAY and
CLAYSTONE as at 5-86,
6-120.

Sec. CC:
0% sand
5% silt 98%
95% clay
TR heavy minerals
TR diatoms
TR sponge spicules

Mixed greenish gray (5G 6/1) and olive gray (5Y 2/1)
CLAY.

Sec. 1 (130 cm):
0% sand
15% silt 80%
85% clay
TR heavy minerals
2% carbonate unspec.
TR calcareous nannoplankton
15% diatoms
TR sponge spicules

Sec. 2 (36 cm):
TR sand
90% silt
8% clay
2% heavy minerals
TR volcanic glass
TR glauconite
5% diatoms

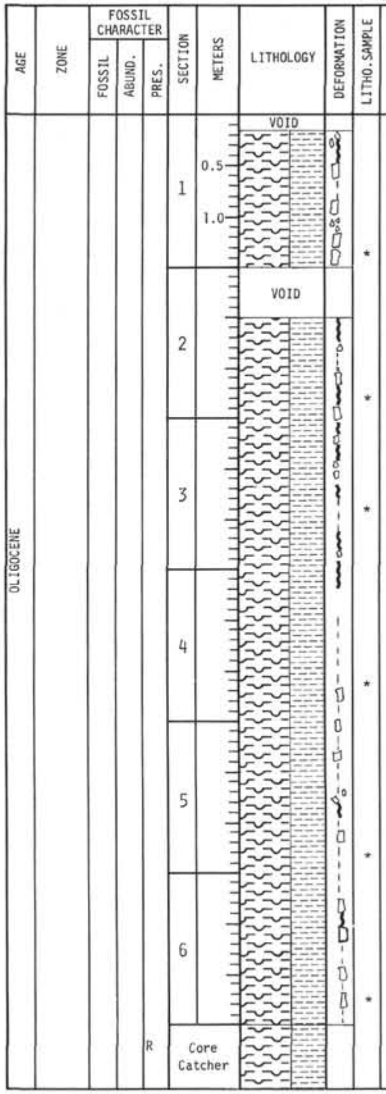
Sec. 4 (55 cm):
0% sand
84% silt (lamina)
16% clay
1- 2% heavy minerals
TR carbonate unspec.
5% diatoms (rare min.)
TR radiolarians
TR sponge spicules

Sec. 5 (86 cm):
0% sand
8% silt
92% clay
TR heavy minerals
TR calcareous nannoplankton
20-25% diatoms
TR sponge spicules

Sec. 6 (120 cm):
0% sand
8% silt 65%
92% clay
TR heavy minerals
TR carbonate unspec.
TR calcareous nannoplankton
30% diatoms
TR sponge spicules

Explanatory notes in Chapter 1

Site 274 Hole Core 20 Cored Interval: 180.5-190 m (recovery 9.5 m, 100%)



LITHOLOGIC DESCRIPTION

No contact seen with olive gray clay and claystone of Core 19. However, mixed types in 19 CC.

CLAYEY DIATOM OOZE, stiff, and locally semilithified to CLAYEY DIATOMITE, greenish gray (5G 6/1).

Sec. 1 (135 cm):
0% sand
10% silt 35%
90% clay
TR heavy minerals
TR glauconite
60% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Bulk X-ray (184.4 m):

| | |
|---|---|
| Amorph. | - 58.0% |
| Ident. | - 42.0% |
| Quar. | - 26.1% |
| K-Fe. | - 7.7% |
| Plag. | - 18.4% |
| Mica | - 29.0% |
| Chlo. | - 2.0% |
| Mont. | - 16.9% |

Sec. 2 (127 cm):
0% sand
5% silt 45%
95% clay
TR heavy minerals
52% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

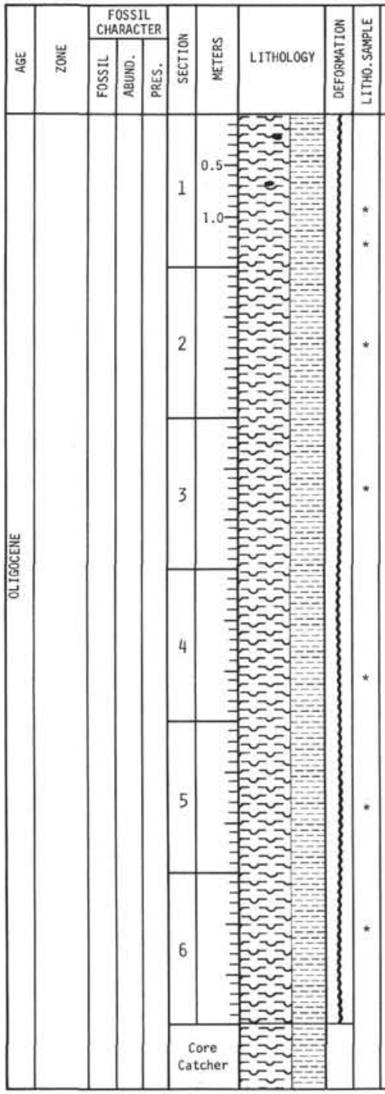
Sec. 3 (82 cm):
0% sand
5% silt 38%
95% clay
TR heavy minerals
60% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 4 (103 cm):
0% sand
5% silt 48%
95% clay
TR heavy minerals
TR glauconite
45% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 5 (135 cm):
0% sand
10% silt 35%
90% clay
TR heavy minerals
60% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 6 (110 cm):
0% sand
10% silt 35%
90% clay
TR heavy minerals
TR carbonate unspec.
60% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Site 274 Hole Core 21 Cored Interval: 190-199.5 m (recovery 9.5 m, 100%)



LITHOLOGIC DESCRIPTION

No color contact seen with Core 20-6 type.

angular fragments of argillite pebble

Sec. 1 (93 cm):
0% sand
10% silt
90% clay
TR heavy minerals
TR carbonate unspec.
~1% calcareous nannoplankton
85% diatoms (some min.)
(nannos concentrated in light olive gray patches)

Bulk X-ray (198.2 m):

| | |
|---|---|
| Amorph. | - 77.5% |
| Ident. | - 22.5% |
| Quar. | - 35.7% |
| K-Fe. | - 9.9% |
| Plag. | - 19.5% |
| Mica | - 27.2% |
| Chlo. | - 3.7% |
| Mont. | - 2.0% |
| Pyri. | - 2.0% |

CLAYEY DIATOM OOZE, stiff, olive gray (5Y 4/1), generally highly deformed. Much vertical streaking of core.

Sec. 1 (126 cm):
approximately same as 93, but 50% diatoms

Sec. 2 (80 cm):
0% sand
10% silt 48%
90% clay
TR heavy minerals
1% carbonate unspec.
50% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 3 (69 cm):
0% sand
20% silt 15%
80% clay
TR heavy minerals
TR carbonate unspec.
2% calcareous nannoplankton
80% diatoms
TR radiolrians
TR sponge spicules
TR silicoflagellates

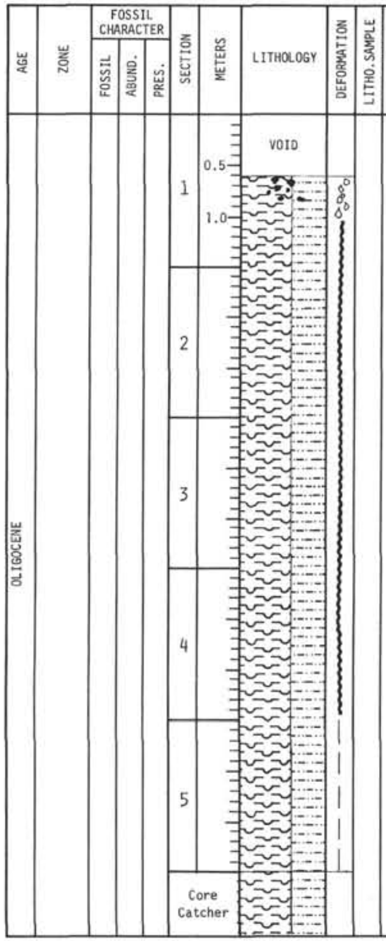
Sec. 4 (100 cm):
2% calcareous nannoplankton
75% diatoms

Sec. 5 (80 cm):
0% sand
20% silt 32%
80% clay
TR heavy minerals
1% carbonate unspec.
TR calcareous nannoplankton
60% diatoms
TR radiolarians
TR silicoflagellates

Sec. 6 (46 cm):
0% sand
20% silt
80% clay
TR heavy minerals
TR foraminifera
2- 3% calcareous nannoplankton
75% diatoms
TR radiolarians
TR silicoflagellates

Explanatory notes in Chapter 1

Site 274 Hole Core 22 Cored Interval: 199.5-209 m (recovery 8.2 m, 76%)



LITHOLOGIC DESCRIPTION

Concentration of numerous pebbles and highly varied lithologies, including Mn-coated pebbles and nodules.

DETRITAL SILTY CLAY-RICH DIATOM OOZE, olive gray (5Y 4/1), stiff, generally highly deformed-much vertical streaking.

Sec. 2 (82 cm):
0% sand
33% silt 25%
67% clay
TR heavy minerals
1% carbonate unspec.
1% calcareous nannoplankton
65% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 3 (140 cm):
0% sand
20% silt 12%
80% clay
TR heavy minerals
TR carbonate unspec.
75% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 4 (103 cm):
0% sand
33% silt 15%
67% clay
TR heavy minerals
TR carbonate unspec.
80% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

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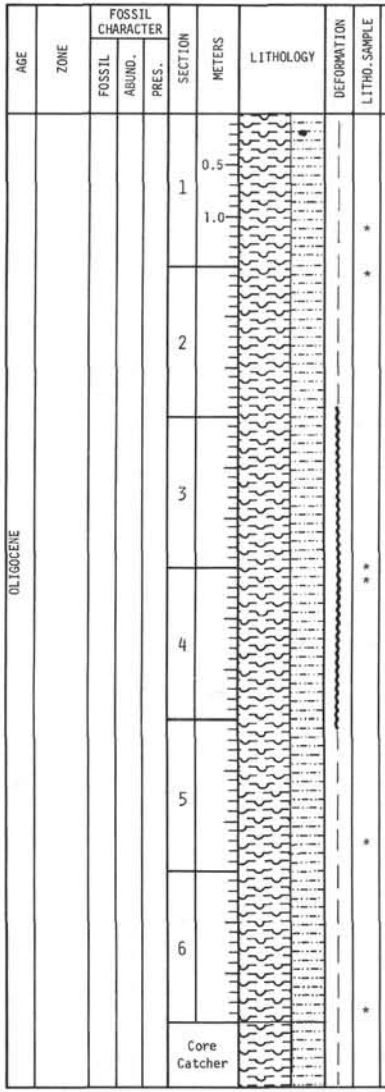
Site 274 Hole Core 23 Cored Interval: 209-218.5 m (recovery 9.5 m, 100%)



LITHOLOGIC DESCRIPTION

note pebble!

DETRITAL CLAY to SILTY CLAY DIATOM OOZE, light olive gray (5Y 6/1) to olive gray (5Y 5/1), stiff. Much vertical streaking.

Sec. 1 (117 cm):
35% detrital
30% clay
TR carbonate unspec.
65% diatoms

Sec. 1 (145 cm):
0% sand
67% silt 22% (dark gray)
33% clay
TR heavy minerals
1% carbonate unspec.
60% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 3 (146 cm):
0% sand
16% silt 28%
84% clay (light olive)
TR glauconite
65% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 3 (149 cm):
0% sand
40% silt 35% (olive gray)
60% clay
55% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

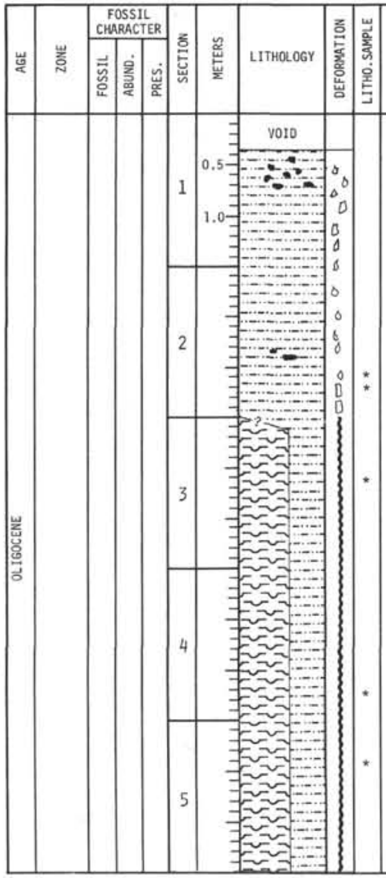
Bulk X-ray (211.9 m):
Amorph. - 81.0%
Ident. - 19.0%
Quar. - 36.6%
K-Fe. - 7.8%
Plag. - 21.7%
Mica - 27.7%
Chlo. - 3.8%
Pyri. - 2.5%

Sec. 5 (116 cm):
0% sand
33% silt 40% (light
67% clay olive)
TR heavy minerals
TR carbonate unspec.
55% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 6 (136 cm):
0% sand
16% silt 45% (olive
84% clay green)
∿2% heavy minerals
TR carbonate unspec.
45% diatoms (intensely fragmented)
TR radiolarians
TR sponge spicules
TR silicoflagellates

Explanatory notes in Chapter 1

Site 274 Hole Core 24 Cored Interval: 218.5-228 m (recovery 8.5 m, 79%)



LITHOLOGIC DESCRIPTION

Concentration of numerous pebbles of varied lithologies and coarse sand, granules. Includes Mn nodules. Mostly drilling breccia to 108, Sec. 2.

DETRITAL CLAY to SILTY CLAY DIATOM OOZE. Olive gray (5Y 4/1), soft breccia to stiff.

Sec. 2 (104 cm):
0% sand
60% silt 65%
40% clay
TR micronodules
30% carbonate unspec.
TR calcareous nannoplankton
5% diatoms

Sec. 2 (116 cm):
TR sand
10% silt 40%
90% clay
TR heavy minerals
TR volcanic glass
50% carbonate unspec.
TR foraminifera
10% calcareous nannoplankton
1- 2% diatoms
TR sponge spicules

Locally DIATOM DETRITAL CLAYSTONE with burrows, 108-125, Sec. 2.

Sec. 3 (60 cm):
0% sand
20% silt (light olive
80% clay gray)
TR heavy minerals
TR micronodules
1- 2% carbonate unspec.
TR calcareous nannoplankton
75% diatoms
TR radiolarians
1- 2% sponge spicules

Sec. 4 (101 cm):
50% diatoms

Sec. 5 (33 cm):
60% diatoms

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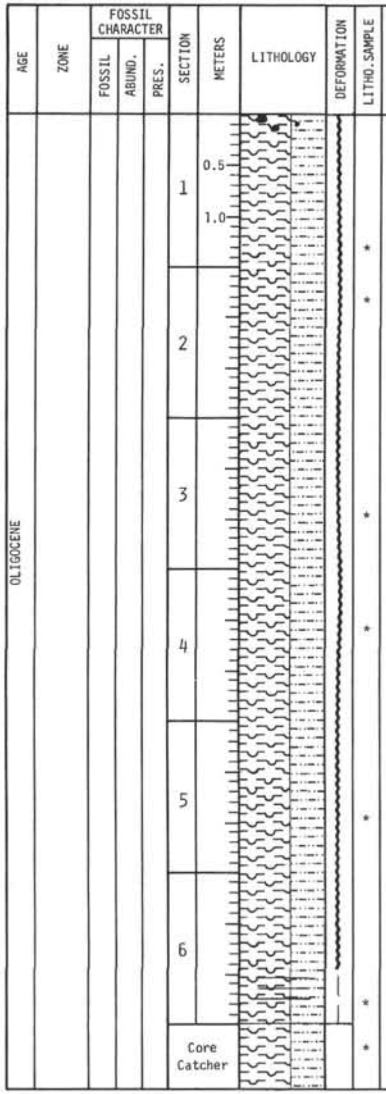
Site 274 Hole Core 25 Cored Interval: 228-237.5 m (recovery 9.0 m, 95%)



LITHOLOGIC DESCRIPTION

A few pebbles concentrated near top.

DETRITAL CLAY to SILTY CLAY DIATOM OOZE, olive gray (5Y 4/1), stiff to soft, to light olive gray (5Y 5/1) which makes up ~70-80% of Secs. 2-6. Much vertical streaking.

Sec. 1 (131 cm):
70-75% diatoms

Sec. 2 (32 cm):
80% diatoms

Sec. 3 (91 cm):
70% diatoms

Sec. 4 (52 cm):
70% diatoms

Sec. 5 (80 cm):
65% diatoms

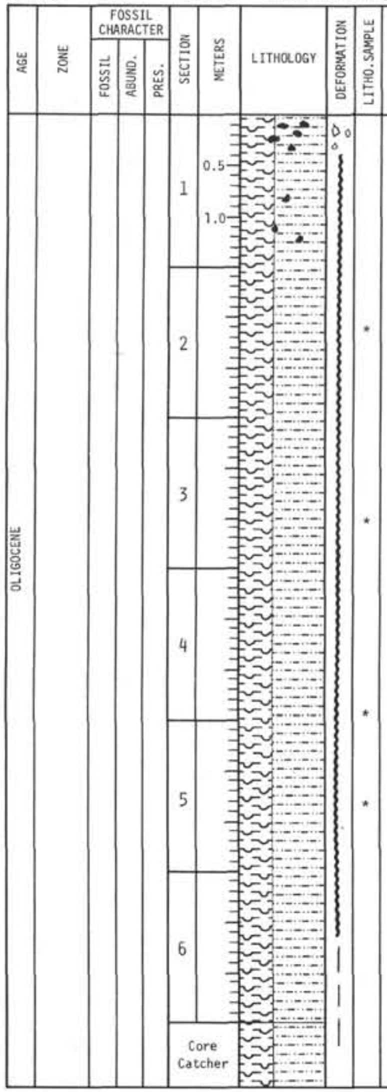
diatom estimates may be too high

Sec. 6 (107 cm):
55-60% diatoms

Sec. 6 (143 cm):
55-60% diatoms

Explanatory notes in Chapter 1

Site 274 Hole Core 26 Cored Interval: 237.5-247 m (recovery 9.2 m, 97%)



LITHOLOGIC DESCRIPTION

Pebble concentration hear top, but scattered through section. Varied lithologies.

DIATOM DETRITAL SILTY CLAY, light olive gray (5Y 5/1), stiff. Much vertical streaking.

Bulk X-ray (241.4 m):

| | |
|---|---|
| Amorph. | - 80.4% |
| Ident. | - 19.6% |
| Side. | - 1.6% |
| Quar. | - 34.9% |
| K-Fe. | - 11.0% |
| Plag. | - 20.4% |
| Mica | - 26.7% |
| Chlo. | - 3.3% |
| Pyri. | - 2.1% |

Sec. 2 (60 cm):
0% sand
40% silt 60%
60% clay
heavy minerals
TR carbonate unspec.
35% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 3 (97 cm):
0% sand
40% silt 55%
60% clay
heavy minerals
TR glauconite
2% carbonate unspec.
35% diatoms
TR radiolarians
TR sponge spicules
TR silicoflagellates

Sec. 4 (134 cm):
30% diatoms

Sec. 5 (76 cm):
0% sand
40% silt
60% clay
30% diatoms

Faint dark mottling and layering 30-100 cm in Sec. 6.

Sec. 6 (93 cm):
0% sand
40% silt
60% clay
30% diatoms

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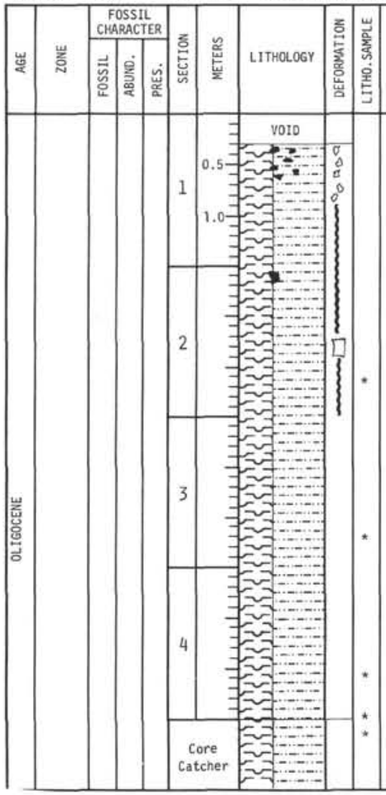
Site 274 Hole Core 27 Cored Interval: 247-256.5 m (recovery 5.7 m, 60%)



LITHOLOGIC DESCRIPTION

Many pebbles in top 30 cm varied lithologies.

DIATOM DETRITAL SILTY CLAY (similar to Core 26 in appearance). Highly disturbed, much vertical streaking.

pebble

locally semilithified

Sec. 2 (110 cm):
0% sand
28% silt 48%
72% clay
45% diatoms

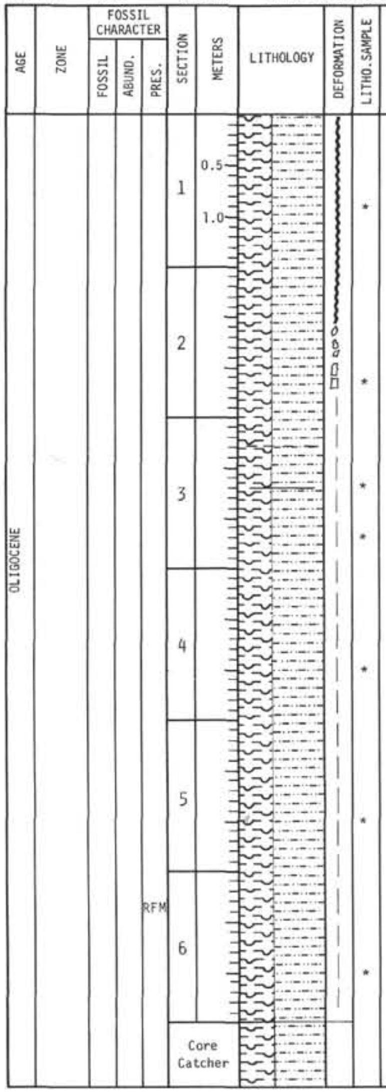
Sec. 3 (117 cm):
0% sand
30% silt
70% clay
40% diatoms

Sec. 4 (90 cm):
TR sand
38% silt
61% clay
30% diatoms

Sec. 4 (136 cm):
diatoms mineralized, dark spots

Explanatory notes in Chapter 1

Site 274 Hole Core 28 Cored Interval: 256.5-266 m (recovery 9.5 m, 100%)



LITHOLOGIC DESCRIPTION

DIATOM DETRITAL SILTY CLAY (similar to Core 27). Core much disrupted and vertically streaked.

Sec. 1 (82 cm):
0% sand
33% silt 49%
67% clay
40% diatoms

Sec. 2 (110 cm):
TR diatoms in carbonate clay

locally semilithified to lithified (calcareous)

Sec. 3 (60 cm):
0% sand
33% silt 20%
67% clay
35% carbonate unspec.
TR glauconite
40% diatoms

color contact
Light olive gray (5Y 6/1).
color contact
Olive gray (5Y 4/1).

Sec. 4 (110 cm):
0% sand
40% silt
60% clay
40% diatoms

Sec. 5 (105 cm):
0% sand
25% silt 47%
75% clay
45% diatoms

Sec. 6 (100 cm):
45% diatoms

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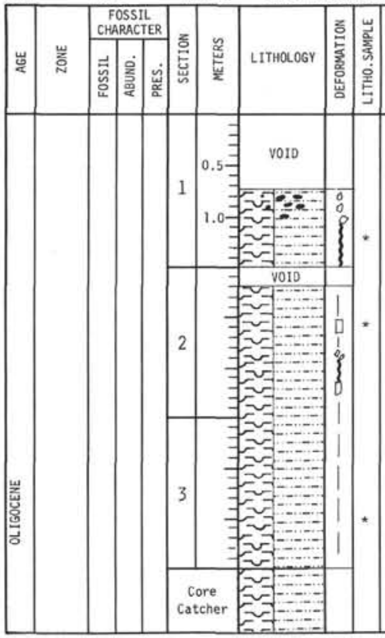
Site 274 Hole Core 29 Cored Interval: 266-275.5 m (recovery 3.7 m, 38%)



LITHOLOGIC DESCRIPTION

Pebble concentration

DIATOM DETRITAL SILTY CLAY
(similar to Core 28)
generally highly disturbed.

Sec. 1 (120 cm):
0% sand
25% silt 44%
75% clay
50% diatoms

Sec. 2 (53 cm):
60% diatoms

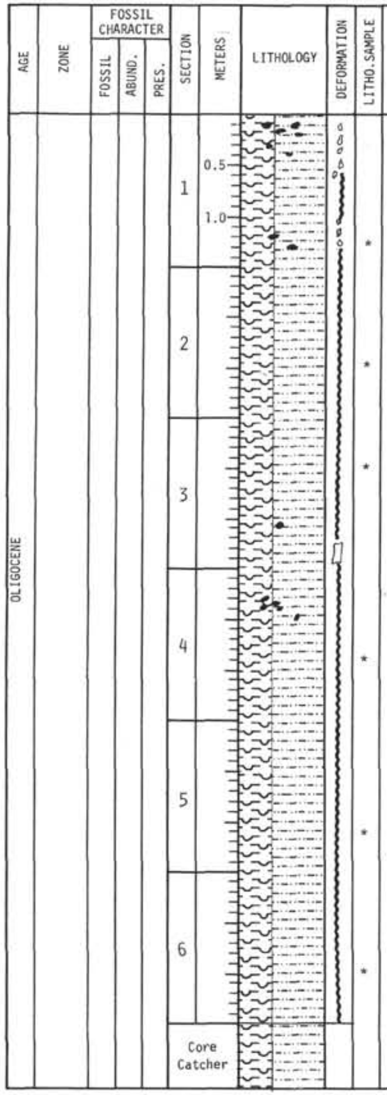
locally semilithified

Bulk X-ray (267.8 m):
Amorph. - 83.7%
Ident. - 16.3%
Side. - 1.5%
Quar. - 33.5%
K-Fe. - 8.9%
Plag. - 19.8%
Mica - 27.7%
Chlo. - 3.0%
Mont. - 2.3%
Pyri. - 3.3%

Sec. 3 (93 cm):
45% diatoms

Explanatory notes in Chapter 1

Site 274 Hole Core 30 Cored Interval: 5-285 m (recovery 9.5 m, 100%)



LITHOLOGIC DESCRIPTION

DIATOM DETRITAL SILTY CLAY (similar to Core 29). Much disturbed, vertically streaked.

Sec. 1 (130 cm):
0% sand
45% silt 55%
55% clay
40% diatoms

Sec. 2 (95 cm):
35% diatoms

Sec. 3 (45 cm):
35% diatoms

basalt pebble
semilithified block

numerous pebbles, varied lithology - granitic, quartzite, argillite

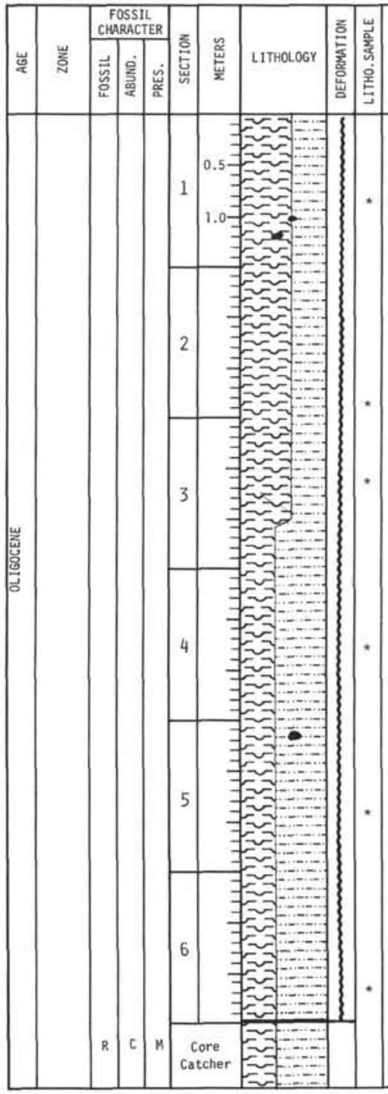
Sec. 4 (79 cm):
50% diatoms

Sec. 5 (104 cm):
40% diatoms

Sec. 6 (96 cm):
45% diatoms

---

Site 274 Hole Core 31 Cored Interval: 285-294.5 m (recovery 9.5 m, 100%)



LITHOLOGIC DESCRIPTION

DIATOM DETRITAL SILTY CLAY to DETRITAL CLAY DIATOM OOZE. Olive gray (5Y 5/1), stiff (generally similar to Core 30).

Sec. 1 (89 cm):
0% sand
20% silt 38%
80% clay
55% diatoms

scattered pebbles, at 125 cm, Mn? coated graywacke.

Sec. 2 (130 cm):
0% sand
35% silt
65% clay
55% diatoms

granite pebble at 120 cm

Sec. 3 (60 cm):
60% diatoms

Sec. 4 (80 cm):
45% diatoms

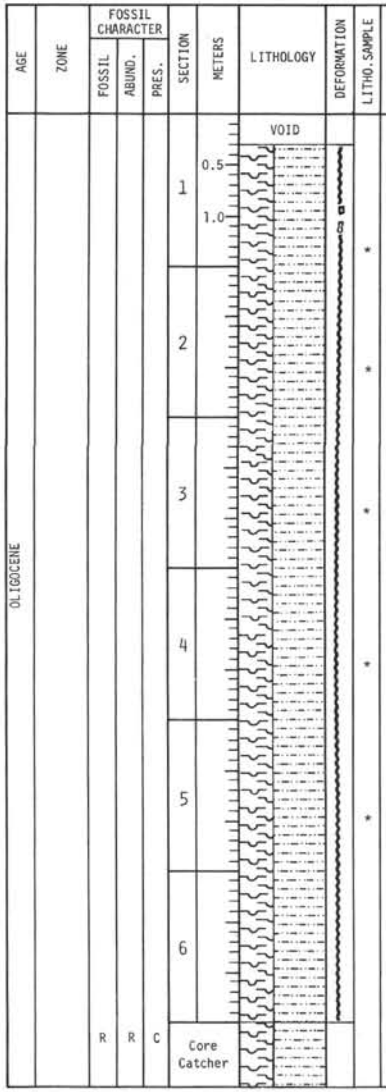
gabbro pebble at 20 cm

Sec. 5 (86 cm):
40% diatoms

Sec. 6 (100 cm):
48% diatoms

Explanatory notes in Chapter 1

Site 274 Hole Core 32 Cored Interval: 294.5-304 m (recovery 9.5 m, 100%)



LITHOLOGIC DESCRIPTION

DIATOM DETRITAL SILTY CLAY, olive gray (5Y 4/1) to dark greenish gray (5GY 4/1), stiff to locally soupy to soft in breccia.

<u>Bulk X-ray (300.4 m)</u>:
Amorph. - 78.0%
Ident. - 22.0%
Quar. - 31.4%
K-Fe. - 9.3%
Plag. - 18.6%
Mica - 29.1%
Chlo. - 2.5%
Mont. - 7.3%
Pyri. - 1.8%

Sec. 1 (136 cm):
0% sand
20% silt 54%
80% clay
36% diatoms

Sec. 2 (110 cm):
0% sand
30% silt 58%
70% clay
35% diatoms

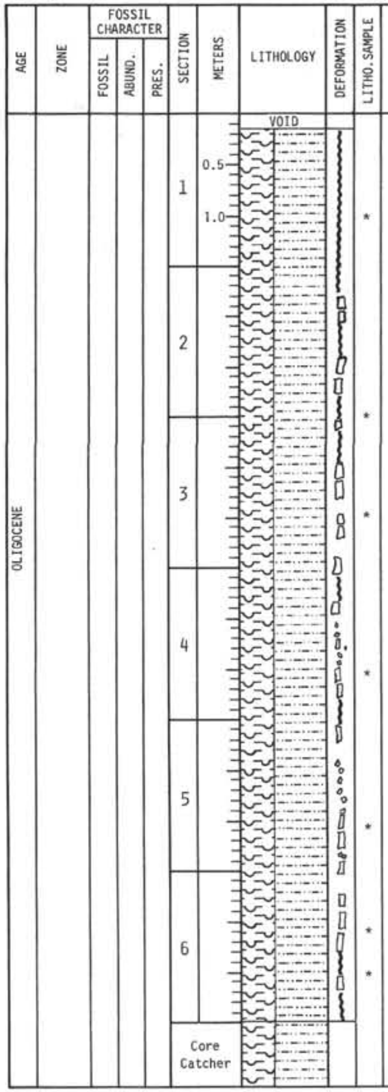
Sec. 3 (90 cm):
42% diatoms

Sec. 4 (93 cm):
50% diatoms

Sec. 5 (90 cm):
32% diatoms (rare min.)

---

Site 274 Hole Core 33 Cored Interval: 304-313.5 m (recovery 9.5 m, 100%)



LITHOLOGIC DESCRIPTION

DIATOM DETRITAL SILTY CLAY (smae lithology as Core 32), stiff, becoming semilithified, toward base, to DIATOM DETRITAL SILTY CLAYSTONE. Streakiness in stiff regions, but shows dark gray mottles and layering where more lithified.

Sec. 1 (106 cm):
0% sand
33% silt 46%
67% clay
45% diatoms

Sec. 2 (148 cm):
50% diatoms

Sec. 3 (98 cm):
40% diatoms

Sec. 4 (104 cm):
42% diatoms

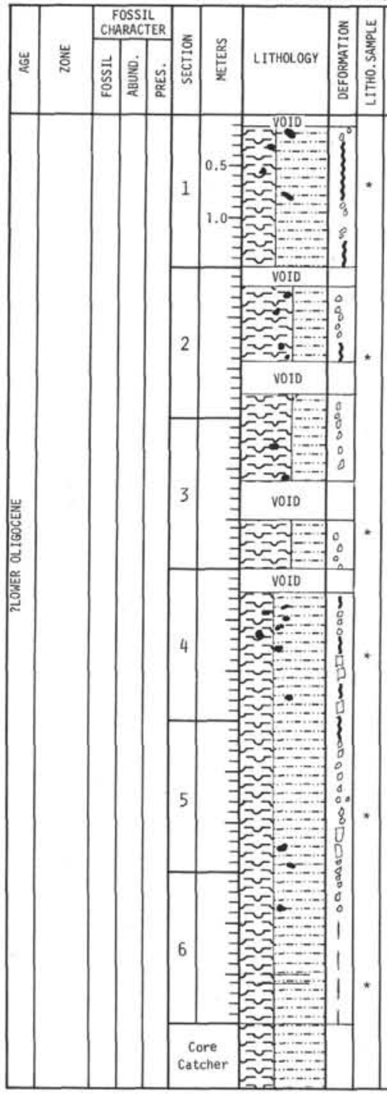
Sec. 5 (104 cm):
50% diatoms

Sec. 6 (68 cm):
35% diatoms

Sec. 6 (93 cm):
40% diatoms

Explanatory notes in Chapter 1

Site 274 Hole Core 34 Cored Interval: 313.5-323 m (recovery 9.5 m, 100%)



LITHOLOGIC DESCRIPTION

Scattered pebbles

DIATOM DETRITAL SILTY CLAY (same lithology as Core 33), olive gray (5Y 4/1), stiff. Core highly disturbed, much drilling breccia.

Sec. 1 (70 cm):
0% sand
45% silt 46%
55% clay

Scattered pebbles in breccia.

Sec. 2 (80 cm):
55% diatoms

Scattered pebbles in breccia.

Sec. 3 (105 cm):
56% diatoms

numerous pebbles in breccia

Semilithified patches of mottled (burrows?) DIATOM SILTY CLAYSTONE

Sec. 4 (81 cm):
44% diatoms

granite pebble

Sec. 5 (98 cm):
48% diatoms

Semilithified SILTY CLAYSTONE

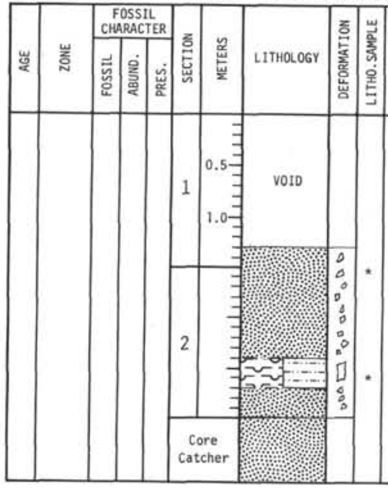
quartzite pebble
diorite pebble

Sec. 6 (110 cm):
48% diatoms

relatively little disturbed, mottled and layered SILTY CLAY

---

Site 274 Hole Core 35 Cored Interval: 323-332.5 m (recvoery 1.6 m, 17%)



LITHOLOGIC DESCRIPTION

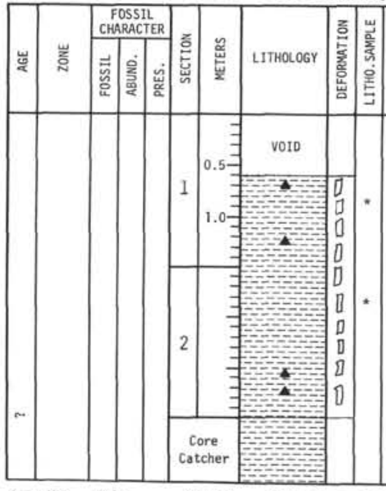
DIATOM DETRITAL SILTY CLAYSTONE in sand and gravel of CHERT cuttings. Claystone medium mottled and layered.

Sec. 1 (143 cm):
sand-size cuttings of chert

Sec. 2 (107 cm):
0% sand
44% silt 58%
56% clay
5- 7% heavy minerals
TR glauconite
TR micronodules
~2% carbonate unspec.
30% diatoms
TR radiolarians
2% sponge spicules

---

Site 274 Hole Core 36 Cored Interval: 332.5-342 m (recovery 2.3 m, 25%)



LITHOLOGIC DESCRIPTION

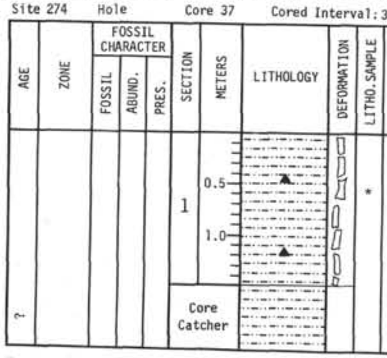
SILT-RICH CLAYSTONE and minor CHERT. Olive gray (5Y 4/1), semilithified to lithified (chert). Much of claystone lithified in Sec. 2. Chert ~5% of recovered core. Claystone is moderately mottled, some burrows, and ± layered.

Sec. 1 (86 cm):
0?% sand
20% silt 95%
80% clay
~2% heavy minerals
3- 5% carbonate unspec.
TR diatoms
TR radiolarians

Sec. 2 (30 cm):
0% sand
22% silt 88%
78% clay
2% heavy minerals
TR glauconite
3- 5% carbonate unspec.
TR diatoms
TR sponge spicules

---

Site 274 Hole Core 37 Cored Interval: 342-351.5 m (recovery 1.5 m, 16%)



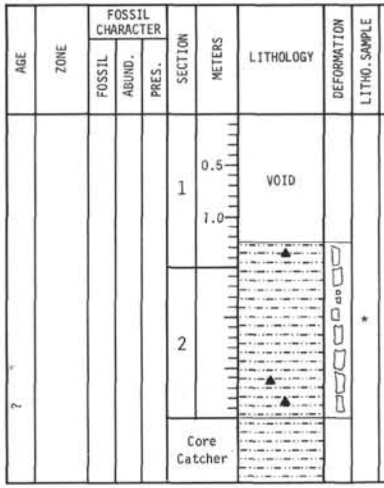
LITHOLOGIC DESCRIPTION

CLAYSTONE, SILTY CLAYSTONE, CHERTY CLAYSTONE and CHERT. Claystone - olive gray (5Y 4/1), chert ~10% of core semilithified to lithified. Dark gray lenses and thin layers of claystone common, some ?burrows.

Sec. 1 (51 cm):
TR sand
12% silt 91%
77% clay
TR glauconite
1% heavy minerals
TR micronodules
5% carbonate unspec.

Explanatory notes in Chapter 1

Site 274 Hole Core 38 Cored Interval: 351.5-361 m (recovery 1.8 m, 19%)

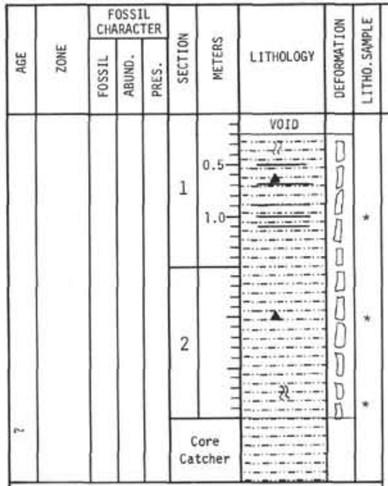


LITHOLOGIC DESCRIPTION

SILTY CLAYSTONE, olive gray (5Y 4/1), lithified and CHERT, mixed. Chert-dark olive gray (5Y 3/1) to olive black (5Y 2/1). Claystone locally mottled. Claystone grades vertically into chert at many places.

Sec. 2 (47 cm):
0% sand
33% silt 90%
67% clay
10% carbonate unspec.
TR diatoms
TR radiolarians
TR sponge spicules

Site 274 Hole Core 39 Cored Interval: 361-370.5 m (recovery 2.7 m, 29%)



LITHOLOGIC DESCRIPTION

SILTY CLAYSTONE, semilithified to locally lithified, minor CHERT.

Sec. 1 (91 cm):
TR sand
16% silt 90%
82% clay
TR micronodules
TR carbonate unspec.
TR diatoms
TR radiolarians

SILTY CLAY - olive gray (5Y 4/1) contains subhorizontal layers and lenses of darker SILTY CLAYSTONE a few mm thick.

Sec. 2 (45 cm):
TR sand
25% silt 82%
73% clay
TR glauconite
10% carbonate unspec.
TR diatoms
TR radiolarians
TR sponge spicules
TR plant debris?

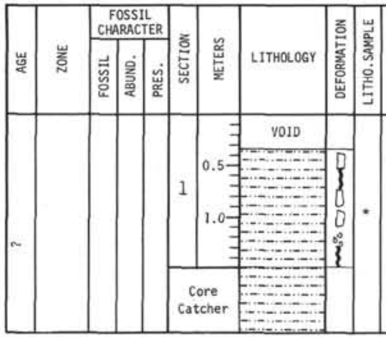
Locally MICARB-BEARING to MICARB-DETRITAL CLAYSTONE (Sec. 2, 80 cm).

<u>Bulk X-ray (363.6 m)</u>:

| | |
|---|---|
| Amorph. | - 44.0% |
| Ident. | - 56.0% |
| Dolo. | - 4.1% |
| Side. | - 3.3% |
| Quar. | - 26.2% |
| Cris. | - 12.0% |
| K-Fe. | - 8.5% |
| Plag. | - 11.6% |
| Mica | - 21.9% |
| Chlo. | - 2.2% |
| Mont. | - 6.4% |
| Trid. | - 0.8% |
| Clin. | - 0.9% |
| Pyri. | - 2.1% |

Sec. 2 (80 cm):
2% sand
40% silt
58% clay
TR glauconite
40% carbonate unspec.
TR diatoms

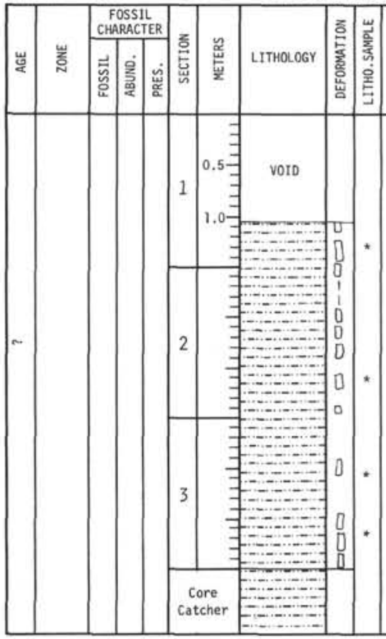
Site 274 Hole Core 40 Cored Interval: 370.5-380 m (recovery 1.0 m, 10%)



LITHOLOGIC DESCRIPTION

SILTY CLAYSTONE, semilithified, olive gray (5Y 4/1). Similar to Core 39, but no CHERT recovered.

Site 274 Hole Core 41 Cored Interval: 380-389.5 m (recovery 3.3 m, 35%)



LITHOLOGIC DESCRIPTION

SILTY CLAYSTONE, olive gray (5Y 4/1), semilithified to stiff (between blocks). Local clay-rich darker layers and lenses, some mottles.

Sec. 1 (127 cm):
TR sand
22% silt 90%
77% clay
TR glauconite
1% micronodules
5- 7% carbonate unspec.
TR diatoms
TR sponge spicules

whitish forams scattered in core

Sec. 2 (95 cm):
0% sand
27% silt
73% clay
TR glauconite
TR micronodules
2% carbonate unspec.
TR diatoms
TR sponge spicules

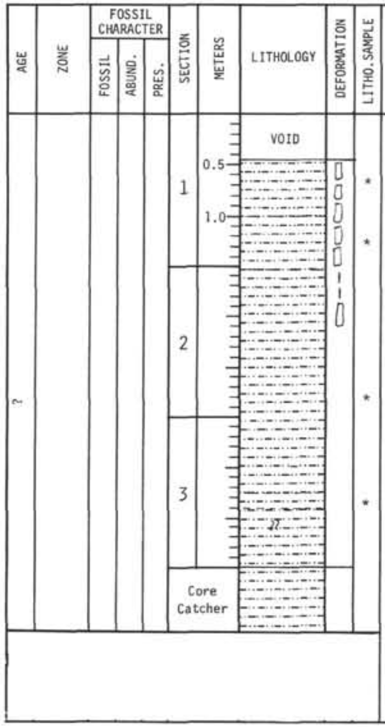
Locally MICARB-BEARING to MICARB SILTY CLAYSTONE.

Sec. 3 (45 cm):
0% sand
22% silt 88%
78% clay
TR micronodules
5% carbonate unspec.
TR diatoms
TR plant debris
(woody fragments)

Sec. 3 (108 cm):
0% sand
27% silt
73% clay
60% carbonate unspec.
TR diatoms

Explanatory notes in Chapter 1

Site 274 Hole Core 42 Cored Interval: 389.5-399 m (recovery 4.0 m, 42%)



LITHOLOGIC DESCRIPTION

SILTY CLAYSTONE to locally SILTY CLAY. Olive gray (5Y 4/1), ltihified to semilithified, locally slightly mottled.

color contact, gradational
Light olive gray (5Y 5/1) SILTY CLAYSTONE.
color contact
Olive gray (5Y 4/1) SILTY CLAYSTONE.

Sec. 2 (123 cm):
0% sand
12% silt
88% clay
TR glauconite
TR- 1% micronodules
TR carbonate unspec.
TR diatoms

Locally MICARB-RICH (at 79 cm).

Bulk X-ray (392.4 m):

|  |  |
|---|---|
| Amorph. | - 29.5% |
| Ident. | - 70.5% |
| Quar. | - 12.7% |
| Cris. | - 39.9% |
| K-Fe. | - 3.7% |
| Plag. | - 6.0% |
| Mica | - 15.9% |
| Chlo. | - 1.0% |
| Mont. | - 13.2% |
| Trid. | - 2.1% |
| Clin. | - 2.0% |
| Gyps. | - 3.4% |

Sec. 1 (60 cm):
0% sand
23% silt 90%
77% clay
TR glauconite
2- 3% carbonate unspec.
TR diatoms
TR radiolarians
TR sponge spicules

Sec. 1 (106 cm):
0% sand
30% silt
70% clay
TR glauconite
TR micronodules
50% carbonate unspec.
TR diatoms
TR sponge spicules
TR plant debris

Sec. 3 (79 cm):
0% sand
10% silt
90% clay
TR glauconite
15% carbonate unspec.
TR plant debris (woody debris)

Sec. 3 (100 cm):
0% sand
8% silt
92% clay
TR micronodules
1% carbonate unspec.
TR diatoms

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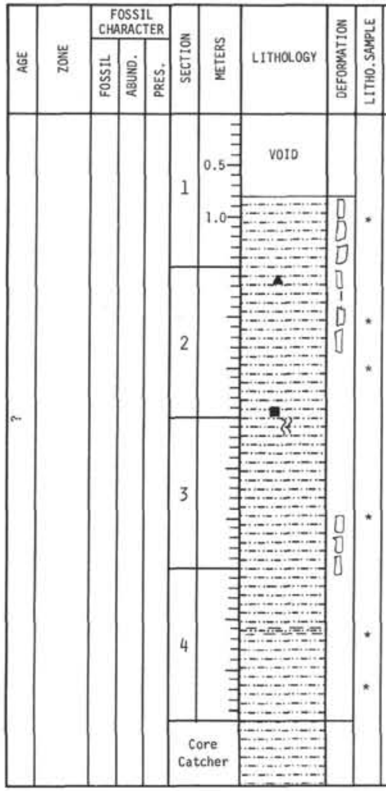
Site 274 Hole Core 43 Cored Interval: 399-408.5 m (recovery 5.2 m, 55%)



LITHOLOGIC DESCRIPTION

SILTY CLAYSTONE, olive gray (5Y 4/1), semilithified to stiff, commonly with faintly darker, mm-thick layers and lenses of clay. Very minor CHERT, gradational into claystone locally (15-20 cm in Sec. 2).

Sec. 1 (102 cm):
0% sand
23% silt
77% clay
TR micronodules
TR foraminifera
TR diatoms
TR radiolarians

Pyrite partly filling burrow(?).

Sec. 2 (49 cm):
0% sand
25% silt
75% clay
TR glauconite
1% micronodules
TR diatoms

Sec. 2 (90 cm):
approximately same as 49 cm

Locally micarb-rich.

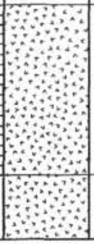
Sec. 4 (58 cm): (MICARB-RICH 3 cm thick layer)
TR sand
18% silt
80% clay
TR glauconite
40% carbonate unspec.
TR diatoms
TR plant debris

Core appears brecciated and locally injected by clay to form "pseudo bedding". Whitish foram-like bodies 80-150 cm.

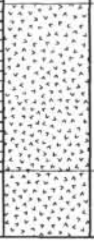
Sec. 4 (109 cm):
0% sand
40% silt
60% clay
TR glauconite
3% micronodules
40% carbonate unspec.
TR diatoms
TR plant debris (Paleozoic? pollen)

Explanatory notes in Chapter 1

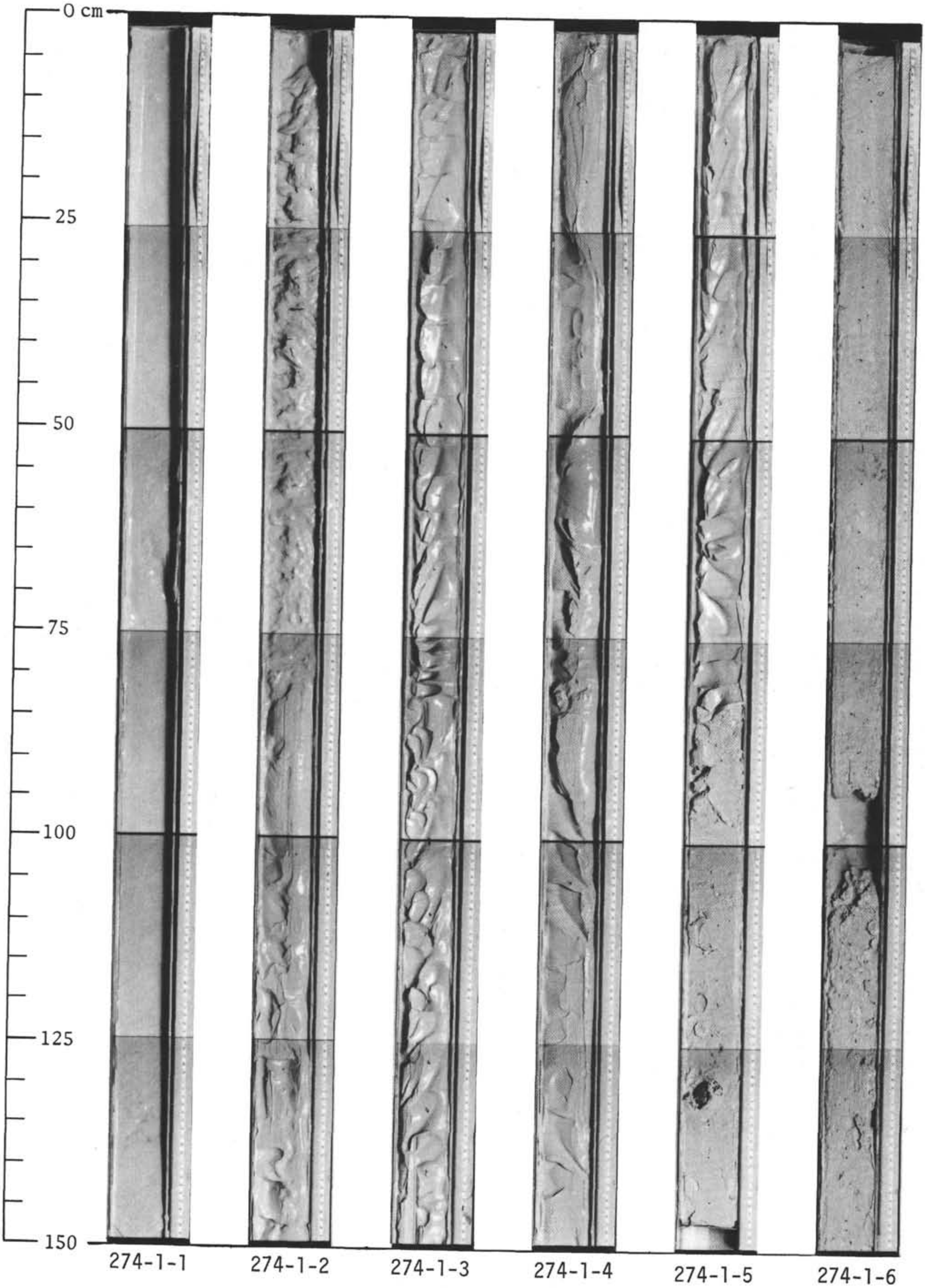
Site 274 Hole Core 44 Cored Interval: 408.5-418 m (recovery 1.9 m, 20%)

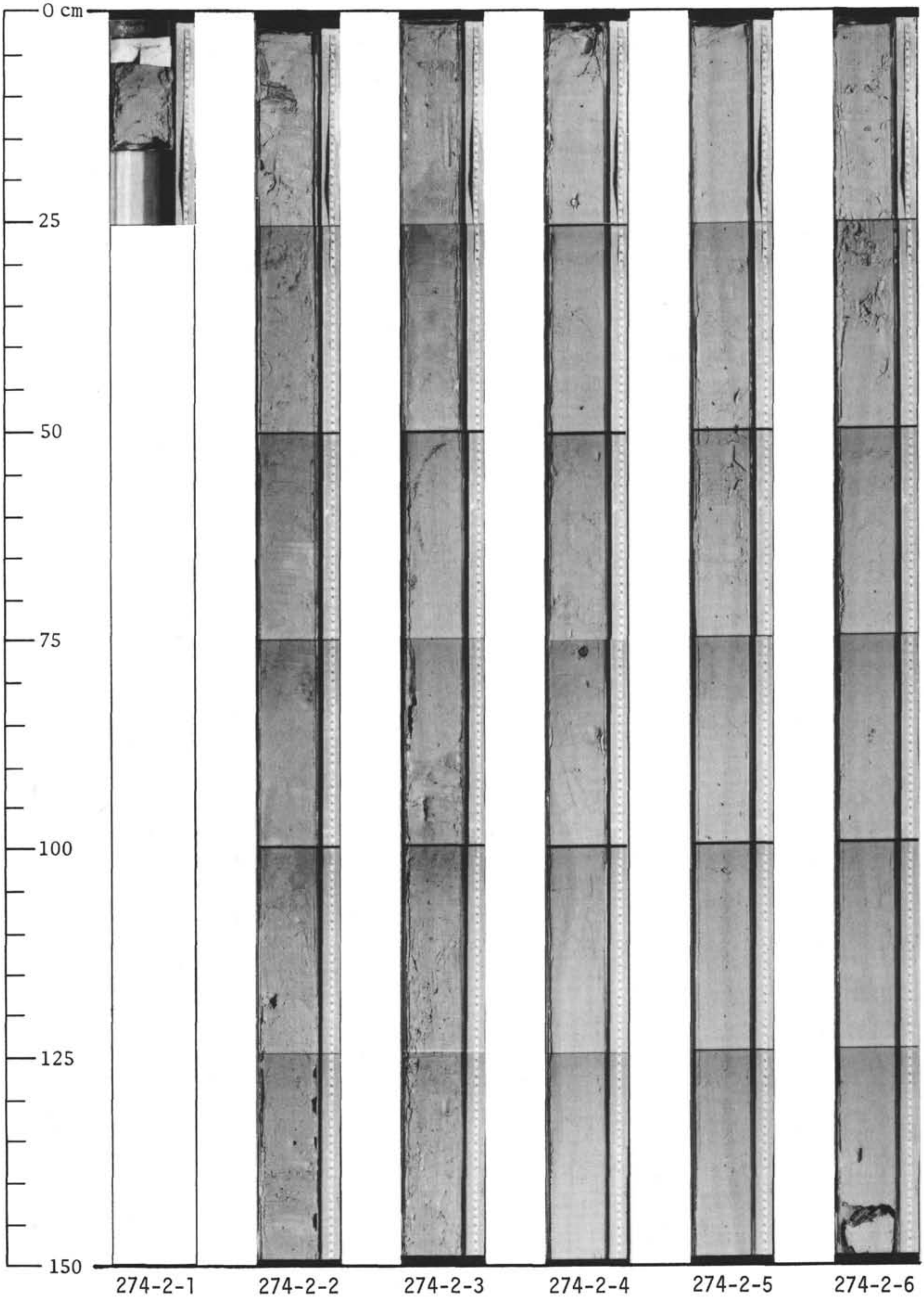
| AGE | ZONE | FOSSIL CHARACTER | | | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | FOSSIL | ABUND. | PRES. | | | | | | |
| | | | | | 1 | 0.5<br>1.0 | VOID | | | |
| | | | | | 2 | |  | | | BASALT, medium gray (N5), dense, mostly holocrystalline and nonporphyritic. Veined irregularly by whitish to greenish carbonate and chlorite. With increase of carbonate/chlorite, locally forms breccia. |
| | | | | | Core Catcher | | | | | |

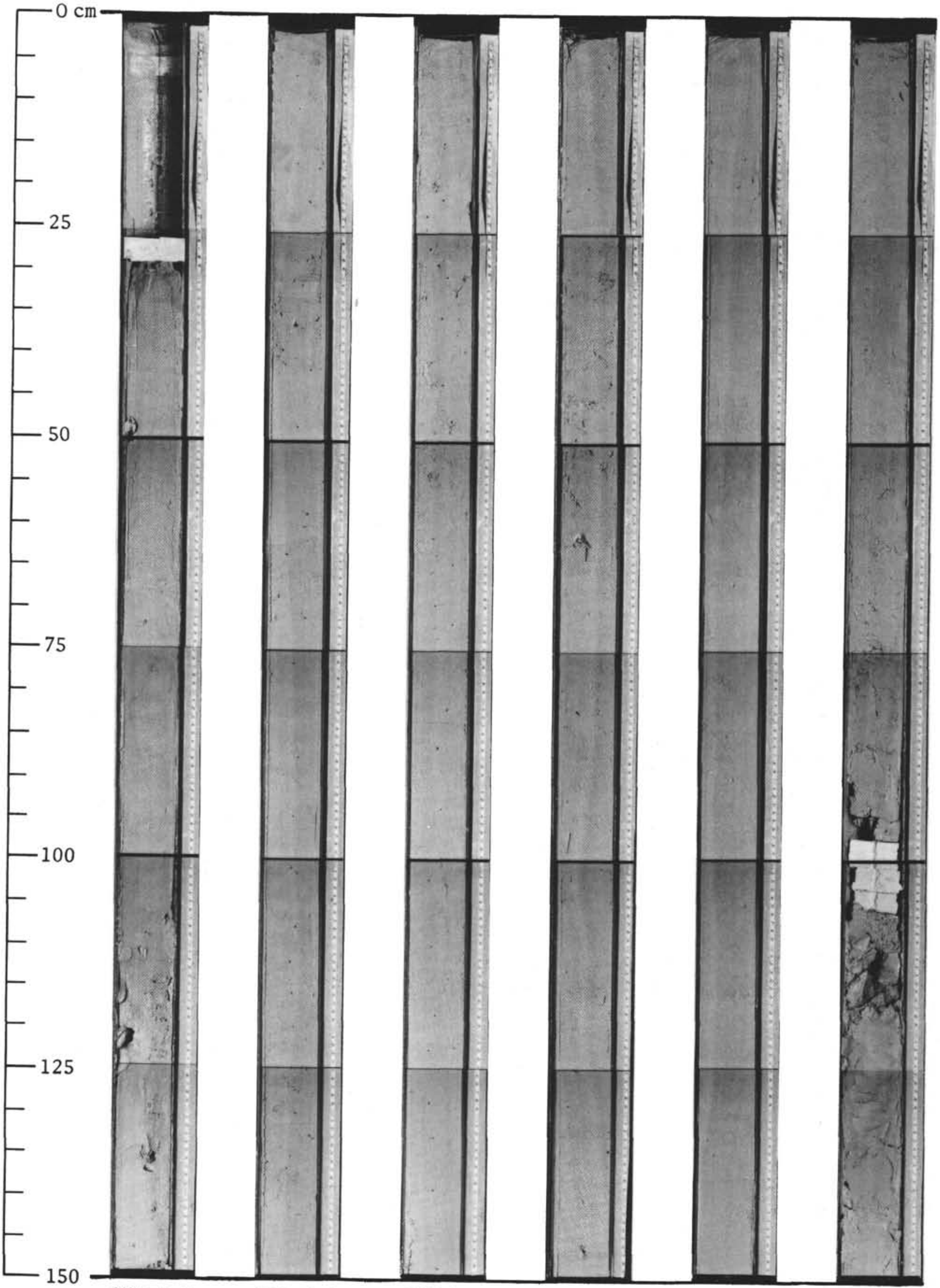
Site 274 Hole Core 45 Cored Interval: 418-421 m (recovery 1.7 m, 52%)

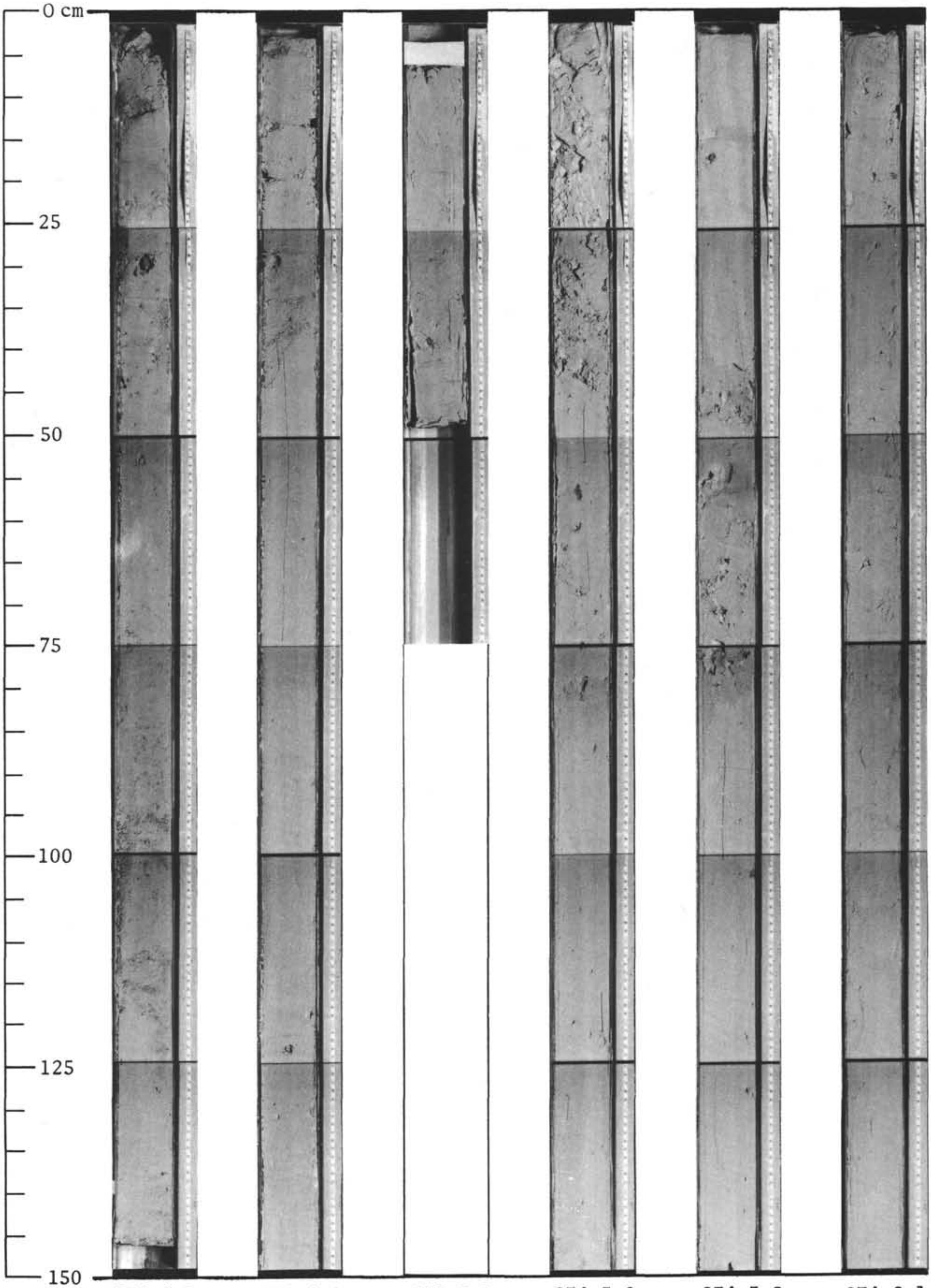
| AGE | ZONE | FOSSIL CHARACTER | | | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | FOSSIL | ABUND. | PRES. | | | | | | |
| | | | | | 1 | 0.5<br>1.0 | VOID | | | |
| | | | | | 2 | |  | | | BASALT, appears generally a little more altered than in Core 44. More breccia than in Core 44. Locally vesicular to amygdaloidal; nonporphyritic. |
| | | | | | Core Catcher | | | | | ~8 cm of vesicular amygdaloidal basalt as in 130-150 cm, Sec. 2. |

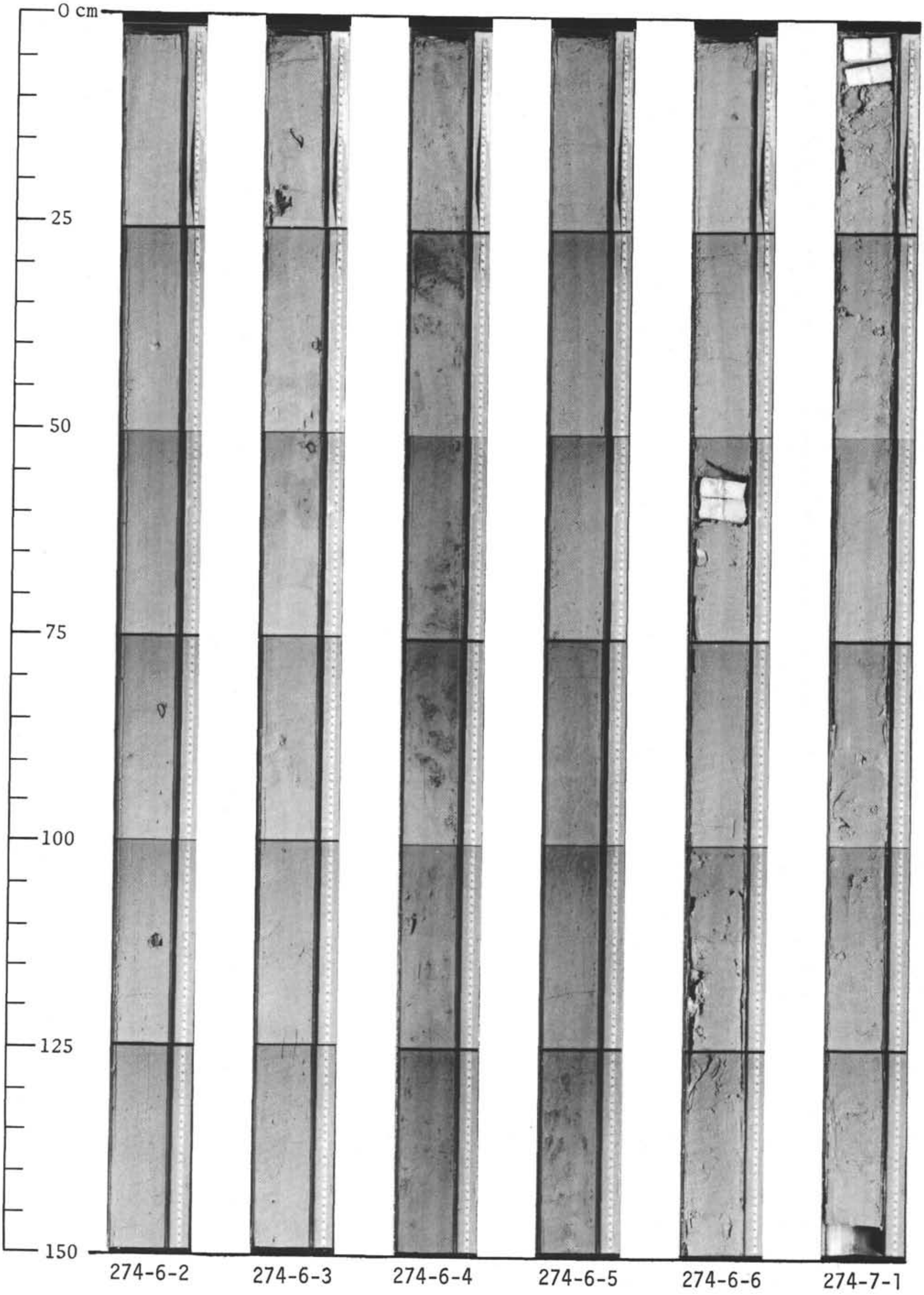
Explanatory notes in Chapter 1


0 cm
25
50
75
100
125
150
274-1-1
274-1-2
274-1-3
274-1-4
274-1-5
274-1-6


0 cm
25
50
75
100
125
150
274-2-1
274-2-2
274-2-3
274-2-4
274-2-5
274-2-6


0 cm
25
50
75
100
125
150
274-3-1
274-3-2
274-3-3
274-3-4
274-3-5
274-3-6


0 cm
25
50
75
100
125
150
274-4-1
274-4-2
274-5-1
274-5-2
274-5-3
274-6-1


0 cm
25
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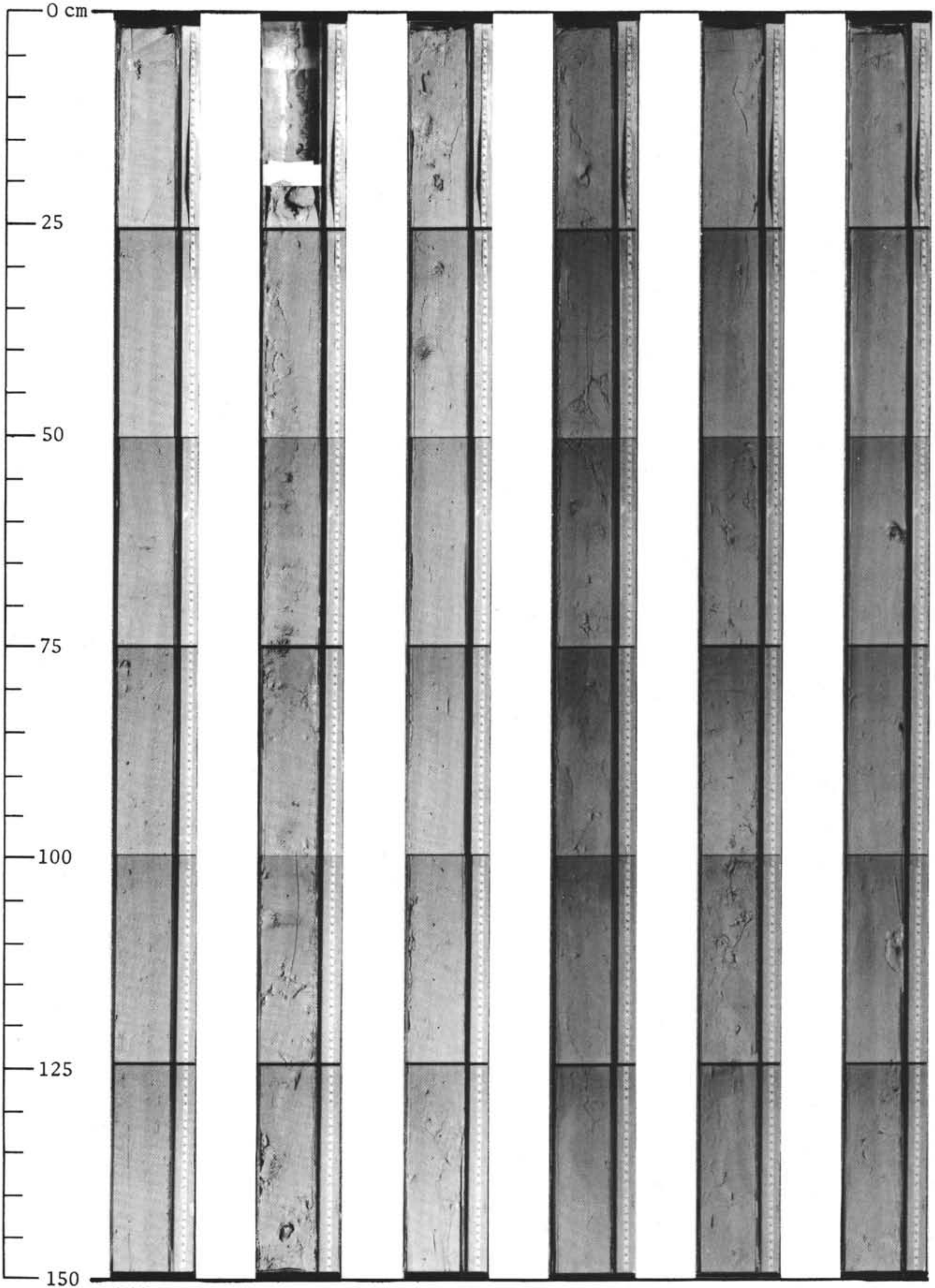
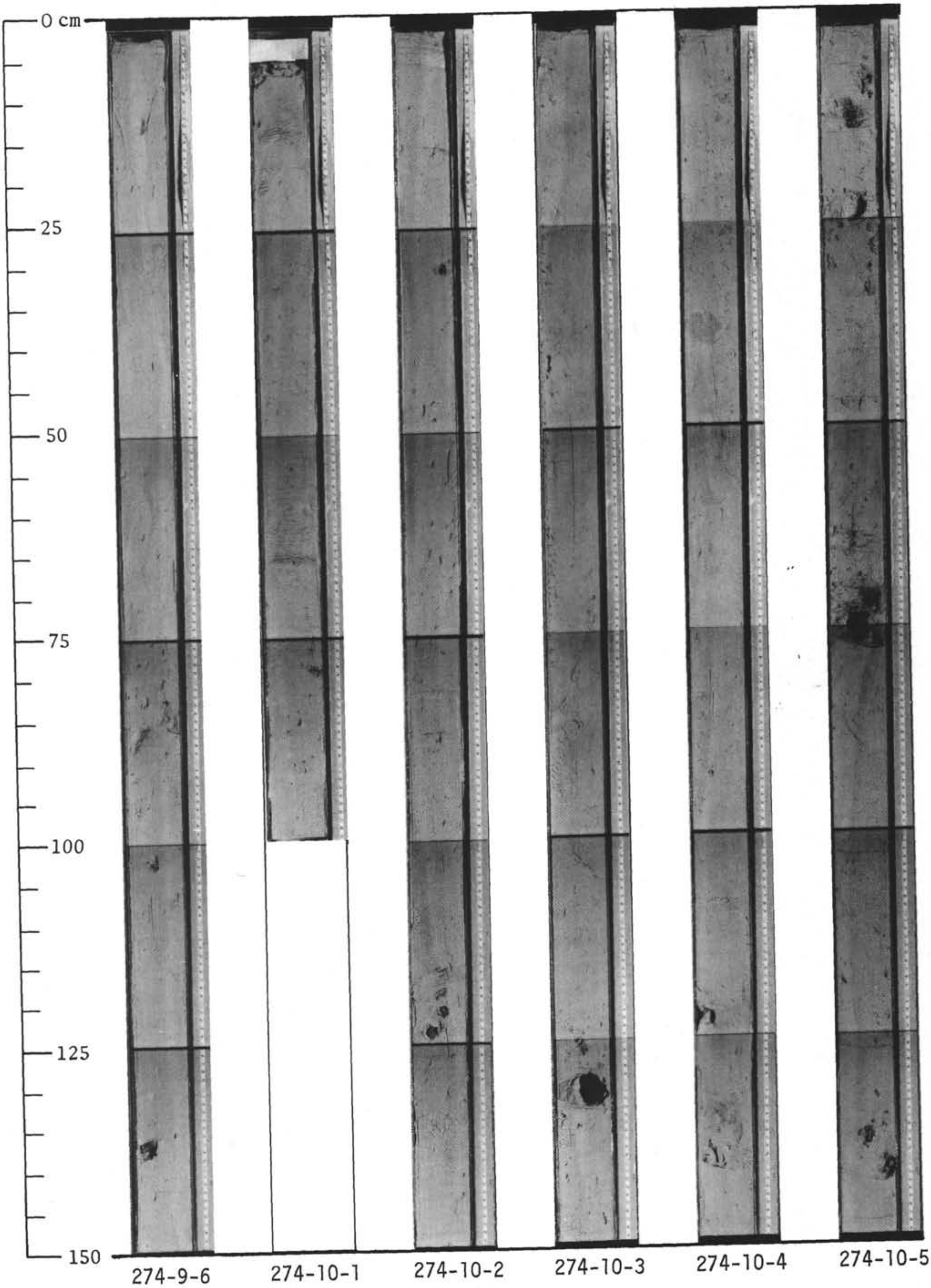
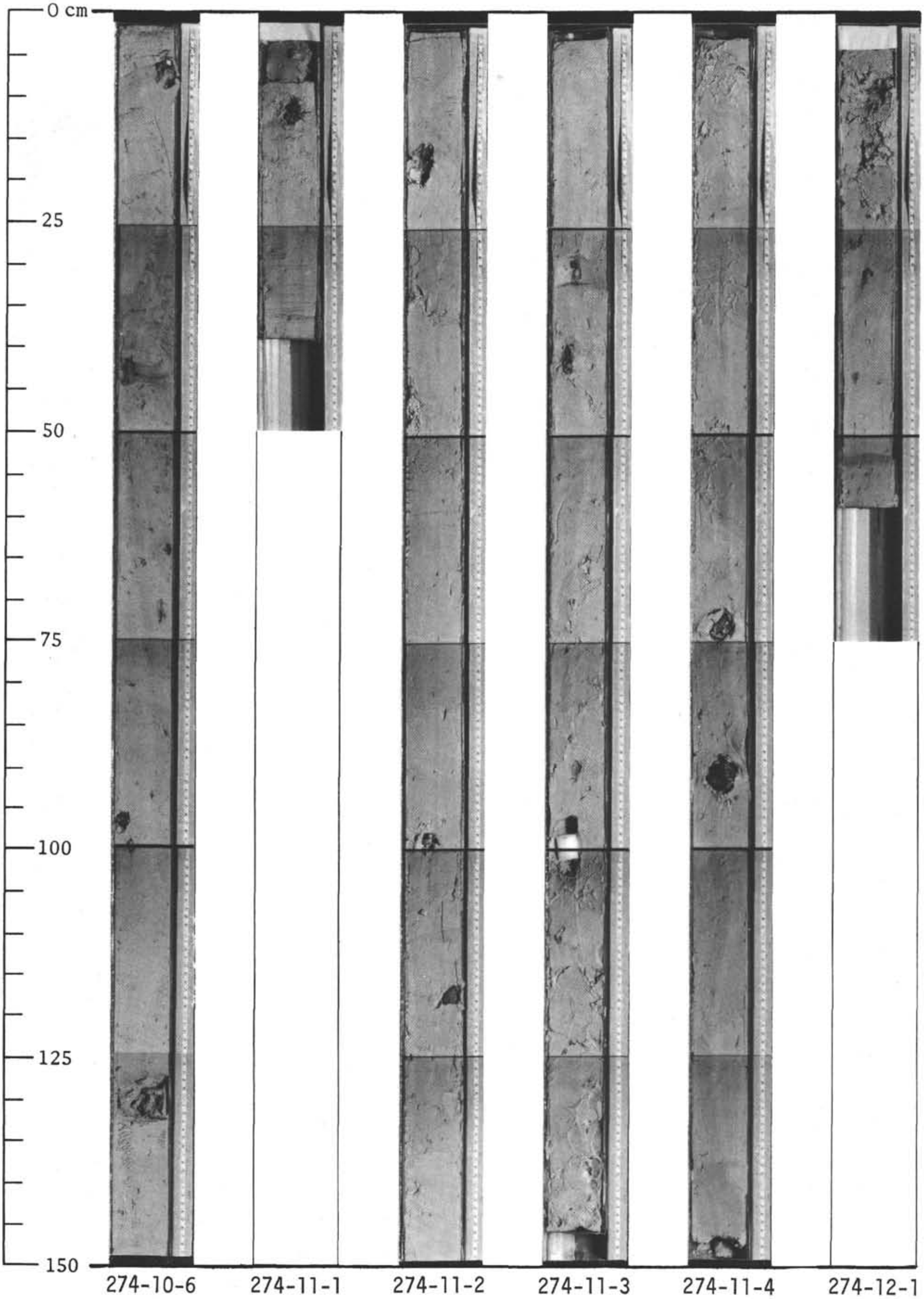
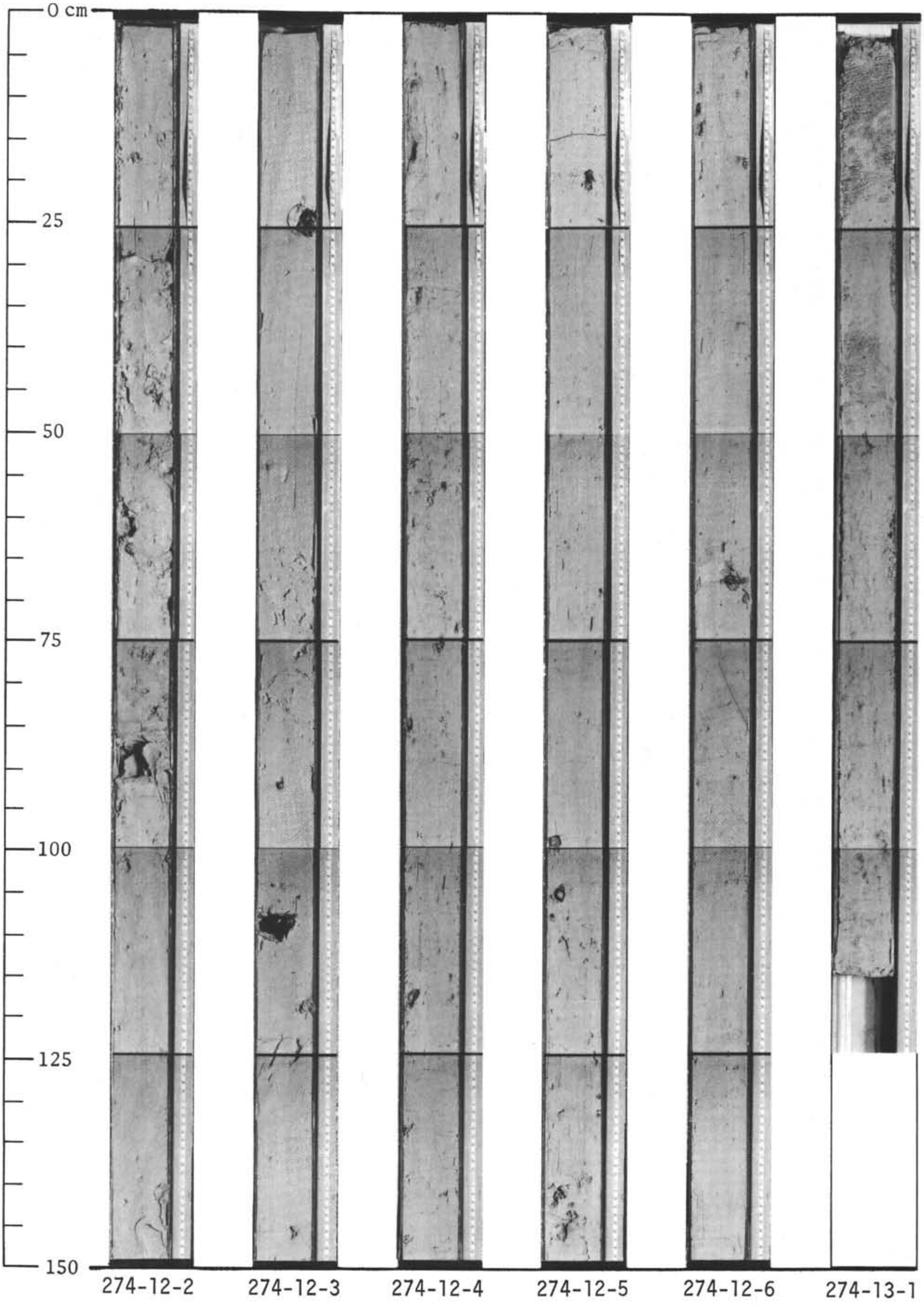
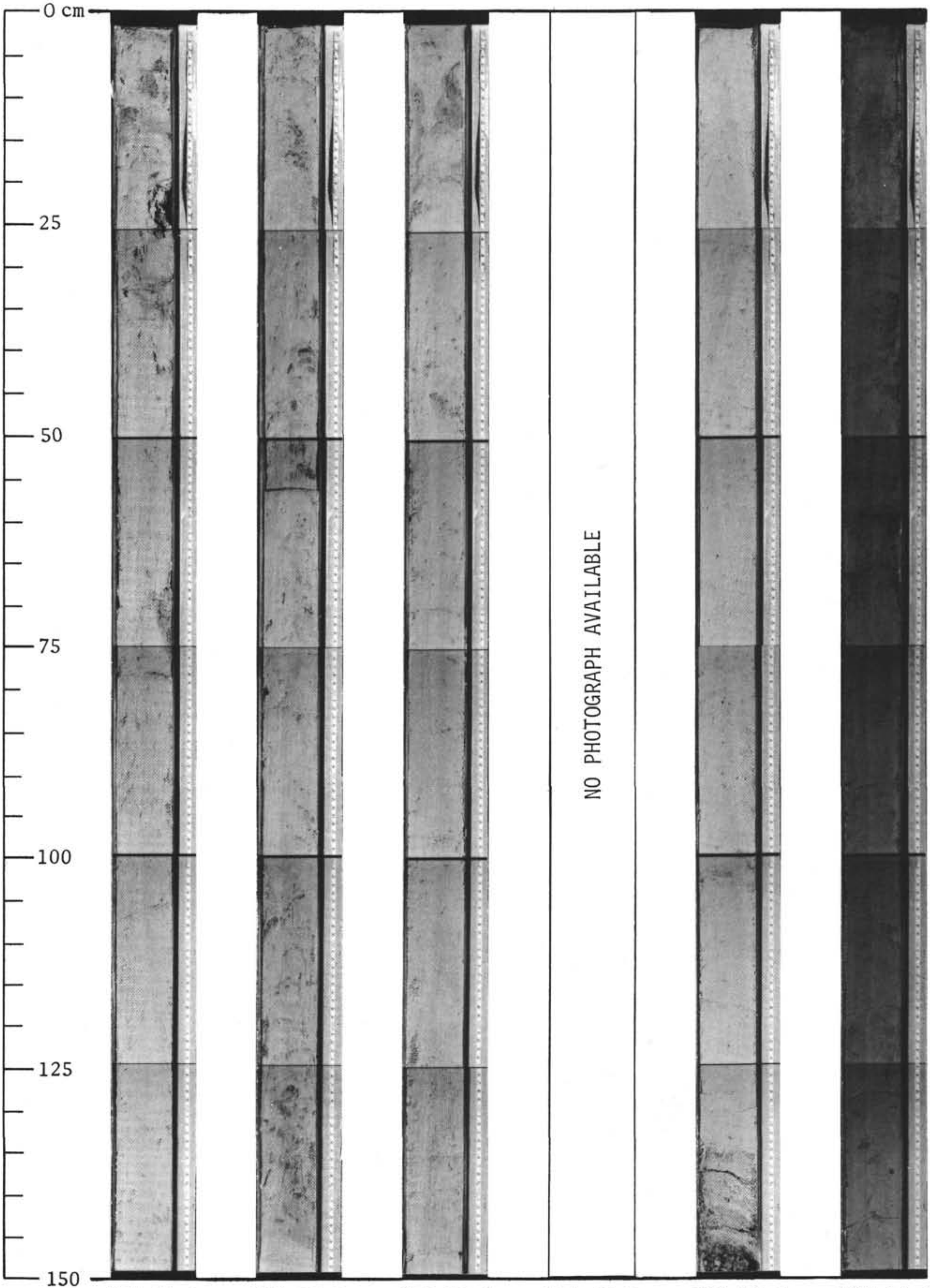
75
100
125
150
274-6-2
274-6-3
274-6-4
274-6-5
274-6-6
274-7-1

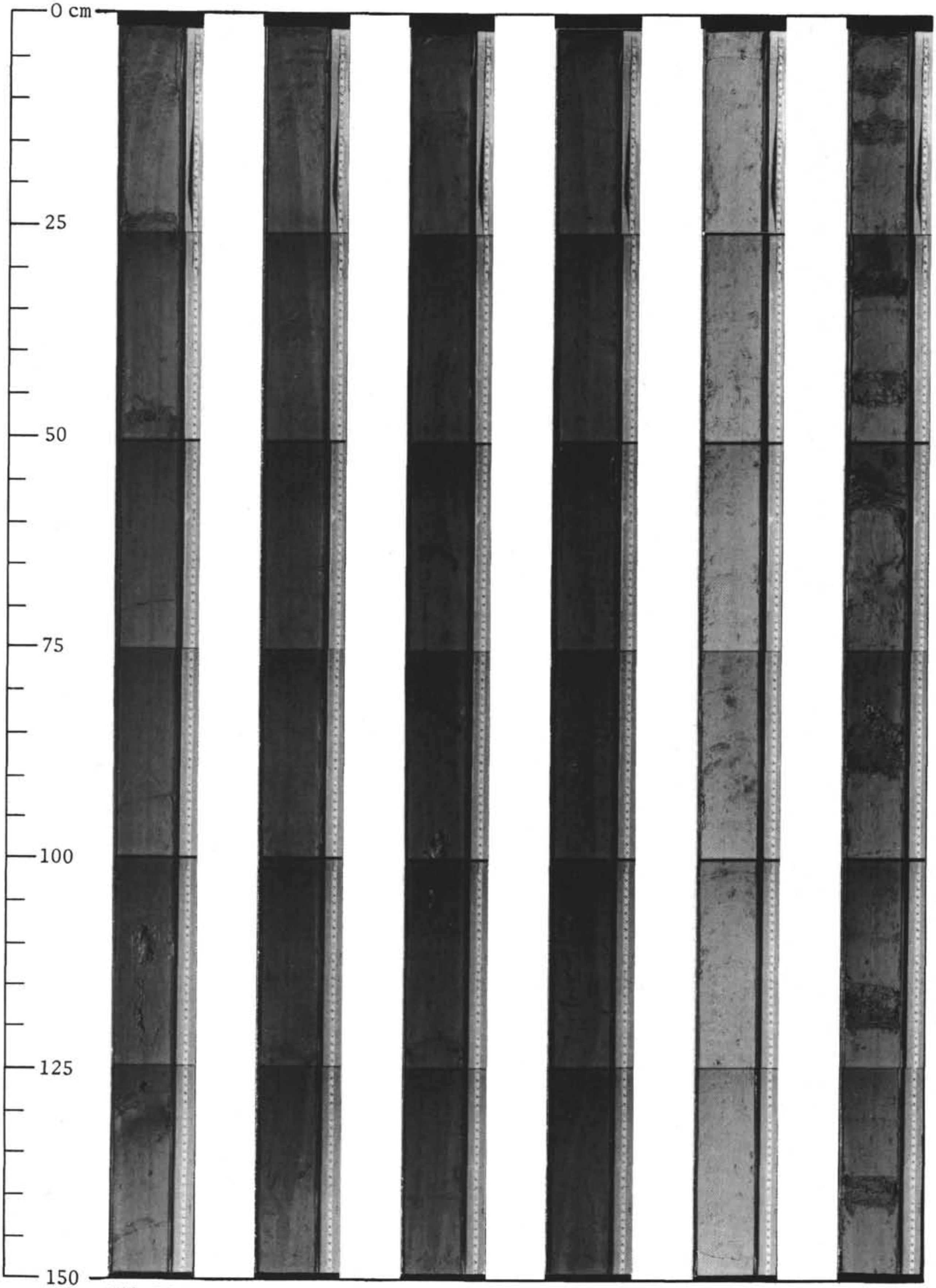

0 cm
25
50
75
100
125
150
274-7-2
274-9-1
274-9-2
274-9-3
274-9-4
274-9-5

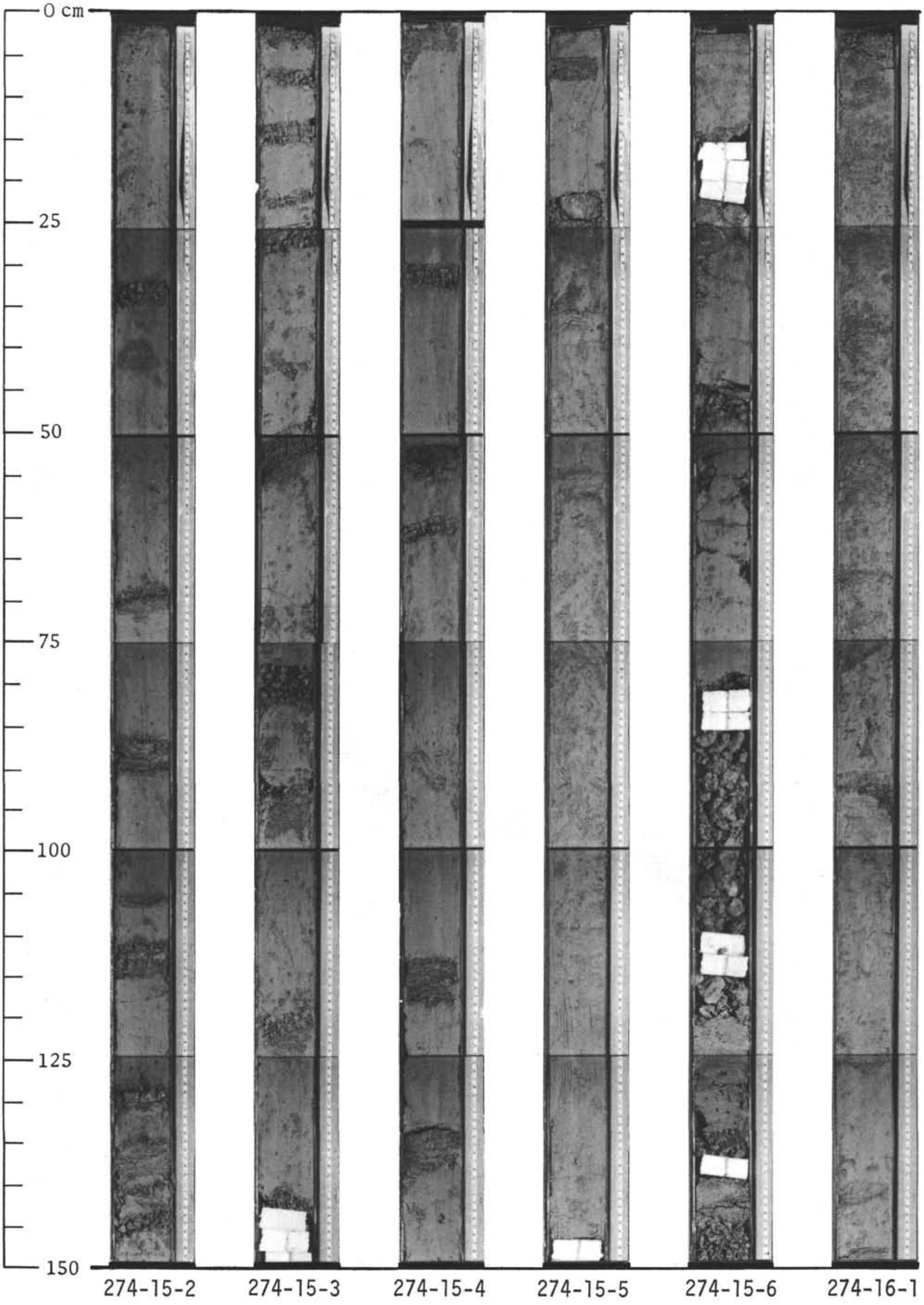

0 cm
25
50
75
100
125
150
274-9-6
274-10-1
274-10-2
274-10-3
274-10-4
274-10-5

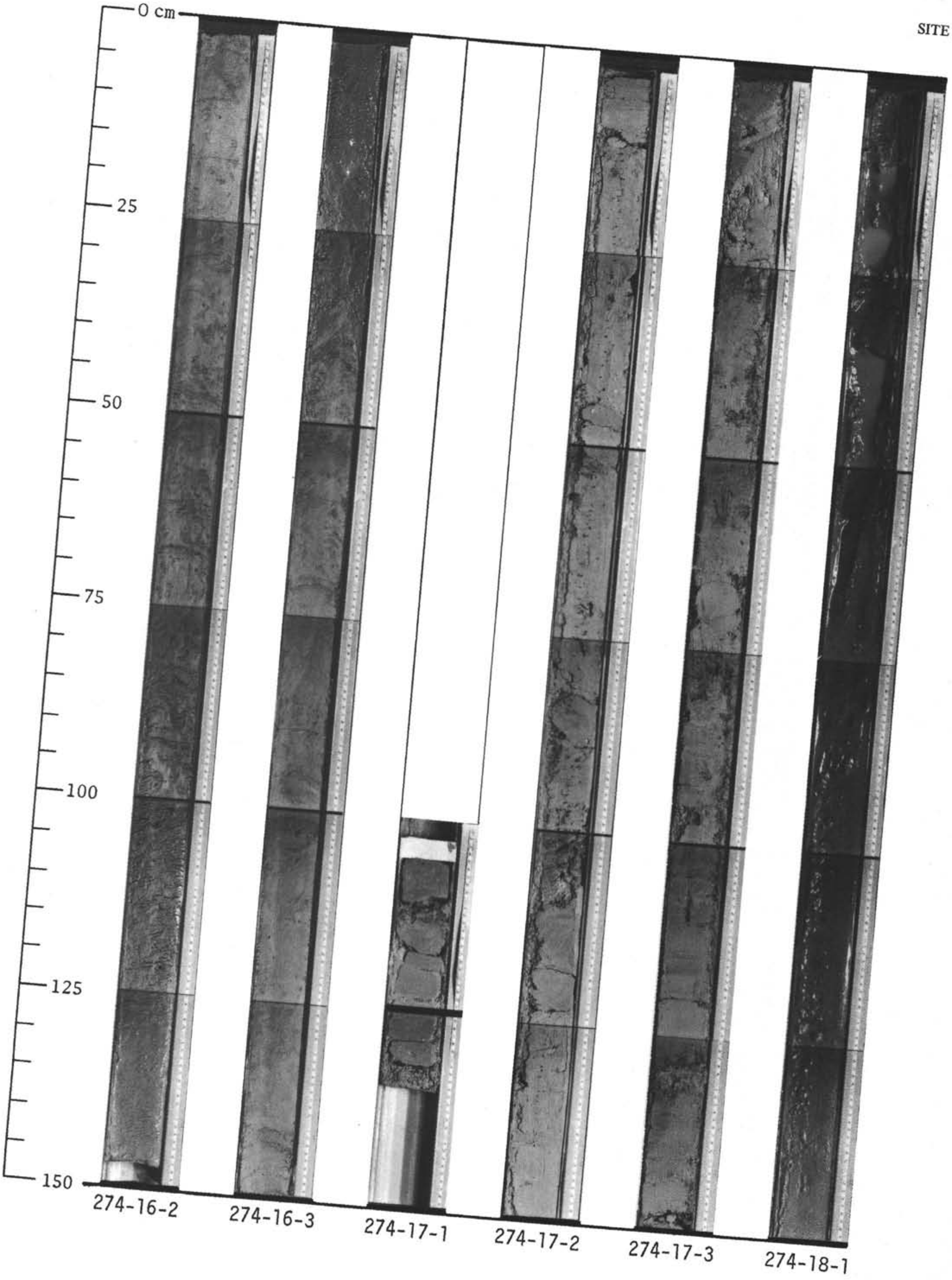

0 cm
25
50
75
100
125
150
274-10-6
274-11-1
274-11-2
274-11-3
274-11-4
274-12-1

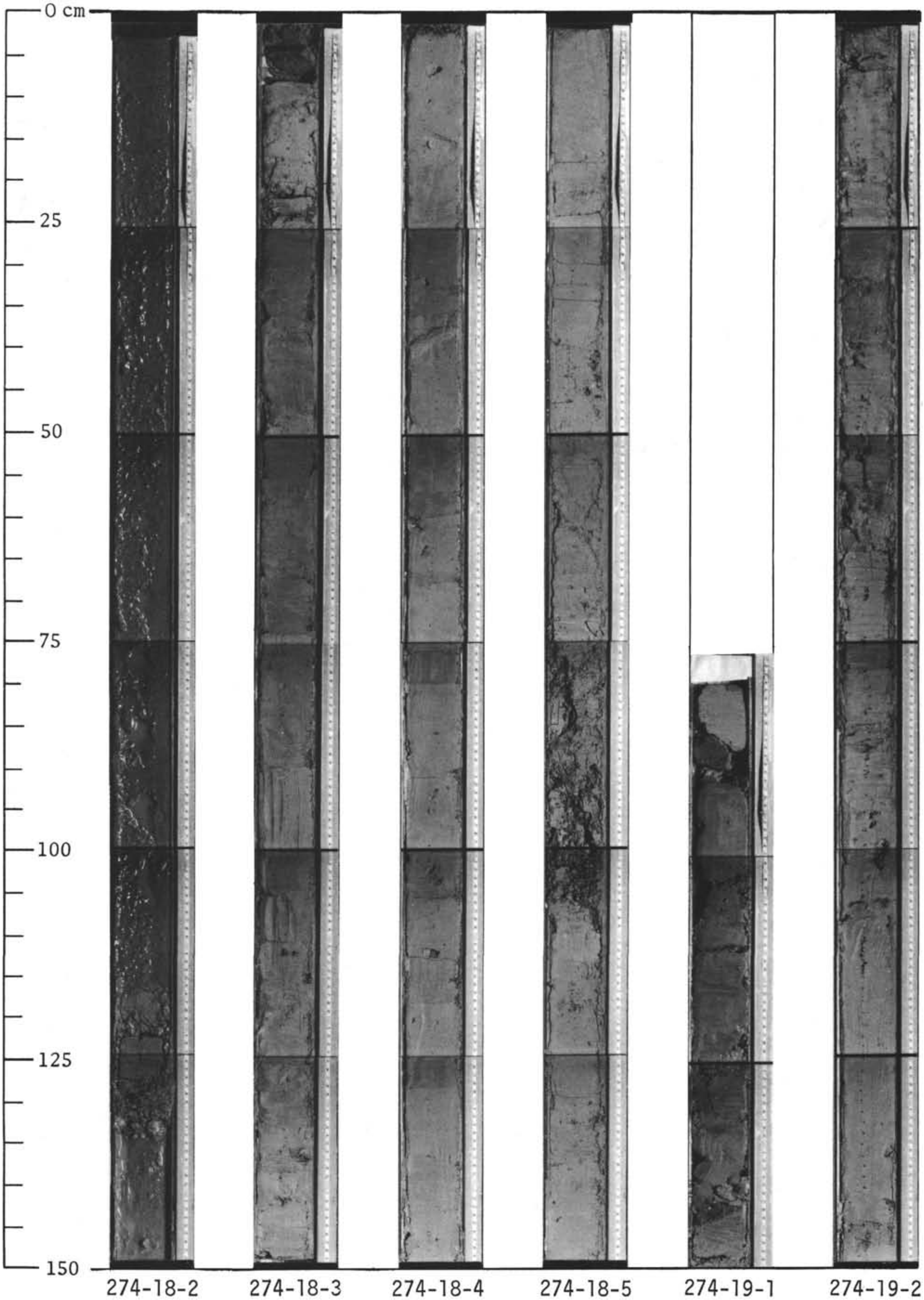

0 cm
25
50
75
100
125
150
274-12-2
274-12-3
274-12-4
274-12-5
274-12-6
274-13-1

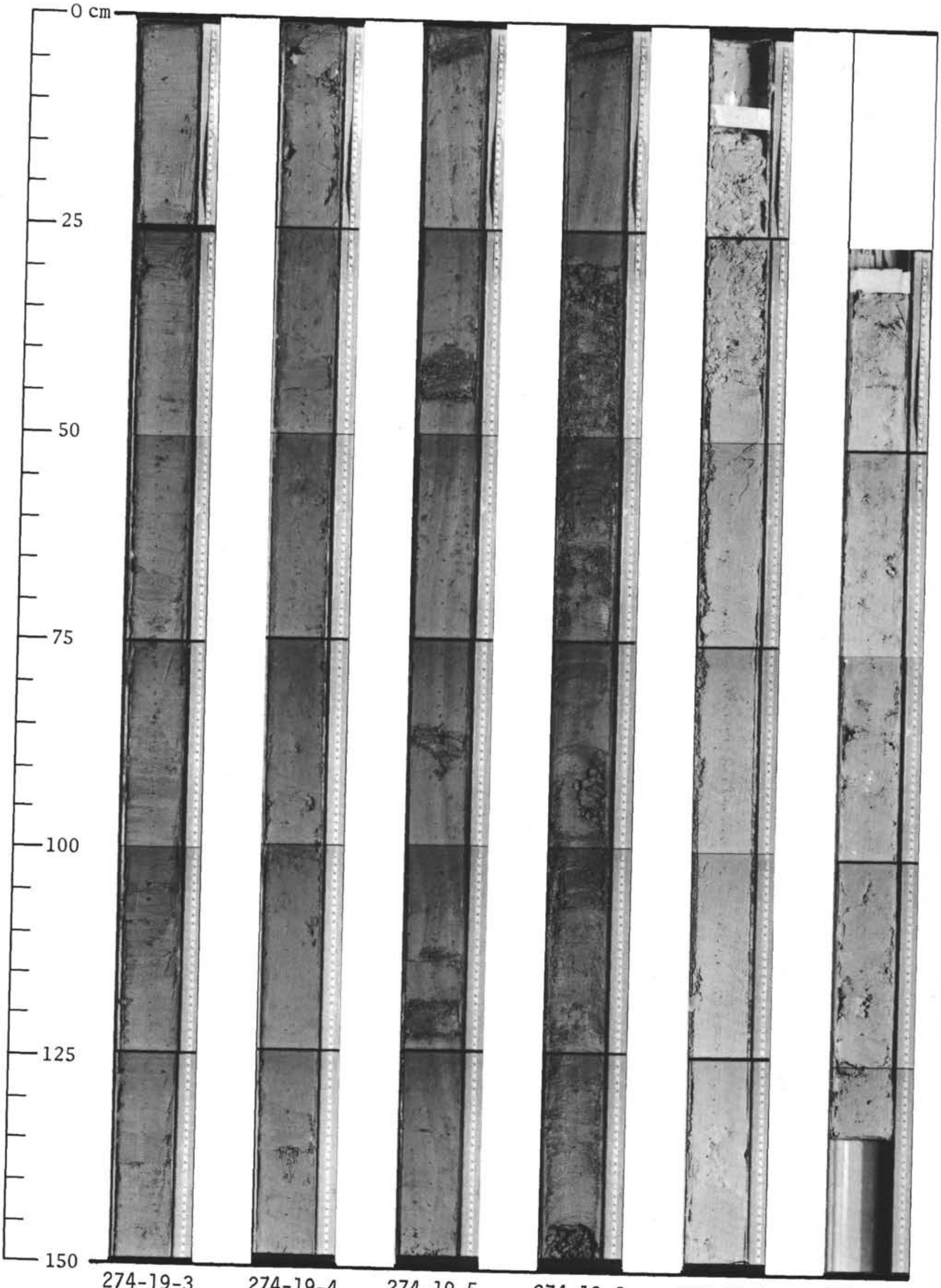

0 cm
25
50
75
100
125
150
NO PHOTOGRAPH AVAILABLE
274-13-2
274-13-3
274-13-4
274-13-5
274-13-6
274-14-1


0 cm
25
50
75
100
125
150
274-14-2
274-14-3
274-14-4
274-14-5
274-14-6
274-15-1


0 cm
25
50
75
100
125
150
274-15-2
274-15-3
274-15-4
274-15-5
274-15-6
274-16-1


0 cm
25
50
75
100
125
150
274-16-2
274-16-3
274-17-1
274-17-2
274-17-3
274-18-1


0 cm
25
50
75
100
125
150
274-18-2
274-18-3
274-18-4
274-18-5
274-19-1
274-19-2


0 cm
25
50
75
100
125
150
274-19-3
274-19-4
274-19-5
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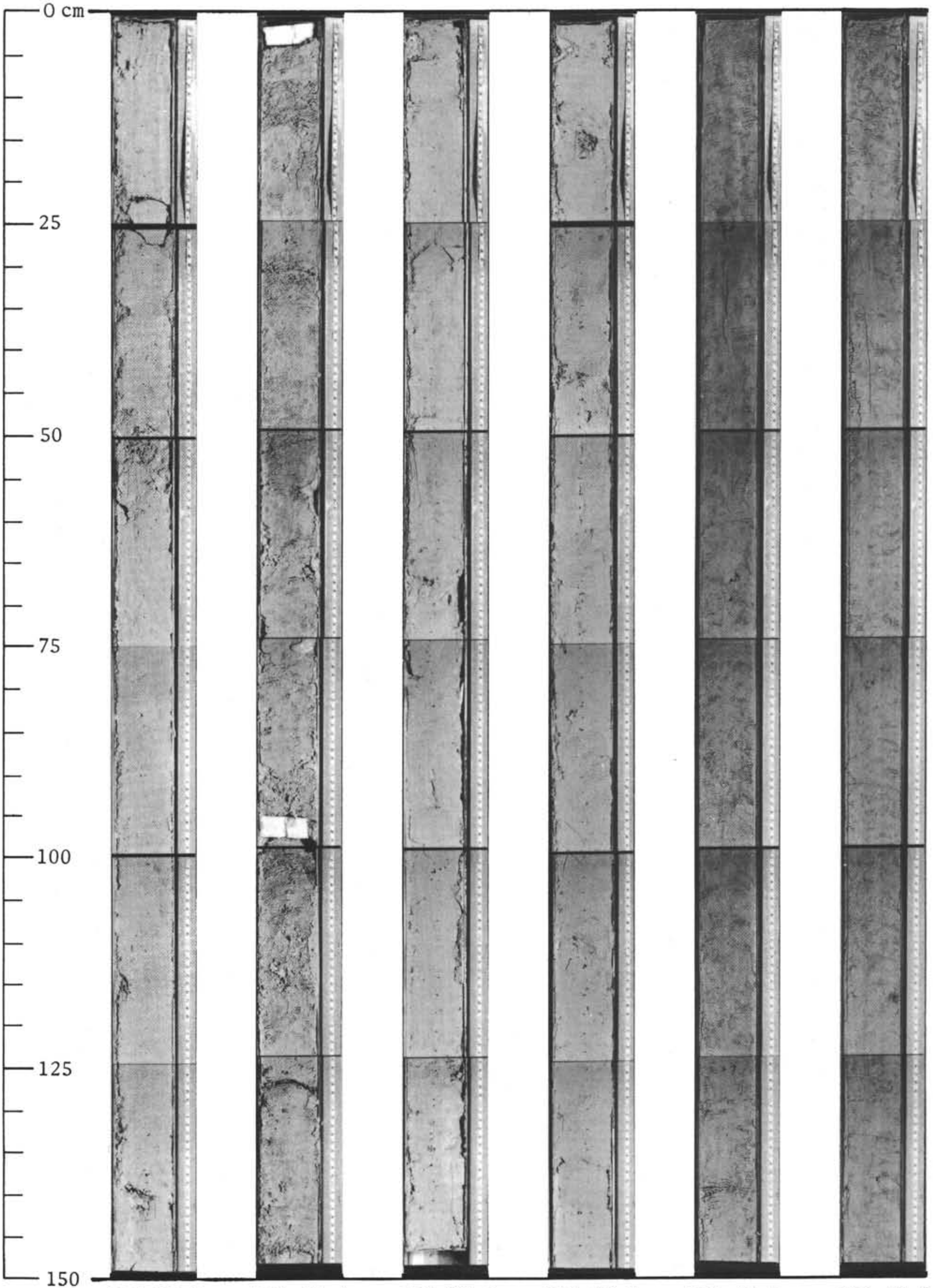
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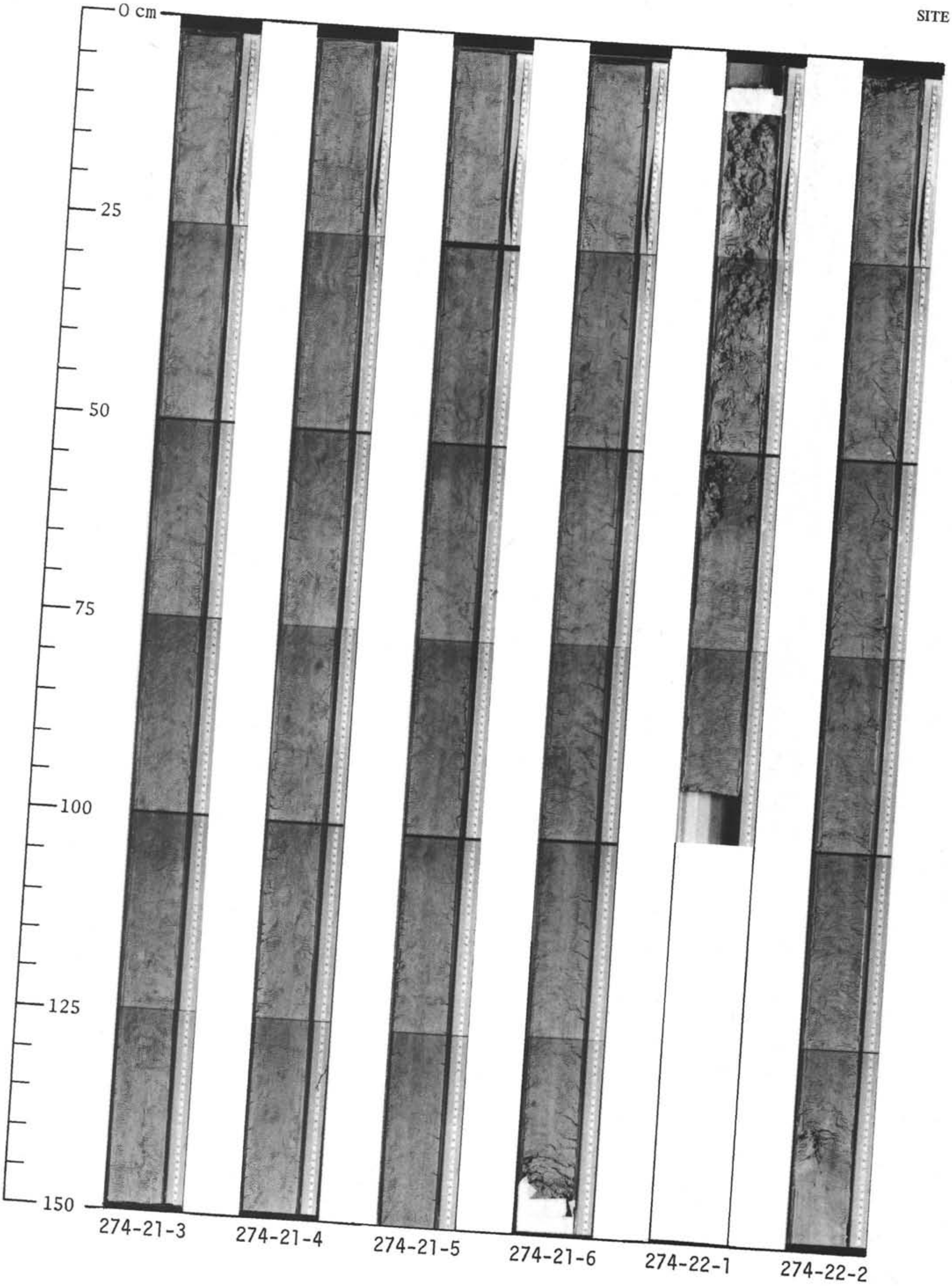
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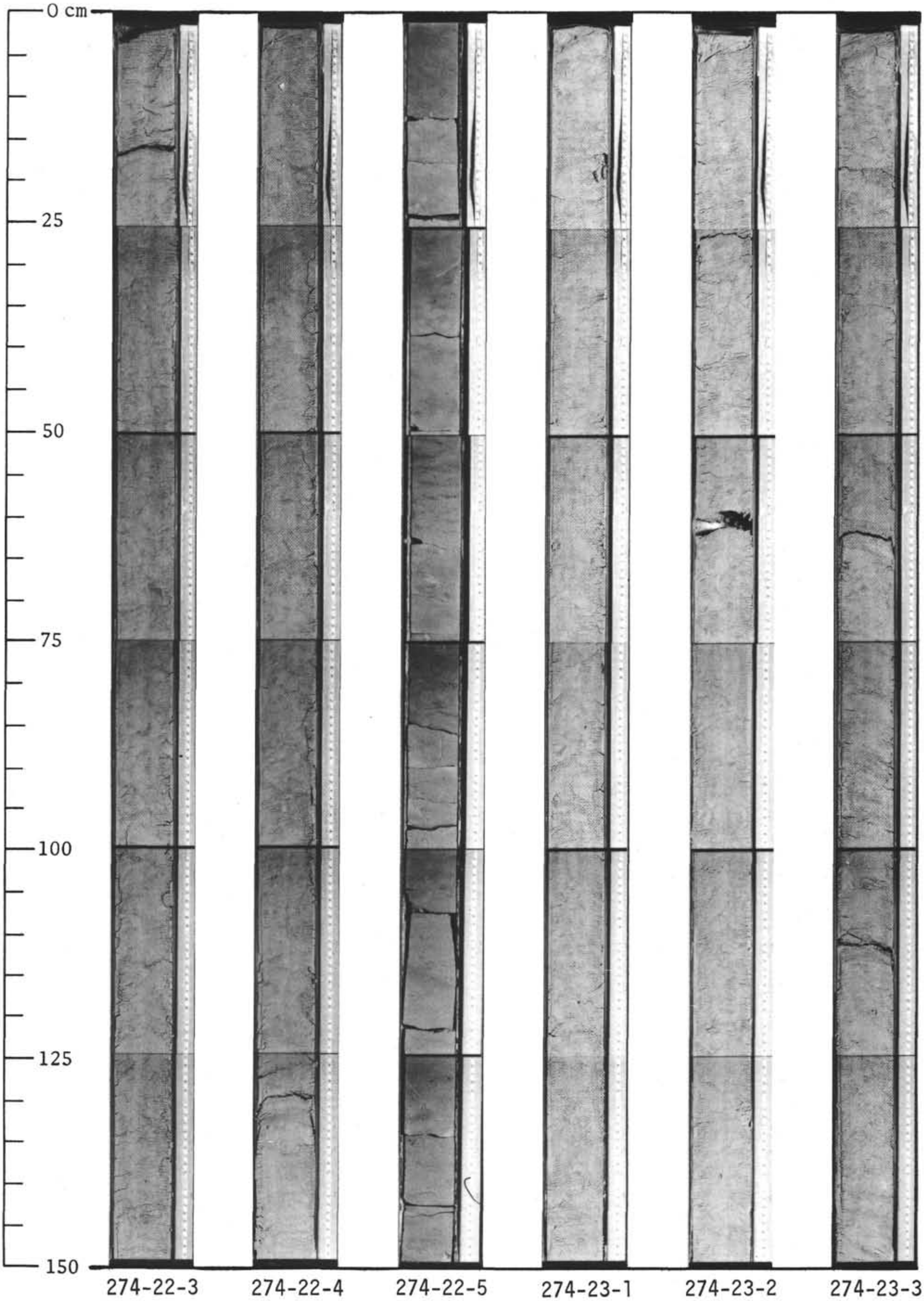
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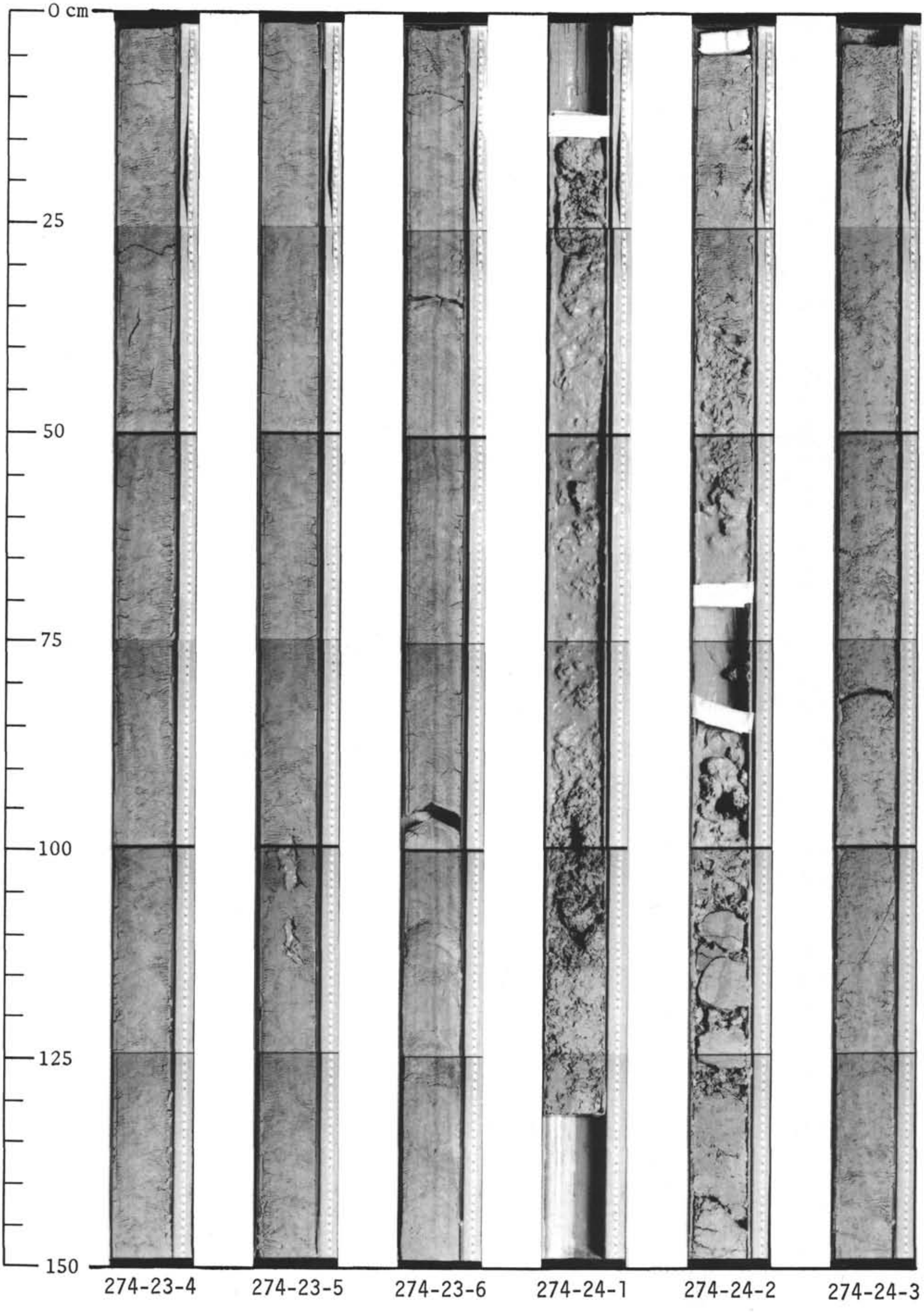
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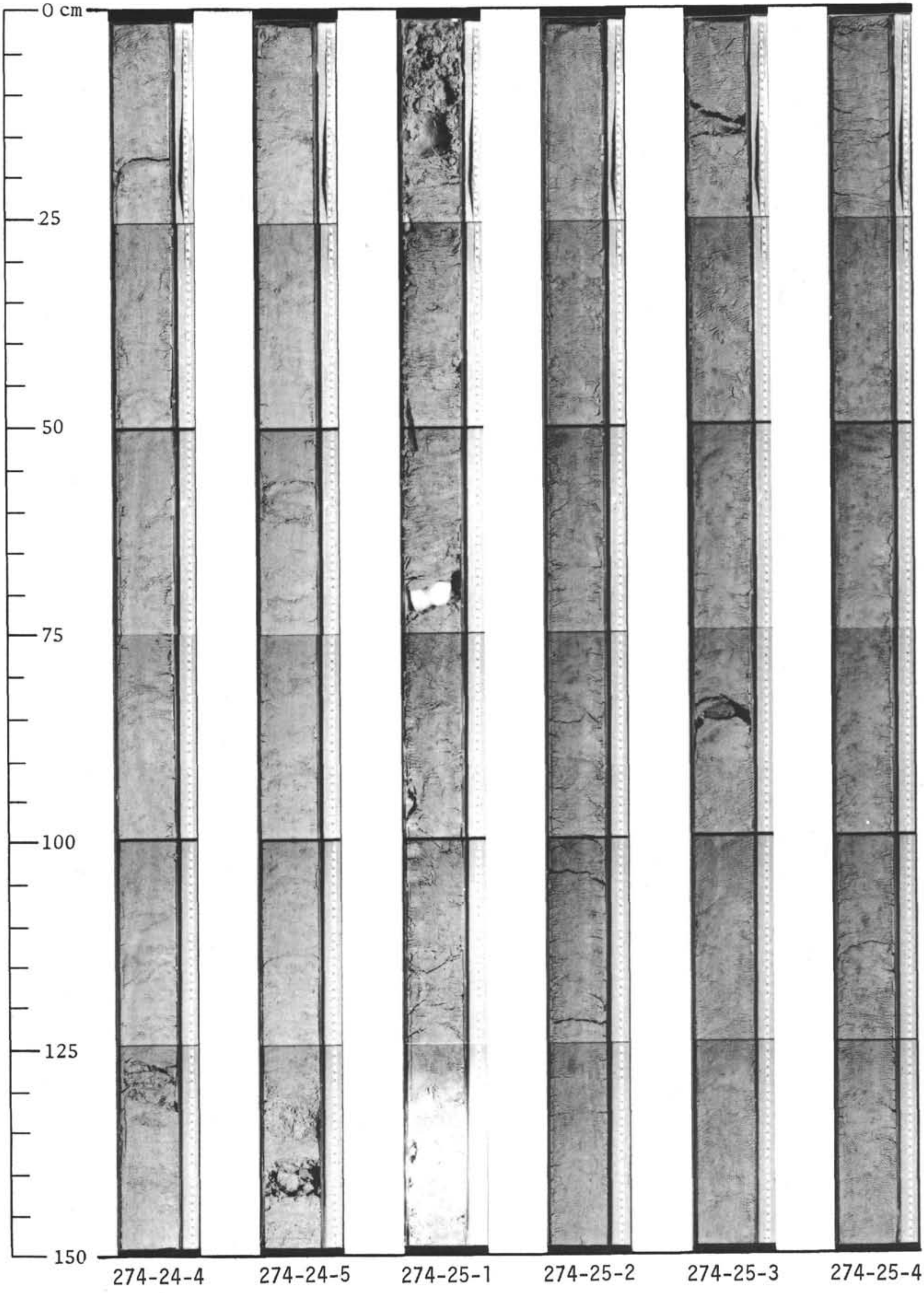
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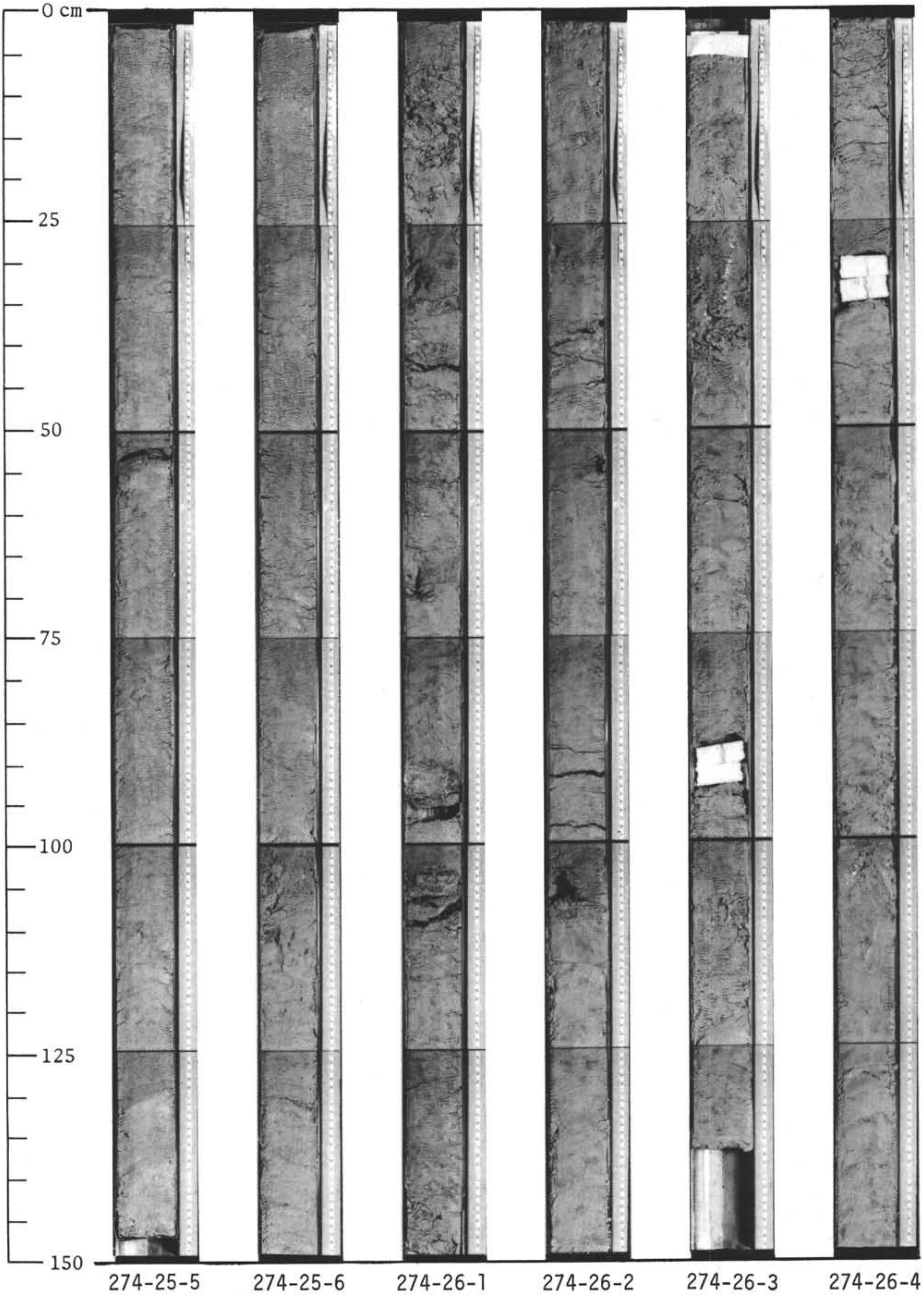
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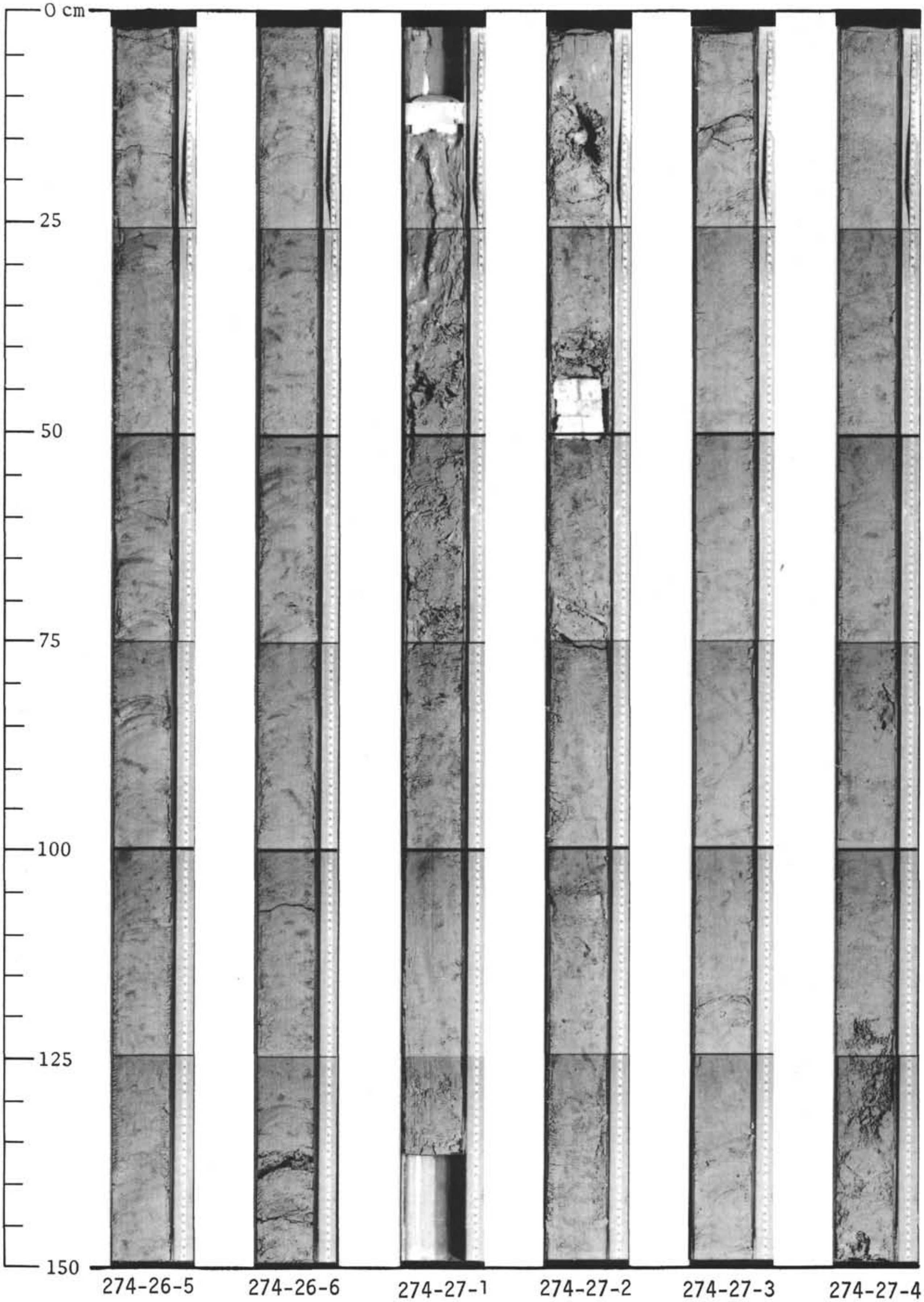
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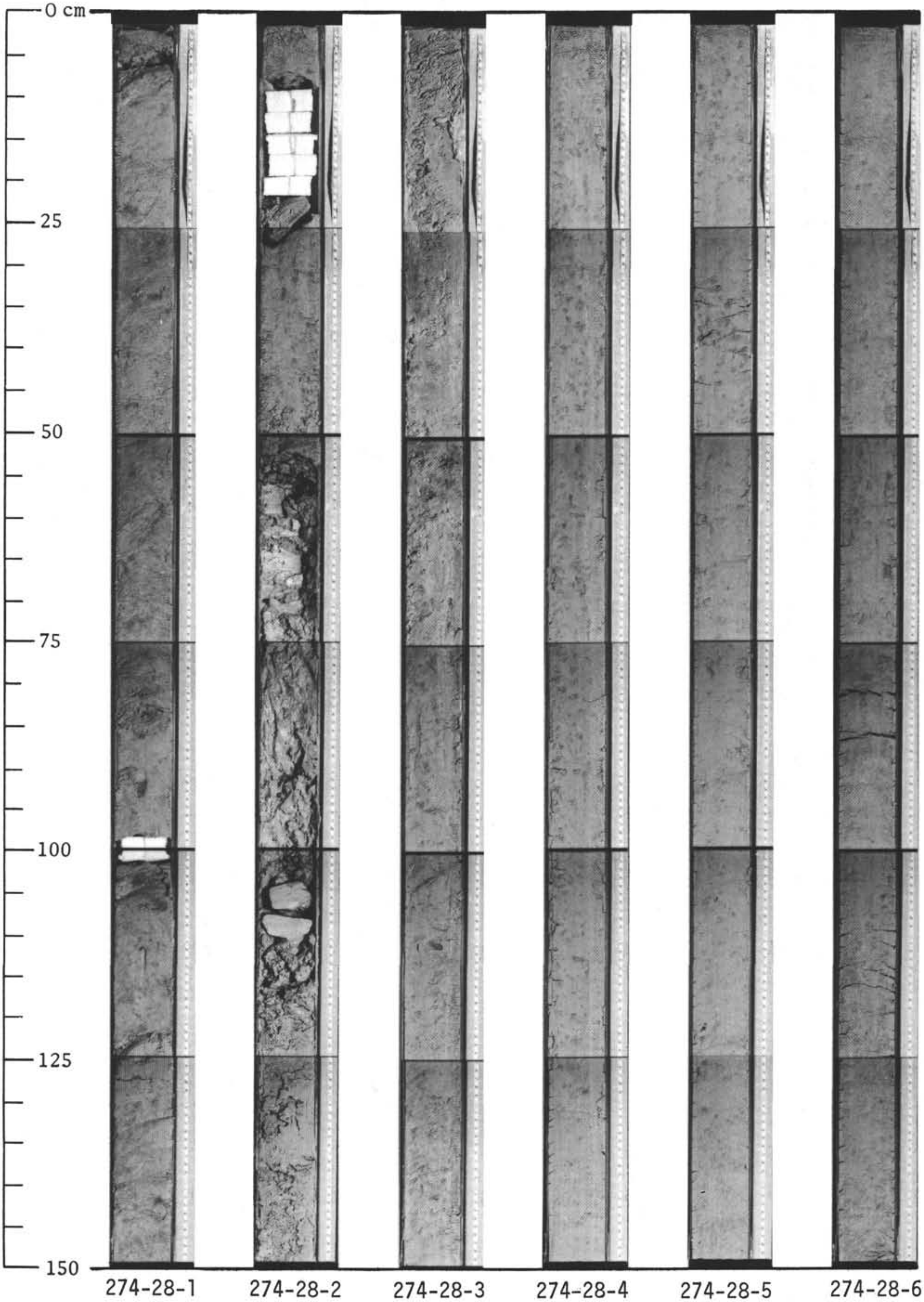
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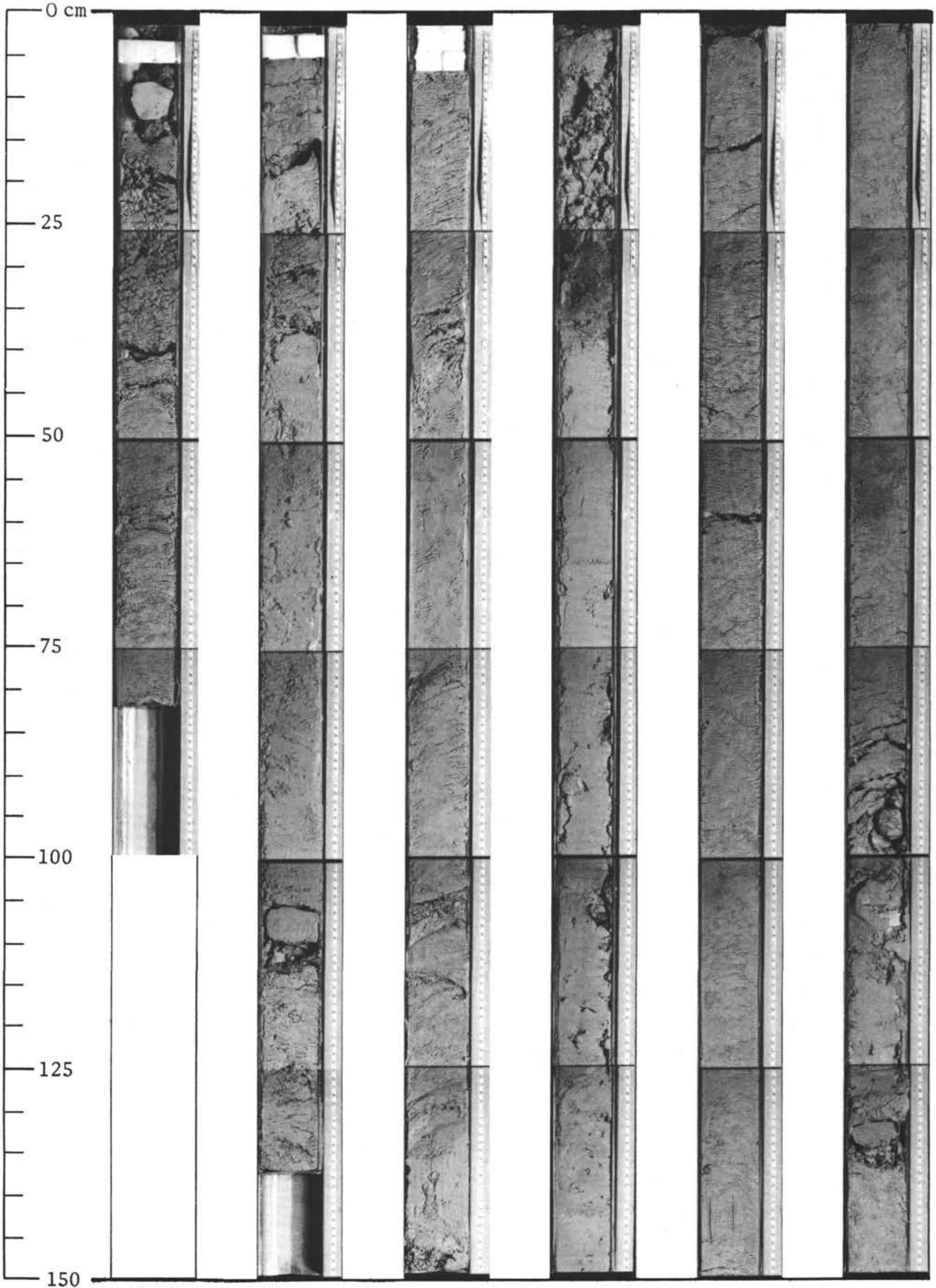
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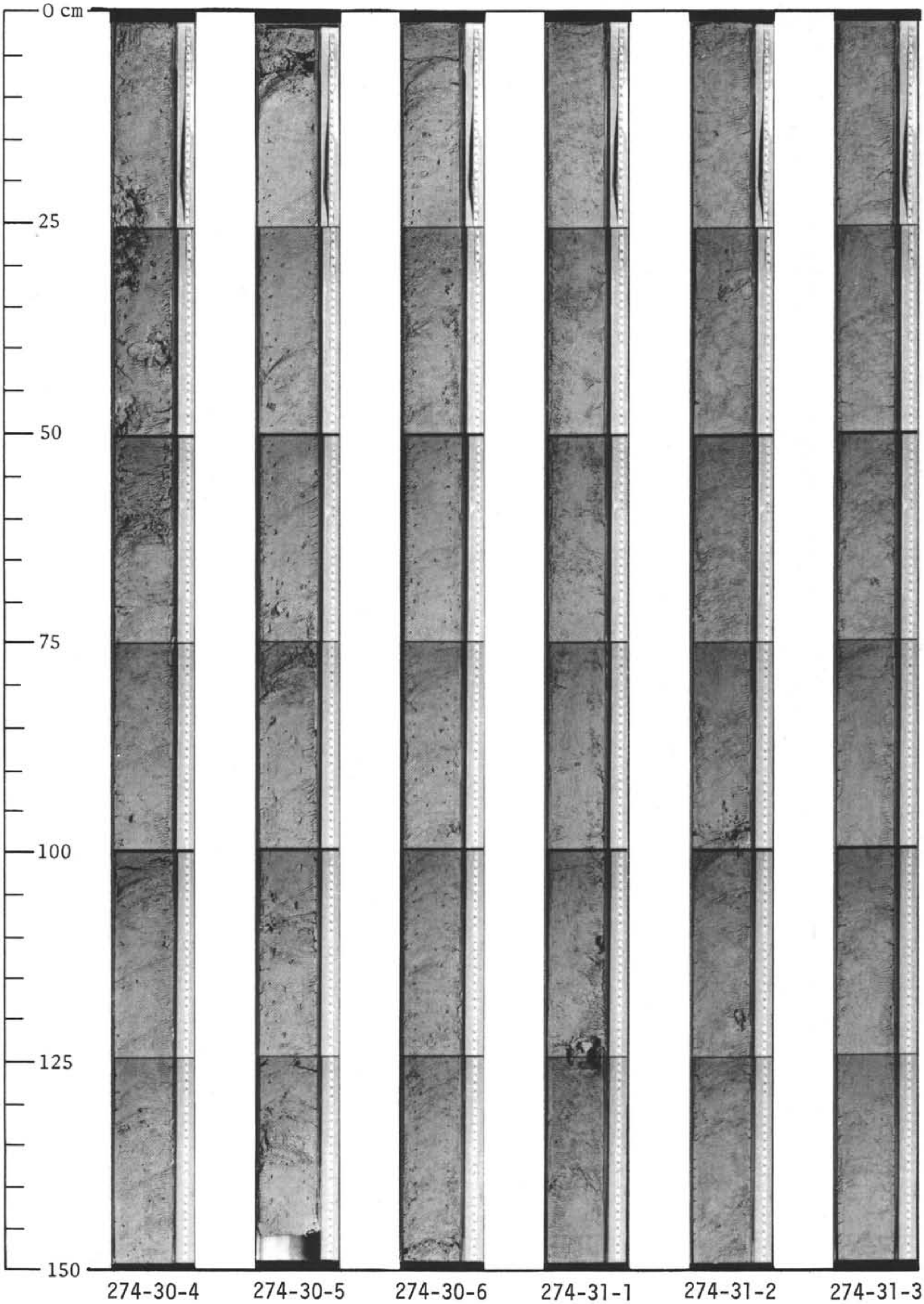
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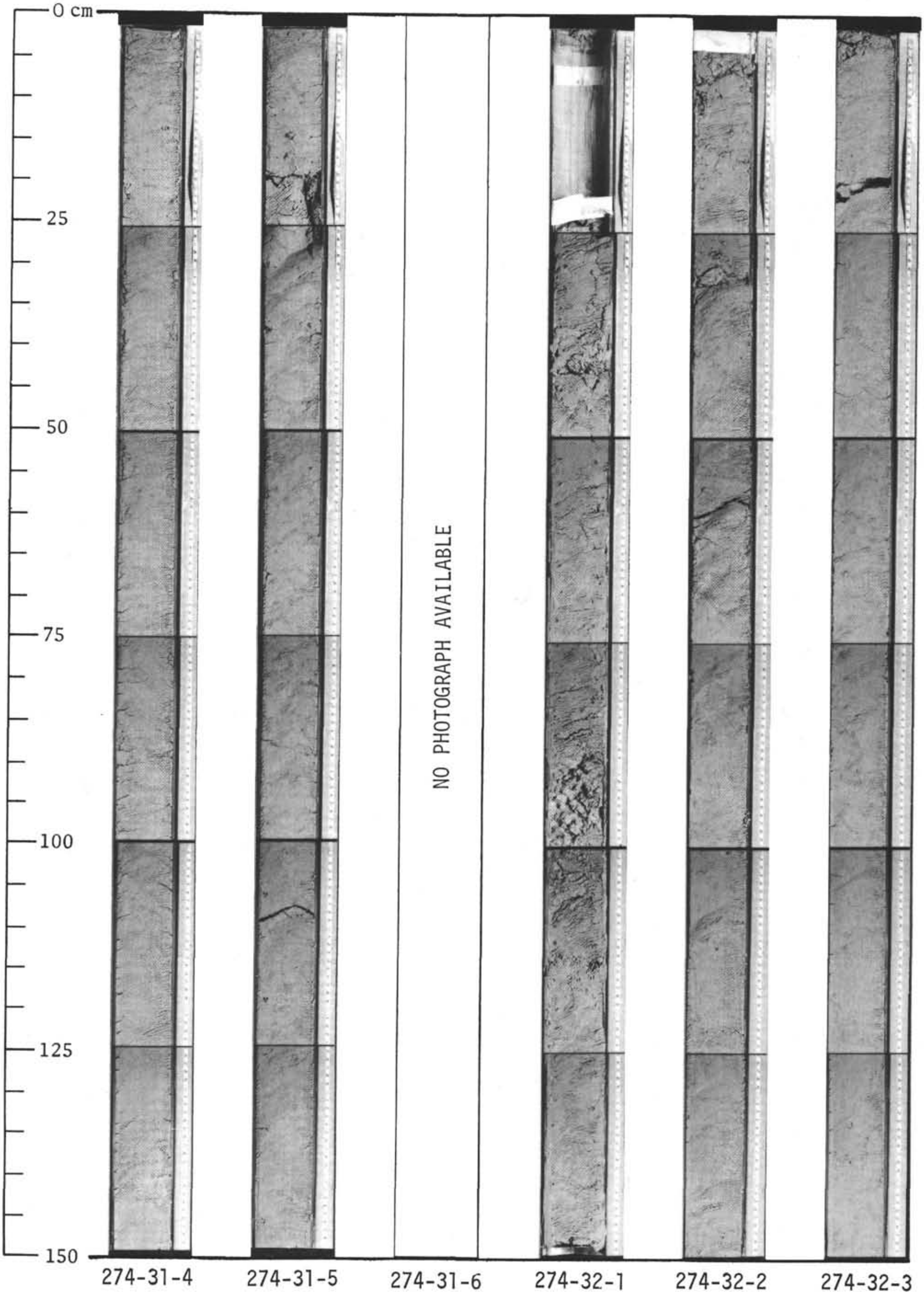
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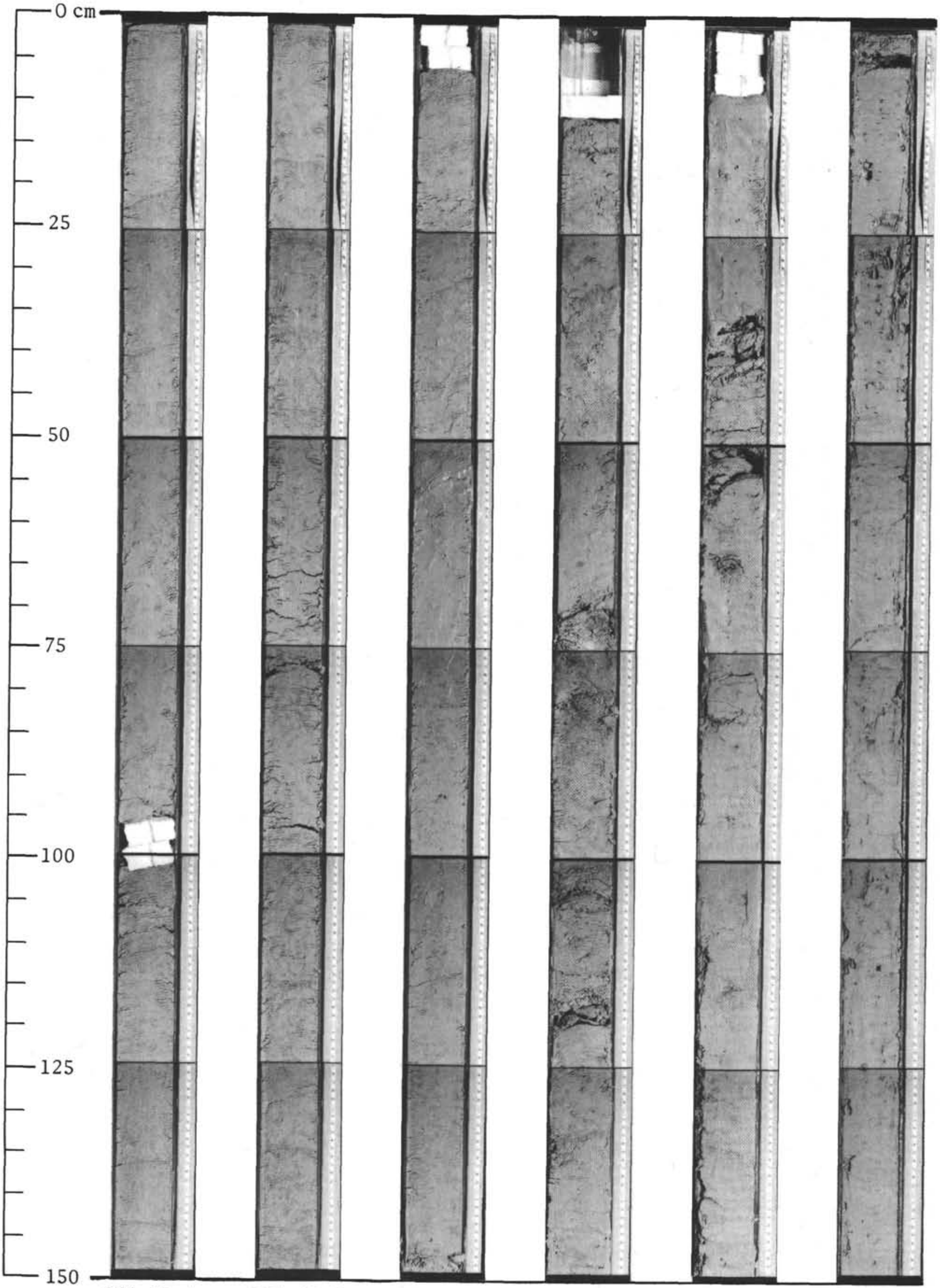
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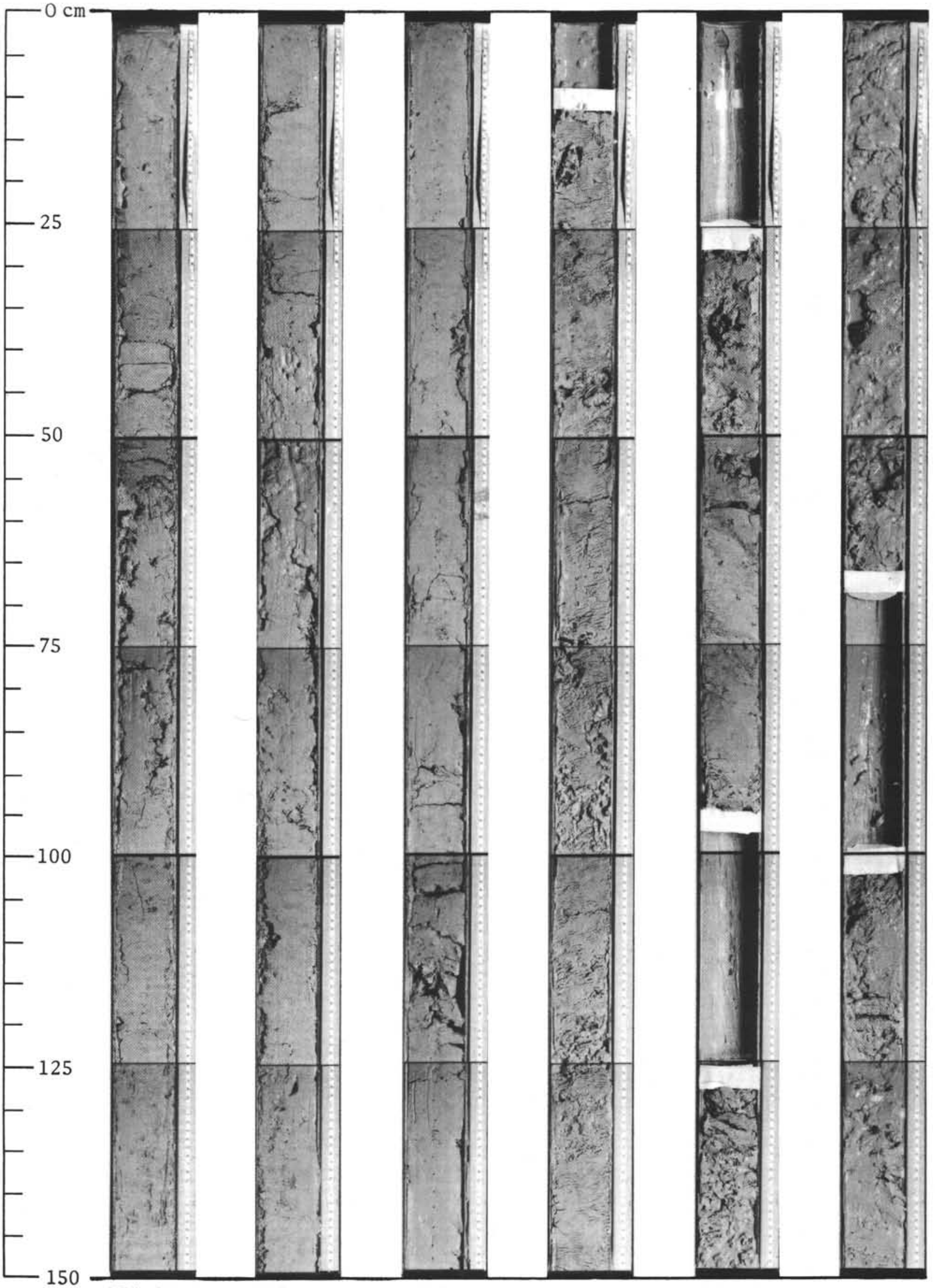
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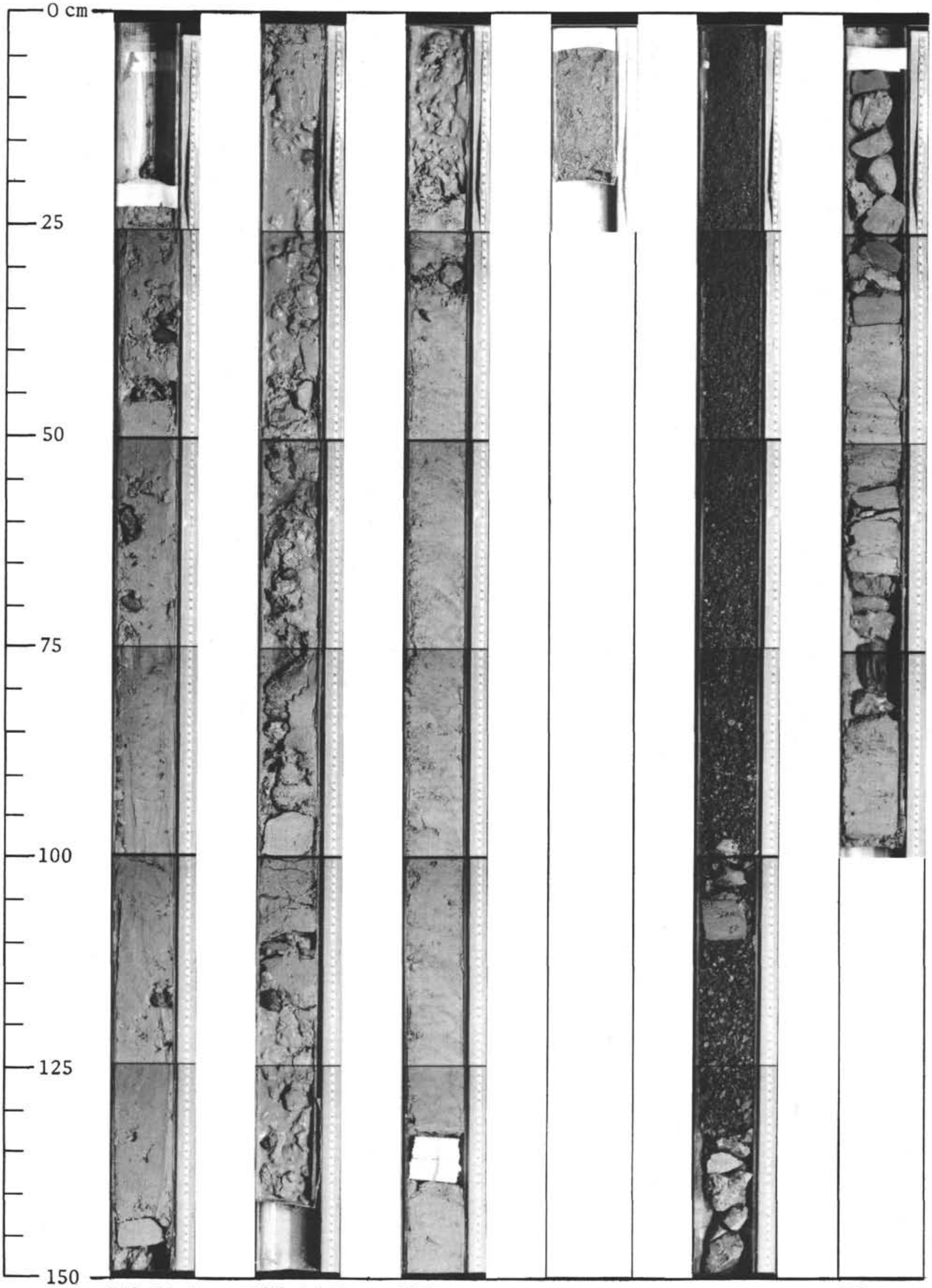
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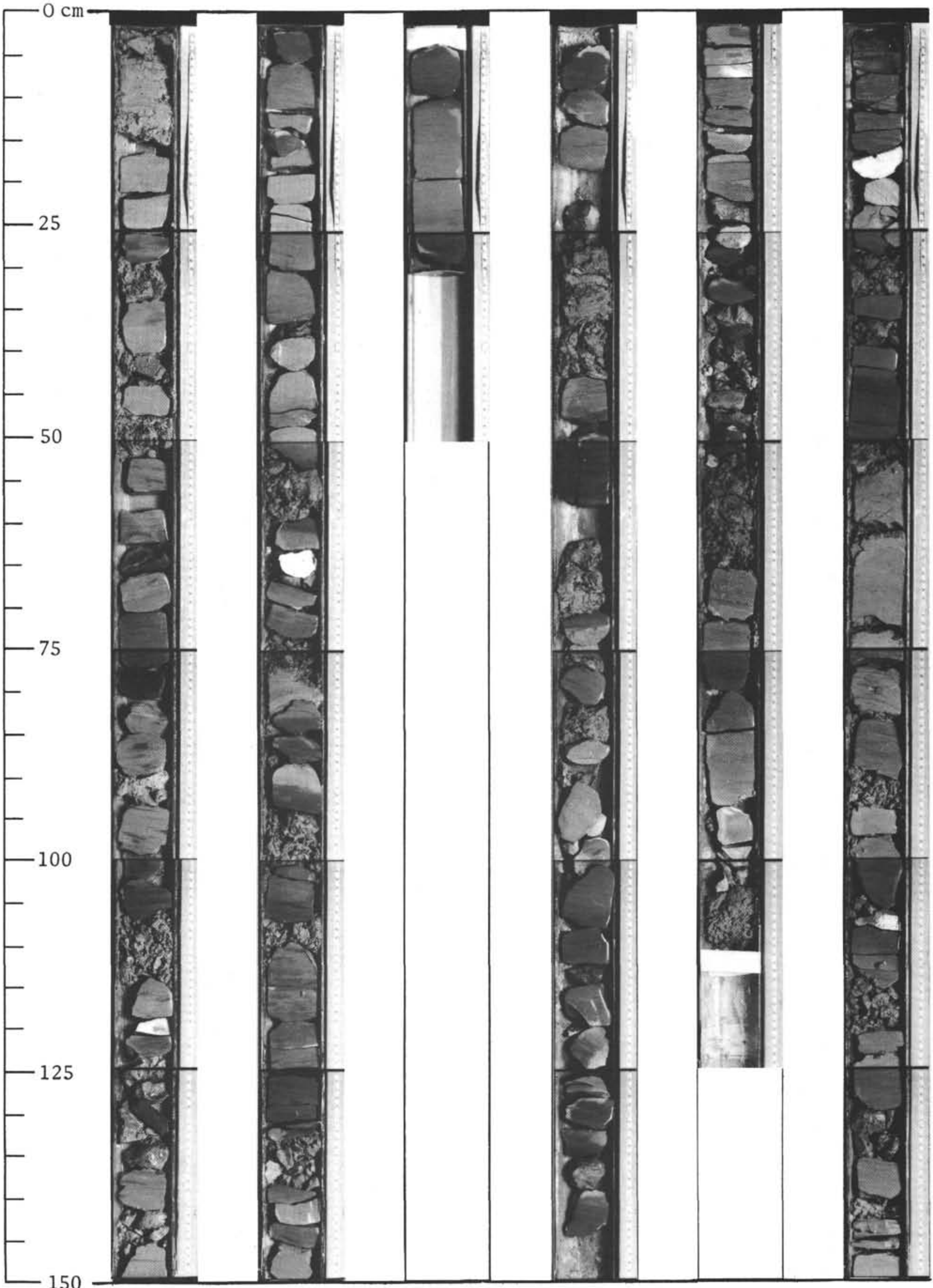
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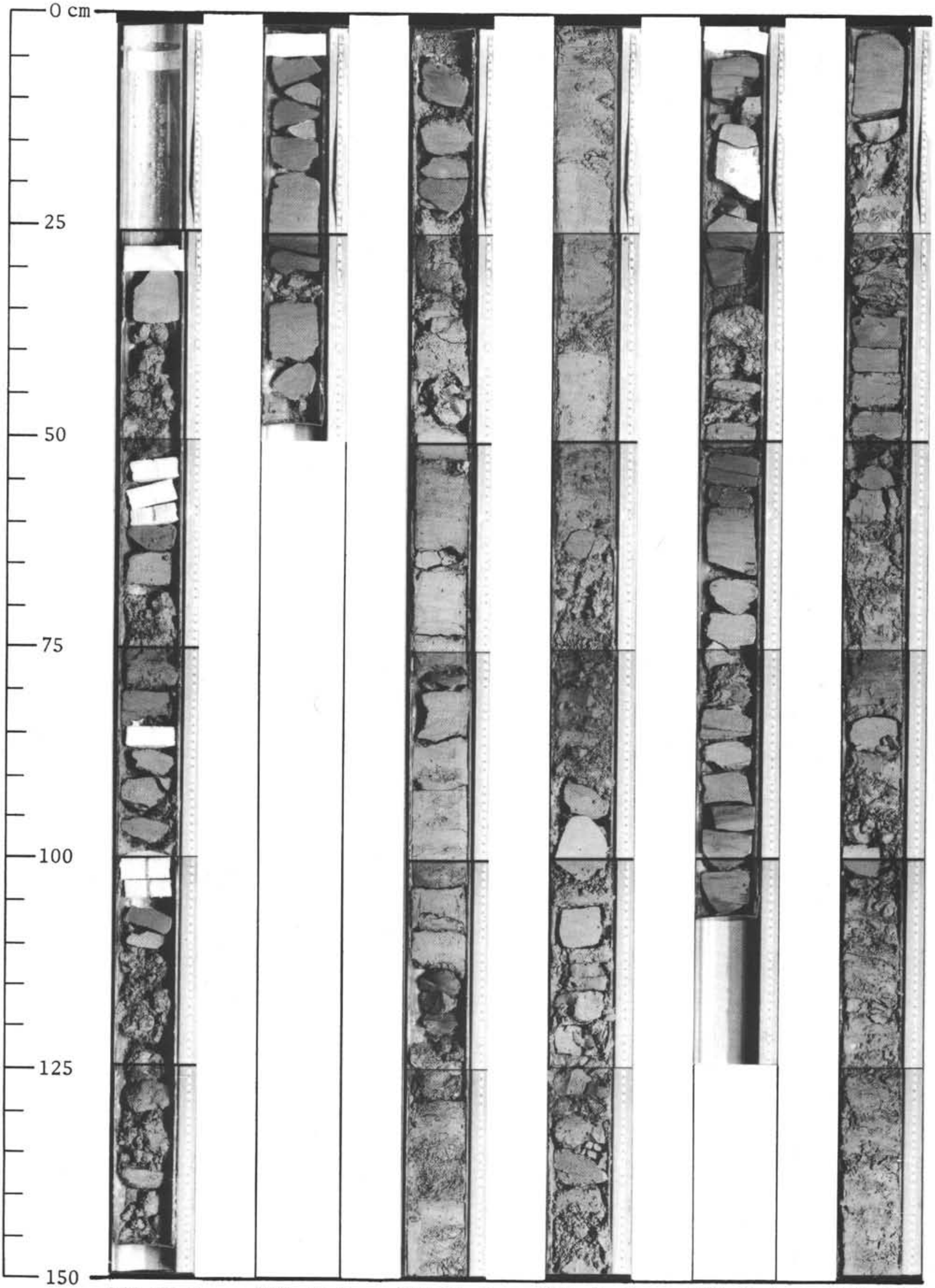
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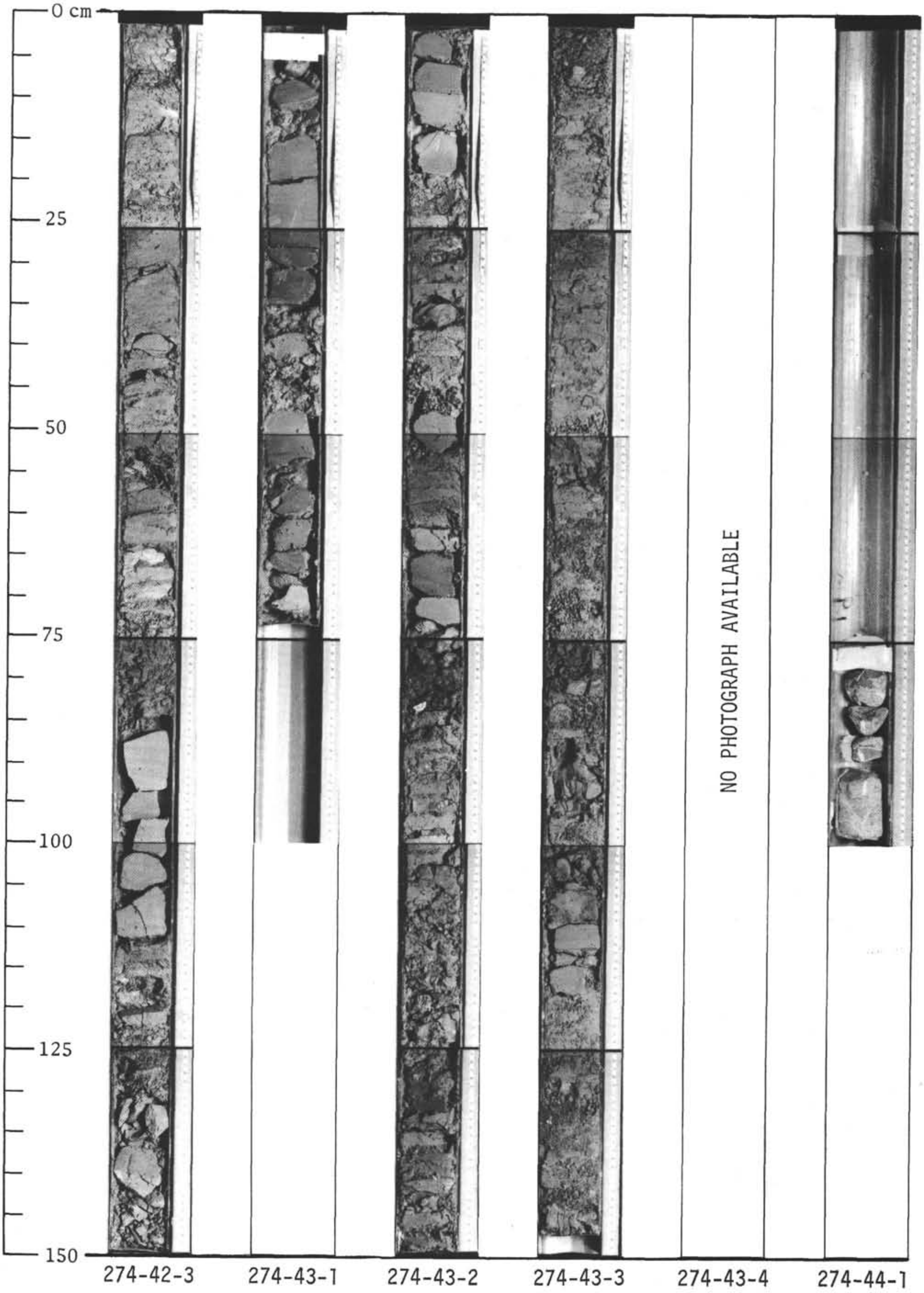
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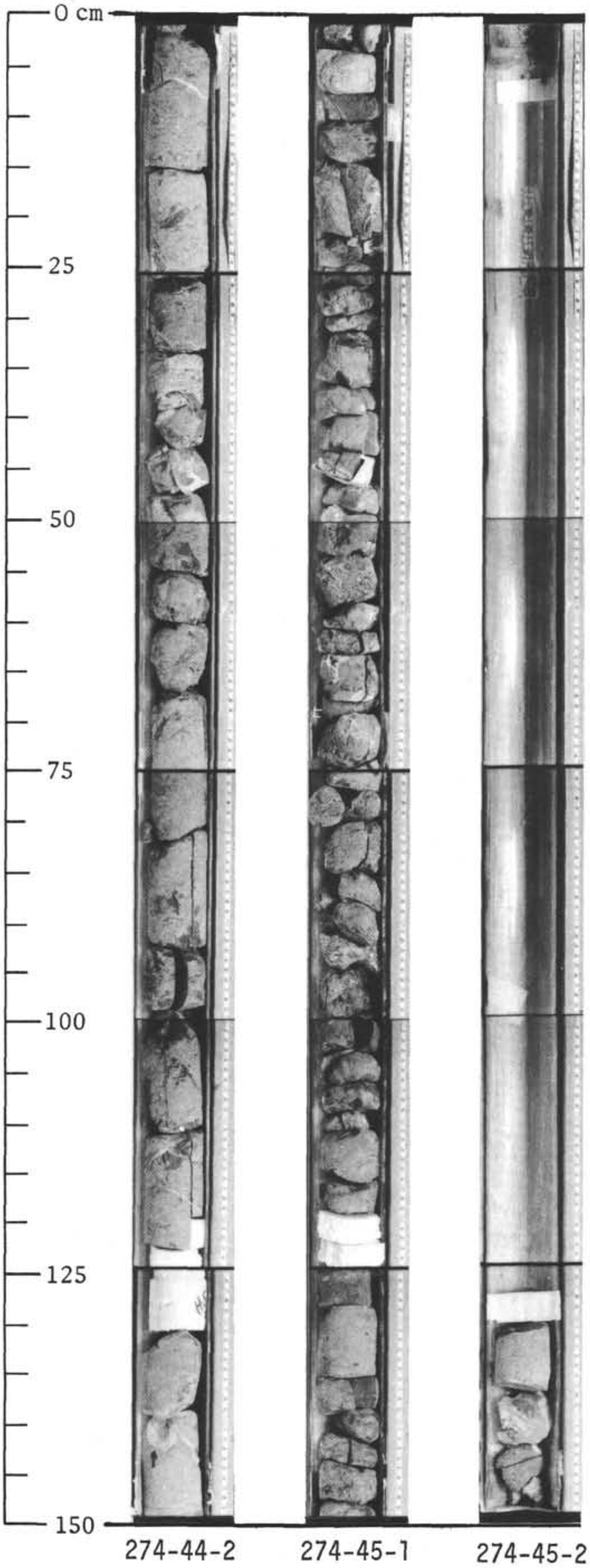
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