8. SITE 50

Shipboard Scientific Party[1]

SITE DATA

Occupied: July 3, 1969.

Position: West flank of Shatsky Rise:
Latitude 32° 24.2′N
Longitude 156° 34.3′E

Water Depth: 4487 meters.

Hole 50.0: Two cores, total depth 45 meters in cherty chalk of Tithonian (latest Jurassic) age.

Hole 50.1: Four cores, total depth 36 meters, probably in Pleistocene mantle.

MAIN RESULTS

Basal sediments shown on acoustic profiles are latest Jurassic cherty chalks. Jasper and basalt pebbles suggest B′ is a volcanic basement complex.

BACKGROUND

Site 49 had been selected to investigate the basal part of the sedimentary sequence as revealed by the acoustic profiles, and to sample the underlying opaque material. However, the cherty nature of the sediments prevented penetration of the section at Site 49, and the only recourse appeared to be to move to a spot of even thinner sedimentary cover. Such a place existed, just downslope from Site 49, where Horizon B′ comes very close to the surface (Chapter 5, Figure 1; Chapter 7, Figure 1; this Chapter, Figure 1).

The scientists were reluctant to drill into presumably hard rocks with so little cover, and had memories of twist-offs at Sites 45 and 46. But the importance of dating the oceanic crust here and of discovering the composition of the material below horizon B′ made it seem worthwhile to take a risk–to touch and sample hard rock beneath the surface layers, without attempting to penetrate into it. The *Challenger* bathymetric and magnetic profile is given as Figure 2.

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OPERATIONS

The beacon was dropped at 0230 hours July 3, and drifted according to plan to a resting place 10 fathoms above the foot of the slope.

Hole 50.0 was spudded at 1000 hours. A first core, at subbottom depth 38 to 42 meters, recovered only "milky" water–a suspension of chalk, which turned out to be of Jurassic age and remains the oldest definitely identified sample from the Shatsky Rise.

A second core, 42 to 45 meters subbottom, encountered chalk and chert, as well as a basalt pebble.

Rough drilling, no penetration with light drill weight, and the likelihood of twisting off made it unwise to continue this hole. Tools were brought to the mudline for a second try. Hole 50.1 was spudded at 1400 hours. A core of Pleistocene brown clay was recovered from 5 to 14 meters subbottom; this clay continued detrital cobbles of chert and of limestone. Further coring was deemed too hazardous, and the site was abandoned at 0300 hours July 4.

TABLE 1
Summary of Coring at Site 50

	Interval Cored (Below Mudline)		Recovery	
Core No.	(ft)	(m)	(ft)	(m)
50.0-1	125-138	38.1-42.1	0	0.0
50.0-2	138-147	42.1-44.8	9	2.7
50.1-1	16-46	4.9-14.0	28	8.5
50.1-2	47-76	14.3-23.2	22	6.7
50.1-3	76-106	23.2-32.3	30	9.1
50.1-4	106-118	32.3-36.0	5	1.5

Water depth: 4486.7 meters (14,720 feet).

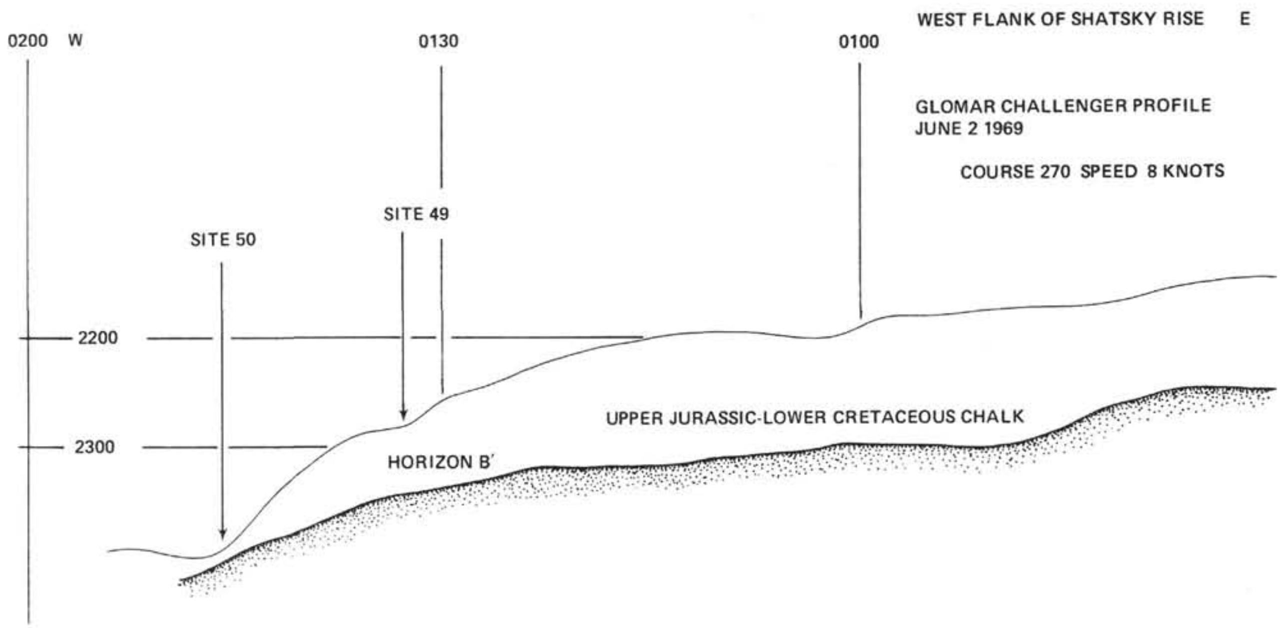

Figure 1. *Drawing of* Challenger *profile at Sites 49 and 50.*

NATURE OF THE SEDIMENTS

Hole 50.0

The first of two cores attempted in this hole recovered only very watery, white nannoplankton chalk ooze that was stored in buckets.

The second core was drilled between 42 and 45 meters below mudline but recovered 9 meters of white nannoplankton chalk ooze that was so watery the core sections could not be split. Based on sampling at the ends of sections, this sediment appears to consist largely of abundant nannofossils, rare clay minerals and zeolites, and rare to common crystals and aggregates of coarse elongate crystals of calcite. These grains are coarse silt to fine silt size, and their origin is uncertain, but they may be in part finely abraded skeletal (mollusk?) fragments, in part of authigenic origin. Most samples examined in Core 2 have scattered, angular, pebble to coarse sand size fragments of chert that varies in color from yellow, yellow-brown, brown, red and dark gray to black. These chert grains probably represent parts of thin chert beds or small nodules fragmented during drilling.

The core catcher for Core 2 contained abundant small pieces of chert with a variety of colors including light yellow-brown, very dark gray-brown, dark reddish-brown, reddish-brown, mottled red and yellow-brown and white. These pieces occur in two forms:

(1) Angular, often platy fragments up to 5 centimeters across; these appear to have been fragmented during coring. Some have thin crusts and interlayers of lithified chalk, and they may represent parts of nodular chert bodies lying within unlithified chalk ooze.

(2) Rounded pebbles which appear abraded and somewhat weathered, and occasionally have thin exterior coatings of manganese-iron oxide. These pebbles may have been recovered from a conglomeratic layer that also contained the weathered basalt pebbles described below.

Thin sections (Chapter 38) of the cherts show scattered silicified planktonic foraminifera and radiolarian molds filled mainly by chalcedonic quartz or sometimes by opaque iron oxides or pyrite. These altered microfossils lie in a matrix of microcrystalline quartz or finely fibrous chalcedonic quartz arranged in a granular mosaic. Veins filled by chalcedonic quartz are common in some specimens (Chapter 38). These cherts appear to be replacements of chalk ooze by secondary silica.

Also present in the catcher of Core 2 are what appears to be a highly abraded internal mold of a gastropod and one pebble of rounded, altered amygdaloidal basalt containing epidote(?).

Hole 50.1

The four cores taken from this hole, between 4.9 and 33 meters subbottom depth, penetrated mainly siliceous and calcareous oozes in the upper part and zeolitic brown clays in the lower part.

The top of Core 1 has a layer, 5 centimeters thick, of manganese-iron oxide nodules. These lie above about 4 meters of yellowish-brown to brown, slightly mottled

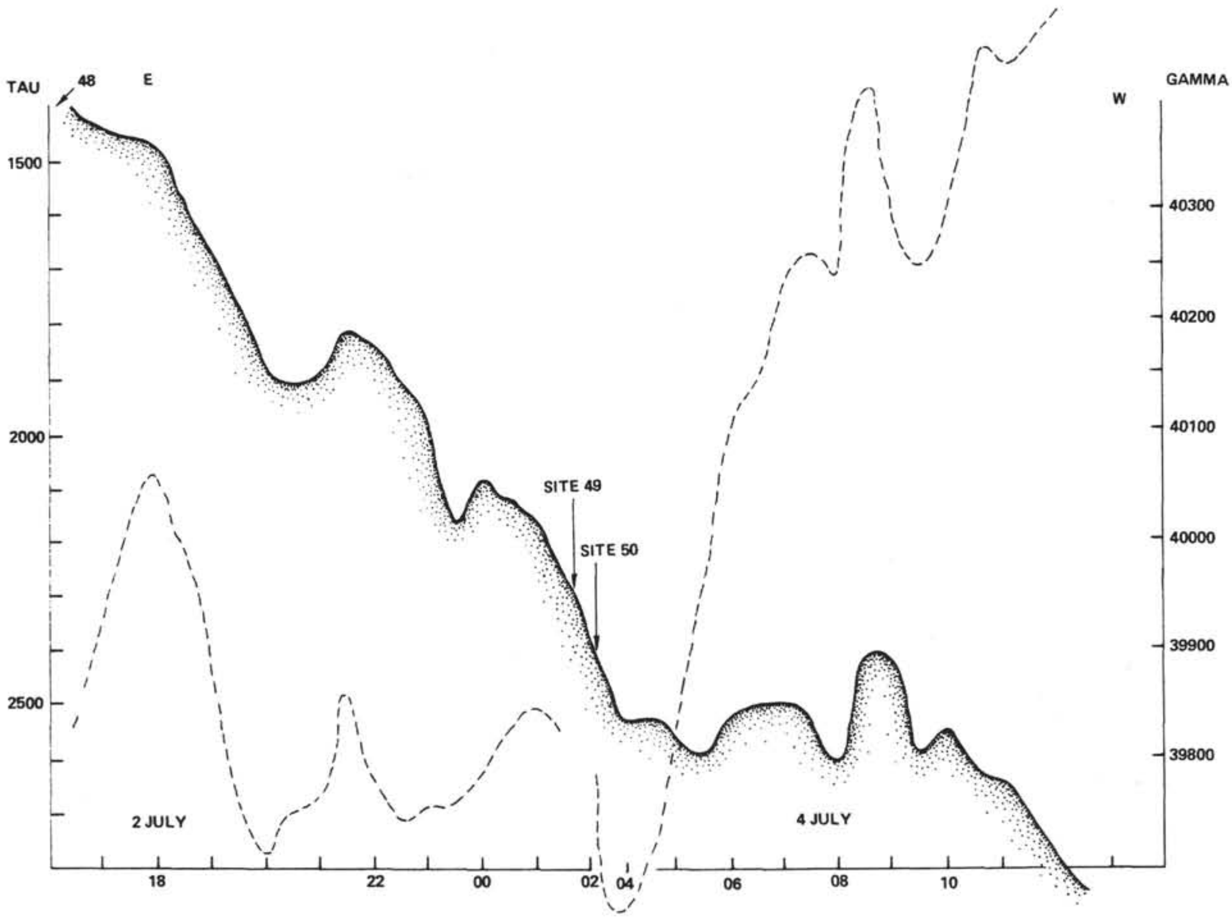

Figure 2. Challenger *bathymetric and magnetic profile at Sites 49 and 50.*

diatom-radiolarian ooze (Sections 1 through 3) composed of abundant diatom frustules, radiolarian tests, and clay minerals, common nannofossils, and variable amounts of volcanic glass, quartz, feldspar, and fragments of pelecypod shells. Within this siliceous ooze are thin layers (5 to 20 centimeters thick) of very pale brown or yellowish-brown calcareous clay and nannoplankton marl ooze in which nannofossils dominate; Radiolaria, diatoms and clay minerals are abundant; and, shell fragments (mollusks?) and volcanic glass are common to rare. At the top of Section 4 is a dark yellowish-brown layer of volcanic ash composed chiefly of glass and clay minerals, with lesser amounts of diatoms, Radiolaria, zeolites and limonitic grains, and very small amounts of feldspar and shell fragments. Below this layer, Sections 4 and 6 are light to dark yellowish-brown nannoplankton marl ooze with very irregular mottles and streaks, apparently the result of drilling disturbance, of dark yellowish-brown and very pale brown marl ooze. This calcareous ooze is a mixture of abundant nannofossils, diatoms, Radiolaria and clay minerals, along with small amounts of mollusk (?) shell fragments, zeolites and volcanic glass. At the base of Section 6 is a clay-rich layer of poorly sorted volcanic ash.

Sections 1 through 3 of Core 2 are poorly sorted, ash-rich brown clay characterized by abundant shards of clear volcanic glass that is often vesicular. In addition to the clear glass, there are small amounts of pale brown and reddish-brown glass as well as yellow palagonite; clayey, pellet-like grains are common in this clay diatoms and Radiolaria are common to abundant, nannofossils and fragments of mollusk (?) shells vary from common to rare, and silt to fine sand size grains of quartz, feldspar and amphibole occur in small amounts. Dispersed throughout this interval are small pebble size fragments of chert and slightly lithified volcanic ash.

Below the above interval, the predominant sediment is brown, dark brown and dark yellowish-brown zeolitic clay (Sections 4 through 6 of Core 2, all of Core 3, and the one partial section recovered in Core 4). Lath-shaped, silt to fine sand size zeolite crystals are abundant in these clays and form from a half to a third of the sediment samples examined in smear slides. Altered volcanic glass, in the form of altered yellow palagonite and pellet-like aggregations of clay minerals, zeolites and limonitic grains, are common throughout this interval; unaltered very pale brown glass occurs in very small amounts only at the top of this interval. Fine silt to clay size limonitic grains are a common constituent, and components present in variable amounts include nannofossils, euhedral to subhedral carbonate crystals of silt size (dolomite?), silt to fine sand size quartz and plagioclase grains, and a few hematite grains. At the base of Section 6 in Core 3 is a zone about 3 centimeters thick containing small, flattish white pebbles of lithified but friable white volcanic ash that are coated with manganese iron oxide. The core catcher of Core 4 contained poorly preserved radiolarian molds of secondary quartz.

Sections 1 through 5 of Core 2 contain several layers, from 5 to 20 centimeters thick, of poorly sorted, clay-rich volcanic ash.

PHYSICAL PROPERTIES

These physical properties do not necessarily represent *in situ* conditions as the sediments were disturbed during coring operations.

Natural Gamma Radiation

Holes 50.0 and 50.1

Pleistocene brown zeolitic clay, diatom radiolarian ooze and volcanic ash were recovered from the uppermost 36 meters in Hole 50.1, and Jurassic white nannoplankton ooze was recovered from 38 to 45 meters in Hole 50.0 (see hole and core plots). Natural gamma emissions ranged from 0 to 3300 counts/ 7.6-cm core segment/1.25 minutes, with a mode of about 1250 being typical of brown clays.

In general, the gamma radiation exponentially decreased from the Pleistocene brown clayey diatom-radiolarian ooze to the brown calcareous clays within 5 to 9 meters (50.1-1). Underlying these sediments are calcareous clay, nannoplankton marl ooze with radiolarians and diatoms, and also volcanic ash (50.1-2), which emitted consistent gamma counts and then increased linearly between 28 and 32 meters (50.1-3) where zeolitic clays are present. Jurassic nannoplankton chalk ooze from 38 to 42 meters (50.0-1) emitted consistently low gamma radiation.

More specifically, the higher counts were from the Pleistocene sediments. The highest count of 3300 was emitted from a layer of Pleistocene manganese nodules and dark yellow-brown clayey diatom-radiolarian ooze (50.1-1-1). Pleistocene brown zeolitic clays in core 50.1-3 also emitted a high gamma count of 2250 which appears to be related to the zeolite percentages of the brown clays. The gamma radiation emitted from Pleistocene volcanic glass layers, in the brown clay matrix of Section 4, Core 2, of 50.1 was only slightly greater (100 counts) than the typical count of 1100 emitted from the matrix. The lowest counts, averaging 300, were obtained from the Jurassic nannoplankton chalk oozes from Core 50.0-1 (38 to 42 meters). This low count may be attributed to the lack of clays or zeolites. Part of the above variations were caused by porosity variations or, in other words, variations in the amount of solid material being scanned.

The exponential decrease of radiation at the top of the Pleistocene stratigraphic section may possibly indicate a decaying radioactive isotope or simply an exponential change of the types of minerals or fossils accumulating (or ions associated with some clay and zeolite minerals). At other sites, high radiation is associated with Pleistocene diatom-radiolarian-rich sediments.

Gamma counts were plotted against their stratigraphic depth and direct similarities were observed with wet-bulk density, penetrability, and heat conductivity, and an inverse similarity with porosity. Sediments with low porosities and high densities contain more particulate material to be scanned than those with high porosities and low densities. Therefore, if the particulate matter that emits the radiation remains the same, and the porosity decreases, then the radiation will obviously increase

The sources of natural gamma radiation normally do not relate specifically to those substances that conduct heat, or resist needle penetration; however, they are related to a common property. This property is porosity, which relates inversely to thermal conductivity and penetrability (typical), and directly to the clay and zeolite content of the sediment, which typically emit the most radiation and occur in high porosity sediment. The needle penetration is resisted by the plasticity of clay minerals at this site.

Porosity, Wet-Bulk Density, and Water Content

Holes 50.0 and 50.1

In general, porosity irregularly increased downward from Pleistocene clayey siliceous ooze to brown ashey and zeolitic clays; then decreased in the Jurassic nannoplankton chalk ooze (see hole and core plots). These porosity variations appear to be a function of grain size. Water content varies accordingly, and wet-bulk density variations, of course, were the inverse of the porosity variations. Porosity versus depth had indirect similarities to heat conductivity, natural gamma radiation, and penetrability. These relationships were discussed in the natural gamma radiation section.

Porosity, wet-bulk density, and water content of the Pleistocene brown siliceous ooze, clay, and ash (5 to 36 meters) and Jurassic white nannoplankton ooze (38 to 45 meters), cored in Hole 50.1 ranged from 30 to 90 per cent(?), 1.20(?) to 2.20 g/cc, and 46 to 64 per cent, respectively. The higher porosities (about 77 per cent, 1.38 g/cc) occurred in the Pleistocene brown ashey clays, clayey siliceous ooze, and zeolitic clay, with the lower porosities (approximate average of 55 per cent, 1.74 g/cc) occurring in the coarser Jurassic nannoplankton chalk oozes. The lowest porosities of the Jurassic ooze were about 30 to 40 per cent. Very low GRAPE porosities of 22 to 33 per cent were recorded from areas in the cores where chert fragments or nodules were present. Since the fragments were surrounded by sediment, their true porosities were much lower.

Sound Velocity

Holes 50.0 and 50.1

Sound velocities ranged from 1.46 to 1.65 km/sec and averaged 1.54 km/sec. The lower velocities (about 1.51 km/sec) occurred in Pleistocene brown siliceous ooze and clay (5 to 36 meters) and the higher velocities (about 1.60 km/sec) occurred in Jurassic-Cretaceous nannoplankton chalk ooze (38 to 45 meters), (see hole and core plots). The highest velocity of 1.65 km/sec was in section 50.0-2-4 which was not opened, but judging from the GRAPE records the Jurassic sediment here appears to be rock or lithified chalk fragments mixed with chalk ooze.

In general, sediment velocities varied irregularly with depth to the Jurassic sediment, where it increased. This velocity change was a function of grain size, sediment type, and porosity.

Heat Conductivity

Holes 50.0 and 50.1

Two heat conductivities in the Pleistocene brown clay and two measurements in the Jurassic nannoplankton chalk ooze from Site 50 ranged from 1.87 to 3.42 $\times 10^{-3}$ cal$^{-\circ}$C^{-1}cm^{-1}sec^{-1} averaging 2.56 $\times$ 10^{-3}. The higher heat conductivities occurred in the Jurassic nannoplankton chalk ooze, which has lower porosities than the brown clay. Conductivity values irregularly increased with increasing depth (see hole and core plots). Heat conductivity plotted with depth is directly similar to wet-bulk density and penetrability. Porosity and gamma radiation versus depth are inversely similar to heat conductivity (see discussion in natural gamma radiation section).

Penetrometer

Holes 50.0 and 50.1

Penetrometer measurements were recorded only within the Pleistocene brown clay at Site 50. Penetration ranges from 22 $\times$ 10^{-1} millimeters to complete penetration to the core liner. The average value of penetrometer measurements which did not completely penetrate the sediment is 138 $\times$ 10^{-1} millimeters. Penetrometer core averages versus core depth had direct similarities to heat conductivity, gamma radiation, and wet-bulk density of the same plot (see hole and core plots).

CONCLUSIONS

At Site 50 Late Jurassic cherty chalks are overlain by Pleistocene brown clay, with abundant volcanic constituents, some marly beds, and siliceous fossils.

The late Jurassic (Kimmeridgian and early Tithonian) age assignment is based on the occurrence of coccoliths transitional between *Stephanolithion bigoti and S. laffitei.*

It seems probably that the bit penetrated the very base of the sediments here, Horizon B′. Nothing was recovered from layer B′ as such, despite several attempts. The scientists would have continued to try, had not the drilling hazards (lack of adequate cover over hard rocks) been so extremely great.

The bottom of the hole yielded chert pebbles and cobbles of detrital origin, with rounded edges and manganese coating. Such pebbles are also seen in the Pleistocene clays above. Some of them contain Mid-Cretaceous planktonic foraminifera, presumably derived from the Cretaceous subcrops up the slope. These pebbles must have caved into the hole, out of the Pleistocene muds.

In addition to these, the bottom cores also yielded pebbles of types not seen above—specifically, a piece of hematitic jasper of the sort associated with ophiolite sequences, and a pebble of amygdaloidal basalt. It seems possible that these pebbles were derived from a basal conglomerate under the Jurassic chalks. In any event, these pebbles indicate the basalt and jasper play a role in the acoustically "opaque" rocks below Horizon B′.

Finally, this site establishes the age of the oceanic crust under the Shatsky Rise as pre-late Jurassic.

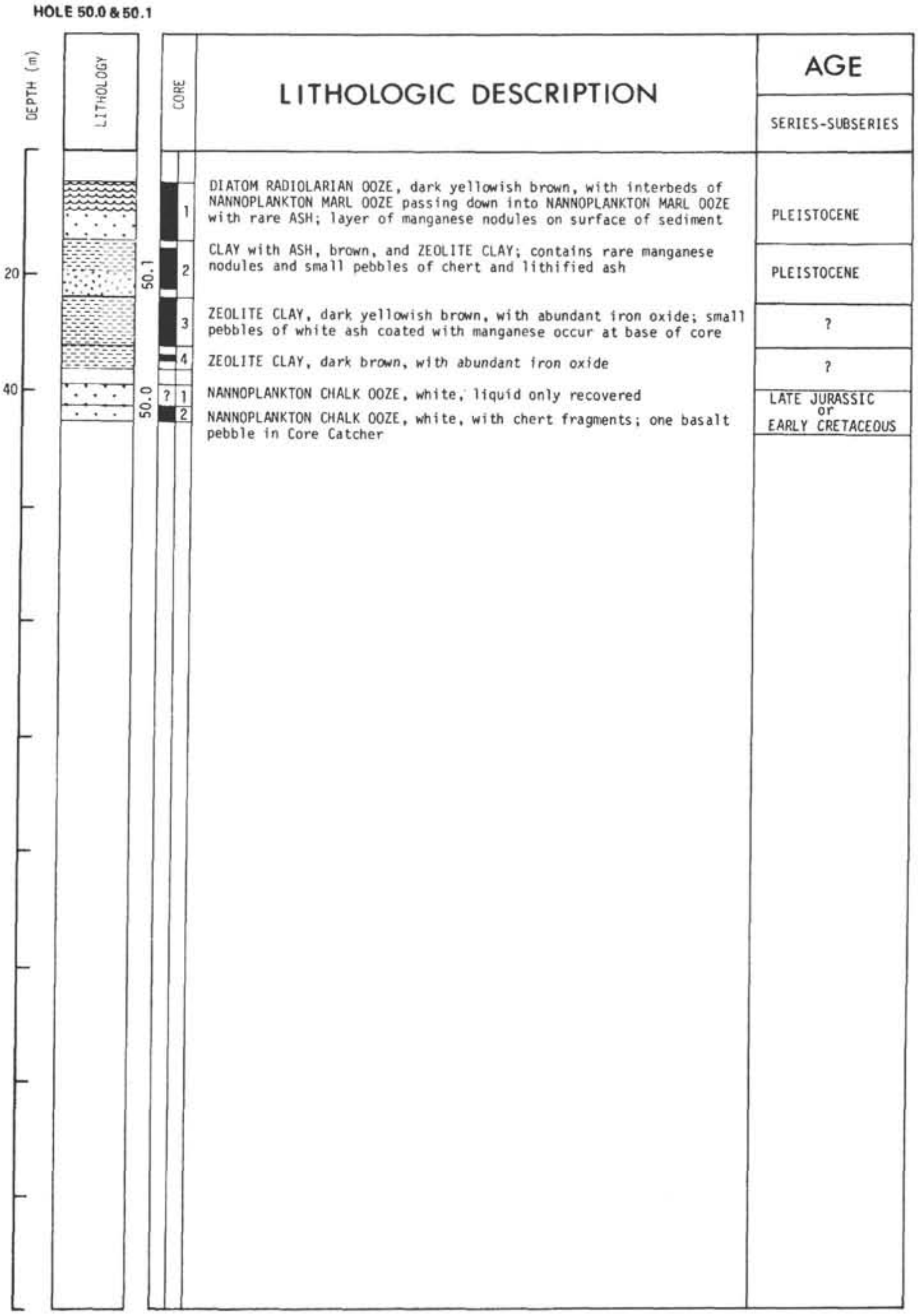

Figure 3. *Summary of lithology in Hole 50.0 and 50.1.*

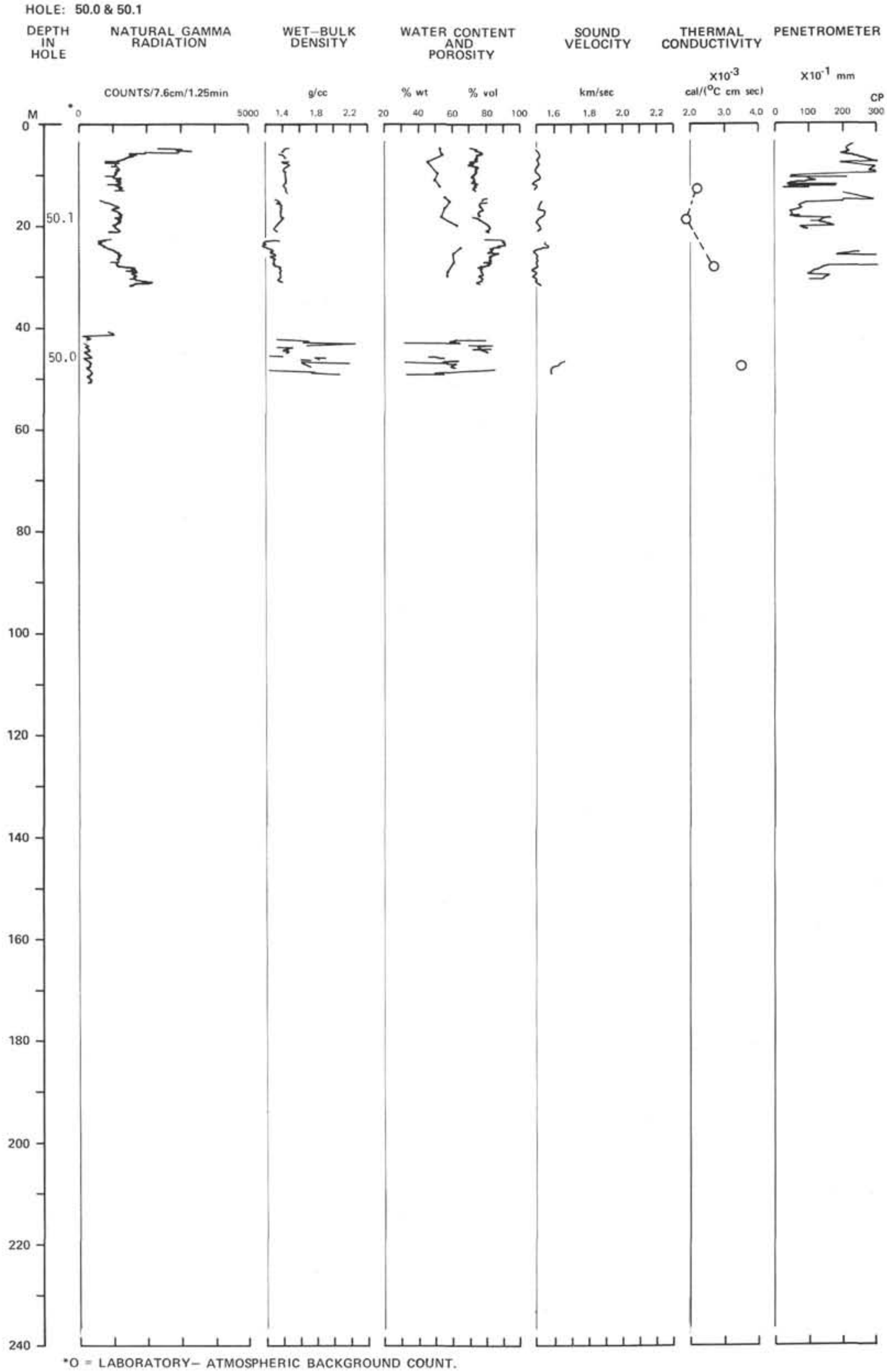

Figure 4. *Summary of physical properties in Hole 50.0 and 50.1.*

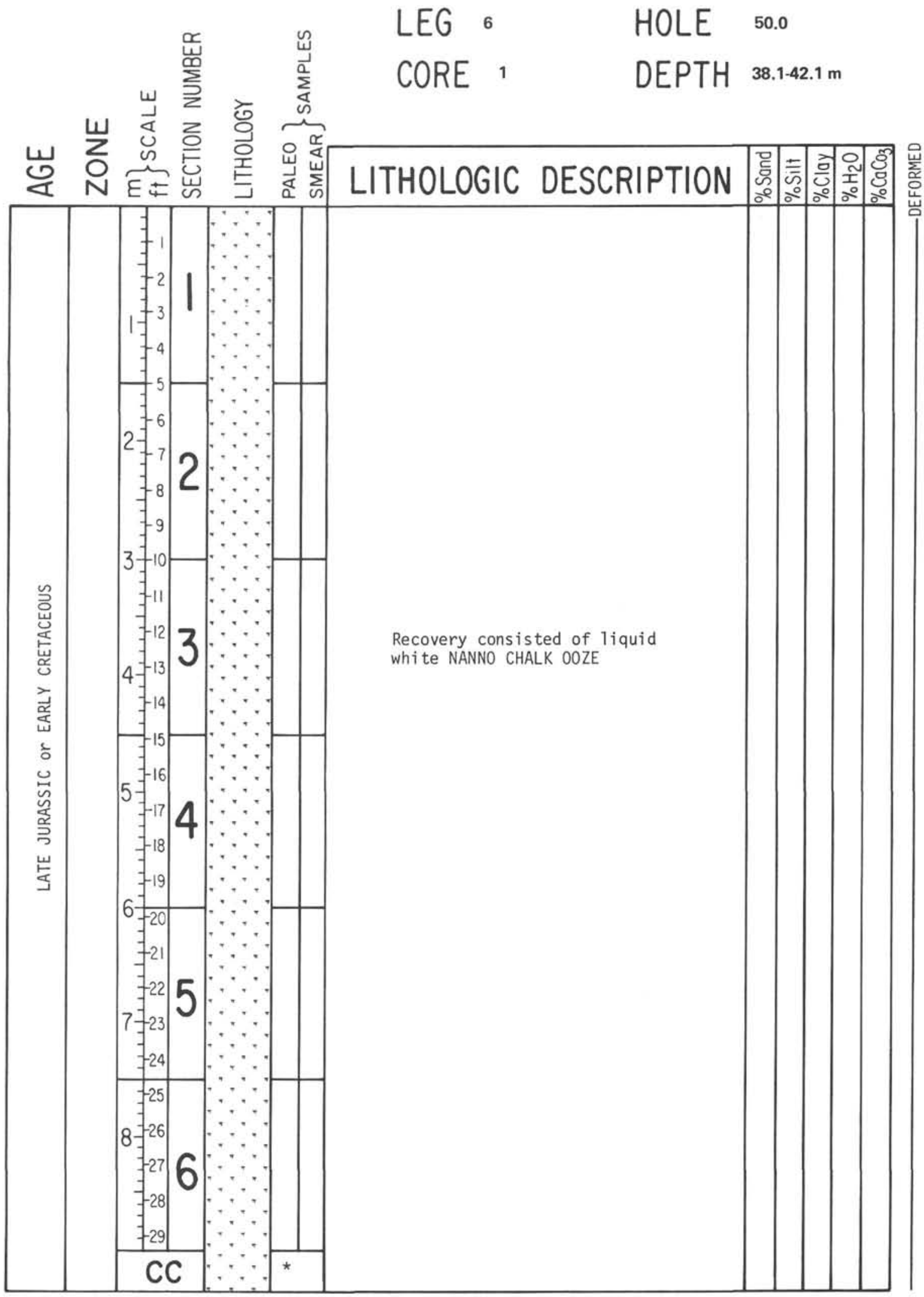

Figure 5. *Summary of lithology in Hole 50.0 Core 1.*

LEG 6 HOLE 50.0
CORE 1 DEPTH 38.1-42.1 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
Lowermost Cretaceous (or uppermost Jurassic) benthonic foraminifera and ostracods are mixed with small numbers of Tertiary and Cretaceous (Campanian, Cenomanian-Albain) planktonic foraminifera. Most of the benthonic foraminifera are also present at Site 49. The abundant benthonic foraminifera include: *Lenticulina muensteri, L. suprajurassica L.* sp. cf. *L heiermanni, L. subgaultina, L. incurvata Nodosaria chapmani, Dentalina communis, Frondicularia hastata, Dorothia oxycona.* Ostracods include: *Pontocyprella* sp., *Bairdea* spp., *Monoceratina* sp., *Cytherella* spp., *Cytherelloidea* sp.	Only a fluid outwash containing nannoplankton was recovered from the core. An Upper Jurassic or possible, Lower Cretaceous assemblage with the following species is present--*Diazomatolithus lehmani, Discolithina asper, Parhabdolithus embergeri, Rhabdolithus* sp. cf. *R. septrum, Stephanolithion* sp. aff. *S. bigoti, S. laffittei, Watznaueria barnesae, W. britannica, W.* sp. cf. *W. coronata, Zygodiscus fibulus,* and several undescribed species. No species of *Nannoconus* are present.	The core catcher sample contains poorly preserved (quartz infilled) radiolarians of Mesozoic (probably Cretaceous) age. CORE CATCHER: *"Dictyomitra" spp., "Stichocapsa" spp., Stylosphaera spp.,* hagiastrins, and spiny-ringed saturnalins.

Figure 6. *Summary of biostratigraphy in Hole 50.0 Core 1.*

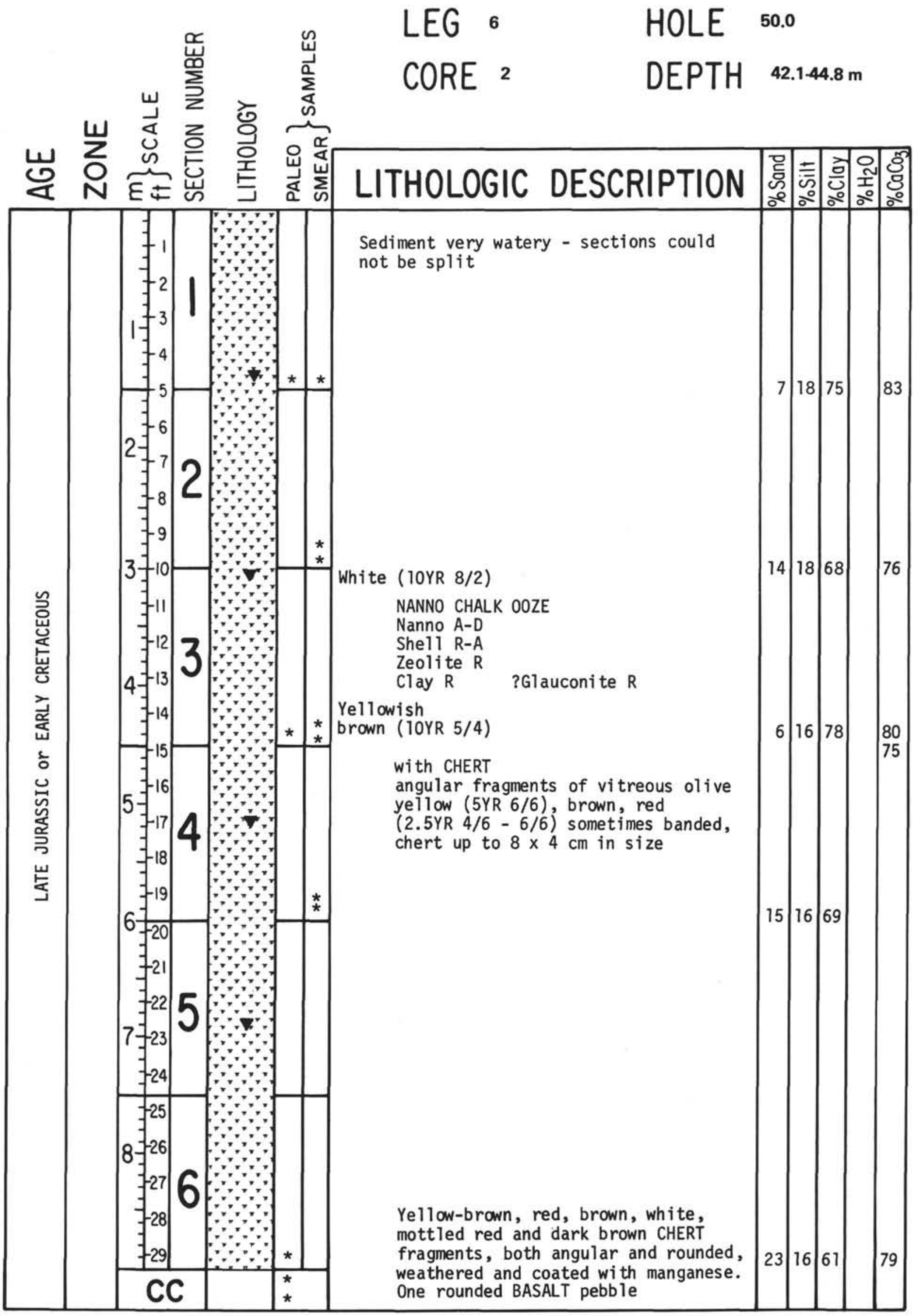

Figure 7. *Summary of lithology in Hole 50.0 Core 2.*

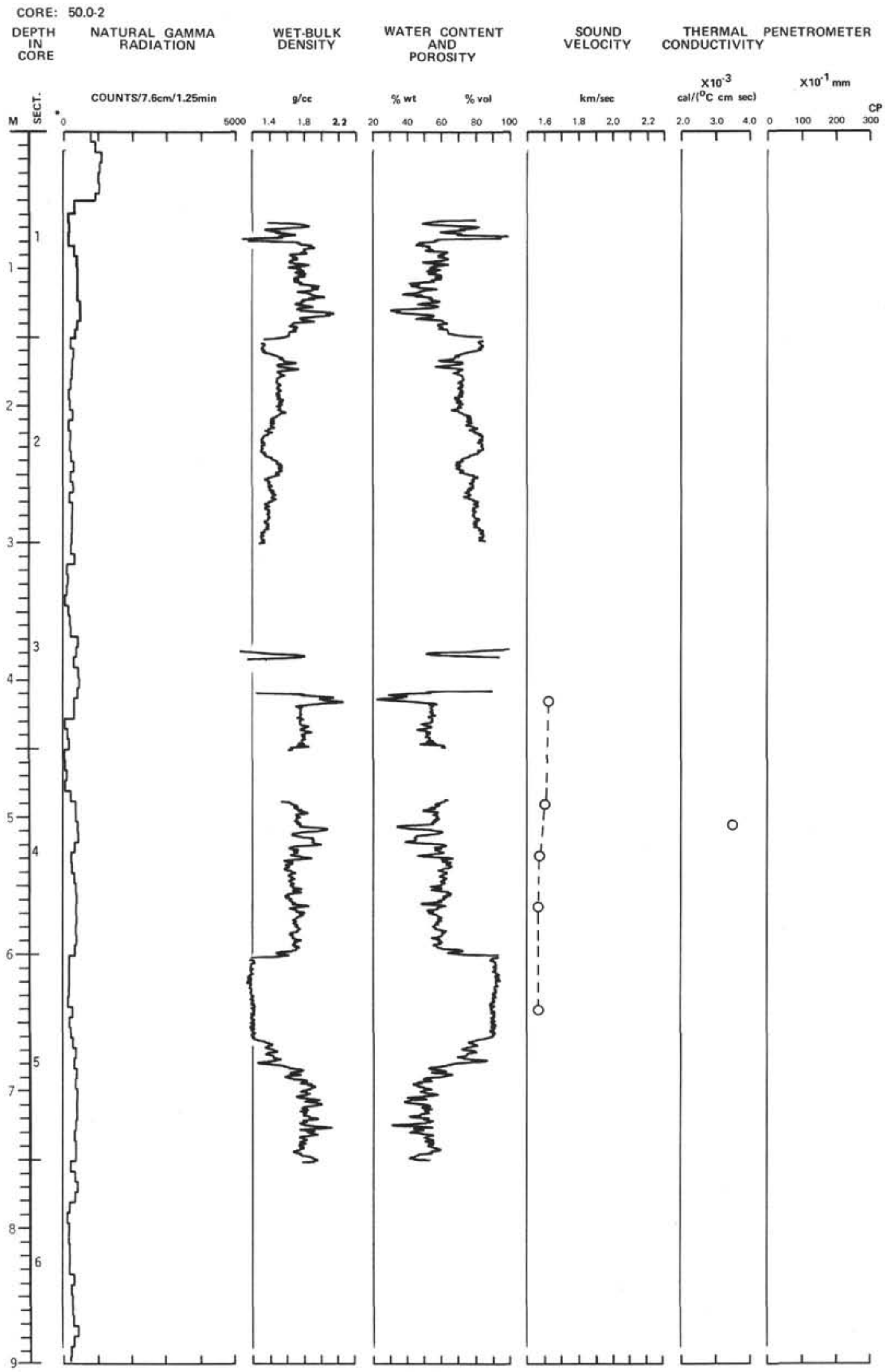

Figure 8. *Summary of physical properties in Hole 50.0 Core 2.*

LEG 6 HOLE 50.0

CORE 2 DEPTH 42.1-44.8 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
Lowermost Cretaceous (uppermost Jurassic) benthonic foraminifera and ostracods are mixed with small numbers of Tertiary and upper Cretaceous planktonic foraminifera. The benthonic foraminifera are the same as present in 50.0-1 and very similar to the species at Site 49.	An Upper Jurassic or possibly Lower Cretaceous assemblage of nannoplankton is present in this core. Species present include *Diazomatolithus lehmani*, *Discolithina asper*, *D. rugosa*, *Parhabdolithus embergeri*, *Rhabdolithus* sp. cf. *R. septrum*, *Stephanolithion* sp. aff. *S. bigoti*, *S. laffittei*, *Watznaueria barnesae*, *W. britannica*, and several undescribed species. No species of *Nannoconus* are present.	The core catcher sample contains poorly preserved (quartz infilled) radiolarians of Mesozoic (probably Cretaceous) age. CORE CATCHER: *"Dictyomitra" spp.*, *Pseudoaulophacus sp.*, spiny-ringed saturnalins, *"Stichocapsa" sp.*, *Conosphaera sp.*, hagiastrins, and *Stylosphaera sp.*

Figure 9. *Summary of biostratigraphy in Hole 50.0 Core 2.*

NO PHOTOGRAPHS OF HOLE 50.0 CORE 2

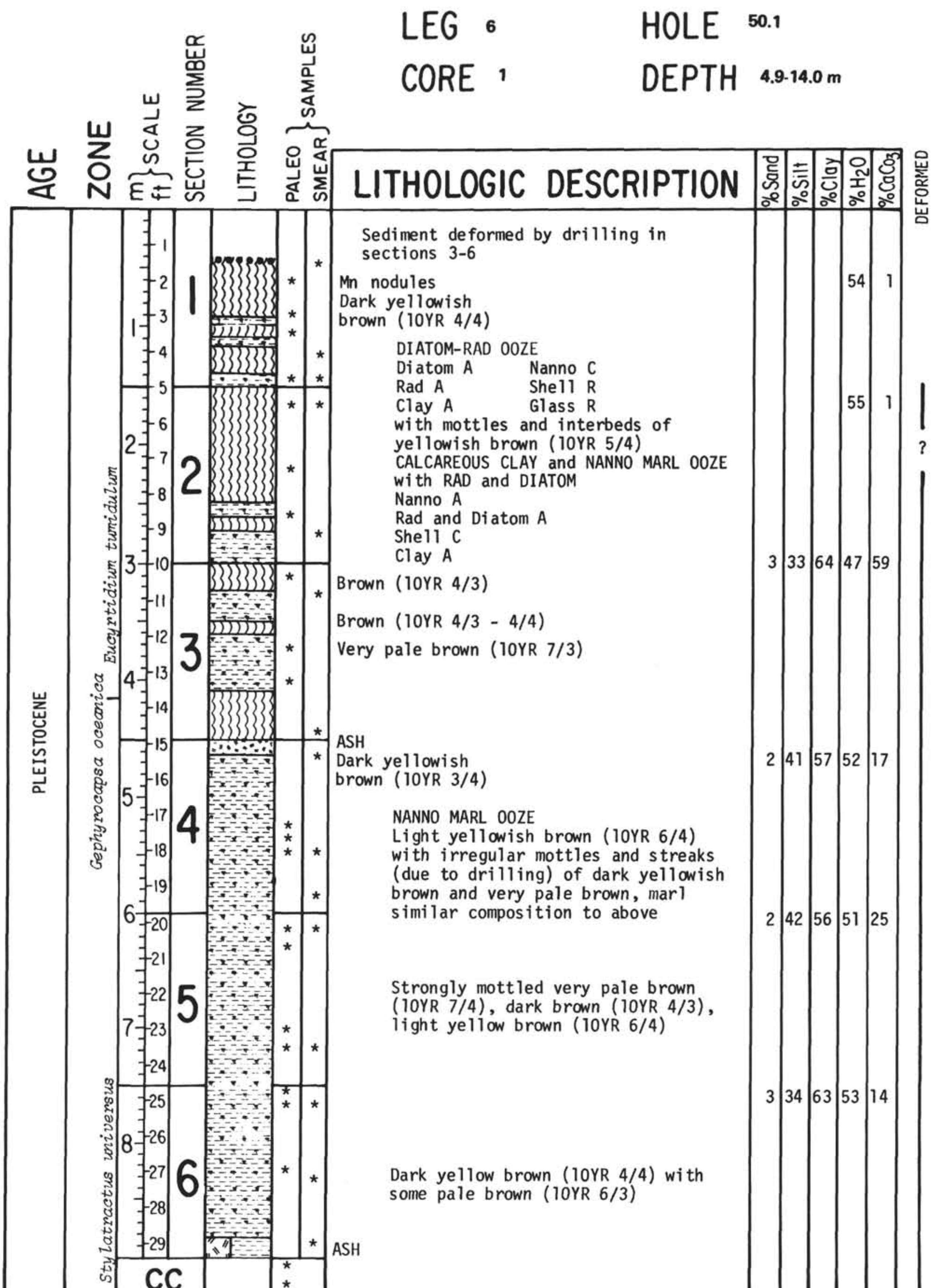

Figure 10. *Summary of lithology in Hole 50.1 Core 1.*

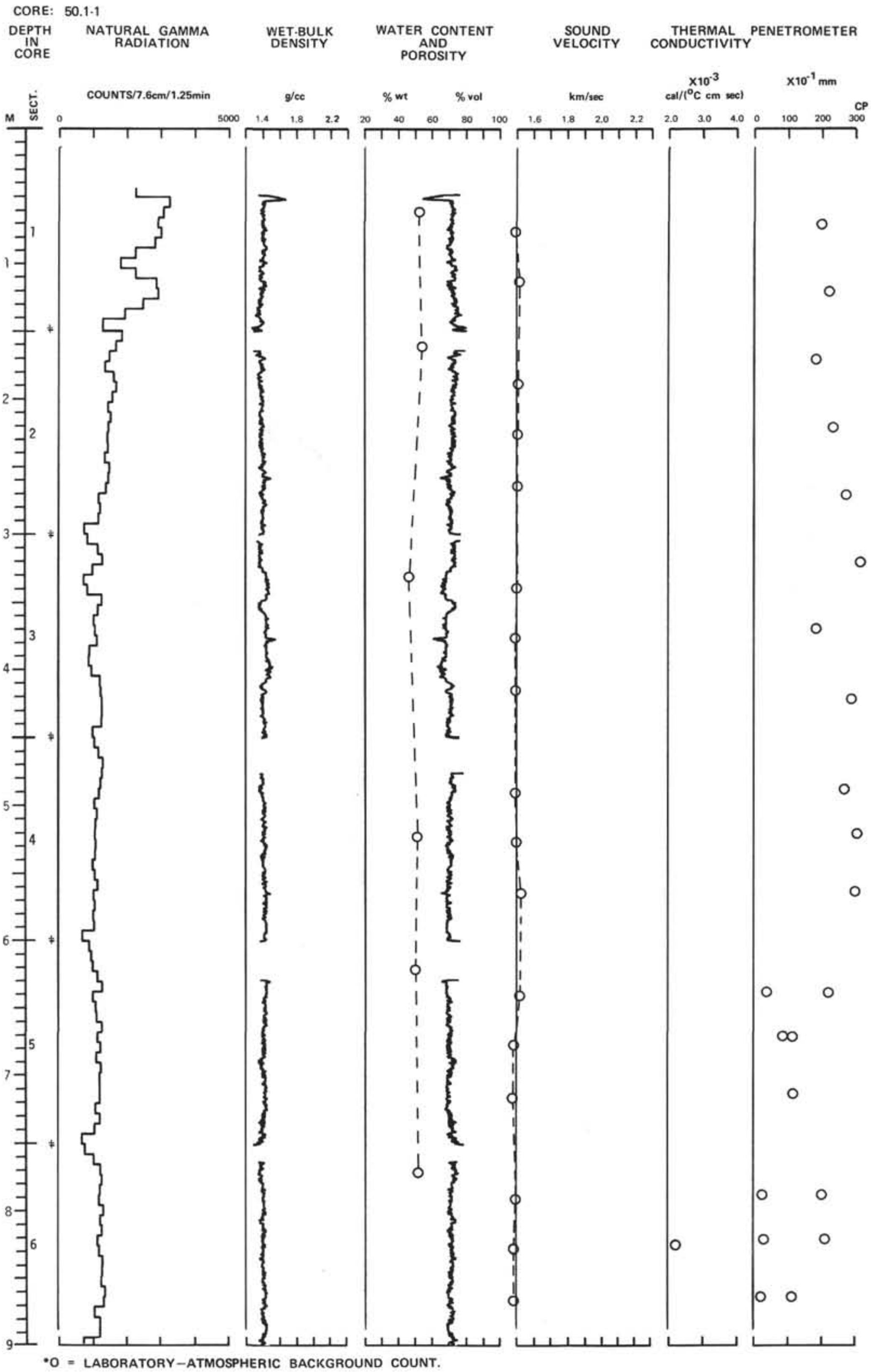

Figure 11. *Summary of physical properties in Hole 50.1 Core 1.*

LEG 6 HOLE 50.1

CORE 1 DEPTH 4.9-14.0 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	Pleistocene nannofossil assemblages of the *Gephyrocapsa oceanica* Zone are present throughout the core. Species present include *Ceratolithus cristatus*, *Coccolithus* sp. cf. *C. doronicoides*, *Cyclococcolithina leptoporus*, *Gephyrocapsa oceanica*, and *Umbilicosphaera mirabilis*.	The upper part of the core contains species of the upper Pleistocene *Eucyrtidium tumidulum* Zone. The lower part contains species of the middle Pleistocene *Stylatractus universus* Zone. TOP: *Eucyrtidium tumidulum*, *Druppatractus acquilonius*, *Eucyrtidium calvertense*, and *Lithopera bacca*. BOTTOM: *Stylatractus universus*, *Druppatractus acquilonius*, *Eucyrtidium calvertense*, *E. tumidulum*, and *Lithopera bacca*.

Figure 12. *Summary of biostratigraphy in Hole 50.1 Core 1.*

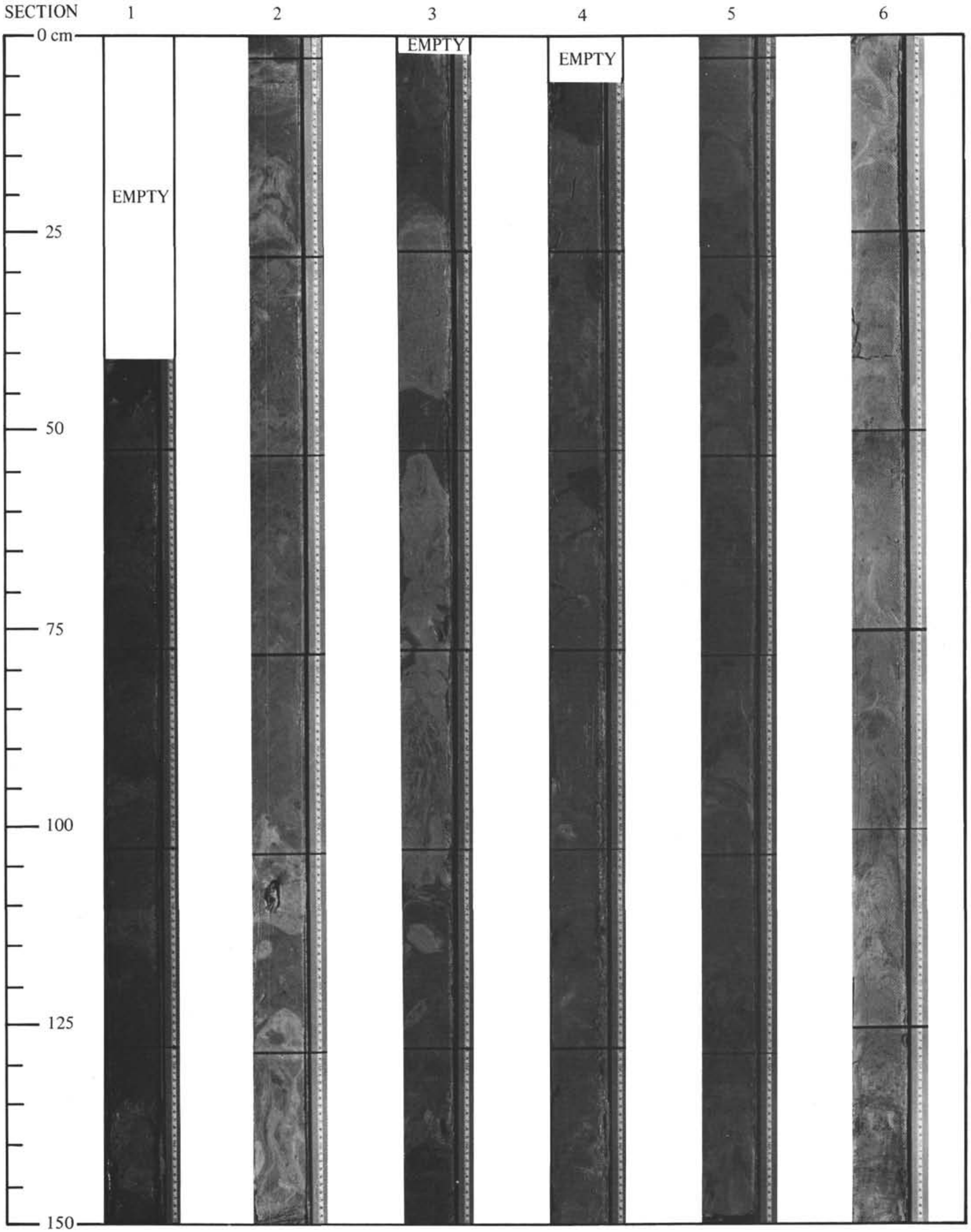

Plate 1. *Photographs of Hole 50.1 Core 1.*

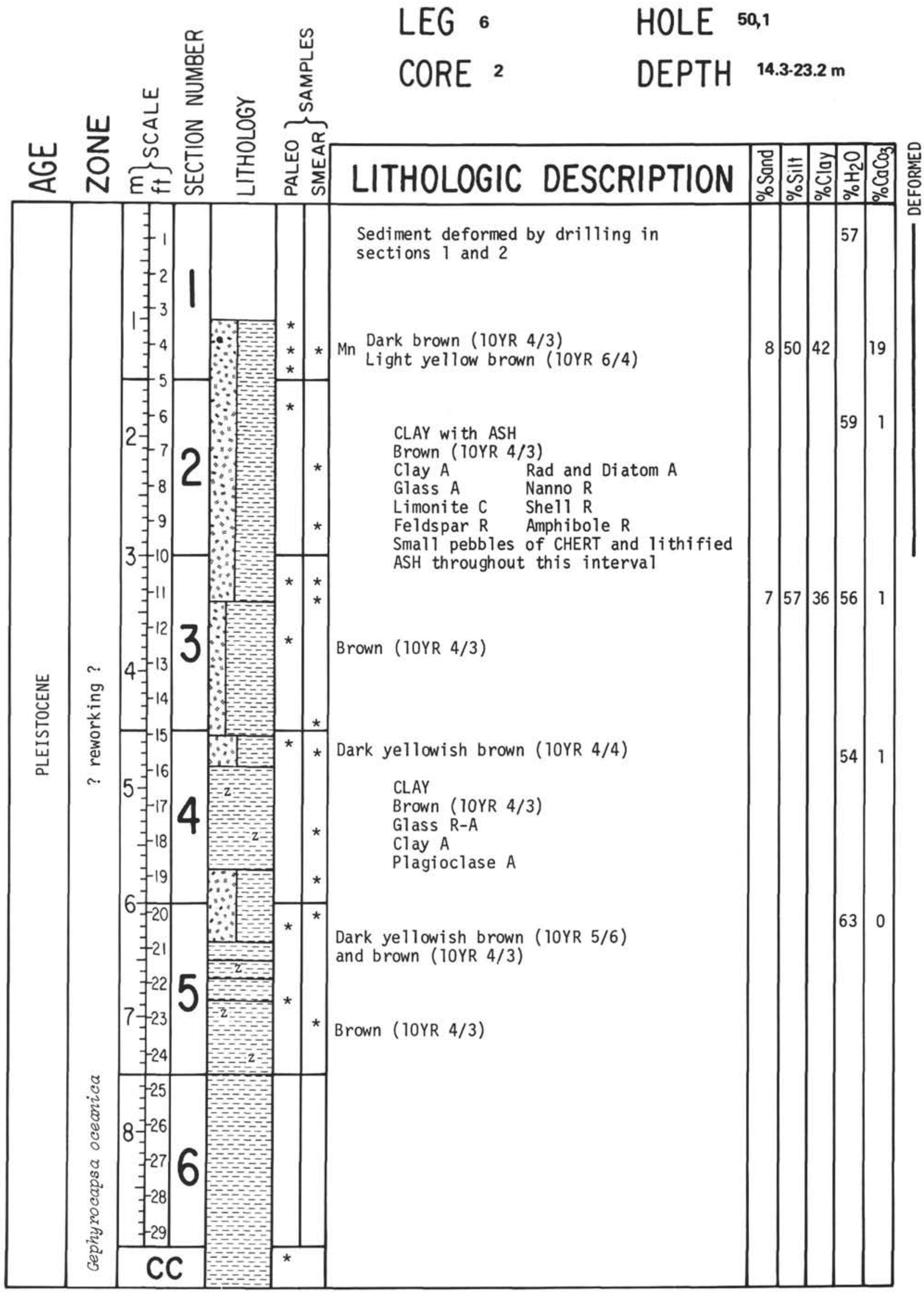

Figure 13. *Summary of lithology in Hole 50.1 Core 2.*

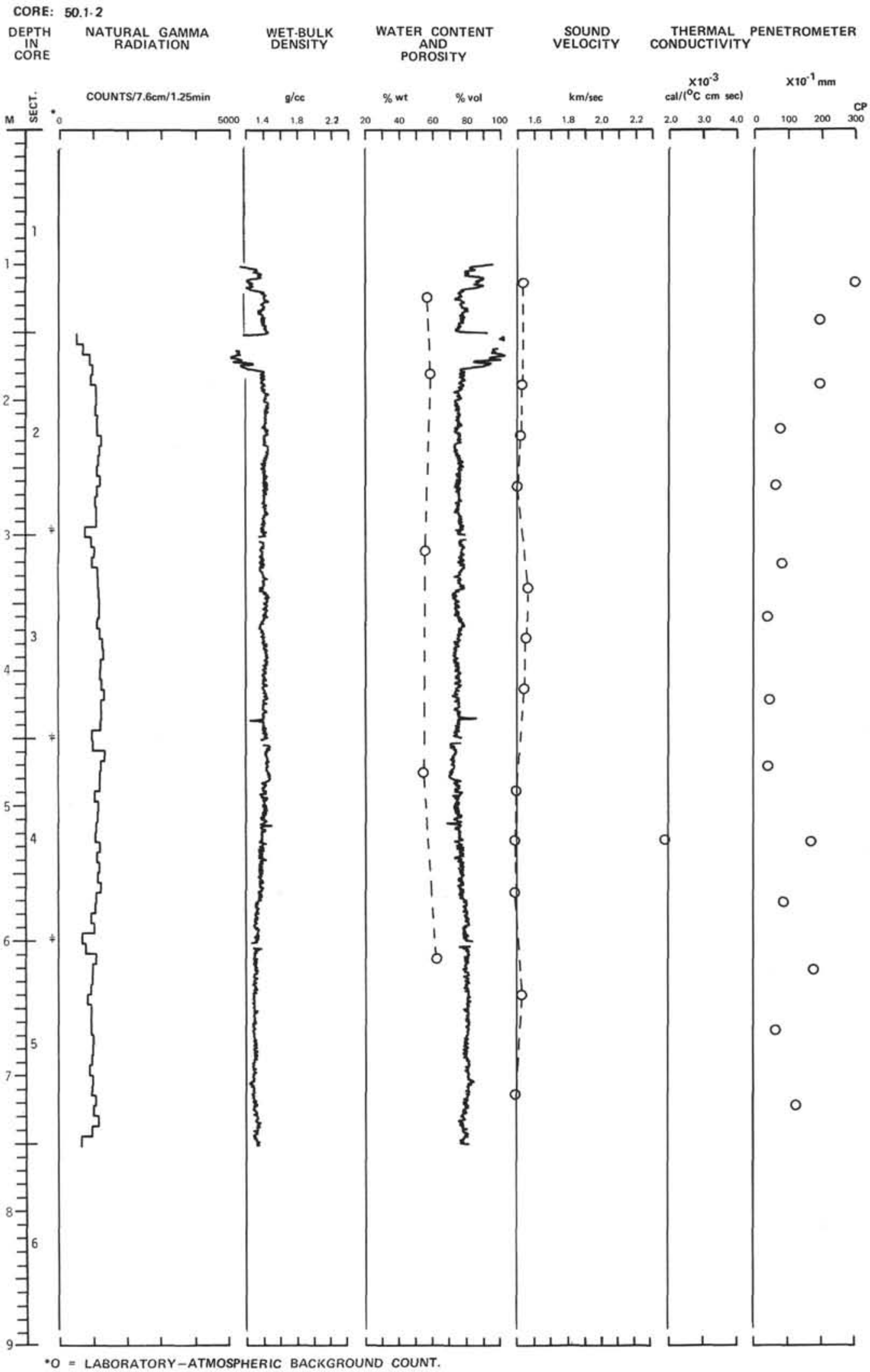

Figure 14. *Summary of physical properties in Hole 50.1 Core 2.*

LEG 6 **HOLE** 50.1

CORE 2 **DEPTH** 14.3-23.2 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	Most of the samples from this core are barren. The upper section of the core contains a reworked assemblage including Eocene species--*Campylosphaera dela*, *Cyclococcolithina formosus*, *Discoaster* sp. aff. *D. lodoensis*, Jurassic or Cretaceous species--*Watznaueria barnesae*, *Stephanolithion laffittei*, and Plio-Pleistocene species *Ceratolithus rugosus*, *Cyclococcolithina leptoporus*, and *C. macintyre*. The core-catcher sample contains a Pleistocene assemblage with *Ceratolithus cristatus*, *Cyclolithella annula*, *Gephyrocapsa oceanica*, and *Helicopontosphaera kamptneri*.	Radiolaria are rare in the upper part of the core and poorly preserved toward the middle. The lower part of the core contains no Radiolaria. Most of the species are characteristic of the upper Pliocene and lower and middle Pleistocene. TOP TO MIDDLE: *Stylatractus universus*, *Eucyrtidium calvertense*, and *Stichocorys peregrina*.

Figure 15. *Summary of biostratigraphy in Hole 50.1 Core 2.*

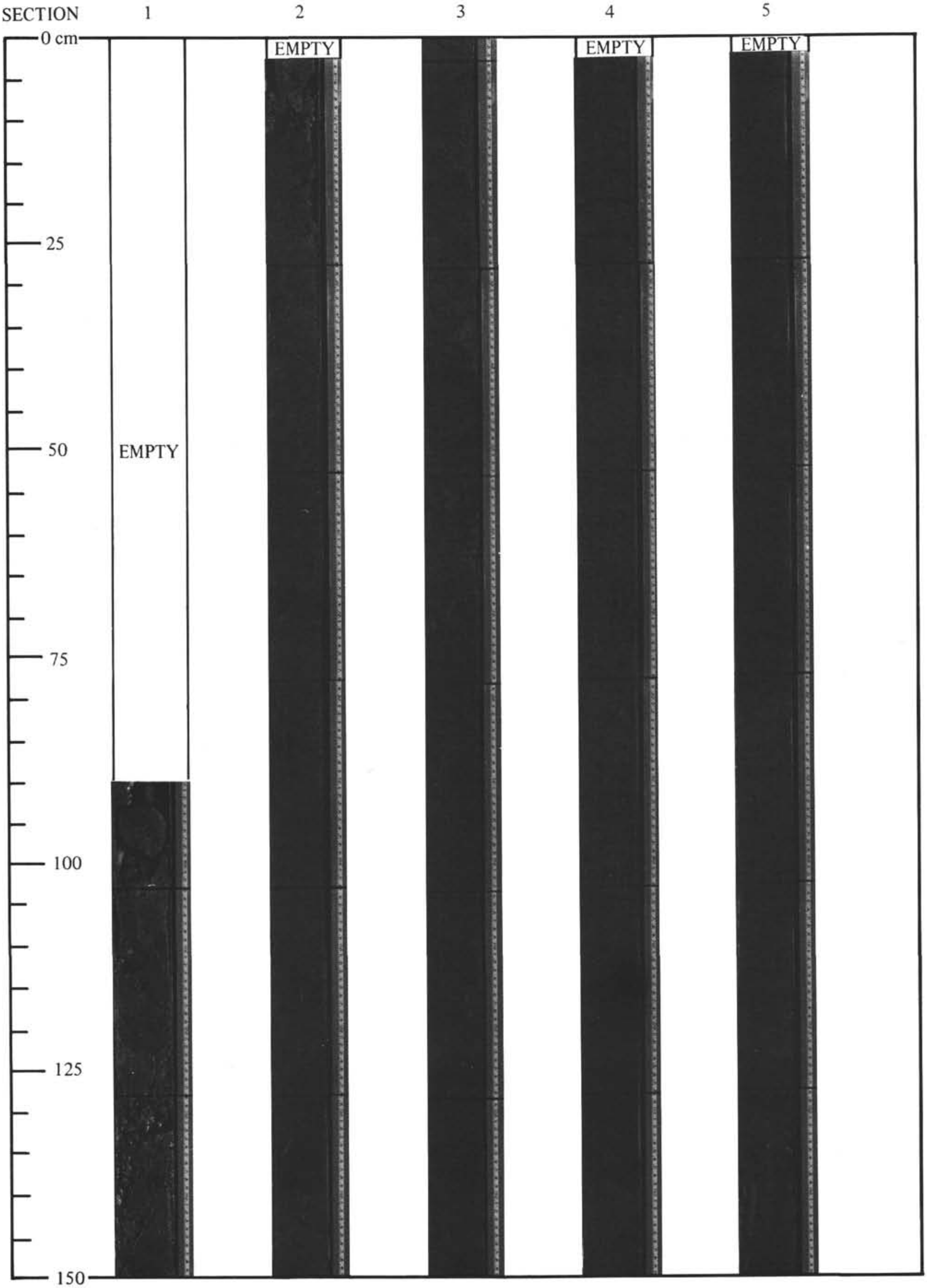

Plate 2. *Photographs of Hole 50.1 Core 2.*

LEG 6 HOLE 50.1

CORE 3 DEPTH 23.2-32.3m

AGE	ZONE	SECTION NUMBER	PALEO SAMPLES	SMEAR SAMPLES	LITHOLOGIC DESCRIPTION	%Sand	%Silt	%Clay	%H_2O	%$CaCO_3$
		1	*	*	Sediment very watery, cores not split	0	29	71		0
		2		* *		0	17	83	64	0
		3	*	*	ZEOLITIC CLAY with FeO Dark yellowish brown (10YR 3/4) Clay A (Kaolinite) Glass A Plagioclase A Limonite A Phillipsite C	0	24	76	62	0
		4		*	Rare streaks and mottles of yellowish brown (10YR 5/4)	0	21	79	61	0
		5		*	Small mottles and streaks of brown yellow (10YR 6/6)	1	18	81	58	0
		6	*		ZEOLITIC SILTY CLAY with FeO Brown (10YR 3/4), dark yellow brown (10YR 3/3), very dark gray (10YR 3/1) mottles Glass A Phillipsite A Clay A Limonite A Numerous small flat pebbles of white ash coated with manganese	1	22	77	57	1
		CC	* *							

Scale: m 1–8; ft 1–29

Figure 16. *Summary of lithology in Hole 50.1 Core 3.*

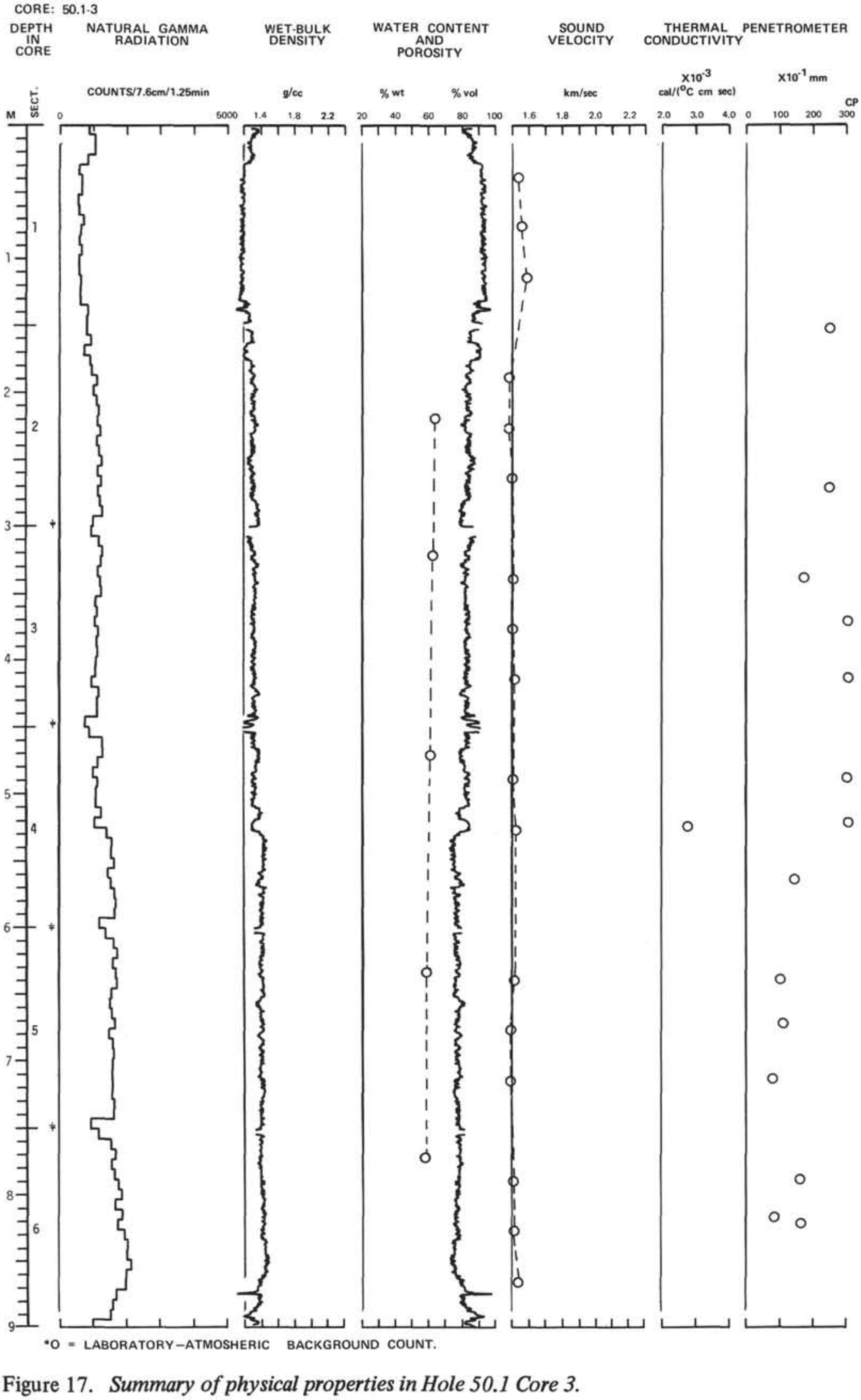

Figure 17. *Summary of physical properties in Hole 50.1 Core 3.*

LEG 6 HOLE 50.1

CORE 3 DEPTH 23.2-32.3 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	None.

Figure 18. *Summary of biostratigraphy in Hole 50.1 Core 3.*

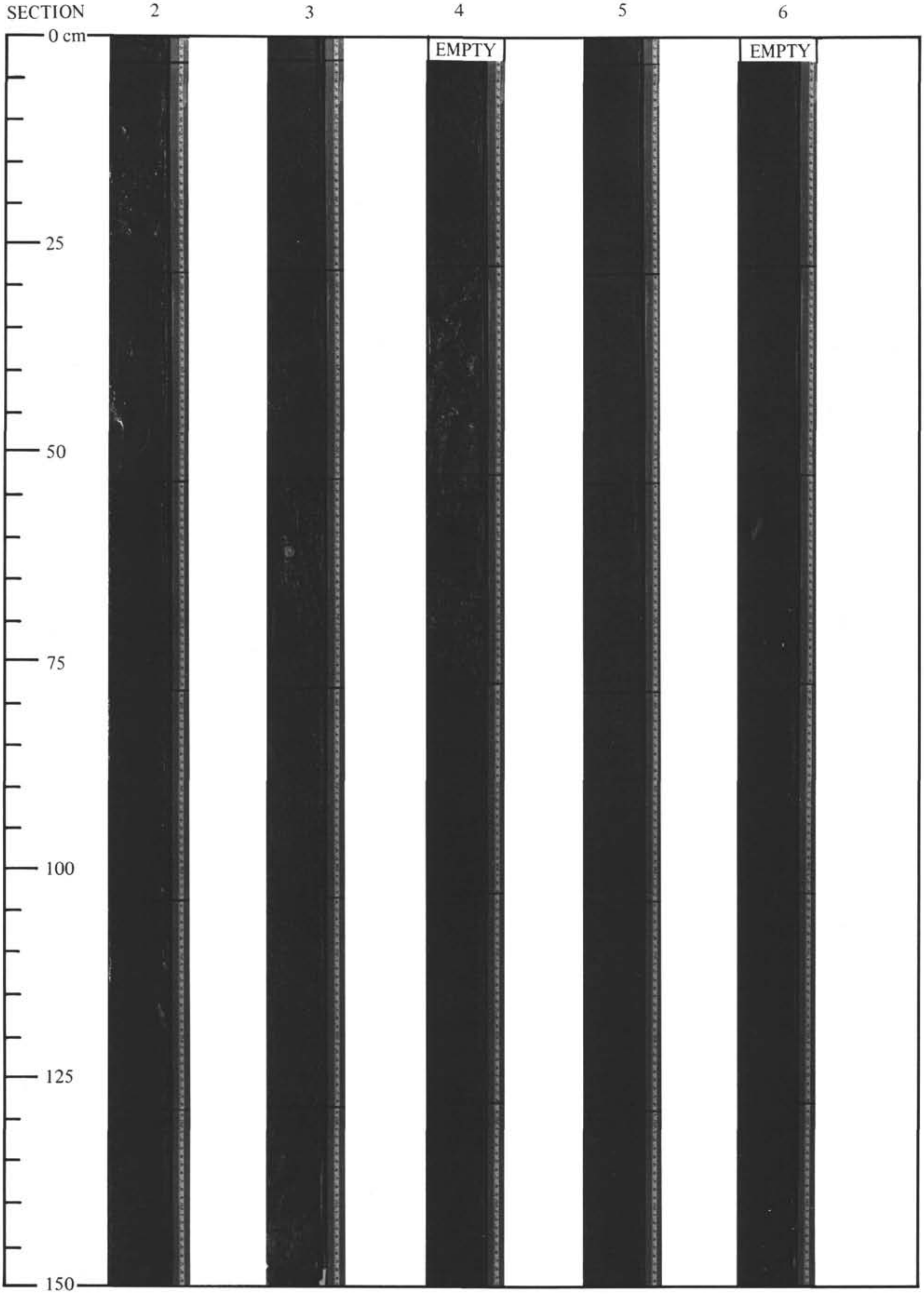

Plate 3. *Photographs of Hole 50.1 Core 3.*

LEG 6 HOLE 50.1

CORE 4 DEPTH 32.3-36m

AGE	ZONE	SECTION NUMBER	LITHOLOGY	SAMPLES PALEO	SAMPLES SMEAR	LITHOLOGIC DESCRIPTION	%Sand	%Silt	%Clay	$\%H_2O$	$\%CaCO_3$
?CRETACEOUS		1		* *	*	ZEOLITIC SILTY CLAY with FeO Dark brown (10YR 3/3) Clay A (Kaolinite) Glass A Limonite A Phillipsite C Plagioclase A	1	25	74		0
		2									
		3									
		4									
		5									
		6									
		CC		* *							

Figure 19. *Summary of lithology in Hole 50.1 Core 4.*

LEG 6 HOLE 50.1

CORE 4 DEPTH 32.3-36 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	The core catcher sample contains poorly preserved (quartz infilled) radiolarians of Mesozoic (probably Cretaceous) age. CORE CATCHER: *"Dictyomitra" spp., "Stichocapsa" spp.,* and *Conosphaera sp.*

Figure 20. *Summary of biostratigraphy in Hole 50.1 Core 4.*