8. SITE 217

The Shipboard Scientific Party[1]

ABSTRACT

Site 217 is situated in 3010 meters of water on the eastern flank of Ninetyeast Ridge. The stratigraphic column at this site is composed of three units which are summarized below. Uppermost is a clay-rich nannofossil ooze unit, 0 to 145 meters, of Quaternary to middle-late Miocene age. This is underlain by a unit with shallow water affinities composed of nannofossil ooze and chalk, micarb chalk, silicified micarb chalk, and foraminifera-rich nannofossil chalk with chert, 145 to 600 meters, of late Miocene to late Campanian age. The final unit, which contains possible mudcracks at the base, is an interbedded sequence of dolomite sandstone, micarb chalk, chert, and silicified micarb chalk, 600 to 664 meters, of late Campanian age. The occurrence of clays between middle Miocene and Recent times within the upper nannofossil ooze unit may be related to the modern Bengal Fan sedimentation which in turn may have followed a major Himalayan orogenic phase in the Miocene. A combination of biostratigraphic and lithologic observations indicates that the Ninetyeast Ridge in the vicinity of Site 217 subsided from shallow depths during Late Cretaceous times.

SITE DATA

Date Occupied:
217: 24 Feb 72 (0440)
217A: 27 Feb 72 (0200)

Date Departed:
217: 27 Feb 72 (0200)
217A: 29 Feb 72 (0800)

Time on Site:
217: 69 hours 20 minutes
217A: 54 hours

Position:
lat 08°55.57′N
long 90°32.33′E

Water Depth (to rig floor):
3030 meters (Echo sounding)
3020 meters (Drill pipe)

Penetration:
217: 614.5 meters
217A: 663.5 meters

Number of Holes: 2

Number of Cores:
217: 37
217A: 17

Total Length of Cored Section:
217: 345.5 meters
217A: 161.5 meters

Total Core Recovered:
217: 183.4 meters
217A: 41.6 meters

Acoustic Basement:
Depth: 550 meters
Nature: Siliceous limestone and chert

Age of Oldest Sediment: Campanian

Basement: Not reached

BACKGROUND AND OBJECTIVES

After leaving Site 216 it was decided to run due north up the axis of the Ninetyeast Ridge to the next site. The seismic reflection record was most informative showing an almost continuous layer of 0.4 to 0.6 sec of transparent sediment with one clear reflector overlying an undulating basement.

Site 217 was chosen in the northernmost portion of the Ninetyeast Ridge just south of the flat turbidite sediments of the Bengal Fan (Figure 1). From the two previous sites on the ridge, 214 and 216, it appeared certain that the ridge (a) is attached to the Indian plate, (b) gets progressively older northward, and (c) has been above the calcite compensation depth for most of its history. Thus Site 217,

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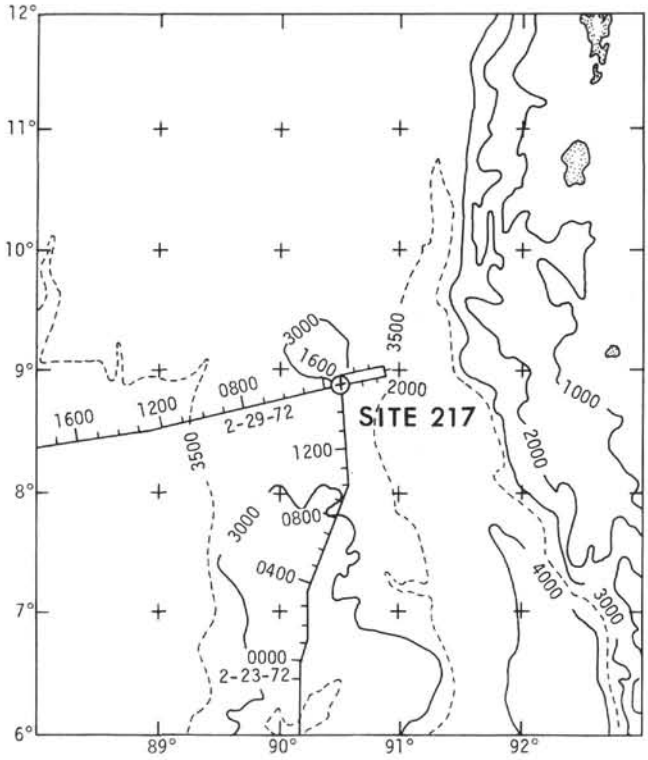


Figure 1. *Bathymetry in vicinity of Site 217.*

8° further north than anomaly 32, presents a unique chance to document the movement of India during the Late Cretaceous.

Curray and Moore (1971) have identified two prominent unconformities on structural highs in the Bay of Bengal and have suggested that the youngest of these marks a tectonic event between predominantly turbidite sections deposited during two short time intervals, one in the Plio-Pleistocene, the other in the late Miocene. They have further suggested that the older sediments, or their pelagic temporal equivalents, overlay the northern section of the Ninetyeast Ridge which in turn has been uplifted during the Pliocene exposing these sediments. The initial reason for drilling Site 217 was to date these unconformities and to sample the sediments above and below them.

OPERATIONS

Site 217 was approached along the crest of Ninetyeast Ridge from the south. Several miles south of the proposed site the seismic reflection profile of ANTIPODE XI cruise was picked up and followed across the site area. *Glomar Challenger* then headed due east for approximately 1½ hours down the eastern flank of the ridge to the onlapping Bengal Fan turbidites before returning to the selected site. A lighted spar buoy was dropped underway, after which speed was reduced to 5 knots and the seismic gear secured. The *Glomar Challenger* then reversed course to the buoy and the acoustic beacon deployed.

For drilling this site, a 3-cone long-tooth button bit was used. One core was taken every 38 meters throughout the uppermost 344 meters of the hole and continuous coring was carried out from this depth to the bottom of the hole. No difficulties were encountered in calcareous ooze and chalk sediments down to a depth of about 540 meters. However, at this depth numerous thin chert stringers appeared in a relatively hard silicified limestone. These chert layers caused drilling difficulties, shown by poor recovery and increasing times required to drill cores. Core recovery and drilling rate fell off progressively with depth until at a sediment depth of 614.5 meters drilling rate dropped essentially to zero. At this point it was decided to run the center bit in order to test the rate of bit wear, but it was found impossible to latch it into place, presumably due to a badly worn bit. The drill string was then pulled and the bit was found to have lost all three cones.

At Hole 217, 37 cores were taken. Recovery was 183.5 meters of sediment (Table 1) representing 53.1% recovery. Two heat flow measurements were taken in Hole 217 (Table 1); for details see Chapter 13.

A new hole, 217A, was then spudded in adjacent to 217. For this, a 4-cone chizzel-tooth journal-bearing bit was used, hopefully to ensure a greater drilling depth in cherty limestones. Four cores were taken continuously from 0 to 38 meters. Then, with the center bit in place, drilling proceeded down to the level of the cherty limestones at about 540 meters. Drilling rate fell off significantly at this depth and on pulling the center bit it was found to be badly worn. It was then decided to core continuously to the bottom of the hole. A succession of cherts, siliceous limestones, and dolomites was successfully cored down to the bottom of the hole at 663.5 meters. The hole was terminated at this depth due to a combination of time allowance and an increasingly slow drilling rate. The bit was pulled and found to be moderately worn, having lost several teeth from the cones.

In all, 17 cores were cut at Hole 217A, for a recovery of 41.6 meters of sediment, representing 25.8% recovery (Table 2).

LITHOLOGIC SUMMARY

Two holes were drilled at Site 217 in the unsuccessful attempt to penetrate the thick sedimentary accumulation and reach basement rocks on this part of the Ninetyeast Ridge. Virtually the entire sedimentary section encountered to an overall depth of 664 meters consists of carbonate sediments including nannofossil ooze and chalk, shelly micarb chalk, and very fine to medium-grained dolomite (dolarenite). These range in age from Recent at the surface to Upper Cretaceous, probably Campanian, at the bottom of the hole. Chert occurs in the Paleocene-Eocene and is prominent in the early Maastrichtian-Campanian part of the section where it occurs interbedded with dolarenite and shelly partly silicified micarb chalk.

Within the sedimentary section, three main lithologic units and four subunits are distinguished (Figure 2) as

TABLE 1
Coring Summary, Hole 217

Core	Date (Feb)	Time	Depth from Drill Floor (m)	Depth Below Sea Floor (m)	Cored (m)	Recovered (m)	Recovery (%)
1	24	1150	3020.0-3029.5	0-9.5	9.5	9.5	100
2	24	1304	3060.0-3069.5	40.0-49.5	9.5	4.9	52
3	24	1410	3098.0-3107.5	70.0-79.5	9.5	3.0	32
HF[a]	24	1530	3117.0-3119.0	97.0-99.0	0	0	0
4	24	1655	3136.0-3145.5	116.0-125.5	9.5	8.0	84
HF[a]	24	1800	3155.0-3157.0	135.0-137.0	0	0	0
5	24	1905	3174.0-3183.5	154.0-163.5	9.5	0.7	7
6	24	2020	3212.0-3221.5	182.5-192.0	9.5	9.4	99
7	24	2130	3250.0-3259.5	230.0-239.5	9.5	7.8	82
8	24	2256	3288.0-3297.5	268.0-277.5	9.5	9.1	96
9	25	0030	3326.0-3335.5	306.0-315.5	9.5	9.5	100
10	25	0207	3364.0-3373.5	344.0-353.5	9.5	8.1	85
11	25	0335	3384.0-3393.5	364.0-373.5	9.5	0	0
12	25	0530	3393.5-3403.0	373.5-383.0	9.5	0.3	3
13	25	0618	3403.0-3412.5	383.0-392.5	9.5	1.0	10
14	25	0720	3412.5-3422.0	392.5-402.0	9.5	7.4	78
15	25	0838	3422.0-3431.5	402.0-411.5	9.5	2.0	21
16	25	0955	3431.5-3441.0	411.5-421.0	9.5	9.0	95
17	25	1100	3441.0-3450.5	421.0-430.5	9.5	5.9	62
18	25	1206	3450.5-3460.0	430.5-440.0	9.5	3.6	40
19	25	1310	3460.0-3469.5	440.0-449.5	9.5	6.0	64
20	25	1420	3469.5-3479.0	449.5-459.0	9.5	6.5	54
21	25	1530	3479.0-3488.5	459.0-468.5	9.5	6.5	68
22	25	1635	3488.5-3498.0	468.5-478.0	9.5	4.5	47
23	25	1740	3498.0-3507.5	478.0-487.5	9.5	7.5	79
24	25	1855	3507.5-3517.0	487.5-497.0	9.5	9.5	100
25	25	2004	3517.0-3526.5	497.0-506.5	9.5	7.3	77
26	25	2119	3526.5-3536.0	506.5-516.0	9.5	6.8	72
27	25	2245	3536.0-3545.5	516.0-525.5	9.5	3.3	35
28	26	0045	3545.5-3555.0	525.5-535.0	9.5	8.0	85
29	26	0230	3555.0-3564.0	535.0-544.0	9.0	5.6	63
30	26	0420	3564.0-3573.5	544.0-553.5	9.5	3.8	42
31	26	0610	3573.5-3583.0	553.5-563.0	9.5	2.1	22
32	26	0805	3583.0-3592.5	563.0-572.5	9.5	2.2	23
33	26	0933	3592.5-3602.0	572.5-582.0	9.5	3.4	36
34	26	1057	3602.0-3611.5	582.0-591.5	9.5	1.1	12
35	26	1305	3611.5-3621.0	591.5-601.0	9.5	0.1	1
36	26	1516	3621.0-3630.5	601.0-610.5	9.5	0.8	9
37	26	1711	3630.5-3634.5	610.5-614.5	4.0	0.6	15
Total					345.5	184.8	53.1

Note: Echo sounding depth (to drill floor) = 3030 meters; drill pipe length to bottom - 3020 meters.

[a]HF - heat flow only.

TABLE 2
Coring Summary, Hole 217A

Core	Date (Feb)	Time	Depth from Drill Floor (m)	Depth Below Sea Floor (m)	Cored (m)	Recovered (m)	Recovery (%)
1	27	0840	3020.0-3029.5	0-9.5	9.5	5.2	55
2	27	0935	3029.5-3039.0	9.5-19.0	9.5	6.5	68
3	27	1030	3039.0-3048.5	19.0-28.5	9.5	5.3	56
4	27	1200	3048.5-3058.0	28.5-38.0	9.5	4.7	50
5	28	0050	3560.0-3569.5	540.0-549.5	9.5	3.4	37
6	28	0250	3569.5-3579.0	549.5-559.0	9.5	2.4	27
7	28	0455	3579.0-3588.5	559.0-568.5	9.5	2.5	27
8	28	0630	3588.5-3598.0	568.5-578.0	9.5	1.4	14
9	28	0755	3598.0-3607.5	578.0-587.5	9.5	0.1	1.4
10	28	0945	3607.5-3617.0	587.5-597.0	9.5	2.4	25
11	28	1140	3617.0-3626.5	597.0-606.5	9.5	CC	1
12	28	1359	3626.5-3636.0	606.5-616.0	9.5	1.8	19
13	28	1530	3636.0-3645.5	616.0-625.5	9.5	1.0	11
14	28	1835	3645.5-3655.0	625.5-635.0	9.5	1.8	19
15	28	1950	3655.0-3664.5	635.0-644.5	9.5	1.1	12
16	28	2150	3664.5-3674.0	644.5-654.0	9.5	0.4	4
17	28	2340	3674.0-3683.5	654.0-663.5	9.5	1.3	14
Totals					161.5	41.3	25.8

Note: Echo sounding depth (to drill floor) = 3030 meters; drill pipe length to bottom = 3020 meters.

shown below. Boundaries between these units are gradational and lithologic changes are subtle, hence undue emphasis should not be attached to the unit boundaries.

Unit	Depth Below Sea Floor (m)	Lithology	Age	Cores
1	0 to 145	Clay nannofossil ooze	Recent to mid-late Miocene	1-4, 1A-4A
2a	145 to 370	Clay-rich nannofossil ooze chalk	Mid-late Miocene to Eocene	5-11
2b	370 to 420	Foram-rich nannofossil chalk and chert	Mid Eocene to Paleocene	12-16
2c	420 to 480	Nannofossil chalk	Late to mid Maastrich-tian	16-23
2d	480 to 600	Micarb chalk, partly shelly, and chert	Mid Maas-trichtian to late Campanian	23-35, 5A-11A
3	600 to 664	Dolarenite, chert, clay-stone with some shelly micarb chalk in upper part	Late Campa-nian	36-37 12A-17A

Unit 1—Clay Nannofossil Ooze (Cores 1-4, 1A-4A)

For the most part Unit 2 consists of light greenish gray (5G8/1) to light bluish gray (5B7/1) clay nannofossil ooze. Nannofossils make up 40% to 60% of the sediment and clay content averages about 25% to 35%. All other typical pelagic biogenous remains, foraminifera, diatoms, Radiolaria, and silicoflagellates occur in this unit in relatively minor amounts and, though based on very sparse control, appear to vary systematically within the section. Thus, foraminifera are abundant (10% to 15%) in the upper 50 to 60 meters and decrease to 3% to 5% in the lower part; siliceous remains (Radiolaria and diatoms) are common (5% to 10%) in the upper 10 meters, virtually disappear below 20 meters, and reappear (up to 15%) below 100 meters where they are largely pyritized. Trace amounts of manganese micronodules and volcanic glass are found throughout the section, and one ash-rich layer occurs at a depth of 42 meters.

Another feature of possible significance is the presence of color banding (alternating layers of olive gray [5Y4/1], light olive gray [5Y6/1], and greenish gray [5GY6/1]) in the upper 30 meters of this section. This is related to a fluctuating calcium carbonate content (see Chapter 39).

Unit 2—Nannofossil Ooze-Chalk (Cores 5-35, 5A-11A)

Nannofossils constitute the bulk of Unit 2, averaging about 80%, and the sediment ranges from fairly stiff nannofossil ooze in the upper 60 to 80 meters to progressively more indurated nannofossil chalk, micarb

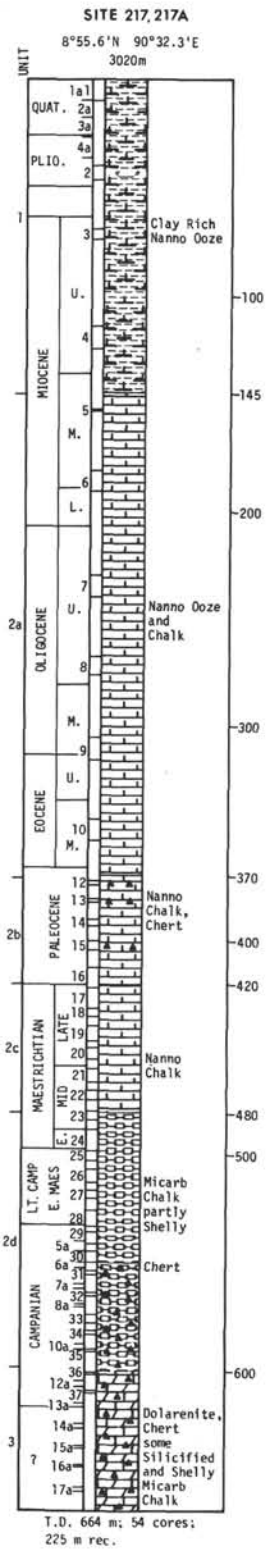


Figure 2. *Lithologic units at Site 217.*

chalk, and shelly micarb chalk below. Clay content is low (mostly 10% to 15%) relative to Unit 1, and, probably related to this, the color changes to a fairly uniform yellowish gray (5Y8/1) or very light gray (N8). Other significant constituents of the unit include foraminifera, Radiolaria, and other shell fragments, in particular, *Inoceramus* sp. and oysters. These constituents appear to vary systematically within the section and, combined with other criteria, serve as a basis for division of Unit 2 into the subunits.

Subunit 2a consists of nannofossil ooze and chalk, containing 75% to 80% nannofossils, 10% to 20% clay, 2% to 3% foraminifera, and 1% to 3% siliceous remains. Trace amounts of rhyolitic glass and iron oxide are found throughout. Radiolaria increase in abundance (to 5%) near the base of this subunit, then disappear at a depth of about 370 meters where chert first appears. The absence of siliceous biogenous remains, the presence of light brown (5YR5/6) chert, and an increase of foraminifera (3% to 15%) distinguish the next subunit (2b) from 2a.

At a depth of about 420 meters, several notable changes in sediment characteristics occur: (1) color changes to mottled and banded combinations of grayish orange pink (5YR7/2), very light gray (N8), light brown (5YR6/4), and yellowish gray (5Y8/1); (2) moderate to intense bioturbation becomes persistent; (3) foraminifera drop in abundance to about 1% to 2%; (4) nannofossils change from predominantly whole forms to predominantly fragmental. These differences, which persist downward, serve as a basis for defining subunit 2c, which extends to a depth of 480 meters.

Subunit 2d consists principally of light gray (N7) carbonate siltstone in the interval 480 to 500 meters, light gray to greenish gray (5GY5/1) shelly micarb chalk between 510 and about 555 meters, and siliceous micarb chalk near the base. These sediments are described as micarb chalk because they consist principally of indeterminate fine silt-sized carbonate with less than 5% to 10% of definite recognizable nannofossils, and the sediment is consolidated. The textural change downward to shelly micarb chalk corresponds to increased prominence of *Inoceramus*, oysters, and shell fragments of other large forms which make up 20% to 30% of even the finer beds in the central part of the section. Other constituents observed throughout the section include: foraminifera (3% to 5%); clay (5% to 10%); and trace amounts of pyrite, glauconite, volcanic glass, and sparry calcite.

At a depth of about 550 meters, nodular beds of brownish black (5YR2/1) chert begin and are intercalated with the micarb chalk through the remainder of this subunit. Authigenic silica, both in the groundmass and as a replacement of calcite in foraminifera and faecal pellets of the shelly carbonate siltstones becomes significant at about the same depth as the chert.

A variety of sedimentary structures is present in subunit 2d, particularly below the depth of 530 meters. Thorough understanding of these features will require much more detailed examination; however, a few types tentatively identified include: (1) burrows and lithologic mottles related to intense burrowing; (2) cross lamination; (3) "pseudo-cross lamination" thought to be formed by squashing of burrow structures; (4) lenticular laminations of sandy micarb chalk containing flattened glauconite clasts; (5) steep dipping and contorted "laminations" believed related to penecontemporaneous slumping. For the most part, these structures are observable by virtue of

varied color, and little in the way of macroscopic textural variations could be observed.

Unit 3–Dolarenite, Chert, and Claystone (Cores 36-37 and 12A-17A)

A complex interbedded sequence of dolarenite, chert, and some shelly micarb chalk comprises the sedimentary section of Unit 3. Individual beds average about 10 to 20 cm in thickness, and the contacts between units are generally either sharp of gradational over a very short interval of less than 1 cm. The shelly micarb chalk decreases in abundance downward, so that below about 635 meters the section consists of dolarenite, chert, and minor claystone stringers.

Composition of the dolarenite averages about 85% dolomite rhombs, 10% "silica" matrix, 3% authigenic silica, 2% pyrite, and traces of glauconite. The "silica" matrix is principally made up of unidentified partially crystalline, low birefringent material, possibly cristobalite or oriented aggregates of a clay mineral. Two dolomite lithologies are evident: (1) dark greenish gray (5GY6/1) fine to medium grained dolarenite which is friable; (2) medium dark gray (N4) very fine-fine grained dolarenite which is hard. Commonly these contain *Inoceramus* fragments and show evidence of cross-lamination. The shelly micarb chalk is similar in most respects to those of subunit 2d; however, in Unit 3, they contain the order of 20% to 30% dolomite and 20% "silica" matrix with a correspondingly reduced percentage of calcium carbonate (40% to 50%). Also, the foraminifera and faecal pellets are more completely silicified in this lower unit. Claystones in the lower part of Unit 3 also appear similar to the shelly micarb chalk, but carbonate has been reduced to a maximum of about 20%, and some layers contain virtually no carbonate.

CHEMICAL PROPERTIES

Sixteen samples were collected for interstitial water and shipboard geochemical measurements from the first 30 cores taken at this site. The deepest sample, 217-30-3 (~550 m), was so hard and dry that we were unable to recover any pore water. Only four samples were soft enough to make punch-in pH measurements. Twenty-nine samples from Hole 217 and one from Hole 217A were collected for the organic geochemistry program. These samples consist of 27 minicores of 20 cm length and 2 so-called "O" sections from the tops of full recovery cores. Saran wrap was placed over the exposed sediment prior to fitting with plastic end caps. The caps were secured with plastic electrical tape. The samples were immediately placed in a deep freeze and will be kept frozen.

Punch-in pH measurements were made as soon as possible following recovery. The first three samples were cooled in an ice bath so changes could be monitored over a greater temperature range. The fourth sample was collected by the core lab technicians and held in the refrigerator. It was inadvertently warmed to room temperature and had to be cooled once again in an ice bath before making the slope check. Temperature coefficients and pH values are shown as follows.

Sample	Scope (mv/°C)	pH (punch-in)	pH (flow-through)	Temperature
217-1-6	0.86	7.38	7.26	24.9
217-2-2	0.74	7.04	7.31	24.9
217-3-2	0.98	6.85	7.09	24.4
217-14-4	0.81	6.64	6.90	25.9

These four cores are widely spaced and represent surface, 50-, 80-, and 400-meter levels. The 15 pore water samples are spaced at intervals of 25 to 50 meters from the surface to 500 meters. The observation that pH is decreasing with depth in this hole (punch-in measurements) is supported by most of the pore water measurements. The change from top to bottom amounts to ~0.5 pH units (7.0 to 6.5).

The tests to determine the validity of measurements made with the flow-through pH electrode were continued at this site. Two samples of surface ocean water were checked with both types of electrodes. Measurements were made on one sample (A) immediately; the other (B) was equilibrated with laboratory air. The results are shown below.

Sample	pH (punch-in)	pH (flow-through)
A	8.39	8.26
B	7.62	7.98 (1)
		7.81 (2)

The difference for water collected and checked immediately is about the same as for two previous experiments. While there is a smaller difference for equilibrated water, the two values for the flow-through electrode represent "steady" readings, 10 mv apart, obtained over the time span of the experiments (<1 hour).

BIOSTRATIGRAPHIC SUMMARY

General

The section drilled at Site 217 is calcareous throughout the entire interval penetrated and yielded some calcareous fossils nearly to the bottom. In addition, well-preserved Radiolaria were recovered from the Quaternary to the middle Eocene. The sediments at this site range in age from Quaternary at the top to Late Cretaceous (probably Campanian) at the bottom of the interval penetrated. Preservation of all fossils is best in the late Neogene and generally deteriorates downward. The general aspect of the assemblages suggests that preservation is more closely related to the age of the sediment than to depth of burial, although the latter cannot be ruled out completely as a contributing factor.

From 0 to 353.5 meters the section was cored only intermittently and hence it is not known whether breaks may be present in the section. One hiatus can be recognized, however, in Core 9. This is the interval from the late Eocene to the mid Oligocene. Below this another hiatus probably exists between the bottom of Core 10 (353.5 m) and the top of Core 12 (373.5 m). The missing section of some 20 meters (no sediment was recovered in Core 11)

encompasses part of the middle Eocene, the lower Eocene, and much of the upper Paleocene, and unless all of the above are much attenuated, at least some part of the section must be missing. The Paleocene interval recovered in Cores 12 through 16 extends from the late Paleocene (though by no means the latest) to the Danian. The Maastrichtian seems well developed at this site though many of the diagnostic fossils are not present. The quality of the fossil assemblages deteriorates notably below the late Maastrichtian, concomitant with an increase in nonpelagic constituents in the assemblage as well as silica content in the form of chert. Consequently, only broad limits can be put on the age of the lowest cores, i.e., they are no older than early Campanian nor younger than early Maastrichtian. The general aspect of the calcareous assemblages, however, suggests a Campanian age.

The sediment assumes an increasingly more shallow water aspect towards the bottom of the section, as indicated by the much reduced pelagic constituents in the sediment.

Foraminifera

Planktonic foraminifera were found in all samples examined down to Core 36. They give ages of Pleistocene and early Pliocene on Cores 1 and 2. Sample 3, CC has a good Pliocene assemblage (in contrast to Core 2, CC) but Sample 3-1, 28-30 cm does not. Cores 4 and 5 are upper and middle Miocene, respectively. As in previous holes, there is an improvement in the assemblages recovered in the vicinity of the Oligocene/Miocene boundary; Core 6 is upper Oligocene (Zone N.3) in age. Also as previously, the material deteriorates from there on down, in this case into the middle Eocene (Core 10). The pattern continues with a thick record and good assemblages of the *Planorotalites pseudomenardii* Zone (P.4; Paleocene) which was identified in Cores 12, CC to 15, CC, inclusive. The lower part of the Paleocene is very compressed: Core 16 spans the 3- to 4-m.y. interval of Danian Zone P.1. Fossils of early Danian age extend down to 16, CC, but Maastrichtian species extend up to 16-5, 34-36 cm. It is concluded on foraminiferal evidence that the Cretaceous/Tertiary boundary falls between Cores 16 and 17 and that reworking covers about the same interval of time as that represented by a hiatus at Site 216.

The Cretaceous section begins with a rich upper Maastrichtian assemblage characteristic of the *Globotruncana mayaroensis* Zone in low latitudes. There are variations in specimen number, preservation, and benthonic diversity down to Sample 23, CC, but *G. mayaroensis* persists and the age thus is still upper Maastrichtian. Core 24, CC is quite different: most of the higher species were not found, including *G. mayaroensis*; *Rugoglobigerina* has become abundant; *Globotruncana* is much reduced in diversity; the general aspect is lower Maastrichtian. However, the top part of Core 24 is transitional, and the presence of *G. intermedia* in the absence of *G. mayaroensis* may indicate the mid-Maastrichtian *G. gansseri* Zone, for which there is little evidence otherwise. The *Rugoglobigerina* assemblage continues through the interval in which *Inoceramus* prisms are common in the residues (especially Core 29). In Cores 31 to 36, where tests are silicified, sponge spicules are often frequent and *Inoceramus* is much less common, the assemblages differ from those above in that *Rugoglobigerina* is relatively less common and *Globotruncana* cf. *marginata* is present. Only very small planktonics occur in Core 36, CC, and no fossils were found in a residue from Core 37. The virtually total absence of the *Globotruncana stuarti* group below the upper Maastrichtian renders correlation and age determination very tentative. However, *Bolivinoides draco miliaris* in Core 27 indicates a late Campanian-early Maastrichtian age, and *Globotruncana* of the *arca/rosetta* type in Core 36 suggests a Campanian age. Two samples from Hole 217A, Core 14 contained rare silicified benthonics and long-ranging planktonics. Nothing was found in 217A-15, CC. It can be assumed that the dolarenites section does not extend below the Campanian.

Nannofossils

Calcareous nannofossils were recovered throughout the interval cored at Hole 217, from Core 1 to Core 34 The section ranges in age from Quaternary at the top to Upper Cretaceous (probably Campanian) at the bottom. The intermittently cored upper portion of the section yielded the following ages:

Core 1; Pleistocene. The *Emiliania huxleyi* Zone is represented in Section 1; the *Gephyrocapsa oceanica* Zone in Sections 2 and 3; and the *Pseudoemiliania lacunosa* Zone in Sections 4 through 6.

Core 2; early Pliocene. The entire core is assignable to the *Discoaster asymmetricus* or *Reticulofenestra pseudoumbilica* Zone.

Core 3; late Miocene, *Discoaster quinqueramus* Zone.

Core 4; late Miocene, *Discoaster neohamatus* Zone.

Cores 5 and 6; undifferentiated middle Miocene, except Core 6, Sections 5 and 6 which are assignable to the *Sphenolithus heteromorphus* Zone.

Core 6, CC; early Miocene, *Sphenolithus belemnos* Zone.

Cores 7 and 8, Section 1; Oligocene, *Sphenolithus ciperoensis* Zone.

Core 8, Section 2 through Core 9, Section 5; Oligocene, *Sphenolithus distentus* through *Cyclococcolithina formosa* zones.

Core 9, Section 6; late Eocene, *Discoaster barbadiensis* Zone.

Core 10; middle Eocene, *Chiasmolithus grandis* Zone.

Core 11; no recovery.

Core 12 through Core 16, Section 6; Paleocene. Core 12, Section 1 is assignable to the *Discoaster multiradiatus* Zone; Cores 13 and 14 are mid-Paleocene; and Cores 15 and 16 are probably early Paleocene (Danian) in age. The nannofossils in the core catcher of Core 16 are late Maastrichtian in age, though admixed with some Danian forms.

Cores 17 through 24 are probably late Maastrichtian in age. Neither *Nephrolithus frequens* nor *Tetralithus murus*, the high latitude and low latitude index species, respectively, for the late Maastrichtian are present, and the age assignment is based on the occurrence of *Cylindralithus gallicus. Bronsoina parca* has its highest occurrence in Core 24, indicating an early Maastrichtian age, below Core 24 *Tetralilithus ritidus trifidus* also occurs. *Bronsoina parca* occurs as low as Core 36 (217A-12 or 217A-13) indicating

an age not older than Campanian for this level. The lowest core, Core 37, yielded no calcareous nannofossils.

In general, the preservation and diversity of nannofossils is good in the late Neogene (late Miocene through Quaternary). Below this level, however, species diversity is much reduced and preservation is poor, with many specimens heavily calcified. Especially poor preservation is noticeable in the Paleocene-Eocene interval, and there appear to be several substantial gaps in the sedimentary record which cannot be accounted for entirely by the incomplete core recovery.

In the Upper Cretaceous interval the species diversity is substantially greater than in the Tertiary and reaches its peak around Cores 24 and 25. Below that level the number of species seemingly declines, though it appears erratic, depending on the chertiness of the sample. The absence of *Nephrolithus frequens* in the late Maastrichtian is puzzling in view of the persistence of that species in the same interval at Site 216. The absence of *Tetralithus murus*, the scarcity of *Lithraphidites quadratus* in the late Maastrichtian, and its absence in the early Maastrichtian may suggest that ecological factors other than climate may have operated in determining the complexion of the Maastrichtian assemblages.

Radiolaria

Radiolaria are present and generally well preserved in most of the samples examined from Cores 1 through 12 at Hole 217. These cores range in age from Quaternary to middle Eocene. Below Core 12 Radiolaria are absent. The following age assignments can be made for the intervals cored.

Core 1 contains abundant, well-preserved Radiolaria of Quaternary age. In Core 2, which is lower Pliocene in age based on the discoaster assemblages, Radiolaria are virtually absent in the two samples examined (217-2-1, 125-127 cm; 217-2, CC). Core 3 contains the boundary between the *Stichocorys peregrina* Zone at the top of the core (Sample 217-3-1, 70-72 cm) and the *Ommatartus penultimus* Zone in the core catcher. Core 4 is within the *Ommatartus antepenultimus* Zone. Core 5 is within the upper *Dorcadospyris alata* Zone. Core 6 is within the *Calocycletta virginis* Zone. Core 7 is within the *Dorcadospyris ateuchus* Zone. Core 8 is within the upper *Theocyrtis tuberosa* Zone. Core 9 contains the boundary between the *Theocyrtis tuberosa* Zone and the *Thyrosocyrtis bromia* Zone. Core 10 contains three radiolarian zones of middle Eocene age: *Podocyrtis mitra* Zone (Samples 217-10-1, 108-110 cm and 217-10-2, 68-70 cm); *Podocyrtis ampla* Zone (Sample 217-10-4, 70-72 cm); and *Thyrsocyrtis triacantha* Zone (Sample 217-10, CC). Core 11 was empty. Core 12 contained poorly preserved middle Eocene radiolarian fragments. Below Core 12 Radiolaria are absent.

CORRELATION OF REFLECTION PROFILE AND STRATIGRAPHIC COLUMN

Site 217 is situated on the crest of the northernmost extension of Ninetyeast Ridge. Seismic profiles in the area show a relatively thick (0.6 to 0.8 sec) draped sedimentary unit over the ridge, similar to that seen at the previous ridge site to the south (Site 216). The northern section of the ridge is flanked by sediments of the Bengal Abyssal Fan, and draped ridge sediments are seen to dip below the onlapping turbidites.

Details of the seismic reflection profile at Site 217 show a unit of moderately transparent sediment about 0.6 sec in thickness above acoustic basement. Minor reflectors occur throughout the sediment layer, with two notable zones of reflection, labeled 1 and 2 (see Figure 3) at 0.2 and 0.4 sec. Of these two, number 2 is the strongest.

The most plausible correlation between the seismic reflection profile and the drilled sediment column relates the uppermost weak reflector, at 0.2 sec, to onset of chalkiness in the nannofossil ooze, at about 150 meters. The underlying strong reflector at 0.4 sec may correspond with uppermost (Eocene) chert stringers within the chalk at 375 m. Acoustic basement, at 0.6 sec, best correlates with the upper level of indurated dolomites within the dolomite-chert sequence, at a sediment depth of 600 meters.

If the above relationships are true, then the interval velocity between the sediment surface and Reflector 1 is 1.5 km/sec, between Reflectors 1 and 2 is 2.2 km/sec, and between Reflector 2 and acoustic basement is 2.3 km/sec. The overall interval velocity down to acoustic basement is 2.0 km/sec.

Depths of reflectors and interval velocities are as follows.

Reflector	2-Way Time (sec.)	Depth (m)	Interval Velocity (km/sec)	
0	0	0	1.5	2.0
1	0.20	150	2.2	
2	0.40	375	2.3	
3	0.60	600		

SUMMARY AND CONCLUSIONS

Site 217 is situated on the eastern flank of the northern Ninetyeast Ridge, near its juncture with the Java Trench. It was chosen in an area of relatively thick (>0.6 sec), acoustically stratified draped sediments, approximately 22 km from the nearest obvious onlapping Bengal Fan turbidites. Water depth at the site is 3010 meters.

Igneous rock was not reached, and the oldest lithologic unit samples is a Campanian dolarenite-chert complex in which the dolomite is clearly of secondary origin. Sugary rhombs of this mineral have replaced shallow-water bioclastic material of possible lagoonal or shelf origin, and at least two repeated phases of dolomitization are indicated by zoned dolomitic overgrowths on sparry calcite nuclei (see Chapter 21). Occasional complete dessication of the depositional environment is suggested by the tentative identification of a mud-crack in fine-grained carbonates near the base of the hole.

Progressive sinking of the Ninetyeast Ridge is reflected in the overlying lithologic unit which is composed of late Campanian to mid-late Miocene foraminifera- and clay-rich nannofossil ooze, chalk, and chert. Basal portions of this unit contain definite evidence for a shallow water environment in the form of a molluscan macrofauna (notably oysters), a microfauna and flora with shallow-water affinities, and the presence of glauconite. Paleonto-

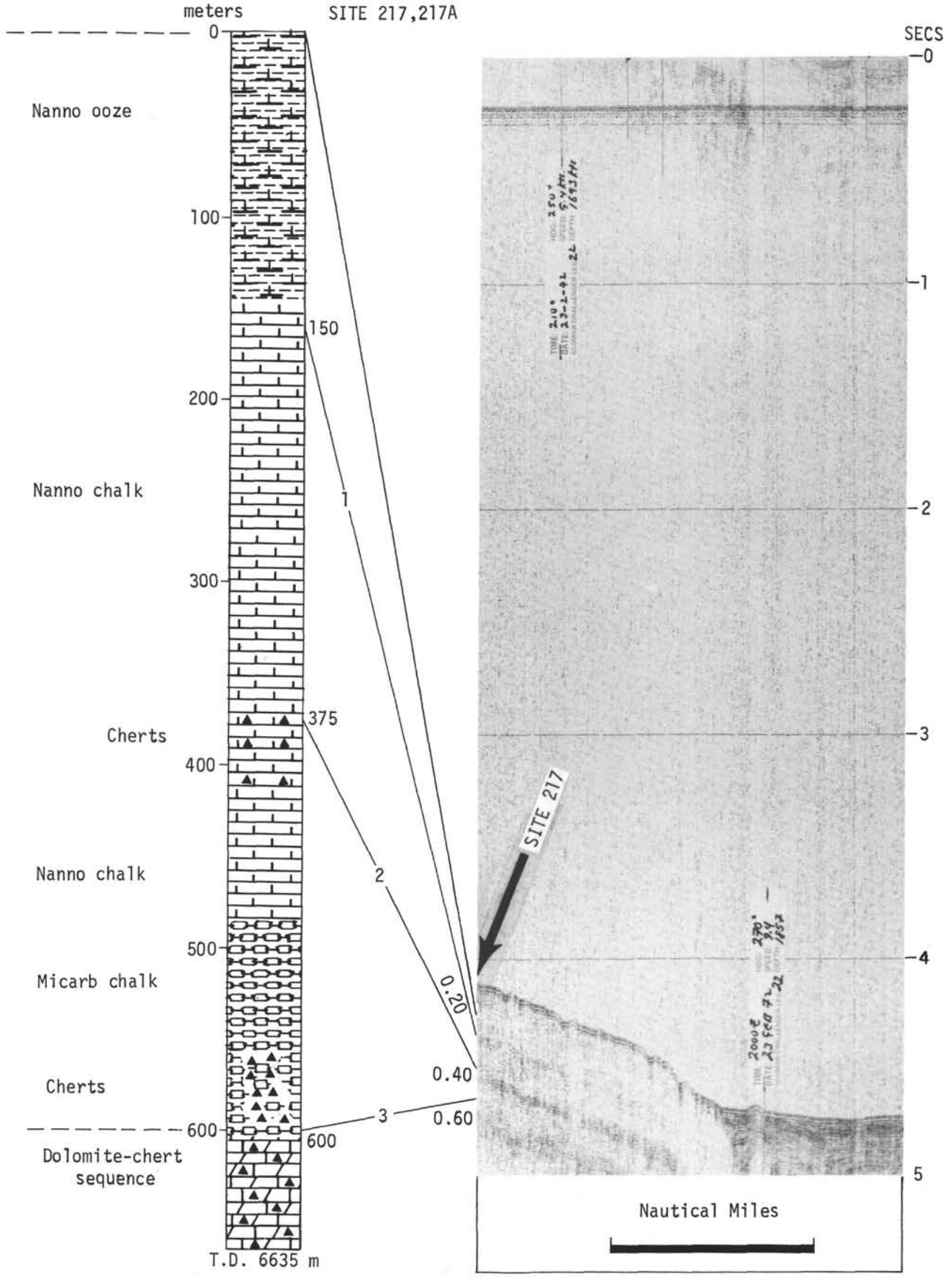


Figure 3. *Correlation of reflection profile and stratigraphic column at Site 217.*

logic evidence indicates an oceanic environment for the carbonate ooze and chalk section above 500 meters.

The uppermost lithologic unit is dominantly an oceanic calcareous nannofossil ooze of mid-late Miocene to Recent age. Oozes in this unit contain a significant admixture of terrigenous clay particularly in the upper part, which may be due to greater turbidite activity in the Bay of Bengal fan in late Miocene times.

The basal sediments from Site 217 are at least 7 to 10 m.y. older than those at Site 216. The distance separating the two sites is less than 800 km. Thus the effective spreading rate of the ridge is probably between 8 and 10 cm/yr, considerably less than that between Sites 216 and 214. Some speculations concerning the implications of these different spreading rates have been included in the regional synthesis chapter.

The two unconformities recognized by Curray and Moore (1971) were found to be uppermost Miocene and Paleocene-Eocene respectively. The deeper of these was thus considerably older than their estimated Miocene age.

REFERENCE

Curray, J. R. and Moore, D. G., 1971. Growth of the Bengal deep-sea fan and denudation in the Himalayas: Geol. Soc. Am., v. 82, p. 563-572.

Site 217 Hole Core 1 Cored Interval: 0-9.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
PLEISTOCENE	E. huxleyi	R	C	E	1	0.5, 1.0			-30	FORAM RICH CLAY NANNO OOZE olive gray (5Y4/1), greenish gray (5GY6/1, occasional mottles light bluish gray (5B7/1) - colors streaked due to drilling. Nannos 41% Clay 36% Forams 15% Rads 2% Spicules 1% Carbonate fragments (detrital?) 5% Basaltic glass, hornblende, feldspar, silicoflag., diatoms, opaques Tr.
	G. oceanica				2				-115	
									-125	FORAM RICH CLAY NANNO OOZE 5B7/1 mottles Nannos 44% Forams 15% Clay 30% Rads 3% Carbonate fragments 5% Diatoms 1% Silicoflag. 1% Spicules 1%
		R	C	E	3		GEO CHEM			
					4					Sections 4, 5, 6 too watery to split. CLAY NANNO OOZE
	P. lacunosa				5					X-ray at 0.40 m Calc 69, Quar 11, Plag 3, Kaol 2, Mica 14, Chlo 1
					6					
	N23	R F	A A	E F	Core Catcher					CLAY NANNO OOZE

Explanatory notes in Chapter 1

Site 217 Hole Core 2 Cored Interval: 40-49.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY PLIOCENE	Discoaster asymmetricus - Reticulofenestra umbilica Zone	N R	A -	G	1	0.5 1.0	VOID		-140	FORAM NANNO RICH CLAY OOZE light bluish gray (5B7/1) with streaks of medium gray (N5) Carbonate of silt and fine sand size 40% Nannos 20% Forams 10% Clay 30% Glauconite Tr.
					2		GEO CHEM			
		N	A	F	3				-40	GLASS FORAM RICH CLAY NANNO OOZE greenish gray (5GY6/1) Nannos 40% Clay 35% Forams 10% Volcanic glass (rhyolitic) 10% Carbonate fragments 5% black Mn spots
					4		GEO CHEM			
	N19	N R F	A + C	G P P	Core Catcher				-145	FORAM RICH CLAY NANNO OOZE light bluish gray with mottled zones of medium light gray (N6) Nannos 45% Forams 15% Clay 35% Carbonate fragments 5% Epidote, feldspar, spicules Tr. X-ray at 43.70 m Calc 88, Quar 4, Plag 1, Mica 6 Mont 1

Explanatory notes in Chapter 1

Site 217 Hole Core 3 Cored Interval: 70-79.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE MIOCENE	Discoaster quinqueramus Zone / S. peregrina Zone (R) / O. penultimus Zone (R)	N F	A C	G F	1	0.5				moderate bioturbation (0-75 cm)
		R	A	E		1.0			80	NANNO OOZE light bluish gray (5B7/1) laminated with greenish gray (5G6/1) (75-80 cm)
							GEO CHEM			occasional black Mn mottles
					2					unopened
										CLAY NANNO OOZE light bluish gray streaked with greenish gray Nannos 64% Clay 30% Carbonate fragments 3% Forams 2% Basic glass Tr. Silic. foss. Tr.
	?	N R F	A C C	G G F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 4 Cored Interval: 116-125.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE MIOCENE	Discoaster neohamatus Zone / Ommatartus antepenultimus Zone (R)				1	0.5	VOID			
		N	A	P		1.0				CLAY NANNO OOZE light greenish gray (5G8/1) with mottles dusky yellow (5Y6/4), very stiff Nannos 60% Clay 25% Rads 5% Forams 5% Diatoms 3% Spicules 2%
		N	A	P	2				33	pale olive (10Y6/2) siliceous foss. pyritized
										greenish gray (5GY6/1)
										5G8/1 with mottles 10Y6/2
					3				30	10Y6/2 with mottles 5G8/1 60 cm pyritized burrow cast
					4					5G8/1 section unopened X-ray at 122.60 m Calc 86, Quar 4, Plag 1, Kaol 2, Mica 3, Mont 3
		N	A	P	5					5G8/1 olive gray 5Y3/2
		N	A	P	6				110	CLAY NANNO OOZE 5G8/1, very stiff Nannos 55% Clay 35% Rads 3% Forams 3% Diatoms 1% Carbonate fragments 3% Silic. fossils not so pyritized as in Sections 1-3.
										pale olive (10Y6/2)
	?N15 ?N16	N R F	A C C	G G P	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 5 Cored Interval: 154-163.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MIOCENE	Dorcadospyris alata Zone (R)	N R	A C	G M	1	0.5 1.0	VOID	I I I I I I I	-130	CLAY RICH NANNO OOZE yellowish gray (5Y7/2) very stiff with one chalky layer Nannos (and micarb?) 77% Clay 20% Forams 2% Siliceous foss. <1%
	N12	N R F	A C R	G M P	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 6 Cored Interval: 182.5-192 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MIOCENE	Sphenolithus heteromorphus Zone / Calocycletta virginis Zone (R)	N R	A C	P M	1	0.5 1.0			-30	very pale orange mottles (10YR8/2) bioturbation CLAY RICH NANNO CHALK moderate orange pink (5YR8/4) Nannos (and some Micarb) 78% Forams (small) 7% Clay 15% Silic. foss. Tr.
					2					burrows slight bioturbation moderate bioturbation very pale orange (10YR8/2)
		N	A	P	3				-57	VOID ASH NANNO OOZE pale yellowish brown (10YR6/2) Nannos (and some Micarb) 57% Glass (29% rhyolitic, 1% basaltic) 30% Clay 10% Forams 2% Rads 1% Spicules Tr.
					4					
					5		GEO CHEM			CLAY RICH NANNO OOZE yellowish gray (5Y8/1) Nannos (and some Micarb) 86% Clay 12% Forams 2% Volcanic glass, spicules Tr.
EARLY MIOCENE	Sphenolithus belemnos Zone				6					homogeneous moderate bioturbation occasional mottles of very light gray (N8) homogeneous
	low N3	N R F	A C C	F G F	Core Catcher				-90	

Explanatory notes in Chapter 1

Site 217 Hole Core 7 Cored Interval: 230-239.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
OLIGOCENE	Sphenolithus ciperoensis Dorcadospyris ateuchus Zone (R)				1	0.5	VOID			
		N R	A C	F G		1.0			-130	CLAY RICH NANNO CHALK very light gray (N8) occasional mottles bluish white (5B9/1) Nannos (and some Micarb) 84-86% Forams 3% Clay 11% Rads 1- 3% Spicules Tr.
					2					
					3				-10	yellowish gray (5Y8/1) - slightly higher rad content
		R	C	G			GEO CHEM			
					4				-93	faint laminae slight bioturbation
		R	C	G	5					moderate bioturbation
					6					patches light brownish gray (5YR6/1)
									-100	yellowish gray (5Y8/1) with laminae of very light gray (N8) - moderate bioturbation
	pretty high N2	N R F	C C	M M	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 8 Cored Interval: 268-277.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE OLIGOCENE	Sphenolithus distentus Zone Theocyrtis tuberosa Zone (R)	N	A	F	1	0.5			-80	
		R	C	G		1.0				
					2					
					3					CLAY RICH NANNO CHALK very light gray (N8) with specks and mottles of light brownish gray (5YR6/1). Occasional flake of dusky yellow green (5GY5/2) Nannos 83% Clay 12% Forams 3% Rads 2% Spicules Tr.
					4		GEO CHEM			
					5				-120	116-130 cm contains 5% volcanic glass (rhyolitic >basaltic)
	N2	R F	C R	G P	6					
		N	A	F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 9 Cored Interval: 306-315.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MID OLIGOCENE	Sphenolithus distentus Zone	N	A	F	1	0.5			80	very pale orange (10YR8/2)
	Theocyrtis tuberosa Zone (R)	R	C	G		1.0				NANNO CHALK yellowish gray (5Y8/1) with occasional mottles and streaks of very light gray (N8) in Sections 1 and 2. Slight-moderate bioturbation. Nannos (and Micarb) 89-93% Clay 5- 7% Forams Tr.- 3% Rads Tr.- 3% Spicules, glass, iron oxide Tr.
					2					
		R	C	G	3				80	
		N	A	F	4					
LATE EOCENE	Discoaster barbadiensis Zone Cribrocentrum inflatum Zone (P16) T. bromitz Zone (R)	N	A	F	5				80	
		R	C	G						Sections 4,5,6 moderate orange pink (5YR8/4)
		N	A	F	6					
		N R F	A C R	F G P	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 10 Cored Interval: 344-353.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE EOCENE	Morozovella lehneri Zone (P12) (F) Podocyrtis mitra Zone (R)	N	A	P	1	0.5	VOID			
		R	C	G		1.0				
		R	C	G	2				80	NANNO CHALK yellowish (5Y8/1) grading down to very light gray (N8). Occasional dipping laminae of greenish gray (5GY6/1). Mostly homogeneous, slight mottling in places. Nannos (some Micarb and carbonate fragments) 75-85% Rads 5% Clay 10-20% Glass, spicules, forams Tr.
		R	C	G	3					
	Globigerinatheka kugleri Zone (P11) (F) Nannotetrina alata Zone T. triacantha Zone (R) Podocyrtis ampla Zone (R)	R	C	G	4		GEO CHEM			
		R	C	G	5					
		R	C	G	6				80	
		N R F	A A R	P G P	Core Catcher					Core 11 no recovery in interval 364 to 373.5 m.

Explanatory notes in Chapter 1

Site 217 Hole Core 12 Cored Interval: 373.5-383 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
PALEOCENE	Discoaster multiradiatus - Fasciculithus tympaniformis	F	A	F	1	0.5	VOID			CORE 11 NO RECOVERY in interval 364 to 373.5 m
		N	A	F		1.0				
									-148	NANNO CHALK pale yellowish brown (10YR6/2) mottled with very pale orange (10YR8/2) Nannos (some Carbonate fragments) 87% Forams 3% Clay 10% 115-125 cm fragments of light brown (5YR5/6) and dusky yellowish brown (10YR8/2) very hard translucent chert also very hard (silicified) chalk.
		N R F	A + A	F P F	Core Catcher					

Explanatory notes in Chapter 1 *Planorotalites pseudomenardii (P4) (F)

Site 217 Hole Core 13 Cored Interval: 383-392.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MID PALEOCENE	Fasciculithus tympaniformis Zone *				1	0.5	VOID			fragments of chert and hard chalk as in Core 12
						1.0			-80	NANNO CHALK light olive gray (5Y6/1) chert pebbles in chalk
									-120	grayish orange pink (5YR7/2) NANNO CLAY pale yellow brown (10YR6/2) Nannos (and Micarb) 80% Forams 10% Clay 10% pinkish gray (5YR8/1) 115-145 cm bioturbation
		N R F	A - A	F F	Core Catcher					BIOMICRITE WITH CHERT LENSES thin section 109 cm Foram shells - some filled with silica 10% Micrite - few patches silicified 90%

Explanatory notes in Chapter 1 *Planorotalites pseudomenardii Zone (P4) (F)

Site 217 Hole Core 14 Cored Interval: 392.5-402 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MID PALEOCENE	Fasciculithus tympaniformis Zone Planorotalites pseudomenardii Zone (P4) (F)	N F	A C	F F	1	0.5			-10	mostly yellowish gray (5Y8/1)
						1.0				
		F	C	F	2					very pale orange (10YR8/2)
		F	C	F	3				-108	NANNO CHALK with some Mn micronodules (<5mm) Nannos 90-95% Forams 5-10% Clay Tr.- 5% Iron oxide Tr.
		F	C	F	4					
		F	C	F	5					alternating 10YR8/3 and pinkish gray (5YR8/1)
									-140	moderate bioturbation
		N R F	C - C	F F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 15 Cored Interval: 402-411.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
PALEOCENE (POST-DANIAN)	Cruciplacolithus helis Zone Cyclococcolithina robusta Zone Planorotalites pseudomenardii Zone (P4)(F)	F	C	F	1	0.5 1.0			120	FORAM CLAY RICH NANNO CHALK Nannos (and some Micarb) 65% Forams 10% Clay 25% Glass and FeO Tr. Chert pebble - dark reddish brown (10R3/4) grayish orange pink (5YR7/2) with mottles very pale orange (10YR8/2)
		F	C	P	2				87	pinkish gray (5YR7/1) laminae 10YR6/2 chert chips pale yellowish brown (10YR6/2) mottled - bioturbation pale yellowish brown (10YR6/2) CLAY NANNO CHALK Nannos (and some Micarb) 60% Forams 5% Clay 35%
		N R F	C - A	F F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 16 Cored Interval: 411.5-421 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
U.K. PALEOCENE (DANIAN)	P1d/P2 boundary (F)	F	A	F	1	0.5 1.0			80	CLAY FORAM RICH NANNO CHALK moderate orange pink (5YR8/4) moderate to strong bioturbation Nannos (some Micarb) 75% Forams 15% Clay 10% Iron Oxide Tr.
	P1d (F)	F	A	F	2					
	Cruciplacolithus helis Zone (N)	F	C	F	3					
					4					49-53 cm grayish olive (10Y4/2)
										moderate to strong bioturbations all sections
	P1d	F	C	F					52	
	P1c (F)	F	C	F	5				80	CLAY FORAM RICH NANNO CHALK Nannos 78% Forams 12% Clay 10% Glass, iron oxide Tr.
	P1b (F)	F F F	C C	F F	6					
	P1a (F)	N R F	C - C	F F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 17 Cored Interval: 421-430.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE MAESTRICHTIAN	Globotruncanella mayaroensis (F)	F	C	F	1	0.5, 1.0	VOID		80	NANNO CHALK mostly grayish orange pink (5YR7/2) with bands and mottles of very light gray (N8) slight bioturbation throughout Nannos (and Micarb) 90% Forams 5% Clay 5%
					2					
					3				145	99% nannos in light gray part
					4		GEO CHEM			
		N R F	C - R	F P	Core Catcher					

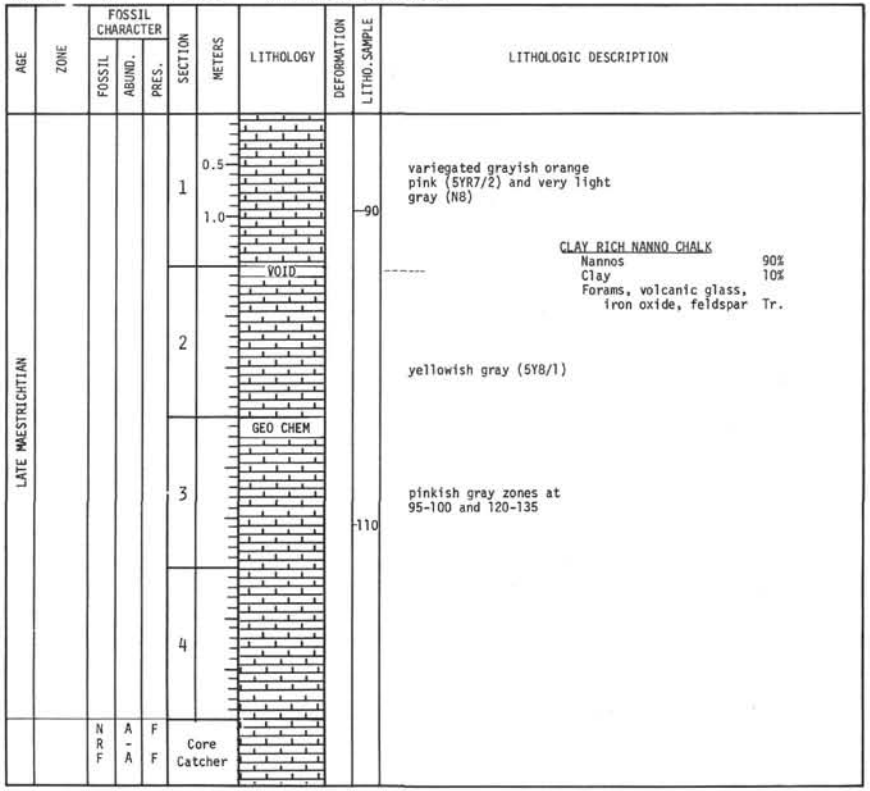
Explanatory notes in Chapter 1

Site 217 Hole Core 18 Cored Interval: 430.5-440 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE MAESTRICHTIAN					1	0.5, 1.0	VOID		90	CLAY RICH NANNO CHALK variegated grayish orange pink (5YR7/2), light brown (5YR6/4), very light gray (N8) moderate bioturbation Nannos (and Micarb) 89% Clay 10% Forams 1% Iron oxide Tr.
					2		GEO CHEM		118	115-118 cm layer of light brown (5YR5/6) contains 3% iron oxide (hematite?)
		N R F	A - R	P P	3					
					Core Catcher					

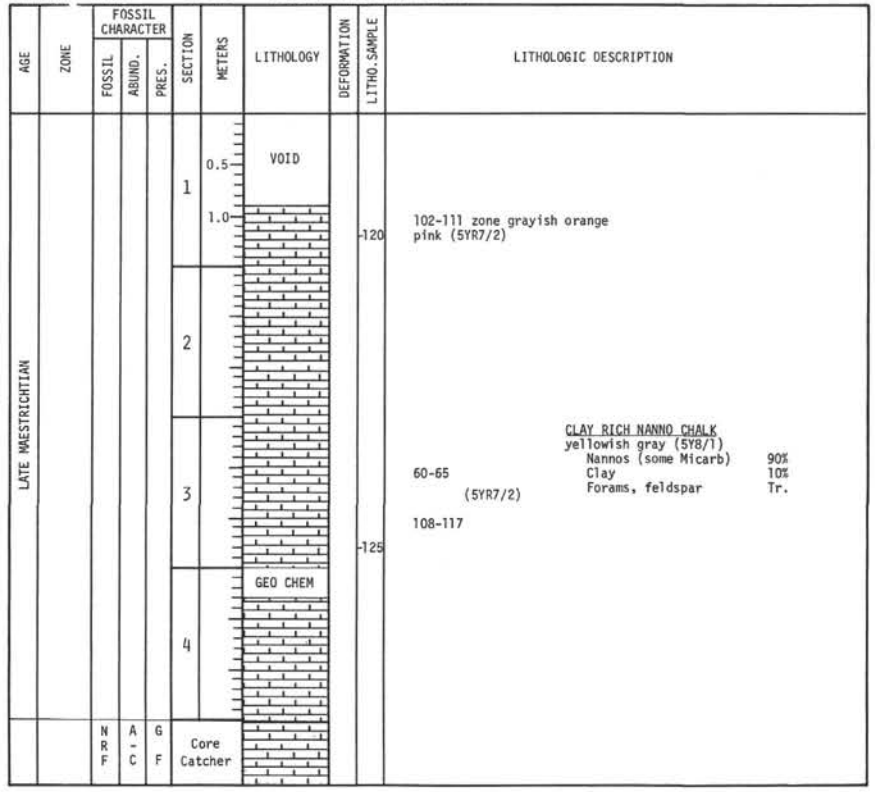
Explanatory notes in Chapter 1

Site 217 Hole Core 19 Cored Interval: 440-449.5 m



Explanatory notes in Chapter 1

Site 217 Hole Core 20 Cored Interval: 449.5-459 m



Explanatory notes in Chapter 1

Site 217 Hole Core 21 Cored Interval: 459-468.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MID MAESTRICHTIAN					1	0.5 1.0	VOID		130	
					2		GEO CHEM			
					3		VOID			CLAY RICH NANNO CHALK Nannos (and some Micarb) 85% Forams 5% Clay 10% Feldspar and glass Tr. predominantly yellowish gray (5Y8/1) with faint bands of grayish orange pink (5YR7/2) slight to moderate bioturbation throughout occasional dark gray streak may mark fractures
					4					
					5				70	
		N R F	A - C	F F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 22 Cored Interval: 468.5-478 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MID MAESTRICHTIAN							GEO CHEM			
					1	0.5 1.0			80	
					2					CLAY RICH NANNO CHALK diffuse color banding of light brown (5YR6/4) and light gray (N7) beds average 10-20 cm thick slight bioturbation throughout brown layer: Nannos (and Micarb) 85%; Clay 15%; Feldspar, iron oxide Tr. gray layer: Nannos (and Micarb) 87%; Clay 12%; Forams 1%
					3				65	
		N R F	A - C	P F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 23 Cored Interval: 478-487.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MID MAESTRICHTIAN	Globotruncana mayarsensis				1	0.5 1.0				pale yellowish brown (10YR6/2) mottled with light olive gray (5Y6/1) (5Y6/1) with mottles (10YR6/2) very light gray (N8) CLAY RICH NANNO CHALK Nannos (and Micarb) 83% Clay 15% Forams 1% Feldspar, glass, iron oxide Tr.
					2	GEO CHEM				(N8) and light gray (N7) 10YR6/2
					3				80	
					4					N8 and N7
					5				90	CLAY RICH NANNO CHALK (see explanation in lithologic summary) Carbonate: mostly of silt size, =5% sand sized fragments, <10% recognizable nannos 83% Clay 15% Forams 2% 143 cm - 5 mm thick Inoceramus shell
		N R F	C - A	P F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 24 Cored Interval: 487.5-497 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY MAESTRICHTIAN		F	A	F	1	0.5 1.0			70	
					2					
					3					CLAY RICH NANNO CHALK Carbonate silt (similar Core 23, Section 5) 85% Clay 15% Forams, feldspar, iron oxide Tr. mainly light gray (N7) with mottles of very light gray (N8) - moderate bioturbation throughout
					4					
					5				130	
					6					
		N R F	A - A	F F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 25 Cored Interval: 497-506.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE CAMPANIAN TO EARLY MAESTRICHTIAN	Tetralithus nitidus trifidus Zone				1	0.5	VOID		-80	CLAY RICH NANNO CHALK intermottled light gray (N7) and very light gray (N8) scattered black specks moderate bioturbation throughout Most carbonate of silt size with ≈7% sand size; <5% recognizable nannos 85% Forams 3% Clay 12% Pyrite and feldspar Tr. Oyster shells Section 1, 91-130 cm and Section 5, 43 cm. Black specks (113 cm smear in Section 1) contain 20-25% clay and 2% pyrite.
						1.0			-113	
					2					
					3					
							GEO CHEM			
					4					
					5				-90	
		F R N	A - A	P F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 26 Cored Interval: 506.5-516 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE CAMPANIAN TO EARLY MAESTRICHTIAN	Tetralithus nitidus trifidus Zone				1	0.5	VOID		-100	prominent burrows CLAY RICH NANNO CHALK light gray and very light gray (N7-N8) moderate bioturbation Carbonate silt including ≈7% sand size fragments 88% Clay 11% Forams 1%
						1.0				
					2					burrows I I I
					3				-69	67-70 cm coarser layer I I oysters Carbonate silt including ≈10% sand size fragments 65% Shell frags.-mostly 20% Clay 12% Forams 3% Inoceramus - shown by I
					4					oysters oysters burrow
					5					Few shells only Section 5.
		F R N	A - A	P F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 27 Cored Interval: 516-525.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE CAMPANIAN TO EARLY MAESTRICHTIAN	Tetralithus nitidus trifidus Zone				1	0.5, 1.0	VOID		130	CLAY SHELL RICH NANNO CHALK very light gray (N8) mottled with light gray (N7)
					2		GEO CHEM		80	Inoceramus layers (I) CLAY SHELL RICH NANNO CHALK Carbonate silt and sand 60% Sand sized calcite - mainly 25% Clay 10% Forams 5%
					3				80	slight bioturbation SHELL RICH NANNO CHALK Carbonate silt and sand 80% Shell fragments 10% Clay 9% Forams 1%
		F R N	A - A	P F	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 28 Cored Interval: 525.5-535 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE CAMPANIAN TO EARLY MAESTRICHTIAN	Tetralithus nitidus trifidus Zone				1	0.5, 1.0			80	moderate to intense bioturbation scatted Inoceramus and oyster shells CLAY SHELL RICH NANNO CHALK light gray (N7) mottled with very light gray (N8) Carbonate of silt and sand size 64% Shell fragments 25% Clay 10% Forams 1%
					2					N8 with mottles N7 slight bioturbation
					3				60	I N8 with mottles and burrows N7 I CLAY SHELL RICH NANNO CHALK Carbonate silt (some sparry calcite) 55% Shells (mostly Inoceramus) 30% Clay 10% Forams 5%
					4		GEO CHEM		43	moderate bioturbation I pyrite specks at 70 cm I dark "clay rich" laminae inclined 10° Carbonate silt and sand 60% Clay 20% Shell 20%
					5					I I = Inoceramus fragments
		N	A	F	6		VOID			I
		F R	A -	P	Core Catcher					No c/c

Explanatory notes in Chapter 1

Site 217 Hole Core 29 Cored Interval: 535-544 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
CAMPANIAN TO EARLY MAESTRICHTIAN	Eiffellithus angustus Zone				1	0.5, 1.0			I, I, I	CLAY-RICH SHELLY NANNO CHALK light gray (N7) with mottles, burrows, and occasional laminations of medium light gray gray (N6)
					2				64	greenish gray (5GY5/1) SHELL-RICH ZONE Sand and coarse silt size shell fragments - mainly Inoceramus, some forams and few faecal pellets 50% Fine silt size carbonate with =10% sparry calcite 42% Forams 3% Clay 5% Iron oxide Tr.
					3				125	interlaminated and mottled 5GY6/1 and N7 shelly zone moderate to intense bioturbation occasional Inoceramus and oyster shell N7, 5GY6/1, N5
					4		GEO CHEM VOID		110	I = Inoceramus fragments 130-135 laminae
		F R N	A - C	P P	Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole Core 30 Cored Interval: 544-553.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					1	0.5, 1.0	VOID		90	CLAY RICH SHELL MICARB CHALK 5GY6/1 and N7 mottled Silt-size carbonate 54% Shell fragments and and few faecal pellets 33% Clay 10% Forams 3% Authigenic silica, glass, feldspar Tr. moderate-strong biotubation 5GY6/1 and N8
					2					45,50,65 - lenticular laminae containing concentration of small shells - calcarenite
					3		GEO CHEM		114	N7 and 5GY6/1 SILICA SHELL MICARB CHALK Chalcedonic(?) silica seen in matrix 3% Few squares, poor rhombs, and laths of authigenic carbonate ~5% N8 with mottles and laminae(?) of 5GY6/1 105-120 cm coarser layer 5GY6/1
		R N	- F	P	Core Catcher					135 - lamina of flat granules (white) in greenish matrix
										120-150 cm of Section 3 N8 with mottles and laminations(?) of 5GY6/1 oysters at 145 cm BIOMICRITE thin section 118 cm Section 3 Forams and few pelecypod shell fragments; >half forams filled with chalcedony, only larger pelecypods partially silicified 50% Microcrystalline carbonate, no nannos visible 50% c/c green gray chalk as above +3 cm of olive gray (5Y3/2) chert and greenish gray silicified limestone

Explanatory notes in Chapter 1

Site 217 Hole Core 31 Cored Interval: 553-563.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
CAMPANIAN					1	0.5–1.0			-99 -101	gray green
					2					
		F N	C F	P P	Core Catcher					

SILICA BEARING MICARB CHALK
complex interlaminations and mottles of dark greenish gray (5GY4/1), greenish gray (5G6/1) and light gray (N7) - scale of lenticular laminae <1 to 5 mm occasional large shell fragments (oyster?) scattered throughout

	gray	green
Microcrystalline carbonate	53%	slightly more clay and silica?
Shell fragments	33%	
Authigenic SiO_2	7%	
Authigenic $CaCO_3$	5%	
Clay	2%	

BIOMICRITE
thin section 129 cm Section 1

Forams, pelecypod shells, current oriented	30%
Microcrystalline carbonate matrix	70%

Foram shells mostly filled with sparite. Rare patches of chalcedonic silica.

Section 2, 25-35 cm and 70-80 well laminated - occasional lenticular lamination (<2 m) of calcarenite - alternating greenish gray and light gray 140-150 intense bioturbation

chert and silicified limestone

Site 217 Hole Core 32 Cored Interval: 563-572.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
CAMPANIAN					1	0.5–1.0	VOID		-145 -25 -115	brownish black (5YR2/1) chert nodules; ← Inoceramus
		N F	C C	P P	2					
					3					

SILICA RICH MICARB CHALK

Micrite (5% whole Nannos)	82%
Auth. SiO_2	15%
Auth. $CaCO_3$	3%

Complex interlaminations and compressed mottles (?) of dark greenish gray (5GY4/1), greenish gray (5GY6/1) and light gray (N7) also chemical "banding" causing 'pseudomicrolamination'.

FORAM BEARING SILICA SHELL RICH MICARB CHALK

Micrite (1% whole Nannos)	55%
Shell fragments and faecal	25%
Auth. SiO_2 (excluding replacement SiO_2)	5%
Forams - partially silicified	7%
Clay	5%
Auth. $CaCO_3$	2%
Hornblende, volc. glass, glauc., pyrite	Tr.

Explanatory notes in Chapter 1

Site 217 Hole Core 33 Cored Interval: 572-582.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
CAMPANIAN					1	0.5–1.0	VOID			
					2		GEO CHEM		-41 -130	predominantly gray; green mudstone frag.-mostly glauconite; predominantly greenish gray
		N F	R C	P P	3					2-5° dips on lamination
					Core Catcher					

CLAY BEARING SILICA SHELL RICH MICARB CHALK

Micrite and Nanno fragments	68%
Auth. SiO_2	10%
Silt-sized shell fragments	10%
Clay	5%
Auth. carb.	5%
Forams	2%

Structure: laminations and mottled as in Core 32 with few slump structures also occasional pods of calcarenite moderate bioturbation, some shell fragments.

Site 217 Hole Core 34 Cored Interval: 582-591.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
CAMPANIAN					1	0.5–1.0	VOID		-70 -110	lamination, but little bioturbation, dark greenish gray (5GY4/1) laminated with light gray (N7); 80-90 highly silicified layer (N4); chert (5YR2/1) brownish black
		N	R	P						
		F	R	P	Core Catcher					

SILICA CLAY RICH MICARB CHALK

Micrite	54%
Clay	25%
Auth. SiO_2	10%
Auth. $CaCO_3$	5%
Forams (silicified)	3%
Silt-size shell fragments	2%
Pyrite	1%
Volc. glass, glauc.	Tr.

X-ray at 582.50 m Calc 85, Mont 15

Explanatory notes in Chapter 1

Site 217 Hole Core 35 Cored Interval: 591-601.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					Core Catcher					CC only 1 piece (4 cm) of dusky yellowish brown (10YR2/2) CHERT 1 piece (7 cm) of dark gray (N4) limestone, laminated SILICA BEARING GLASS RICH LIMESTONE Sparry calcite 87% Devit. volc. glass 10% Auth. quartz 2% Pyrite 1%

Site 217 Hole Core 36 Cored Interval: 601-610.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
CAMPANIAN					1	0.5 1.0	VOID		83 130	brownish black (5YR2/1) chert with calcite veins interbedded fine grained dark greenish gray (5GY4/1) and coarse grained greenish gray (5GY6/1) fine layers - SILICA CLAY RICH MICARB CHALK same as Core 34 coarse layers - SILICA BEARING DOLOMITE RICH BIOMICRITE Micrite (few Nannos) 50% Dolomite 30% Calcite (shells and auth. carb.) 14% Auth. SiO_2 5% Pyrite 1%
		F	R	P	Core Catcher					115-134 SILICA BEARING MICRITE RICH DOLOMITE Dolomite 75% Micrite aggregates 20% Auth. SiO_2 5% Feldspar, pyrite, glauc. Tr. MICARB CHALK
		F	R	P						

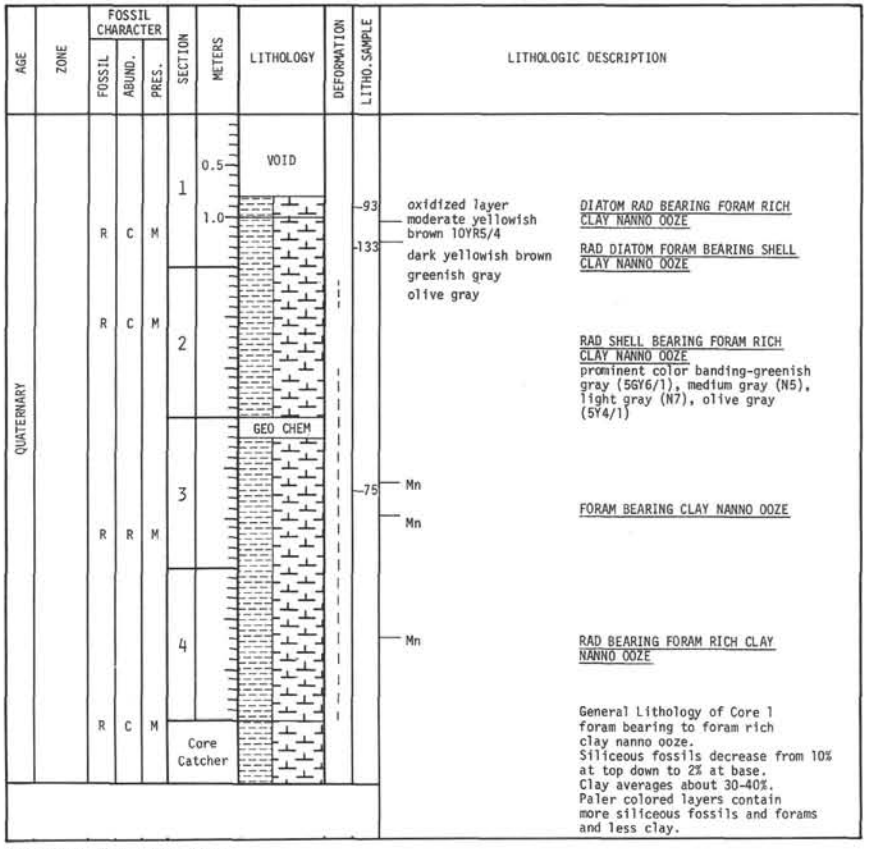
Explanatory notes in Chapter 1

Site 217 Hole Core 37 Cored Interval: 610.5-614.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					1	0.5 1.0	VOID		130	mostly coarse grained medium dark gray (N4) CLAY SILICA BEARING MICRITE RICH DOLOMITE Dolomite 80% Matrix (micrite?) 15% Auth. SiO_2 (some chert) 3% Clay 2% Pyrite Tr.
		F	-		2					two thin (101-105 and 121-123 cm) fine green gray (5GY6/1) layers FORAM SILICA BEARING MICARB CHALK Micrite (few Nannos) 93% Auth. SiO_2 5% Silic. forams 2% X-ray at 611.80 m Calc 12, Dolo 80, Quar <1, Mont 7
		N	-		3					
					Core Catcher					

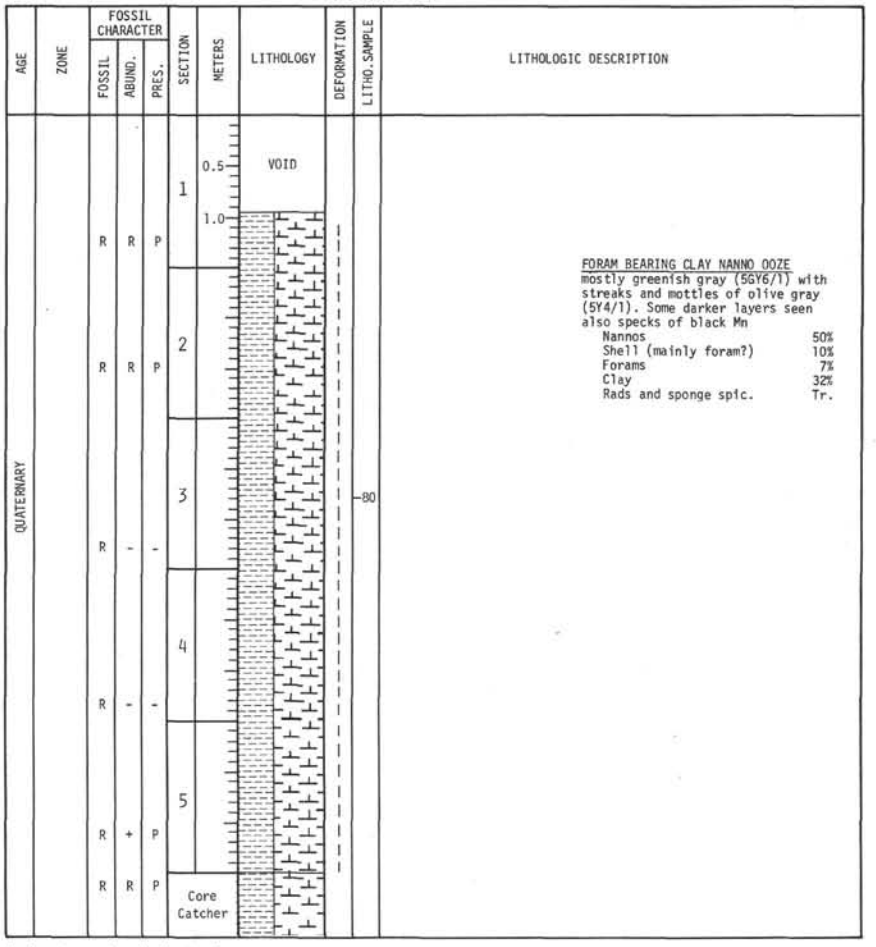
Explanatory notes in Chapter 1

Site 217 Hole A Core 1 Cored Interval: 0-9.5 m



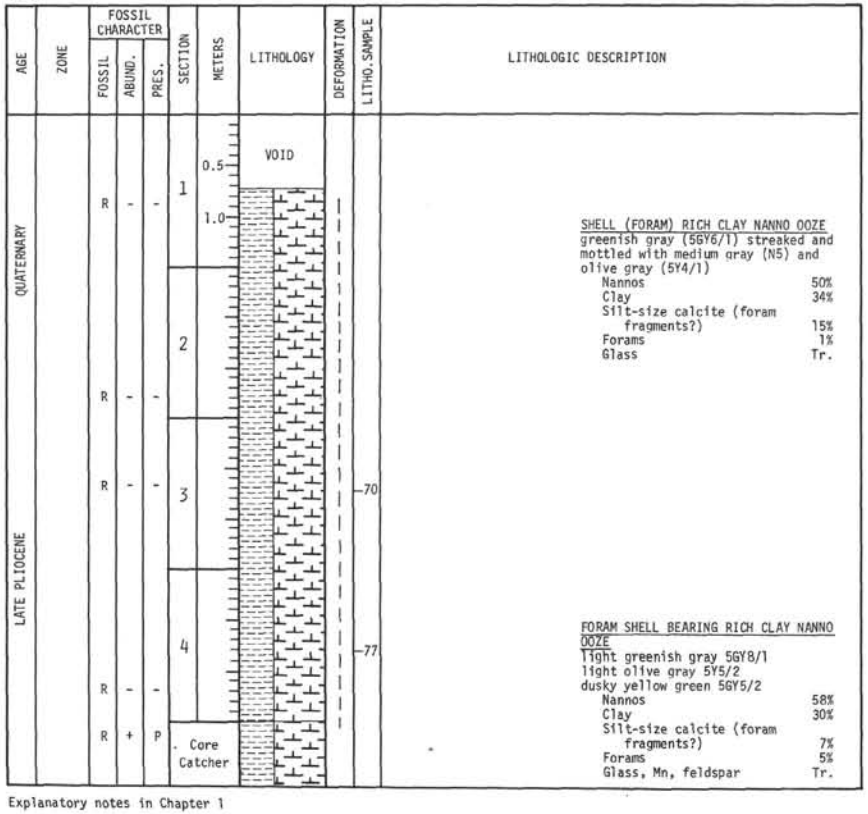
Explanatory notes in Chapter 1

Site 217 Hole A Core 2 Cored Interval: 9.5-19 m



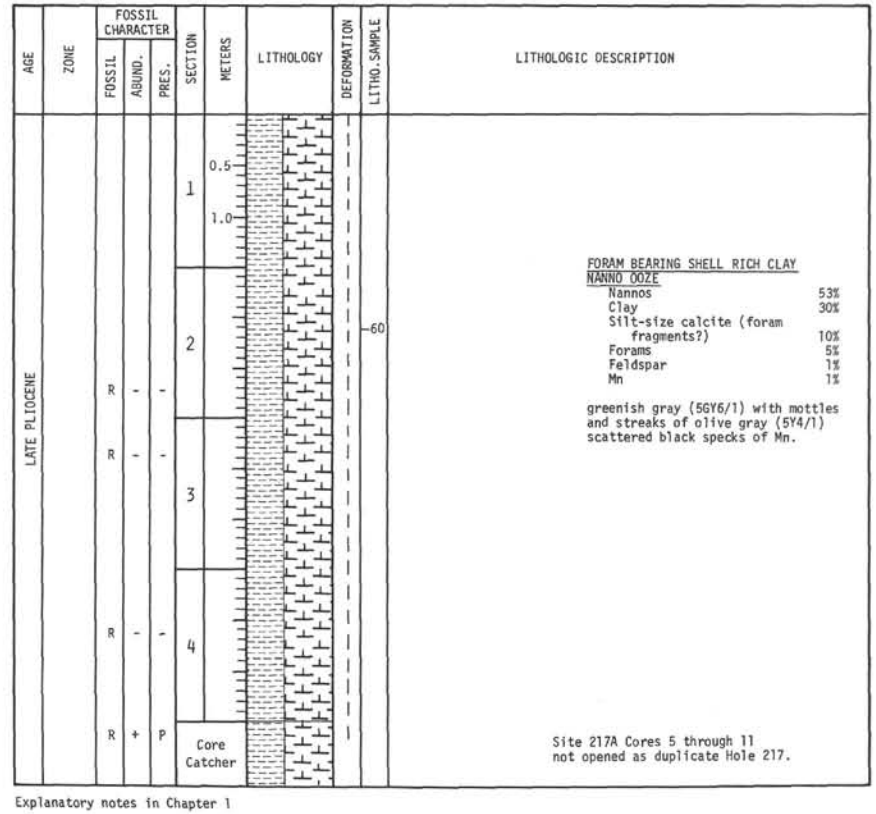
Explanatory notes in Chapter 1

Site 217 Hole A Core 3 Cored Interval: 19-28.5 m



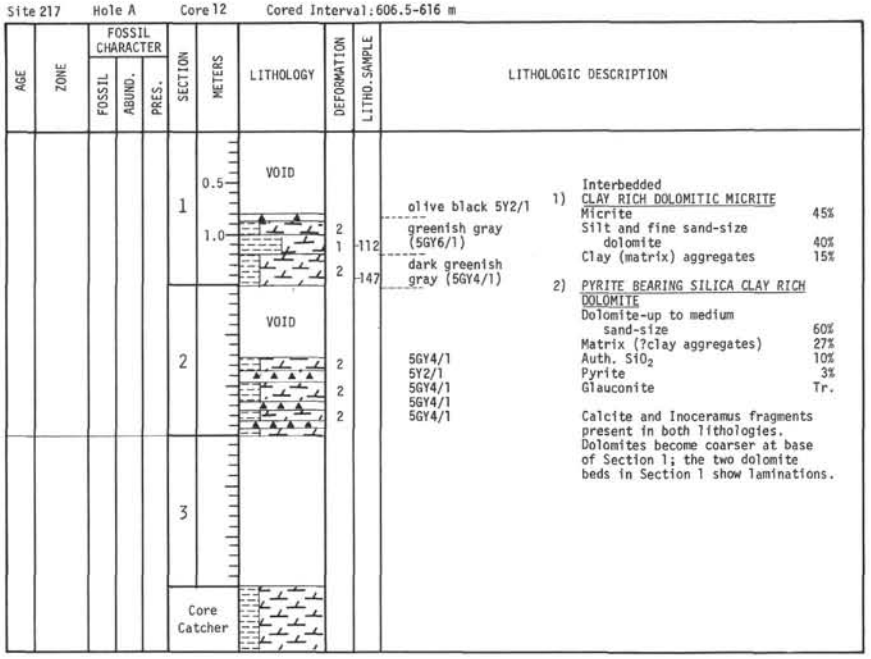
Explanatory notes in Chapter 1

Site 217 Hole A Core 4 Cored Interval: 27.5-38 m

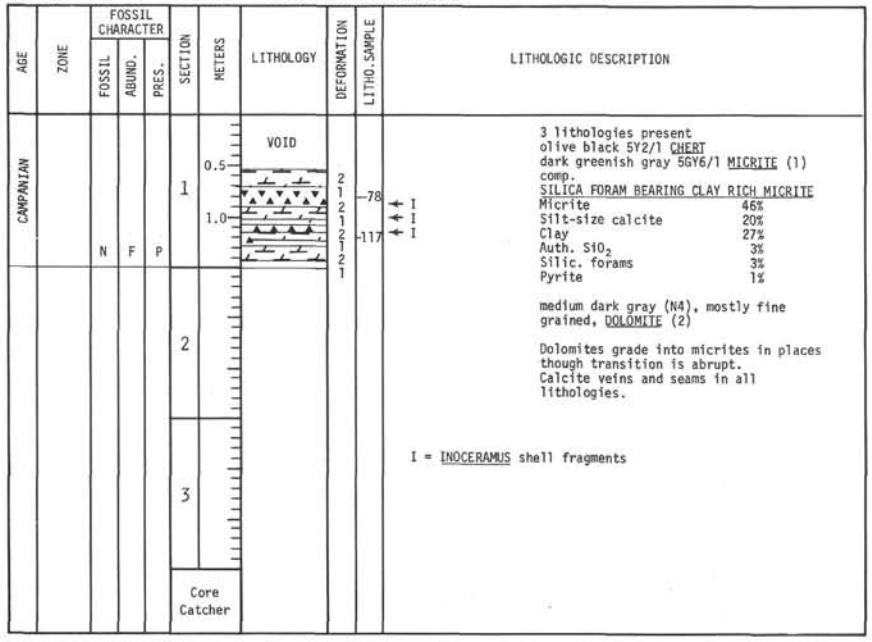


Explanatory notes in Chapter 1

Site 217 Hole A Core 12 Cored Interval: 606.5-616 m

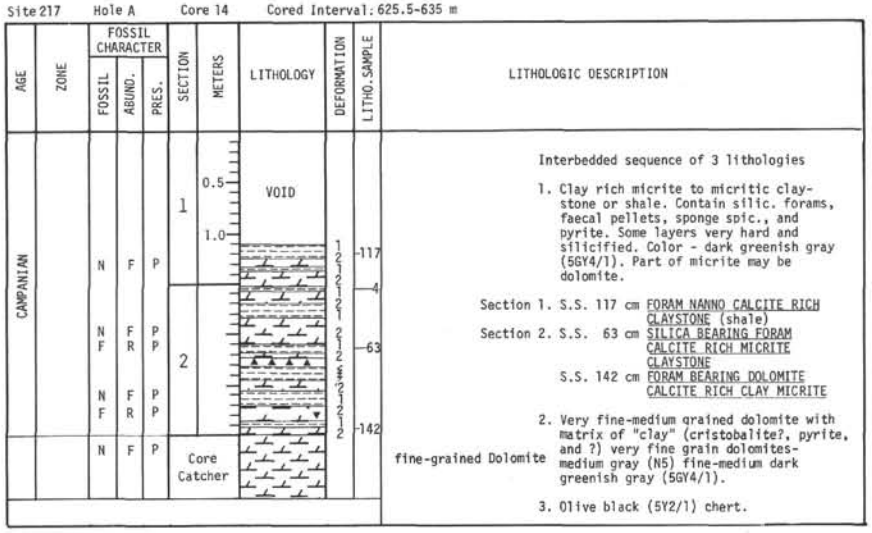


Site 217 Hole A Core 13 Cored Interval: 616-625.5 m

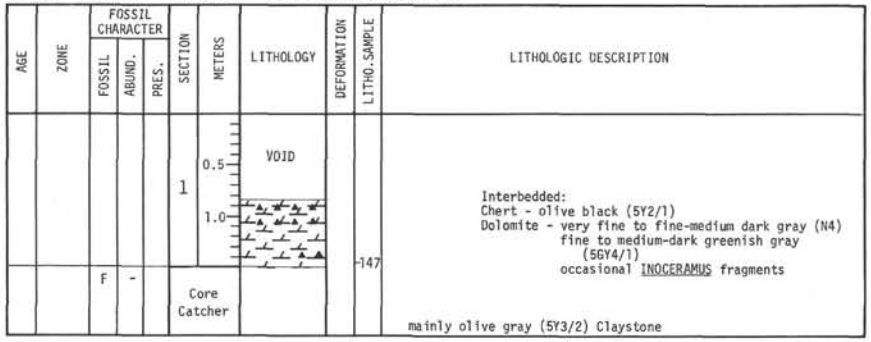


Explanatory notes in Chapter 1

Site 217 Hole A Core 14 Cored Interval: 625.5-635 m



Site 217 Hole A Core 15 Cored Interval: 635-644.5 m



Explanatory notes in Chapter 1

Site 217 Hole A Core 16 Cored Interval: 644.5-654 m

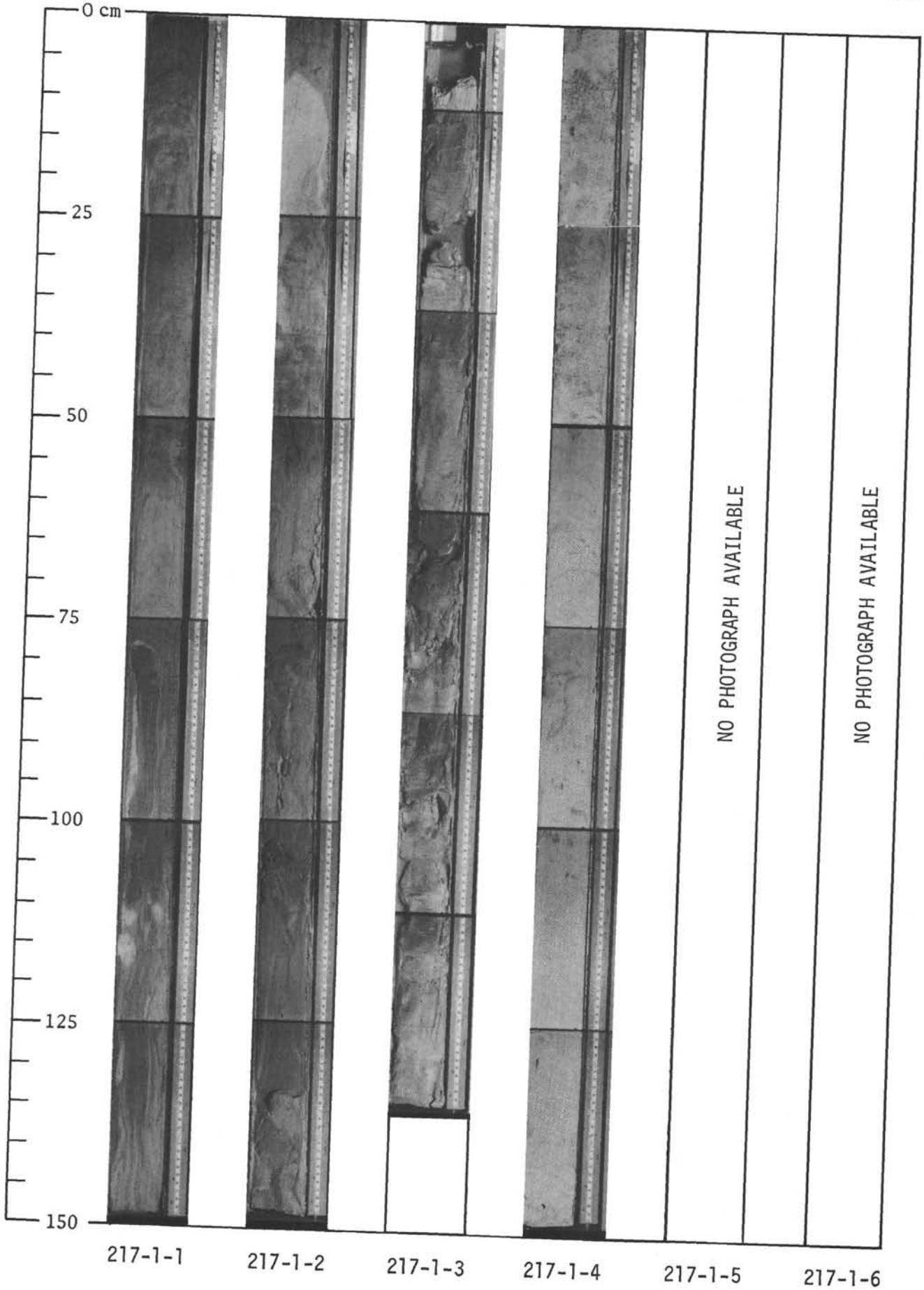
AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					1	0.5 1.0	VOID		-102	Interbedded Dolomite - medium gray (N5) in fone grained size dark greenish gray (5GY4/1) medium grain size Chert - olive black PYRITE CLAY BEARING DOLOMITE Dolomite 90% Clay matrix-brownish aggregates 7% Pyrite 3% Glauc. Tr.
					Core Catcher					

Explanatory notes in Chapter 1

Site 217 Hole A Core 17 Cored Interval: 654-663.5 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		-102	Interbedded Claystone, Chert and Dolomite white veins separate dolomite from chert - made of SiO_2 S.S. DOLOMITE RICH CLAY Clay aggregates 67% Dolomite 30% Pyrite 1% Feldspar(?) 2%
					Core Catcher				No c/c	probable mud crack observed in claystone at top of section Lithologies shown 1) claystone-grayish olive green (5GY3/2) 2) dolomite-light olive gray (5Y6/1)

Explanatory notes in Chapter 1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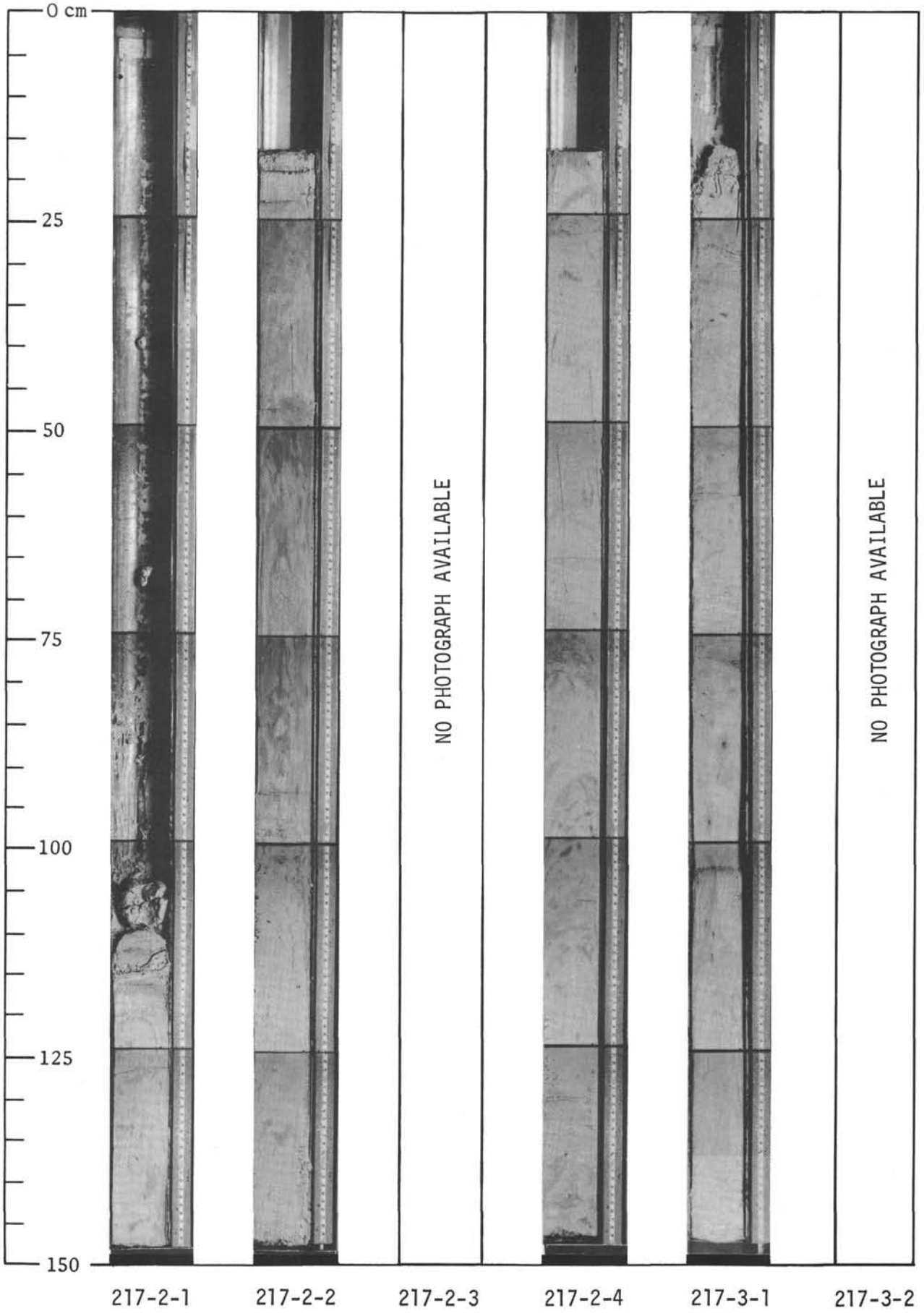
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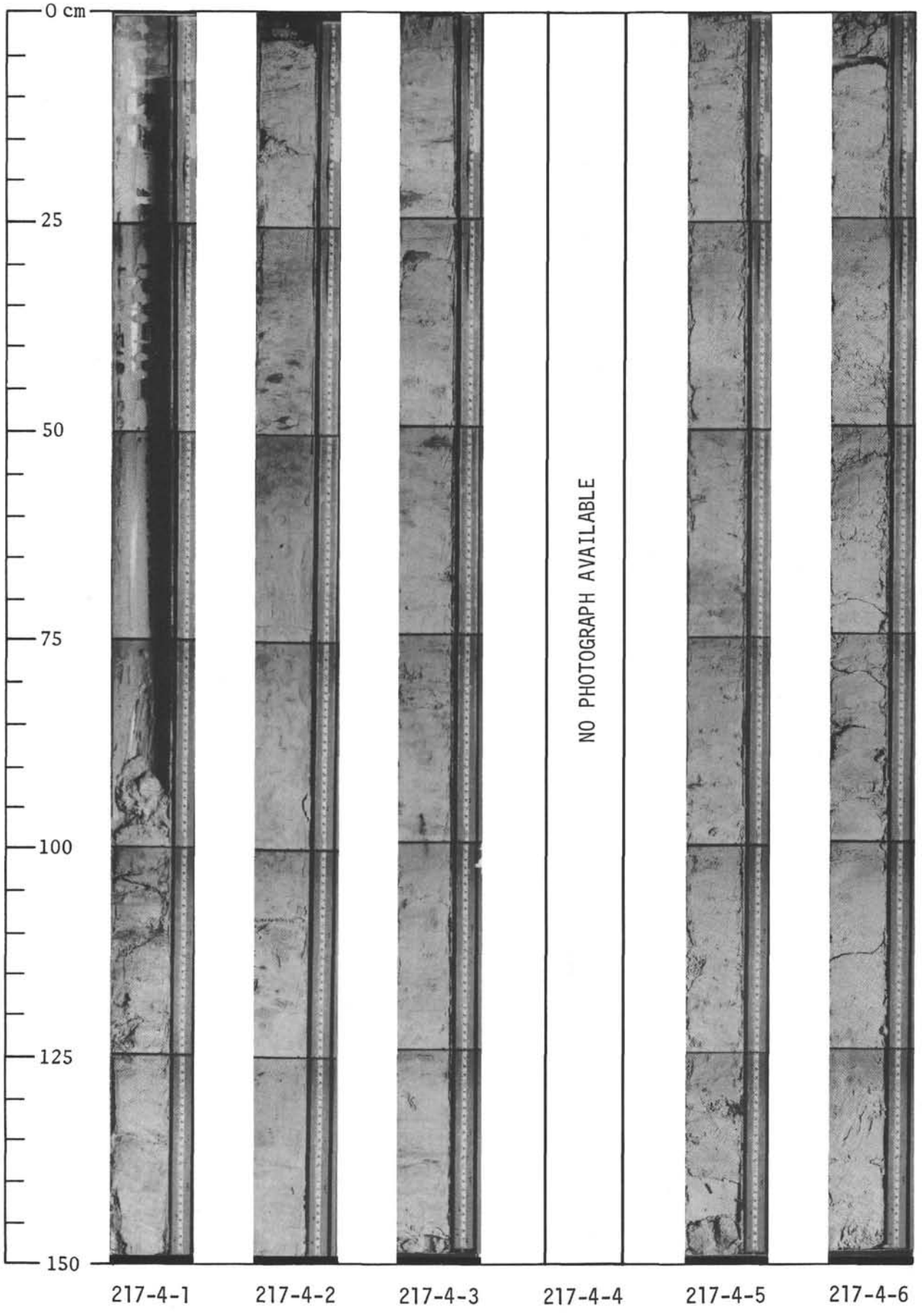
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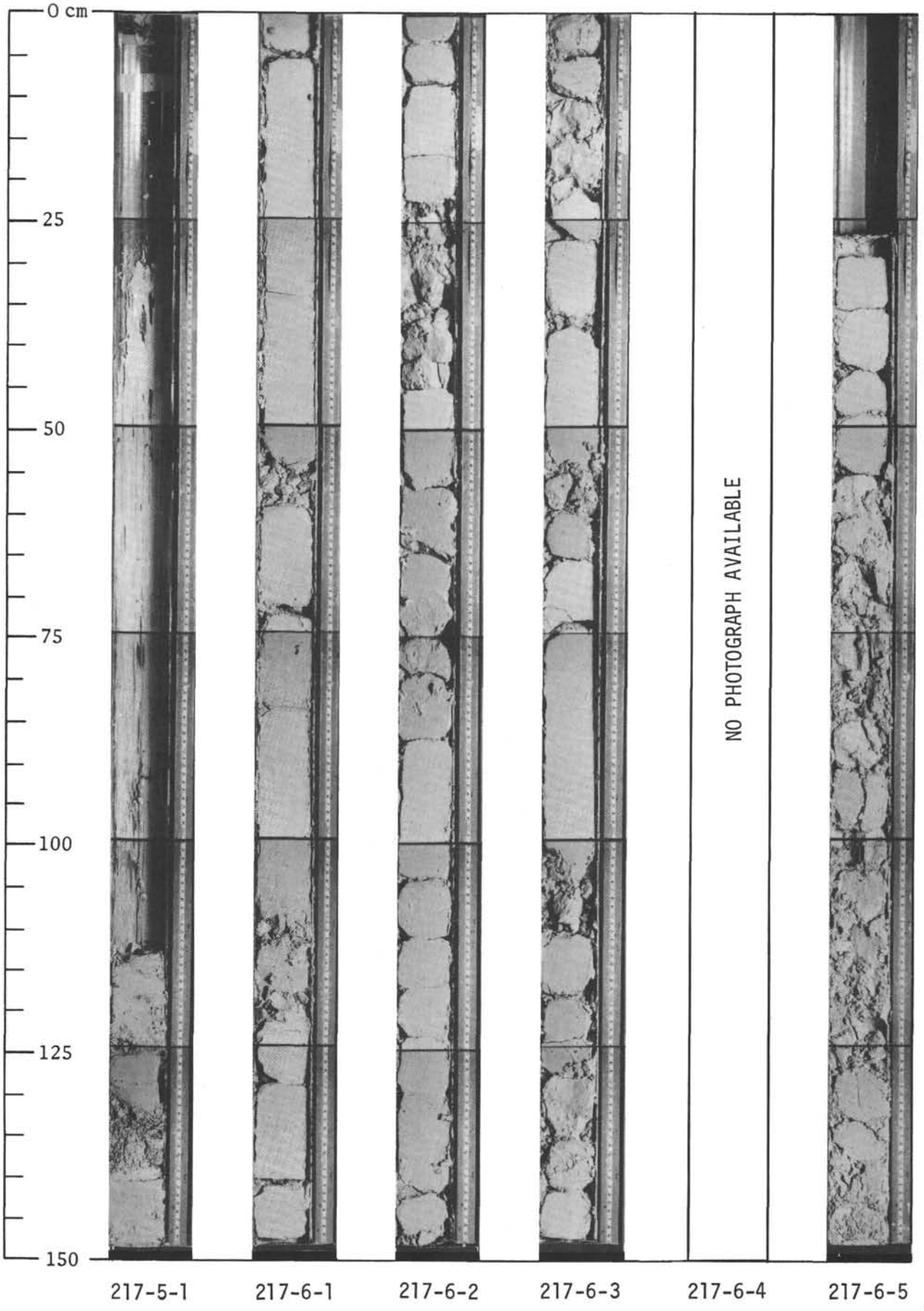
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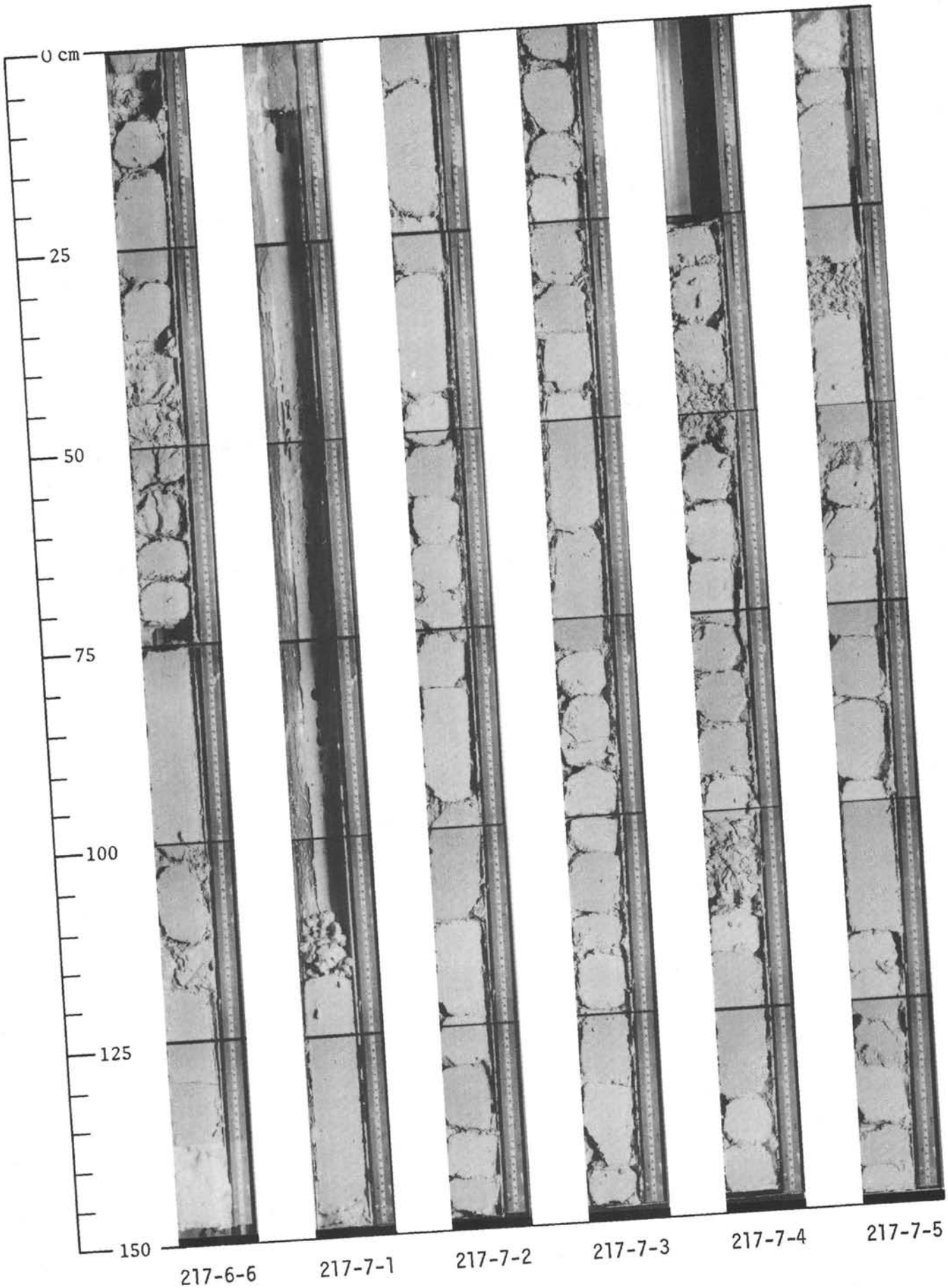
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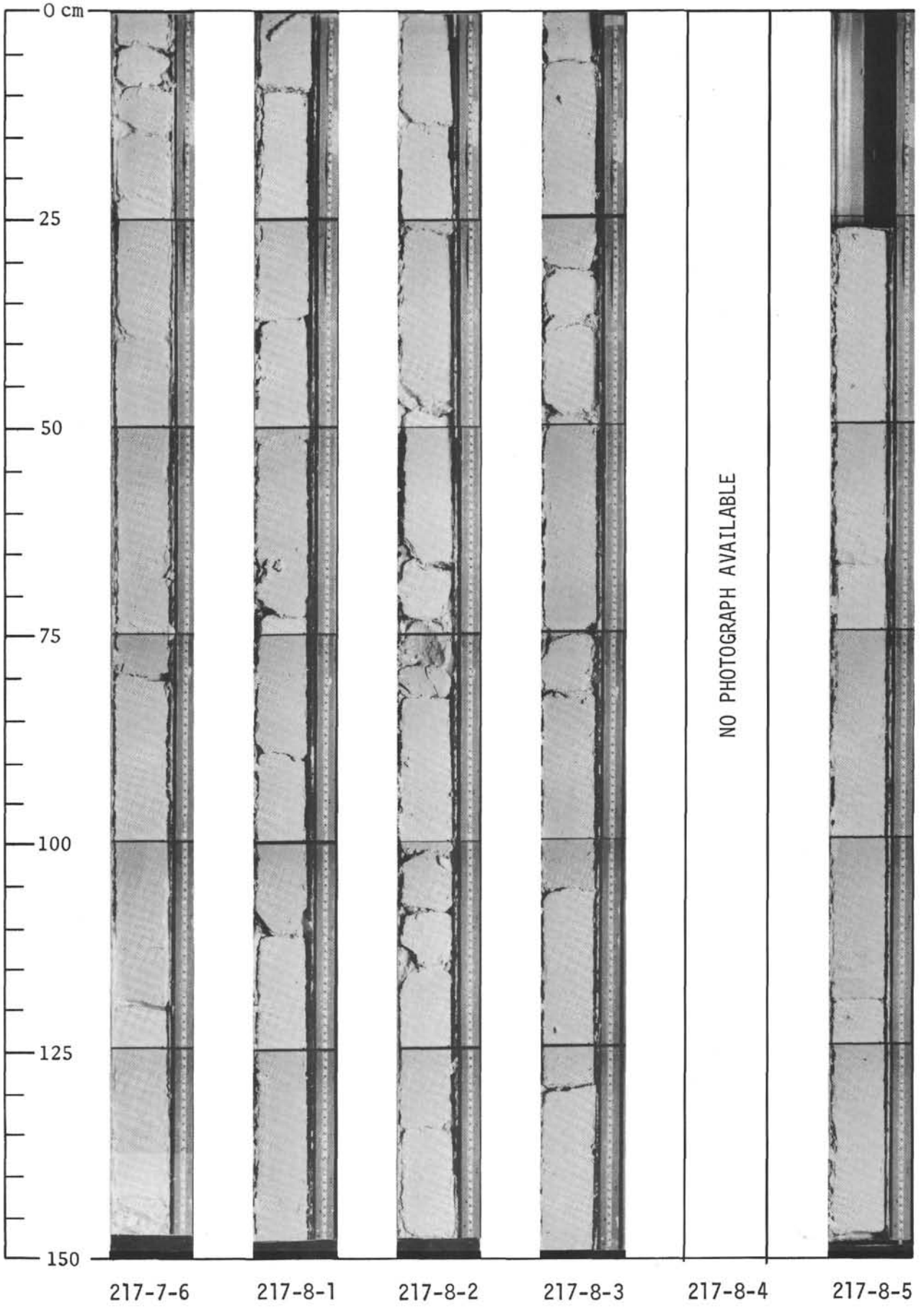
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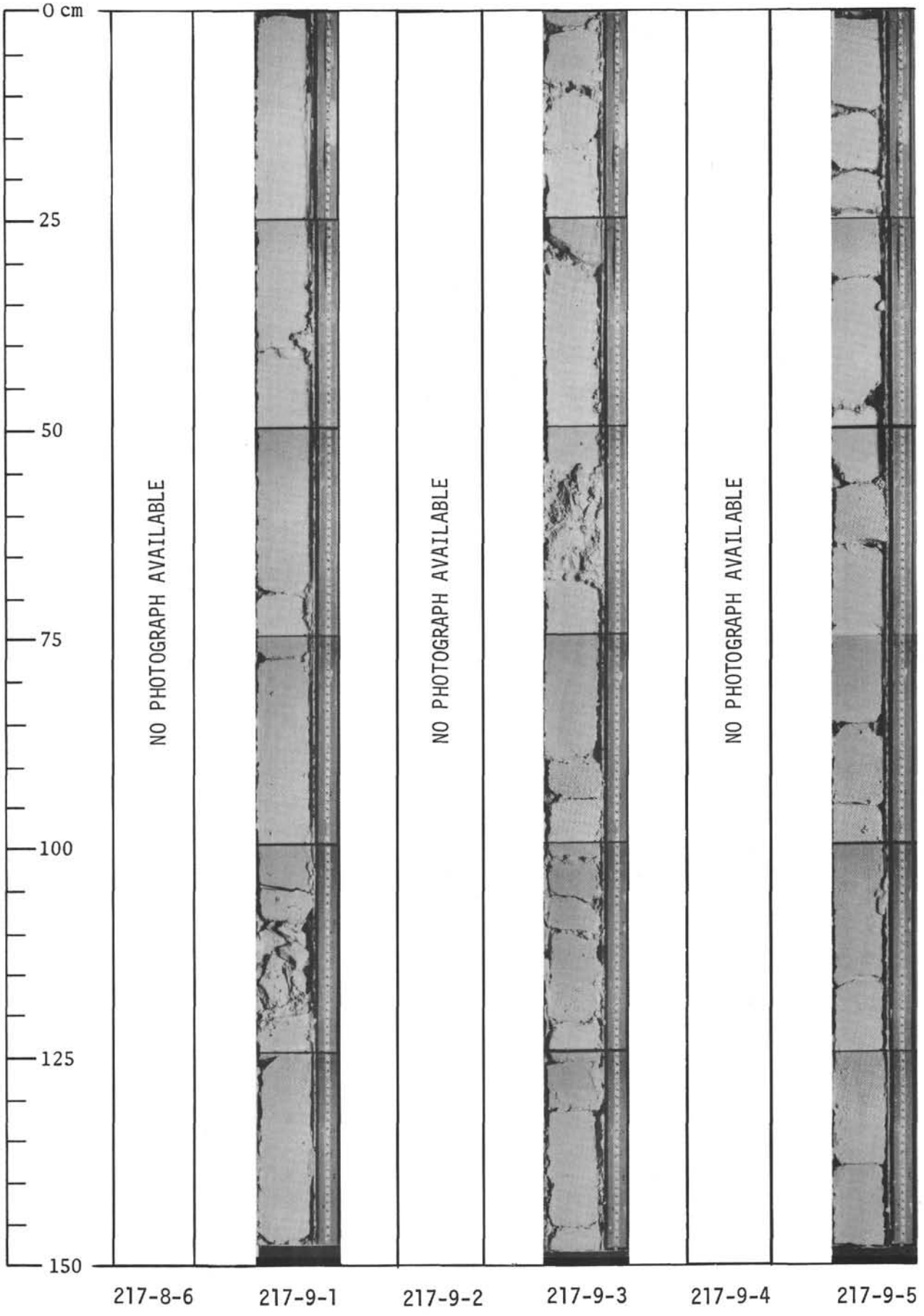
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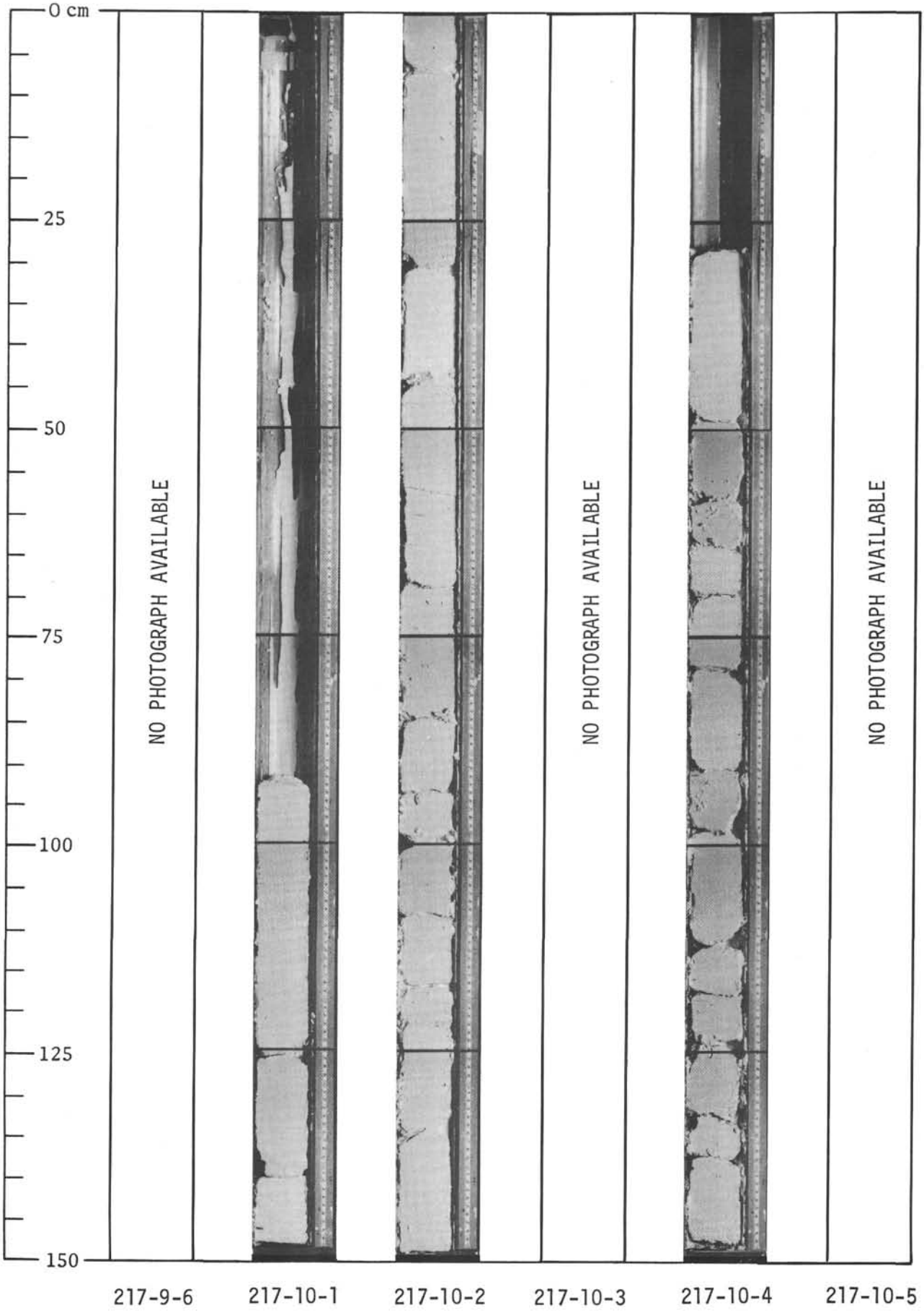
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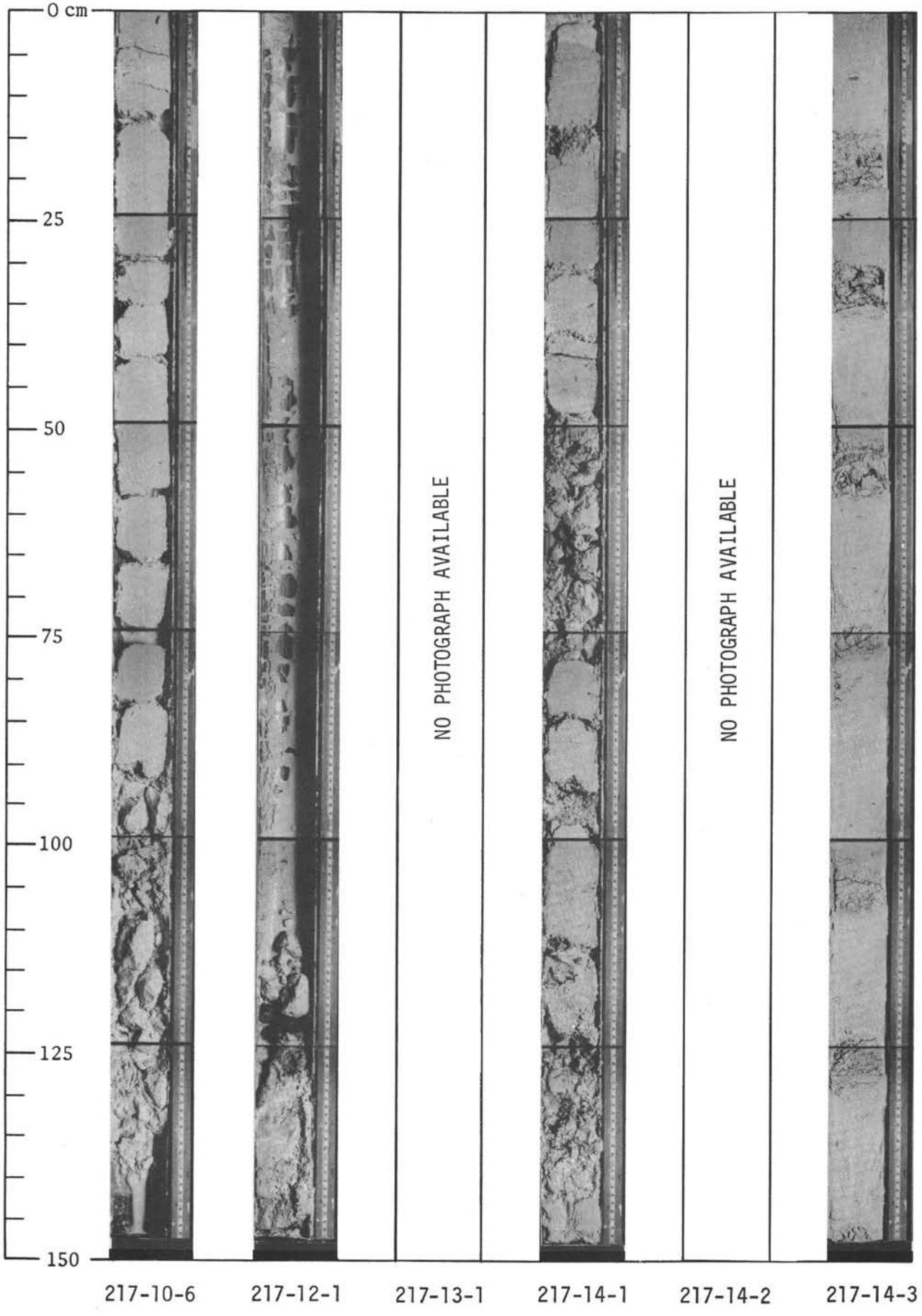
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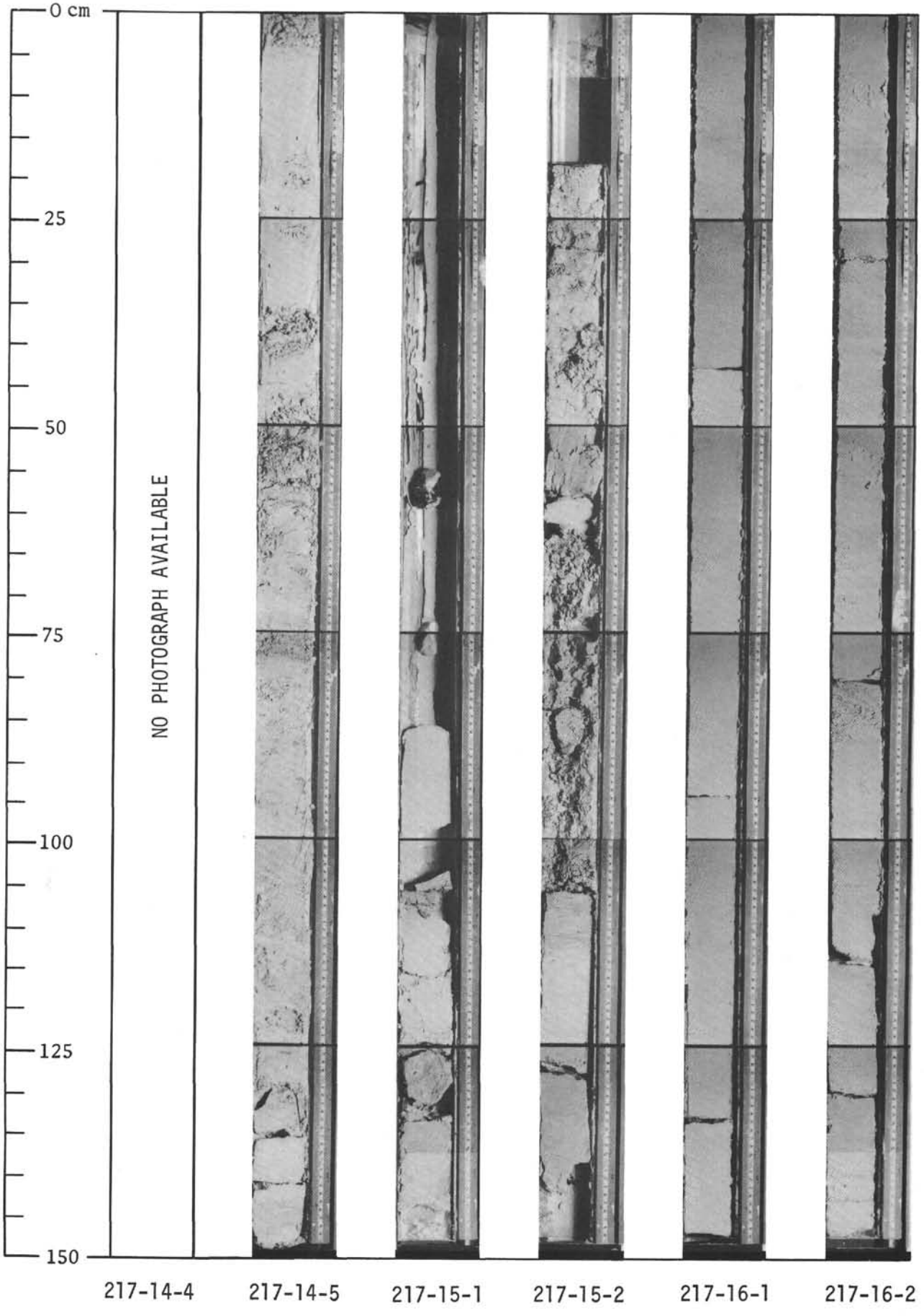
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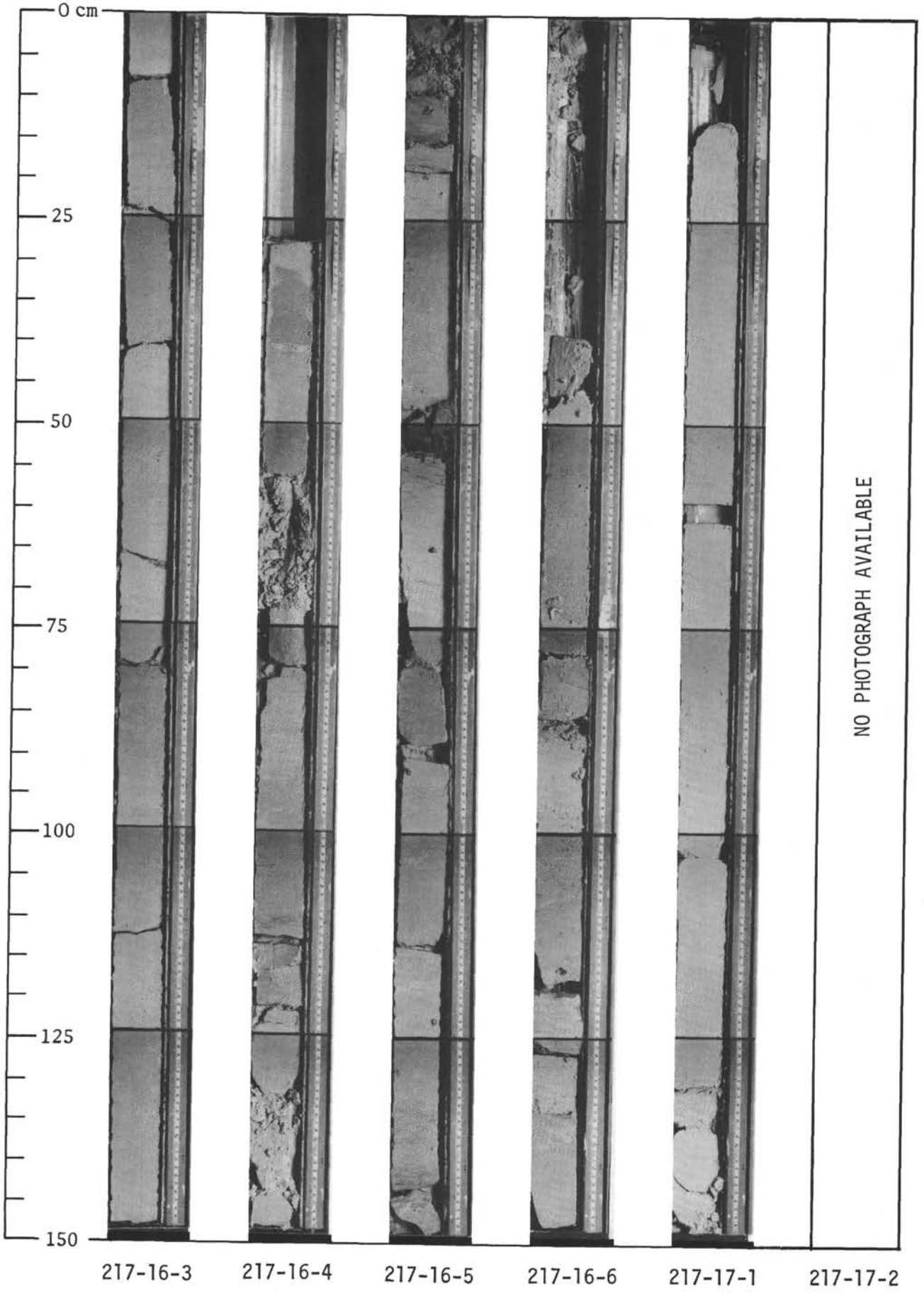
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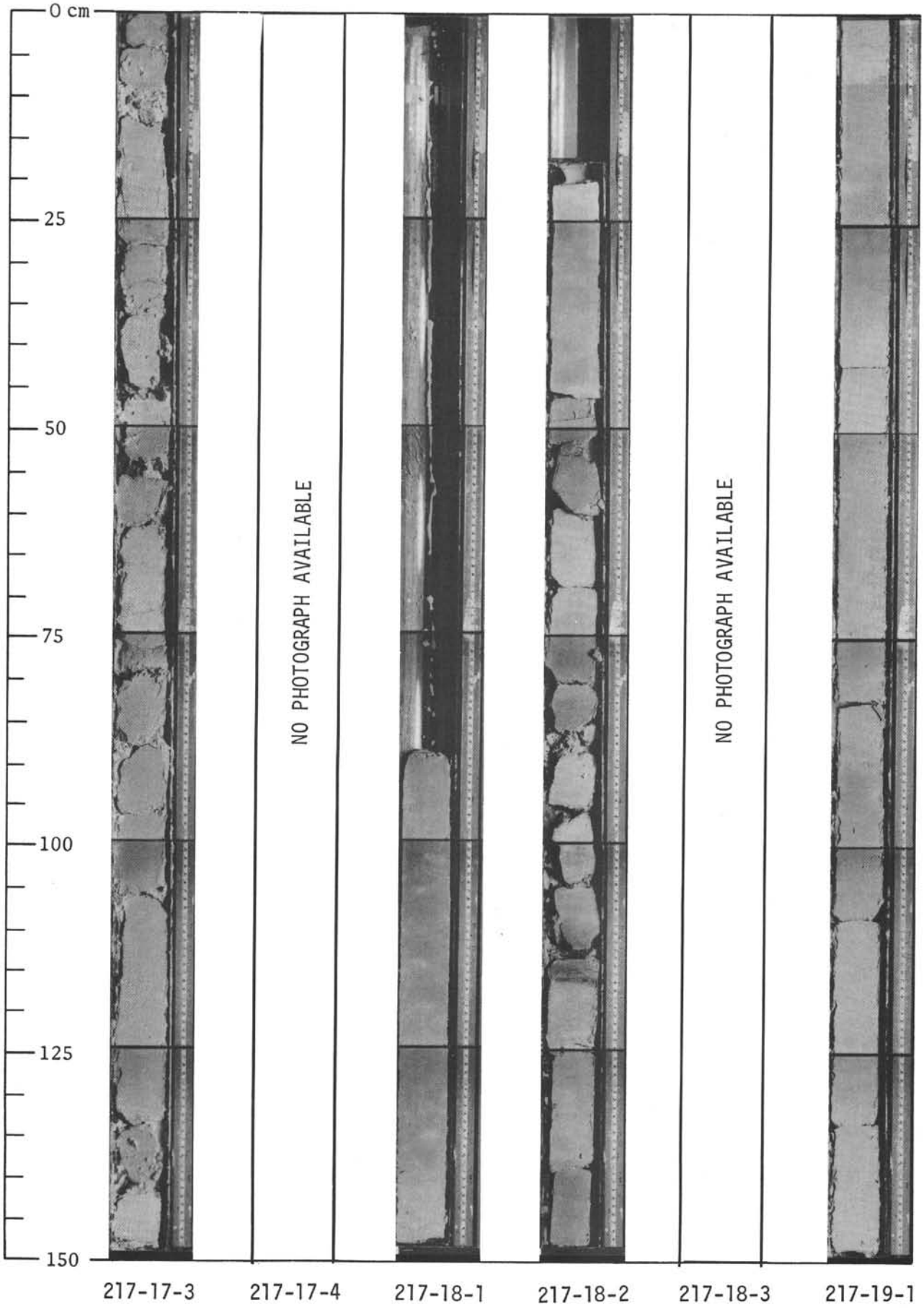
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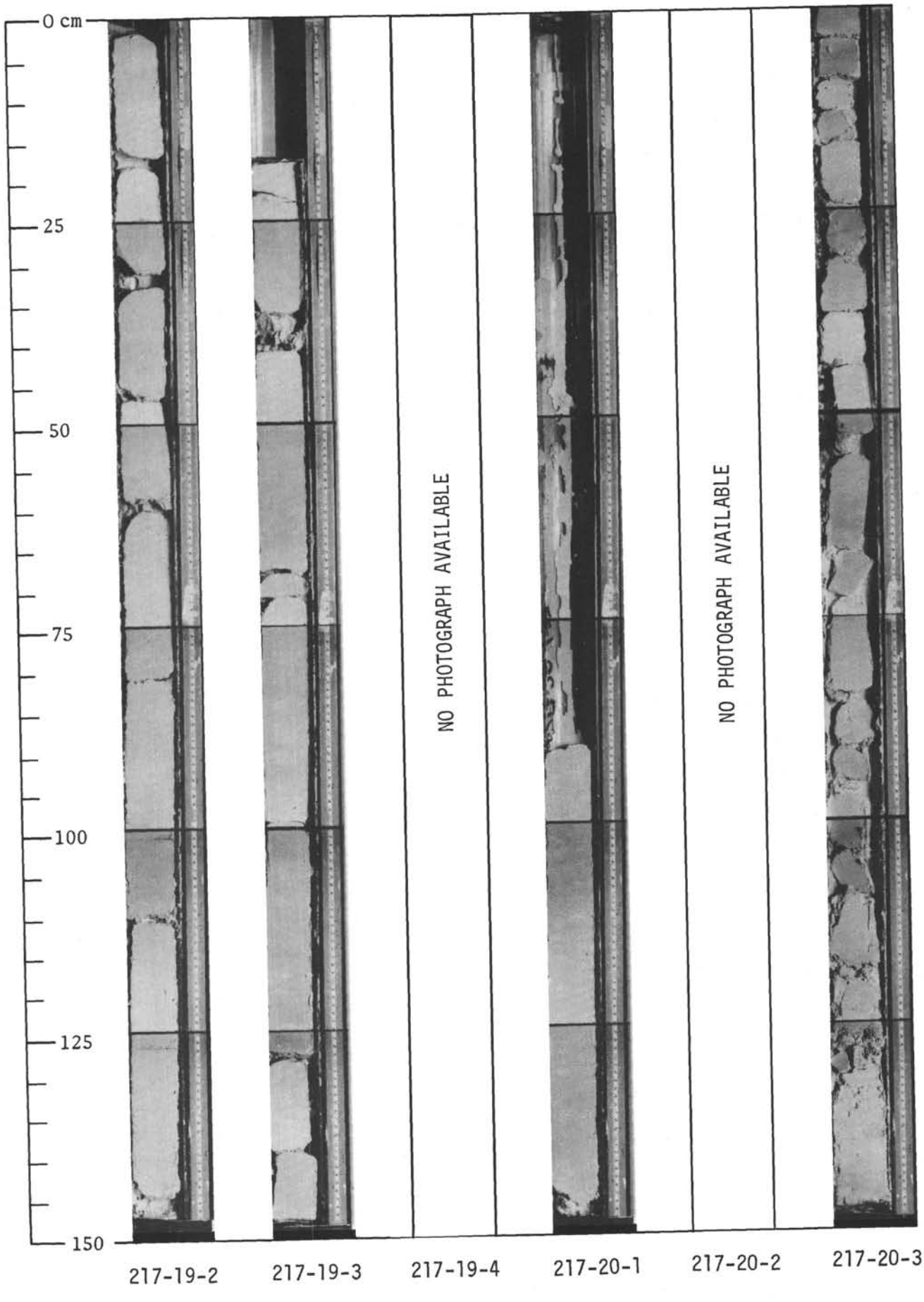
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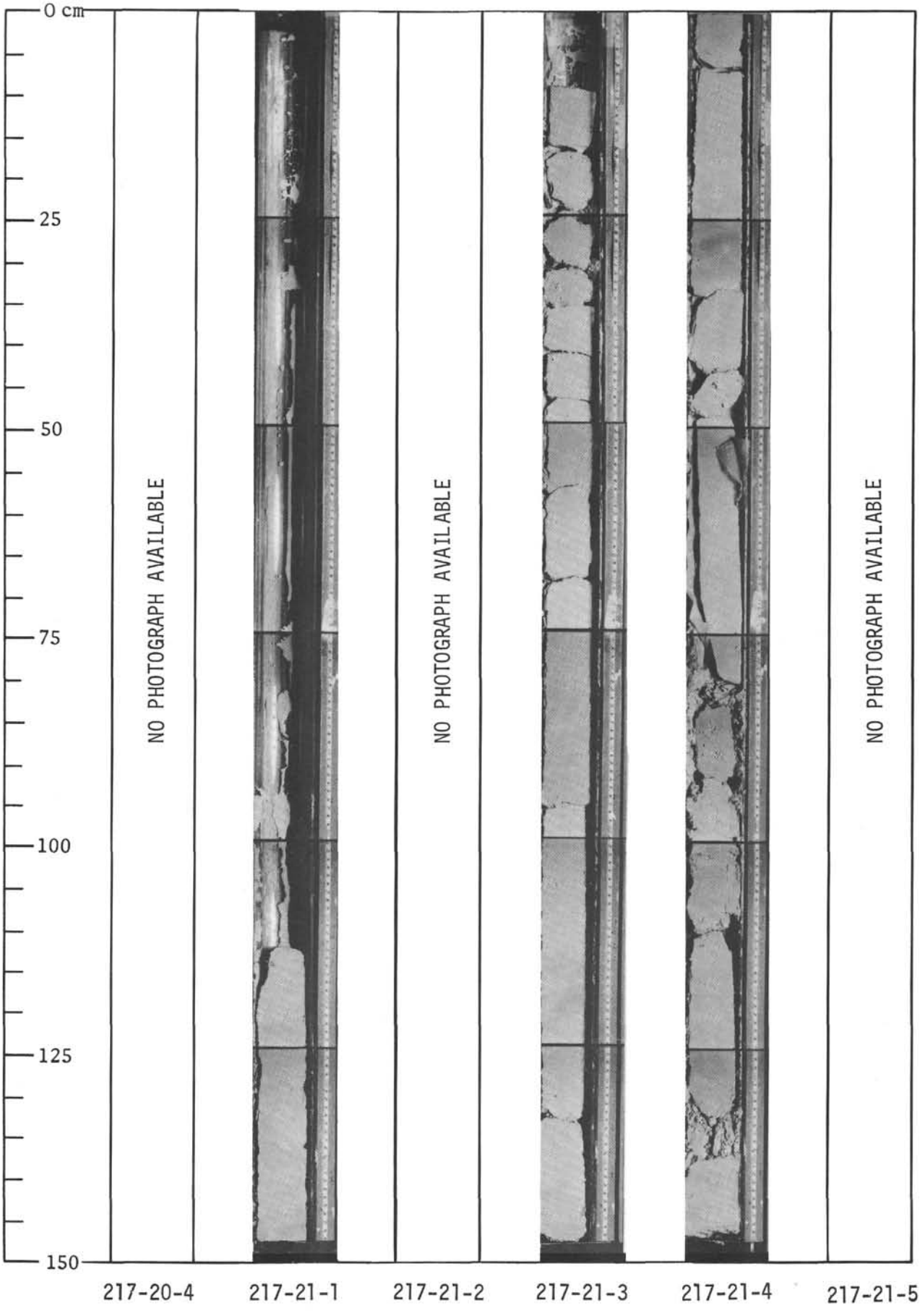
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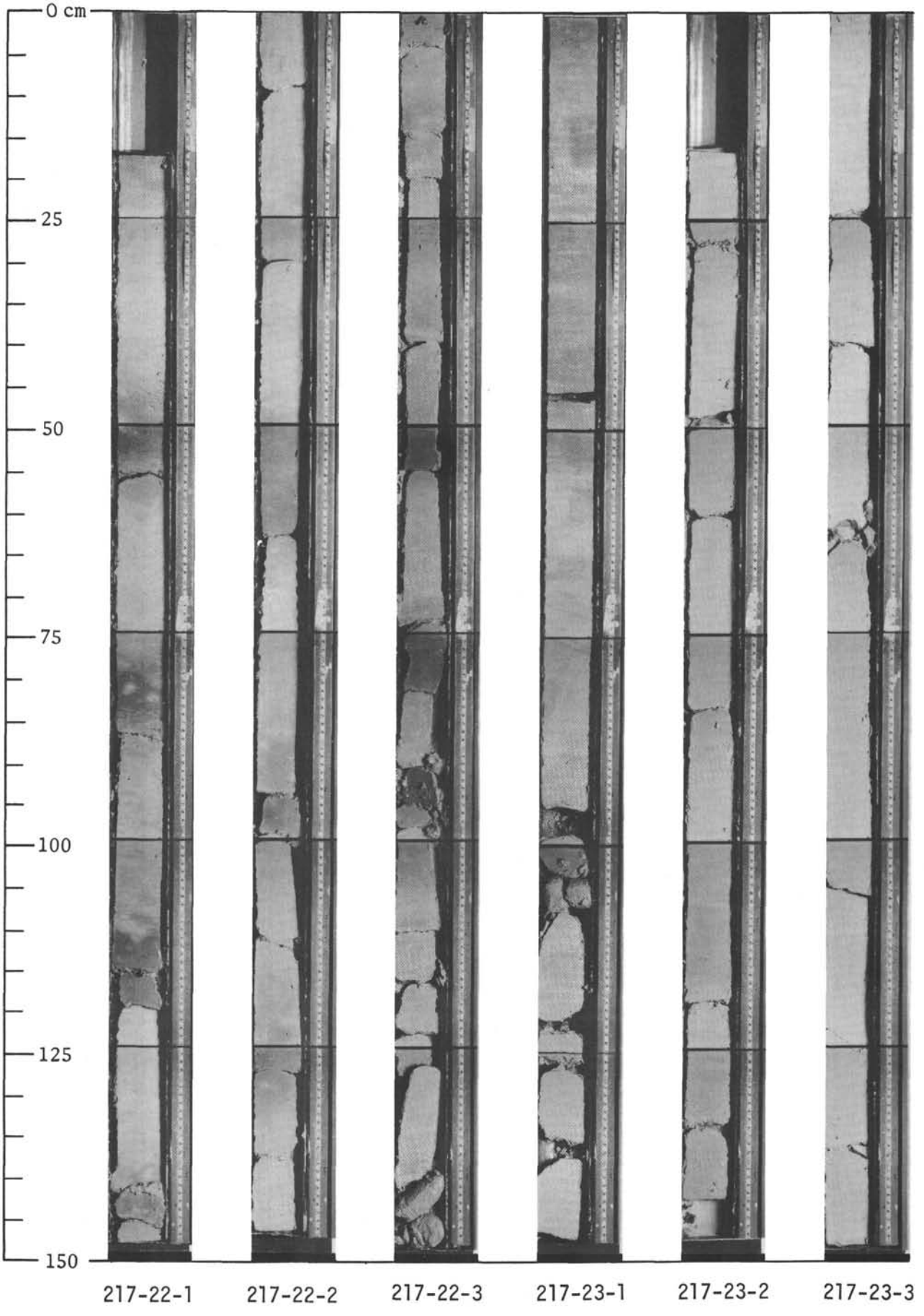
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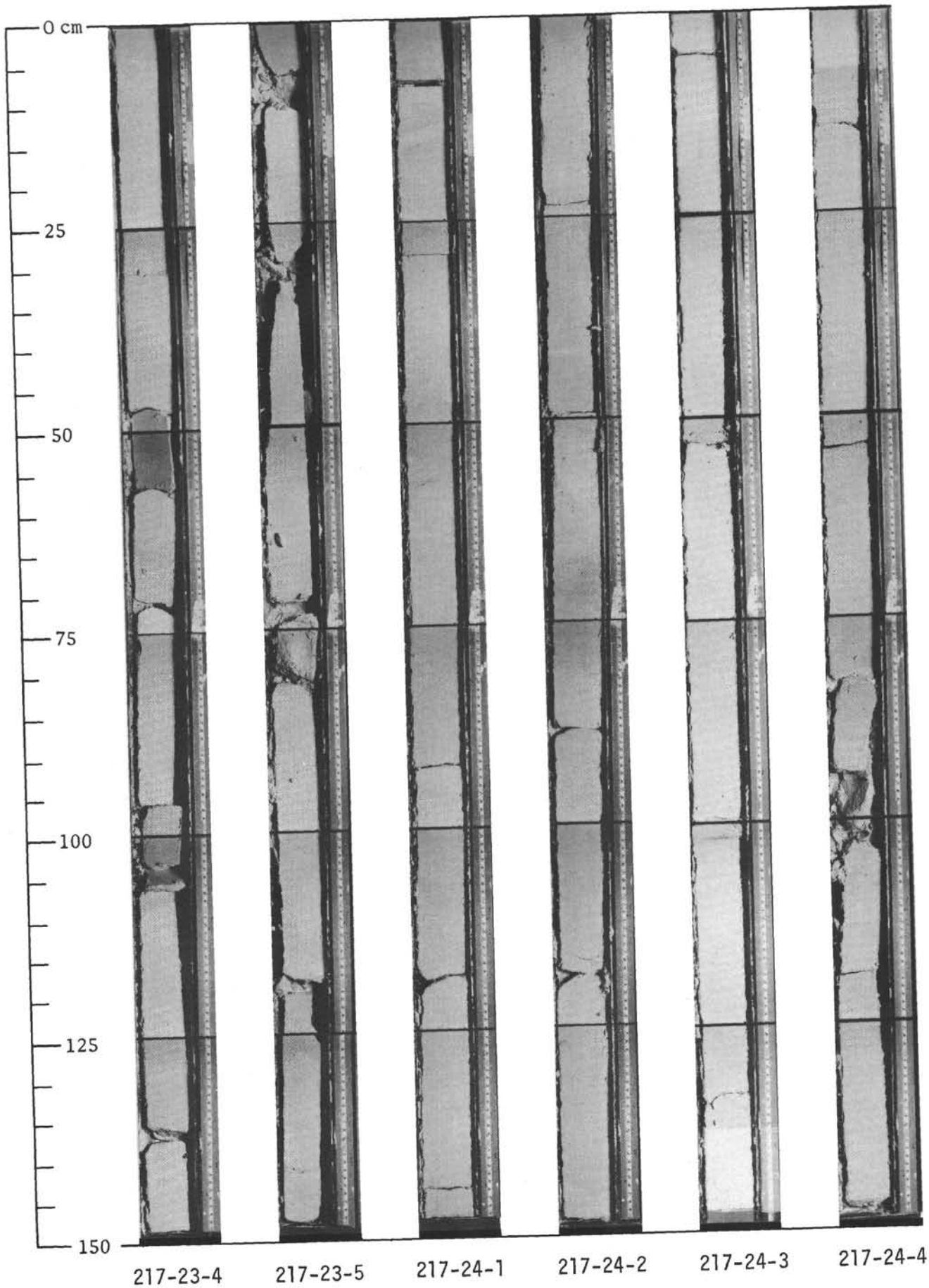
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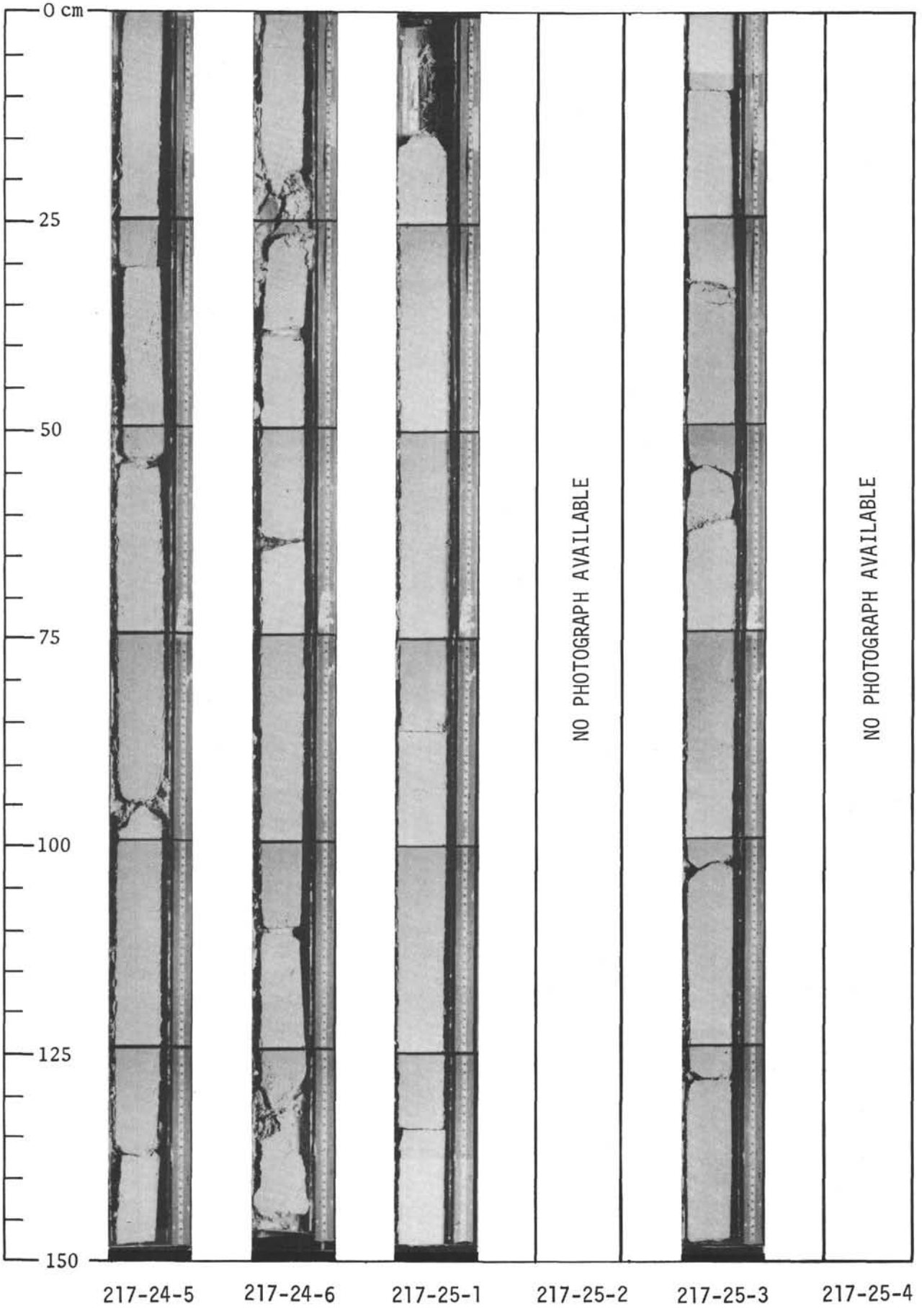
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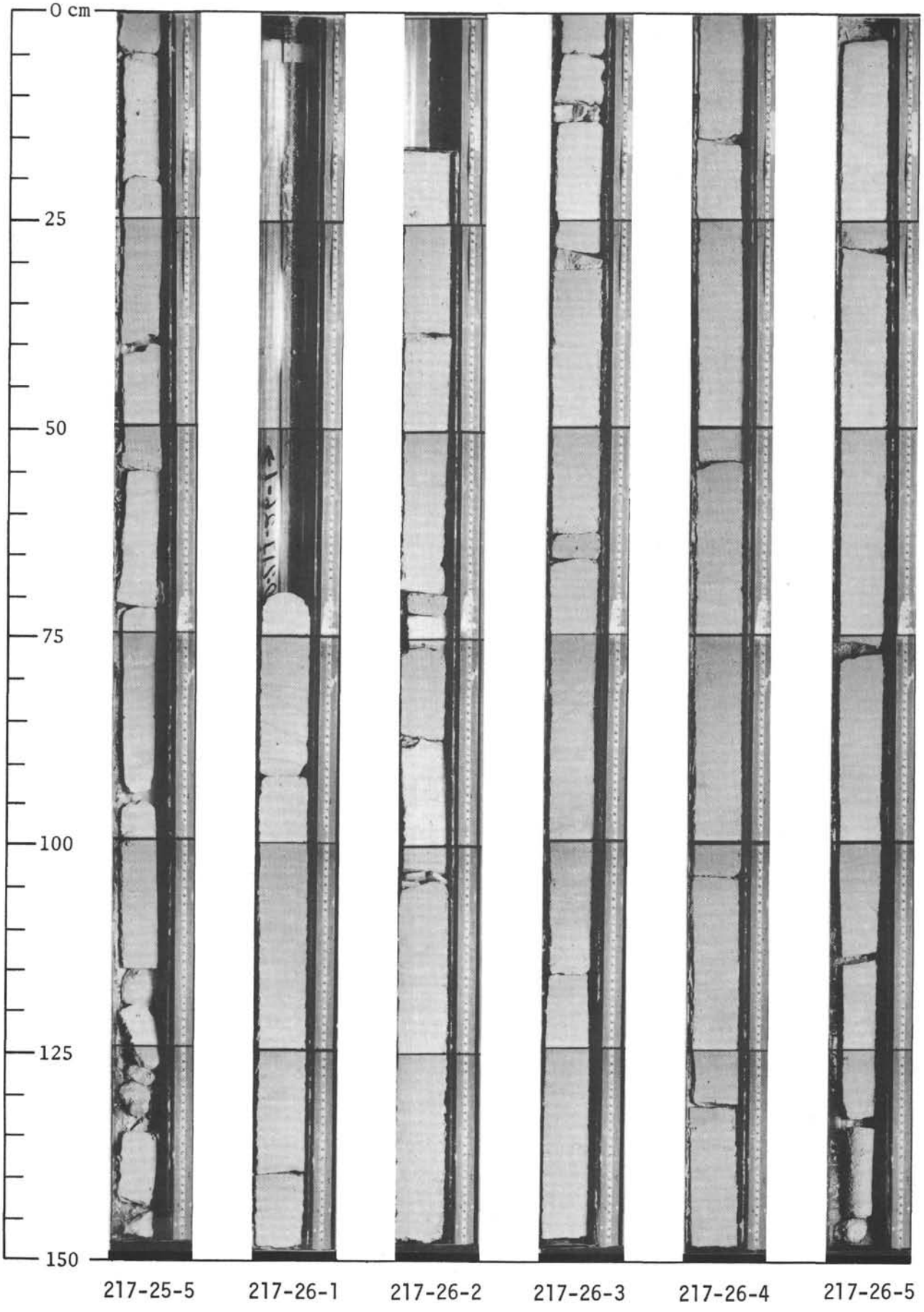
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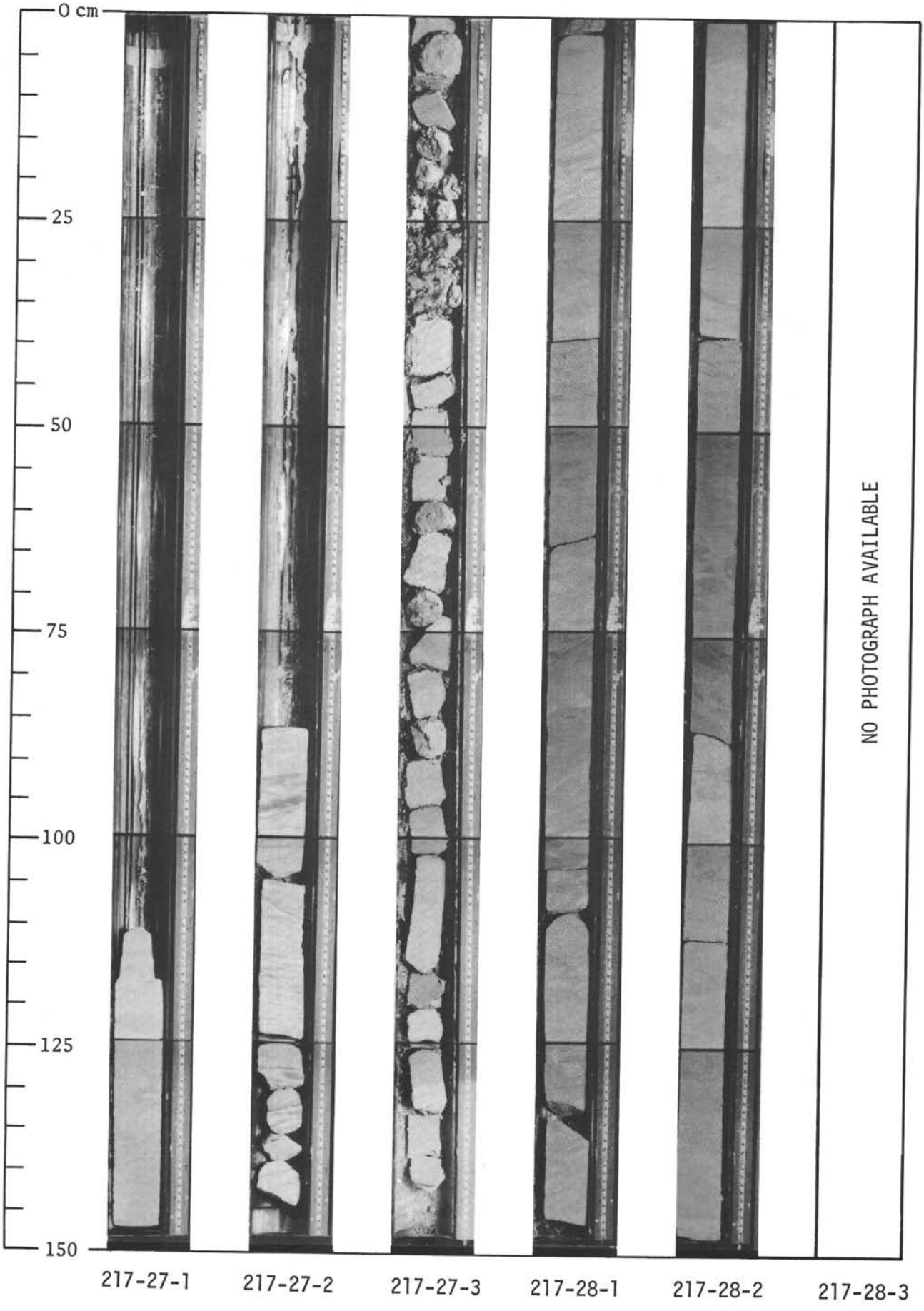
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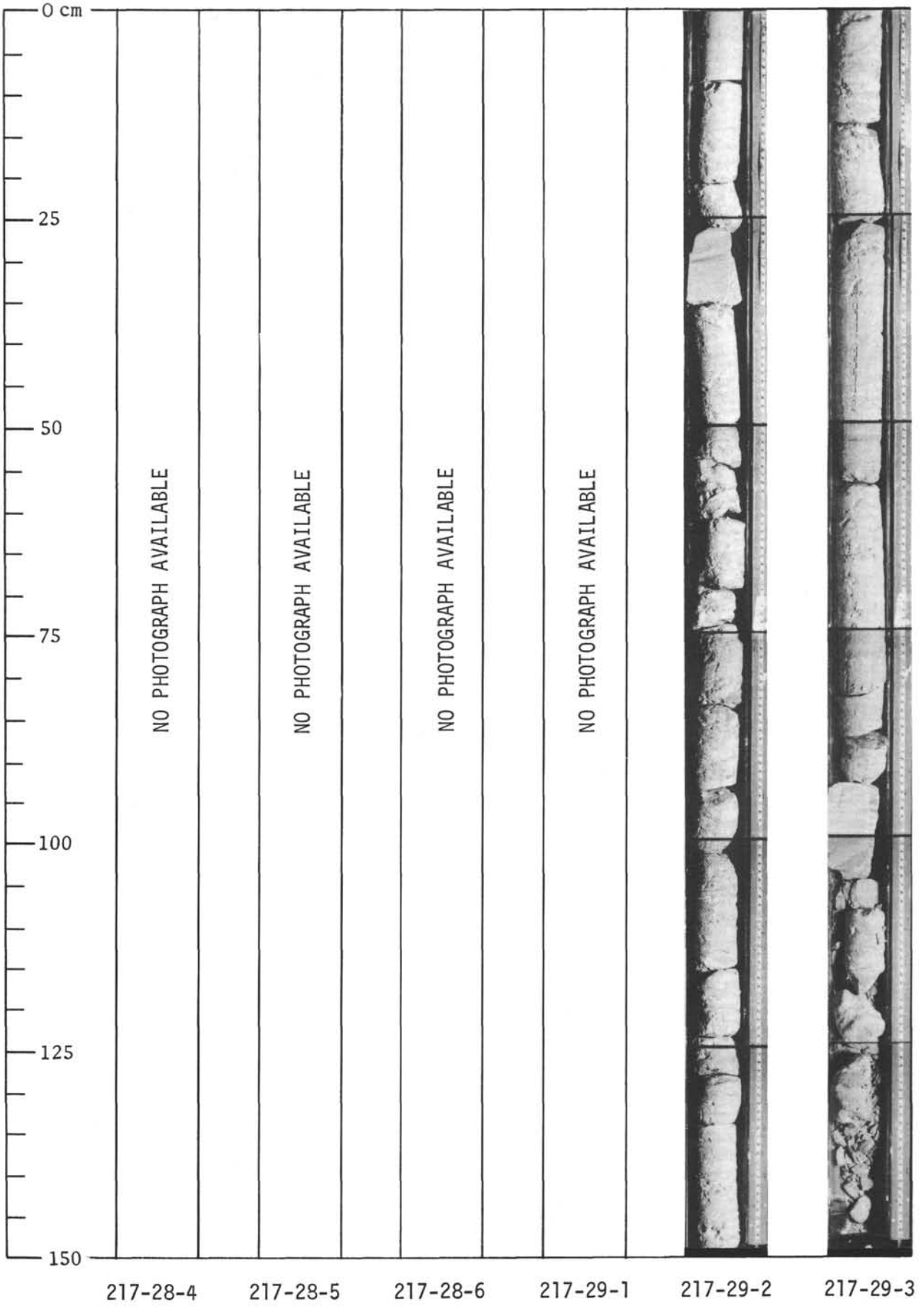
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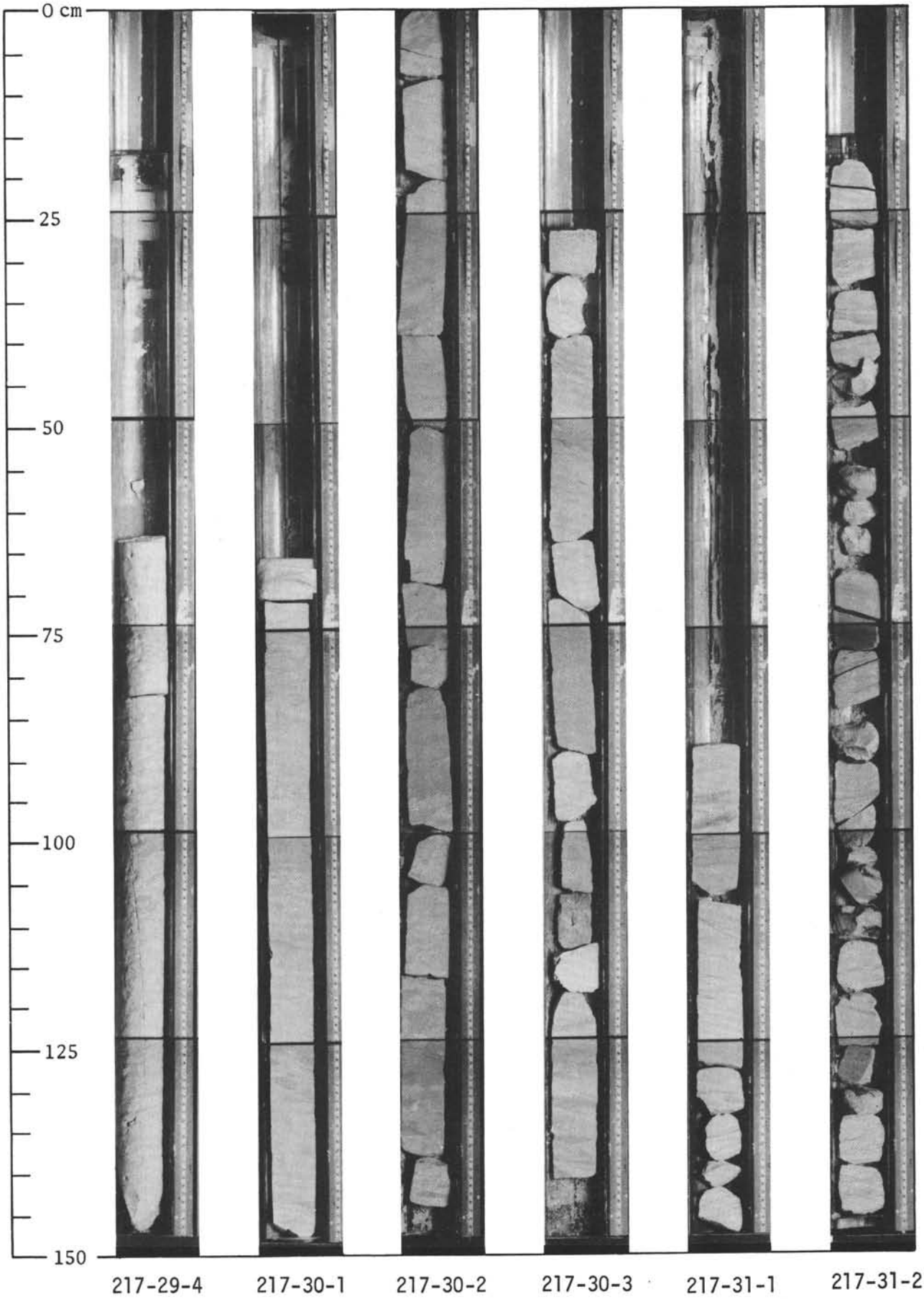
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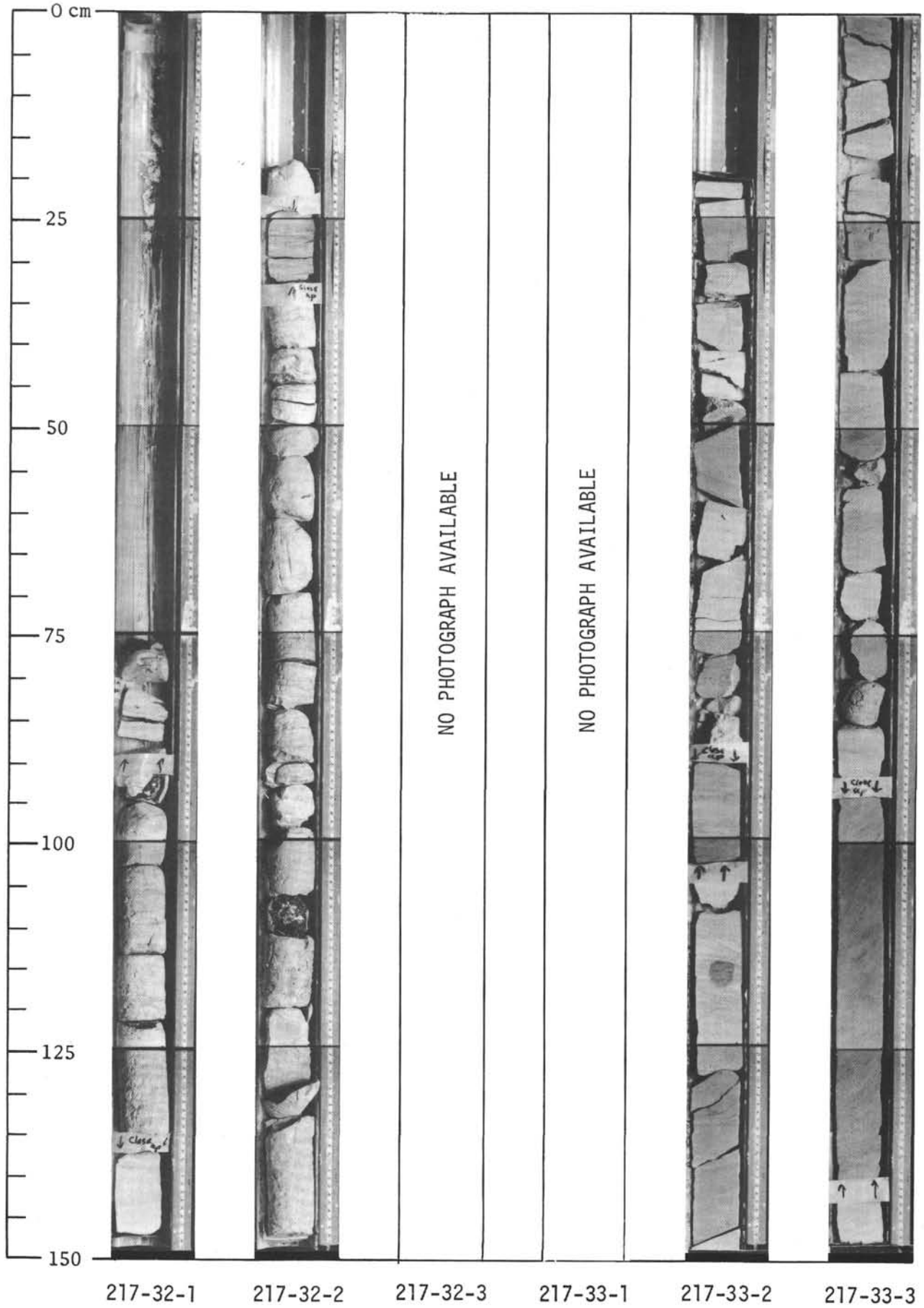
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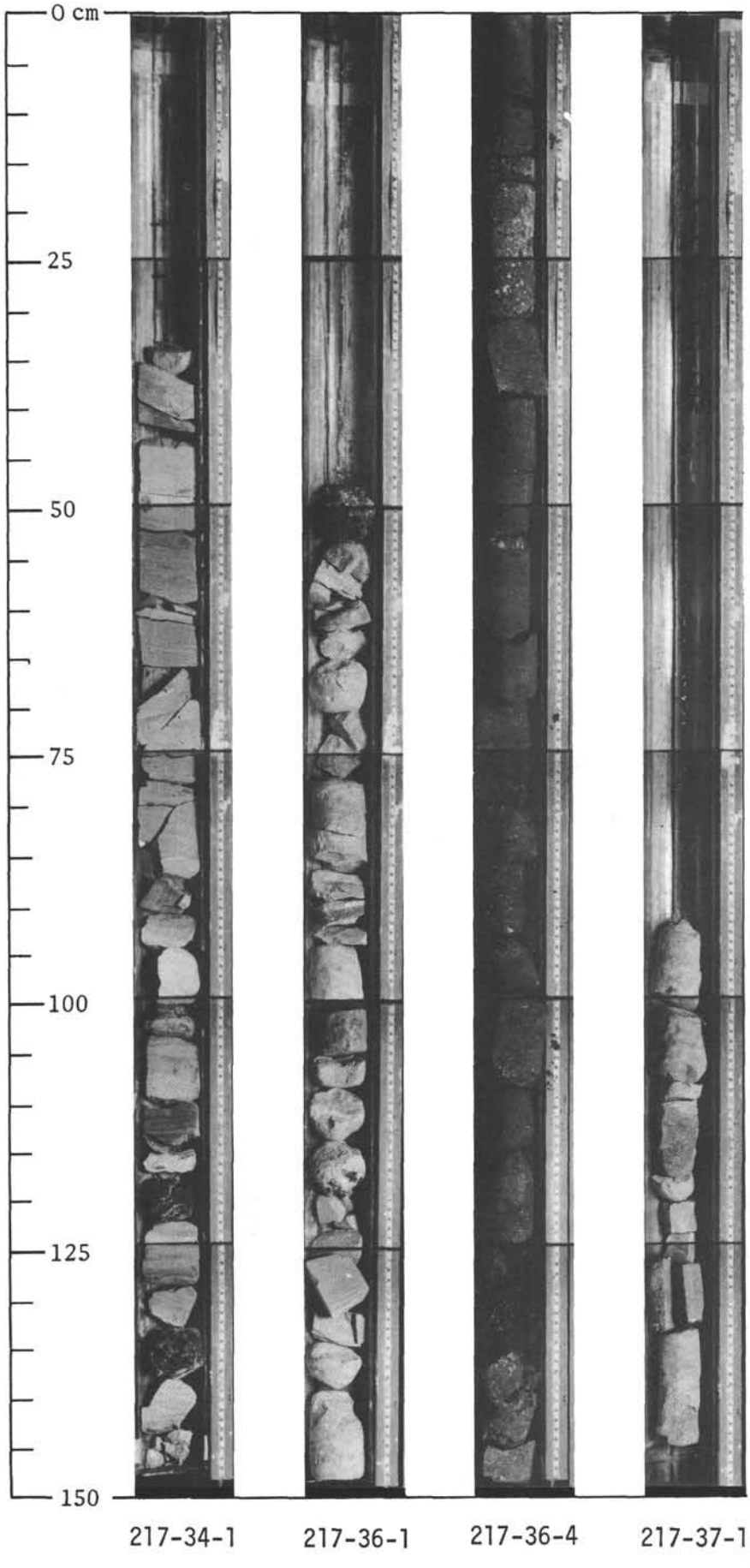
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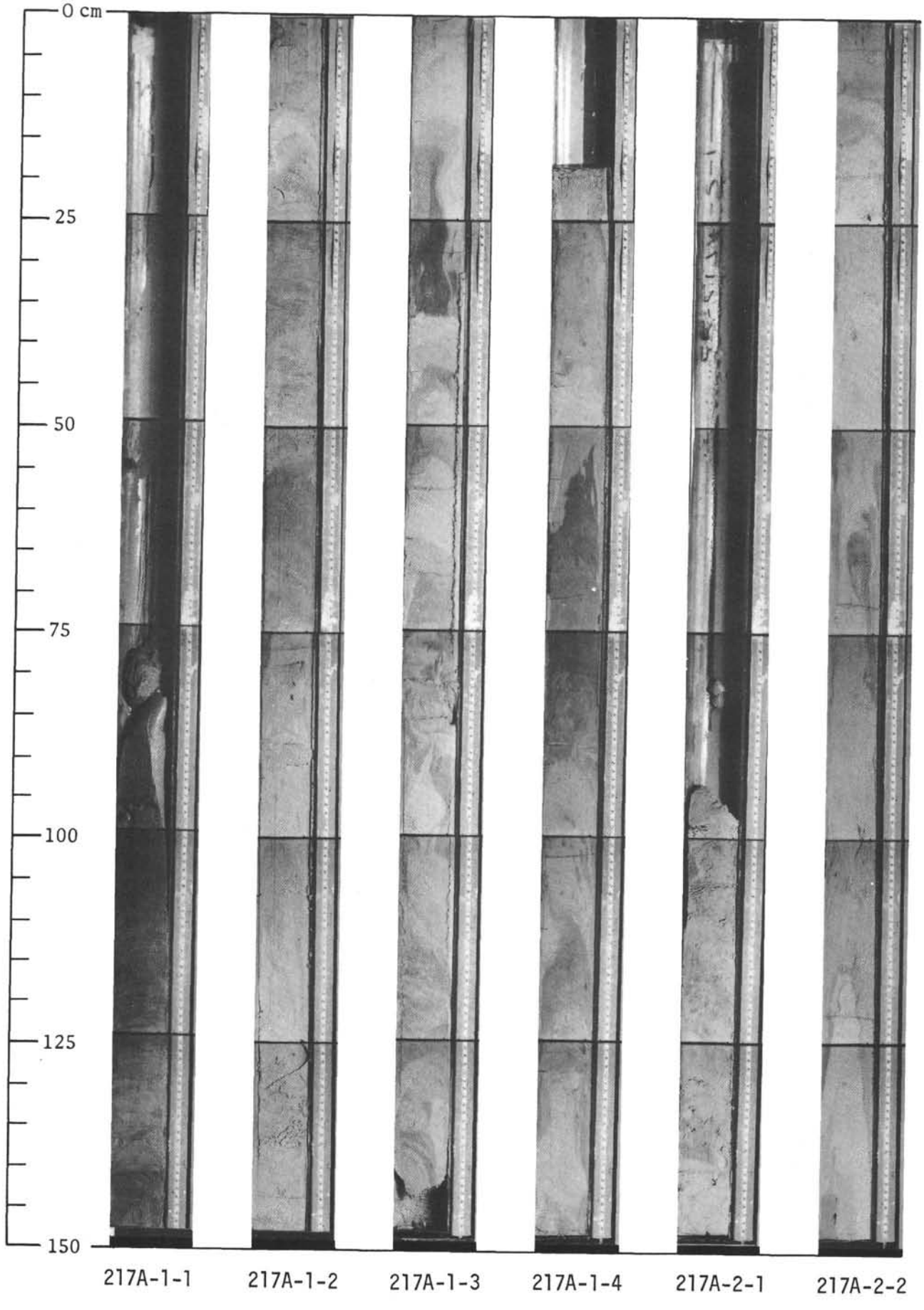
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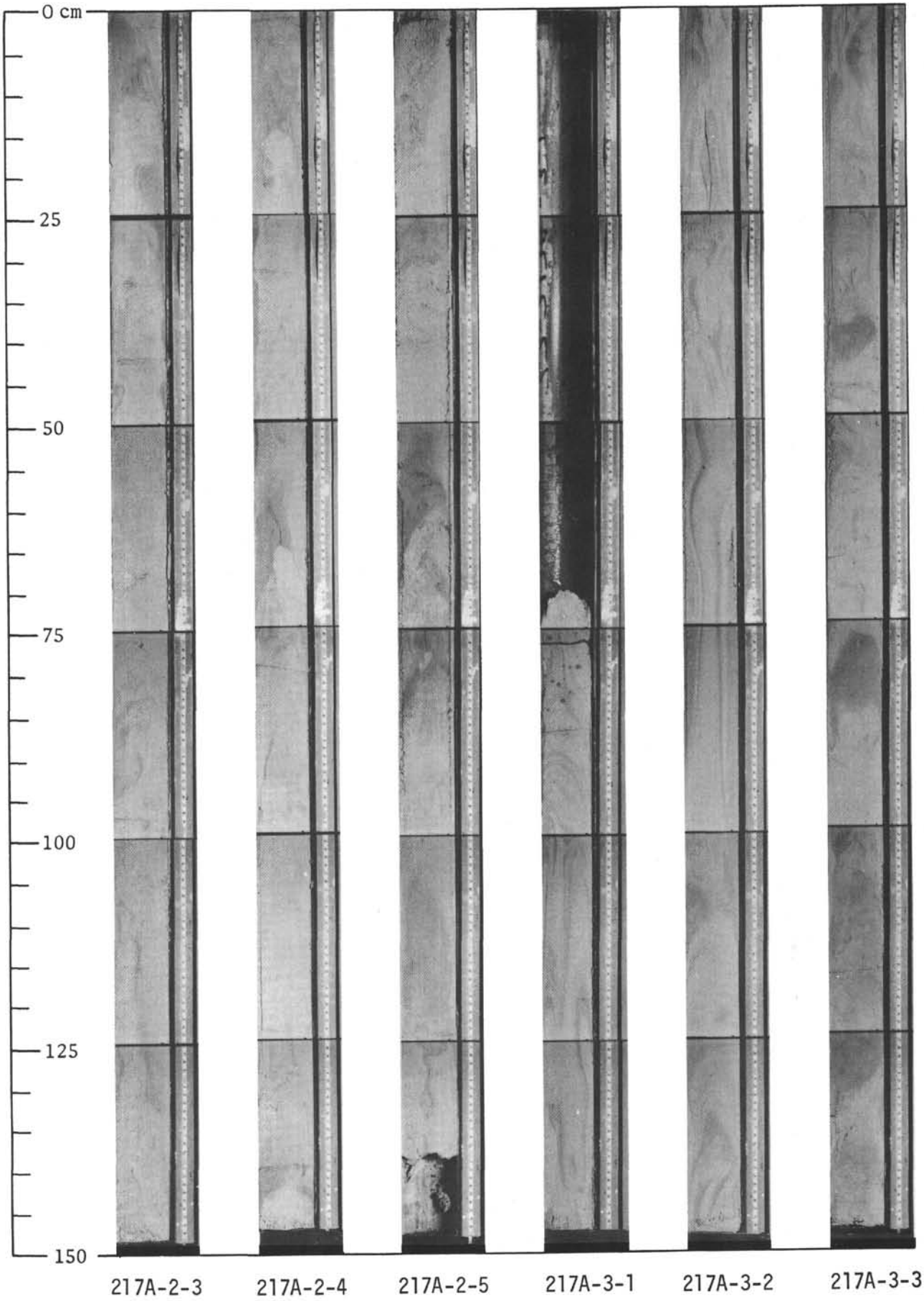
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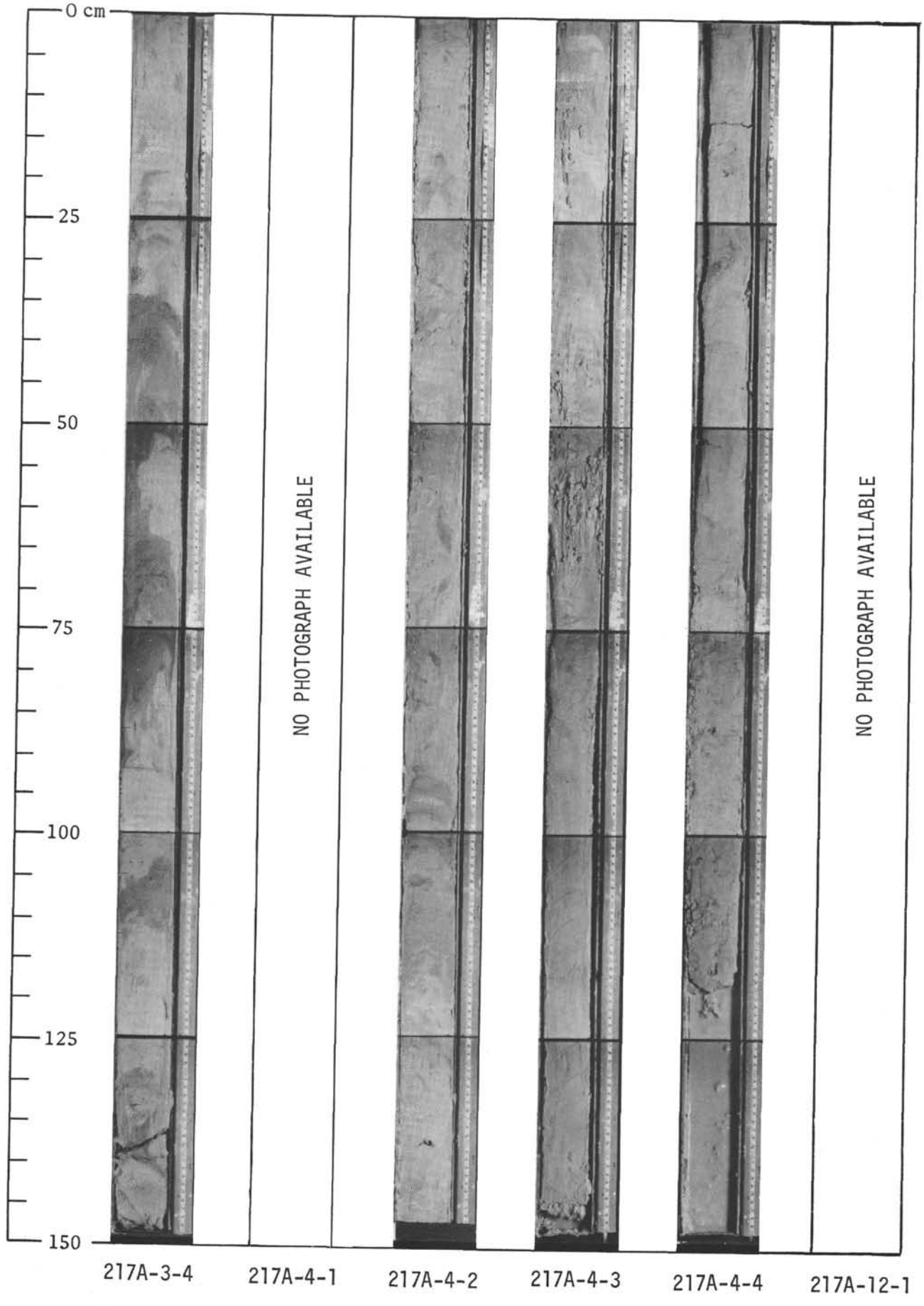
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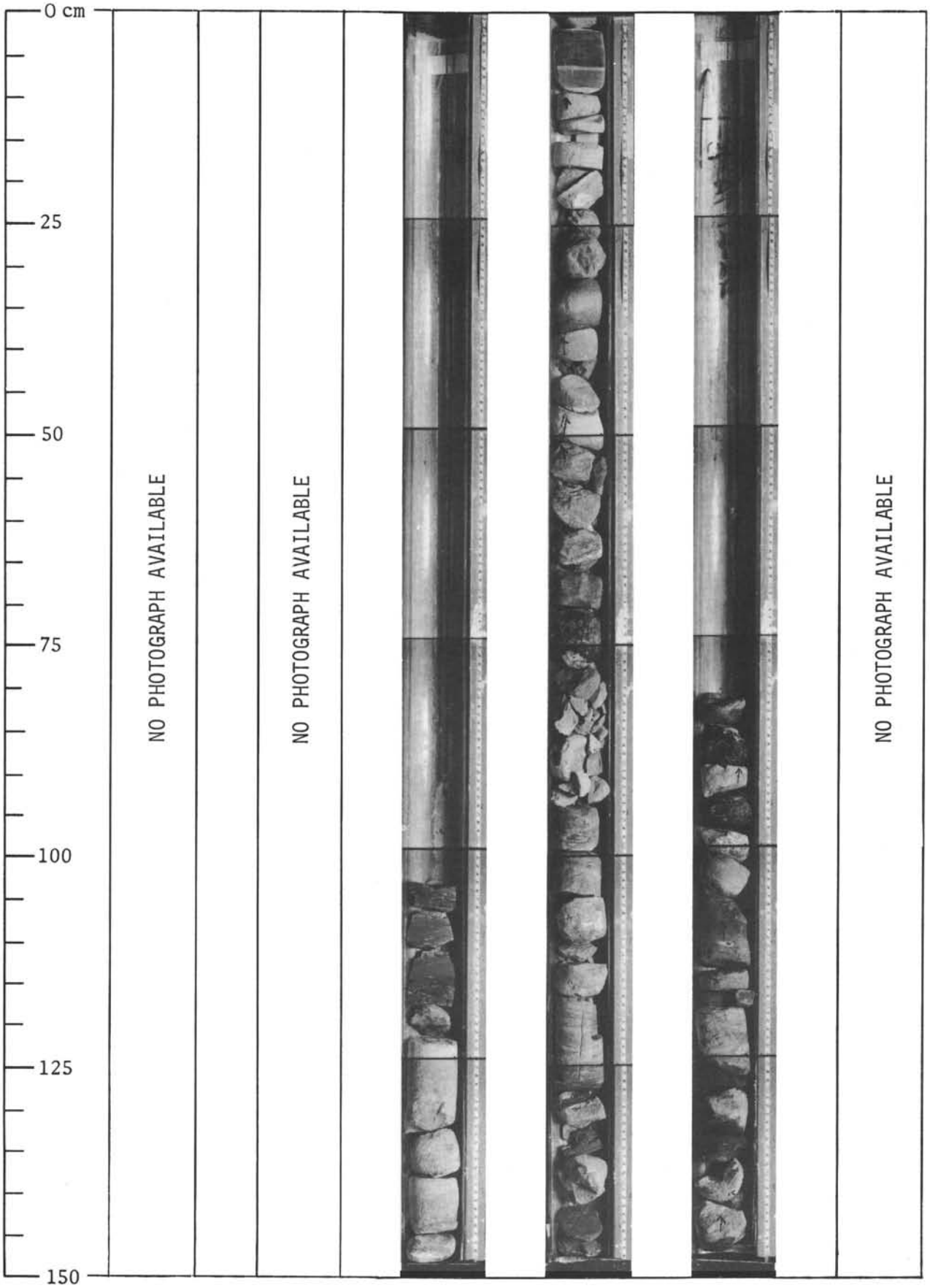
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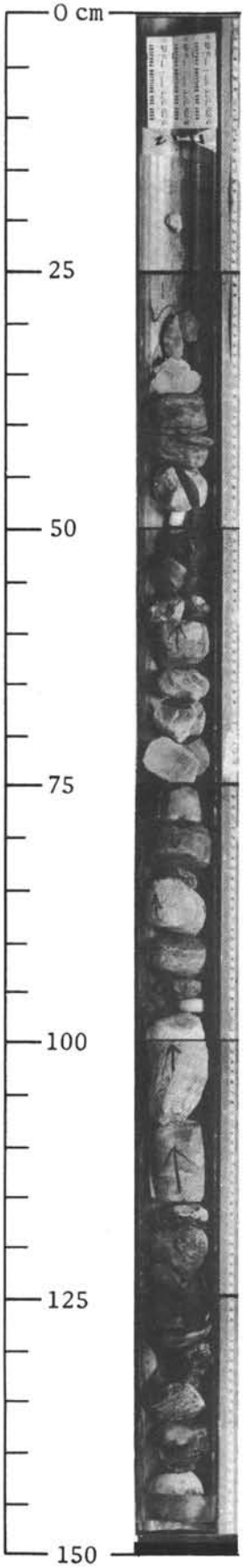

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