4. SITE 266

The Shipboard Scientific Party[1]

SITE DATA

Date Occupied: 2 January 1973

Date Departed: 4 January 1973

Position: 56°24.13'S; 110°06.70'E

Water Depth: 4167 corrected meters (echo sounding)

Water Depth (adopted): 4173 meters (drill pipe from rig floor)

Total Penetration: 384 meters

Number of Cores: 24

Total Section Cored: 219.5 meters

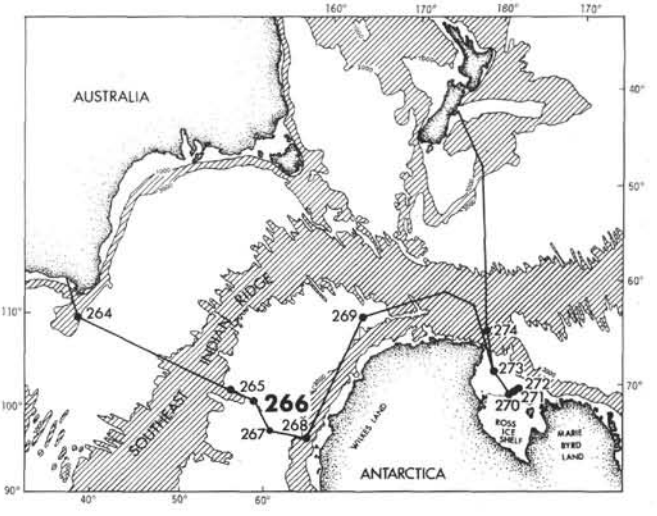
Total Section Recovered: 145.2 meters

Percentage Core Recovery: 66%

Oldest Sediment Cored:
Depth below sea floor: 370.3 meters
Lithology: Nanno clay
Age: Early Miocene

Basement:
Depth below sea floor: ~0.44 sec (reflection time)
Depth below sea floor: 370.3 meters (drilled)
Average velocity to basement: 1.64(?) km/sec
Lithology: Basalt

Principal Results: One hundred forty-eight meters of predominantly diatom ooze of Quaternary to late Miocene age grade down into 105 meters of mixed nanno ooze, nanno clay, diatom clay, and diatom ooze of late to middle Miocene age. The latter unit overlies 117 meters of nanno chalk and claystone of early Miocene/late Oligocene age. The sediments rest on basaltic glass at a subbottom depth of 370 meters, and age of the basal sediments is in good agreement with that predicted on the basis of magnetic anomaly lineations. The sedimentary sequence suggests a gradual cooling at the site from late Oligocene to the present. Ice-rafted detritus found in the upper unit confirms the existence of icebergs in this area by the late Miocene.



BACKGROUND AND OBJECTIVES

Site 266 is located on the south flank of the Southeast Indian Ridge (Figure 1) about 800 km from the ridge crest in a water depth of about 4200 meters. Magnetic anomaly lineation data indicate the age of the crust at this site is about 23-24 m.y. old (late Oligocene). Site 266 was chosen as a companion to Site 265. At Site 266 the total sediment cover is only about 0.2-0.4 sec (160-350 m) and is judged to be representative of the "normal" pattern of sediment distribution over the south flank of the ridge. The sediment is acoustically transparent (Figure 2) and is draped over oceanic layer 2, which exhibits about 500 meters of local relief. The major objective at this site was to compare the history of sedimentation here with that at Site 265, in particular, to determine if abrupt appearance of dominantly carbonate sediments sometime between mid Miocene and early Pliocene as observed at Site 265 is also reflected at this site. The most obvious possible causes include change in the depth of the lysocline (perhaps related to initiation of continental glaciation on Antarctica); a change in the depth of the site of deposition as a consequence of subsidence and lateral migration related to sea-floor-spreading processes or some combination of these processes. Using simple empirical depth-age curves as discussed by Sclater et al. (1971), we can predict that Site 266 would have been at a depth of about 3600-3700 meters during the late Miocene as compared with about 4200 meters at present.

Development of a biostratigraphic zonation of Subantarctic regions for the present back through the Miocene was also a major objective.

An additional objective was to penetrate to and sample layer 2 in order to examine its petrology, age, and magnetic properties.

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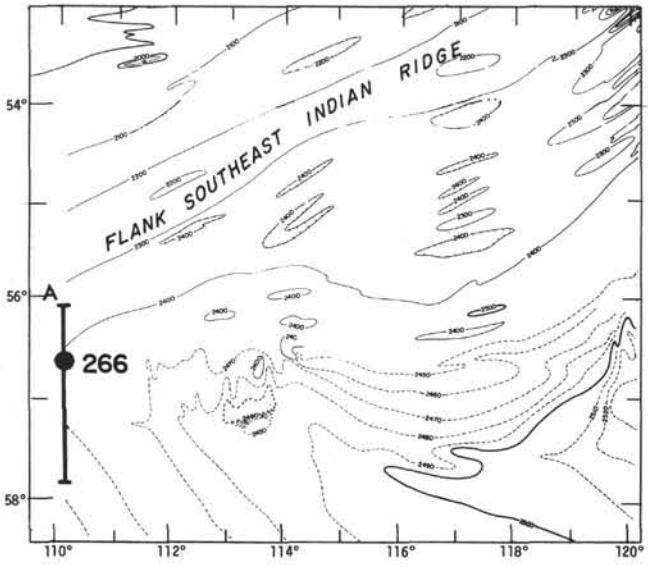

Figure 1. *Location of Site 266 and bathymetry. Contours in fathoms (corrected). Solid line shows location of* Eltanin *49 seismic profile shown in Figure 2.*

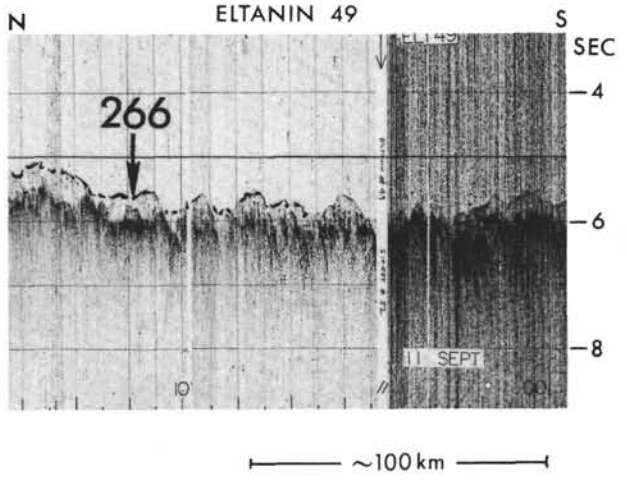

Figure 2. Eltanin *49 acoustic reflection profile across Site 266. Vertical scale in seconds of two-way reflection time. Location of profile shown in Figure 1.*

OPERATIONS

The approach to Site 266 was made on a course of 162° at reduced speed. The final site selection was made on the basis of very noisy PDR and profiler records, and the towed gear was retrieved. The ship reversed course and returned to the selected site using the PDR trace as a guide. A beacon was dropped at 0655 on 2 January 1973 in 4209 meters of water (PDR corrected for sound velocity) but failed to provide a usable signal for positioning. A second beacon was dropped at 0750 in 4167 meters (corrected) of water and dynamic positioning in the automatic mode was achieved by 0830 on 2 January.

While the bottom-hole assembly and drill pipe were being run, a sonobuoy record was obtained. The airgun was floated at about 5 ft subsurface. The records were very noisy for the first hour and ambiguous thereafter. Subbottom depth to acoustic basement was difficult to pick with confidence although a two-way travel time of about 0.44 sec seems most likely. This represented almost twice the thickness of sediments originally anticipated at Site 266.

Hole 266 was spudded in at 1730 on 2 January. Drilling with intermittent coring was carried out to a depth of 384 meters subbottom. A total of 24 cores was taken, 22 in sediment and 2 in basement (Table 1). For those in sediment, total penetration was 205.5 meters and core recovered totaled 142.9 meters for an average recovery rate of 70%. Recovery was variable, with 11 cores having better than 75% and the remainder ranging down to about 5%. The last two cores penetrated 14 meters into basement and recovered 2.3 meters of basalt.

No problems were encountered in either the drilling and coring operations or with the dynamic positioning system except for the failure of the first beacon.

The drill string and bottom-hole assembly were recovered and the rig floor secured at 1530 hr, and the ship got underway on course 226° at 1550 on 4 January 1973.

LITHOLOGY

General

Drilling at Site 266 penetrated a sedimentary sequence some 370 meters thick. The sediment overlies a probable basement of basaltic glass, which was penetrated to a subbottom depth of 384 meters. The sedimentary sequence is readily divisible into three units, based on the relative abundance of calcareous and siliceous biogenous material in each. The uppermost unit, Unit 1, consists of diatom ooze, with minor amounts of carbonate and clay; Unit 2 is made up of a mixed sequence of diatom and nanno oozes, and diatom- and nanno-rich clays; Unit 3 is dominantly nanno chalks with minor nanno claystones.

The sedimentary column ranges in age from probably early Miocene at the base to Quaternary at the top. Changes in lithology from the nannofossil-rich chalks of the early Miocene, through the mixed siliceous and calcareous oozes and clays of the mid to late Miocene, to the dominantly siliceous oozes of the Pliocene and Pleistocene, broadly document a temperature lowering through this interval, and a concurrent increase in the intensity of vertical circulation in the oceans. The presence of small quantities of ice-rafted detritus in the siliceous upper unit provides further documentation of relatively cold conditions during its time of deposition.

Details of the lithologic units recognized are given in Table 2.

Unit 1

A sequence of predominantly diatom ooze extends from the sea floor to a depth of 148.5 meters. Its base is drawn immediately above the first downhole occurrence of nanno ooze. Diatoms are the dominant biogenous component, with trace amounts of radiolarians, silicoflagellates, foraminifera, sponge spicules, and nannoplankton. The calcareous microfossils are most common

TABLE 1
Coring Summary, Site 266

Core	Date (Jan. 1973)	Time	Depth From Drill Floor (m)	Depth Below Sea Floor (m)	Cored (m)	Recovered (m)	Recovery (%)
1	2	1823	4183.0-4189.0	0.0-6.0	6.0	6.0	100
2	2	1943	4208.0-4217.5	25.0-34.5	9.5	3.2	33
3	2	2101	4227.0-4236.5	44.0-53.5	9.5	0.5	6
4	2	2220	4246.0-4255.5	63.0-72.5	9.5	5.2	55
5	2	2343	4265.0-4274.5	82.0-91.5	9.5	9.5	100
6	3	0122	4284.0-4293.5	101.0-110.5	9.5	9.5	100
7	3	0245	4303.0-4312.5	120.0-129.5	9.5	6.4	67
8	3	0350	4312.5-4322.0	129.5-139.0	9.5	8.4	88
9	3	0507	4322.0-4331.5	139.0-148.5	9.5	5.8	61
10	3	0625	4331.5-4341.0	148.5-158.0	9.5	9.5+	100+
11	3	0752	4341.0-4350.5	158.0-167.5	9.5	9.0	94
12	3	0925	4360.0-4369.5	177.0-186.5	9.5	3.5	36
13	3	1038	4379.0-4388.5	196.0-205.5	9.5	8.5	89
14	3	1225	4408.0-4417.5	215.0-224.5	9.5	5.5	58
15	3	1410	4427.0-4436.5	234.0-243.5	9.5	4.7	50
16	3	1530	4436.5-4446.0	243.5-253.0	9.5	3.0	32
17	3	1653	4446.0-4455.5	253.0-262.5	9.5	7.1	75
18	3	1830	4465.0-4474.5	272.0-281.5	9.5	7.3	77
19	3	1956	4484.0-4493.5	291.0-300.5	9.5	9.5	100
20	3	2125	4503.0-4512.5	310.0-319.5	9.5	5.5	58
21	3	2239	4522.0-4531.5	329.0-338.5	9.5	9.5	100
22	4	0021	4550.5-4560.0	357.5-367.0	9.5	5.8	61
23	4	0325	4563.0-4567.5	370.0-374.5	4.5	0.8	14
24	4	0635	4567.5-4577.0	374.5-384.0	9.5	1.5	16
Total					219.5	145.2	66

TABLE 2
Lithologic Units, Site 266

Unit	Lithology	Subbottom Depth (m)	Unit Thickness (m)	Age
1	Diatom ooze, minor micarb-bearing and clay diatom oozes	0-148	148	Plio-Pleistocene
2	Mixed nanno oozes, nanno clay, diatom ooze, diatom-rich clay	148-253	105	Middle and late Miocene
3	Nanno chalk, minor ooze and nanno claystone	253-370	117	Early Miocene to early mid-Miocene
4	Basaltic glass	370-?	?	

in the upper part of the unit; forams were observed only in Cores 1-3, but traces of nannos extend down to Core 8. Micarb is similarly confined to the upper part of the sequence, ranging from a concentration of approximately 8% in Core 1 to trace amounts in Core 4.

On the whole, clay concentrations are low throughout the sequence, although locally they become significant. No pattern in the distribution of clay-rich intervals was observed; clay concentrations of 20%-30% occur in Sections 4 and 5 of Core 5, and an isolated concentration of 85% occurs near the base of Core 9. Among material of possibly terrigenous derivation, only the clay fraction reaches more than trace quantities. X-ray analysis shows relatively high frequencies of kaolinite in Unit 1; this was absent from Unit 2. Fine quartz and feldspar (averaging less than 10μ diameter) occurs in Cores 3-9, and sand-sized detritus is present in minute amounts in Cores 1-9. Grains of quartz, microcline and pink garnet, in excess of 250μ diameter, have been identified in these cores and are probably of ice-rafted origin. The presence of angular microcline suggests derivation in part from granitic terrane. A marked increase in fine K-feldspar and plagioclase, from Core 9 upwards, as shown by X-ray analysis of bulk samples, supports such an origin for the terrigenous material. In Cores 2 and 5 augite is also present in high frequencies, as determined by X-ray methods.

Sediments of Unit 1 are poorly consolidated and soft throughout, reaching a stiff consistency only locally. No bedding is discernible. Colors are dominantly light

olive-browns, but include grayish-yellows and grayish-olives to greenish-grays. Some intervals show color grading which has a cyclic repetition; in some intervals in Cores 4, 5, and 6 the color units are olive-gray in their upper parts and grade evenly down to pale greenish-gray or light olive at the base. The units are variable in thickness, and no compositional difference between different colored regions was discernible on preliminary microscopic examination. Mottling occurs with varying intensity, due in large part to the aggregation of thread-like diatoms into clots of pale yellowish "diatom cotton." None of the mottling is interpreted as evidence of burrowing.

Sedimentation rates in Unit 1 range from 28 to 53 m/m.y. in the upper part of the sequence to 14 m/m.y. at the base.

Unit 2

This unit consists of a mixed sequence of diatom and nanno oozes and clays that form a transitional interval between the siliceous oozes of Unit 1 and the calcareous claystones and chalks of Unit 3. The unit has a maximum thickness of 104.5 meters, its top being drawn at the highest occurrence of nanno ooze in the core catcher of Core 9 (148.5 m subbottom), and its base delineated at the lowest horizon at which sediments are consistently diatom rich (top of Core 17, 253 m subbottom).

The unit is distinguished by its heterogeneity, consisting of diatom-bearing nanno oozes. It includes the lowest diatom ooze encountered in this hole (Core 12, Section 3), and the highest nanno ooze (Sample 9, CC), features which may be of paleoclimatic interest. Radiolarians, sponge spicules, and foraminifera (in Cores 13, 14, 16 only) are minor biogenic components. Sediments in which diatoms are the chief biogenic component make up 25% of the core recovered from Unit 2. Very fine quartz, feldspar, and volcanic glass occur in trace amounts.

Clay content is on the whole higher than in Unit 1, and high clay percentages occur in both nanno- and diatom-rich sediments. The distribution of clay-rich sediments in the unit is highly erratic, and clay content fluctuates widely over short intervals; for example, in Core 16, clay content drops from 70% to 80% to a trace amount across a color boundary spanning a 10-cm interval. The diatom content also drops across this boundary, whereas nannofossils increase to dominance. Similar changes occur within Sections 2 and 3 of Core 14, and in Sections 5 and 6, Core 13, with the clay-rich intervals becoming richer in diatoms. This suggests that some high clay percentages may be associated with removal or nondeposition of nannofossils; whether such a process is diagenetic or syngenetic is not yet known. However, high clay content also occurs in association with high nanno content in other core sections, so that further X-ray determinations are required to identify the clay minerals before an interpretation of their origin can be made. X-ray analyses to date show a marked drop in the proportion of montmorillonite in this unit, by comparison with Unit 1; additionally, the unit lacks kaolinite, but chlorite is consistently present.

Colors are variable throughout Unit 2. Very pale oranges to grayish-oranges predominate. In general, the nanno-rich sequences are palest in color, ranging from yellowish-gray through pale orange to pinkish-gray; diatom-rich clays tend to be darker and fall within a yellowish-brown to olive-gray range. Slight to moderate mottling is common in all lithologic types. A single interval, 10 cm thick, in Section 2 of Core 13 showed evidence of burrowing. Pale greenish-gray mottling in pale brown clays and nanno oozes of Cores 14 and 15 is probably due to patchy reduction zones of diagenetic origin. The consistency of the sediments ranges from soft to stiff, with nanno oozes being generally firmer than diatom-rich intervals, and the sediments becoming increasingly coherent with depth. The only indication of bedding is that suggested by color changes, but these do not always represent significant changes in composition.

Sedimentation rates in Unit 2 average 10 m/m.y.

Unit 3

Unit 3, the lowest sedimentary unit in the sequence, is approximately 117 meters thick, measured from the lowest sampled limit of diatom-rich intervals (base of Core 16, 253 m subbottom) to the basalt (top of Core 23, 370 m subbottom). The unit shows greater homogeneity than Units 1 and 2, consisting predominantly of nanno ooze and chalk. Diatoms generally decrease in abundance with increasing depth; in Unit 3 they are present in trace amounts only, with the exception of higher concentrations in clay-rich intervals in Cores 18 and 19. Foraminifera are present, in trace amounts only, in Cores 19 to 22.

Clay is the only component of possibly terrigenous origin in Unit 3, and its distribution is irregular. One high clay percentage (55%) in Section 3 of Core 18 is associated with a high diatom/low nanno count and is thus similar to the common clay associations of Unit 2. Other high clay concentrations occur in Section 2 of Core 16, where $CaCO_3$ is as low as 8%, and in Sections 2, 3, and 5 of Core 19, and Sections 5 and 6 of Core 21. These are associated with high nanno/low diatom frequencies, so are presumably of different origin.

This unit shows greater homogeneity in color than the younger units. Light brownish-grays to light grays, with some pale greenish-grays predominate in Cores 17-20, with rare clay-rich intervals deepening to yellowish-brown. In Cores 21 and 22 pale to very pale orange hues predominate. Mottling is slight throughout, although one zone of very distinct burrowing occurs in Core 20, Section 4, where tubes 3-4 mm wide are infilled with bluish-white chalk. The sediments of Unit 3 are mostly semilithified, with the degree of lithification increasing downwards. Soft to stiff nanno oozes are present in Core 17, but a progressive increase in lithification becomes evident in Sections 3 to 5 of Core 18. Lithification is patchy but distinctive in this core, with semilithified intervals 5-10 cm thick alternating with stiff oozes. These hard, chalky intervals increase in thickness and frequency downwards to Core 19, where chalk predominates. The cohesiveness of the chalks increases through Cores 21 and 22, although at no point could they be regarded as more than semilithified.

Sedimentation rates range from 3 m/m.y. in the top half of Unit 3, to 63 m/m.y. below Core 19.

Unit 4

The lowest unit penetrated probably represents the top of the oceanic basement, and was encountered at 370 meters subbottom, in Core 23. Although the unit was penetrated to a depth of 14 meters, only a little over 2 meters of core were recovered.

The unit consists of hard, dull blue-black, mostly devitrified, basaltic glass. Rare fragments show black vitreous surfaces with conchoidal fracture. Vesicles and amygdules are developed at intervals, showing a particularly dense development between 25-85 cm in Core 24, Section 1. The cavities are 2-3 mm in diameter, and partially or completely infilled with white crystalline calcite, or with an unidentified yellow (?zeolitic) mineral. Microscopically, the rock consists of devitrified glass with prominent spherulitic texture. Phenocryst development appears to be completely absent.

It seems likely that the section penetrated represents the top of a flow, although the igneous/sedimentary contact was not observed. Section 4 of Core 22 contained fragments of probable basaltic glass up to 1 cm in diameter, but these were recovered from an interval of drilling breccia, so that nothing of their relationship to the overlying chalks could be discerned. The chalks, however, show no obvious signs of recrystallization or other alteration features, so the contact with the basaltic glass below is assumed to be sedimentary. Sediments recovered from around the basalts of Core 23 appear to be drilling sludge, consisting of varicolored fragments of chalk and claystone less than 0.5 cm in diameter, in a soft, plastic, diatom-rich nanno clay. The chalk and claystone fragments closely resemble the lithologies of Cores 21 and 22, so the possibility that they are uphole contaminants cannot be ruled out.

PHYSICAL PROPERTIES

Bulk-density determinations were obtained on nearly all cores using both syringe samples and the GRAPE technique. The syringe samples also provided porosity measurements. These data, together with sonic velocity observations, have been plotted (Figure 5).

The lithologic column is similar to that found at Site 265 and this similarity extends to the physical properties as well. From the surface of the sediment to the base of the diatom ooze at nearly 150 meters, porosity decreases from about 90% to 80%. Associated with this porosity decrease is an increase in wet bulk density of between 0.10 and 0.15 g/cc. Superimposed on this overall trend are smaller-scale variations which in many cases appear to correlate with varying amounts of clay and nannofossil content of the diatom ooze. Sonic velocities in the same interval (measured across the unsplit cores) vary between 1.46 and 1.50 km/sec with no obvious systematic trend.

From 150 meters subbottom to basaltic basement the predominant sediments are nanno oozes and clays. Porosities in these sediments range between 65% and 70%, while wet bulk densities vary generally between 1.50 and 1.70 g/cc. Sonic velocities in this interval remain between 1.45 and 1.50 km/sec down to 300 meters subbottom. Below this level nanno chalks and claystones are encountered and the measured velocities increase to a maximum of about 1.60 km/sec.

Several sonic velocities were obtained on basalt samples from Cores 23 and 24. Values ranged from 4.95 to 5.95 km/sec with a spread of some 0.6 km/sec for several measurements in different directions on a single fragment.

Alkalinity, *p*H, and salinity data are summarized in Figure 3. Alkalinity is lower than at Site 265, with a mean of 3.08 meq/kg, consistent with the general trend of lower alkalinity values for lower rates of deposition. Alkalinity is higher in the diatom ooze (mean 3.45 meq/kg) than in the clayey nanno oozes in the lower part of the section (mean 2.75 meq/kg). *p*H and salinity fluctuate slightly throughout the hole, but show no distinctive trends.

BIOSTRATIGRAPHIC SUMMARY

Foraminifera, nannofossils, radiolarians, and diatoms occur together in the section at Site 266. Foraminifera are sparse and occur sporadically, and considerable parts of the section (Cores 4-12, 15, 17, and 18) are barren. Nannofossils are absent from Cores 1 through 6, but are common to abundant below this interval. Radiolarians are common in post-Miocene sediments but are rare and poorly preserved in the remainder of the section. The most continuous and detailed biostratigraphic record for this site is provided by the diatoms, which occur commonly throughout Cores 1-17; below this interval, however, preservation is poor and abundance is reduced to trace amounts, making age determination difficult.

Precise age determinations on the basis of any single fossil group or on combinations of various groups are characterized by a great deal of uncertainty. The calcareous assemblages lack diversity, and taxa used for zonal definition in lower-latitude sequences are absent. Maximum biostratigraphic resolution by means of these groups is presently only at the series level, and conflicts exist with age determinations based on the siliceous groups (e.g., Cores 7-11 on the basis of nannofossils are tentatively assigned to the middle Miocene while the diatom determination for this interval is upper Miocene or lower Pliocene). Conflicts such as these are probably a result of our present lack of knowledge concerning high-latitude planktonic biostratigraphy.

Assuming more-or-less continuous deposition at Site 266, the diatoms provide the most coherent sequence of ages for this site. On this basis, Cores 1 through 3 are Pleistocene, Cores 4 through 7 are definitely Pliocene, the Miocene/Pliocene boundary occurs somewhere in the interval of Cores 8-11, the upper/middle Miocene boundary falls between Cores 12 and 13, and the middle Miocene is present at least down to Core 16. The best consensus of all fossil groups is that the base of the section at Site 266 is of early Miocene age.

In general, the lack of diversity of calcareous assemblages indicates a high-latitude depositional environment, especially in the upper part of the section

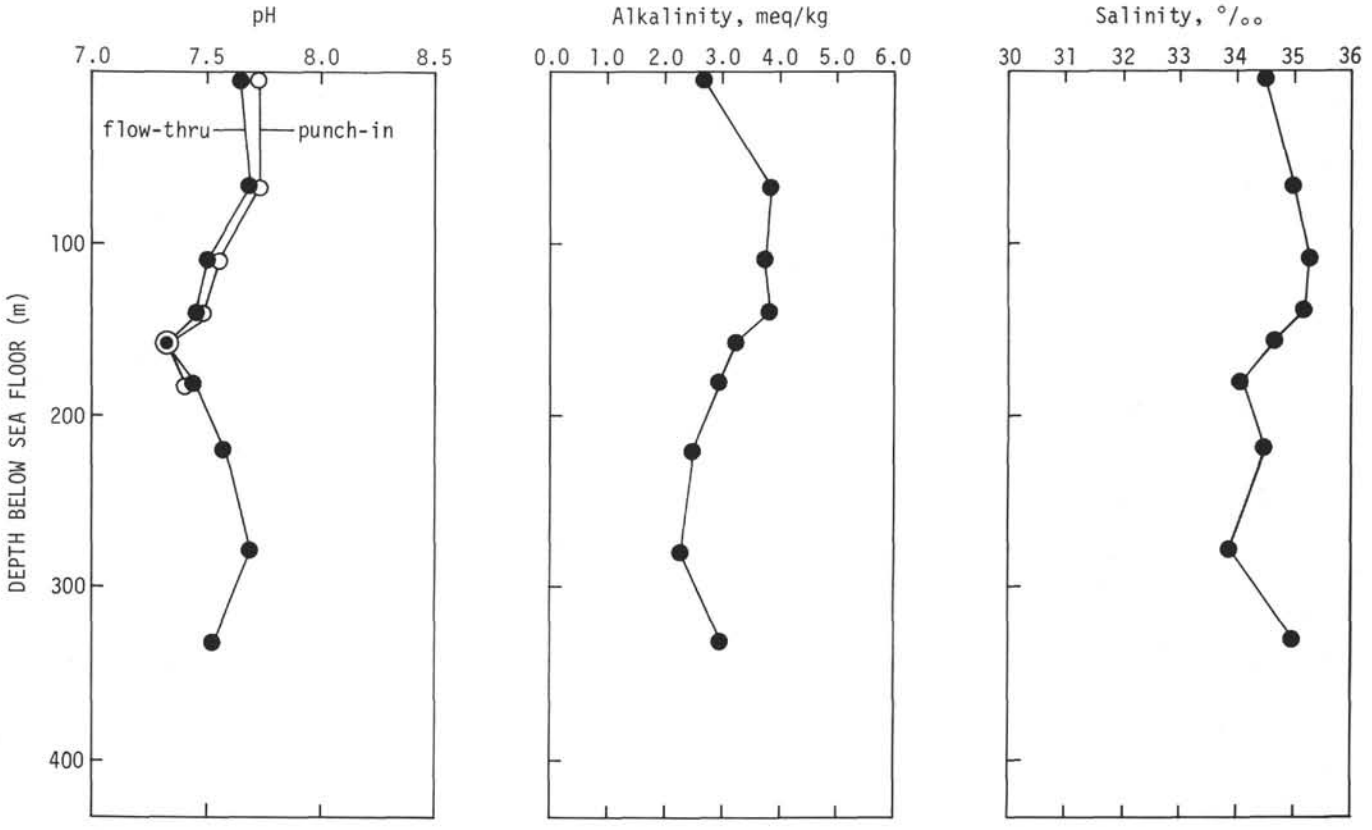

Figure 3. *Shipboard measurements of* pH, *alkalinity, salinity of sediment pore waters at Site 266.*

(Cores 1-11). A more equable environment (cool subtropical) is indicated for Cores 12-23 by the presence of well-preserved *Discoaster* spp. Thus, the major change in environment from cool subtropical to Antarctic (origin or northward shift of Antarctic Convergence?) seems to have taken place in the late Miocene or at the Miocene/Pliocene boundary.

Foraminifera

Planktonic foraminifera are scarce throughout the sediments at Site 266 and for a considerable interval (Cores 4-12) they are absent. All assemblages are of very limited diversity, in no case comprising more than two species. This is undoubtedly due to the high latitude of Site 266, but may also be a result of selective dissolution, especially in older parts of the section, where mid-Tertiary assemblages consist of the single species *Catapsydrax unicavus*.

Cores 1 through 3 contain sparse populations of left-coiling *Globorotalia pachyderma*, indicating upper Miocene or younger sediments. Below this, and down to Core 12, the section is barren of planktonic foraminifera. Cores 13 and 14 contain an assemblage dominated by a species of *Globorotalia* that appears to be very closely related to *G. zealandica*, and may be a high-latitude variety of this species. Thus, the sediments of these cores are of either latest early Miocene or earliest middle Miocene age. Associated with *G. zealandica s.l.* in Core 13 is *Globorotaloides suteri* (one specimen seen). The *G. zealandica s.l.* association is separated from underlying faunas by a barren interval in Core 15.

Core 16 contains a sparse fauna of *Catapsydrax dissimilis* and *Globigerina* sp. (probably *G. woodi*). The presence of the latter species indicates an age not older than earliest Miocene (Waitakian stage).

The oldest fauna encountered at Site 266 is separated from the above assemblage by a barren interval in Cores 17 and 18. This fauna consists of the single species *Catapsydrax unicavus*, which indicates an age of upper Oligocene or lower Miocene. A more refined age determination cannot be made for this interval.

Nannofossils

Site 266 cored a Recent to lower Miocene section similar in microfossil content to Site 265. The uppermost cores (1 to 9) were predominantly siliceous oozes lacking nannofossils. Only one horizon (1-4, 90 cm) containing nannofossils was found and this contained only a few specimens of *Cyclococcolithus leptoporus* and a small *Gephyrocapsa* species.

The lower cores (9 to 23) contained a greater number of moderately well-preserved nannofossils.

The brown siliceous oozes in Cores 9 to 11 generally contain a small number of nannofossils. Assemblages are small, and usually poorly preserved although a few good specimens can be found. In Cores 12, 13, and 14 there was an increase in the number of nannofossils and in Cores 15 to 22 nannofossils were common in the sediments. The assemblages of Cores 12 to 23 were different from the sediments seen in Site 265 and characteristically contained well-preserved *Discoaster* sp., suggesting sediment formation in cool subtropical

water. Placolith species commonly present in this site include: *Coccolithus pelagicus*, *Cyclococcolithus leptoporus*, *Reticulofenestra pseudoumbilica*, *Discoaster stellulus*, *Cyclicargolithus floridanus*, *Coccolithus miopelagicus*. *Discoaster deflandrei* and *D. variabilis* were the major *Discoaster* species present but small numbers of *Discoaster pentaradiatus*, *D. pansus*, *D. brouweri*, *D. calcaris*, *D. torulus*, *D. asymmetricus*, *D. exilus*, *D. obtusus*, *D. calculosus*, *D.* cf. *druggi*, and *D. trinidadensis* were found. The *Sphenolith* species *Sphenolithus dissimilis* and *Sphenolithus belemnos* were also commonly present. Occasional reworked specimens of *Reticulofenestra bisecta*, *Discoaster lidzii*, and *Reticulofenestra umbilica* were also present.

These species allowed the sediments to be biostratigraphically subdivided as follows: Pleistocene to Pliocene: Sample 1-1, 60 cm to Sample 9-2, 63 cm; lower Pliocene: Sample 9-3, 64 cm to Sample 9-4, 148 cm; upper Miocene: Sample 10-1, 60 cm to Sample 12-2, 130 cm; middle Miocene: Sample 12-3, 39 cm to Sample 17-1, 100 cm; lower Miocene: Sample 17-2, 41 cm to Sample 22-4, 115 cm.

Radiolaria

Radiolaria are common to abundant and well preserved in all of the sediments of post-Miocene age, and few to common, and well preserved in the sediments of Miocene age.

The Miocene/Pliocene boundary is found between Cores 9 and 10. Radiolarian zones represented are: Cores 1-3, the *Saturnalis circularis* Zone; Core 4, the *Eucyrtidium calvertense* Zone; Cores 5-9, the *Holotholus vema* Zone; Core 10, the *Theocalyptra bicornis spongothorax* Zone; Core 11 to Core 12, Section 3, the *Antarctissa conradae* Zone; Core 12, Section 4 to Sample 12, CC, the *Actinomma tanyacantha* Zone; Cores 13-16, the *Calocyclas disparidens* Zone; Core 17, the *Spongomelissa dilli* Zone; Core 18, Sections 1 to 3, the *Eucyrtidium punctatum* Zone; Core 18, Section 4 to Core 20, Section 2, the *Lophocyrtis rexipileus* Zone; and Core 23, Section 3 to Core 23, Section 1, the *Cyrtocapsella tetrapera* Zone.

Core 23, Section 1 and Core 22, Section 3 contain some downward reworked upper Miocene Radiolaria. Other sections show no sign of upward or downward reworked Radiolaria. A small hiatus or a compressed section, indicated by the lack of transitional forms of an evolutionary lineage between *Antarctissa conradae* and *Antarctissa strelkovi*, may be present between Cores 9 and 10. The *Antarctissa denticulata* Zone and *Stylatractus universus* Zone are not present at the top of this hole.

Diatoms

Diatom abundance and preservation is best in Cores 1 through 10. Below this point it worsens, but is sufficient for stratigraphic purposes.

Cores 1 through 2-3, 30 cm contain the *Coscinodiscus lentigenosus* Zone. Sample 2, CC through Core 4 contain a portion of the *Coscinodiscus elliptipora/Actinocyclus ingens* Zone. Cores 5 and 6 contain a portion of the *Nitzschia interfrigidaria* Zone. Core 7 through Sample 7 CC contain a portion of the *Nitzschia praeinterfrigidaria* Zone. Sample 8-1, 55 cm through 10-1, 0 cm contain the *Denticula hustedtii* Zone. Samples 10-1, 90 cm through 12, CC contain the *Denticula hustedtii/Denticula lauta* Zone. Core 13 through Sample 15-3, 60 cm contain a portion of the *Denticula antarctica/Coscinodiscus lewisianus* Zone. Samples 16-1, 90 cm through 16, CC contain the *Denticula antarctica* Zone. Core 17 through Sample 18-2, 60 cm contain the *Denticula nicobarica* Zone. After Sample 18-3, 60 cm is the *Coscinodiscus* sp. Zone to Core 24.

Silicoflagellates

Silicoflagellates are abundant to common and well preserved in the upper 147 meters of post Miocene sediments (Cores 1 to 9), but are not as well preserved and are either rare to common or entirely absent in the basal 223 meters of Miocene sediment.

Within the upper 100 meters, the only zonal boundary that can be recognized, indistinctly, is the base of the *Distephanus speculum* Zone A (between 4-3, 120 cm and 4-4, 120 cm). The base of the *Distephanus speculum* Zone B is within the drilling gap at 110 to 121 meters (between 6, CC and 7-1), and the base of the *Distephanus boliviensis* Zone is at 135 meters (between 8-4, 47 cm and 8-4, 120 cm). The *Dictyocha aspera* var. *pygmaea/Dictyocha fibula* var. *pumila* Zone base is at 138.5 to 139.5 meters (between 8-6, 125 cm and 9-1, cm). The *Dictyocha pseudofibula* Zone is not present at Site 266, however, its absence is probably due to a climatically controlled latitudinal restriction of the marker species and is not a result of an unconformity. The Pliocene/Miocene boundary and the base of the *Mesocena diodon* Zone are not represented and must occur in the unrecovered sediment interval (9-5 and 9-6) between 144.5 and 149 meters. An interval barren of silicoflagellates extends from 150 meters to the top of the *Mesocena circulus* Zone which is at approximately 159 meters (between 10-6, 82 cm and 11-1, 60 cm), the base of the zone is at 162 to 163 meters (between 11-3, 90 cm and 11-4, 40 cm). The base of the middle Miocene *Dictyocha mutabilis* Zone occurs in the uncored interval at 205 to 215 meters (between 13-6 and 14-1), and the base of the *Distephanus longispinus* Zone is at 257-258 meters (between 17-3, 62 cm and 17-4, 60 cm). The middle/lower Miocene boundary and the base of the *Corbisema triacantha* Zone occurs in the uncored interval from 279 to 292 meters (between 18-5 and 19-1). The base of the *Naviculopsis navicula* Zone is at 299 to 311 meters (between 19-6, 62 cm and 20-1, 60 cm); the base of the *Naviculopsis regularis* Zone is at 315 to 330 meters (between 20-4, 64 cm and 21-1, 61 cm); and the base of *Naviculopsis robusta* Zone is below 370 meters (23-1, 35 cm).

Palynology

Samples from Cores 4, 5, 6, 8, 9, 10, 11, 13, 14, 16, 17, 18, 19, 20, 21, and 22 were macerated and examined for palynological remains. All except Core 9 proved barren, possibly due to excessive dilution of organic-walled microfossils by diatoms and nannoplankton. Relatively rapid sedimentation rates for much of the sequence do not suggest that the absence of palynomorphs is due to

oxidation during deposition. A clay-rich interval in Sample 9-3, 63-65 cm yielded very rare dinoflagellates of the genus *Leptodinium*, which could not be identified to species, plus smooth and spinose acritarchs. Very fine woody fragments in this core residue suggest an unusually high terrigenous contribution.

SUMMARY AND CONCLUSIONS

Site 266 is located on the south flank of the Southeast Indian Ridge in a water depth of 4173 meters, lying about 800 km from the ridge crest and roughly 290 km south of Site 265. A major objective at Site 266 was to determine the sedimentation history at moderately high latitude (56°) by sampling a sequence of typical thickness (0.44 sec based on poor sonobuoy data). The most valuable outcome of drilling at Site 266 was the recovery of sediments containing assemblages of all the major microfossil groups back to at least the early Miocene, thus facilitating cross-correlation at other sites. Siliceous microfossils, particularly silicoflagellates, allow good zonation of the upper part of the sequence, calcareous nannofossils are well developed in the lower sequence, and diatoms provide a tie across the intervening strata. Correlation between the seismic profile and the sectin cored at Site 266 is shown in Figure 4.

The pelagic sediments at Site 266 resemble those at Site 265 in consisting of an upper diatom-rich section (Unit 1) of Pliocene and younger age, and a lower one (Unit 3) rich in calcareous nannofossils (early to late Miocene). They differ in that a well-developed transition zone of mixed lithologies (Unit 2) intervenes between the two principal sediment types. Although the mixed zone totals 105 meters in thickness, the zone encompassed by the highest observed nannofossil ooze and the lowest diatom ooze is only about 31 meters thick (between Core 10, Section 1 and Core 12, Section 2). On biostratigraphic determinations and interpolation of the sedimentation rate between Cores 9 and 16, the age of this segmented interval is 4 to 8 m.y. The change from carbonate to siliceous sedimentation at Site 266 which may be climatically significant appears somewhat older than the same change at Site 265 (~5 m.y.). If the highest occurrence of *Discoasters* at Site 266 is taken to mark the time when relatively warm surface water disappeared, then this change occurs within Core 12, corresponding to an interval of about 7.5 to 8.5 m.y. ago. The transition from generally warmer conditions toward cooler ones of the more recent Neogene (as recorded in the sediments) seems to have been an extended one, beginning in the middle Miocene (Core 14) with the appearance of significant numbers of diatoms and

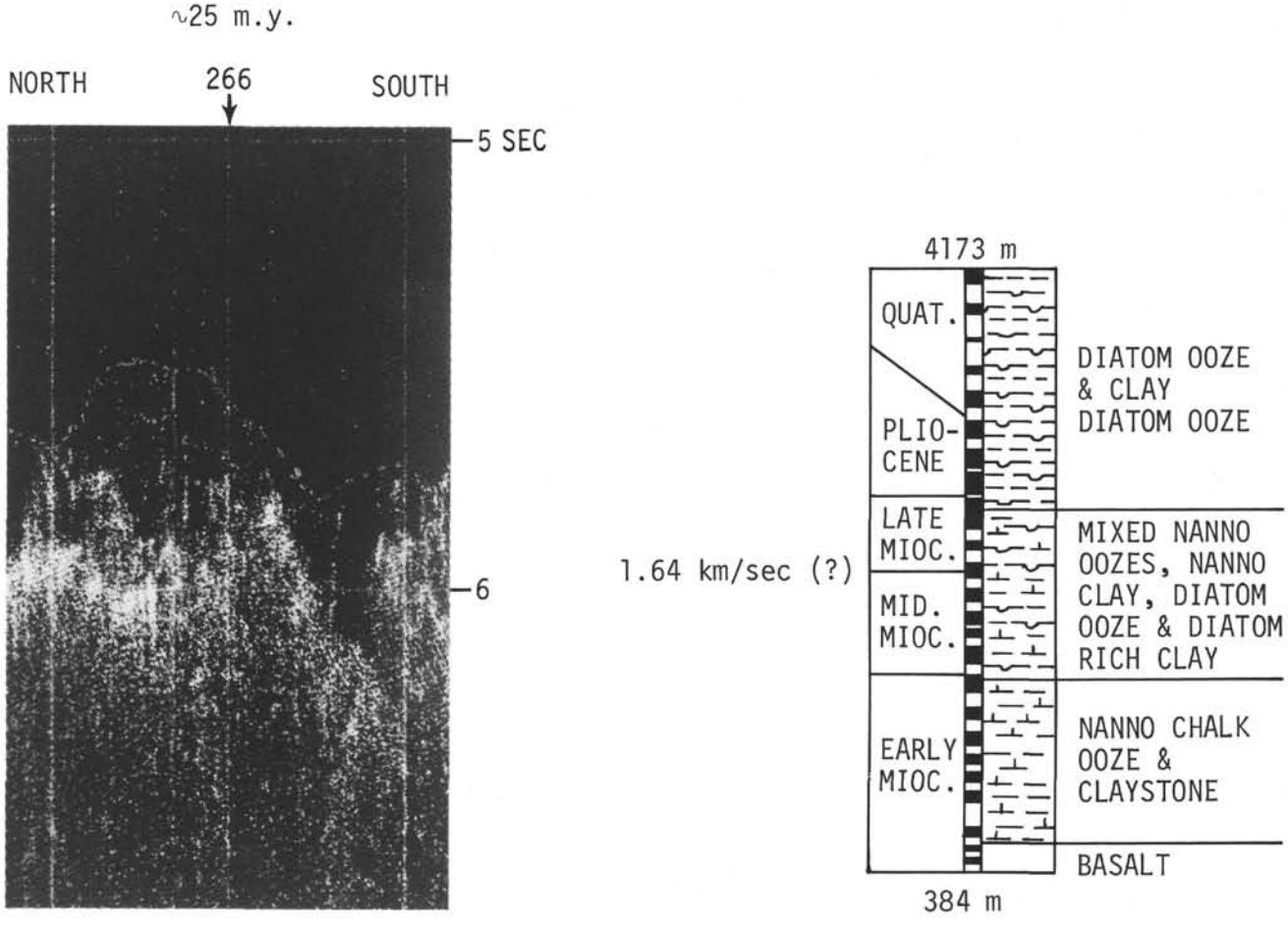

Figure 4. *Comparison of* Eltanin *49 seismic profile at Site 266 and the drilled section.*

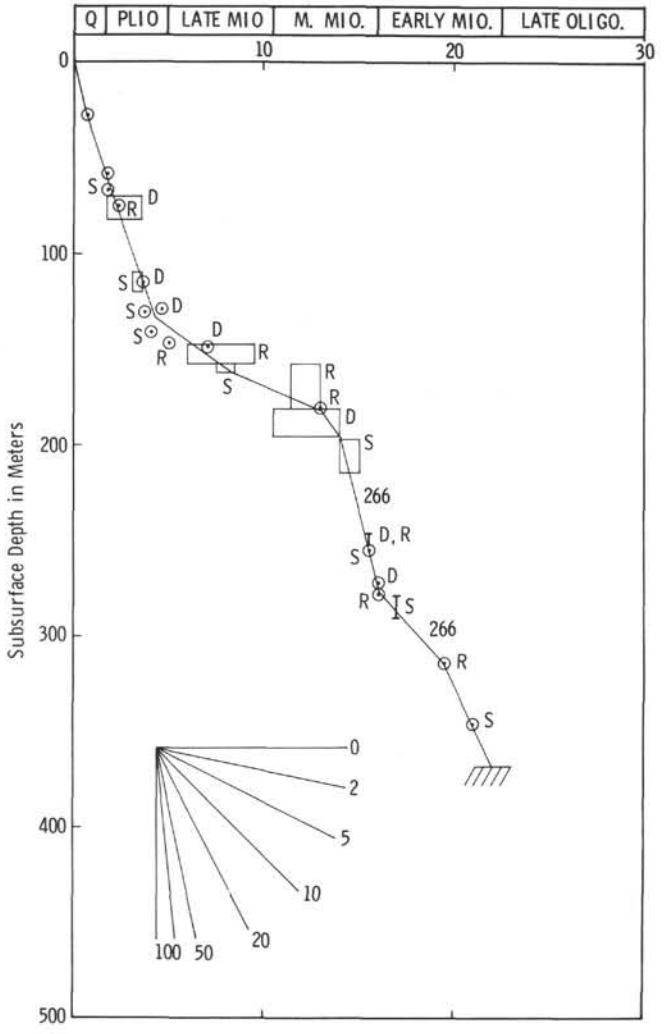

Figure 5. *Age vs. depth at Site 266.*

culminating in the latest Miocene or earliest Pliocene (Core 10) with the virtual disappearance of calcareous nannofossils.

Another guide to climatic conditions at this latitude is the occurrence of ice-rafted coarse sand, which is found in small amounts from the surface sediments down to Core 10, at the top of the carbonate/siliceous transition zone. Below this level, coarse sand was not detected in the sediment, reflecting an absence or much lower abundances of sand. The independent evidence from paleontology for warmer conditions prior to Core 9 deposition, together with the lack of sand in the older sediments, indicate that any icebergs derived from Antarctica before the latest Miocene-earliest Pliocene either must have melted completely before reaching the latitude at Site 266 or followed drift tracks elsewhere.

Diatomaceous sediments and subsidiary fine-grained detrital deposits of Unit 1 accumulated at rates averaging about 30 m/m.y. (range ~14-53 m/m.y.), within the range of accumulation rates known from study of diatomaceous sediments in *Eltanin* piston cores, but in marked contrast with the higher rates at Site 265. In the transition zone (Unit 2), where the detrital component is the most abundant, the accumulation rate is quite low (11 m/m.y.) and in the calcareous Unit 3, where detrital material is intermediate in abundance, the sedimentation rates are moderate, averaging about 20 m/m.y. Thus, clay-and-silt abundance seems to be a reliable inverse indicator of accumulation rate among the variable lithologies at Site 266. No unconformities have been detected in the apparently complete sequence at Site 266.

Bluish-black basaltic glass was cored below the sediments. Devitrification is advanced and phenocrysts appear to be completely absent. Common vesicles and amygdules, the latter showing calcite infilling, indicate that the glass represents the top of a basaltic flow. The lack of recrystallization effects in the overlying chalks suggests that they were deposited on the basalt. The oldest sediments (Core 23) are dated as earliest Miocene on calcareous nannofossils (19-22.5 m.y., Zones NN-1, NN-2). This age is only slightly younger than that deduced from magnetic anomalies for the age of the oceanic basement (23-24 m.y.), and it seems likely that the initial sediments deposited here began to accumulate shortly after formation of the basalt.

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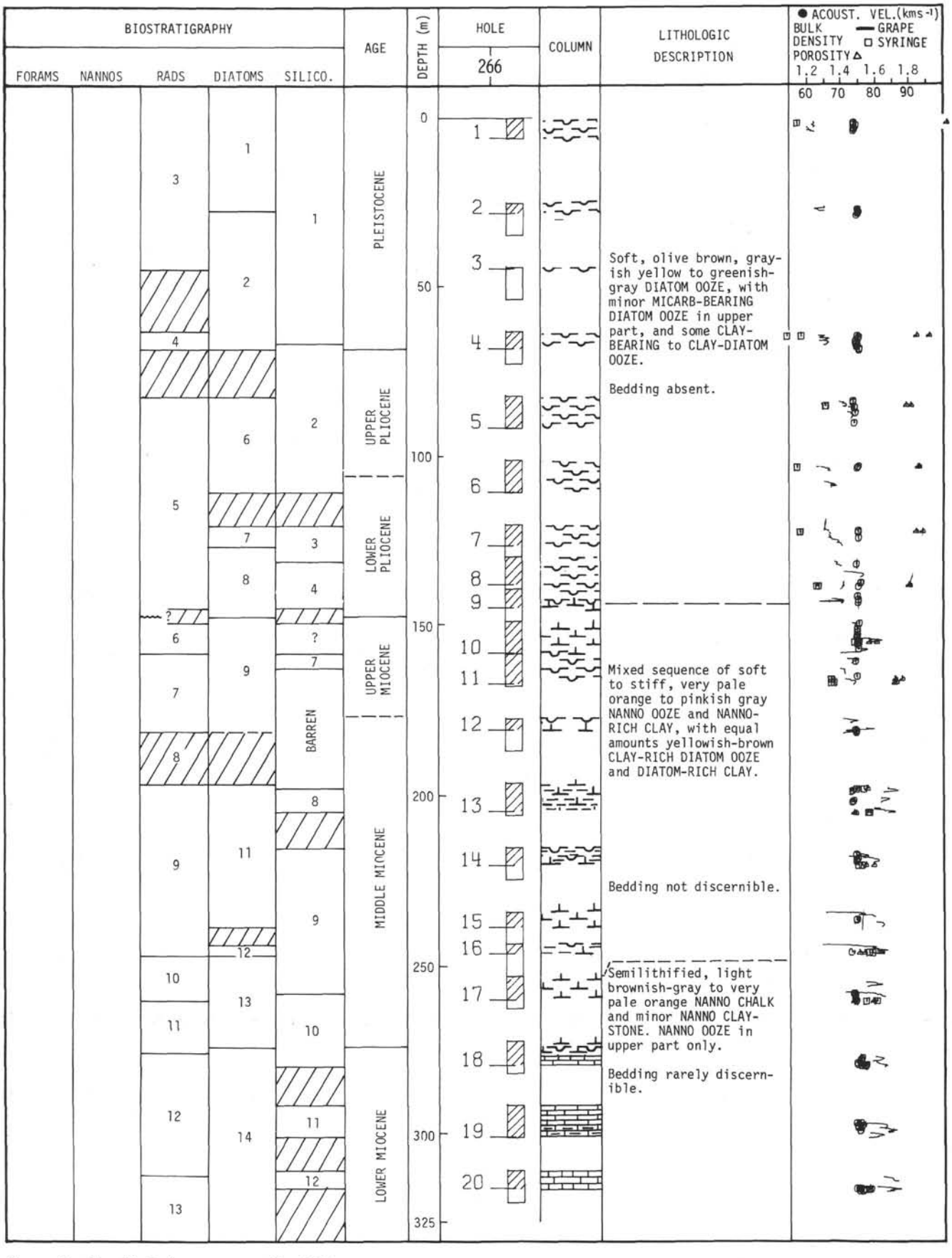


Figure 6. *Graphic hole summary, Site 266.*

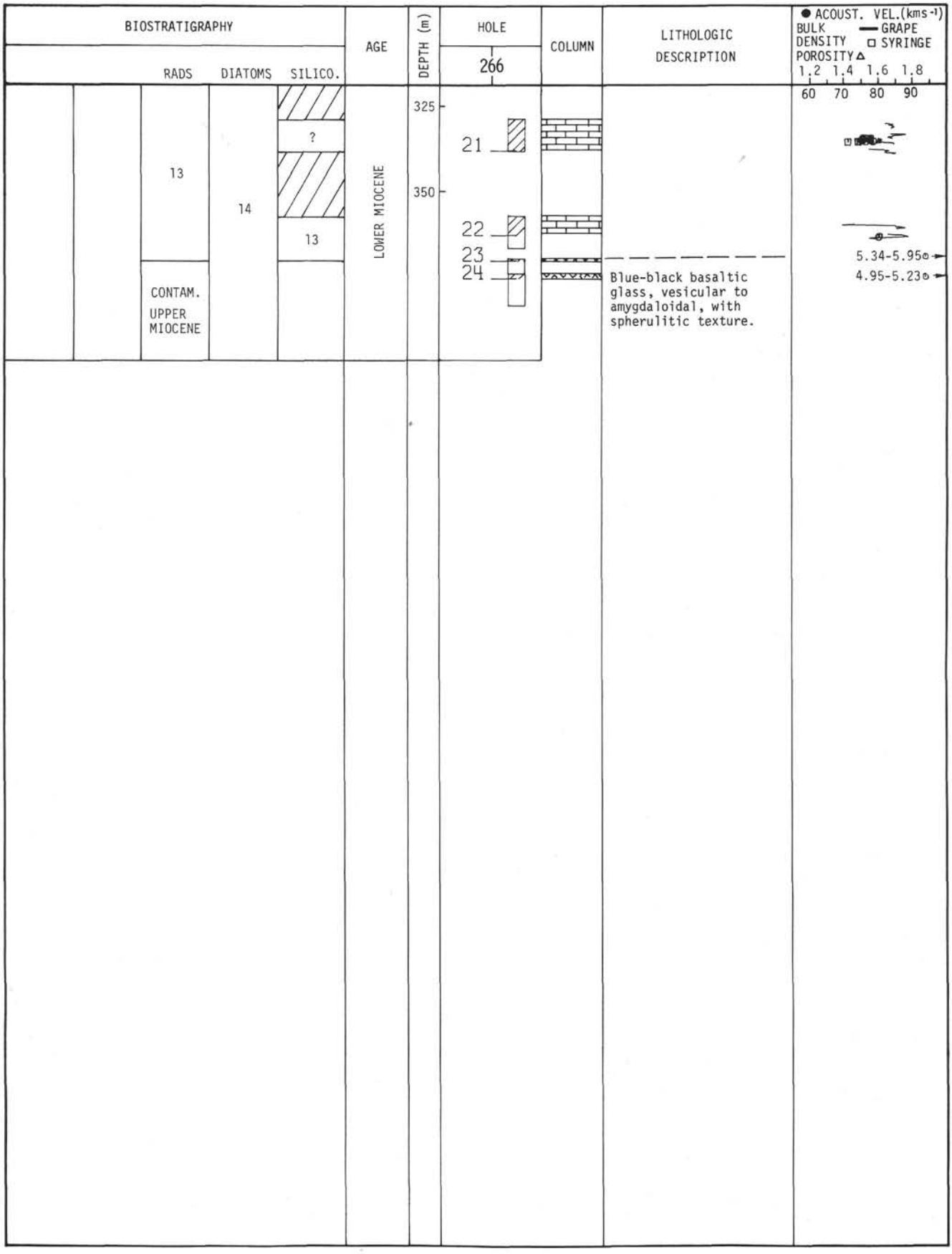
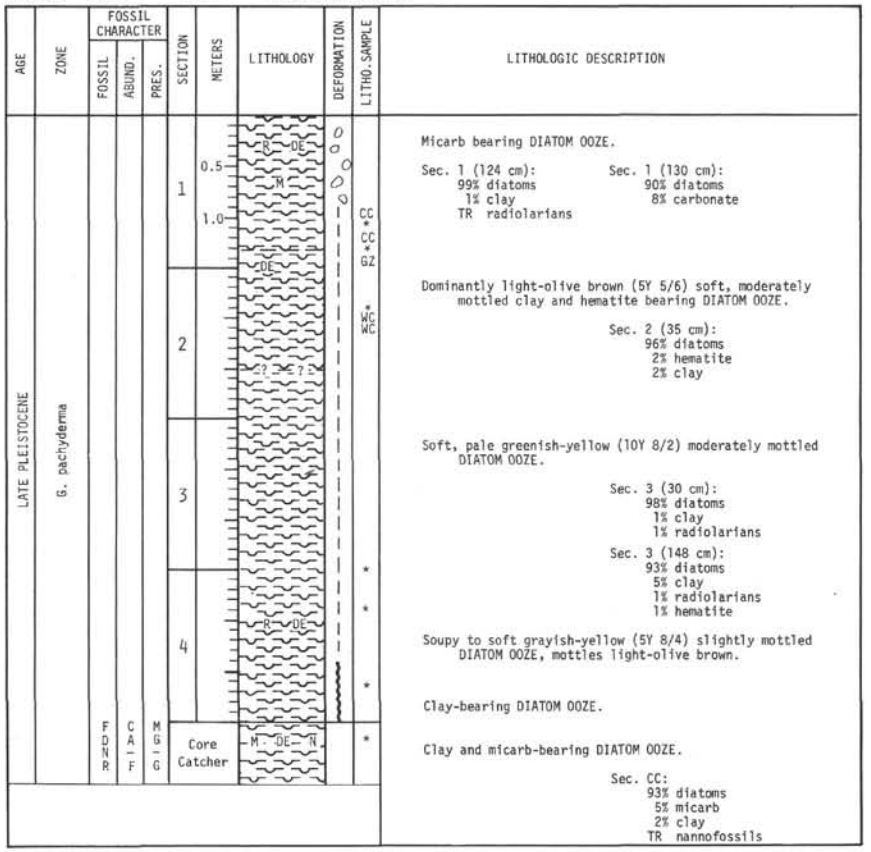


Figure 6. *(Continued).*

Site 266 Hole Core 1 Cored Interval: 0-6 m



LITHOLOGIC DESCRIPTION

Micarb bearing DIATOM OOZE.

Sec. 1 (124 cm):
99% diatoms
1% clay
TR radiolarians

Sec. 1 (130 cm):
90% diatoms
8% carbonate

Dominantly light-olive brown (5Y 5/6) soft, moderately mottled clay and hematite bearing DIATOM OOZE.

Sec. 2 (35 cm):
96% diatoms
2% hematite
2% clay

Soft, pale greenish-yellow (10Y 8/2) moderately mottled DIATOM OOZE.

Sec. 3 (30 cm):
98% diatoms
1% clay
1% radiolarians

Sec. 3 (148 cm):
93% diatoms
5% clay
1% radiolarians
1% hematite

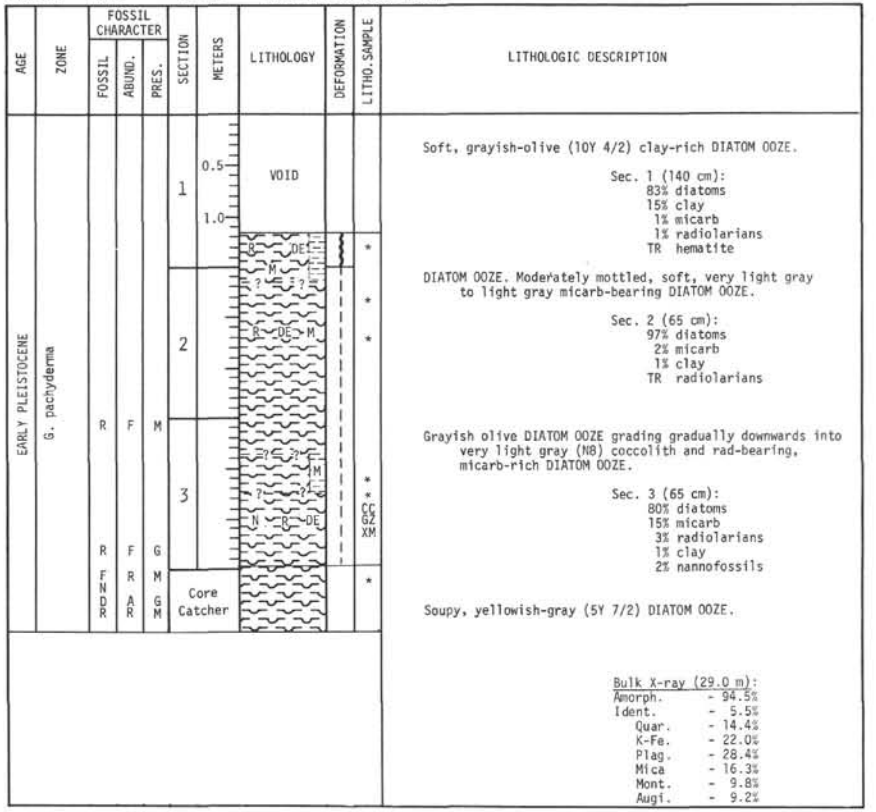
Soupy to soft grayish-yellow (5Y 8/4) slightly mottled DIATOM OOZE, mottles light-olive brown.

Clay-bearing DIATOM OOZE.

Clay and micarb-bearing DIATOM OOZE.

Sec. CC:
93% diatoms
5% micarb
2% clay
TR nannofossils

Site 266 Hole Core 2 Cored Interval: 25-34.5 m



LITHOLOGIC DESCRIPTION

Soft, grayish-olive (10Y 4/2) clay-rich DIATOM OOZE.

Sec. 1 (140 cm):
83% diatoms
15% clay
1% micarb
1% radiolarians
TR hematite

DIATOM OOZE. Moderately mottled, soft, very light gray to light gray micarb-bearing DIATOM OOZE.

Sec. 2 (65 cm):
97% diatoms
2% micarb
1% clay
TR radiolarians

Grayish olive DIATOM OOZE grading gradually downwards into very light gray (N8) coccolith and rad-bearing, micarb-rich DIATOM OOZE.

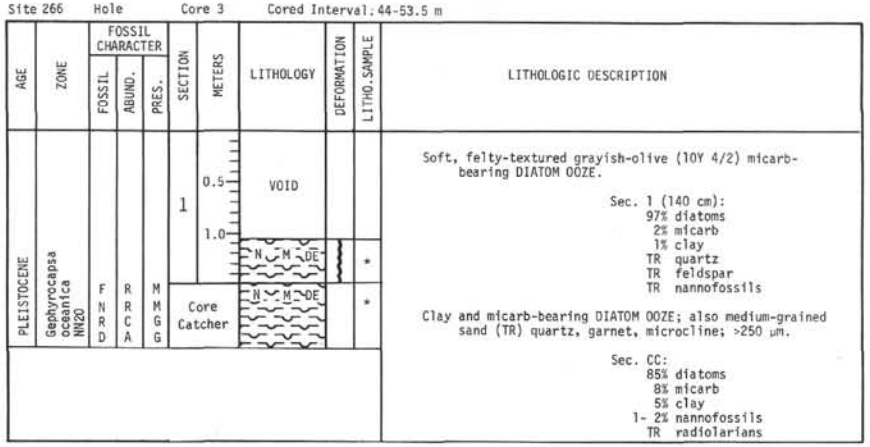
Sec. 3 (65 cm):
80% diatoms
15% micarb
3% radiolarians
1% clay
2% nannofossils

Soupy, yellowish-gray (5Y 7/2) DIATOM OOZE.

Bulk X-ray (29.0 m):

Amorph.	- 94.5%
Ident.	- 5.5%
Quar.	- 14.4%
K-Fe.	- 22.0%
Plag.	- 28.4%
Mica	- 16.3%
Mont.	- 9.8%
Augi.	- 9.2%

Site 266 Hole Core 3 Cored Interval: 44-53.5 m



LITHOLOGIC DESCRIPTION

Soft, felty-textured grayish-olive (10Y 4/2) micarb-bearing DIATOM OOZE.

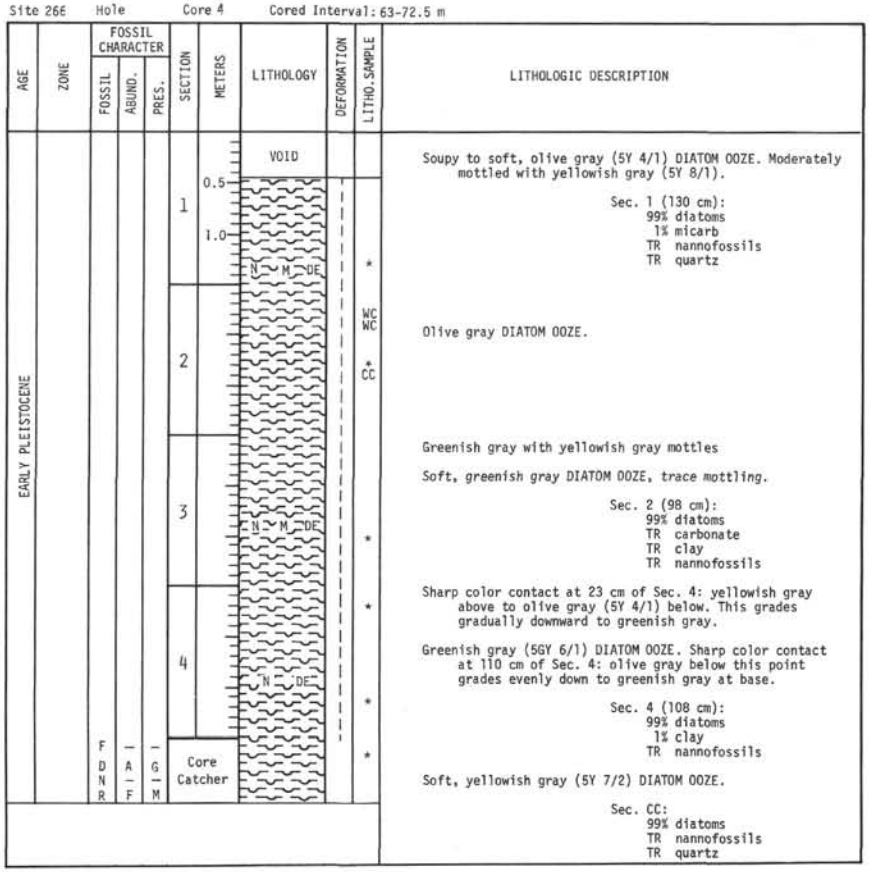
Sec. 1 (140 cm):
97% diatoms
2% micarb
1% clay
TR quartz
TR feldspar
TR nannofossils

Clay and micarb-bearing DIATOM OOZE; also medium-grained sand (TR) quartz, garnet, microcline; >250 µm.

Sec. CC:
85% diatoms
8% micarb
5% clay
1- 2% nannofossils
TR radiolarians

Explanatory notes in Chapter 1

Site 266E Hole Core 4 Cored Interval: 63-72.5 m



LITHOLOGIC DESCRIPTION

Soupy to soft, olive gray (5Y 4/1) DIATOM OOZE. Moderately mottled with yellowish gray (5Y 8/1).

Sec. 1 (130 cm):
99% diatoms
1% micarb
TR nannofossils
TR quartz

Olive gray DIATOM OOZE.

Greenish gray with yellowish gray mottles

Soft, greenish gray DIATOM OOZE, trace mottling.

Sec. 2 (98 cm):
99% diatoms
TR carbonate
TR clay
TR nannofossils

Sharp color contact at 23 cm of Sec. 4: yellowish gray above to olive gray (5Y 4/1) below. This grades gradually downward to greenish gray.

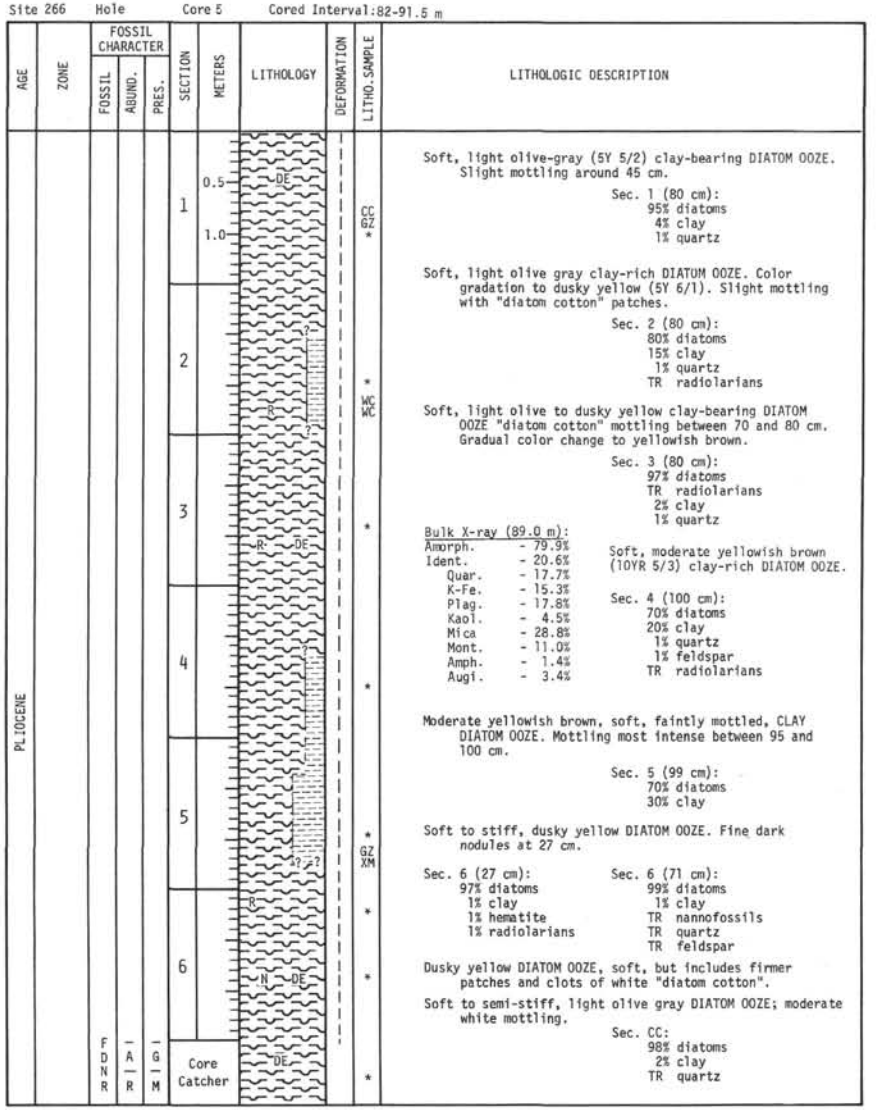
Greenish gray (5GY 6/1) DIATOM OOZE. Sharp color contact at 110 cm of Sec. 4: olive gray below this point grades evenly down to greenish gray at base.

Sec. 4 (108 cm):
99% diatoms
1% clay
TR nannofossils

Soft, yellowish gray (5Y 7/2) DIATOM OOZE.

Sec. CC:
99% diatoms
TR nannofossils
TR quartz

Site 266 Hole Core 5 Cored Interval: 82-91.5 m



LITHOLOGIC DESCRIPTION

Soft, light olive-gray (5Y 5/2) clay-bearing DIATOM OOZE. Slight mottling around 45 cm.

Sec. 1 (80 cm):
95% diatoms
4% clay
1% quartz

Soft, light olive gray clay-rich DIATOM OOZE. Color gradation to dusky yellow (5Y 6/1). Slight mottling with "diatom cotton" patches.

Sec. 2 (80 cm):
80% diatoms
15% clay
1% quartz
TR radiolarians

Soft, light olive to dusky yellow clay-bearing DIATOM OOZE "diatom cotton" mottling between 70 and 80 cm. Gradual color change to yellowish brown.

Sec. 3 (80 cm):
97% diatoms
TR radiolarians
2% clay
1% quartz

Bulk X-ray (89.0 m):

Amorph.	- 79.9%
Ident.	- 20.6%
Quar.	- 17.7%
K-Fe.	- 15.3%
Plag.	- 17.8%
Kaol.	- 4.5%
Mica	- 28.8%
Mont.	- 11.0%
Amph.	- 1.4%
Augi.	- 3.4%

Soft, moderate yellowish brown (10YR 5/3) clay-rich DIATOM OOZE.

Sec. 4 (100 cm):
70% diatoms
20% clay
1% quartz
1% feldspar
TR radiolarians

Moderate yellowish brown, soft, faintly mottled, CLAY DIATOM OOZE. Mottling most intense between 95 and 100 cm.

Sec. 5 (99 cm):
70% diatoms
30% clay

Soft to stiff, dusky yellow DIATOM OOZE. Fine dark nodules at 27 cm.

Sec. 6 (27 cm):
97% diatoms
1% clay
1% hematite
1% radiolarians

Sec. 6 (71 cm):
99% diatoms
1% clay
TR nannofossils
TR quartz
TR feldspar

Dusky yellow DIATOM OOZE, soft, but includes firmer patches and clots of white "diatom cotton".

Soft to semi-stiff, light olive gray DIATOM OOZE; moderate white mottling.

Sec. CC:
98% diatoms
2% clay
TR quartz

Explanatory notes in Chapter 1

Site 266 Hole Core 6 Cored Interval: 101-110.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
PLIOCENE		F D N R	F F	M M	1	0.5	R ? DE		*	Soft, dusky yellow (5Y 6/4), clay-rich DIATOM OOZE. Slight mottling between 70 and 80 cm.
						1.0	DE		*	Sec. 1 (51 cm): 85% diatoms, 15% clay, TR radiolarians, TR quartz. Sec. 1 (100 cm): 98% diatoms, 2% clay, TR quartz, TR feldspar
					2		R DE		WC WC *	Soft, yellowish gray to dusky yellow clay-bearing DIATOM OOZE. Soft, dusky yellow (5Y 6/4) clay-bearing DIATOM OOZE with moderate pale greenish yellow mottling. Mottling intense around 70 cm. Gradual color transition to pale yellowish brown (10YR 6/2); slight mottling. Sec. 2 (76 cm): 90% diatoms, 8% clay, 1% quartz, TR radiolarians
					3		R DE		*	Sharp color change near 15 cm to light olive gray, intensely mottled with clots of "diatom cotton". DIATOM OOZE. Even gradation from olive gray to dusky yellow. No bedding visible. Sec. 3 (34 cm): 99% diatoms, TR quartz, TR feldspar, TR radiolarians
					4		R DE		CC GZ *	Soft, dusky yellow, moderately mottled. Color passes evenly down between 70 and 110 cm into pale yellowish brown (10YR 6/2), then into light olive gray (5Y 5/2). Mottling moderate. DIATOM OOZE. Sec. 4 (114 cm): 98% diatoms, 1% clay, TR quartz, TR radiolarians
					5		R DE		*	Soft, light olive gray; moderate mottling, increasing toward 70 cm. Sample from plastic, stiff, grayish olive (10Y 4/2) interval: CLAY-BEARING DIATOM OOZE, soft, with stiff patches grayish olive; slight mottling. Sec. 5 (80 cm): 95% diatoms, 4% clay, TR quartz
					6		R ? DE		*	CLAY-RICH DIATOM OOZE. Sharp color contact around 20 cm; light olive gray above, grayish olive below: grades gradually down to light olive. Another sharp color contact at about 70 cm, with similar gradation below. Sec. 6 (25 cm): 85% diatoms, 14% clay, TR quartz, TR radiolarians
		F D N R	F F	M M	Core Catcher		R DE		*	Soft, grayish olive DIATOM OOZE. Sec. CC: 99% diatoms, TR radiolarians, TR quartz <10 μm, TR feldspar

Bulk X-ray (106.2 m):

Amorph.	- 88.3%
Ident.	- 11.7%
Quar.	- 22.7%
K-Fe.	- 15.4%
Plag.	- 15.5%
Kaol.	- 3.7%
Mica	- 33.5%
Mont.	- 9.2%

Site 266 Hole Core 7 Cored Interval: 120-129.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
PLIOCENE					1	0.5	VOID			Soft to semi-stiff light olive gray (5Y 6/2) DIATOM OOZE; mottling slight. Very soft to soupy; light olive gray. Sec. 1 (129 cm): 99% diatoms, TR clay, TR quartz
						1.0			*	
					2		DE			Soft, pale gray DIATOM OOZE; mottling slight, faint. No bedding visible. Sec. 2 (101 cm): 99% diatoms, TR quartz, TR radiolarians
							R DE		*	
					3		M DE			Soft, light olive gray, moderately mottled with pale gray DIATOM OOZE. Sec. 3 (60 cm): 99% diatoms, TR quartz, TR micarb
									*	Very soft, light olive gray.
					4					Soft, light olive gray, intensely contorted DIATOM OOZE.
									*	
					5		DE		WC WC	Stiff, grayish olive (10Y 4/2). Very soft, intensely deformed, grayish olive (10Y 4/2) DIATOM OOZE. Sec. 5 (113 cm): 99% diatoms, TR quartz (fine)
									*	
		F D N R	M - F	M - G	Core Catcher		DE			Soft, greenish gray (5GY 5/1) clay-rich DIATOM OOZE. Sec. CC: 85% diatoms, 15% clay, TR quartz, TR radiolarians

Explanatory notes in Chapter 1

Site 266 Hole Core 8 Cored Interval: 129.5-139 m

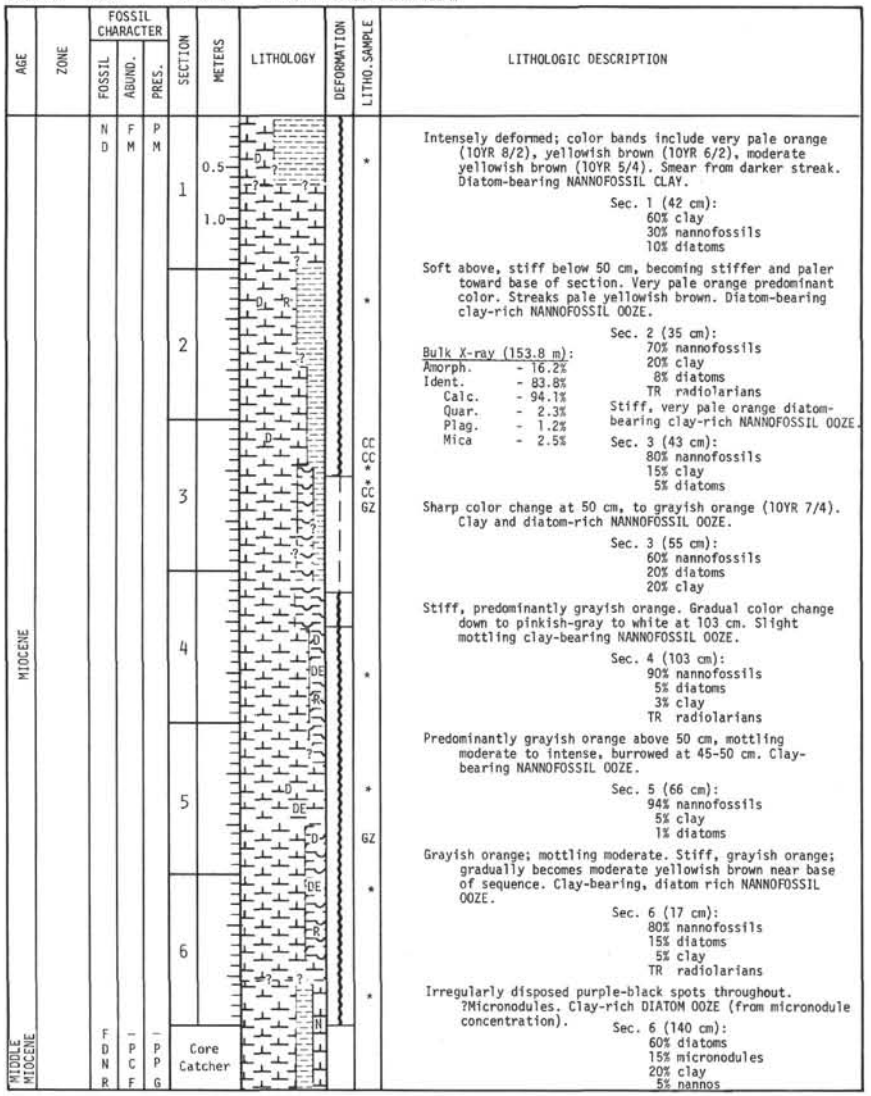
AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
PLIOCENE		F D N R	I F C	I M I M	1	0.5	VOID			Soft to semi-stiff, light olive gray (5Y 5/2), clay-bearing DIATOM OOZE with very slight pale olive mottling. No bedding visible.
						1.0	R DE		*	Sec. 1 (144 cm): 95% diatoms, 4% clay, TR quartz, TR radiolarians
					2		DE		*	Semi-stiff, slightly and faintly mottled, light olive gray DIATOM OOZE. Very soft, faintly mottled. Gradual transition to yellowish gray (5GY 5/3). Sec. 2 (79 cm): 98% diatoms, 1% clay, TR quartz, TR feldspar
					3		N DE		* GZ CC	Soft, intensely deformed, light olive gray. Light olive gray DIATOM OOZE. Alternating stiff and soft intervals, without color change. Faint, slight mottling between 100 and 130 cm. Sec. 3 (50 cm): 98% diatoms, 1% clay, TR quartz, TR feldspar, TR nannofossils
					4		R DE		*	Core soft, light olive gray; slight mottling. Slight greenish-yellow mottling. CLAY-BEARING DIATOM OOZE. Sec. 4 (129 cm): 97% diatoms, 2% clay, TR quartz, TR feldspar, TR radiolarians
					5		DE		* WC WC	Intensely deformed; semi-stiff patches with slight pale mottling interlaced with grayish-olive, plastic matrix. DIATOM OOZE. Sec. 5 (99 cm): 98% diatoms, TR clay, TR quartz, TR feldspar. Bulk X-ray (133.1 m): Amorph. - 84.3%; Ident. - 15.7%; Quar. - 18.2%; K-Fe. - 15.0%; Plag. - 19.6%; Kaol. - 3.2%; Mica - 26.6%; Mont. - 15.8%; Amph. - 1.5%
					6		R DE		*	Light olive gray, slight mottling. Soft, light olive gray, intensely deformed. DIATOM OOZE. Sec. 6 (142 cm): 99% diatoms, TR radiolarians, TR quartz, TR feldspar
					Core Catcher				*	Soft, light olive gray, clay-rich DIATOM OOZE. Sec. CC: 85% diatoms, 14% clay, TR quartz, micronodules

Site 266 Hole Core 9 Cored Interval: 139-148.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
PLIOCENE(?)		F D N R	I F M F	I F C G	1	0.5	VOID			Intensely deformed; network of firmer olive-gray ooze with plastic material of same color. Clay-bearing DIATOM OOZE.
						1.0	R DE		*	Sec. 1 (120 cm): 97% diatoms, 2% clay, TR quartz, TR radiolarians
					2		DE		*	Soft: irregular streaks dark yellowish brown (10YR 5/2), interlaced with light olive gray DIATOM OOZE. Intensely deformed. Sec. 2 (25 cm): 98% diatoms, 1% clay, TR quartz, TR feldspar
					3		VOID		XM * *	Smear from pinkish gray streak 0.5 cm wide = nanno- and diatom-rich CLAY. Soft, light olive gray, streaked with light brownish gray, rare pinkish gray streaks. DIATOM OOZE. Sec. 3 (57 cm): 70% clay, 15% nannofossils, 15% diatoms. Sec. 3 (80 cm): 99% diatoms, TR nannofossils, TR clay, TR micronodules
							N DE			
					4		VOID		*	Soft, light olive gray; contorted streaks of yellowish gray to white near base. DIATOM OOZE (major). DIATOM-RICH CLAY. Sec. 4 (138 cm; smear from pale streak): 85% clay, 15% diatoms, TR nannofossils
					Core Catcher		R DE		* *	Soft, intensely mottled moderate yellowish brown (10YR 6/4) clay bearing DIATOM OOZE; mottles pale orange (10YR 8/2). Sec. CC (yellowish brown): 95% diatoms, 3% clay, TR radiolarians. Diatom-bearing clay-rich NANNOFOSSIL OOZE. Sec. CC (pale mottles): 80% nannofossils, 15% clay, 4% diatoms. Bulk X-ray (142.5 m): Amorph. - 76.2%; Ident. - 23.8%; Calc. - 29.5%; Quar. - 18.1%; K-Fe. - 9.8%; Plag. - 11.5%; Mica - 23.1%; Chlo. - 1.7%; Mont. - 5.0%; Amph. - 1.3%

Explanatory notes in Chapter 1

Site 266 Hole Core 10 Cored Interval: 148.5-158 m



LITHOLOGIC DESCRIPTION

Intensely deformed; color bands include very pale orange (10YR 8/2), yellowish brown (10YR 6/2), moderate yellowish brown (10YR 5/4). Smear from darker streak. Diatom-bearing NANNOFOSSIL CLAY.

Sec. 1 (42 cm):
60% clay
30% nannofossils
10% diatoms

Soft above, stiff below 50 cm, becoming stiffer and paler toward base of section. Very pale orange predominant color. Streaks pale yellowish brown. Diatom-bearing clay-rich NANNOFOSSIL OOZE.

Sec. 2 (35 cm):
70% nannofossils
20% clay
8% diatoms
TR radiolarians

Bulk X-ray (153.8 m):
Amorph. - 16.2%
Ident. - 83.8%
Calc. - 94.1%
Quar. - 2.3%
Plag. - 1.2%
Mica - 2.5%

Stiff, very pale orange diatom-bearing clay-rich NANNOFOSSIL OOZE.

Sec. 3 (43 cm):
80% nannofossils
15% clay
5% diatoms

Sharp color change at 50 cm, to grayish orange (10YR 7/4). Clay and diatom-rich NANNOFOSSIL OOZE.

Sec. 3 (55 cm):
60% nannofossils
20% diatoms
20% clay

Stiff, predominantly grayish orange. Gradual color change down to pinkish-gray to white at 103 cm. Slight mottling clay-bearing NANNOFOSSIL OOZE.

Sec. 4 (103 cm):
90% nannofossils
5% diatoms
3% clay
TR radiolarians

Predominantly grayish orange above 50 cm, mottling moderate to intense, burrowed at 45-50 cm. Clay-bearing NANNOFOSSIL OOZE.

Sec. 5 (66 cm):
94% nannofossils
5% clay
1% diatoms

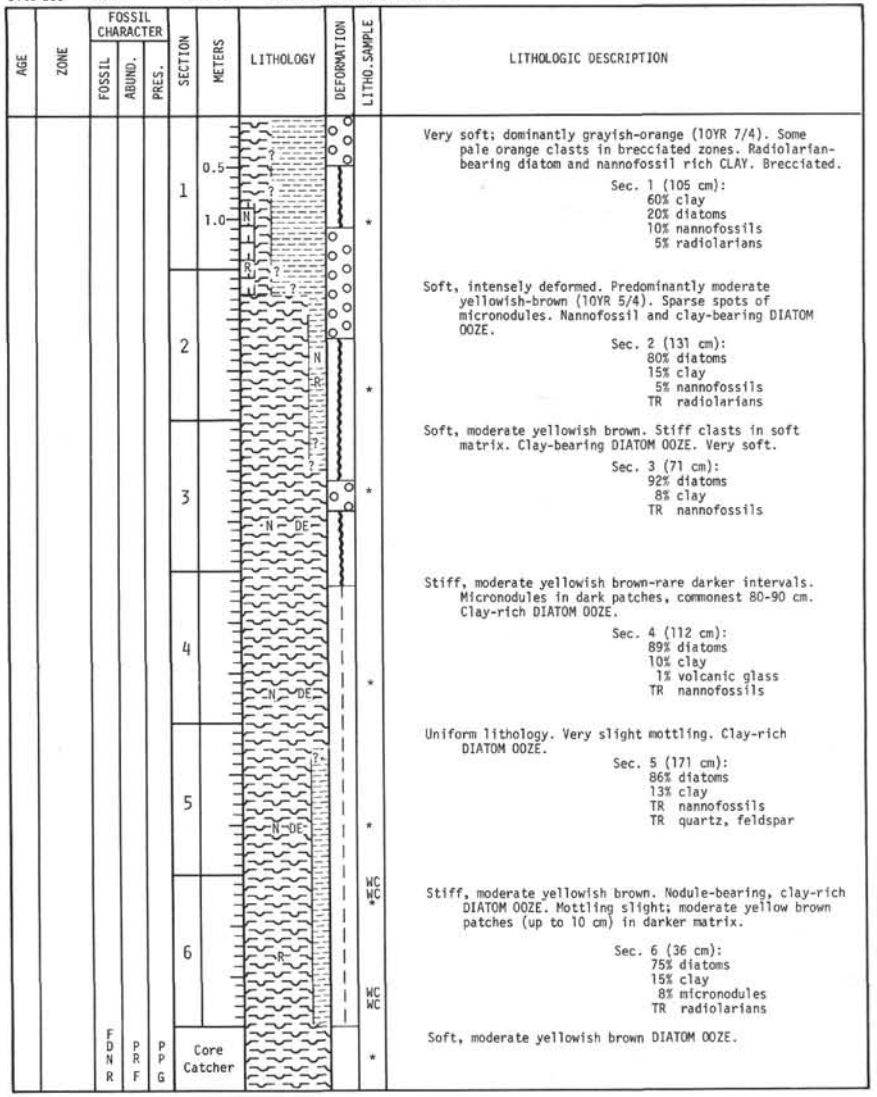
Grayish orange; mottling moderate. Stiff, grayish orange; gradually becomes moderate yellowish brown near base of sequence. Clay-bearing, diatom rich NANNOFOSSIL OOZE.

Sec. 6 (17 cm):
80% nannofossils
15% diatoms
5% clay
TR radiolarians

Irregularly disposed purple-black spots throughout. ?Micronodules. Clay-rich DIATOM OOZE (from micronodule concentration).

Sec. 6 (140 cm):
60% diatoms
15% micronodules
20% clay
5% nannos

Site 266 Hole Core 11 Cored Interval: 158-167.5 m



LITHOLOGIC DESCRIPTION

Very soft; dominantly grayish-orange (10YR 7/4). Some pale orange clasts in brecciated zones. Radiolarian-bearing diatom and nannofossil rich CLAY. Brecciated.

Sec. 1 (105 cm):
60% clay
20% diatoms
10% nannofossils
5% radiolarians

Soft, intensely deformed. Predominantly moderate yellowish-brown (10YR 5/4). Sparse spots of micronodules. Nannofossil and clay-bearing DIATOM OOZE.

Sec. 2 (131 cm):
80% diatoms
15% clay
5% nannofossils
TR radiolarians

Soft, moderate yellowish brown. Stiff clasts in soft matrix. Clay-bearing DIATOM OOZE. Very soft.

Sec. 3 (71 cm):
92% diatoms
8% clay
TR nannofossils

Stiff, moderate yellowish brown-rare darker intervals. Micronodules in dark patches, commonest 80-90 cm. Clay-rich DIATOM OOZE.

Sec. 4 (112 cm):
89% diatoms
10% clay
1% volcanic glass
TR nannofossils

Uniform lithology. Very slight mottling. Clay-rich DIATOM OOZE.

Sec. 5 (171 cm):
86% diatoms
13% clay
TR nannofossils
TR quartz, feldspar

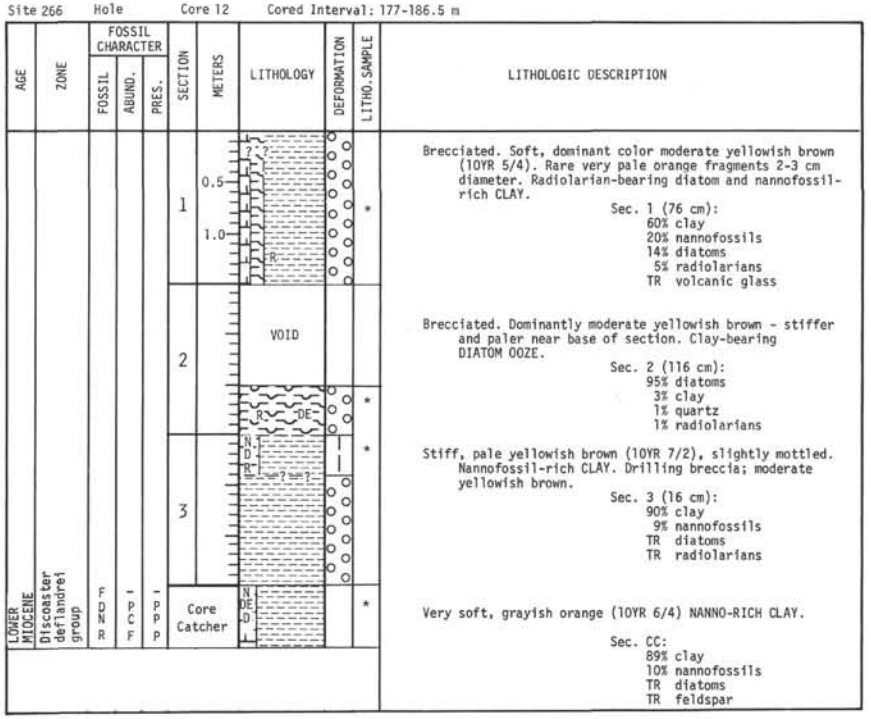
Stiff, moderate yellowish brown. Nodule-bearing, clay-rich DIATOM OOZE. Mottling slight; moderate yellow brown patches (up to 10 cm) in darker matrix.

Sec. 6 (36 cm):
75% diatoms
15% clay
8% micronodules
TR radiolarians

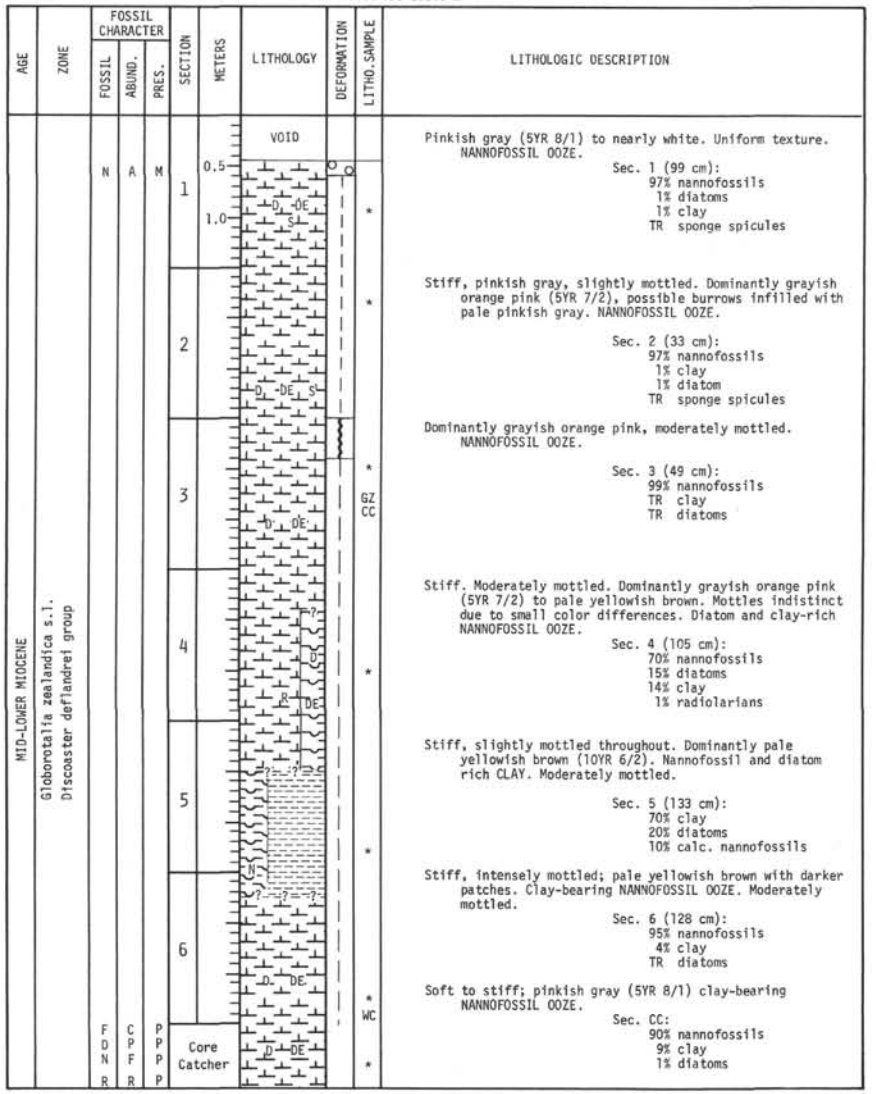
Soft, moderate yellowish brown DIATOM OOZE.

Explanatory notes in Chapter 1

Site 266 Hole Core 12 Cored Interval: 177-186.5 m

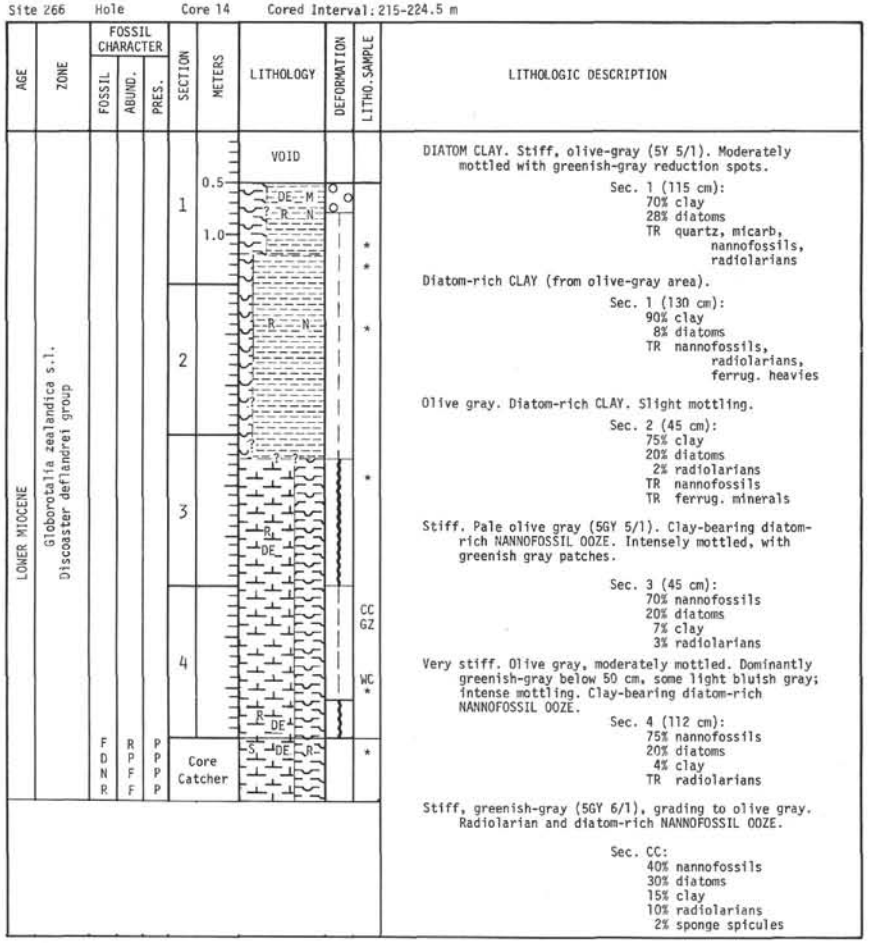


Site 266 Hole Core 13 Cored Interval: 196-205.5 m



Explanatory notes in Chapter 1

Site 266 Hole Core 14 Cored Interval: 215-224.5 m



LITHOLOGIC DESCRIPTION

DIATOM CLAY. Stiff, olive-gray (5Y 5/1). Moderately mottled with greenish-gray reduction spots.

Sec. 1 (115 cm):
70% clay
28% diatoms
TR quartz, micarb, nannofossils, radiolarians

Diatom-rich CLAY (from olive-gray area).

Sec. 1 (130 cm):
90% clay
8% diatoms
TR nannofossils, radiolarians, ferrug. heavies

Olive gray. Diatom-rich CLAY. Slight mottling.

Sec. 2 (45 cm):
75% clay
20% diatoms
2% radiolarians
TR nannofossils
TR ferrug. minerals

Stiff. Pale olive gray (5GY 5/1). Clay-bearing diatom-rich NANNOFOSSIL OOZE. Intensely mottled, with greenish gray patches.

Sec. 3 (45 cm):
70% nannofossils
20% diatoms
7% clay
3% radiolarians

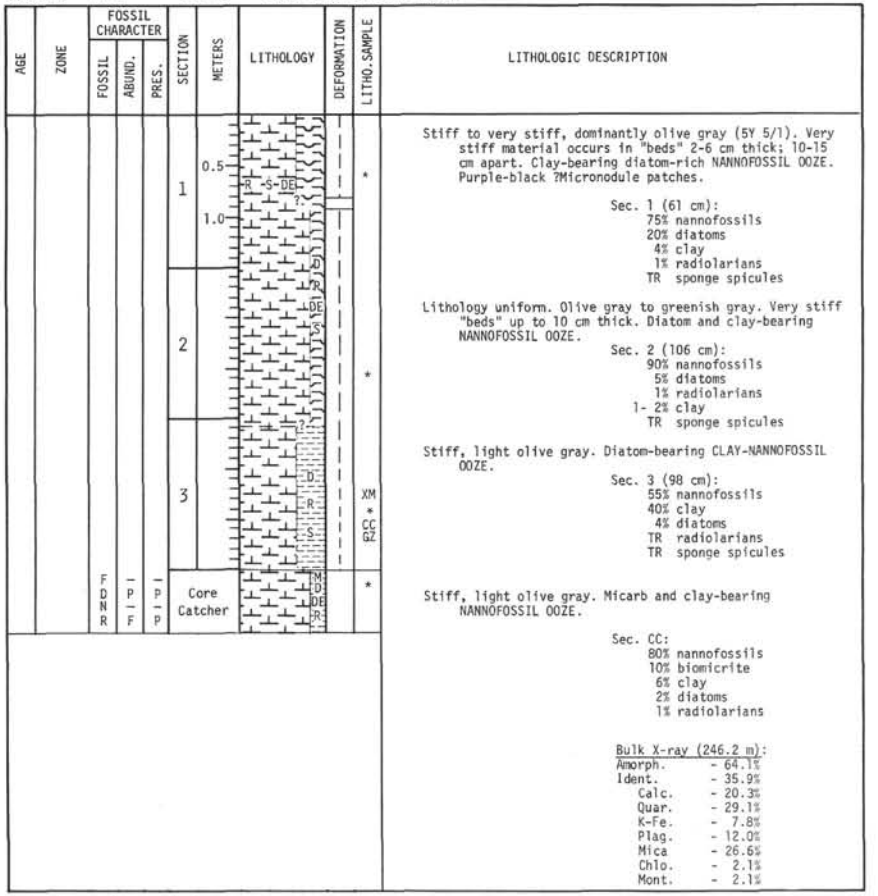
Very stiff. Olive gray, moderately mottled. Dominantly greenish-gray below 50 cm, some light bluish gray; intense mottling. Clay-bearing diatom-rich NANNOFOSSIL OOZE.

Sec. 4 (112 cm):
75% nannofossils
20% diatoms
4% clay
TR radiolarians

Stiff, greenish-gray (5GY 6/1), grading to olive gray. Radiolarian and diatom-rich NANNOFOSSIL OOZE.

Sec. CC:
40% nannofossils
30% diatoms
15% clay
10% radiolarians
2% sponge spicules

Site 266 Hole Core 15 Cored Interval: 234-243.5 m



LITHOLOGIC DESCRIPTION

Stiff to very stiff, dominantly olive gray (5Y 5/1). Very stiff material occurs in "beds" 2-6 cm thick; 10-15 cm apart. Clay-bearing diatom-rich NANNOFOSSIL OOZE. Purple-black ?Micronodule patches.

Sec. 1 (61 cm):
75% nannofossils
20% diatoms
4% clay
1% radiolarians
TR sponge spicules

Lithology uniform. Olive gray to greenish gray. Very stiff "beds" up to 10 cm thick. Diatom and clay-bearing NANNOFOSSIL OOZE.

Sec. 2 (106 cm):
90% nannofossils
5% diatoms
1% radiolarians
1- 2% clay
TR sponge spicules

Stiff, light olive gray. Diatom-bearing CLAY-NANNOFOSSIL OOZE.

Sec. 3 (98 cm):
55% nannofossils
40% clay
4% diatoms
TR radiolarians
TR sponge spicules

Stiff, light olive gray. Micarb and clay-bearing NANNOFOSSIL OOZE.

Sec. CC:
80% nannofossils
10% biomicrite
6% clay
2% diatoms
1% radiolarians

Bulk X-ray (246.2 m):

Amorph.	- 64.1%
Ident.	- 35.9%
Calc.	- 20.3%
Quar.	- 29.1%
K-Fe.	- 7.8%
Plag.	- 12.0%
Mica	- 26.6%
Chlo.	- 2.1%
Mont.	- 2.1%

Explanatory notes in Chapter 1

Site 266 Hole Core 16 Cored Interval: 243.5-253 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	Globigerina woodi/C. dissimilis	F N D R	F I F F	P I M	1	0.5 1.0	D DE N R		* *	Moderate yellowish brown fragments. Diatom-rich CLAY. Sec. 1 (53 cm): 80% clay 15% diatoms 1% quartz 1% nannofossils 1% radiolarians Grayish orange pink (5YR 7/2) fragments. Diatom bearing NANNOFOSSIL OOZE. Sec. 1 (55 cm): 90% nannofossils 8% diatoms TR clay TR radiolarians
					2		D DE R ? N R D R DE		CC XM * * GZ	Drilling breccia; fragments enclosed in mobilized ooze. Dark yellowish brown (10YR 4/2), moderately mottled with greenish gray Diatom-rich CLAY. Sharp color contact about 130 cm. Sec. 2 (125 cm): 85% clay 14% diatoms 1% nannofossils TR radiolarians Pale yellowish brown NANNOFOSSIL OOZE. Sec. 2 (135 cm): 99% nannofossils TR diatoms TR radiolarians TR clay
					Core Catcher					Bulk X-ray (237.9 m): Amorph. - 49.0% Ident. - 51.0% Calc. - 52.8% Quar. - 16.4% K-Fe. - 4.7% Plag. - 8.3% Mica - 14.8% Chlo. - 1.5% Mont. - 1.4%

Site 266 Hole Core 17 Cored Interval: 253-262.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					1	0.5 1.0	VOID D R		*	Breccia lumps, pale yellowish brown. Stiff, very light brownish gray to very light gray. NANNOFOSSIL OOZE. Sec. 1 (97 cm): 99% nannofossils TR diatoms TR radiolarians
					2		D R		*	Stiff to soft, intensely deformed. Dominantly pinkish-gray to light brownish gray. NANNOFOSSIL OOZE. Sec. 2 (51 cm): 99% nannofossils TR diatoms TR radiolarians
					3				*	Deformed and brecciated. Color as above. NANNOFOSSIL OOZE. Sec. 2 (145 cm): 99% nannofossils TR diatoms Pinkish to light-brownish gray. NANNOFOSSIL OOZE.
					4		D		*	Predominantly stiff, rare soft intervals. Color becoming paler, down to pinkish gray near base of section. NANNOFOSSIL OOZE. Sec. 4 (111 cm): 99% nannofossils TR diatoms
					5		D		CC * GZ WC	Stiff, uniform light gray. Rare purplish-black specks. NANNOFOSSIL OOZE. Sec. 5 (85 cm): 99% nannofossils TR diatoms
		F N D R	- - P C	- - P P	Core Catcher		D		*	Stiff, pale yellowish brown. NANNOFOSSIL OOZE. Sec. CC: 99% nannofossils TR diatoms Bulk X-ray (259.9 m): Amorph. - 9.4% Ident. - 90.6% Calc. - 96.7% Quar. - 1.9% Mica - 1.4%

Explanatory notes in Chapter 1

Site 266 Hole Core 18 Cored Interval: 272-281.5 m

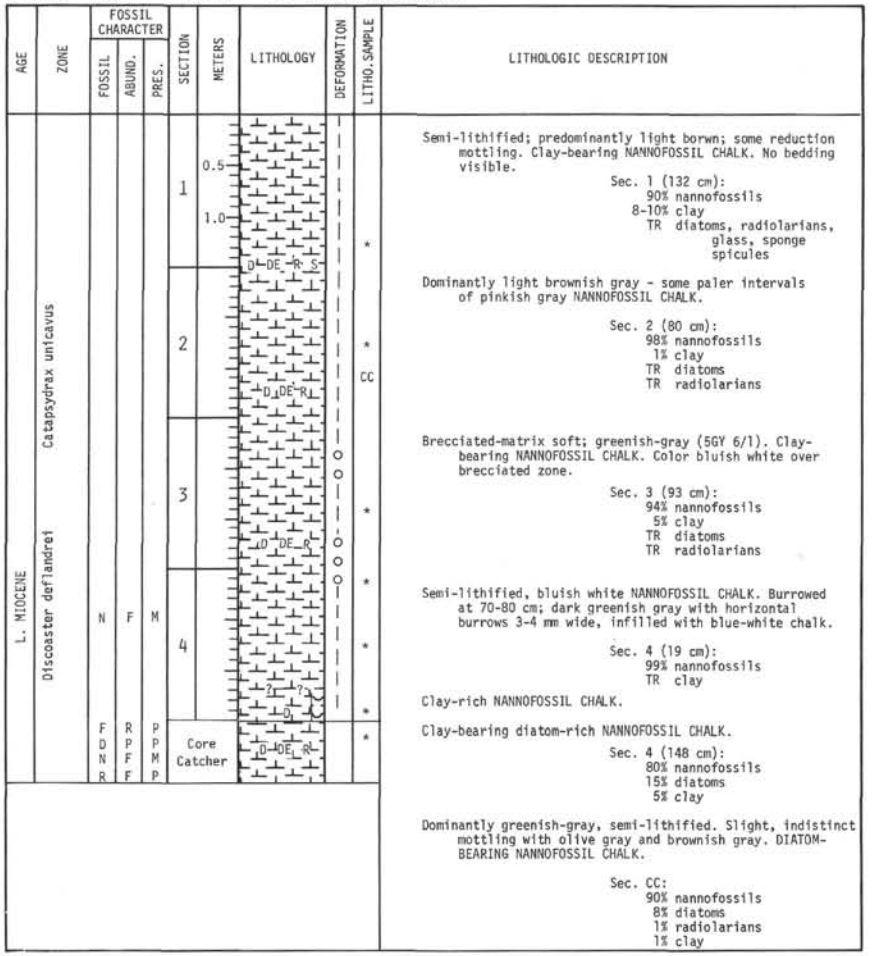
AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					1	0.5	VOID			Drilling breccia. Predominantly light gray to pinkish gray, soft clay-bearing NANNOFOSSIL OOZE. Some clasts semi-lithified, olive gray (5Y 5/1) with some reduction mottling. Sec. 1 (80 cm): 92% nannofossils 7% clay TR diatoms TR radiolarians
						1.0	D DE R		*	
					2					Semi-lithified olive-gray fragments increasing. Smear from pale olive gray fragments. NANNOFOSSIL CHALK. Sec. 2 (124 cm): 98% nannofossils 1- 2% clay TR diatoms TR sponge spicules
							D DE S		*	
					3		VOID			Brecciation intense: color pinkish-light brownish gray. Nanno-bearing, diatom-rich CLAY. Sec. 3 (130 cm): 55% clay 30% diatoms 5% nannofossils 1% radiolarians
							? N R		*	
									*	NANNOFOSSIL CHALK. Clay-bearing NANNOFOSSIL CHALK. Sec. 3 (148 cm): 99% nannofossils, TR radiolarians. Stiff light brownish gray zones separated by semi-lithified chalks of the same color. (6-10 cm thick)
					4		R		*	
									*	NANNOFOSSIL CHALK Sec. 4 (82 cm): 98% nannofossils, 1% diatoms, TR glass
										NANNOFOSSIL OOZE Sec. 5 (114 cm): 97% nannofossils, 1% clay, 1% diatoms, TR radiolarians. Semi-lithified zones become closer spaced, up to 10 cm apart
					5		D R DE		CC	
									*	
					Core Catcher		D DE		*	Light brownish gray, soft. Some greenish gray mottling. Diatom-bearing NANNOFOSSIL OOZE. Sec. CC: 97% nannofossils 2% diatoms TR clay TR heavy minerals
		M N D R	A R F F	P P M M						

Site 266 Hole Core 19 Cored Interval: 291-300.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LOWER MIOCENE	Catapsydrax unicavus Discoaster deflandrei				1	0.5	DE M D		*	NANNOFOSSIL CHALK. Brecciated throughout; some fragments probably still in place. Dominantly light brownish gray (5YR 5/1). Gradual gradation to light olive gray at base. Sec. 1 (35 cm): 98% nannofossils 1- 2% clay TR diatoms, micarb
						1.0				Semi-lithified, slightly mottled light brownish gray (5YR 6/1). NANNOFOSSIL CLAYSTONE. Sec. 2 (40 cm): 60% clay 40% nannofossils TR radiolarians, diatoms
					2		R D		*	
									CC	
										Light brownish gray, grades evenly down to greenish gray.
					3		? ? D R			Clay and diatom-rich NANNOFOSSIL CHALK. Sharp color contact at 142 cm greenish-gray above dark yellowish brown (10YR 4/2). Sec. 3 (141 cm): 60% nannofossils 15% diatoms 20% clay 5% radiolarians
									*	
							D R		*	Diatom-rich NANNOFOSSIL CLAYSTONE. Gradual change to light brownish gray. Sec. 3 (148 cm): 55% clay 30% nannofossils 14% diatoms Tr radiolarians
					4		? ? D		*	
										Diatom-bearing NANNOFOSSIL CHALK. Sec. 4 (58 cm): 97% nannofossils 3% diatoms
					5		? ? D R ? ?			Semi-lithified, light brownish gray. Slight mottling. No bedding visible. Diatom-bearing NANNOFOSSIL CLAYSTONE. Sec. 5 (107 cm): 55% clay 40% nannofossils 4% diatoms TR radiolarians
									*	
					6		D R ?			Uniform lithology. CLAY-NANNOFOSSIL CHALK. Purplish black nodules common. Sec. 6 (61 cm): 60% nannofossils 38% clay TR diatoms TR radiolarians
									*	
					Core Catcher		M D R		*	Semi-lithified, light brownish gray. Diatom-bearing NANNOFOSSIL CHALK. Sec. CC: 94% nannofossils 5% diatoms TR radiolarians, micarb
		M N D R	A R F F	P P M M						

Explanatory notes in Chapter 1

Site 266 Hole Core 20 Cored Interval: 310-319.5 m



Semi-lithified; predominantly light borwn; some reduction mottling. Clay-bearing NANNOFOSSIL CHALK. No bedding visible.

Sec. 1 (132 cm):
90% nannofossils
8-10% clay
TR diatoms, radiolarians, glass, sponge spicules

Dominantly light brownish gray - some paler intervals of pinkish gray NANNOFOSSIL CHALK.

Sec. 2 (80 cm):
98% nannofossils
1% clay
TR diatoms
TR radiolarians

Brecciated-matrix soft; greenish-gray (5GY 6/1). Clay-bearing NANNOFOSSIL CHALK. Color bluish white over brecciated zone.

Sec. 3 (93 cm):
94% nannofossils
5% clay
TR diatoms
TR radiolarians

Semi-lithified, bluish white NANNOFOSSIL CHALK. Burrowed at 70-80 cm; dark greenish gray with horizontal burrows 3-4 mm wide, infilled with blue-white chalk.

Sec. 4 (19 cm):
99% nannofossils
TR clay

Clay-rich NANNOFOSSIL CHALK.

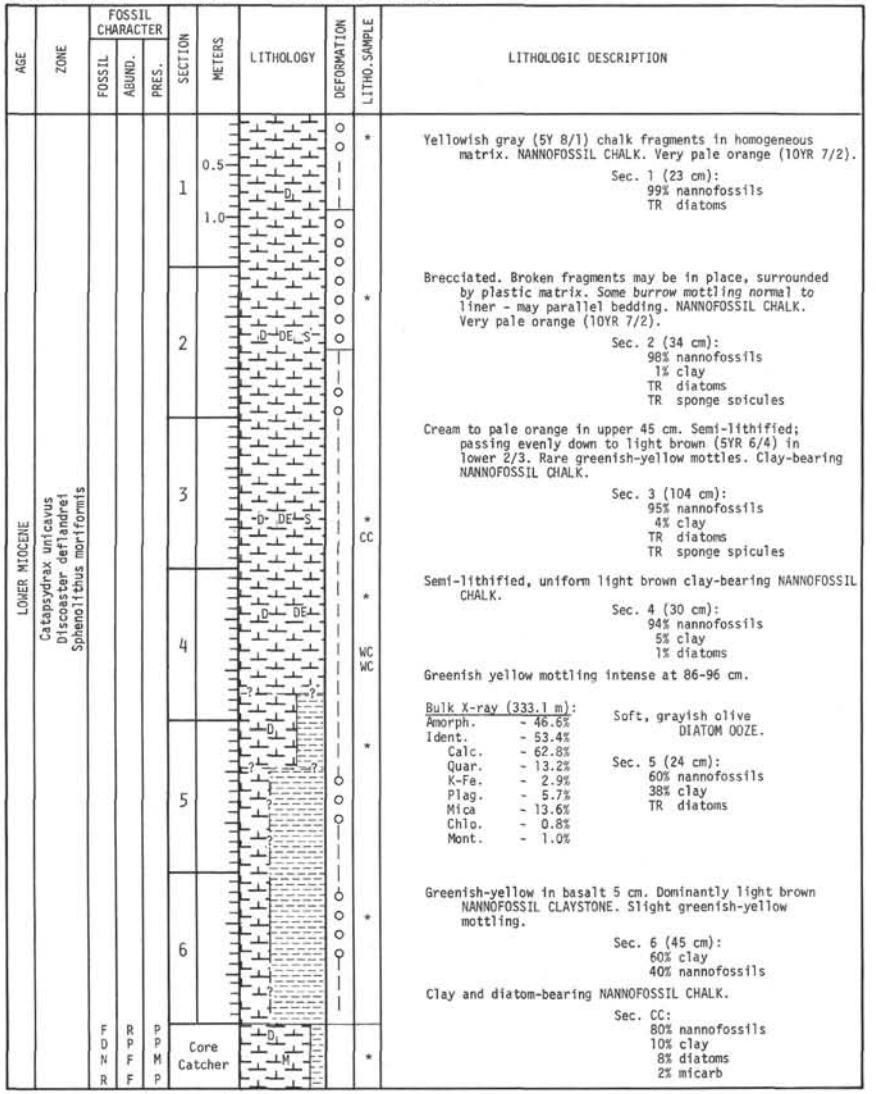
Clay-bearing diatom-rich NANNOFOSSIL CHALK.

Sec. 4 (148 cm):
80% nannofossils
15% diatoms
5% clay

Dominantly greenish-gray, semi-lithified. Slight, indistinct mottling with olive gray and brownish gray. DIATOM-BEARING NANNOFOSSIL CHALK.

Sec. CC:
90% nannofossils
8% diatoms
1% radiolarians
1% clay

Site 266 Hole Core 21 Cored Interval: 329-335.5 m



Yellowish gray (5Y 8/1) chalk fragments in homogeneous matrix. NANNOFOSSIL CHALK. Very pale orange (10YR 7/2).

Sec. 1 (23 cm):
99% nannofossils
TR diatoms

Brecciated. Broken fragments may be in place, surrounded by plastic matrix. Some burrow mottling normal to liner - may parallel bedding. NANNOFOSSIL CHALK. Very pale orange (10YR 7/2).

Sec. 2 (34 cm):
98% nannofossils
1% clay
TR diatoms
TR sponge spicules

Cream to pale orange in upper 45 cm. Semi-lithified; passing evenly down to light brown (5YR 6/4) in lower 2/3. Rare greenish-yellow mottles. Clay-bearing NANNOFOSSIL CHALK.

Sec. 3 (104 cm):
95% nannofossils
4% clay
TR diatoms
TR sponge spicules

Semi-lithified, uniform light brown clay-bearing NANNOFOSSIL CHALK.

Sec. 4 (30 cm):
94% nannofossils
5% clay
1% diatoms

Greenish yellow mottling intense at 86-96 cm.

Bulk X-ray (333.1 m):

Amorph.	- 46.6%
Ident.	- 53.4%
Calc.	- 62.8%
Quar.	- 13.2%
K-Fe.	- 2.9%
Plag.	- 5.7%
Mica	- 13.6%
Chlo.	- 0.8%
Mont.	- 1.0%

Soft, grayish olive DIATOM OOZE.

Sec. 5 (24 cm):
60% nannofossils
38% clay
TR diatoms

Greenish-yellow in basalt 5 cm. Dominantly light brown NANNOFOSSIL CLAYSTONE. Slight greenish-yellow mottling.

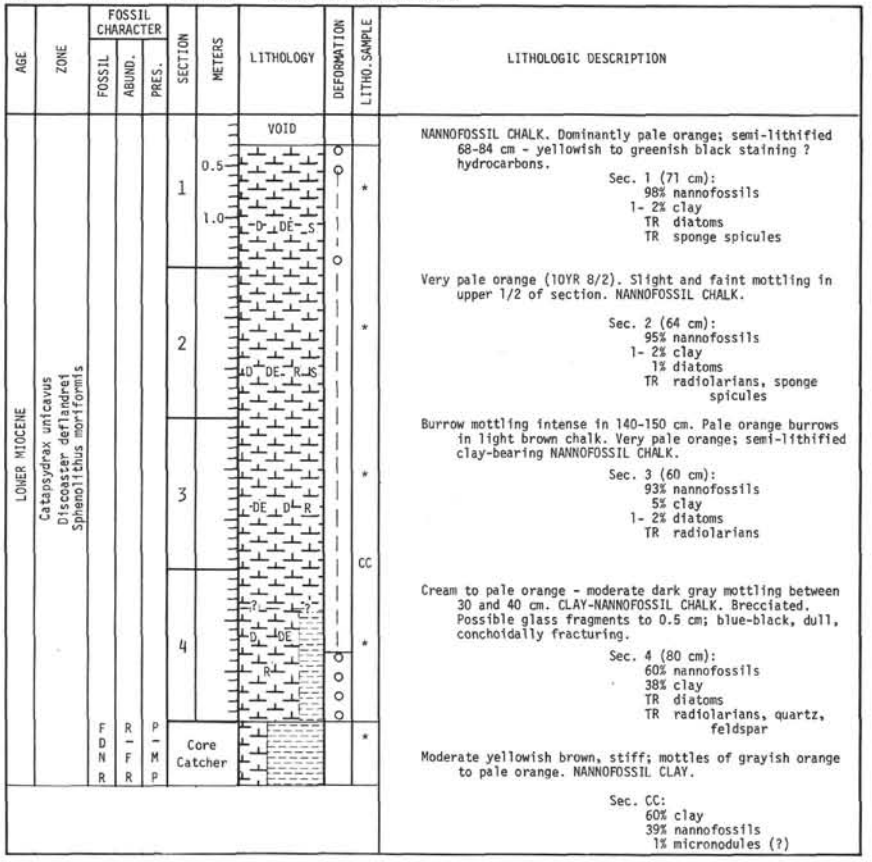
Sec. 6 (45 cm):
60% clay
40% nannofossils

Clay and diatom-bearing NANNOFOSSIL CHALK.

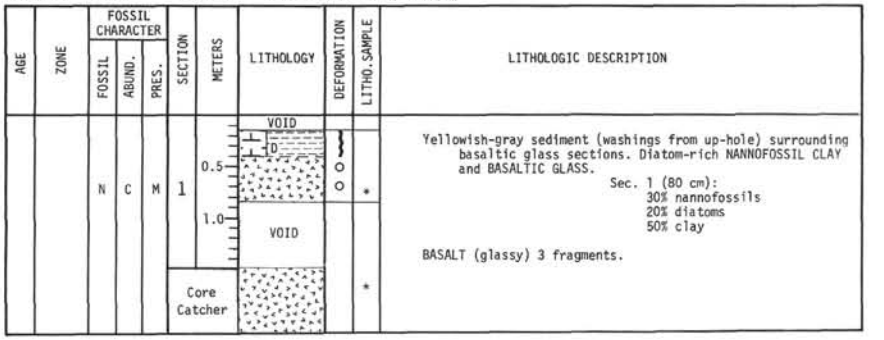
Sec. CC:
80% nannofossils
10% clay
8% diatoms
2% micarb

Explanatory notes in Chapter 1

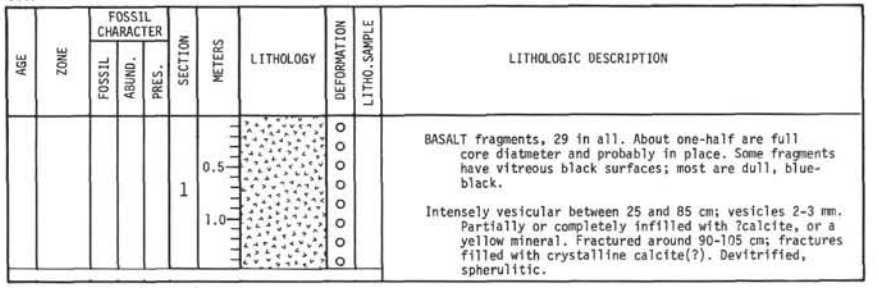
Site 266 Hole Core 22 Cored Interval: 357.5-367 m



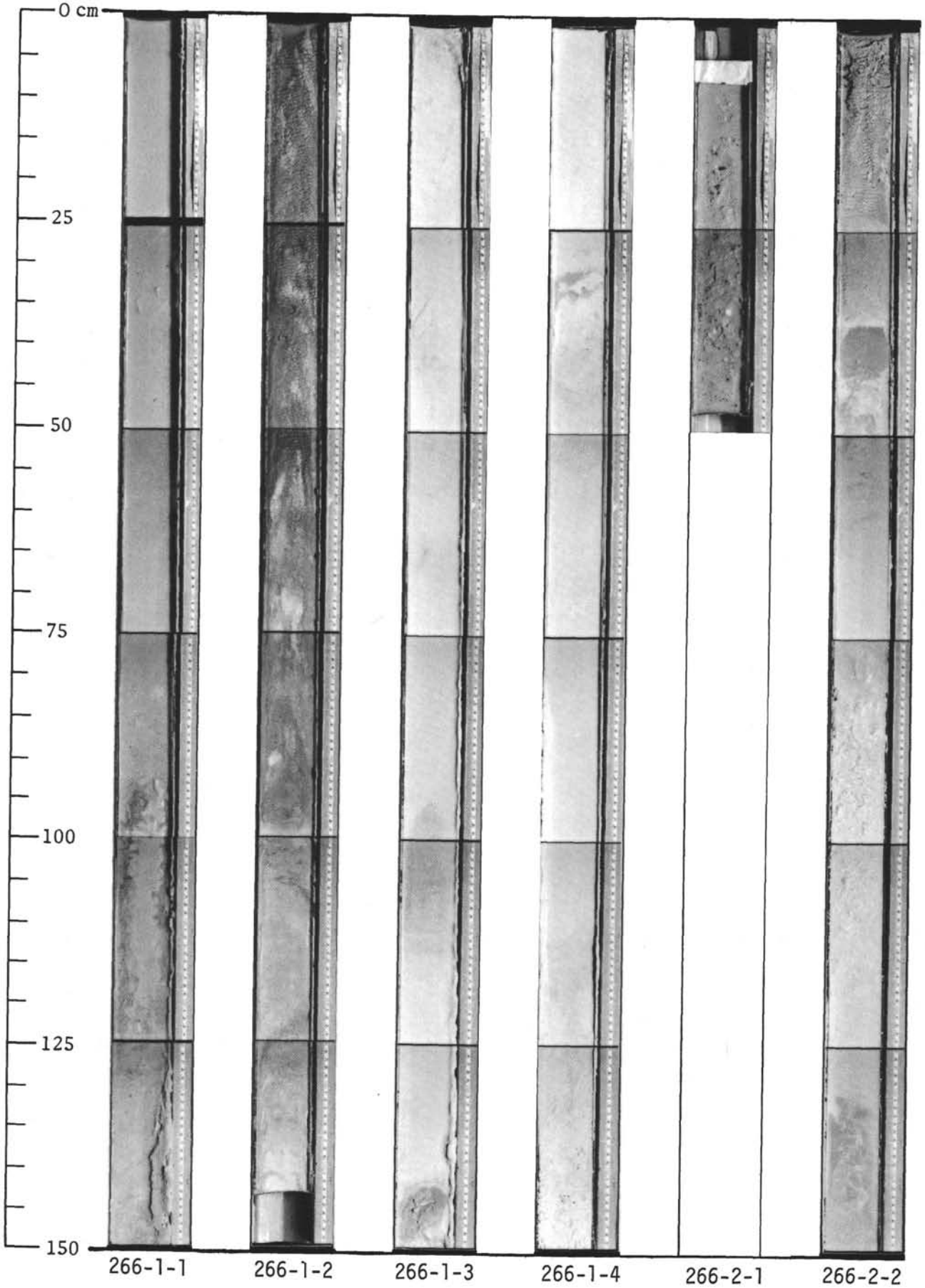
Site 266 Hole Core 23 Cored Interval: 370-374.5 m



Site 266 Hole Core 24 Cored Interval: 374.5-384 m



Explanatory notes in Chapter 1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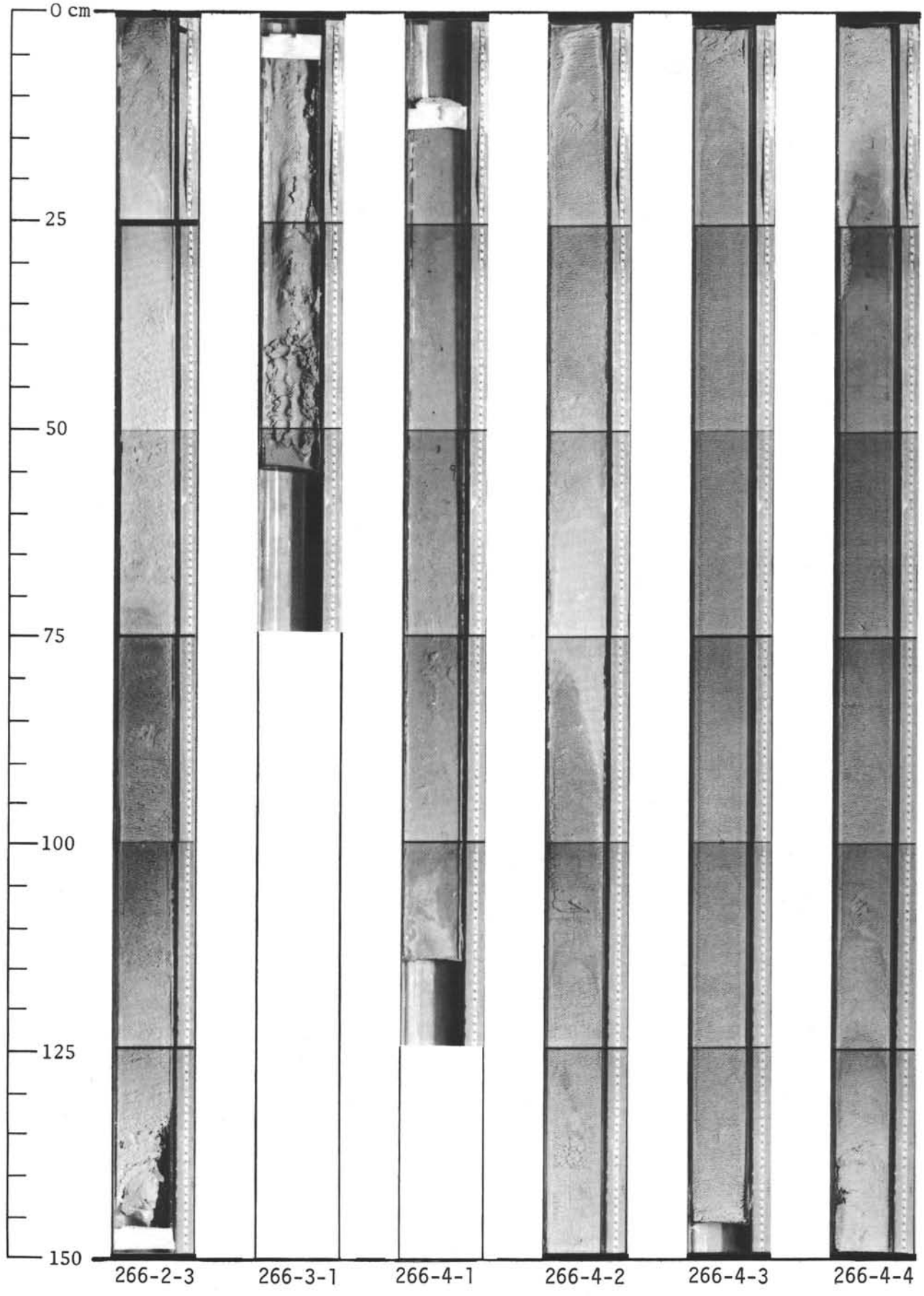
266-1-4
266-2-1
266-2-2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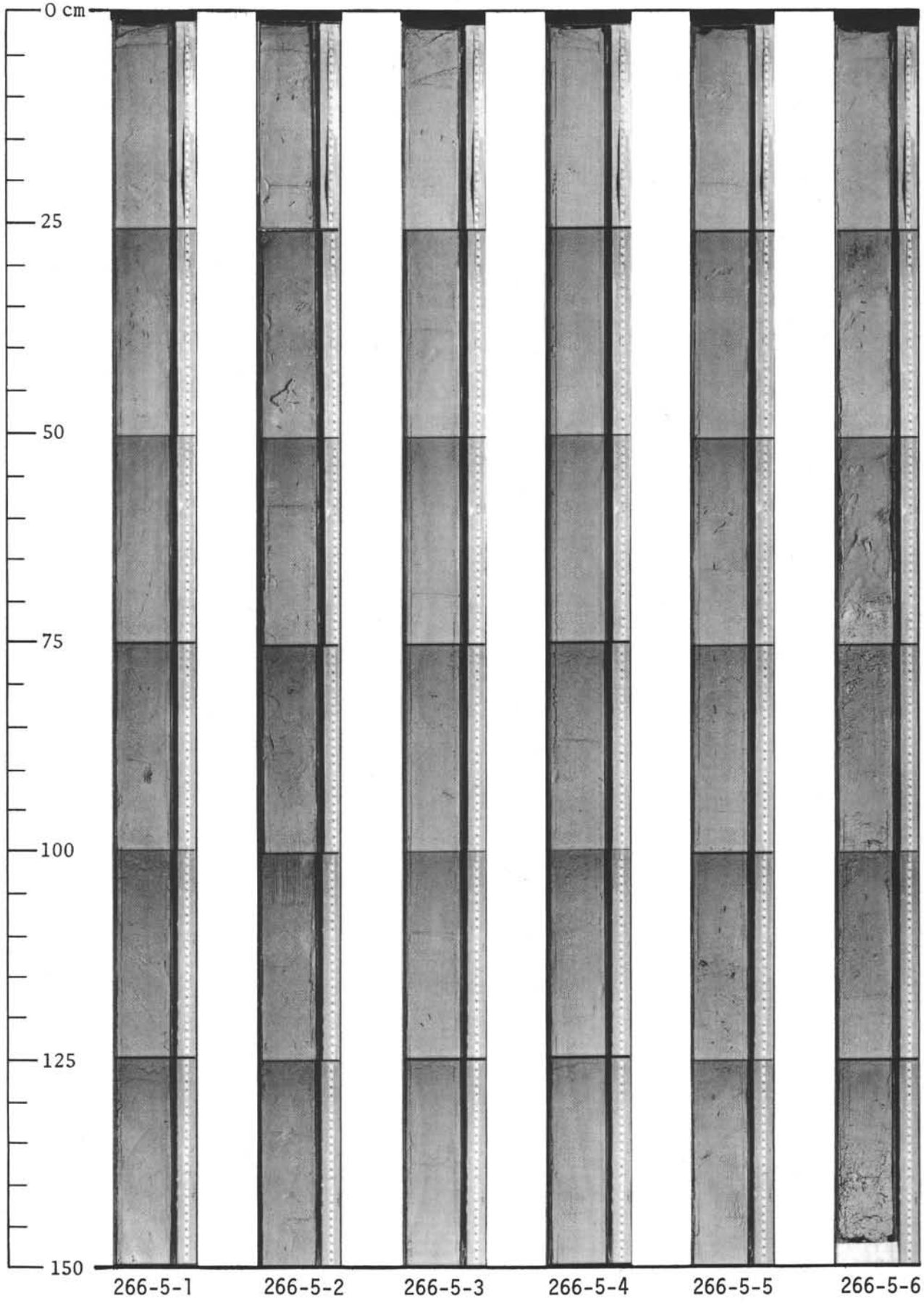
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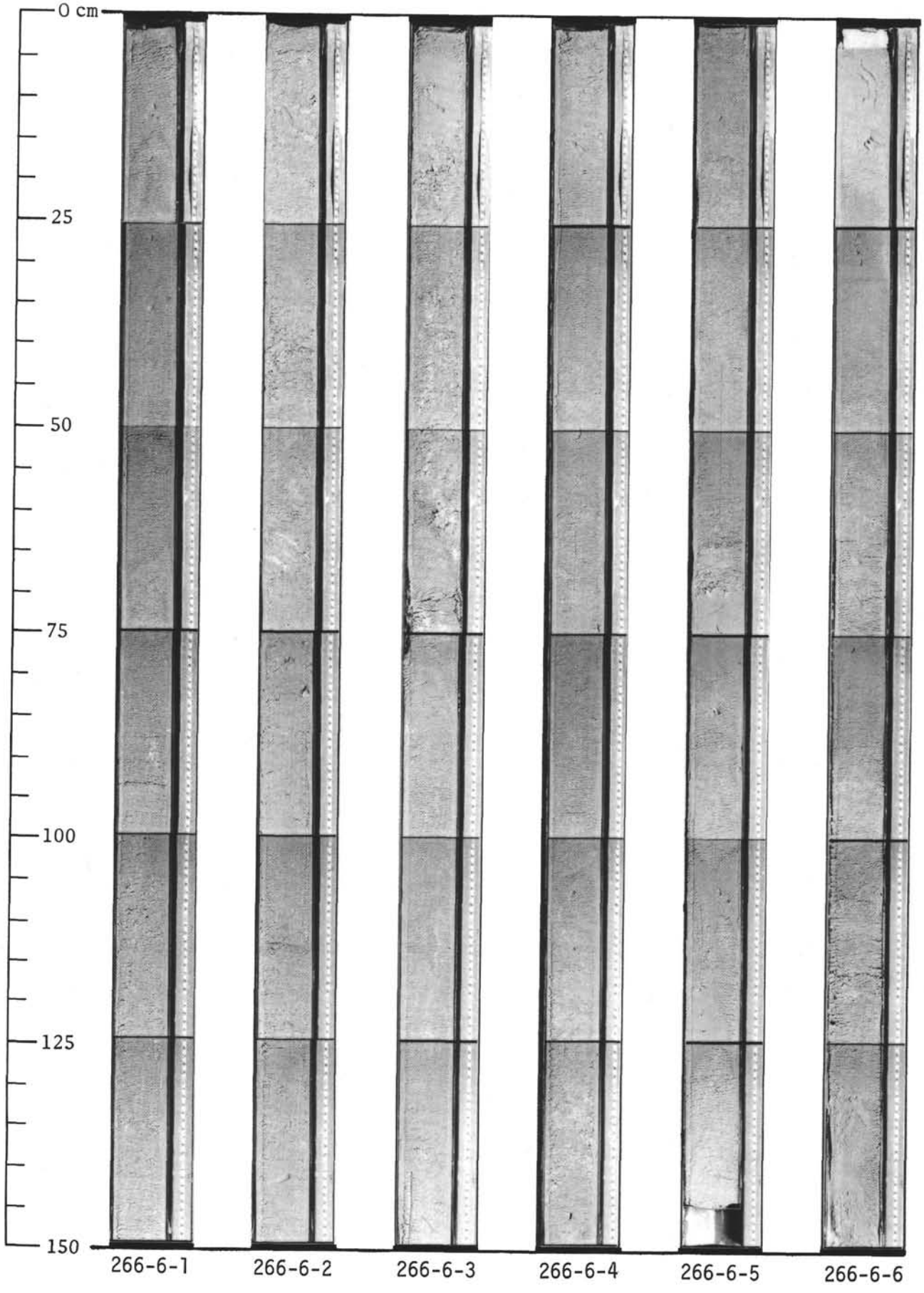
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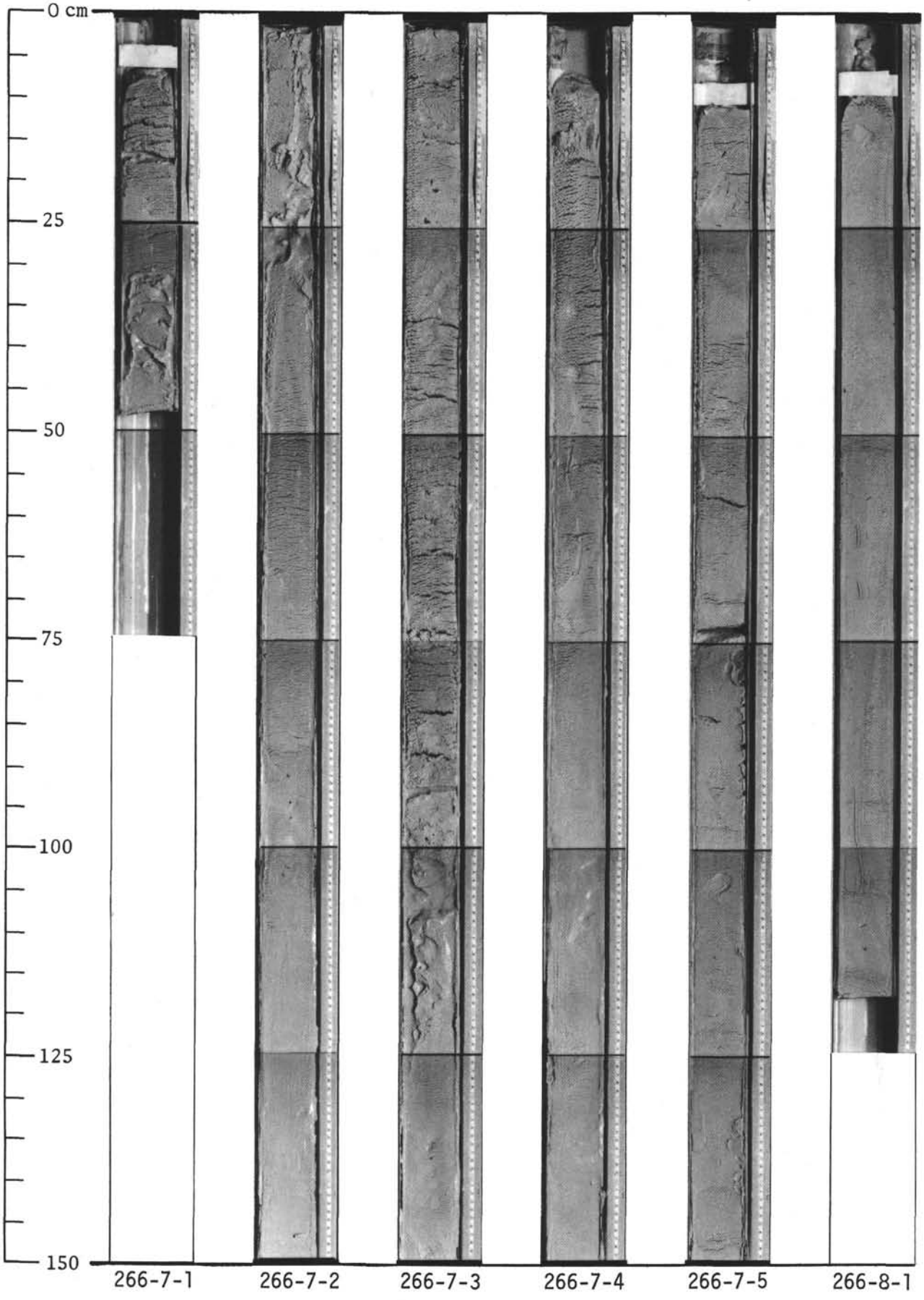
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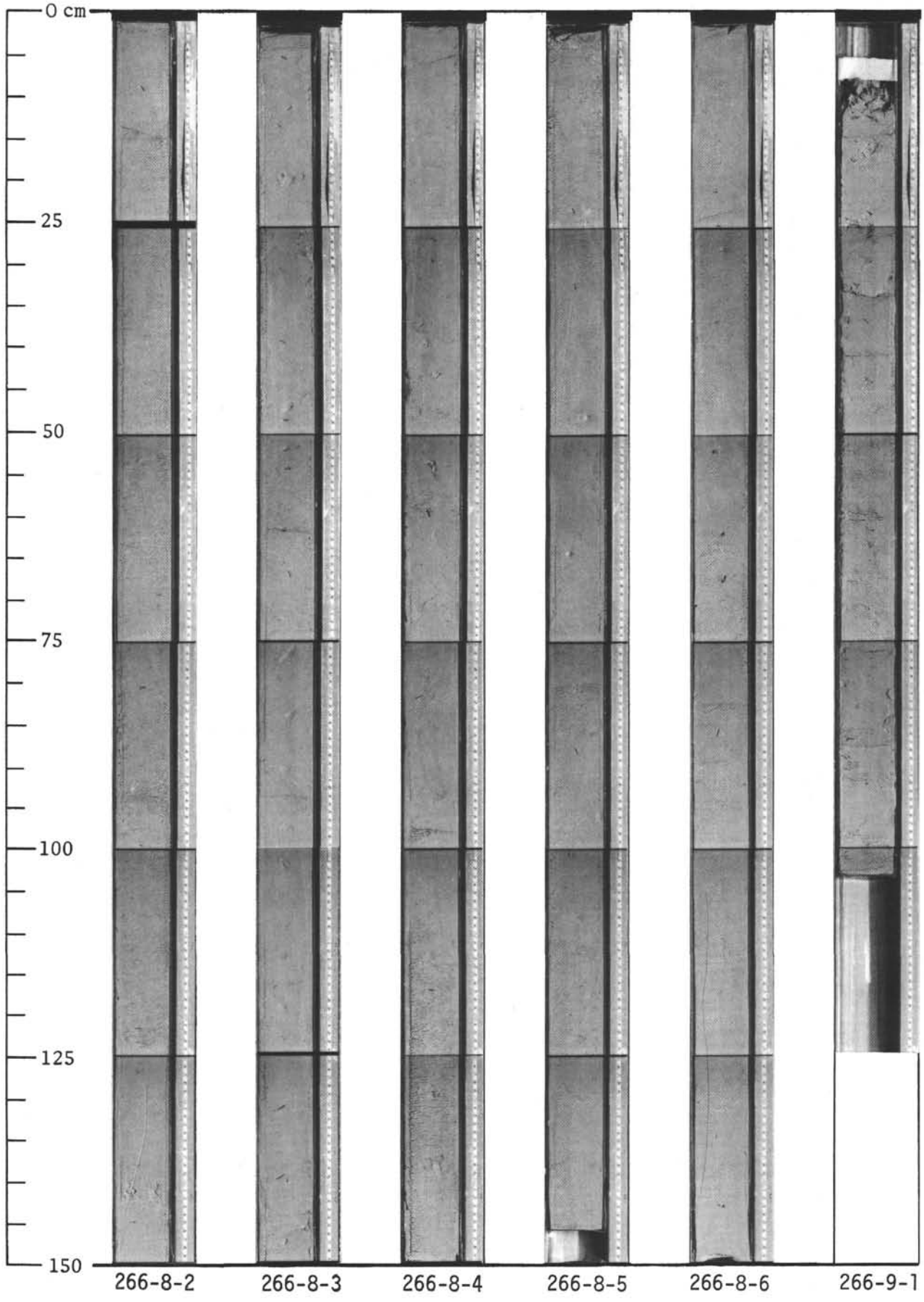
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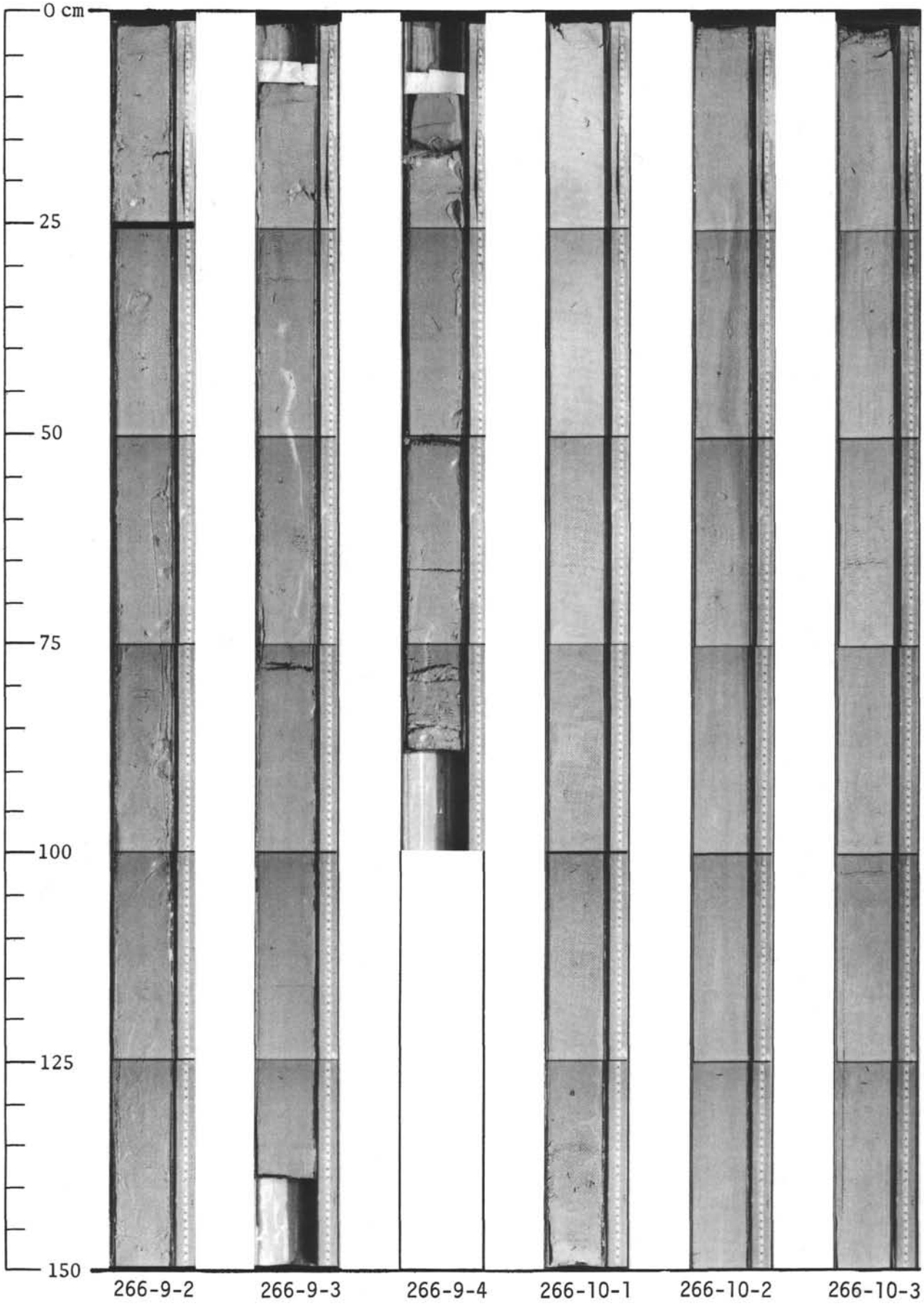
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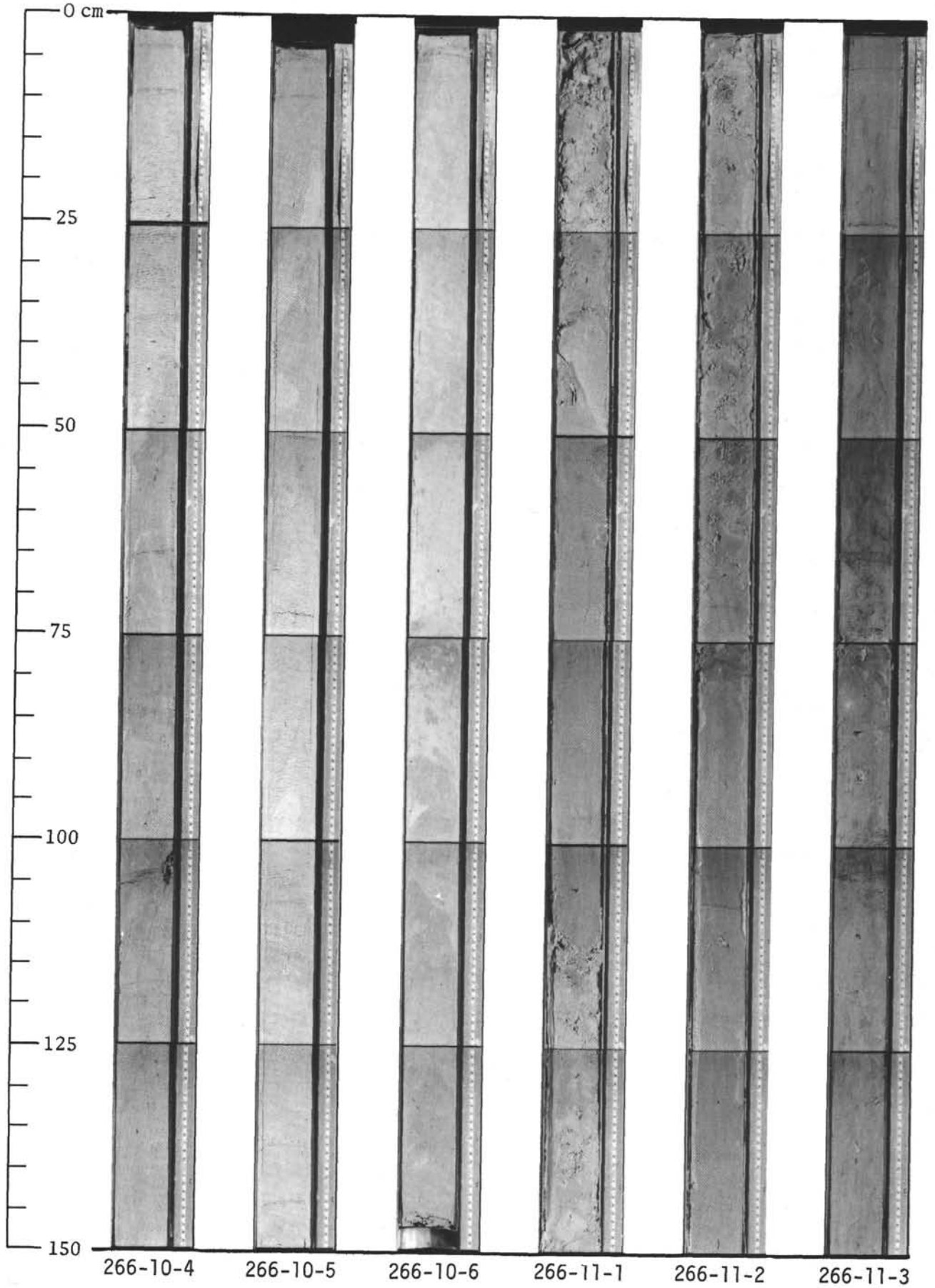
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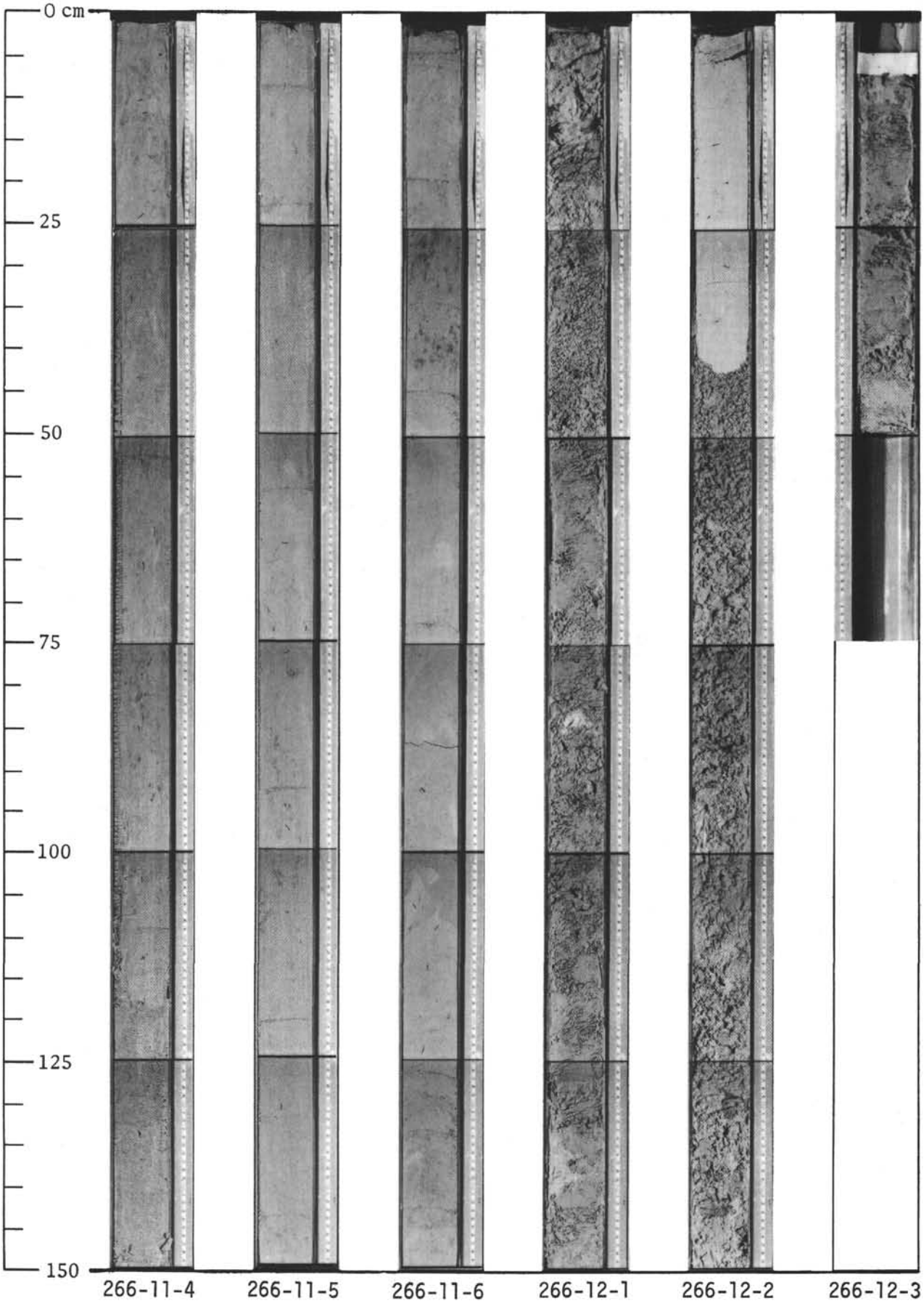
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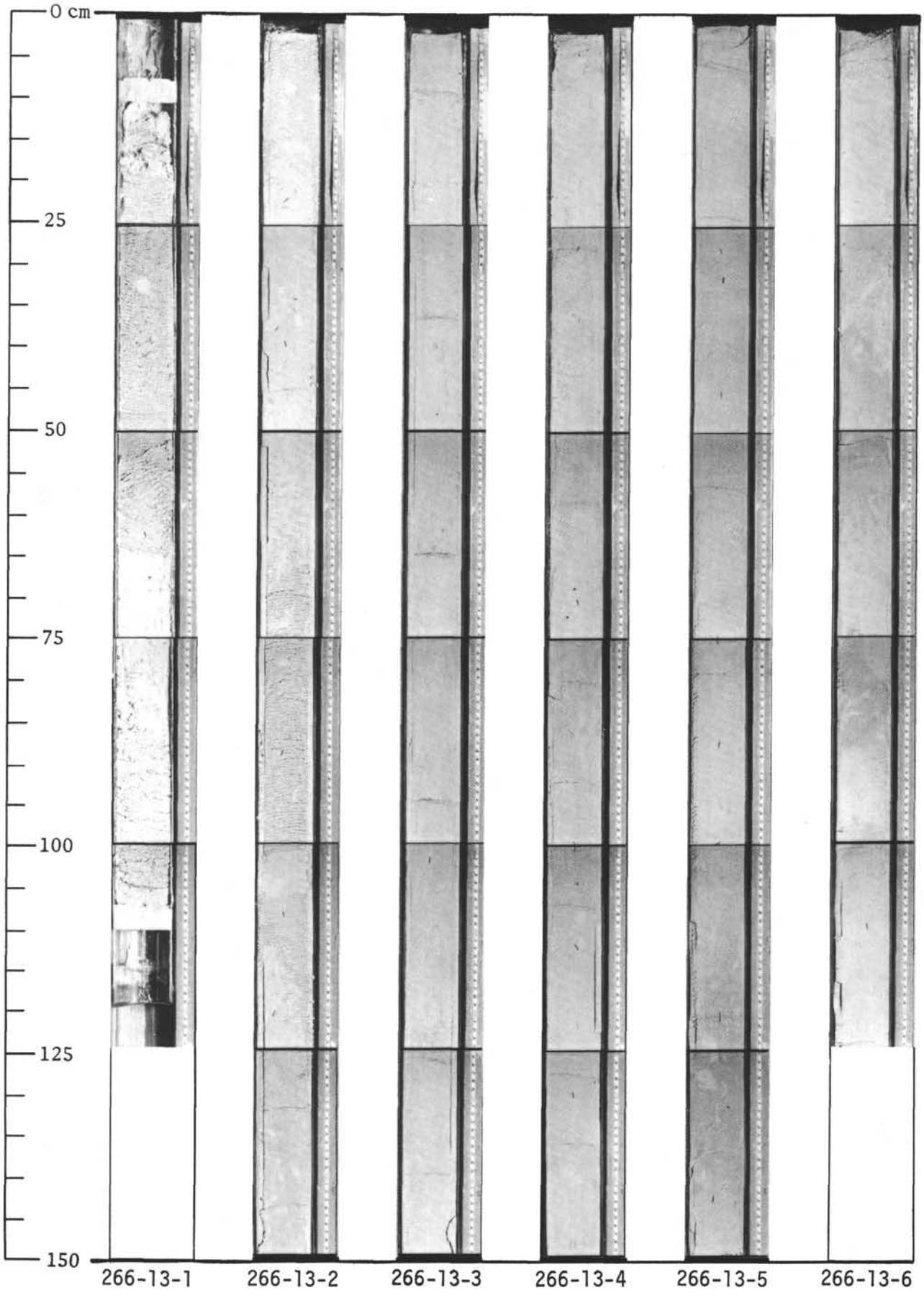
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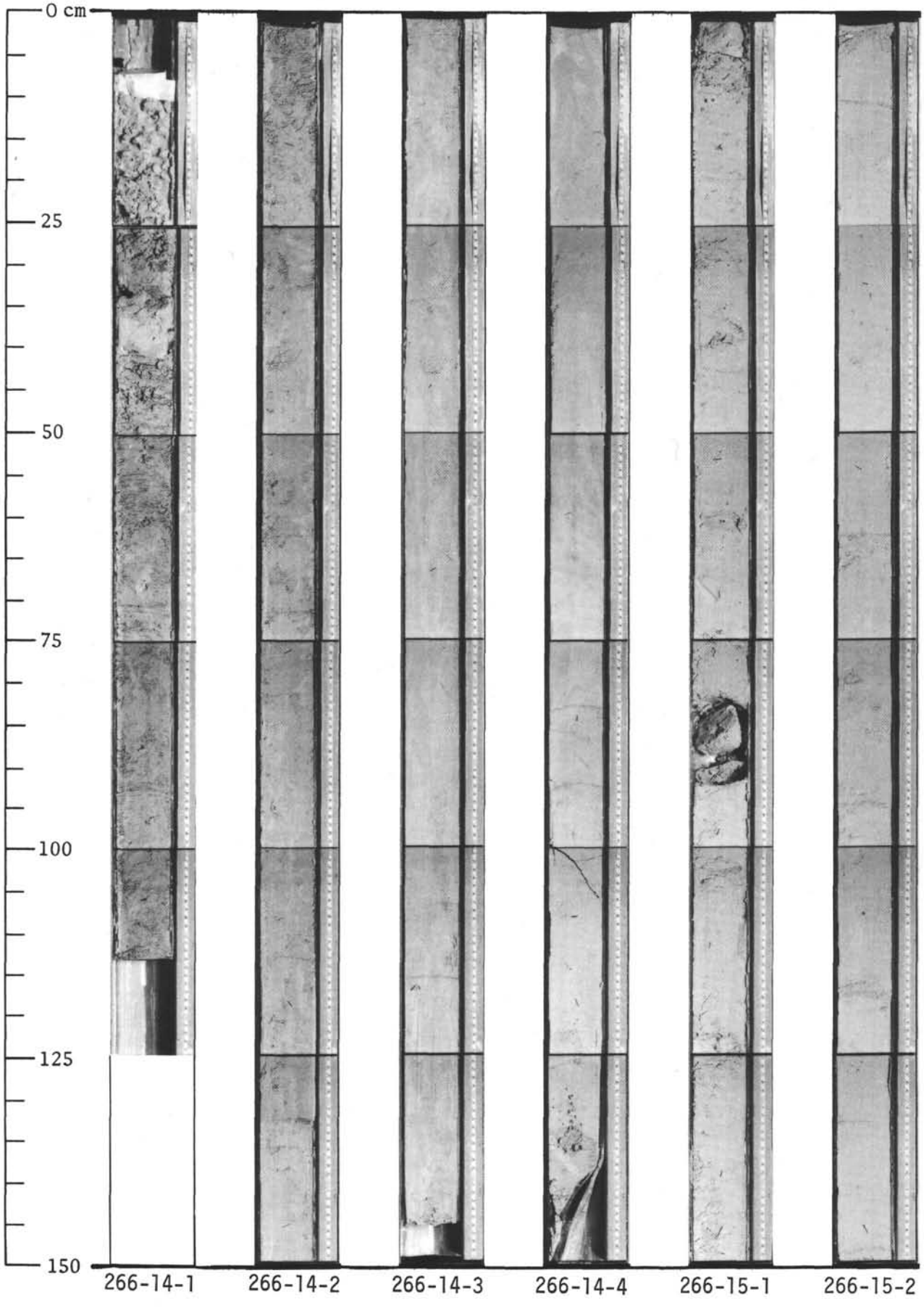
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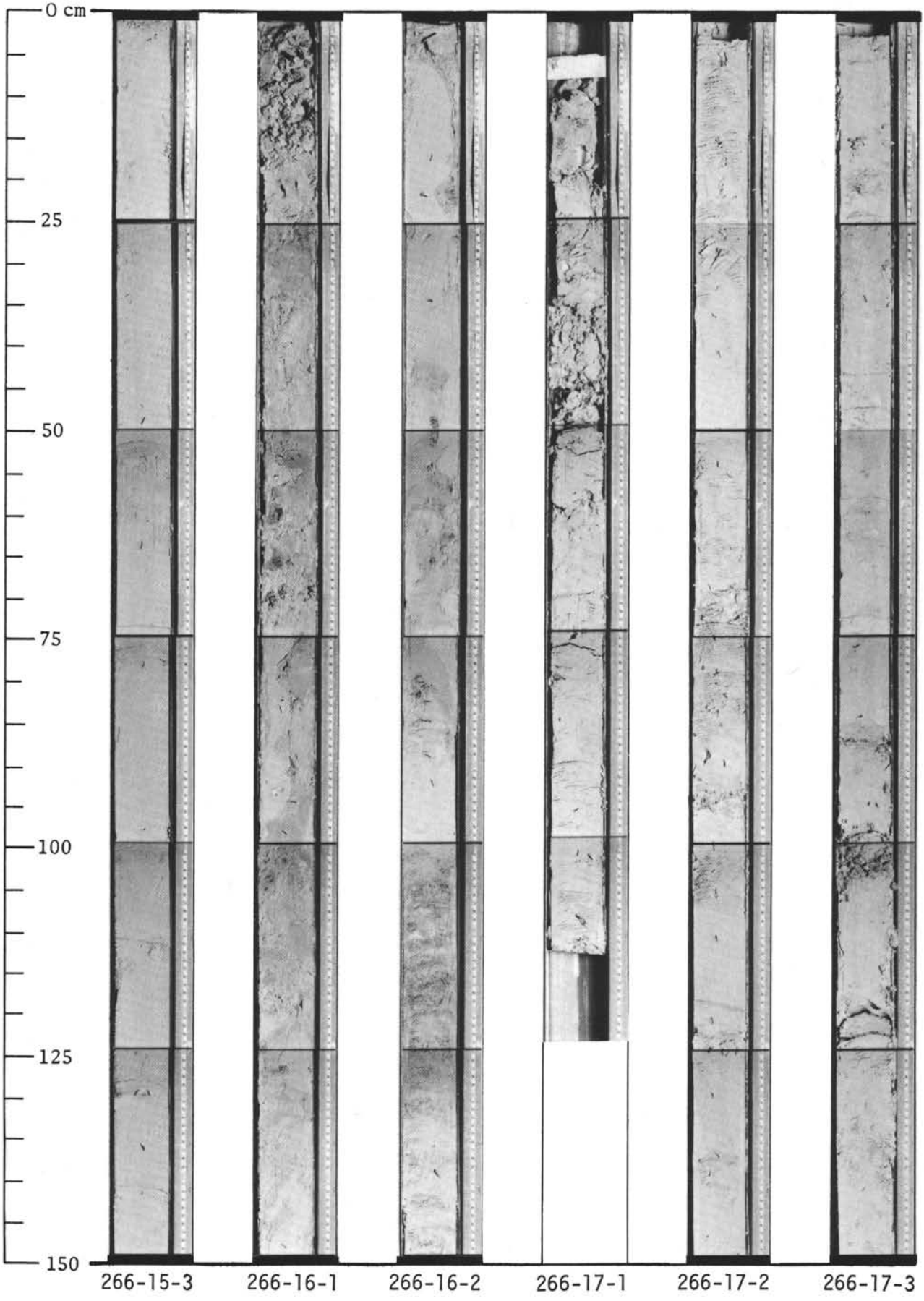
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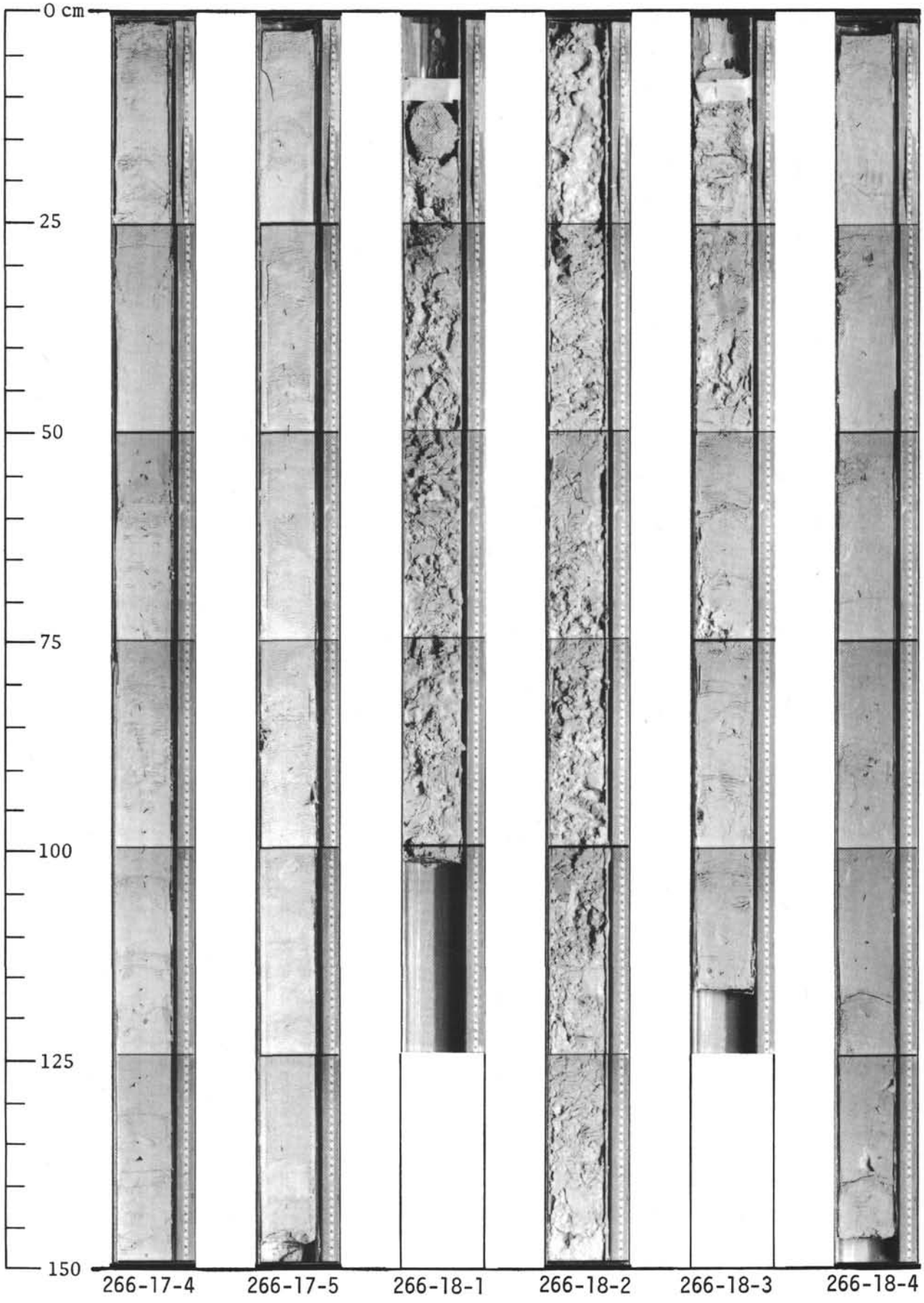
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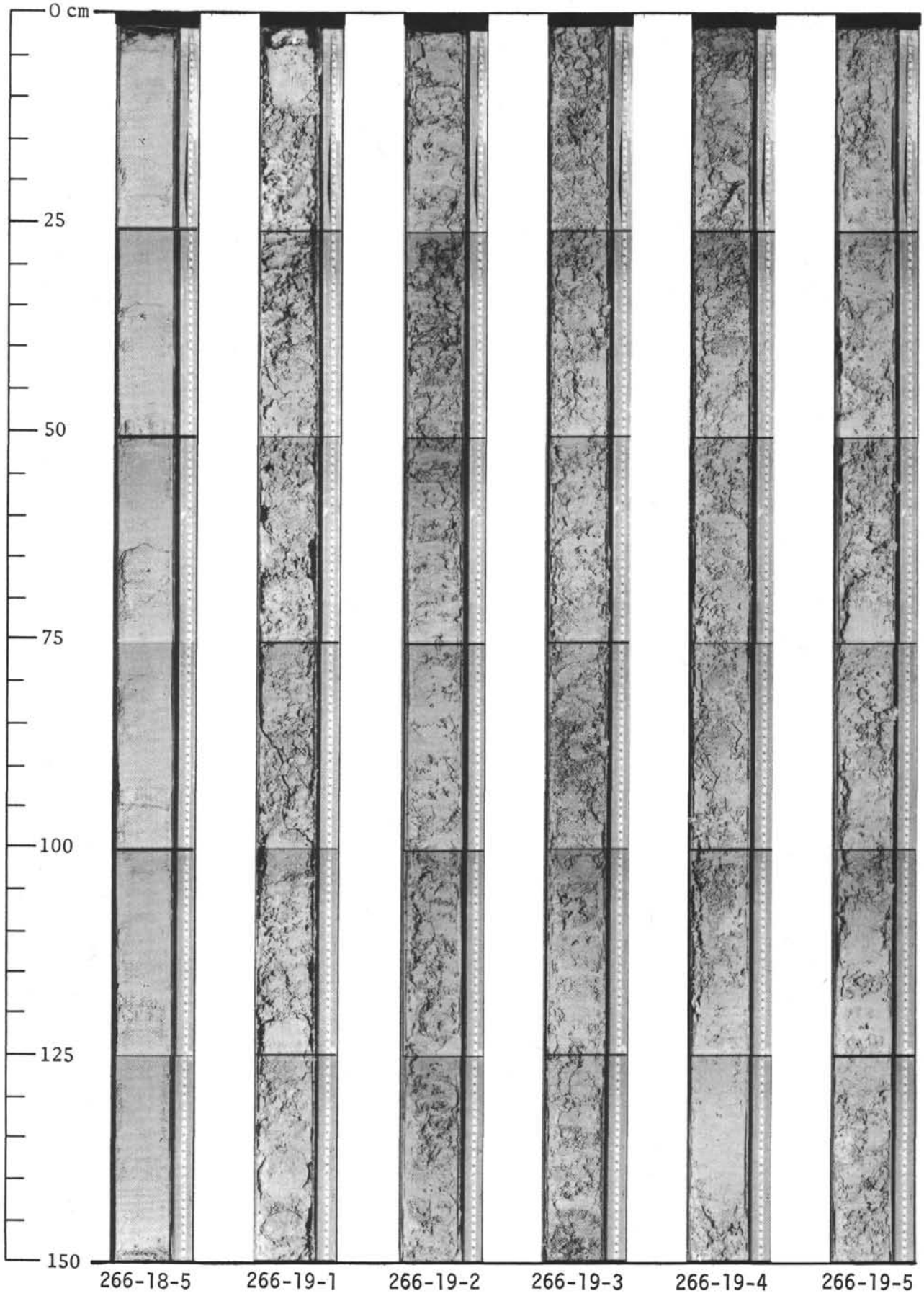
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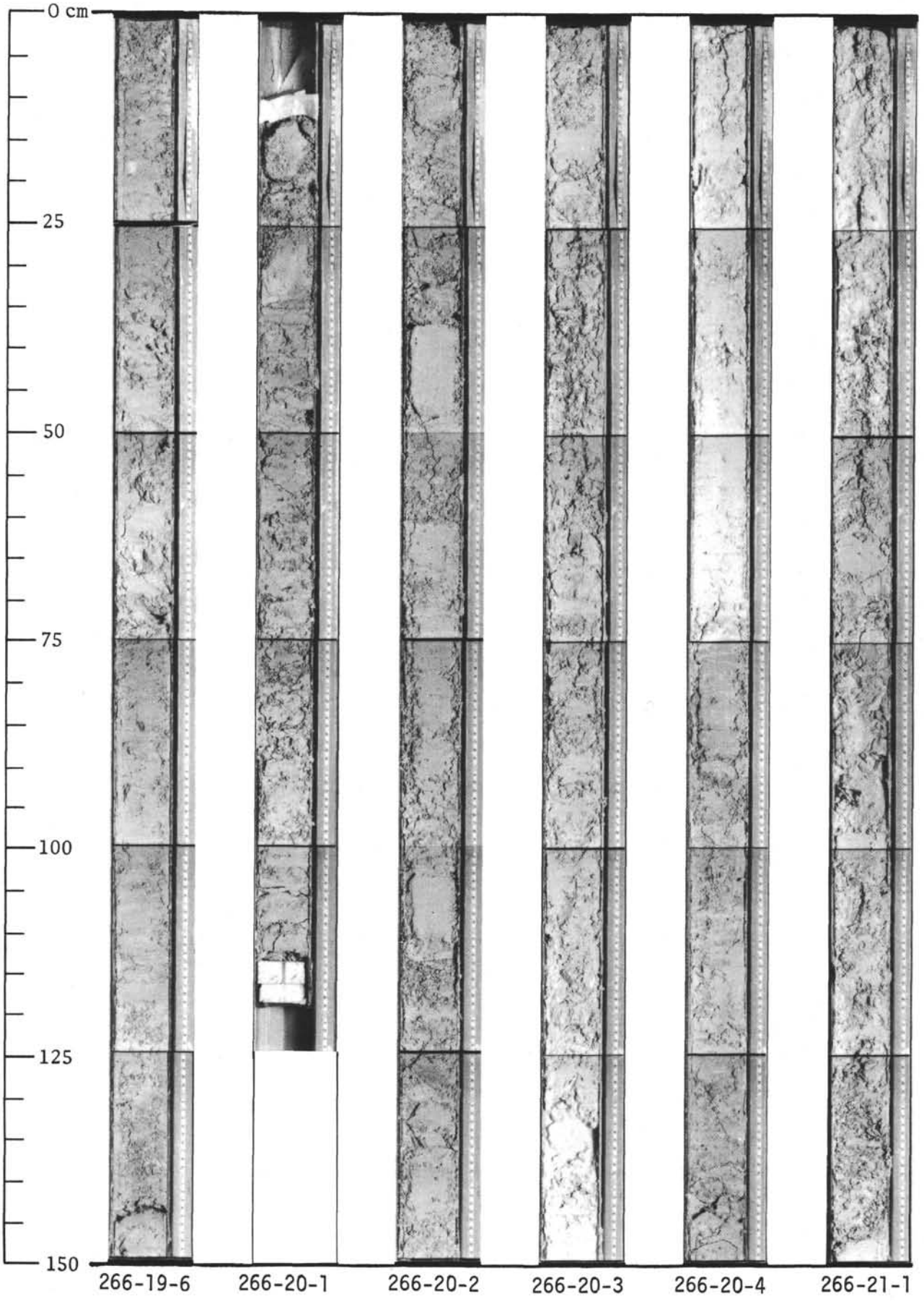
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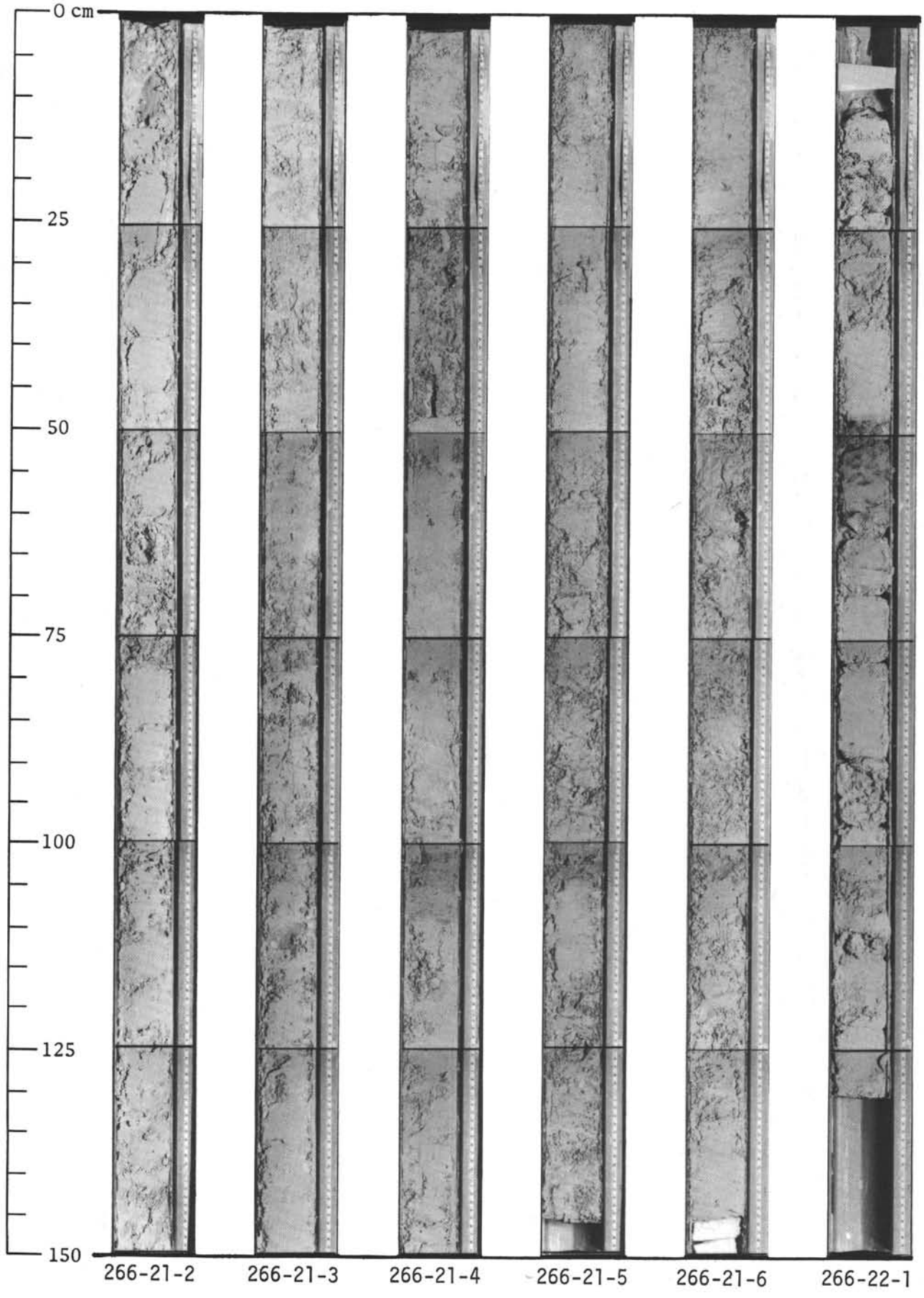
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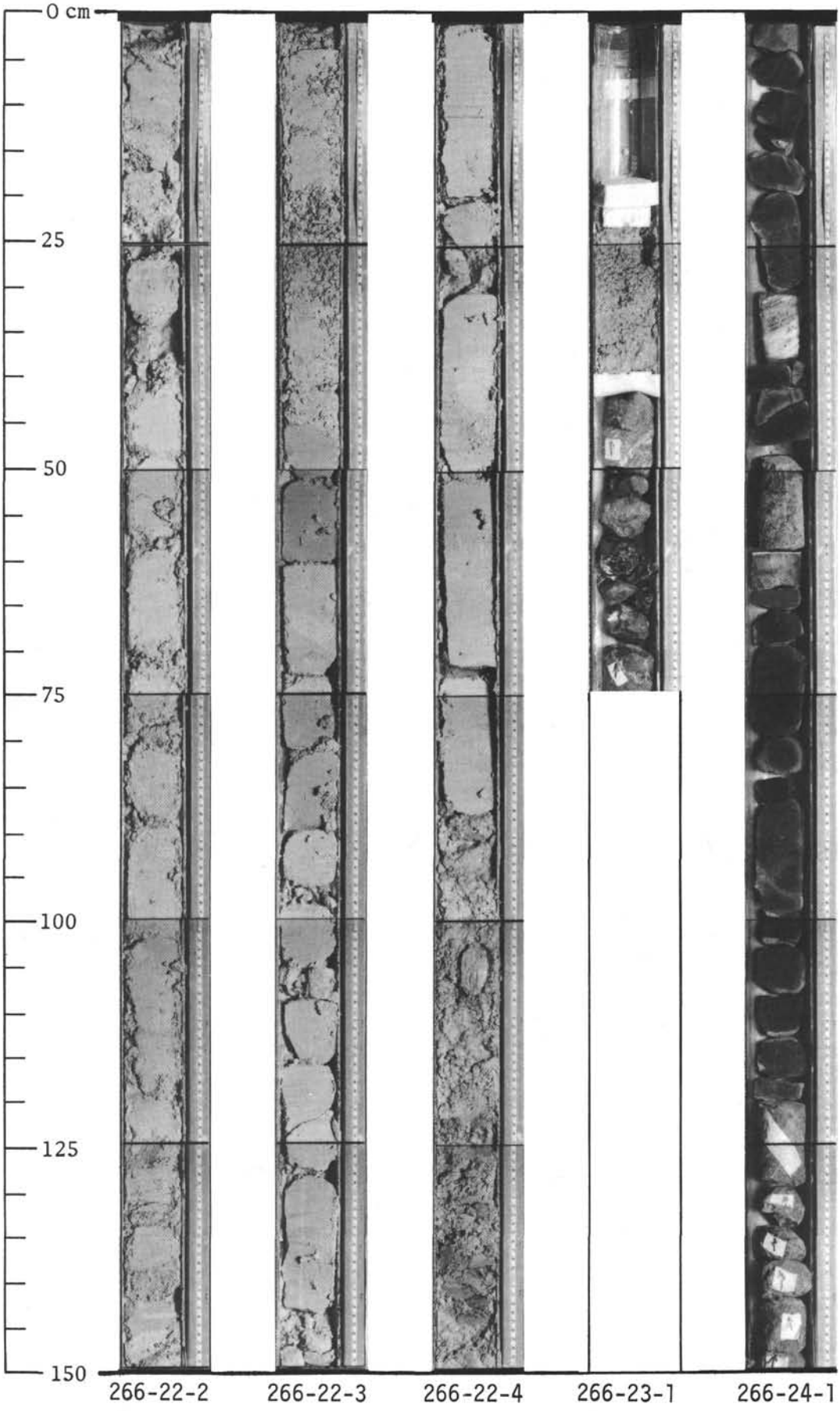
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