10. SITE 75

Shipboard Scientific Party[1]

SITE DATA

Occupied: November 24-27.

Position: Latitude 12° 31.0′S.
Longitude 134° 16.0′W.

Water Depth: 4181 meters.

Hole Depth: 82 meters, ending in basalt overlain by lower Oligocene carbonate ooze.

Holes Drilled: Two holes (including a turbocorer trial with negative results).

Cores Taken: Nine cores in Hole 75, with continuous coring. A tenth run to recover hard rock at bottom was unsuccessful. An attempted turbocore (Hole 75A) was unsuccessful but recovered six small basalt fragments in the bit watercourses.

RESULTS

The cored sediments comprise three lithologic units:

1) An upper unit of red clay (0 to 1.3 meters) containing Quaternary foraminifera at the top and in several thin layers.
2) A moderately uniform lower Miocene and Oligocene sequence of high carbonate content composed of very pure calcareous nannofossil ooze, with minor amounts of red clay (2 to 82 meters). The basal 8 meters, lower Oligocene in age, is approximately one-half red clay calcareous nannofossils; the rest finely divided iron-manganese.
3) Basalt, partly glassy, with palagonite, partly finely crystalline.

BACKGROUND

Site 75 is located 300 miles southeast of the Marquesas Islands; 400 miles south of Site 74. It is the southernmost of the sites along the N-S line drilled during Leg 8 to investigate the east-west trending accumulation of sediments centered about 2°N near 140°W. This site is a replacement for the site at 31°S originally chosen by the JOIDES Pacific Advisory Panel (PAP Site 27). The original site was not drilled since a preliminary SCAN survey indicated insufficient sediment thickness.

The SCAN (PAP 27) and *Challenger* surveys show the sea floor to be relatively flat in the vicinity of the site and to the north. South of the site it deepens by about 100 meters in 4 miles. On a finer scale the bottom is quite rough with relief of 20 to 40 meters and wavelengths of about 1 mile. Sediment thickness to a strong basement reflector near the site is generally nearly constant with maximum variation between 0.09 and 0.15 seconds (Figure 1 and Figure 10, Chapter 2). There are no consistent intermediate reflectors in the vicinity. A piston core, 3.5 meters in length, taken during the SCAN survey at 12° 14.66′S, 134° 18.753′W recovered 2.5 meters of zeolitic clay, over 0.7 meters of calcareous clay ooze, over 0.3 meters of clayey siliceous ooze. Age at the bottom is probably Lower Miocene.

Site 75 is near the center of a flat area about 2 miles across. The only prominent reflector at the site is acoustic basement at 0.100 second. It is correlated with basalt at 82 meters (Figures 6, 7 and 8, Chapter 2).

A topographic map of the vicinity of Site 75, airgun records and further site information are given in Chapter 25.

OPERATIONS

Two holes were drilled at Site 75. Hole 75.0 was continuously cored using a conventional wireline coring assembly and diamond bit. A total of 12 cores were taken in 81.7 meters. Recovery was 69.2 meters or 84 per cent. A series of plastic inner barrel liner failures hindered recovery. A total of only 35 minutes was spent coring on hard rock because of lack of support to the bottom assembly. No bottom sample was obtained.

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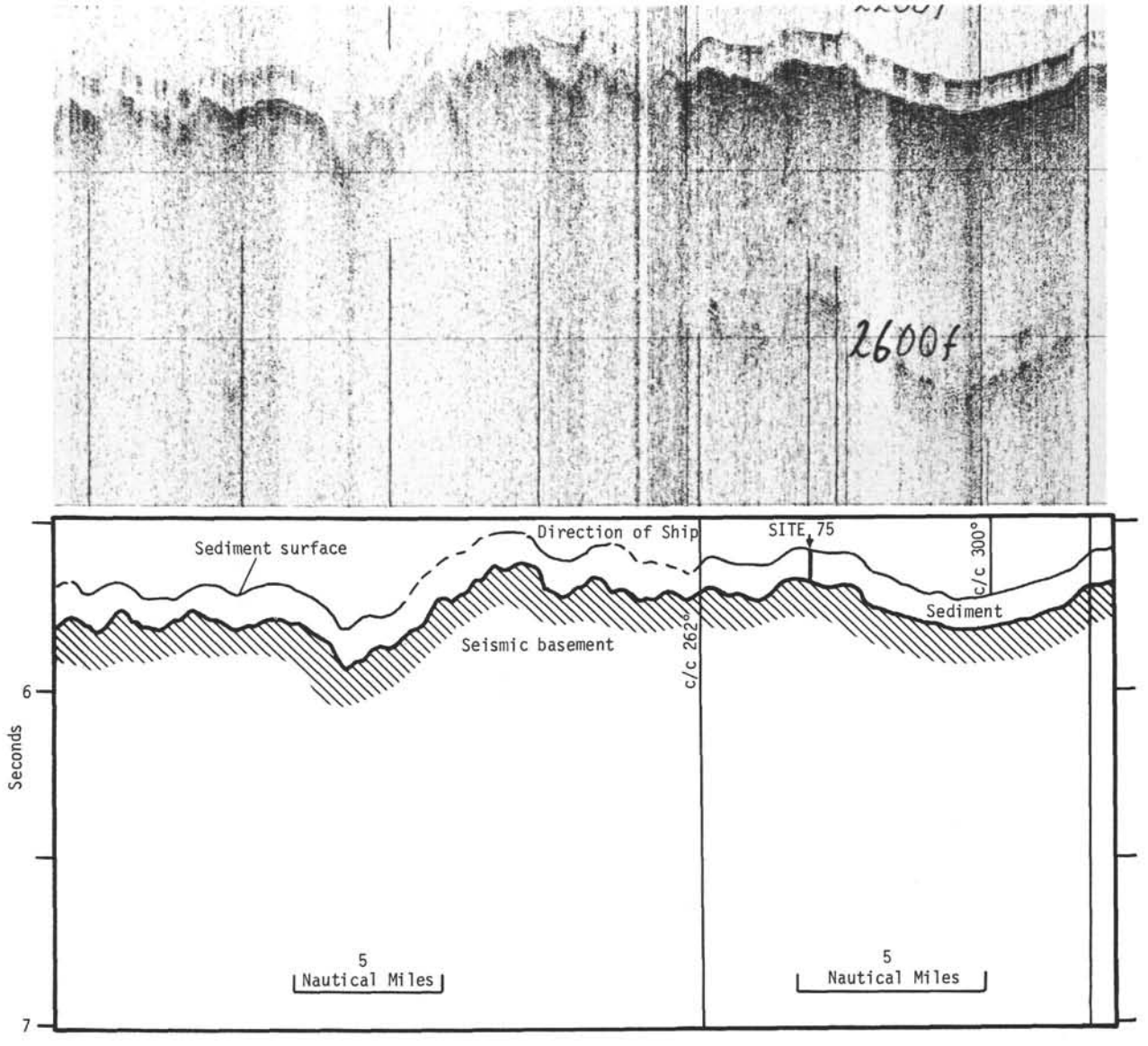


Figure 1. *Airgun record across Site 75 and interpretation.*

Hole 75A was washed to hard rock at 82 meters using the turbocorer. The rotation indicator did not work, and despite spending five hours attempting to start the turbine, all indications are that the turbine did not run. Fortunately, six small pieces of basalt were lodged in the bit watercourses giving a bottom sample, so that the test, although technologically unsuccessful, provided important scientific information.

LITHOLOGY AND STRATIGRAPHY

One sedimentary formation is present above the basalt: the Marquesas Oceanic Formation (1.3 to 82 meters) composed mainly of nannofossil ooze. The surface sediment at Site 75 (0 to 1.3 meters) is a residuum composed of zeolitic brown or "red" clay. Rare calcareous nannoplankton and foraminifera occur in the uppermost 2 centimeters, otherwise the clay is free of calcium carbonate ($CaCO_3$). The clay is very dark brown, contains about 10 to 30 per cent zeolites, and is in sharp contact with the underlying Marquesas Formation.

Marquesas Oceanic Formation

The Marquesas Oceanic Formation is composed of a highly calcareous nannofossil ooze, extending from 1.3 meters to basaltic basement at 82 meters. Calcareous nannoplankton are the main constituent of the ooze (98 per cent) while foraminifera are rare (0 to 1 per

TABLE 1
Summary of Coring at Site 75

	Core No.	Interval Below Seafloor (meters)	Cored (m)	Recovered (m)	Comments
Hole 75	1	0-9	9.1	8.2	
	2	9-18	9.1	9.1	
	3	18-27	9.1	8.5	
	4	27-36	9.1	9.1	
	5	36-45	9.1	9.1	
	6	45-54	9.1	1.8	Liner collapsed–about 6 feet of material recovered that was probably representative
	7	55-64	9.1	5.5	Liner collapsed–18 feet material recovered sections from outside line–probably mixed
	8	64-73	9.1	9.1	
	9	73-82	8.5	8.5	End on hard layer
	10	82-	0	0	Cored 35 min; no penetration; no recovery
Hole 75A – Turbocorer hole		0-82			Washed down; dropped barrel
		82-	0	0	No evidence that bit turned after 5 hours: 6 small fragments basalt recovered from bit watercourses (from pounding action).
Total	11	82	81.7	69.2	84% recovery

cent). Siliceous fossils are absent. Clays (1 to 2 per cent) and trace amounts of zeolites occur throughout the section.

The ooze is mainly light colored, yellowish at the top of the unit grading down to a brownish yellow at 55 meters and to a dark yellowish brown at 74 meters near the bottom of the hole. At this level, the ooze is impregnated by iron-manganese oxides (see Chapter 17).

The ooze is generally homogeneous, but a faint bedding is present in the upper part of the unit between 7.5 and 3.6 meters. Below this depth no bedding is apparent down to 74 meters.

Due to its yellowish-brown color and faint bedding, the Marquesas Formation in this southernmost site is of a slightly different facies from the one observed in equatorial sites, such as 71 and 72.

The top of the unit from 1.3 to 4.5 meters, shows an abrupt darkening from yellow to dark yellowish brown with a well-developed bedding. The sediment is a highly calcareous (85 to 95 per cent $CaCO_3$) nannofossil ooze, but contains 5 to 15 per cent clay and zeolites.

The base of the formation, between 74 and 82 meters, consists of a darker, bedded ooze. The darker color results from the admixture of variable amounts of iron/manganese (Fe/Mn) oxide particles in an otherwise "normal" nannofossil ooze. The sequence is well bedded, each individual bed displaying a specific proportion of oxides, ranging from zero to 40 per cent. Thus some of the interbeds are almost pure nannofossil oozes. Thickness of individual beds ranges from 10 centimeters to a couple of meters, with very sharp boundaries. The color varies with the proportion of oxides, from yellowish brown in the low-oxide layers to dark brown in heavily loaded horizons. This basal Marquesas sequence suggests iron and manganese enrichment of the nannofossil oozes by hydrothermal exhalations, possibly when the site was nearer the crest of the East Pacific Rise (see Chapter 17), or possibly from volcanism associated with formation of this base

of the Marquesas Islands. A stratigraphic hiatus may separate this sequence from the overlying oxide-free nannofossil ooze. The age of the Marquesas Oceanic Formation is early Miocene and Oligocene.

The drilling bottomed, at 82 meters, on a hard layer. The turbodrill brought back in its bit a few chips of dark vesicular basalt, in part finely crystalline and in part glassy.

Figure 5 is a plot of age versus depth, based on the biostratigraphic zonations of the foraminifera, nannoplankton, and Radiolaria, with the time scale, in millions of years, based on that of Berggren (1969).

PHYSICAL PROPERTIES

Porosities range between about 50 and 65 per cent and velocities range between about 1.50 and 1.55 km/sec. Most of the sampled sediments are high in calcium carbonate ($CaCO_3$) and the velocity-porosity data for 65 to 100 per cent calcium carbonate ($CaCO_3$) in Figure 2 fall near the theoretical curve for a grain-matrix density of 2.65 g/cm^3 appropriate for such material. Sonic velocities are less than that for sea water for depths less than 12 meters (Figure 7, Chapter 2).

Natural gamma radiation is about 1600 counts at the top of the section, decreasing rapidly with depth to less than 1000 counts. Activity raises again, slightly, near the bottom of the section.

Results of grain-size and carbon-carbonate analyses are tabulated in Appendices II and III, respectively.

PALEONTOLOGY

Foraminifera

Hole 75 was continuously cored to total depth (82 meters). The stratigraphic section is similar to that of Hole 74, but the post-Lower Miocene portion is even more reduced in thickness, and the Lower Oligocene apparently rests directly on igneous (basaltic?) rock. There are no siliceous microorganisms in Hole 75, and the only significant noncalcareous constituents in the washed residues are fish teeth and bones.

The top layer from the sea floor to Section 75-1-1 at 95 centimeters appears to be of Quaternary age and contains a rich and diversified planktonic fauna with *Globorotalia tumida, Pulleniatina* spp. (dextrally coiled), *Globigerinoides* spp., and also small and thin-walled species such as *Globigerina juvenilis* and *Turborotalita humilis.* In contrast to the other Quaternary faunas of Leg 8, there are no observable solution effects.

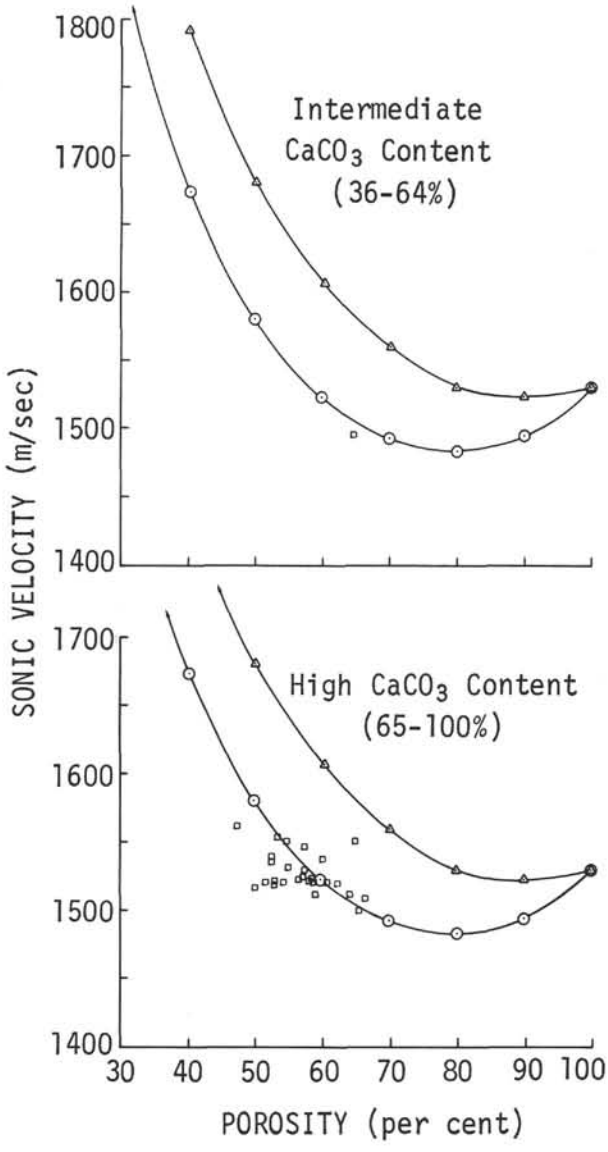


Figure 2. *Sonic velocity versus porosity of unlithified sediments from Site 75 for two ranges of calcium carbonate content. No measured sediment contained less than 36 per cent calcium carbonate. Theoretical curves are based on the equation of Wood (1941). Upper curve, grain-matrix density 2.2 g/cm^3, appropriate for siliceous ooze. Lower curve, grain-matrix density 2.65 g/cm^3, appropriate for calcareous ooze.*

Immediately below this follows what appears to be a condensed Lower Miocene sequence (N. 5-6 to N. 8), which also contains a rather high percentage of fish remains. Section 75-1-2 includes *Globigerinoides sicanus, Globorotalia mayeri* and *Sphaeroidinellopsis seminulina* (s.l.). In the following section (75-1-3), *G.*

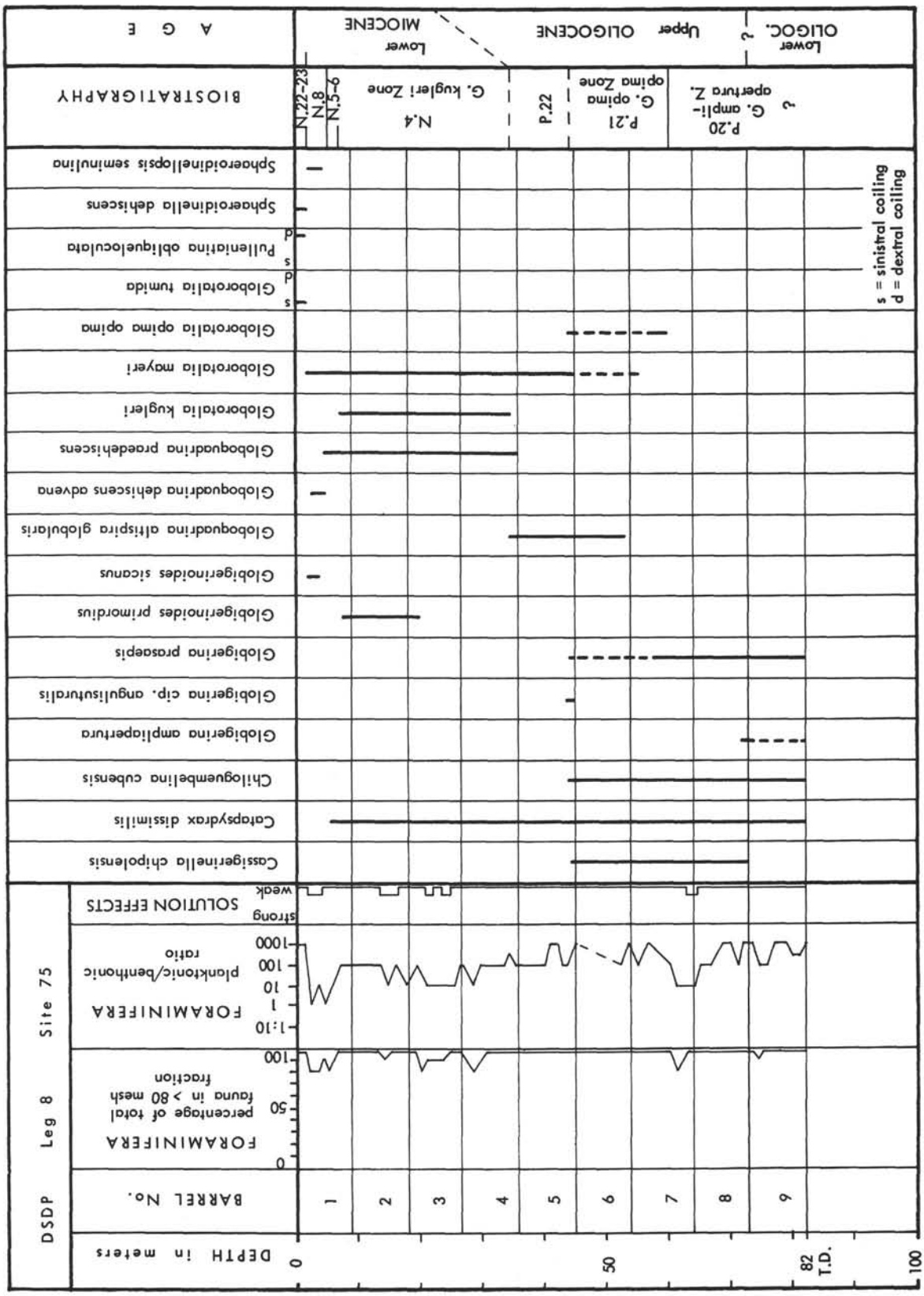


Figure 3. *Foraminifera of Site 75. Frequency distribution, ranges of important species, and biostratigraphy.*

TABLE 2
Calcareous Nannoplankton Occurrences at Site 75

Species	Occurrence (Hole/Core Nos.)
Ceratolithus cristatus Kamptner	75/1
Coccolithus bisectus (Hay, Mohler and Wade) as figured by Bramlette and Wilcoxon	75/8, 9
Coronocyclus nitescens (Kamptner) Bramlette and Wilcoxon	75/1, 3, 7, 9
Cyclococcolithus formosus Kamptner	75/9
C. leptoporus (Murray and Blackman) Kamptner	75/1
C. neogammation Bramlette and Wilcoxon	75/1-9
Discoaster adamanteus Bramlette and Wilcoxon	75/1-4
D. deflandrei Bramlette and Riedel	75/1, 2, 4, 5, 8, 9
D. dilatus Hay	75/1-3
D. druggii Bramlette and Wilcoxon	75/1-3
D. tani nodifer Bramlette and Riedel	75/9
D. tani ornatus Bramlette and Wilcoxon	75/8
D. tani tani Bramlette and Wilcoxon	75/9
Gephyrocapsa oceanica Kamptner	75/1
Helicopontosphaera compacta (Bramlette and Wilcoxon)	75/8
Reticulofenestra umbilica (Levin) Martini and Ritzkowski	75/9
Sphenolithus belemnos Bramlette and Wilcoxon	75/1, 2
S. ciperoensis Bramlette and Wilcoxon	75/4, 5
S. distentus (Martini) Bramlette and Wilcoxon	75/5-8
S. heteromorphus Deflandre	75/1
S. moriformis (Bronnimann and Stradner) Bramlette and Wilcoxon	75/1-9
S. predistentus Bramlette and Wilcoxon	75/6-9
S. pseudoradians Bramlette and Wilcoxon	75/7-9
Triquetrorhabdulus carinatus Martini	75/1-4

sicanus is absent, but *Globoquadrina praedehiscens* is commonly found. Section 75-1-4 already contains the highest *Catapsydrax dissimilis.*

The *Globorotalia kugleri* Zone (N. 4) is located from near the bottom of Core 75-1 (6 meters) to 75-4-5 (34 meters). Specimens of *Globigerinoides primordius* were seen down to Section 75-3-1. The interval from 75-4-6 to 75-7-4, 50 centimeters (34 to 60 meters) probably includes both the *Globigerina ciperoensis ciperoensis* Zone (P. 22) and the *Globorotalia opima opima* Zone (P. 21). Good large specimens of *G. opima opima* are very rare at Site 75. The highest fairly large *G. opima* s.l. is observed at Section 75-5-6. At about the same level we find the highest *Chiloguembelina cubensis.* The deepest part of the hole, from 75-7-4, 137 centimeters, to total depth (60 to 82 meters) is assigned to the *Globigerina ampliapertura* Zone (P. 20). Although small-sized planktonic foraminifera are common, no specimens of *Pseudohastigerina barbadoensis,* which would indicate the basal Oligocene (P. 18-19), were found.

Even more than at Site 74, the samples contain a very large quantity of clay-size material (including calcareous nannoplankton), and the amount of microfauna recovered in the washed residues is usually surprisingly small.

Calcareous Nannoplankton

Calcareous nannoplankton are well preserved throughout all the material recovered at Site 75. The surficial

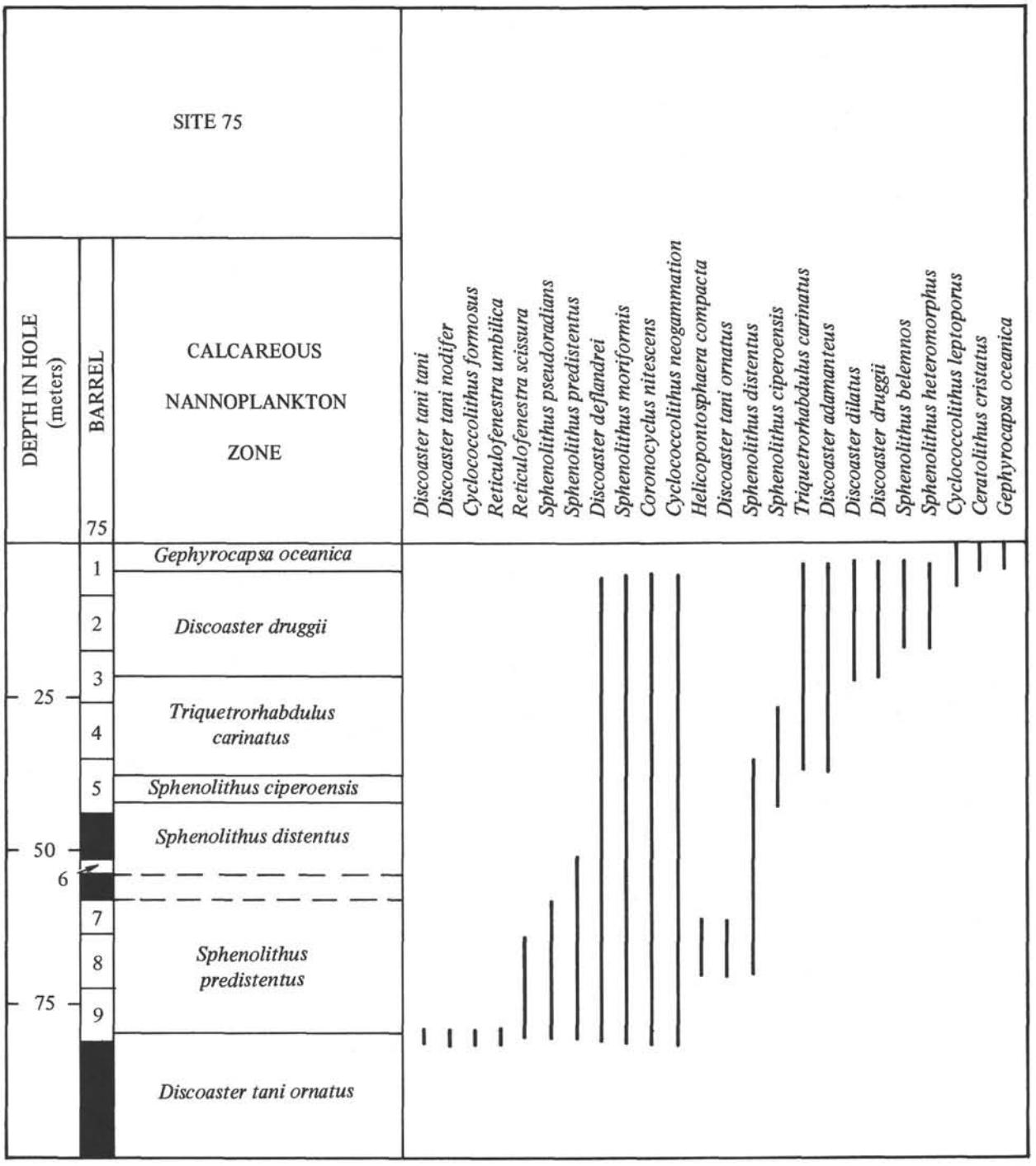


Figure 4. *Calcareous nannoplankton at Site 75. Distribution and biostratigraphy.*

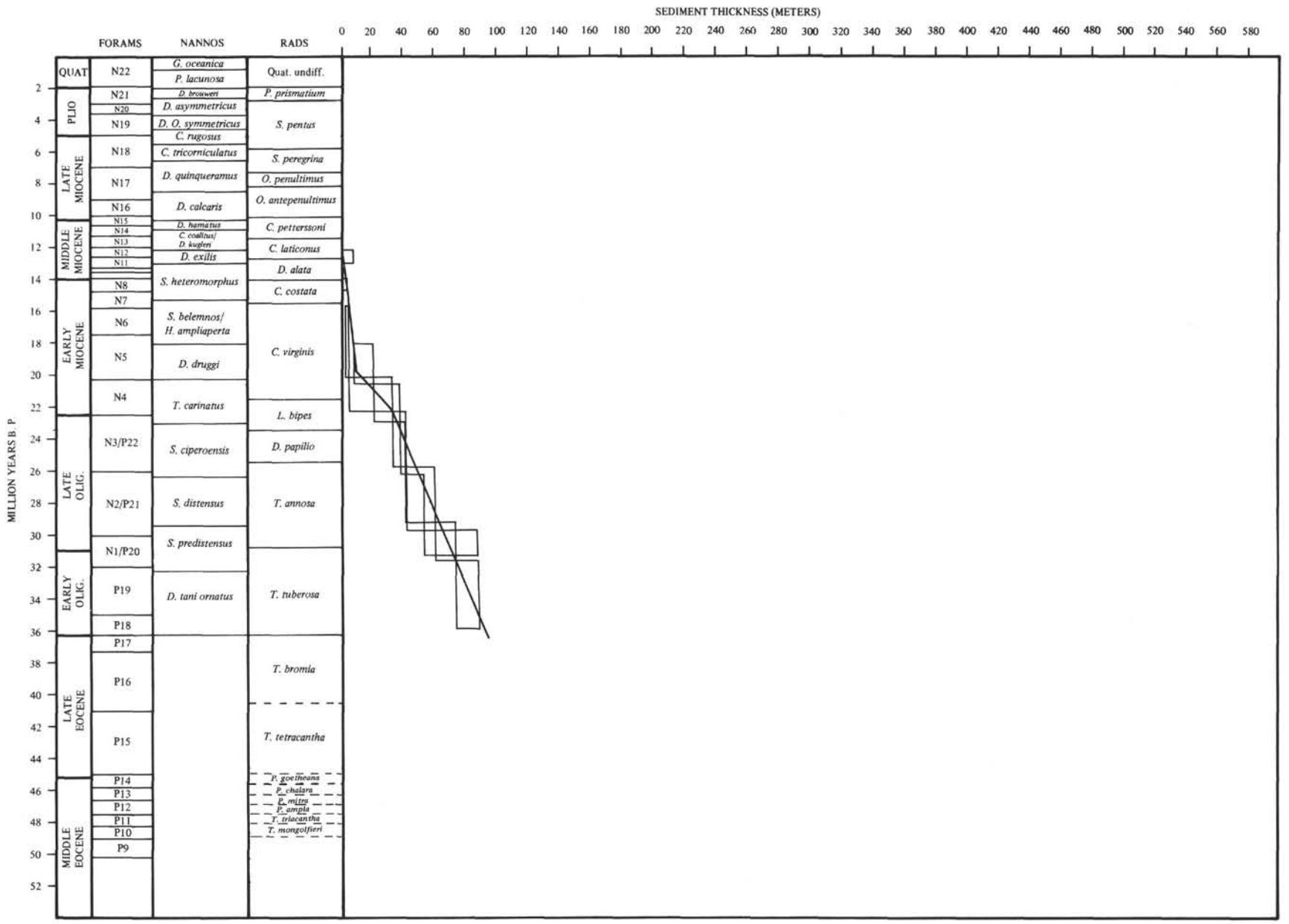


Figure 5. *Age versus depth at Site 75, based on the biostratigraphic zonations of the foraminifera, calcareous nannoplankton and Radiolaria. Ages based on the time scale of Berggren (1969).*

sediment at this site contains the *Gephyrocapsa oceanica* Zone of Quaternary age. Below this, the normal sequence of lower Miocene, Oligocene and Eocene zones are present. Seven nannoplankton zones were distinguished on the basis of only 24 species (Table 2).

Hole 75

Core 1-1: *Gephyrocapsa oceanica* Zone

Core 1-3 to 3-3: *Discoaster druggii* Zone

Core 3-4 to 5-2: *Triquetrorhabdulus carinatus* Zone

Core 5-3 to 5-5: *Sphenolithus ciperoensis* Zone

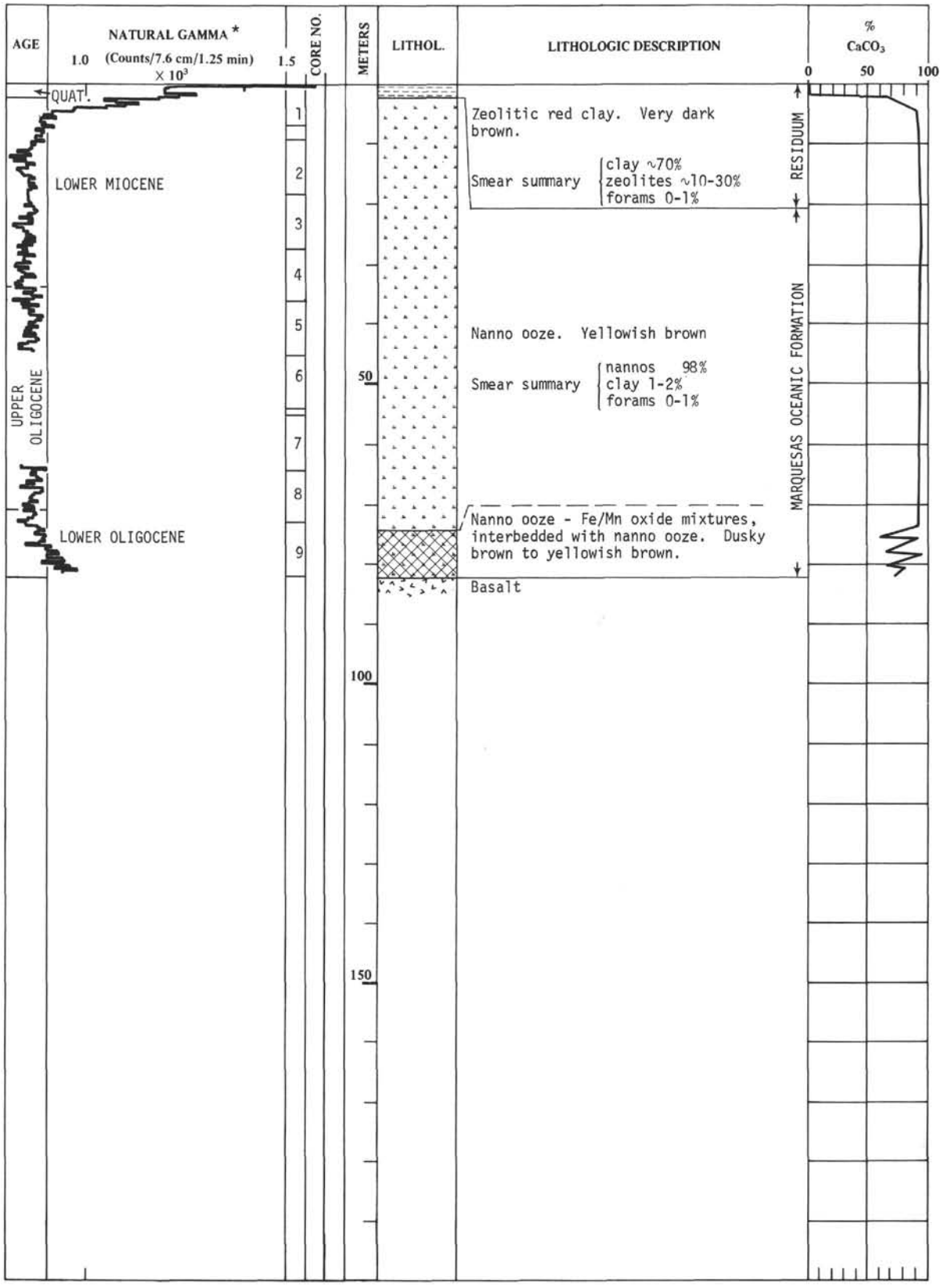
Core 5-6 to 6-CC: *Sphenolithus distentus* Zone

Core 7-1 to 9-5: *Sphenolithus predistentus* Zone

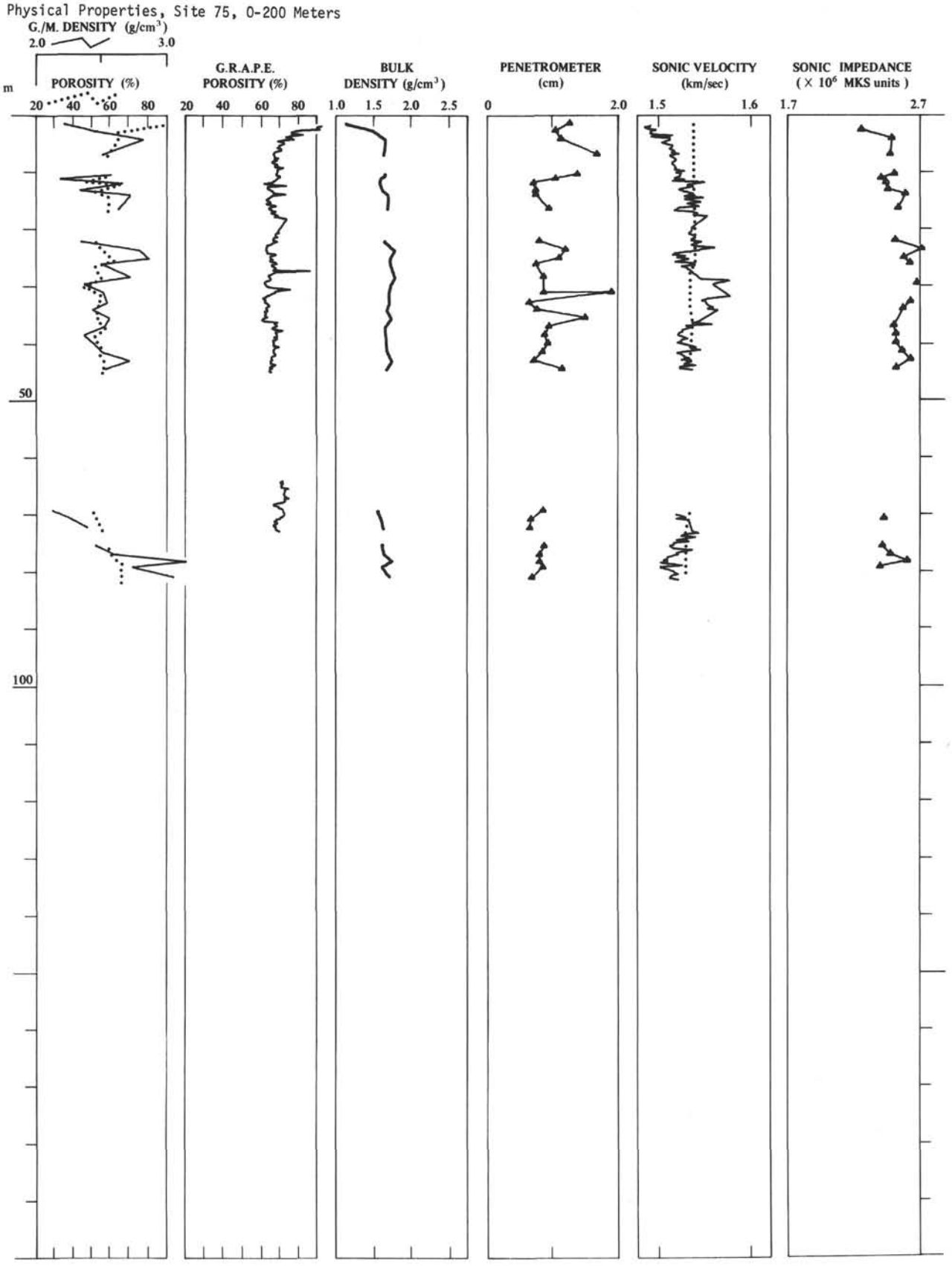
Core 9-CC: *Discoaster tani ornatus* Zone

REFERENCE

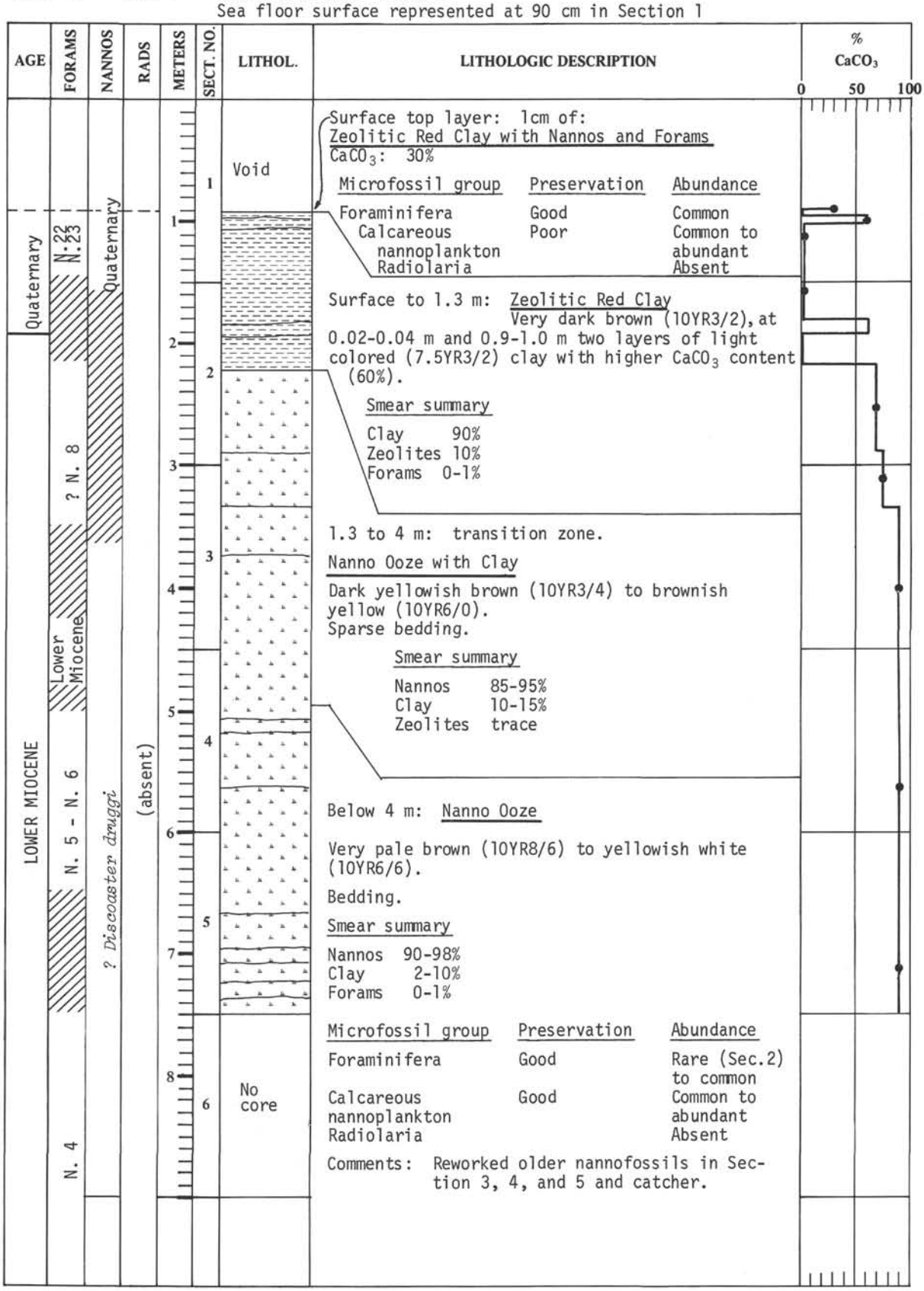
Berggren, W. A., 1969. Cenozoic chronostratigraphy, planktonic foraminiferal zonation and the radiometric time scale. *Nature*. **224**, 1072.


AGE
NATURAL GAMMA *
1.0 (Counts/7.6 cm/1.25 min) 1.5
× 10³
CORE NO.
METERS
LITHOL.
LITHOLOGIC DESCRIPTION
% CaCO₃
0 50 100
QUAT.
LOWER MIOCENE
UPPER OLIGOCENE
LOWER OLIGOCENE
1
2
3
4
5
6
7
8
9
50
100
150
Zeolitic red clay. Very dark brown.
Smear summary
clay ~70%
zeolites ~10-30%
forams 0-1%
Nanno ooze. Yellowish brown
Smear summary
nannos 98%
clay 1-2%
forams 0-1%
Nanno ooze - Fe/Mn oxide mixtures, interbedded with nanno ooze. Dusky brown to yellowish brown.
Basalt
RESIDUUM
MARQUESAS OCEANIC FORMATION

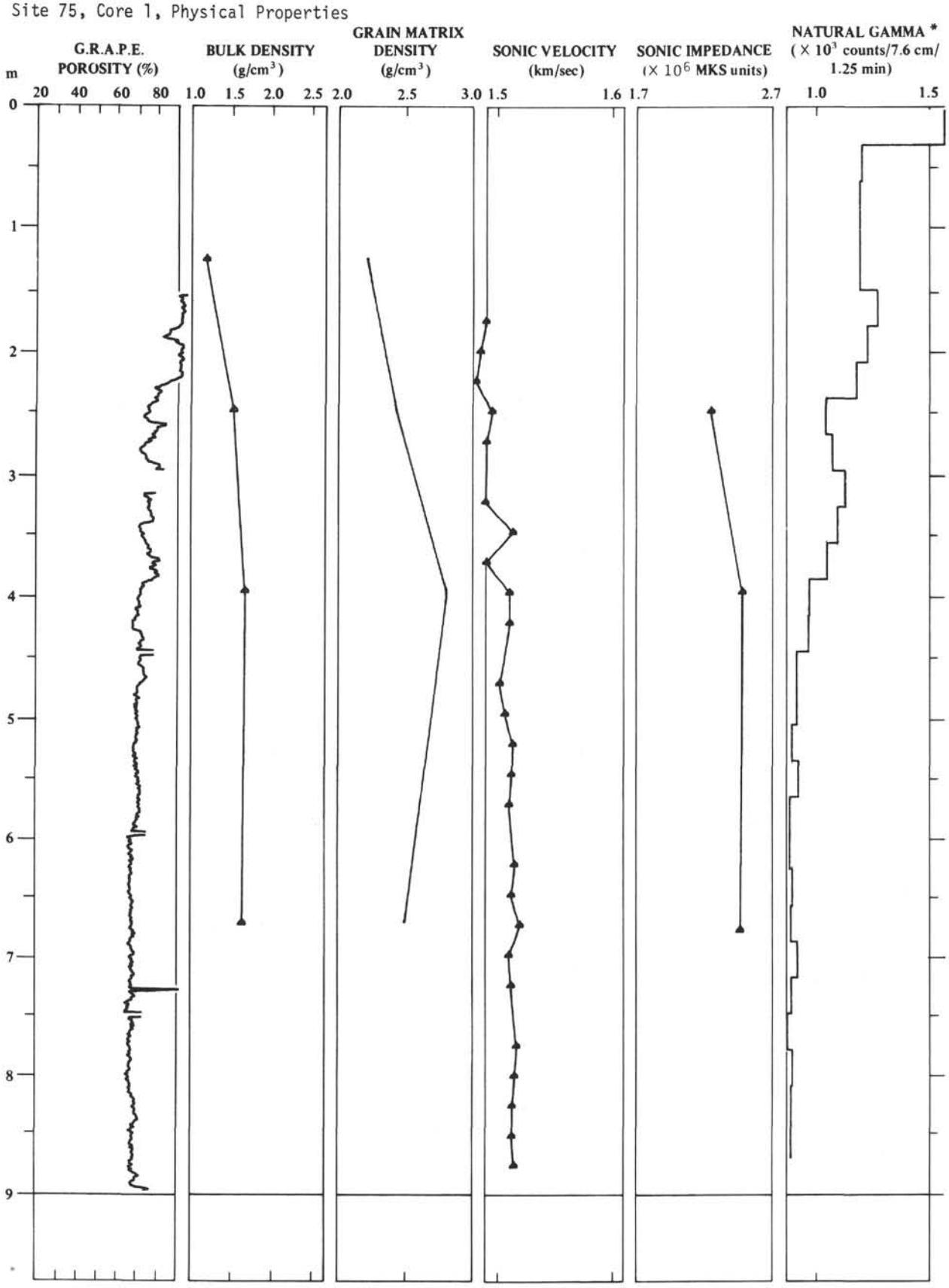
Physical Properties, Site 75, 0-200 Meters



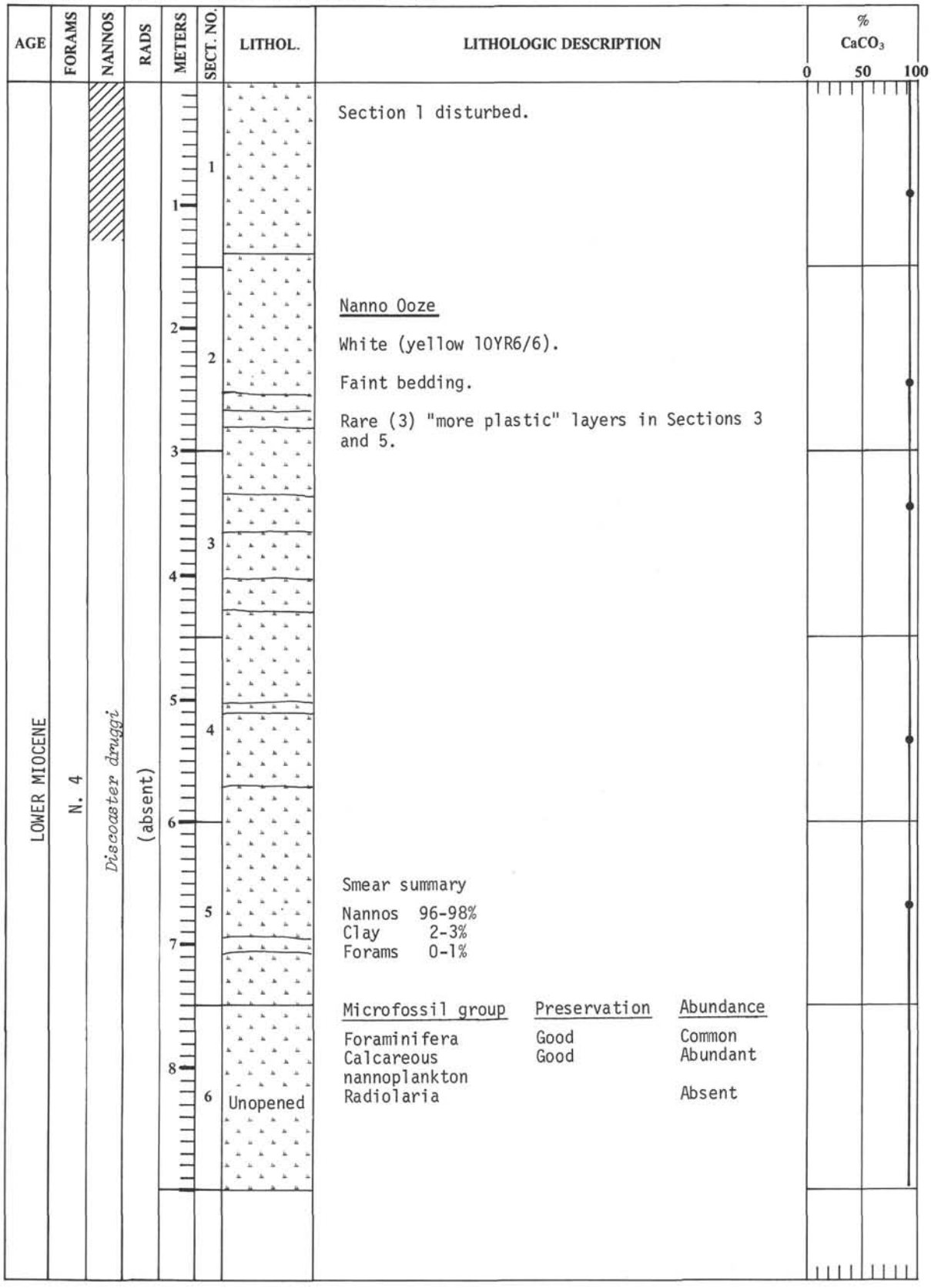
SITE 75 Core 1 Cored interval: 0-6.6 m
Sea floor surface represented at 90 cm in Section 1



Site 75, Core 1, Physical Properties



SITE 75 Core 2 Cored interval: 9-18 m



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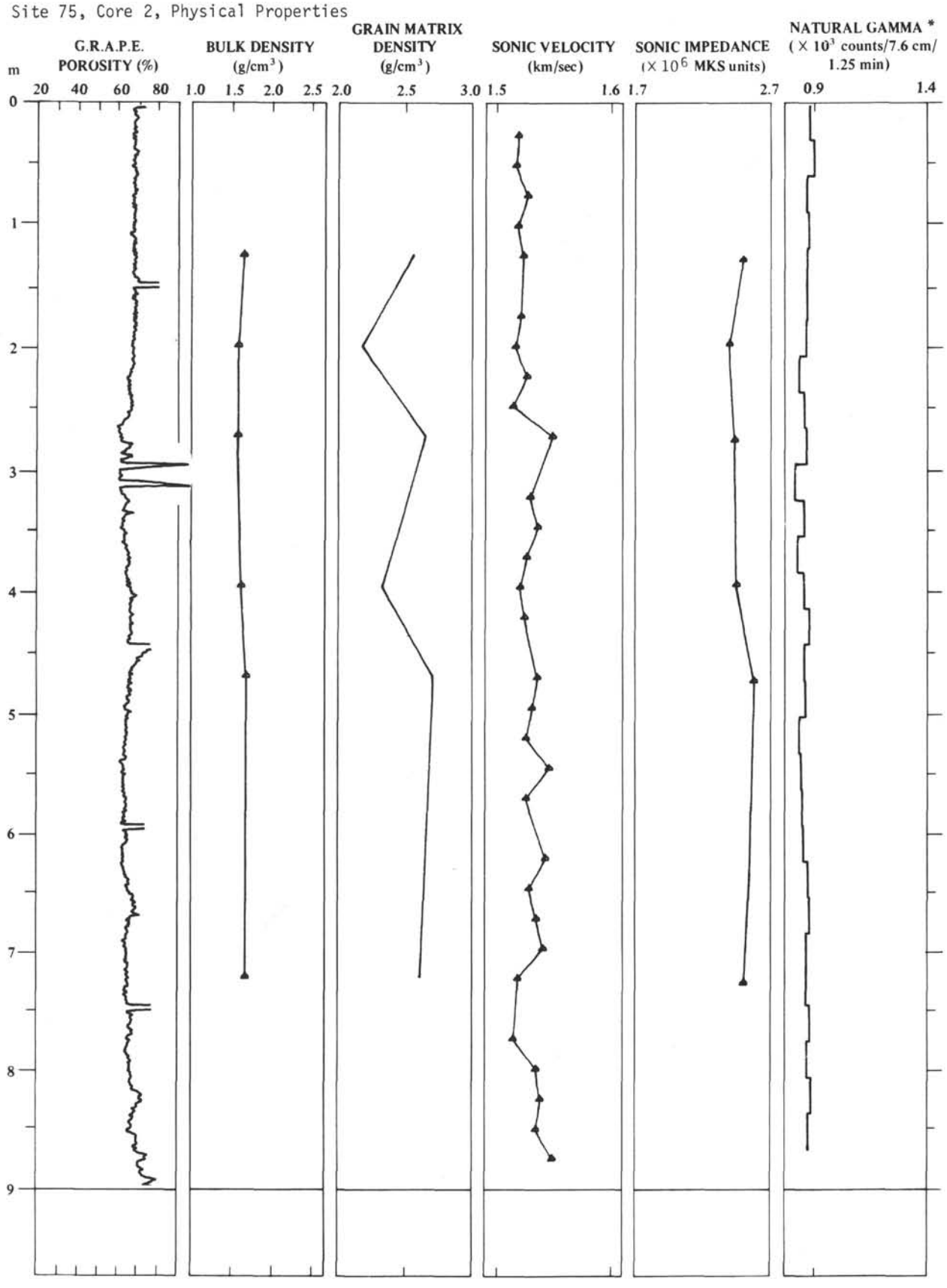
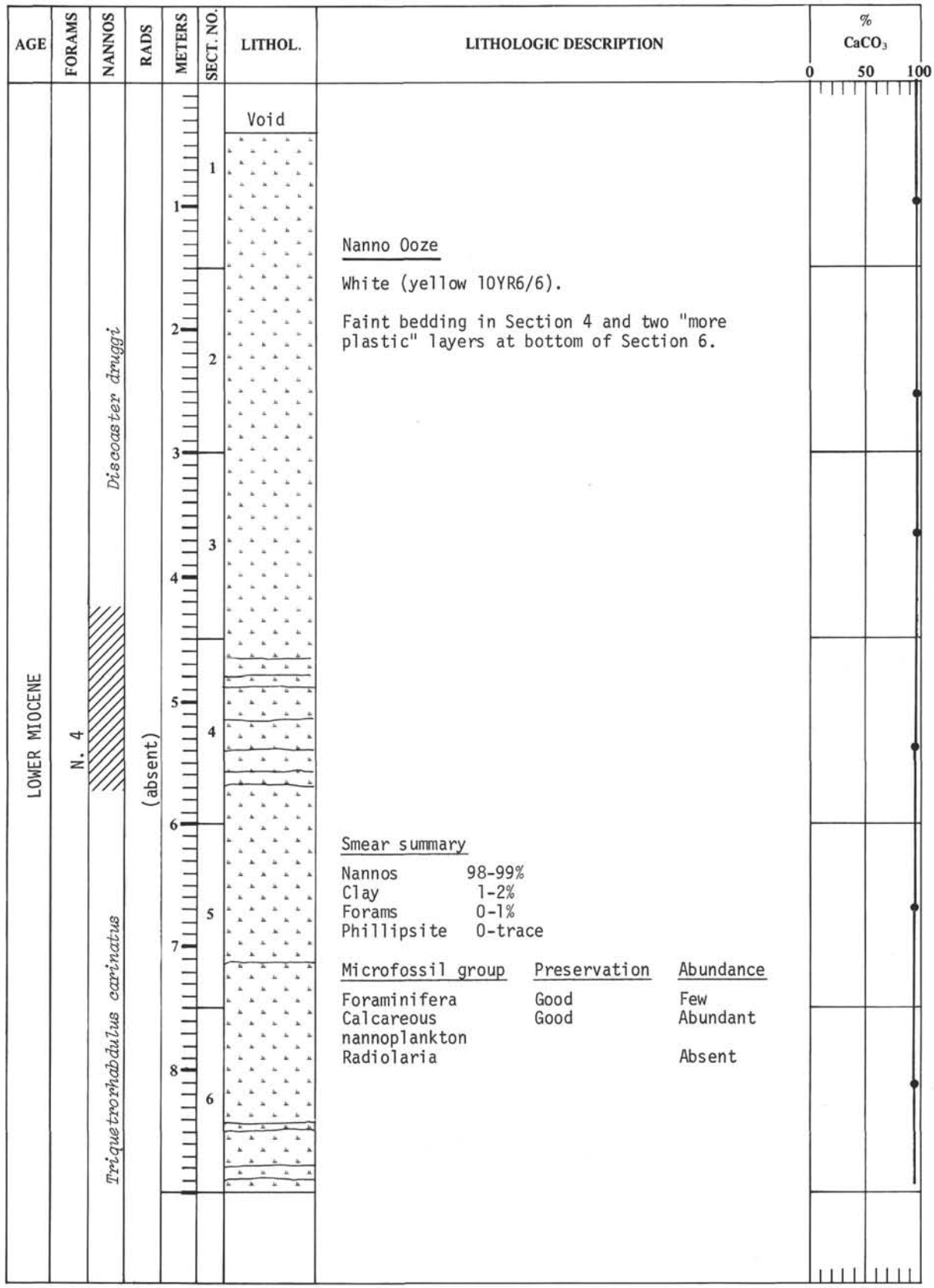


SITE 75 Core 3 Cored interval: 18-27 m



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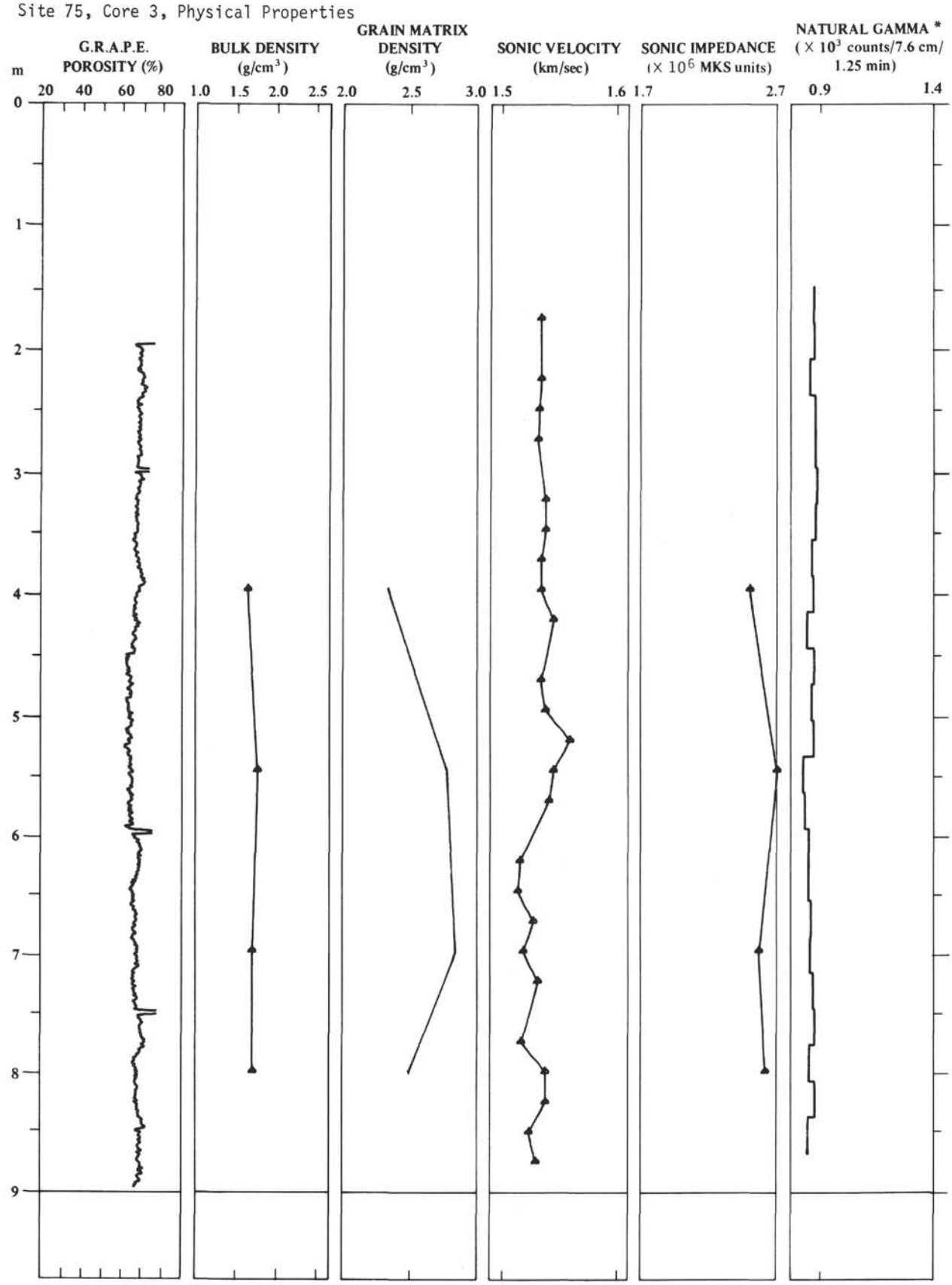
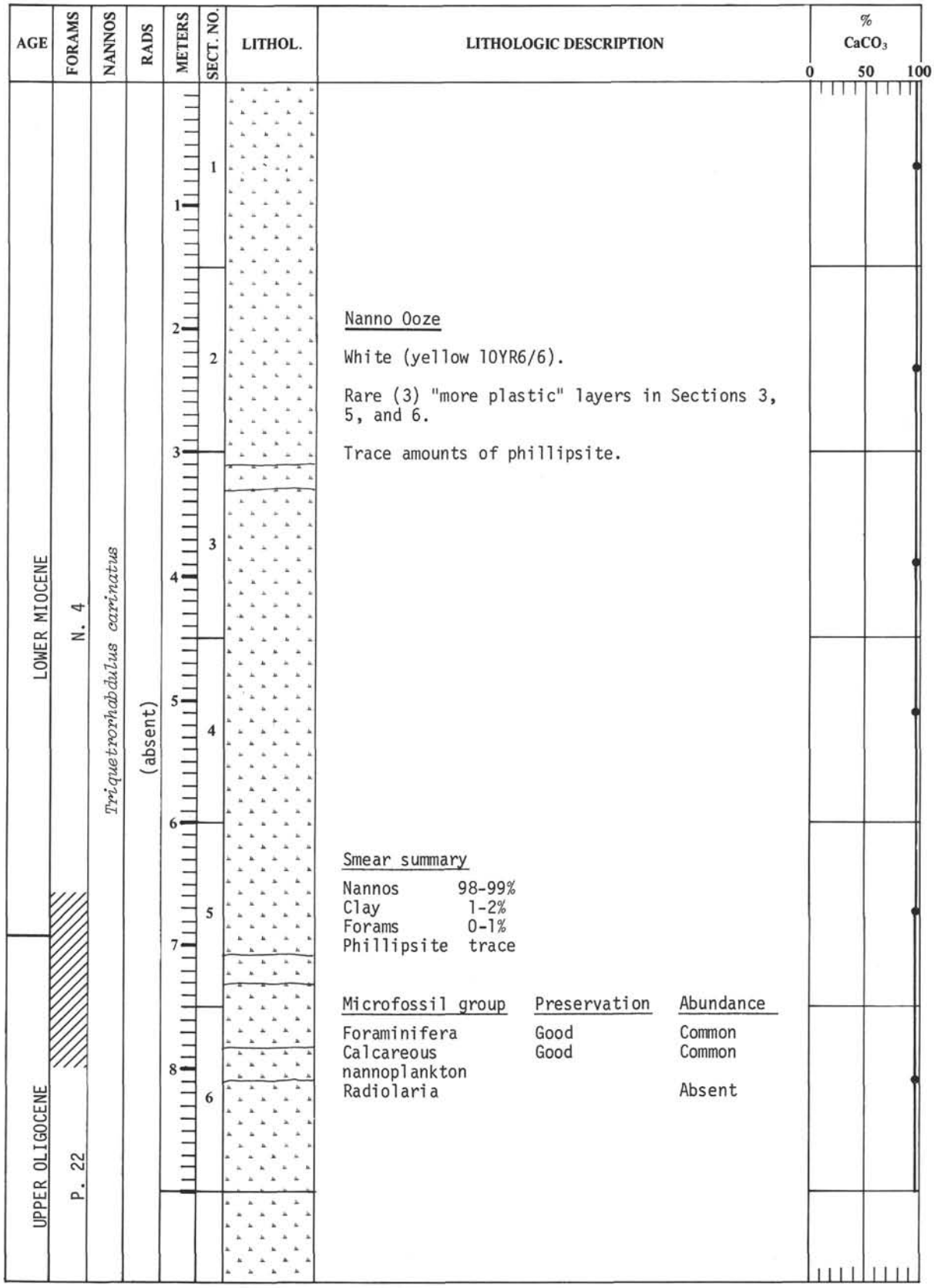
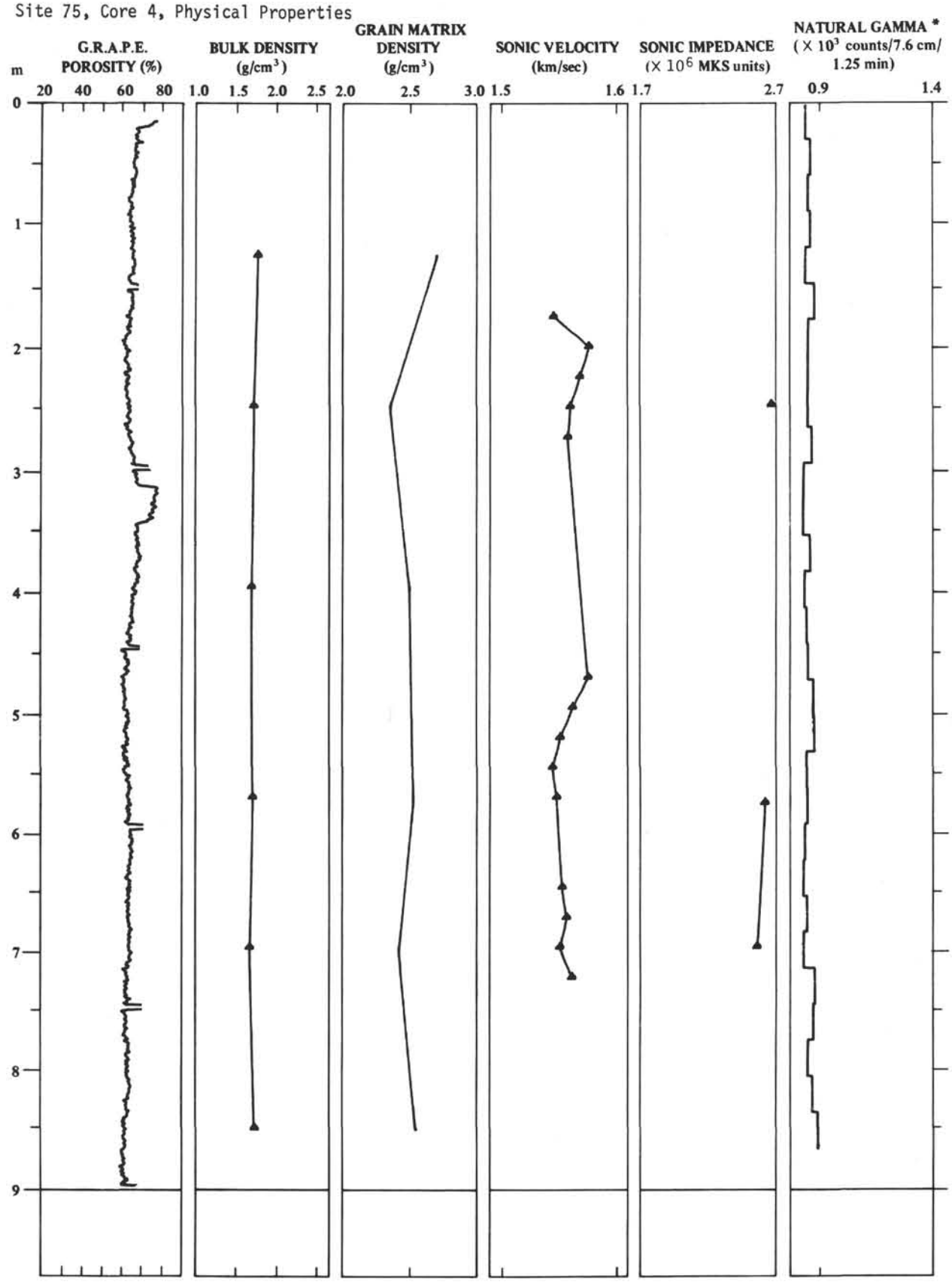


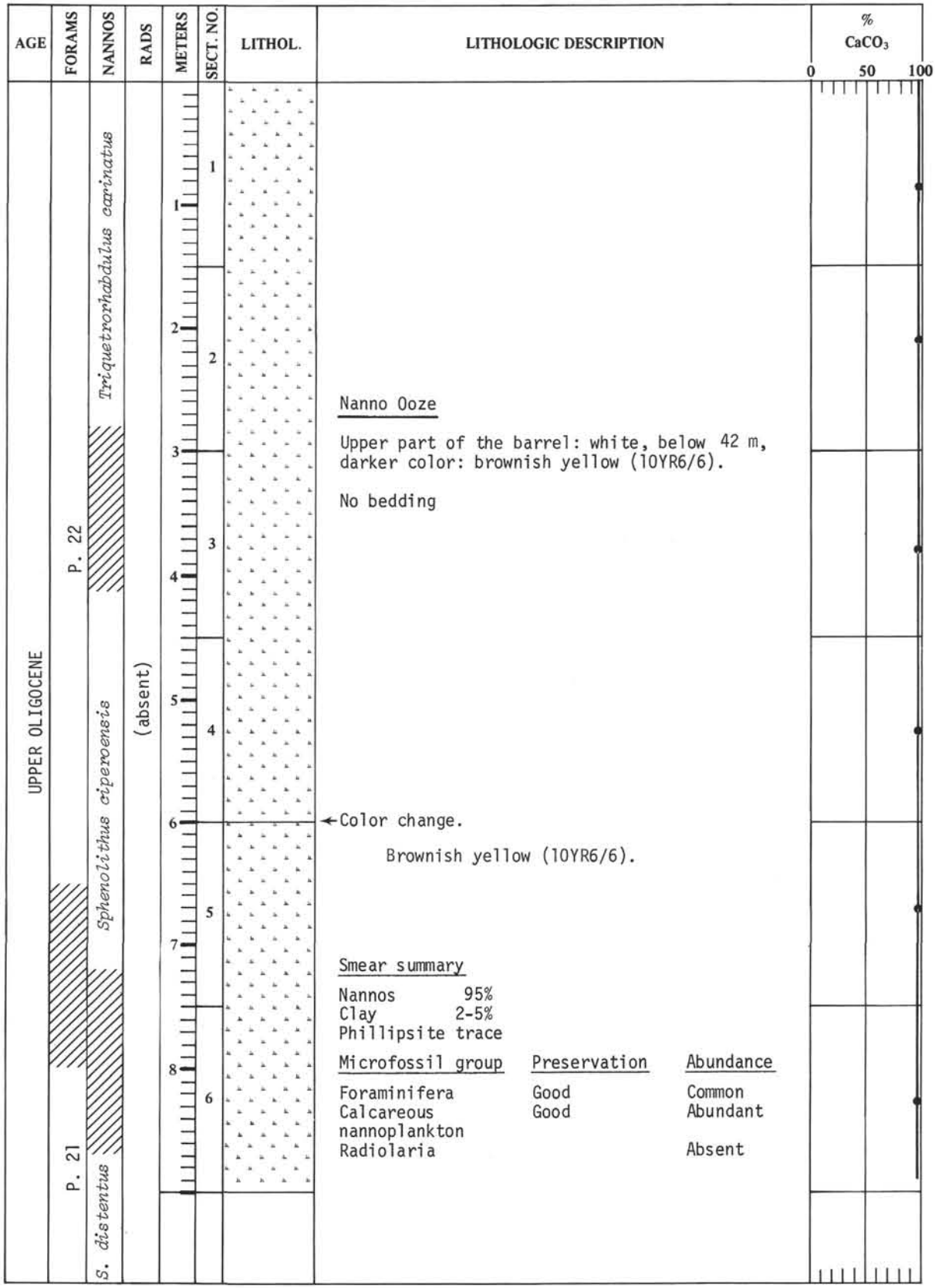
SITE 75 Core 4 Cored interval: 27-36 m



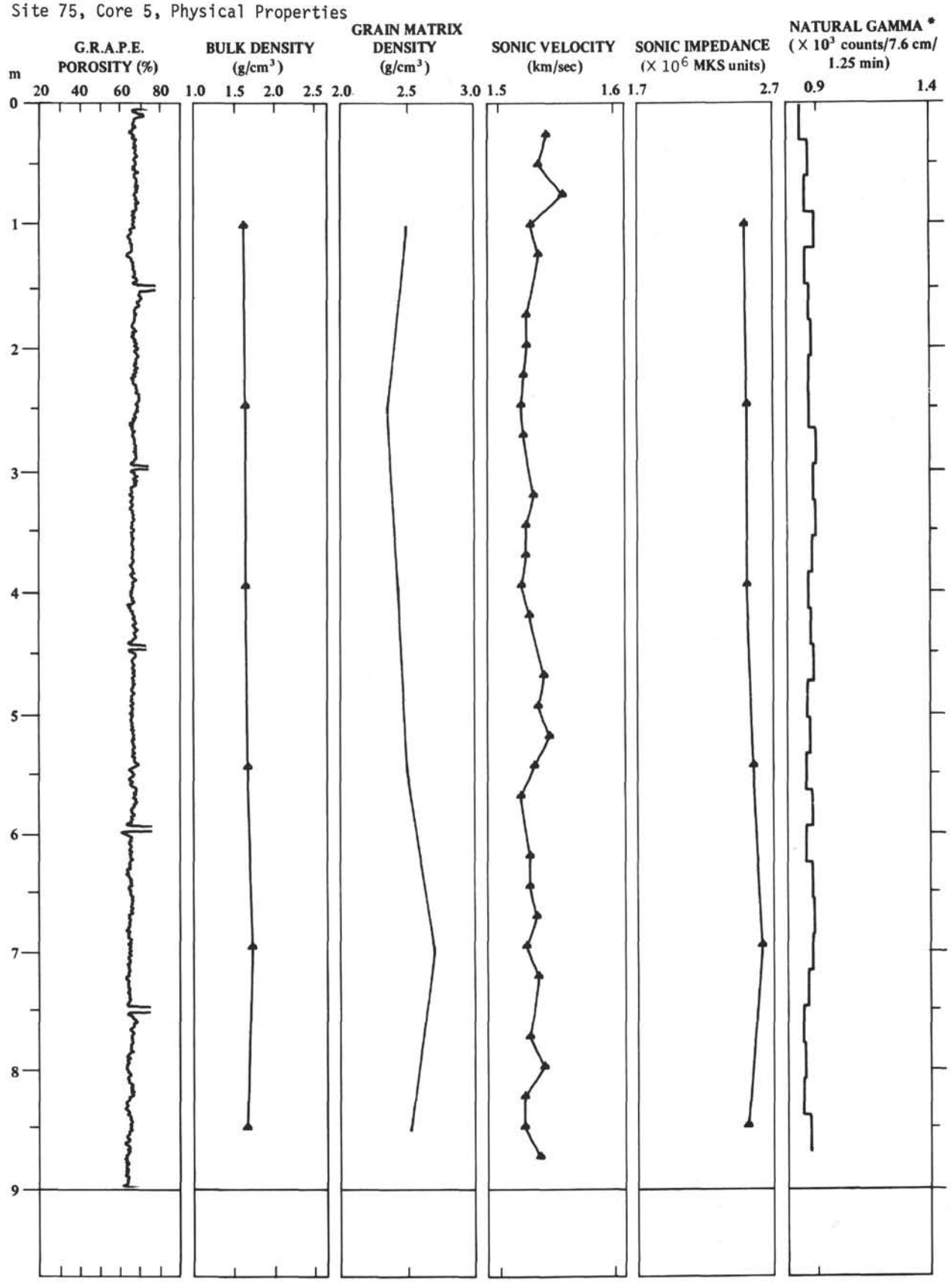
Site 75, Core 4, Physical Properties



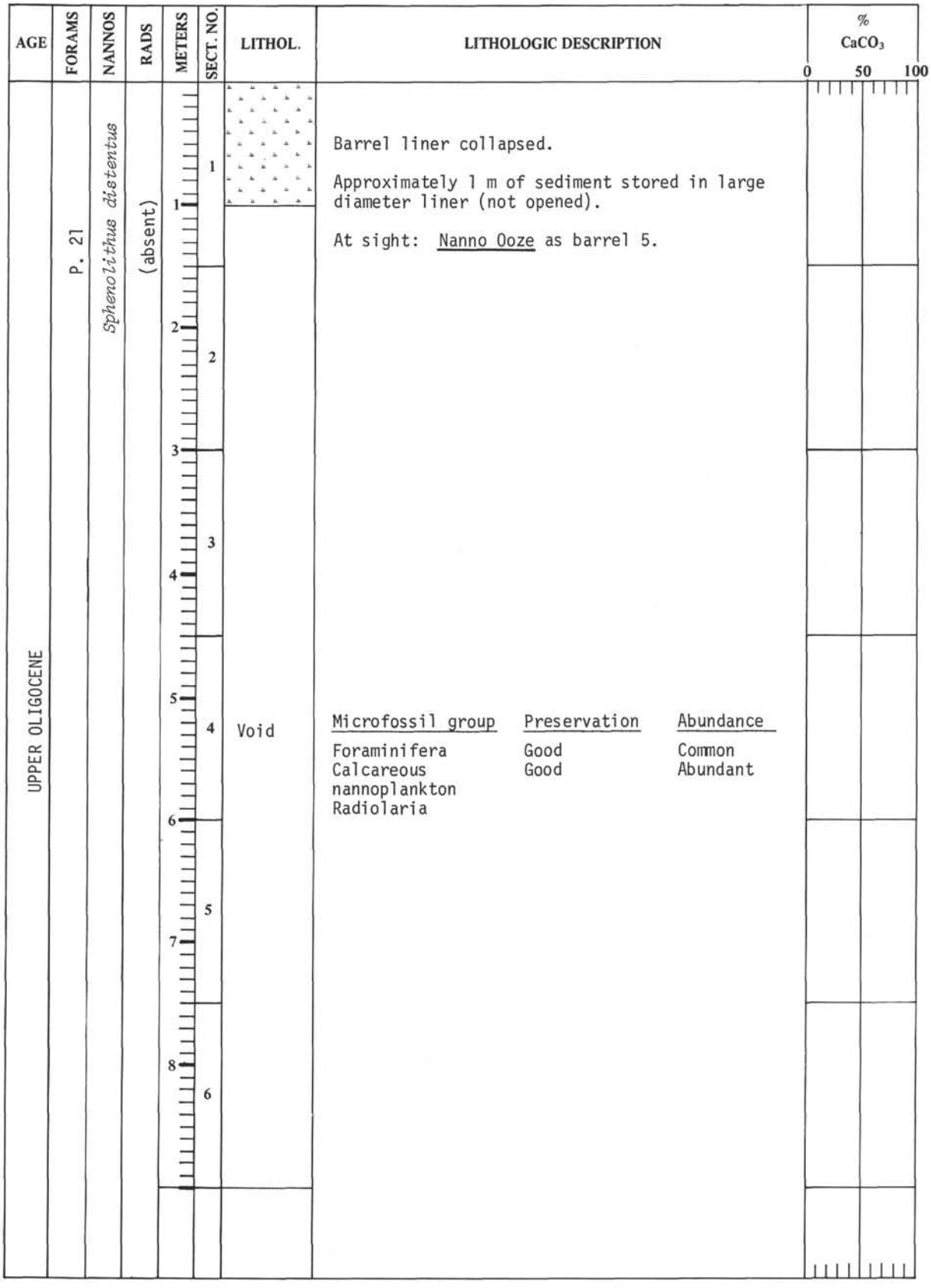
SITE 75 Core 5 Cored interval: 36-45 m



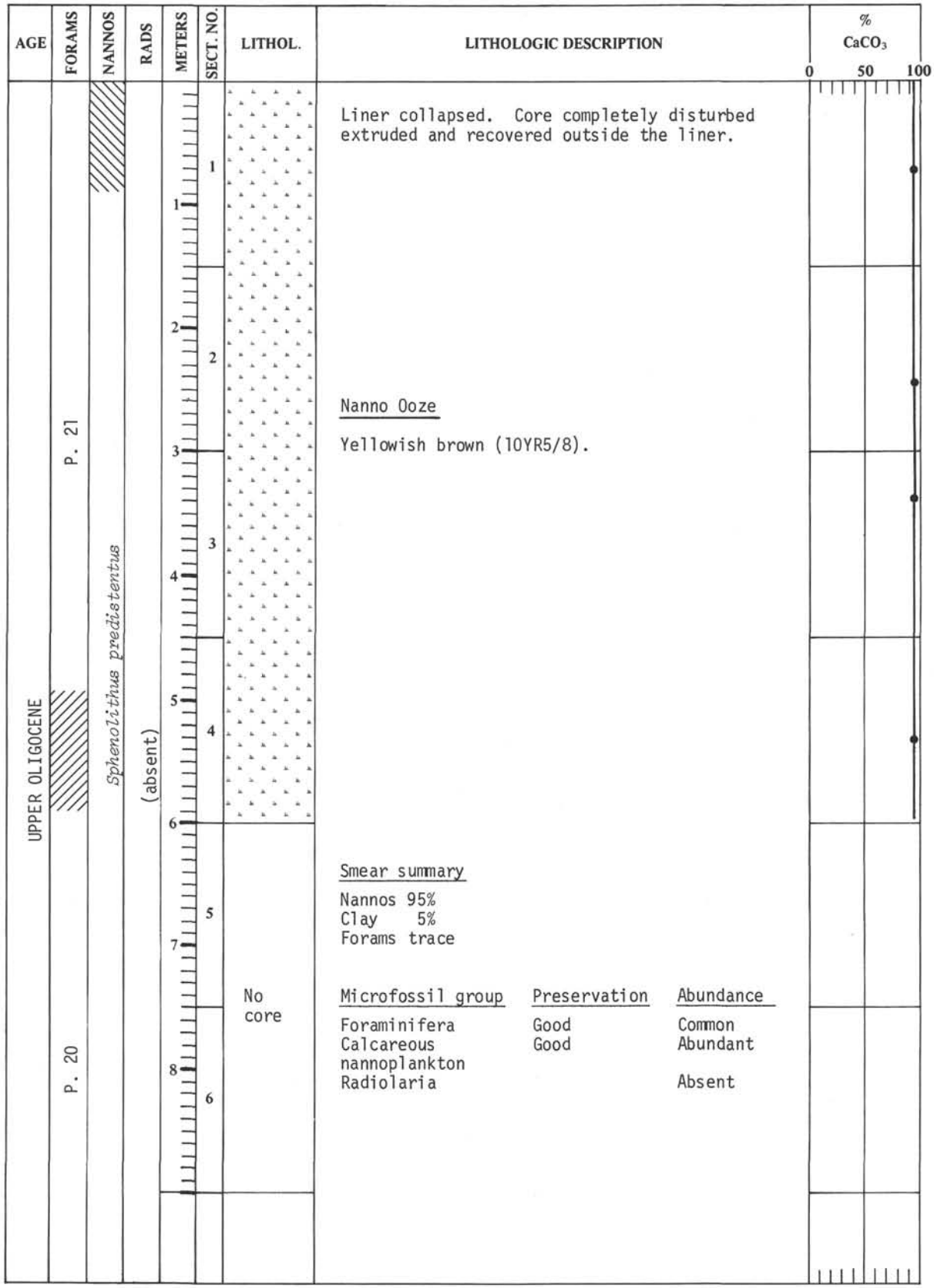
Site 75, Core 5, Physical Properties



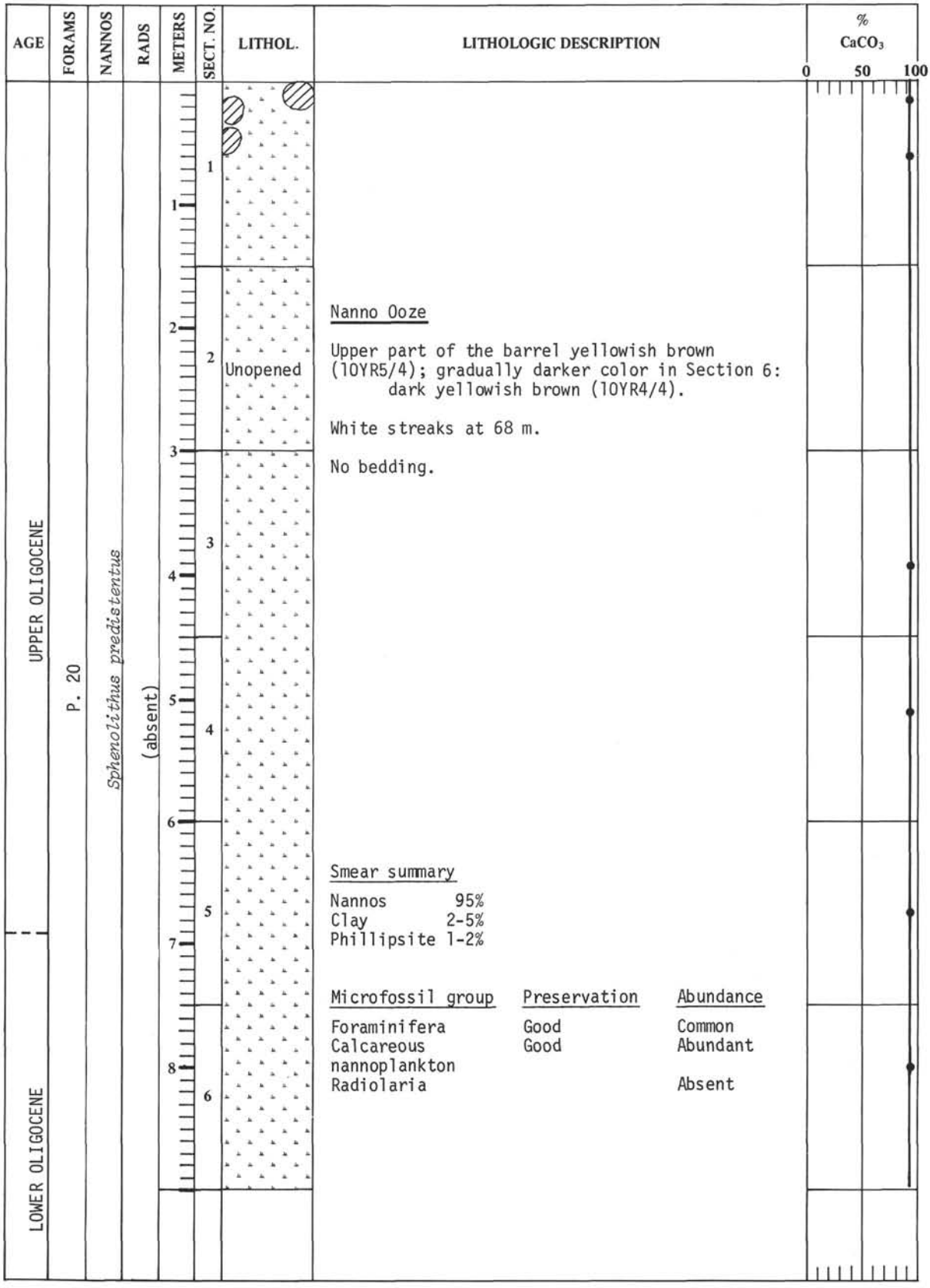
SITE 75 Core 6 Cored interval: 45-54 m



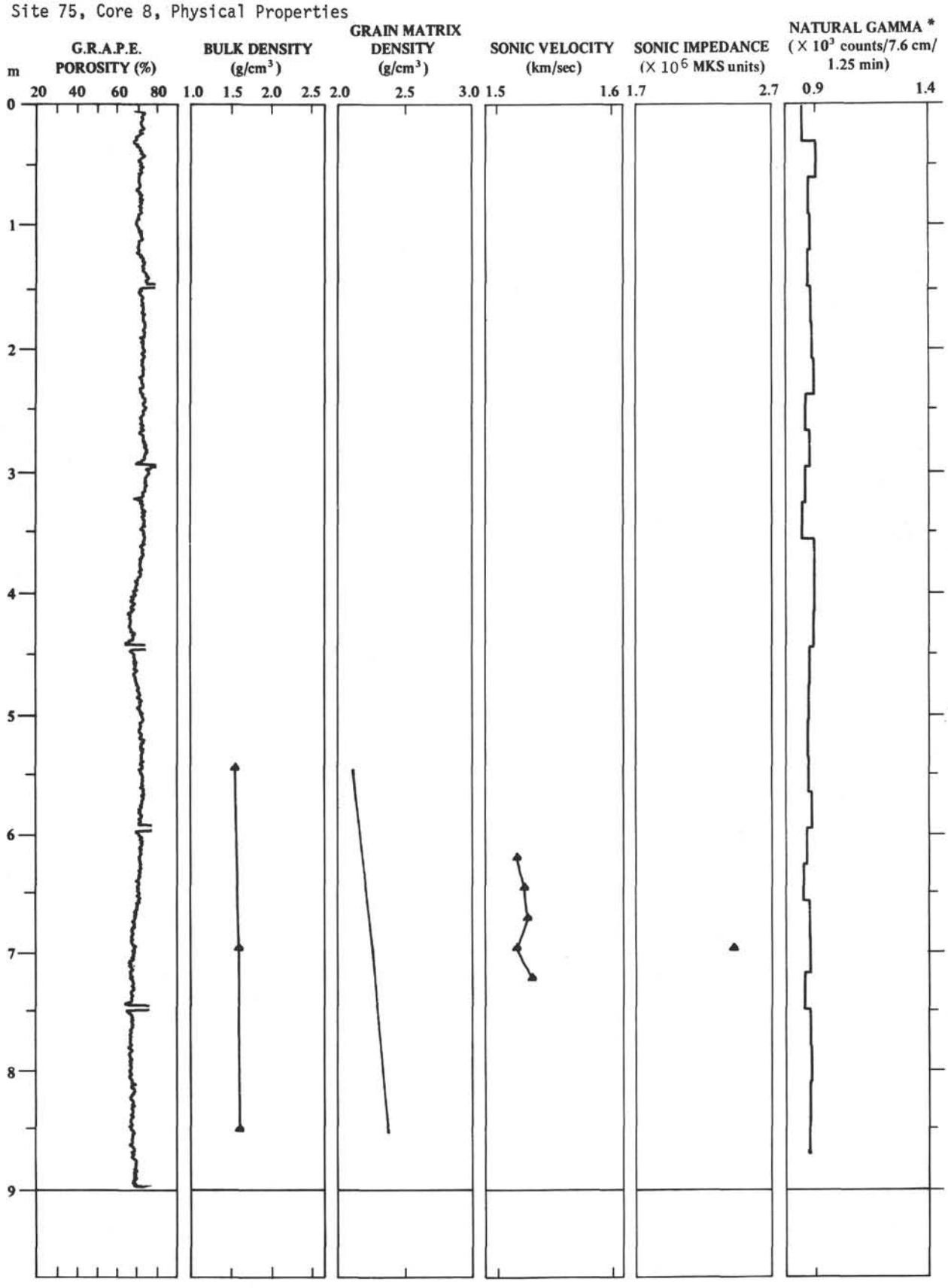
SITE 75 Core 7 Cored interval: 55-69 m



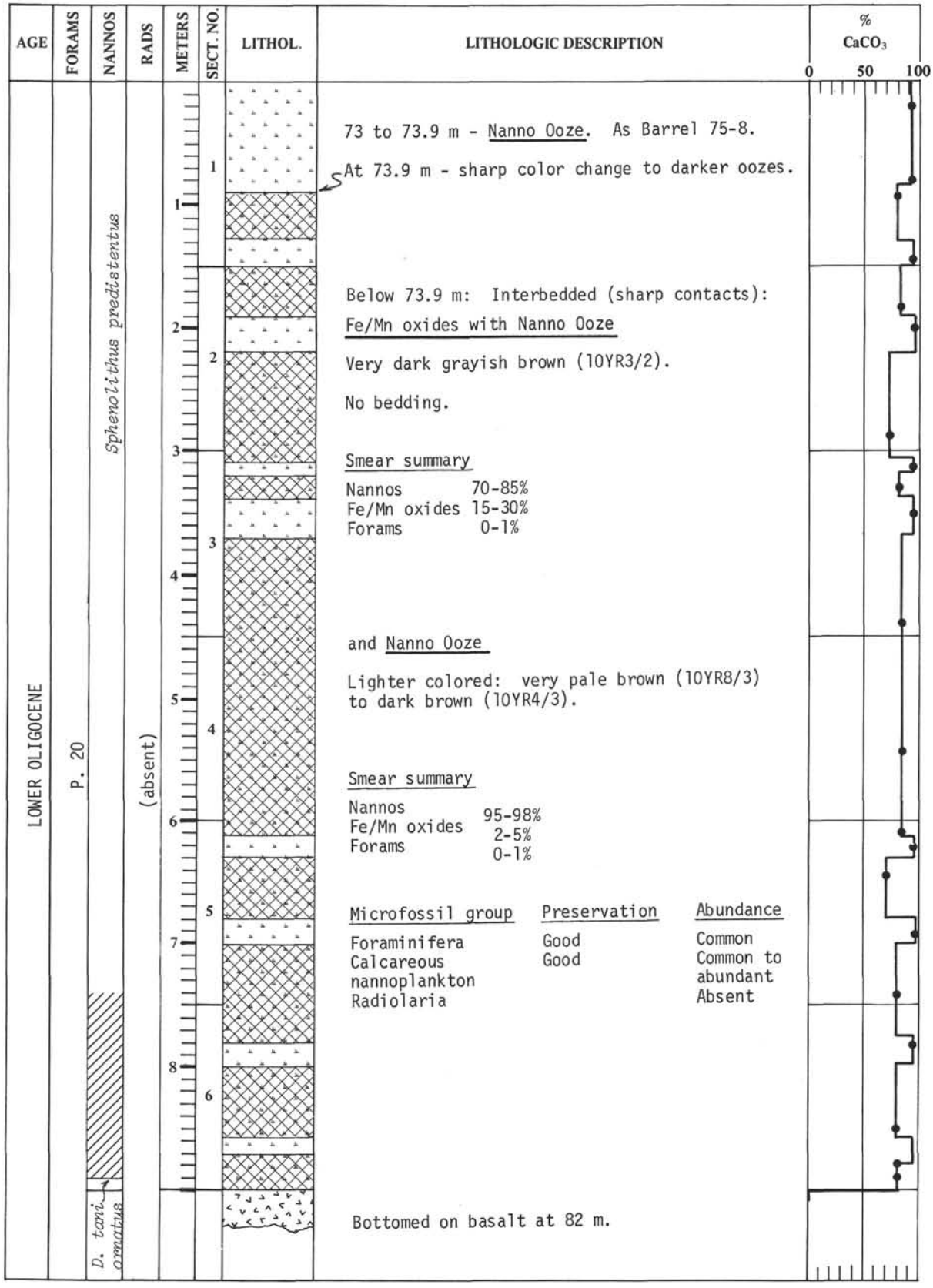
SITE 75 Core 8 Cored interval: 69-73 m



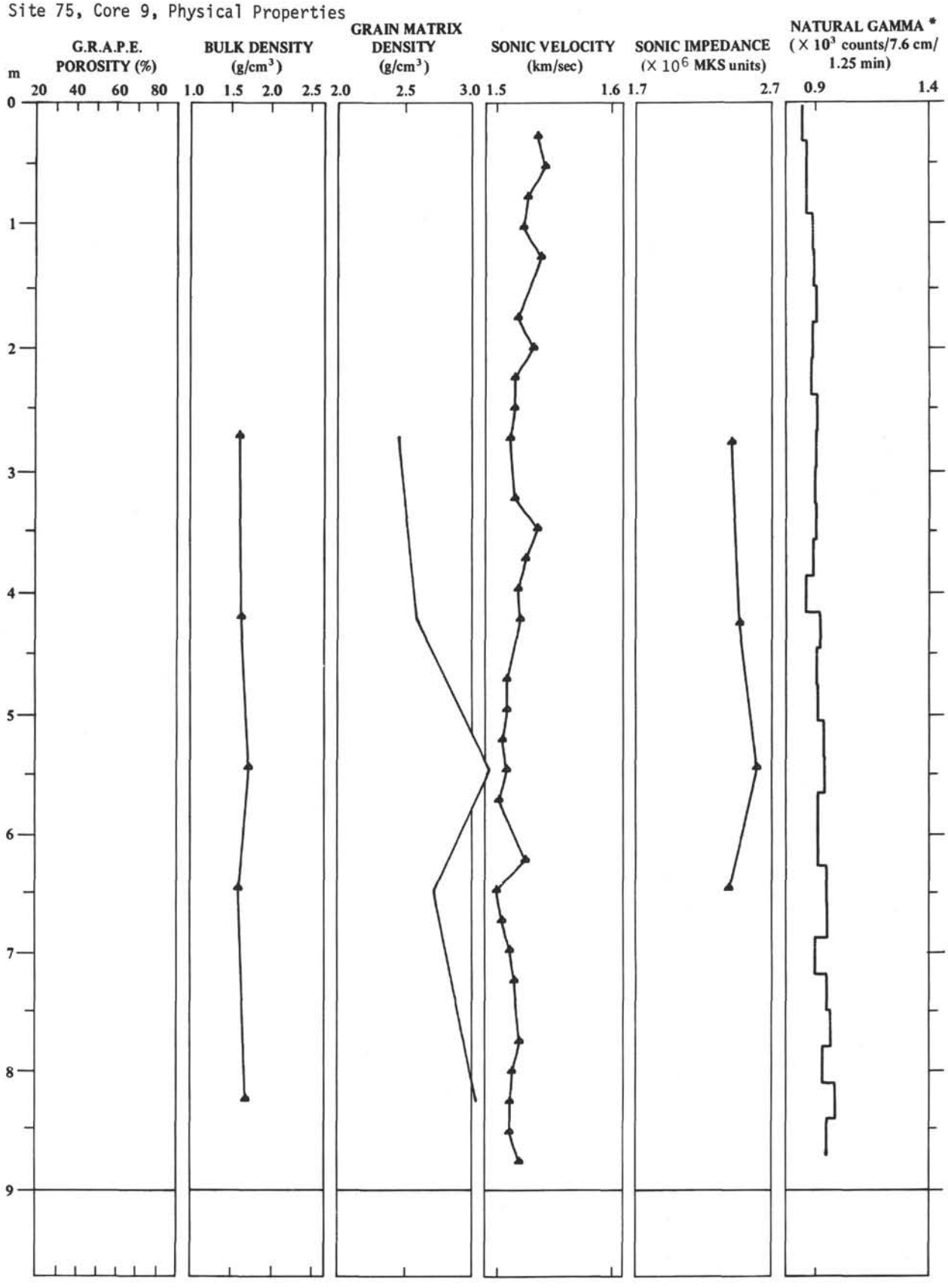
Site 75, Core 8, Physical Properties

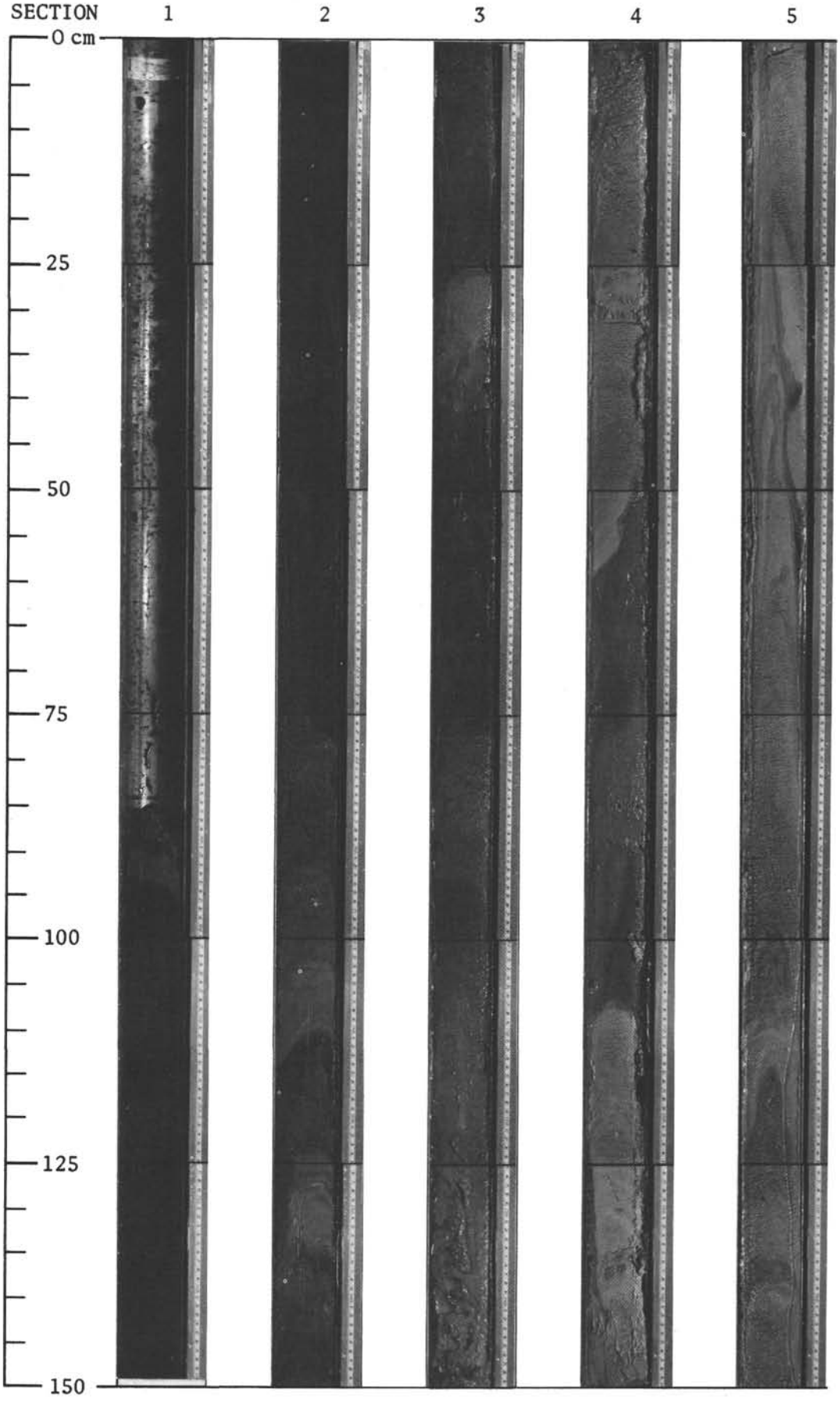


SITE 75 Core 9 Cored interval: 73-82 m

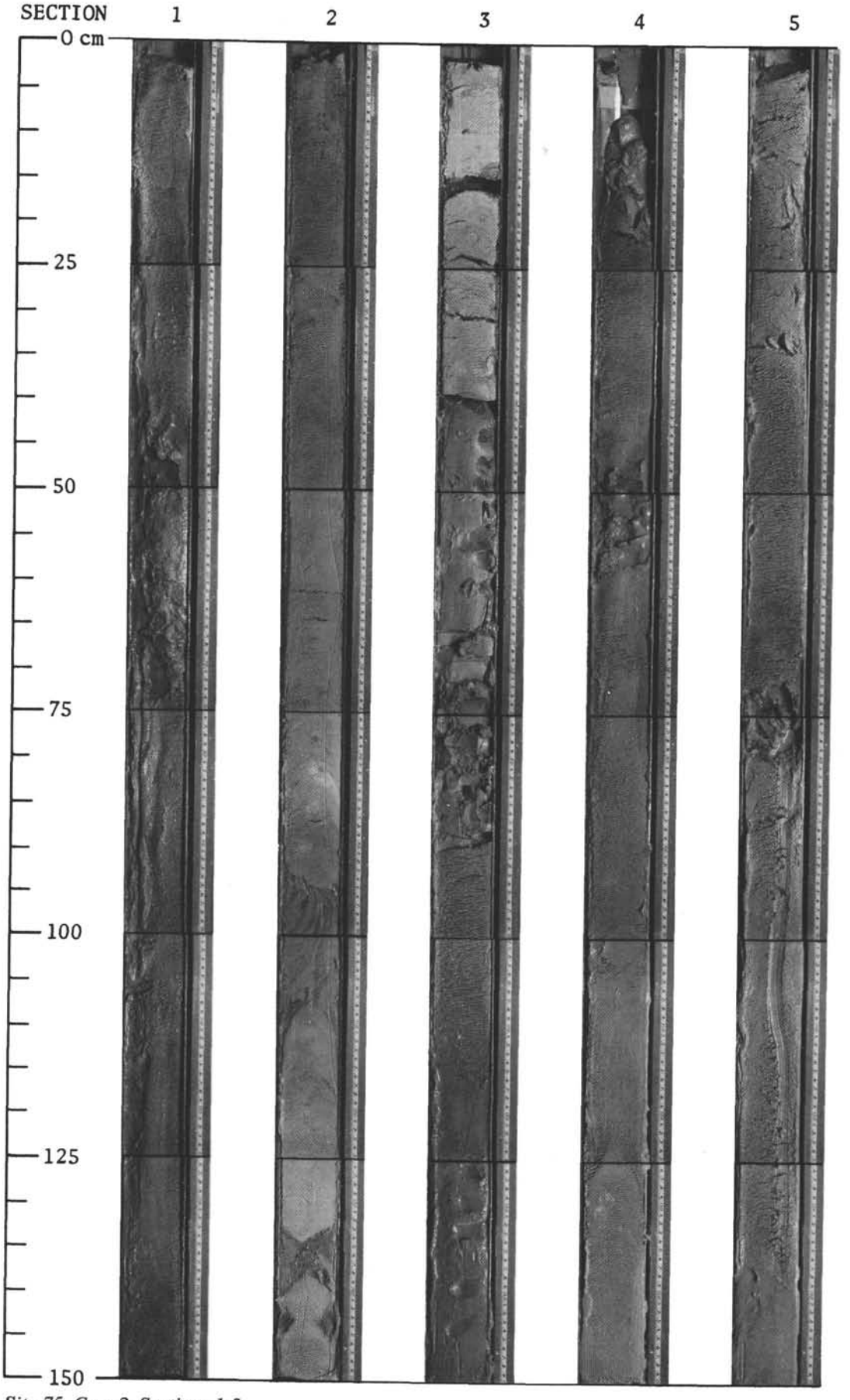


Site 75, Core 9, Physical Properties





Site 75, Core 1, Sections 1-5.



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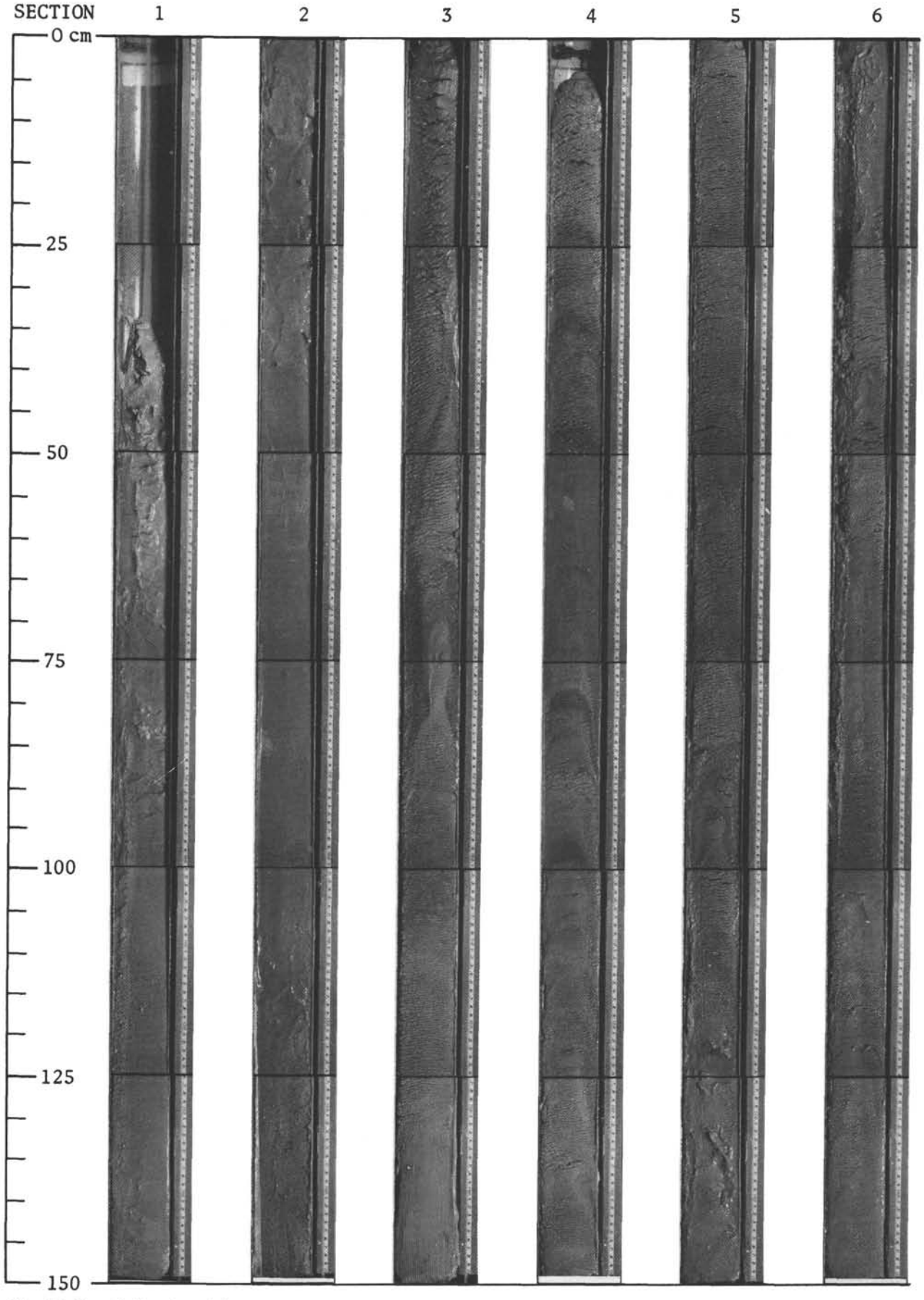
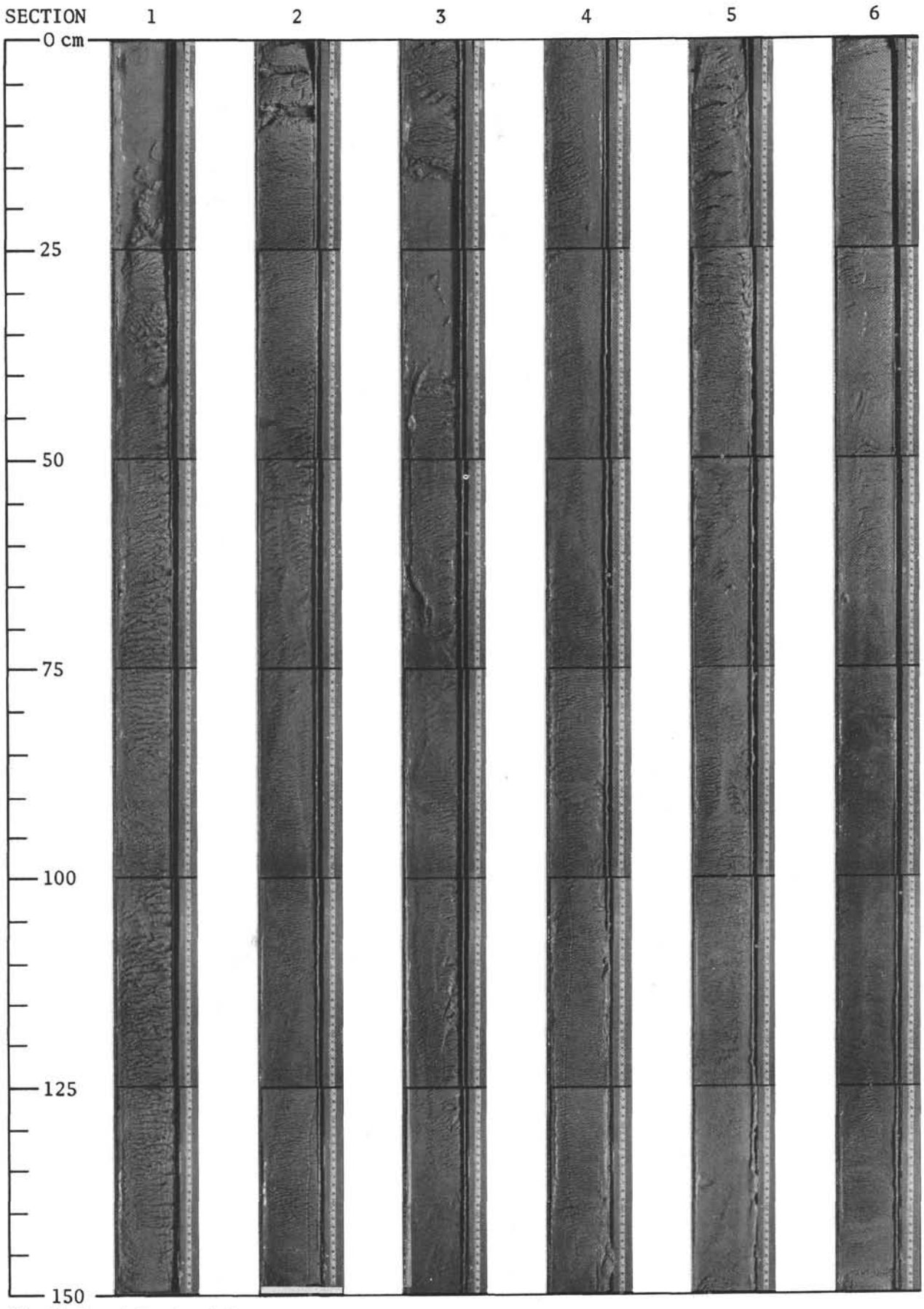


Site 75, Core 3, Sections 1-6.



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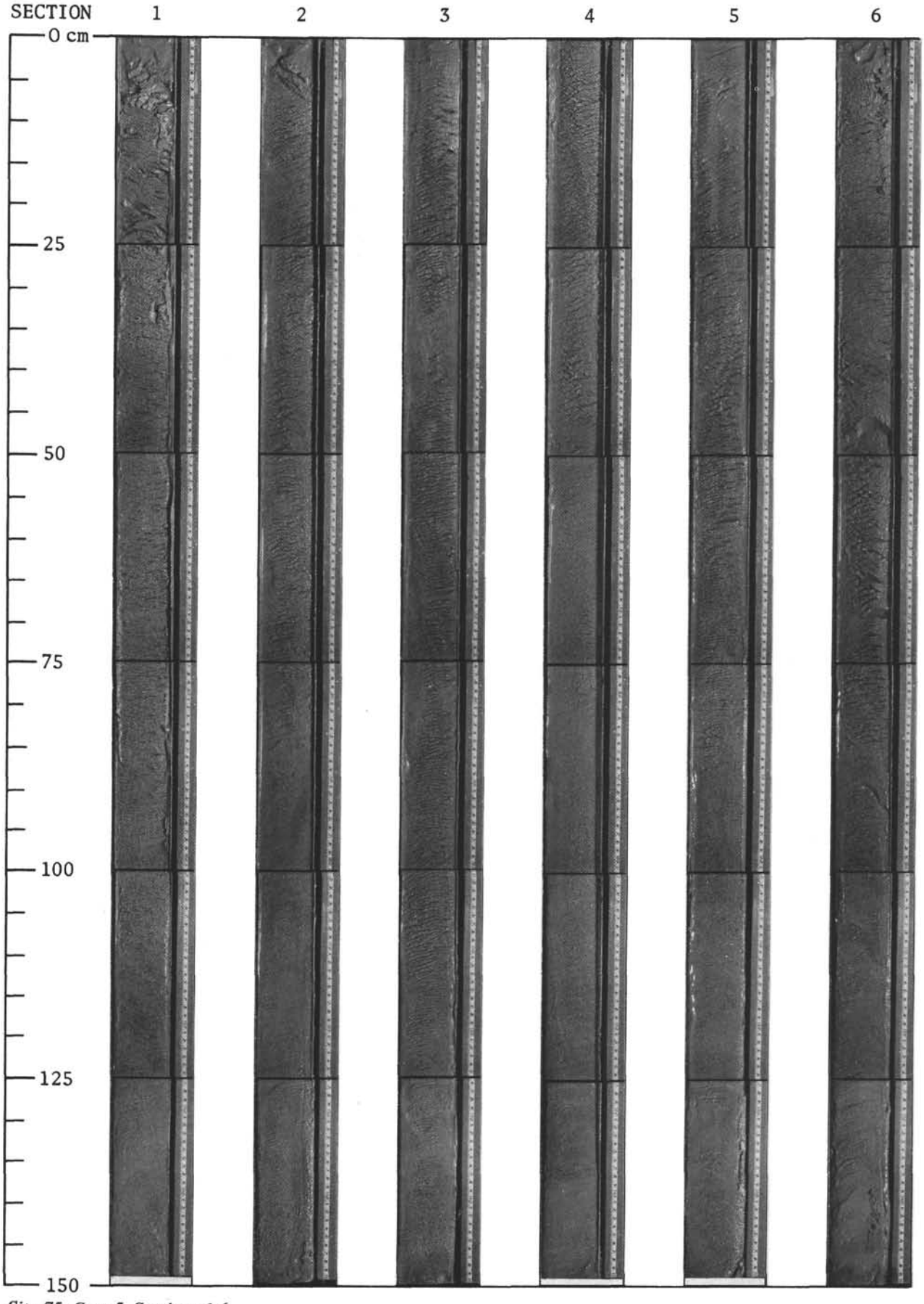

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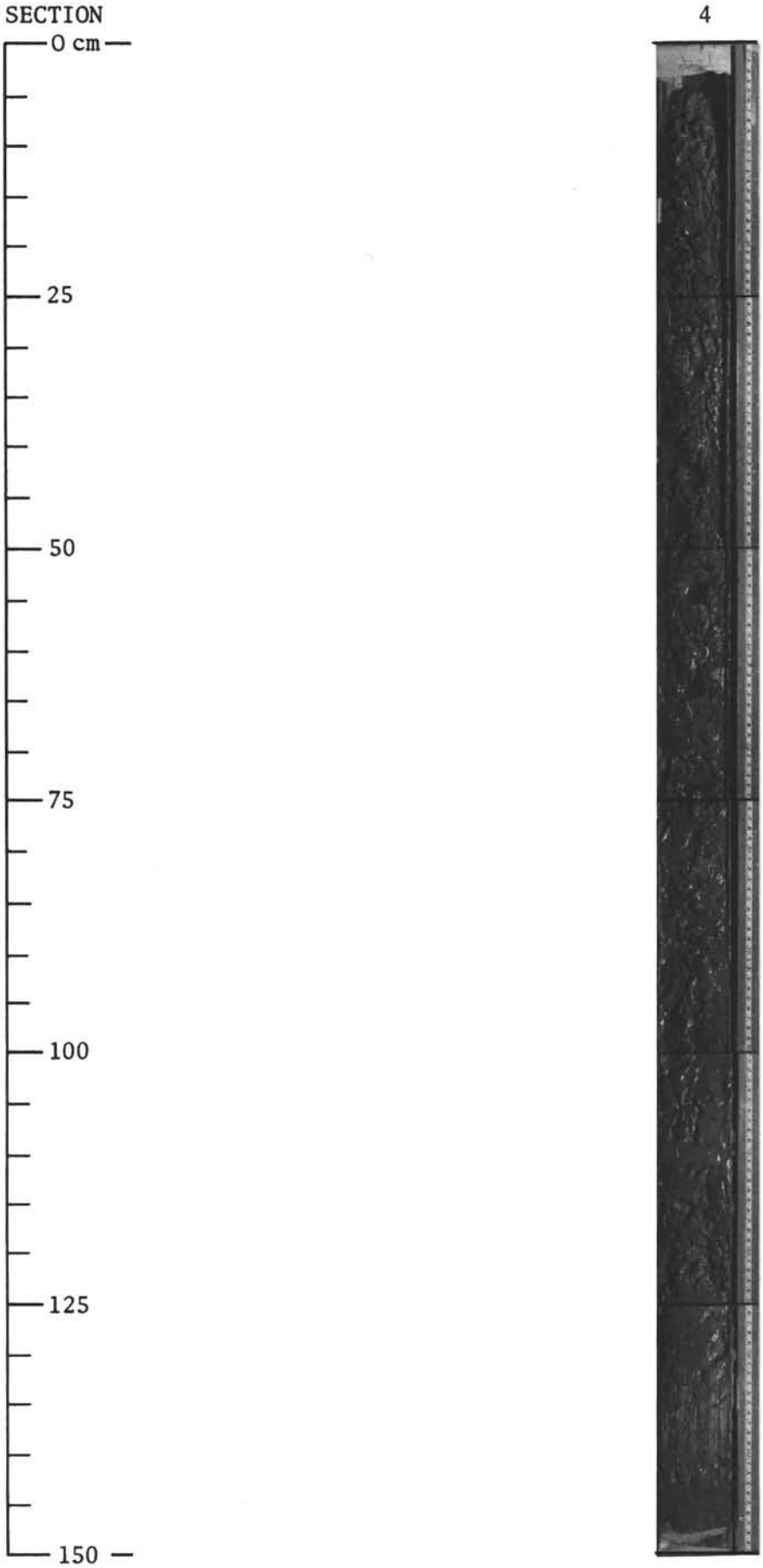
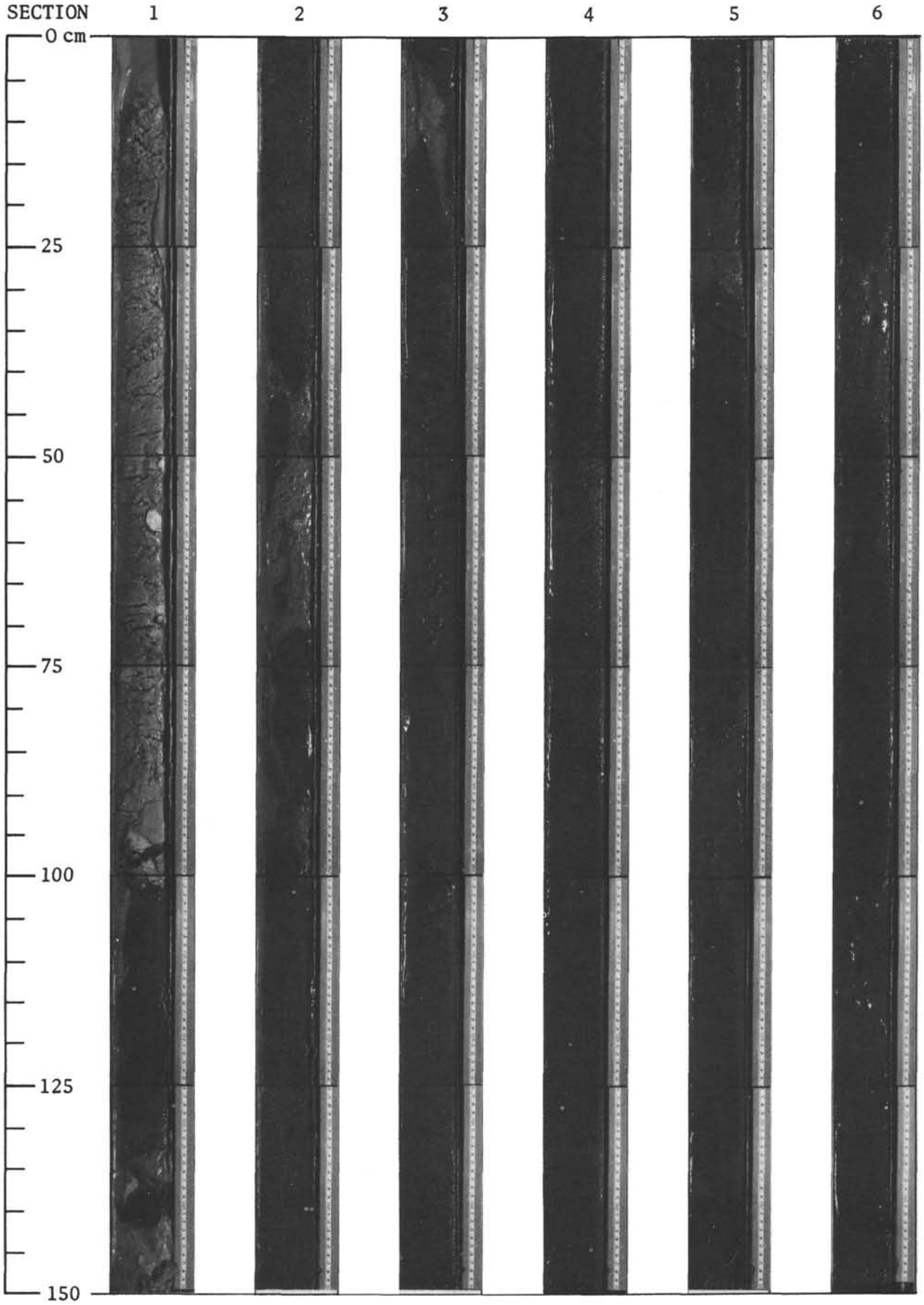


Site 75, Core 7, Section 4.

Site 75, Core 8, Sections 1, 3-6.



Site 75, Core 9, Sections 1-6.