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J.O.I.D.E.S. Blake Panel Report

CRUISE REPORT
AND PRELIMINARY CORE LOG
M/V CALDRILL I--17 April to 17 May 1965

Prepared by

John Schlee
Robert Gerard

NSF Grant GP-4233

August 1965

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In citing this manuscript in a bibliography, the reference should state that it is unpublished.

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INTRODUCTION

In May 1964 the Institute of Marine Science (University of Miami), Scripps Institution of Oceanography (University of California), Woods Hole Oceanographic Institution, and Lamont Geological Observatory (Columbia University) joined in the establishment of the JOINT OCEANOGRAPHIC INSTITUTIONS DEEP EARTH SAMPLING (JOIDES) program. The long range purpose of this organization is to obtain continuous core samples of the entire sedimentary column from the floors of the oceans. It was decided that initial efforts would be limited to water depths of less than 1000 fathoms (6000 feet), and tentative locations were selected for drilling operations off the eastern, western and Gulf coasts of the United States.

Near the end of December 1964 it was found that the M/V CALDRILL I, a drilling vessel capable of working to depths of 6000 feet, was to engage in drilling operations on the Grand Banks of Newfoundland during the summer of 1965 for the Pan American Petroleum Corporation. In discussions with Pan American representatives, they agreed to pay for the moving costs of the vessel should JOIDES be able to organize a drilling program along the track of CALDRILL (between California and the Grand Banks). In this agreement JOIDES assumed responsibility for the vessel only during the period of drilling.

Sites were examined along the track where offshore drilling might yield valuable information on problems of the continental margin and be near good logistic ports on the east and west coasts. Selection was made of an area on the continental shelf and the Blake Plateau off Jacksonville, Florida. Based upon many previous geological and geophysical investigations by the participating laboratories, a considerable body of knowledge had been gained about this region of the continental-oceanic border.

A scientific panel for the specific project was formed with members from the JOIDES institutions plus additional members:

F. F. Koczy - Institute of Marine Science
University of Miami

Tj. Van Andel - Scripps Institution of Oceanography
University of California

K. O. Emery - Woods Hole Oceanographic Institution

J. S. Craeger - University of Washington

J. I. Tracey, Jr. - U. S. Geological Survey

D. Fahlquist - Texas A & M University

C. L. Drake - Lamont Geological Observatory
Columbia University

Drilling sites were chosen along a transect from Jacksonville southeastward to a point about 250 miles offshore, where the ocean depth reaches more than 1000 meters.

For this initial program of JOIDES, the Lamont Geological Observatory was chosen as the operating institution with J. L. Worzel as principal investigator, and C. L. Drake and H. A. Gibbon as program planners.

The field operation began on 17 April 1965 with the arrival of the drilling ship in Jacksonville, and the first hole was begun on the morning of 19 April 50 miles offshore. The mutual interests of the several institutions and of the U. S. Geological Survey led to a mixed group of scientists aboard the ship: Robert Gerard, project supervisor and chief scientist, Tsunemasa Saito and Mark Salkind (Lamont Geological Observatory); John Schlee, principal scientist, J. R. Frothingham, Jr.; F. T. Manheim and K. O. Emery (Woods Hole Oceanographic Institution or U. S. Geological Survey based at Woods Hole); Louis Lidz, Walter Charm and Herman Hofmann (University of Miami); R. L. Wait, W. S. Keys and E. M. Shuter (U. S. Geological Survey); and William Bogert, drilling advisor (Pan American Petroleum Corporation).

DRILLING AND CORING

Holes were drilled at the positions indicated on Fig. 1. Water depths at the drill sites ranged from 25 to 1032 meters and penetrations into the bottom from 120 to 320 meters. Positions were determined by Loran A.

The drilling ship M/V CALDRILL I (Fig. 2) is a converted 176-foot AKL-type navy vessel owned by Caldrill Offshore Inc. of Ventura, California. The ship has a 10-foot diameter center well for drilling and standard rotary drilling equipment as listed in Table 1.

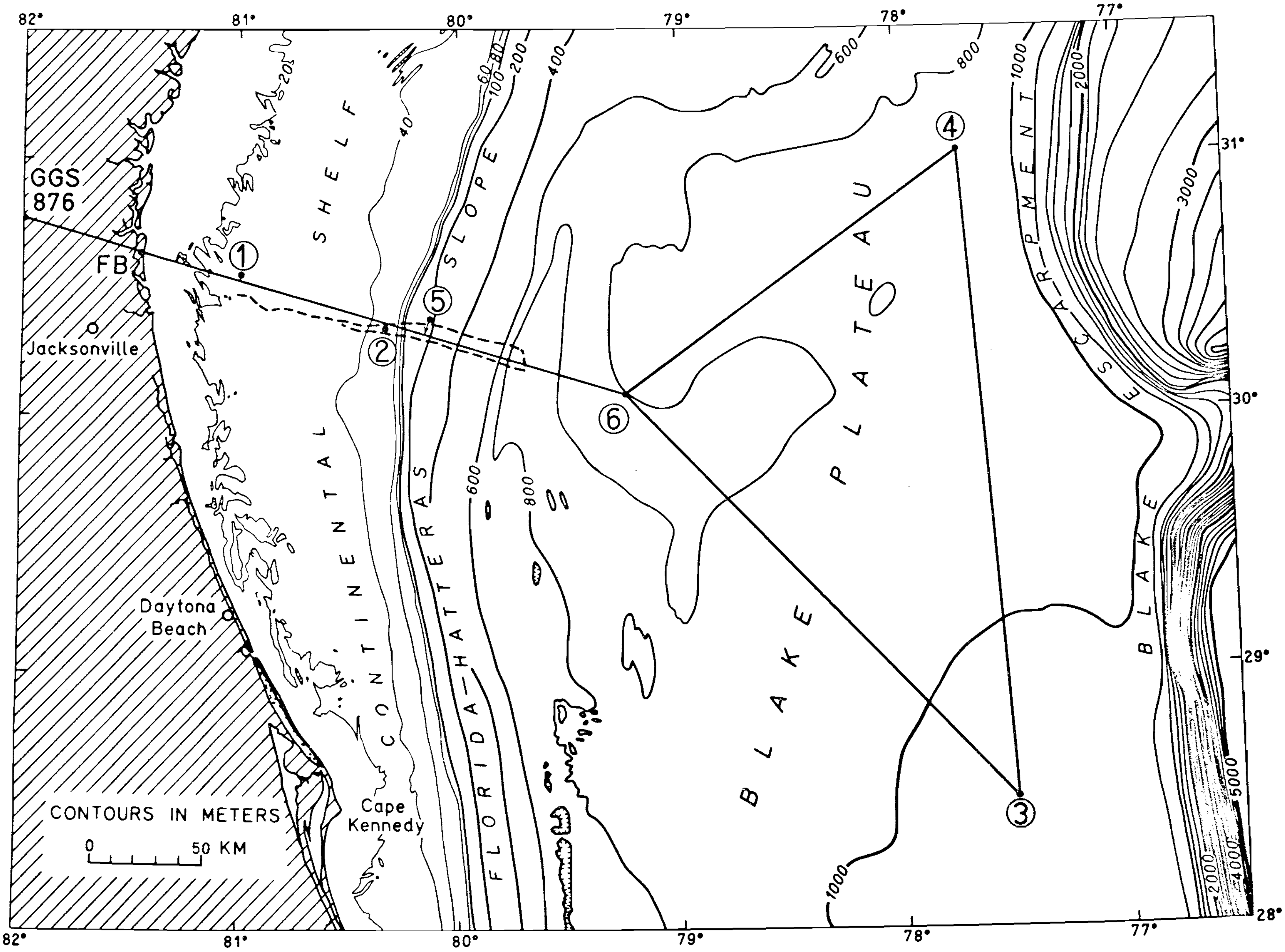
82°
81°
80°
79°
78°
77°
31°
30°
29°
28°
GGS
876
FB
Jacksonville
Daytona
Beach
Cape
Kennedy
CONTINENTAL SHELF
FLORIDA–HATTERAS SLOPE
BLAKE PLATEAU
BLAKE ESCARPMENT
CONTOURS IN METERS
0
50 KM
①
②
③
④
⑤
⑥
20
40
60
80
100
200
400
600
800
1000
2000
3000
4000
5000

Fig. 1

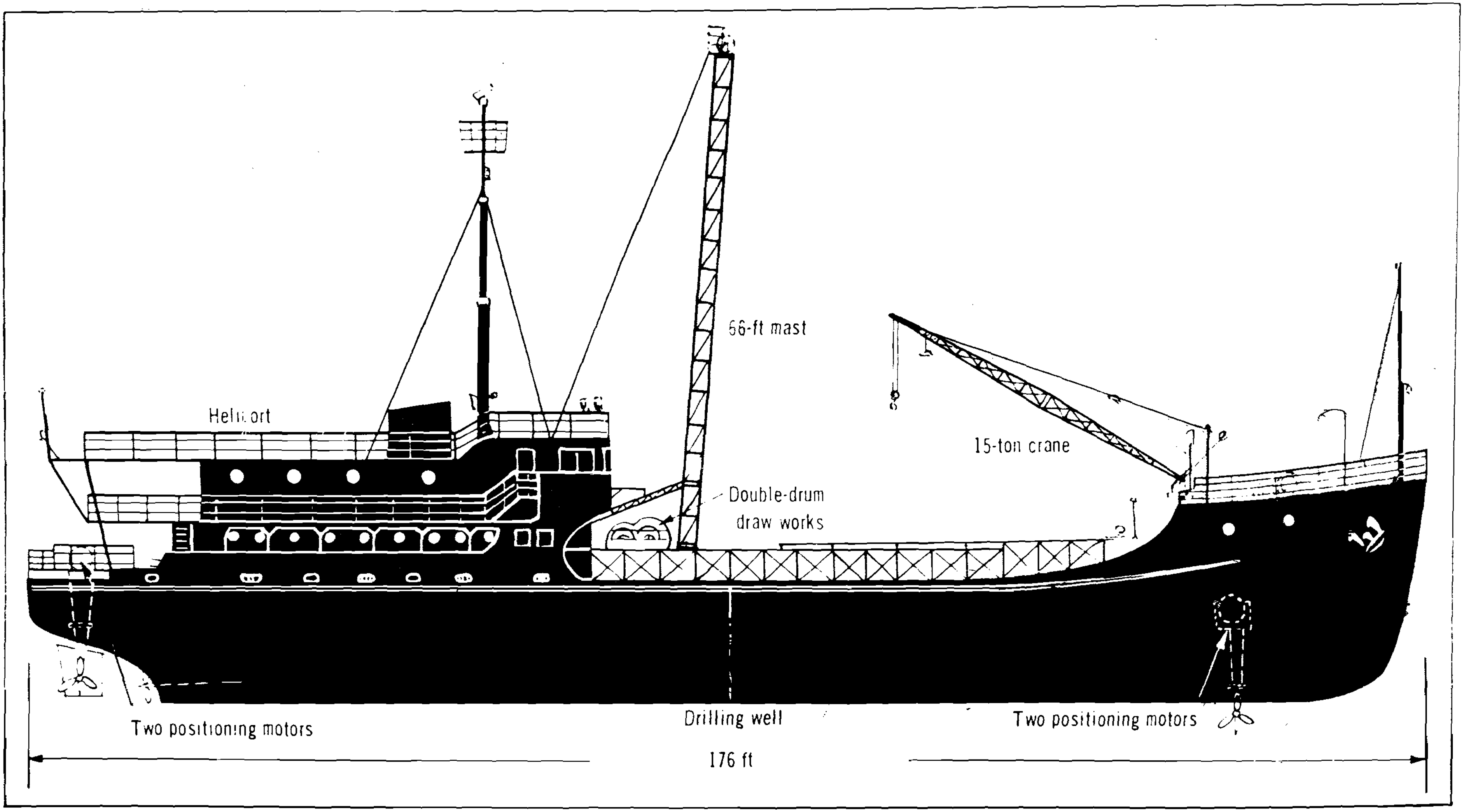
66-ft mast
Heliport
15-ton crane
Double-drum
draw works
Two positioning motors
Drilling well
Two positioning motors
176 ft

Fig. 2

TABLE 1.

DRILLING EQUIPMENT

1. Hopper Model GX-IG, 6-speed, double drum drawworks with separate electric motors driving through Baylor eddy-current couplings. Rated capacity 6000' with 4-1/2" drill pipe.

2. Hopper special 66' 250,000# mast with guide tracks for blocks and swivel. Mast lays down while in transit.

3. Two 700-H.P. Oilwell 6-3/4" x 8" Triplex mud pumps, each driven by a 400-H.P. Cat D343 TA Diesel with 9-speed transmission. Also used for cementing operations equipped with 10,000# fluid ends.

4. One 125-H.P. BJ electric powered, 2-stage centrifugal pump for salt water circulation.

5. One BJ 5" x 6" centrifugal pump for mixing.

6. One 200-H.P. Bowen Itco, Model S3, power swivel.

7. Two 350-kw AC generators driven from ship's main propulsion engines, 500-H.P. each and one 500-H.P. Cat D397T driving a 350-kw AC generator. 1500-H.P. available for rig and harbormaster units.

8. Hopper special hydraulic pipe-racking system and storage bins.

9. Foster hydraulic drill pipe tongs for 2-3/8" to 9-5/8" pipe.

10. Complete hydraulic system to power swivel, tongs, and pipe-racking equipment. One 200-H.P. unit and one 20-H.P. unit.

11. Storage for 300 barrels of drilling mud plus 300 sacks of dry mud or cement.

In order to maintain a fixed position in the ocean while drilling for extended periods, the ship is equipped with an automatic positioning system, which utilizes four 300-H.P. Murray and Tregurtha harbormaster outboard motors, two at the bow and two at the stern (Fig. 3). The speed and direction of the propellors are automatically controlled by signals from an analog computer (Fig. 4). This computer receives signals from a gyro compass and an angle-sensing transducer mounted above a constant-tension taut wire (Fig. 5) from the ship to a 250-kg anchor resting on the ocean bottom. If the ship drifts away from a place directly above the anchor, the transducer senses the departure of the wire from the vertical and generates signals through the computer to the harbormasters, which then move the ship back into position. The position-keeping equipment functioned well and allowed the ship to drill in surface currents up to 140 cm/sec (2.7 kts) and winds up to 20 m/sec (40 kts), while maintaining position over the hole to within 3% of the water depth.

The main drilling tower is a 66-foot mast, mounted amidships, and having a lifting capacity of 125 tons. A six-speed double-drum drawworks, driven by an AC motor (through an eddy-current coupling), supplies the lifting power for handling the drill string. Instead of a kelly and rotary table, a hydraulic power swivel is used to rotate the drill string at a maximum of 60 rpm. Drilling fluid is sea water pumped through the drill tubing by an electrically powered centrifugal pump. For spotting mud during drilling and geophysical logging, M/V CALDRILL I has a storage capacity of 300 barrels of barite mud, which is dispensed by two diesel-powered mud pumps. Drill tubing in 30-foot joints is stored horizontally on hydraulically raised pipe racks having a total capacity of 6000 feet. The tubing is moved from the racks by a conveyor belt and lifted into position by a travelling block in the drilling tower. Hydraulic pipe tongs connect tubing joints together.

Most of the drilling and coring was done with a hard-formation roller bit and wire-line core barrel; a diamond bit was also used (see Table 2). A constant bit weight was provided by one, two, or three drill collars (one ton each) fixed below one or two 5-foot stroke bumper subs (telescoping joints), used to compensate for vertical motion of the ship. Hole re-entry was not attempted; and it was impossible, except at the two shallowest sites (holes 1 and 2), where a heavy base plate was coupled to 60 feet of casing pipe to prevent caving of sand at the top of the hole. The efficacy of this system can be seen by comparing the results at site 2 (Table 2). Holes 2 and 2a were drilled without casing; and after penetrating

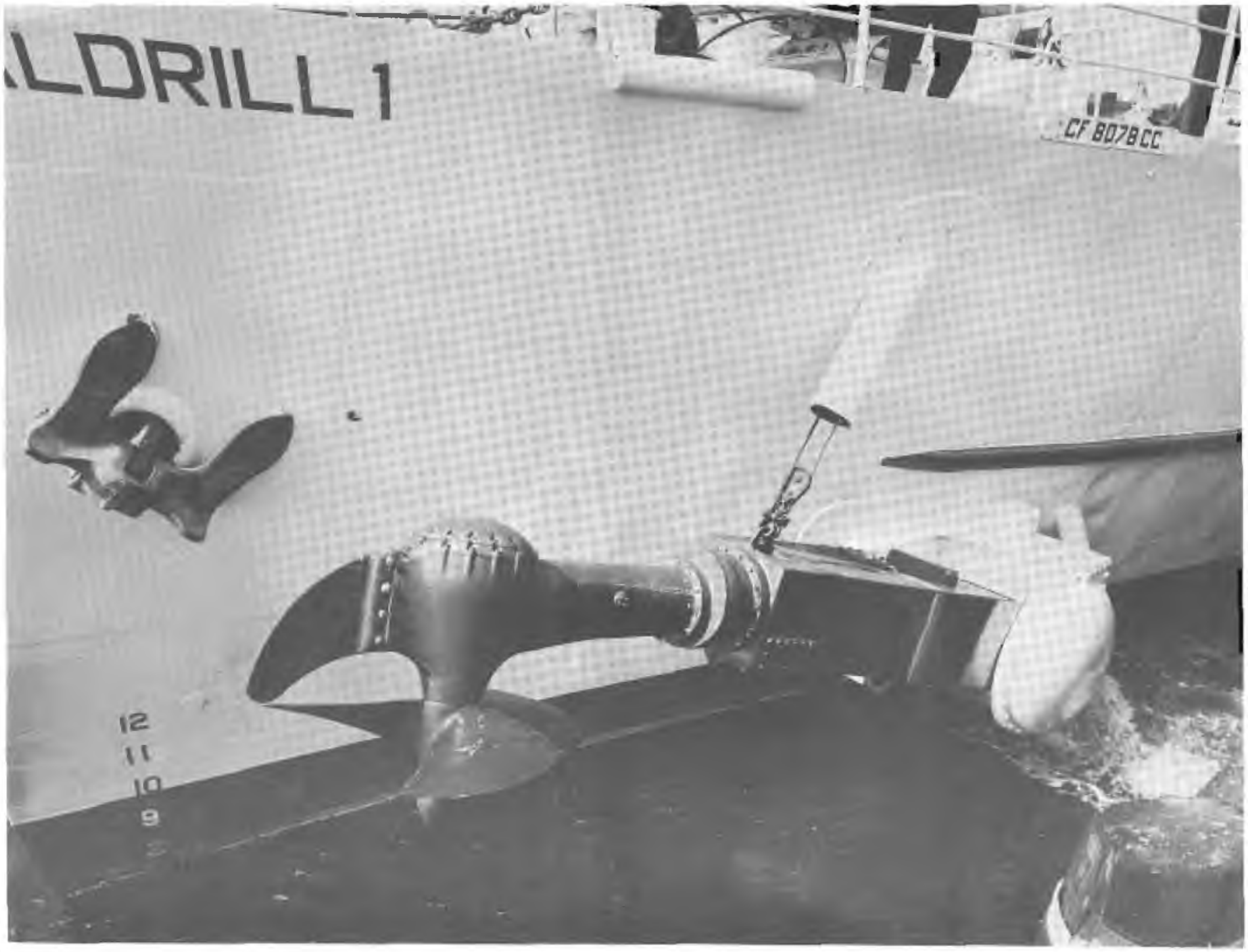

Fig. 3. Harbormaster propulsion unit (port, forward) shown in raised position. The four units are lowered to a vertical position when in use for position-keeping.

Fig. 4. Control console of the automatic-positioning equipment. This unit contains the analog computer plus manual controls for dynamic position keeping over the drill hole.

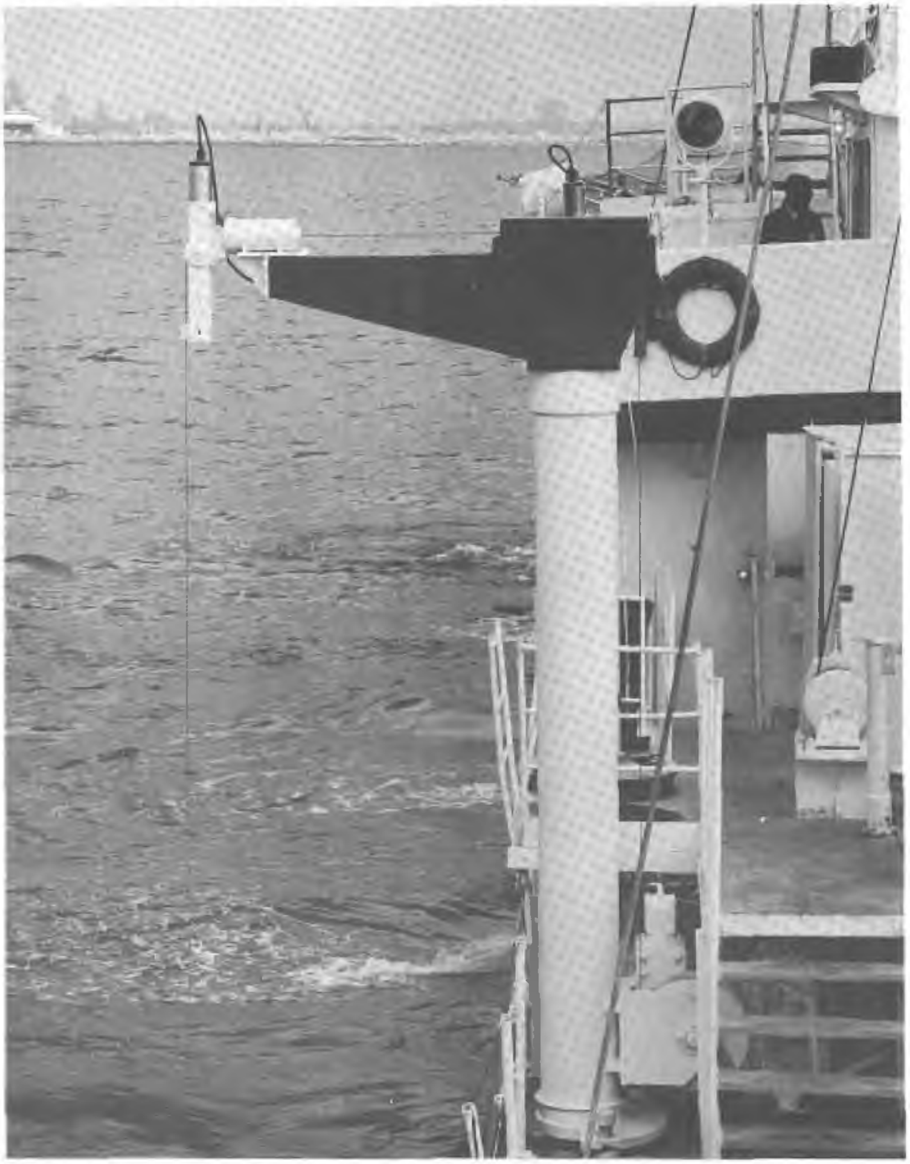

Fig. 5. Constant-tension device, showing the angle-sensing transducer at the outboard end and the taut wire which connects to the anchor on the ocean bottom.

TABLE 2.

Summary of Drilling Data

Site*	Position	Date	Ocean Bottom Depth (m)	Maximum Surface Current Velocity (cm/sec)	(Dir.)	Hole No.*	Bit Type	End of Operation	Interval Drilled (m)	Interval Cored (m)	Total Hours Drilling & Coring	Core Recovery %
1	30°33'N	4/28	25	13-36	Various	1	Roller	Bad weather-pulled out	0- 7.6	7.6-135.6	37.5	32.8
	81°00'W	5/1			- Tidal	1a	Roller	Logged (G)**	0-121.9	121.9-277.4		
2	30°21'N	4/18-21	42	52	Various	2	Diamond	Pulled out	0- 19.8		31.5	23.5
	80°20'W			(est.)	- Tidal	2a	Roller	Logged (G)**, backed off	0- 17.4	17.4-173.4		
	30°20'N	5/10-11	46	26-41	Various	2b	Roller	Logged (G)** (V)***	0- 15.2	15.2- 68.6	21.0	
	80°20'W				- Tidal				68.6- 76.2	76.2- 88.4		
									88.4-146.3	146.3-152.4		
									152.4-158.5	158.5-320.2		
5	30°23'N	4/22-26	190	72-144	N	5	Roller	Strong current-pulled out	0- 9.1	9.1- 30.5	56.5	55.0
	80°08'W					5a	Roller	Plugged - pulled out	0- 17.7	17.7- 57.3		
						5b	Diamond	Plugged - pulled out	0- 50.6	50.6-100.6		
						5c	Roller	Logged (G)**	0- 97.5	97.5-171.6		
										171.6-245.0		
										Intermittent		
6	30°05'N	5/7	805	46	N	6	Roller	Drill tubing broke		0-119.7	17.5	43.5
	79°15'W											
4	31°03'N	5/12	885	33-52	NNW	4	Diamond	Poor recovery-pulled out		0- 91.4	57.0	24.5
	77°45'W					4a	Roller	Fouled taut line		surface		
	31°02'N	5/13-15	892			4b	Roller	Exhausted mud		0-178.3		
	77°43'W											
3	28°30'N	5/3-5	1032	32-50	NNW-NNE	3	Roller	Logged (G)**		0-178.3	40.5	67.6
	77°31'W					3a	Diamond	Computer problem - pulled out	0-170.7	170.7-173.7		

* Site number will be identical with hole number as listed on Core Log sheets.

** Gamma-ray log

** Velocity log

173 meters, the drill tubing became stuck and the tools were lost in backing off. Later, at the same site using 60 feet of casing, hole 2b was drilled to 320 meters with no serious caving or sticking. Only minor sticking and caving occurred in the calcareous ooze at the holes of the Blake Plateau. The parts of the drill string used in the drilling and coring are listed in Table 3. The typical drill string is shown schematically in Fig. 6 and is shown together with the base plate in Fig. 7. For most holes coring or attempted coring was continuous after spudding 20 to 60 feet into the sea floor. Cores were obtained with a wire-line core barrel that was dropped through the drill string to a clamped position at the bottom. It was retrieved, usually at 10-foot intervals of drilling, by a weighted wire line dropped through the tubing.

The rock or sediment core was extruded by hydraulic pressure applied to a rubber piston; a few cores were pushed out by a wooden pole applied to the same rubber piston. Cores were extruded into plastic-covered half-round galvanized-steel trays 5 or 10-feet in length and carried to the shipboard laboratory for description and sampling.[1/] Fig. 8 shows the extruding operation and shipboard core laboratory.

After description, the cores were cut into 2-1/2-foot lengths, enclosed in polyethylene lay-flat tubing, and heat sealed. These lengths were placed in 4-section corrugated cardboard boxes (holding up to 10 feet of core), and all boxes were stored in a refrigerator at 40°F. Upon completion of the cruise, the cores were transferred to permanent storage at the University of Miami - Institute of Marine Science. Except for the time during which cores were split and repackaged, they have been stored at approximately 40°F in sealed polyethylene sleeving.

Core recovery ranged widely, depending on the type of sediment and the bit. It was best in soft unconsolidated silts, clays, and calcareous oozes drilled by a Reed roller bit. It was poorest in well indurated chert or limestone, or in unconsolidated sand. Several different types of core catchers, used separately or in combination, helped retain core. A diamond drill bit and core-barrel assembly were less successful in recovery of core -- particularly in soft sediment. This was due in part to the placement of the inner core-barrel

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[1/] Some sampling for water content and organic materials was done on board because these samples required freezing.

TABLE 3.

DRILL STRING
(listed in ascending order)

1. One Hycalog PC6R diamond bit 7-5/8" x 1-3/4" or Reed PC2 hard-formation roller bit 7-5/8" x 2".

2. One Hycalog wire-line core barrel assembly 15-1/2' x 5-3/4" o.d. outer barrel with 12' x 2-5/8" o.d. x 1-3/4" i.d. inner barrel or Reed PCC wire-line core barrel assembly 14-1/2' x 6" o.d. outer barrel with 10' x 2-3/8" o.d. x 1-13/16" i.d. inner barrel.

3. One, two or three drill collars 30' x 6" o.d. 72 lb/ft.

4. One or two Baash-Ross type BPS bumper sub(s) 5-1/2" o.d. x 3" i.d. x 5' stroke.

5. One joint acme thread drill pipe 30' x 4" o.d.

6. To the surface -- joints of acme thread drill tubing 30' x 3-1/2" o.d.

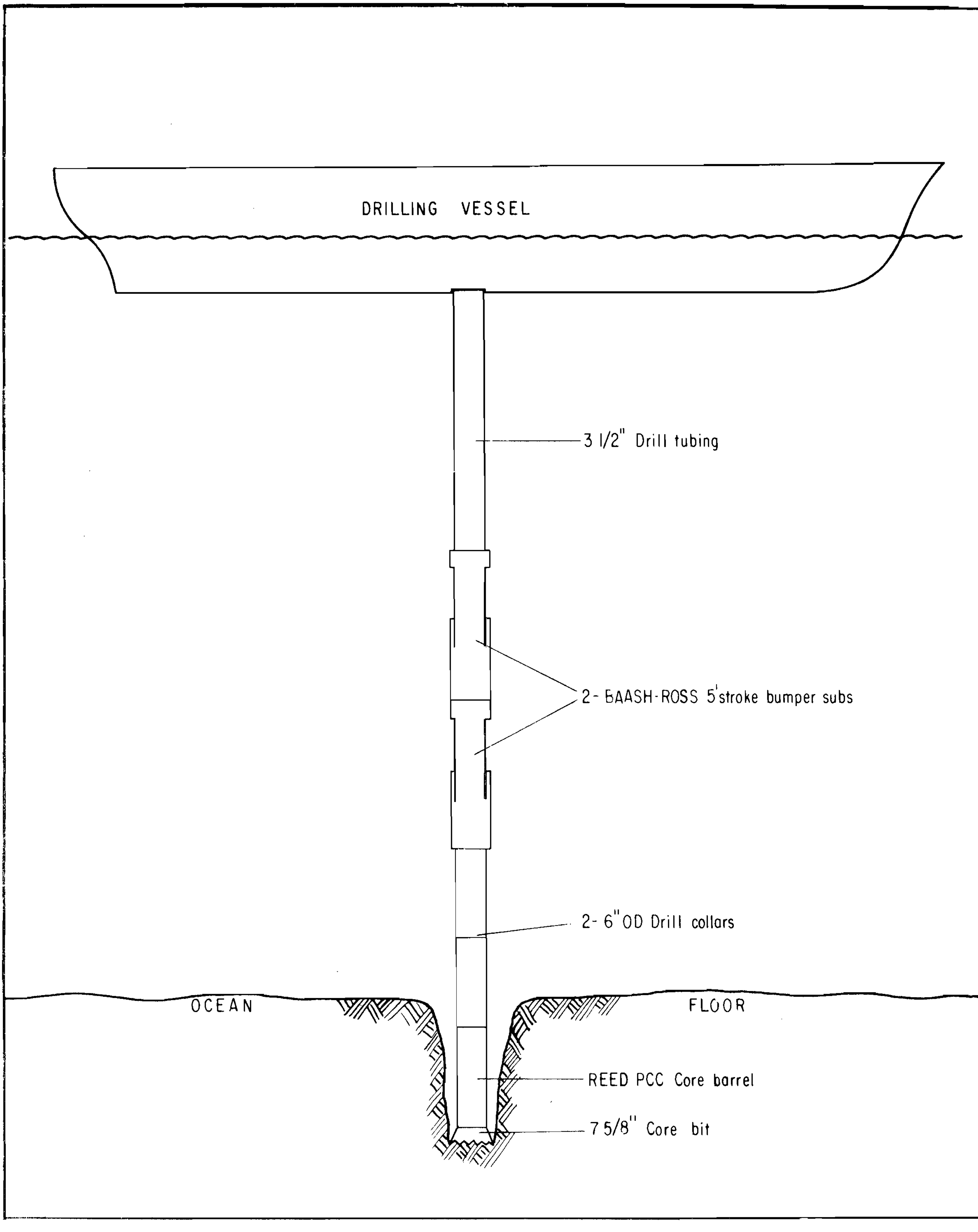

Fig. 6 - Drill String

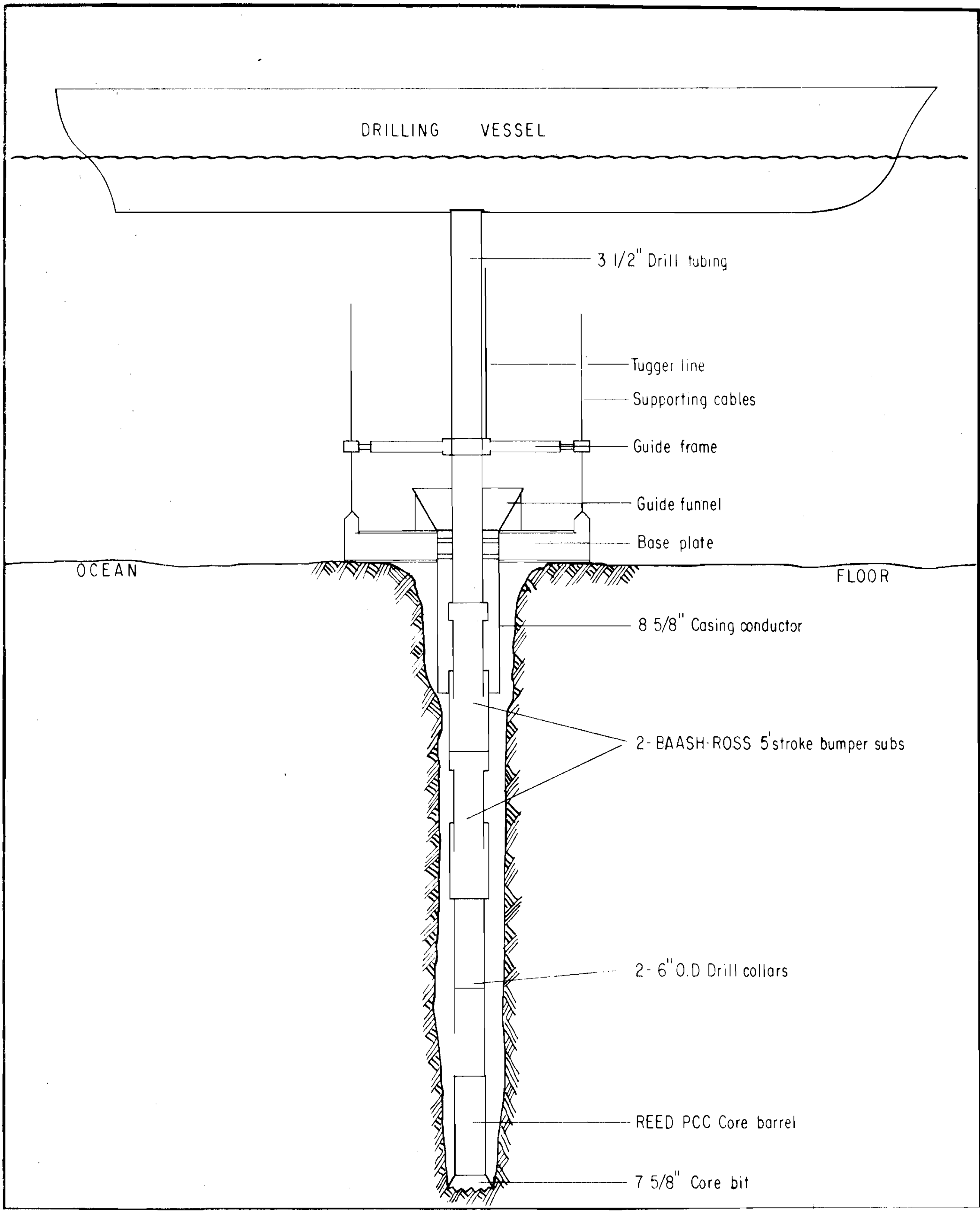

Fig. 7 - Drill String and Base Plate

(Left) Core being extruded on the deck of CALDRILL at site 4.

(Below) Core examination in the laboratory aboard CALDRILL.

Fig. 8

cutter head just above the drill-bit orifice, where it is subject to the washing effects of the circulating fluid. The cutter head of the Reed inner core barrel projects 1-3/4" below the roller bits, hence washing effects are less. Rock cores obtained with the diamond bit were less broken up than similar material taken with the roller bit, i.e. interbedding of limestone and chert is preserved in diamond cores.

Length of extruded core ranged from a few inches to 11'3". Core lengths in excess of 10 feet were due to stretching of the core during extrusion. Occasionally, intervals smaller than 10 feet were drilled, and a few of these cores were longer than the interval drilled; this may be due to stretching or to an inexactness in fixing the interval cored. Core diameter ranged from 1-3/8" (diameter of cutter head) to almost 2", depending on the softness of the material cored. Cores through chert, siliceous limestone, and dolomite were of minimum diameter. Cores of soft ooze and clay, when extruded, were usually larger than the minimum diameter of the inner core barrel. Flowage of soft sediment into the barrel was indicated in a few cores by a concentric structure, wherein a central core of better compacted sediment is surrounded by a sheath of soft sediment. Flowage structures and draping of stratification at the core periphery could be seen on the open cuts of split cores. During shipboard logging, a coating of recent foraminifera and broken shell debris was noted on the outside of some cores; apparently some detritus washed down the sides of the hole and was plastered up the side of the core before retrieval took place. The greater ages of microfossils in the central undisturbed part of the core attest to the incompleteness of flowage.

Subsequent packaging, shipping, and splitting of the cores has resulted in a shortening of 0 to 36% (average 9.6%[2/]) below the lengths measured during shipboard description. The remeasurement took place several weeks later at Miami shortly after the cores were split. In the intervening time, cores had been packaged, shipped, split and repackaged. Some telescoping or flowage apparently occurred. Only most recent values of core length are given in the preliminary log for the interval drilled.

Though cores were still moist several weeks after drilling,

[2/] The figure is the arithmetic average of 100 cores originally 5 feet or longer.

minor color changes were noted at the edges of some cores of noncalcareous clay; the change probably resulted from a reaction with air.

Approximately 2052 meters of drilling was done, during which a total of 1433 meters of coring was attempted with a total recovery of 513 meters. Core recovery averaged 36% overall; best recovery (46%) occurred in the soft formations of silt and clay, whereas poorest recovery (22%) was in hard layers of chert and dolomite. Recovery averaged 28% on the continental shelf, 55% on the Florida-Hatteras Slope, and 38% on the Blake Plateau.

The project had the use of the drilling vessel CALDRILL I for 720 hours, beginning at 1200 hours 17 April and ending at 1200 hours 17 May. A cruise narrative, covering the work done aboard the M/V CALDRILL I during this period, is presented in Appendix A. Table 4 summarizes the time distribution of activities during this period.

TABLE 4. TIME DISTRIBUTION - JOIDES PROJECT

Category No.	Description	Time in hrs	% Total Time
1.	Investigation of Location Checking currents Positioning ship Re-positioning ship Taking dart cores Lowering taut line Taking grab samples Lowering harbormasters	34.25	4.7
2.	Preparation on Location for Drilling Making up tools Running tools to bottom Setting base plate Running casing	43.50	6.0
3.	Drilling and Coring From the Driller's Log it is not possible to make an accurate break between Drilling Time and Coring Time.	261.50	36.3
4.	Recovery of Tools and Equipment Pulling out of hole Raising harbormasters Raising base plate Changing bits Retrieving taut line	47.25	6.6
5.	Logging	29.00	4.0
6.	Drilling Shut Downs Repair time Spotting mud for logging Stuck pipe Fresh-water aquifer tests Plugged bit Pulling up tools - bad weather	32.50	4.5
7.	Time in Port Loading fuel, supplies & equipment Setting up equipment aboard ship Unloading	102.75	14.3
8.	Moving From & to port & between locations	169.25	23.6
	TOTAL	720.00	100.0

CORE DESCRIPTION

The JOIDES cores were described and sampled on shipboard for lithologic and faunal information. The lithology was rechecked by examination of the split cores at the University of Miami depository after the completion of the field work. The preliminary graphic JOIDES core logs for each of the holes are presented in Appendix B of this report.

These logs are intended to provide a general description of the stratigraphy for the interval drilled. More detailed description of individual beds is not feasible on the scale of this log, though it has been made on the original core description during the cruise. The descriptions are representative of the sections where core recovery was high. Where only a small amount of material was recovered, the core is probably not representative. This is especially true where the bit took a long time to drill an interval and only an incomplete core plus scattered chips of chert were recovered.

Certain symbols, abbreviations, and classifications have been used to describe lithology. They are necessary to get in more information and to make it more accurate -- particularly in view of recent advances in carbonate petrology. The abbreviations given on the next pages (Table 5) are taken mainly from Rusnak and Luft (1963), but have been supplemented by abbreviations of Maher (1964) and some devised by the author.

ROCK AND SEDIMENT NAME

Sediment and rock names are given in the first column on the left-hand side of the form. They are based on core descriptions made aboard ship and during reexamination of all cores after they were split. The designation rests on descriptive properties given in abbreviated form at the right side of the log. Three main properties used to affix a name are induration, composition, and texture.

Induration: - The degree of consolidation determines whether the material is considered a rock or sediment. The terms defined below are taken from an informal guide used by the Water Resources Division of the U. S. Geological Survey, as generously provided by R. H. Meade. For the most part, the first three terms are applied to sediments and the last three to sedimentary rocks.

TABLE 5. LIST OF ABBREVIATIONS

Biological Terms

Algae	Alg
Bryozoan	Bry
burrows	burw
coccolith	cclh
coral	cor
Echinoid	Ech
Forams	F
gastropod	gstr
mollusk	mlsc
organisms	org
Ostracods	Ost
pelecypod	plcy
plant	plt
Pteropod	Pt
preserved	prsvd
Radiolaria	R
shell (y)	shl (y)
skeletal	skl
spicules	spcl
Halimeda	Hal

Directional Terms

bottom	bt
horizontal	hor
lower	lwr
middle	mid
near	n/
parallel	//
perpendicular	I
plane	pln
uniform (ly)	unfm (y)
upper	upr
variable	var
vertical	vert

Mineralogical Terms

calcite	cal
clay	cl
dolomite	dol
dolomitic	dolic
ferruginous	fer
glauconite	glauc
limestone	ls
limonite	lmn
manganese	Mn
marcasite	mrcs
mineral	mnrl
mineralization	min
phosphate, phosphatic	phos
pyrite	pyr
quartz	qtz
siderite	sid

Color Terms

black	blk
blue	bl
brown	brn
dark	dk
gradational	grdl
gray	gy
green	gn
light	lt
medium	md
mottle, -d	mot
olive	ol
orange	orn
speckled	spec
stain (ing)	stn (g)
variegated	vrg
white	wh
yellow	yl

Lithologic Terms

arenaceous	aren
argillaceous	argl
asphaltic	asph
calcareous	calc
carbonaceous	carb
cement	cmt
cherty	chty
clay	cl
detrital	detr
micaceous	mic
oolitic	ool
pisolitic	pis
quartzose	qtzs
rock (s)	rk, rx
sand (y)	sd (y)
sandstone	ss
shale	sh
siliceous	sil
silt (y)	slt (y)
siltstone	sltst
tuffaceous	tuf
volcanic	volc
vugs, vuggy	vug

Quantitative Terms

abundant	abu
common	cm
concentration	conc
concentrated	contrd
disseminated	dism
flood	fld
fraction	fxn
highly	hi
large	lrg
light	lt
medium	md
minute	min
moderate	mod
prominent	prmt
rare	r/
scarce	scr
scattered	sca
slight (ly)	sl (y)
small	sm
some	s/
strong (ly)	strn (y)
trace	tr
uniform (ly)	unfm (y)
variable	var
very	v

Miscellaneous Terms

admixed	adm
and	&
angle	∠
apparent	apr
at	@
average	ave
broken	brkn
complete (ly)	cpl (y)
debris	deb
diameter	diam
discontinuous	dsct
distinct	dst
estimate (d)	est
faint	fnt
from	fr
impression	imp
indistinct	indst
irregular	irrg
material	mtrl
mixture	mxt
number	#
odor	od
open space	o-s
oxidation	oxn
oxidized	ox
partial (ly)	prt (y)
partly	pt
percent	%
poor (ly)	pr (y)
preserved	prsvd
range	rng
regular	reg
residue	res
solution	sol
strength (compressive)	S
similar to	~
well	w
with	w/
zone	zn

Textural and Structural Terms

aggregate	agr
angular	ang
bedding	bdng
clear	clr
cloudy	cldy
coarse	crs
compact (ed)	cpt (d)
composite	comp
concretion	cncr
contact	ct
cross-bedded	x-bd
cryptocrystalline	crpxl
crystalline	xln
crystal	xtl
dense	ds
disseminated	dism
distributed	distrib
disturbed	dstb
fine	fn
flake	flk
friable	fri
frosted	fstd
fracture	frac
fragment	frag
gradational	grdl
graded	grd
gradually	grdy
grain	grn
granular	grlr
granule	grnl
gravel	grv
hard	hd

indurated	indur
interbedded	intbd
interlayered	intly
interstitial	intstl
irregular	irrg
lamina (ted)	lam (d)
layer (ed)	lyr (d)
loose	l/
lumps	lmps
massive	msv
matrix	mtx
medium	md
nodule	nod
oolite	ool
parting	ptg
pebble	peb
pebbly	pbly
pellet	pel
plastic	plas
polished	poled
porous	por
regular	reg
replacement	repl
rock (s)	rk,rx
round (ed)	rnd (d)
sharp	shp
shell (y)	shl (y)
soft	sft
sorted, sorting	srt (g)
stain (ing)	stn (g)
streak	stk
stringer	strg
structure	str
subangular	sbang
subrounded	sbrd
texture	text
thin	thn
thin-bedded	t-b
tight	t/
unconsolidated	uncons
uniform (ly)	unfm (y)
void	v/

Unconsolidated - no cementation or compaction; loose, may be dug out easily.

Plastic - sediment may be molded between fingers into long slender ribbons.

Compacted - coherent fine-grained masses which may be broken easily.

Friable - coherent masses (generally in sand range or coarser) which may be broken, but in which individual grains may be dug out with difficulty.

Firm - coherent masses which may be broken by hand only with great difficulty.

Hard - rock-like; hammer needed.

Composition and Texture: - Estimates of major and minor components were made with a binocular microscope. Where percentages are given, visual-estimate charts (Folk) were used. Some observers preferred to use a semi-quantitative terminology, and the one given by Rusnak and Luft (op cit) was used.

Percent	Designation
More than 60	flood
30-60	very abundant
10-30	abundant
5-10	common
1-5	scarce

Some of the more significant components were used as modifiers of the rock or sediment name. When time permitted, more complete descriptions of minerals and biogenic components could be provided; these are given in the right-hand side of the core log, and they are separated in the description by semi-colons. Phosphate was detected as a yellow precipitate with a solution of ammonium molybdate and nitric acid.

Grain size (modal) was estimated by use of a grain-size comparator (coarse silt to granules) and the relative sorting was also noted. Besides the dominant grain size, prominent secondary admixtures (silty, sandy) are listed. If the sediment was obviously polymodal, this fact also is noted.

Classification of Noncalcareous Sediment: - For sediment with less than 30% carbonate, the Shepard (1954) classification was used. The designations in the core log are only approximate because the estimates of carbonate (as determined by watching a weak hydrochloric acid react with the sediment) were crude. Where calcareous shell material was evident, "calc" is used as a modifier in the descriptive section of the log.

Classification of Calcareous Sediment: - The following charts provide terms for calcareous sediment (30% or more carbonate). For fine-grained sediment, the term "ooze" is used, and boundaries follow the classification of Rusnak and Luft (op cit); modifiers given by Riedel et al (1961, p. 1793) are used.

FINE

Carbonate 30% plus Less siliceous organisms	Carbonate 30% minus Siliceous organisms - 30% plus	Carbonate <30% Si. organisms <30% Reddish brown color
calcareous siliceous ooze	siliceous calcareous ooze	red clay

Coarser sediment is referred to as "sand" or "gravel" and modified by Grabau (1904, p. 228-247) terms to point up the calcareous nature of detritus. In addition, terms "biogenic", "oolitic" and "lithic" are employed to show the type of calcareous fraction. Grabau's designations originally were intended for sedimentary rocks, but they have been used subsequently as modifiers for sediment names (Ginsburg, 1956, p. 2405). General grouping of the types of carbonate are carried over from recent rock-carbonate classifications. In cores where a group of animals dominate (Foraminifera - for example), the kinds may also be included as a modifier in the descriptive section to the right side of the log.

SEDIMENT: CARBONATE - rich (more than approximately 30% carbonate)

COARSE

Main Carbonate Type	More than 30% fragments above 3mm*	More than 50% sand size carbonate
Biologic fragments	Biogenic calcirudaceous	Biogenic calcarenitic sand
Oolites		Oolitic calcarenitic sand
Limestone rock fragments	Lithic calcirudaceous gravel	Lithic calcarenitic sand

* Amounts of gravel take precedence.

Classification of Limestone: - Recent advances in carbonate petrology (See Am. Assoc. Petrol. Geol. Mem. 1 edited by W. E. Ham, 1963) show the need for a closer examination of the texture and composition of limestones in order to classify these rocks in terms which could have genetic significance. The approach is not new; sandstones have been studied in a like manner for the past two decades. Inevitably new terms and classifications are introduced which cause the noncarbonate petrologist some consternation.

For the preliminary JOIDES core log, limestones were described (Table 6) in terms of the Dunham classification (Dunham, 1962, p. 108-121). This scheme was used because it pointed up features which might have environmental significance, it was easy to use on board ship, and it has fewer new terms than many other classifications. Where depositional texture can be discerned, Dunham subdivided carbonate rocks on the relative amounts of grains (defined as larger than 20 microns) and mud (generally carbonate). He and others believe that the proportion of muddy matrix reflects the degree to which bottom waters were agitated by waves and currents during deposition of the lime sediment.

TABLE 6.

CLASSIFICATION OF CARBONATE ROCKS ACCORDING TO DEPOSITIONAL TEXTURE

Depositional Texture Recognizable					Depositional Texture Not Recognizable
Original Components Not Bound Together During Deposition				Original Components Bound Together During Deposition	Crystalline Carbonate (Subdivide according to classifications designed to bear on physical texture or diagenesis.)
Contains mud (particles of clay and fine silt size)			Lacks mud and is grain supported	As shown by intergrown skeletal matter, lamination contrary to gravity, or sediment-floored cavities that are roofed over by organic matter and are too large to be interstices.	
Mud-supported		Grain-supported			
Less than 10% grains	More than 10% grains				
Mudstone	Wackestone	Packstone	Grainstone	Boundstone	

from (Dunham, 1962)

COLOR

Color designations are shown on the third column from the left. Where designations are absent, it may be assumed that the last one given immediately above the blank area applies to the interval in question. Colors are in terms of hues, chromas (richness or saturation), and relative lightness (See Goddard et al, 1948, for a brief explanation of the color scheme). A Munsel Book of Color - pocket edition - was used to determine the color of the moist cores; the book contains several hundred color swatches and proved to be more than adequate.

STRUCTURE

Bedding, laminations, mottling, and other sedimentary structures are given to the right and were described when the cores were split at Miami after the cruise. McKee and Weir (1953) bedding classification (Table 7) was followed for descriptive terms except for "massive". This term is used here to indicate an apparent absence of sedimentary structure in a core.

RECOVERY LOG

The amount of core recovered for each interval drilled is shown in the narrow column labeled "Rec."; it is indicated by the blackened portion of the column. Intervals where coring was attempted but no core was recovered are shown by a check-pattern; where coring was not done, the column is blank. In a drilled interval where core recovery is very nearly complete (7 feet or more in a 10-foot section), the missing portion is assumed to be absent from the top of the cored interval, as indicated on the log. The drilling procedure of pumping sea water through the drill string before core retrieval, and before drilling the next interval, probably caused some washing of the uppermost part of the next interval. Where less than 7 feet of core was recovered, its exact depth in the interval is not certain, and hence the position of distinctive horizons cannot be fixed with respect to the sea-floor depth or sea level. The position of shorter cores is indicated schematically in the middle of the drilled

TABLE 7.

CLASSIFICATION OF STRATIFICATION

Terms to describe stratification		Terms to describe cross-bedding		Thickness	Terms for splitting property
Very thick-bedded	Beds	Very thickly cross-bedded	Cross-beds	More than 120 cm	Massive
Thick-bedded		Thickly cross-bedded		120 cm (About 4 feet) to	Blocky
Thin-bedded		Thinly cross-bedded		60 cm (About 2 feet) to	Slabby
Very thin-bedded		Very thinly cross-bedded		5 cm (About 2 inches) to	Flaggy
Laminated	Laminae	Cross-laminated	Cross-laminae	1 cm (About 1/2 inch) to	Shaly (Claystone & siltstone) Plate (Lime- or sandstone)
Thinly laminated		Thinly cross-laminated		2 mm (About .08 inch) or less	Papery

from (McKee & Weir, 1953)

interval on the log, though its exact position is not known.

GRAPHIC LOG

Lithology is given graphically on the second column to the left. Symbols are self-explanatory by looking at the rock or sediment-type list to the left. Like abbreviations, they are taken mainly from Rusnak and Luft (op cit) and Maher (op cit). In a section where two or more lithologies are present, they are shown schematically in the log; neither the relative position nor the amount of the symbol is intended to represent the exact situation in the core.

AGE

Time-stratigraphic boundaries are indicated in the preliminary log at the selected depths. Values are measured from the sea floor downward. The boundaries kindly were provided for the log by Dr. Tsunemasa Saito (Lamont Geological Observatory) and Louis Lidz (Institute of Marine Science - University of Miami).

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APPENDIX A

CRUISE NARRATIVE

17 April

At 1200 hours the M/V CALDRILL I was turned over to the JOIDES Blake Plateau Expedition with the signing of official papers by the chief scientist for JOIDES and the master of the vessel. Scientific supplies and drilling equipment were loaded aboard by JOIDES and CALDRILL personnel until late evening. The core storage refrigerator and logging winch were secured at this time. New wire was wound on several winches, including a small air winch holding approximately 1500 meters of wire rope for hydrographic work.

18 April

The remaining scientific equipment was loaded, and all JOIDES personnel moved aboard. Logging equipment was checked out and the last of the drilling equipment placed aboard and secured. Difficulties arose with the Loran navigation unit, which could not be repaired on this date (Easter Sunday). An oil leak on the port forward harbormaster unit was repaired. The core storage refrigerator motor was removed for rewinding purposes. Both this motor and the Loran unit were left ashore for repair, to be brought out by the crew boat H. J. W. FAY, which arrived from Miami late on this date. The ship got under way and departed the Jacksonville pier at 1800 hours, proceeding down-river and out to position 2.

This position was chosen over position 1 in that it was somewhat deeper and would allow the position-keeping equipment to be checked more easily.

19 April

At 0200 a position south of position 2 was reached, and dart cores were taken with the Sandline winch while the harbormaster units were being lowered into position. A Van Veen bottom-grab sample taken at this location indicated shell fragments and much calcareous debris. At 0930 the position-keeping equipment was in operation, and preparations were under way to assemble the drill string, using a Hycalog diamond drill bit. The drill string touched bottom at 1130 at a depth of 42 meters. Problems with the circulating pump delayed the spudding-in operation. Considerable sticking and other delays ensued due to loss of circulation and pump troubles. A total of 65 feet (20 meters) was drilled with no core recovery in the shelly, unconsolidated sand. During this time, a bathythermograph observation was made and bottom photographs taken with an underwater camera. The drill string was taken up, and the ship was moved a few tenths of a mile to the north to begin another hole using different equipment. By 2130 drilling had begun with a Reed roller bit in place of the diamond bit. Progress was good, and there was a minimum of sticking. Fairly firm material was encountered about 10 meters beneath the ocean bottom.

20 April

Drilling continued during the night with very poor core recovery. A few fragments of material suggested the beginning of the Miocene beds at approximately 35 meters. At 0815 a change to finer-grained sediment permitted good core returns between about 60-70 meters in material which was identified as Miocene. From about 0900 to 1500 the drilling operation was shut down in order to effect repairs on the draw works and the hydraulic drive for the power swivel. Following these repairs, drilling continued with good recovery and by midnight had reached about 135 meters beneath the ocean bottom.

21 April

By 0800 the drill bit had penetrated to 170 meters, and core recovery remained good. At 0900 sticking of the drill string became serious, and we were unable either to circulate drilling fluid or to rotate the drill string. By 1200 circulation and drilling were still impossible, and it was decided to make a gamma-ray log measurement inside the drill tubing down to the maximum penetration of 173 meters. Because explosive perforating charges for downhole cutting of the pipe had not arrived before our departure from Jacksonville, it was necessary to back off the drill string in an attempt to recover some of the equipment. At 1600 hours this maneuver was undertaken. The results were unsuccessful, and only two joints of tubing were recovered; 19 joints, plus one drill collar, one cross-over sub, one bumper sub, and the Reed core barrel and bit were lost in the hole.

At 1630 hours we got under way for a location 40 miles east of site 6 (Fig. 1), estimated to be nearly in the Gulf Stream axis with a depth of about 600 meters. We arrived on position at 2130 hours and began to lower the taut-line position-keeping equipment. The current at this location was estimated at greater than 154 cm/sec (3 kts). Two problems were recognized: the taut line with only 300 lbs. of line tension could not keep a vertical wire angle in the presence of such a strong current, and the harbormaster units were drawing more than 100% of their rated electrical power, thus taxing the ship's equipment beyond safe limits. It was therefore decided to seek a drilling location farther eastward.

22 April

At 0430 a position was reached roughly 20 miles east of the previous position, but here the current, although a little less, was still far too vigorous to attempt to do any work. The wire angle on the taut line was still far from vertical, and it was determined to move still farther to the east and away from the Gulf Stream axis.

Another unsuccessful attempt was made to use the taut-wire positioning equipment at a location close to site 6. Conditions here, although less vigorous than those previously observed, appeared to be marginal for our equipment. At this location currents of about 100 cm/sec (2 kts) were running toward the north. We took a Van Veen bottom-grab sample and a dart core, using the wire-line winch. It was then resolved to run west to position 5 and to modify the taut-wire equipment for greater tension or less drag.

An experiment, using the existing set-up with a 3/32" wire in place of the 3/16" wire to cut down drag, was unsuccessful because the thinner wire broke in trying to pick up the 250-kg anchor weight that was used. Although the drag of the 3/32" wire was calculated to be only half that of the 3/16" wire, its marginal strength required us to attempt a different modification. The mechanical system of the taut line consisted of a 4-part pulley-block arrangement with a counterweight of roughly 600 kg. Using an anchor of sufficient weight, it was possible with this counterweight system to maintain a constant line tension on the wire to the ocean bottom of about 150 kg. The maximum vertical travel of this counterweight-block assembly was approximately 7 meters, which allowed a total of 27 meters of wire length accumulation. It was decided to reduce the 4-part pulley system to a 2-part system and to increase the counterweight to 650 kg. This allowed the line tension to be approximately 325 kg, and consequently extra anchor weights were added to a total of about 425 kg. While this change reduced the total accumulation of the counterweight system by half (approximately 13 meters), this was not considered serious since the position-keeping equipment was capable of holding the ship within 3% of the ocean depth above the hole. Even in 1000-meters depth (the deepest anticipated) we would be able to move laterally about 20% of the water depth before using more than half of the available accumulation. Special wire of the same strength as the taut wire, but having a smaller diameter (swaged construction),was requested by radio telephone.

By 1500 hours the modifications were completed, and the ship arrived at position 5. The current conditions here appeared to be much like those at the attempted position 6; however, in this location the newly modified taut line was able to perform quite well. A bottom-grab sample was taken and showed coarse, shelly silt. The drill string, using a Reed roller bit, spudded-in at 2015 in a depth of 190 meters for hole 5. Below 25-30 feet into the bottom, core recovery became quite good. However, after about 33 meters of penetration it was necessary to pull out of the hole quickly due to strong currents which were hitting the ship broadside. The problem here was ship's electrical power; the electrically driven harbormaster units were drawing excessive current. With the drill string raised, the ship was turned bow into the current to reduce the forces on the ship's hull. We then spudded-in for hole 5a and began to drill back to the depth where we had stopped coring.

A current meter reading at the surface at 2100 hours revealed a surface current of approximately 100 cm/sec (2 kts) toward the north.

23 April

At 0030 we had drilled back to about 30 meters and had begun to core. At 0430 we had gone into a sandy limestone. At a depth of approximately 67 meters the inner core barrel became stuck at the bottom of the drill string, and it was necessary to pull out to retrieve the barrel. This condition was caused by slumping of sediment down the walls of the uncased hole, creating backflow through the drill tubing, which deposited debris in and around the inner core barrel. To stop the backflow of water while pulling out and replacing the inner core barrel, a wire-line stripper was ordered by radio telephone.

At 0920 we again spudded-in for hole 5b, this time with a Hycalog diamond bit. Current measurements showed a current of approximately 100 cm/sec (2 kts) toward the north. These measurements were made by the chip-log method, using oranges thrown off at the bow of the ship and timed until passing the stern, a distance of 56.3 meters. This proved to be a convenient way to measure surface current while the ship was facing into the stream flow. A couple of dye pellets, inserted beneath the skin of the orange, allowed comparison of the rate of speed of the orange and the dyed water (a rate which was identical) and also provided better visibility by creating a bright yellow spot at the sea surface.

At 1250 hours a hard formation was encountered at 67 meters below the bottom. Drilling continued in this material at a rate of one joint of tubing per hour (10 m/hr). Between 1530-1600 hours a bathythermograph measurement was taken and lowering was made with an *in situ* deck-reading salinometer. At 1640 hours the crew boat arrived, bringing observers from Scripps Institution of Oceanography, the University of Washington, and the U. S. Geological Survey, all of whom came for a single day's visit. At 2100 drilling had reached a depth of 100 meters and was in Oligocene formations consisting of interbedded hard and soft clays. At approximately this depth trouble again occurred in retrieving the inner core barrel, and it was necessary to pull out the drill string. As before, sand had accumulated above the inner core barrel. The drill string was again made up using a roller bit, and we spudded-in about midnight for hole 5c.

24 April

By 0730 we had drilled back to the depth where coring had ceased with the previous string. A chip-log current measurement made at 1000 hours revealed a current of 134 cm/sec (2.6 kts) toward the north. Between 1430-1500 hours a bottom current reading was taken using an inclinometer current meter. This measurement, 30 centimeters above the bottom, revealed a current of 7.5 cm/sec (0.1 kts) in the direction towards the north-northwest. Drilling continued through the day with good recovery. At 2130 the strong currents and rising winds required that the harbormasters draw maximum load on the electrical system in order to maintain position. Under these conditions the forward starboard unit heated up dangerously, activating its thermal overload relay, which removed it from operation. The trouble was caused mainly by sargasso weed sticking around the intake for the heat exchanger on this unit. For about thirty minutes, while the unit was being put back into operation, it was necessary to use manual control in the absence of automatic computer control. By midnight the drilling had reached 172 meters and core recovery was good.

25 April

At 0900 drilling continued at a good rate and with good core recovery. In order to keep the slumping to a minimum, we were spotting mud, a few barrels at a time, upon each recovery of the inner core barrel. A bathythermograph measurement was taken at 0915. At 1000 hours a chip-log surface current measurement showed a current of 72 cm/sec (1.4 kts) toward the north.

At 0900 coring reached below 215 meters and core recovery remained good. To speed the coring operation, it was decided to drill 20 feet and core 10 feet for each 30-foot pipe joint. Fuel, water and mud tanks, located deep in the hull, were becoming depleted, which resulted in progressively raising the center of gravity of the ship and lessening its roll stability. Some delays were experienced during the afternoon because of repairs to the mud pump. At 1830 an angle measurement inside the drill string at 204 meters in the hole revealed that the angle was 6° from the vertical. Drilling and coring were continued to 245 meters, where we stopped in the upper Eocene. At 2100 a gamma-ray log was made inside the drill string down to 245 meters. Later the drill string was removed to just below the top of the hole, and electric logging and velocity logging were attempted unsuccessfully.

26 April

At 0100 the wind velocities had risen considerably and currents were running strong. The logging operations had been completed, and the drill tubing was being brought aboard. Retrieval of the pipe joints was hazardous due to the strong current, which bent the drill string as it passed through the moon pool. Several joints of pipe had to be laid aside due to bending that took place during this recovery. By 0500 all drilling equipment had been laid down and the ship headed for Jacksonville, where it arrived at 2000 hours.

27 April

Additional drill tubing, base plates, casing pipe (for drilling in the coarse, sandy shelf sediment), and ship's supplies were loaded on. Fuel, water and mud tanks were replenished, and at 2300 we sailed from Jacksonville.

28 April

At 0330 the ship arrived at location 1, and preparation was made for assembling the bottom plate and casing pipe. The casing consisted of three 20-foot joints of 8-5/8" o.d. pipe. The base plate had four railroad wheels (one at each corner), used as weights, in addition to its heavy steel framework and guide funnel at the center. Guide lines from the ship to the base plate permitted hole re-entry if necessary. This equipment was lowered at the same time as the drill string, which spudded-in at 1500 hours for hole 1. An underwater camera station was taken during the afternoon and bottom grab samples obtained, which revealed gray quartz sand and shell fragments. The in situ salinometer was used, and a bathythermograph measurement was taken. A bottom current measurement showed less than 10 cm/sec (0.2 kts) toward the north-northwest.

By 1720 hours the drill had reached 20 meters below the sea floor and was in Miocene sediment.

29 April

The drilling and core recovery proceeded through the night at such a rapid rate that it was necessary to purposely slow down the operation in order to keep up with core sampling, description, and packaging. The casing was very effective in preventing slumping at this hole, and there was a minimum of sticking and backflow. By midnight penetration had reached greater than 100 meters, and core recovery had been about 90% from the beginning of this operation. We had penetrated a rather thin section of Oligocene by 108 meters and began to drill the Ocala Limestone, a much harder formation.

While drilling in the upper part of the Ocala, artesian flow of fresh water was observed. Although no packers were used to seal off the aquifer, a head of 30-35 feet above the sea surface was measured. Temperature measurements were taken of the rapidly flowing water, and it was sampled for later chemical analysis.

At about 0430 high winds and strong currents broadside to the ship caused excessive power drain by the harbormaster units. It was impossible to turn the ship to relieve the situation because of the four tugger lines attached to the base plate. Therefore, it was necessary to bring up the equipment. Heavy sea conditions resulted in considerable bent tubing.

At 1030 a bathythermograph measurement was taken, and at 1300 a salinometer profile was run. At 1400 a chip-log measurement of surface current was made, revealing a current toward the east at 26 cm/sec (0.5 kts). At 1600 hours the base-plate equipment had been repaired, and we spudded-in for hole 1a at a position a few tenths of a mile from our first hole. At this time a surface parachute drogue was put out and followed by radar. This drogue used a 16-foot diameter parachute and was observed to move westward and then southward over a period of 8 hours at a rate between 20-35 cm/sec (0.4-0.7 kts).

30 April

By 0430 we had drilled down to 210 meters. At 0600 Worzel, Drake and Gibbon from Lamont came aboard for a one-day visit, arriving in time to witness considerable fresh water flow from the aquifer in the Ocala Limestone and further flow from a level between 250-275 meters in the Claiborne formation; a 3-gallon sample of this water was obtained for chemical studies. At 277 meters drilling was stopped, based on assumptions that the middle Eocene would extend to a considerable distance below this level, and that correlations with nearby land wells were already clear.

A gamma-ray log was run through the tubing; an electric log was attempted with no success. A sound-velocity log with a down-hole hydrophone was also attempted, but the hydrophone malfunctioned and no records were obtained.

1 May

The attempts at logging were abandoned at 0130, the tools were all recovered by 0700, and then the ship turned toward Jacksonville, where it arrived at 1100 hours. In port the bent pipe was unloaded for straightening, and important electronic equipment was obtained. All cores collected up to this time (approximately 1000 linear feet) were unloaded and placed in refrigerated storage ashore. Fuel and water were topped off, and departure was made at 1430 hours with an expectation of staying out for approximately one week. Upon passing the sea buoy, an echo sounder run was begun toward position 3, about 250 miles southeast.

2 May

Position 3 was reached at 1745 hours. At 1930 the taut line was set, and a 4-foot dart core was obtained, revealing tan globigerina ooze. The depth at this position was 1032 meters, the greatest depth to which the taut-wire positioning system had ever been used.

3 May

We spudded-in at position 3 at 0130. It was necessary, however, to pull back the drill string after a few minutes due to uncertainties about ship's drift at this location. In order to insure that we did not drag anchor, we added additional weights down the taut wire and reset the equipment. Following this experience we placed an indicator in the counterweight accumulator to show whether the accumulator might be slipping to one end or another of its travel due to uncontrolled ship's drift. Hole 3 was spudded into finally at 0430, and coring began in globigerina ooze.

At 0819 a bathythermograph observation was made. At 1100 a current chip-log surface measurement revealed a current of about 35 cm/sec (0.7 kts) with considerable variability in direction. A parachute drogue was deployed at 1600 at a depth of 366 meters, revealing a current toward the northwest at approximately 154 cm/sec (3 kts). Core recovery was good, and by 2230 we were 140 meters into the bottom. The globigerina ooze at this site held up extremely well while drilling, and there was no need for spotting mud to preserve the hole; salt water circulation was quite adequate to maintain good drilling conditions. No difficulties were encountered in position-keeping in this 1000-meter depth. Tidal changes of current direction were observed, and it was necessary to change the ship's heading occasionally as much as 60°, but in such a depth it did not create a problem between the taut wire and the drill string.

4 May

At about 0530 at a depth of 152 meters chert beds were encountered, and drilling rates dropped greatly. Wearing-out of the hard-formation roller bit in the chert made drilling progressively slower. Further, wearing-out of the hole-gauging cutters created an increasingly smaller hole and caused high torque and sticking of the drilling tools. These conditions made it necessary to cease drilling at 178 meters, still in the chert and ooze of the lower Eocene. At 1700 hours the core tubing was withdrawn to near the top of the hole, mud was pumped, and gamma-ray logging was begun. Another attempt at velocity logging was unsuccessful, and the tools were withdrawn and laid down by 1830 hours.

5 May

At 0030 we began to redrill hole 3a with a diamond bit. No coring was contemplated until the depth achieved with the roller bit on the previous day was reached. The drilling operation was stopped several times during the morning because of pump repairs. At 1200 hours coring was begun at a depth of 170 meters. At 1430, after coring only a few meters, a failure occurred in the computer portion of the automatic positioning equipment, and the ship drifted off dangerously from position. The situation was partially corrected by hand control, but the anchor had dragged an unknown distance from its original position, and hence the ship was displaced above the hole. Reluctantly, tubing was brought up at about one joint per minute until it was all stacked at about 1700 hours. No pipe was bent or tools lost in this operation. The diamond bit appeared to be about half used up after penetrating through about 25 meters of interbedded chert. It was decided not to redrill this hole a third time, because it would have taken at least 12 hours to obtain only an additional 30 meters of core, after which the diamond bit would have been worn out. Considerable difficulty was encountered in bringing back the taut-line anchor, but this was aboard by 2100 hours.

6 May

The conditions at a location between position 3 and 6 were tested on the run back toward Jacksonville. At one position (29°24.5'N, 78°36'W) currents were too strong to permit position-keeping. A chip-log current measurement revealed a surface velocity of 75 cm/sec (1.5 kts) toward the south at this location, where the depth was about 800 meters. Although not as strong as surface currents at some sites already worked, this appeared to be a deep-reaching current, which created severe bending in the drill string after about 100 meters of tubing had been put in the water. This site was abandoned, and the ship proceeded towards position 6, beginning at about 1800 hours. Site 6 was considered important in that a Woods Hole Oceanographic Institution seismic profile revealed a shallow reflector nearly intersecting the ocean bottom near this location.

7 May

At 0005 hours we arrived at position 6 and followed the ship's drift on Loran in order to estimate the current conditions. At 0100 the taut-line was put down, and at 0200 the automatic positioning had been set in operation. At 0245 all tools were in the water, and we spudded-in at 0522 in an ocean depth of 805 meters for hole 6. The spudding-in operation indicated a hard bottom, and a small amount of manganese oxide cemented ooze was recovered in the first core. We began drilling almost immediately in Oligocene sediment, which continued down to 55 meters. At 1130 hours surface current measurements were 47 cm/sec (0.9 kts) toward the north. At 1400 two Van Veen bottom-grab samples were taken, revealing hard manganese oxide cemented ooze. At 1500 hours the crew boat arrived from Jacksonville, bringing additional weights for our counterweight constant-tensioning device. At 1600 hours drilling had reached to about 100 meters and was rather slow. Considerable yawing of the ship was experienced, probably due to the large amount of drag affecting the drill string as compared to the drag on the ship's hull. It would probably have stabilized somewhat if the ship had been laid broadside to the current; such a heading with respect to the current would have put a greater percentage of the drag on the ship and, hence, under direct control of the positioning equipment. Core recovery was poor, and the sensing of the drill bit on bottom was difficult due to the extreme bowing of the drill string in the presence of the strong and deep-reaching current. These problems were increased by the erratic swinging of the ship.

At about 100 meters chert layers were encountered, and the drilling slowed down even further. Below 100 meters the interbedded chert became more like massive chert, and the rate of penetration decreased still further. At about 118 meters we broke through the chert and were in softer ooze, identified as Paleocene. While drilling our first pipe joint in the Paleocene ooze, a short 6-foot pup joint (used between the uppermost length of tubing and the power swivel) broke while turning in the spyder or guide above the moon pool. This joint and the other tubing in the string had been forced against one side of the spyder during much of the drilling due to strong currents. In particular, this joint had been work-hardened, because it was repeatedly brought into the spyder after the lowering of each joint of pipe. Obviously, in conditions such as this, a tapered shoe is needed in order to spread the stress over a greater area. The loss included all tools plus 95 joints of tubing. Our capability of continuing operations in deep water was in jeopardy at this point; we had 67 joints of tubing aboard with 53 joints back in Jacksonville for a total of somewhat more than 4000 feet of drill tubing. It was determined to return to Jacksonville immediately.

8 May

At 1500 hours the CALDRILL I was tied up and began to load pipe and mix mud with the expectation of leaving the following morning.

9 May

Delays in the arrival of food and fuel prevented departure until 1730 on this date.

10 May

Redrilling and deepening of site 2 was attempted next. By 0115 the harbormasters had been put down and the computer and position-keeping equipment stabilized at site 2 in a depth of 46 meters. The base plate and casing pipe were lowered, and the drill string was spudded-in at 0445 for hole 2b. At 1030 alternate coring and drilling had penetrated about 150 meters into the ocean sediment. At 1230 hours we had reached 182 meters of penetration and had tested for fresh water without success.

11 May

Drilling and coring continued during the night and stopped at 0130 at a depth of 320 meters in beds of middle Eocene age. It did not seem feasible to drill through the remaining Eocene section (estimated to be another 300 meters). Therefore, drilling was stopped at this time. A gamma-ray log was taken through the pipe and the pipe withdrawn to near the top of the hole. A velocity log was successfully taken between about 240 and 60 meters; shot arrivals were recorded at 15-meter intervals in the hole. This work was completed by 1030, and after drill string retrieval, the ship headed for position 4.

12 May

At 0030 hours an attempt to hold the ship at a location about 30 miles to the west of position 4 was not successful due to strenuous currents. At 0730 the taut-wire and positioning equipment were set up in a depth of 885 meters. The diamond bit was used and spudded-in at 1050 for hole 4. At 1115 hours a Van Veen bottom-grab sample was taken. Little or no core was obtained through the afternoon, and the penetration rate was very slow. After 90 meters of penetration, sticking developed, and at 2130 we began to pull out of the hole.

13 May

All tools were taken in and laid down by 0030. The diamond bit was found to be in good condition, and it was difficult to understand why the drilling rate had been so poor. The roller bit and equipment were set up and lowered to the bottom, but immediately became entangled with the taut wire and had to be brought back. This was called hole 4a since a small sample of bottom sediment was obtained when the drill bit touched bottom. The taut-wire anchor was replaced at a position about a mile from the original spot, and we again set up for drilling. At 1105 we spudded-in at the new position in a depth of 892 meters for hole 4b. In this drill string a third drill collar was used in order to create greater bit weight.

14 May

During the day strong winds (20 kts) from the north helped to create a choppy sea against a current to the north estimated at 35 cm/sec (0.7 kts). At 0630 the drill reached the lower Paleocene (88 meters), attended by good recovery throughout this hole. Hard siliceous limestone from the lower Eocene (80 meters downward) made for very slow drilling during the day. Drilling recovery was commensurately poor, roughly 1/2-meter per 3-meter core barrel, and the drilling rate was a little under 3 m/hr.

At 0900 a bathythermograph measurement was made, and at 0930 a chip-log measurement showed surface current to be 35 cm/sec (0.7 kts) to the north-northwest. At 1030 a 28-foot parachute drogue was launched at a level of 380 meters and was observed to move at 20 cm/sec (0.4 kts) toward the north-northeast. Sticking and slumping became a problem as the drilling progressed, and it was necessary to spot 6-8 barrels of mud for each core taken. The mud was required after each core retrieval to prevent collapse of the walls in the upper portion of the hole. However, the hole-gauging teeth on the roller bit did not seem to have degraded since we did not experience high torque and sticking in the hole.

15 May

At 0100 hours our mud supply was exhausted except for 50 barrels saved for logging the hole. The final depth was 178 meters. The hole was filled with mud and logging was attempted, but a failure in the logging cable prevented logging of this hole. By 1730 all tools were recovered, and the ship proceeded toward Jacksonville.

16 May

We arrived in port at 2000 hours.

17 May

By 1200 hours all scientific equipment had been removed from the ship, and papers were signed releasing the vessel back to the owner.

APPENDIX B.

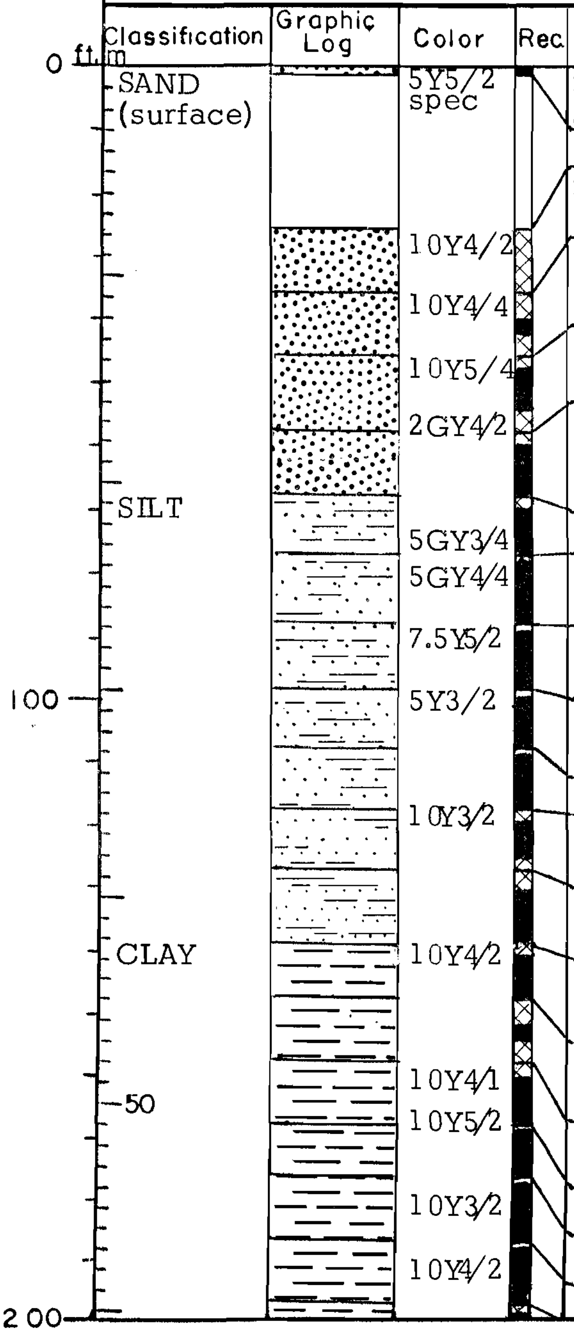
PRELIMINARY JOIDES *CORE LOG*-HOLE 1

AREA: Inner continental shelf east of Jacksonville, Florida

LAT. 30° 33'N **LONG.** 81° 00'W **DATE** 4/28 to 5/1 1965

LOGGER(S) Schlee, Wait, Frothingham **DEPTH** 25 m

REMARKS: One redrill of hole with a slight movement of ship between drill holes; first hole achieved a depth of 135.6 m.



Description

fn to md grn, w srt, qtzs, shly, uncons; qtz-fld, crl to cldy; shl-plcy abu; dk mnrl-scr

fn to md grn, slty, qtzs, phos, uncons; phos-abu, as dk gy grns; few frag of ss; stk of wh cl

md to fn grn, slty, pry srt, qtzs, calc, msv, sl H_2S od; qtz-fld; phos and glauc (?)-cm; sh frag-plcy

fn to md grn, slty, qtzs, calc, msv, uncons, H_2S od; F-abu

v fn grn, slty, calc, qtzs, phos, strn H_2 S od; phos and dk mnrls-cm; post Miocene-Miocene boundary at 20.4 m.

crs grn, sdy, calc, qtzs, phos, cptd, H_2S od

sdy, strny calc, phos, mot, plas to cptd, strn H_2S od; F cm to abu

cly, to sdy calc, fnt mot, pt cptd, H_2S od; qtz-cm; F-cm;phos-cm

qtzs mic, sl calc, phos, msv, plas to cptd, strn H_2S od

mic, qtzs phos, sl calc, msv, plas to cptd; F cm

crs to md grn, qtzs, phos mic, sl calc, fnt bdng and mot, plas to cptd, H_2S od; F cm.

cly, qtzs, mic, phos, sl calc, fnt mot to t-b, H_2S od; 1 inch slty calc phos cl at base of core

slty qtzs, sl calc, phos, indst bdng to mot, pt cptd to plas, mod H_2S od

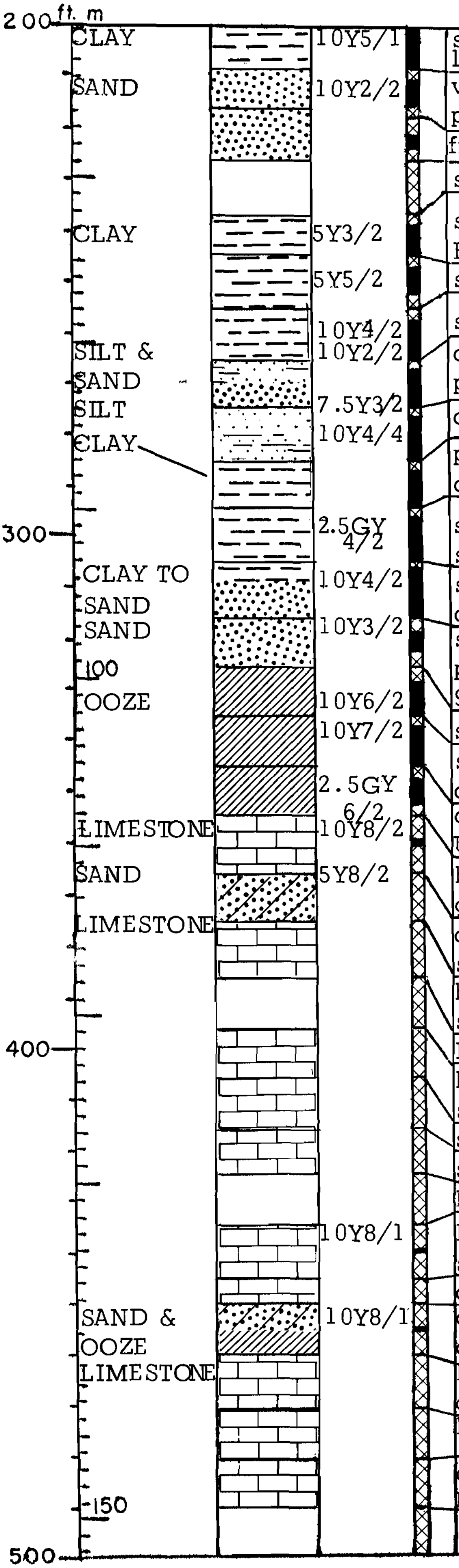
slty, sl phos, sl calc, msv, uncons to cptd, sl H_2S od

slty, qtzs, mic, sl phos, msv to fnt bdng, v sl H_2S od

slty, phos, mot plas to pt cptd, sl H_2S od

slty, msv to indst lamd cptd, strn H_2S od; phos cl ptg near bottom of core

slty, phos, fnt mot, cptd to plas



slty, phos, msv to t-b, cpted to plas, mod H_2S od; lower $2\frac{1}{2}$ ft is a sdy phos slt

v fn to fn grn slty, pbly, w, srt, strny phos, calc; phos as peb up to 12 mm and sct grns

fn grn slty hi phos, fnt mot, uncons, sl H_2S od

single piece of md grn phos chty sltst

slty, sl calc, phos, msv to mot, plas to cptd, sl H_2S od; phos as blk pol grns

slty to sdy, sl calc, phos, fnt mot, cptd to plas

slty, phos, sl calc, msv to irrg mot, plas to cptd

cly to sdy, phos, qtzs, msv to irrg mot, uncons to plas, v sl H_2S od; phos grns-fn to md grn and pol

cly, phos, irrg. mot, plas to cptd, sl H_2S od

phos, fnt to irrg mot, plas to cptd; marked color changes, slty to sdy.

slty, phos, fnt to irrg mot, plas; sct phos peb and sltst lmps at top of core

slty, phos, irrg mot, plas; sct pel of phos thru core; slty cl at top to slty sd at base

slty, phos, calc, uncos to firm; lower 2" is fn grn phos calc cem ss; Miocene-Oligocene boundary at 99.1 m

slty, calc, msv, plas; oily od in lower 2' of core

slty, calc, fnt mot, plas to cptd, sl oily od; mod calc mtx

calc, fnt mot, plas; v fn grn calc mtx; Oligocene-Upper Eocene boundary at 108.2 m

biogenic, calcarenitic, grainstone in sd rng; md grn, msv, firm; plcy shl frag up to 30 mm; 20%void

calcarenitic, biogenic, md grn, slty, pt cptd; brkn shl frags, F, cor deb and rx frags; mtx-abu

biogenic calcarenitic grainstone; md to crs grn. w srt, msv, fri; voids-25%; brkn shl, F, pel

NO CORE RECOVERED

biogenic, calcarenitic, grainstone; v crs grn, mod srt, msv, firm; void-20%; brkn plcy shl, cor

same; voids-20-30%; brkn shl frags, pel, Bry, cor,

same; firm to hd

NO CORE RECOVERED

biogenic, calcarenitic, grainstone, firm to pt cptd; s/ intbd sft packstone

calcarenitic packstone; voids-10-20%

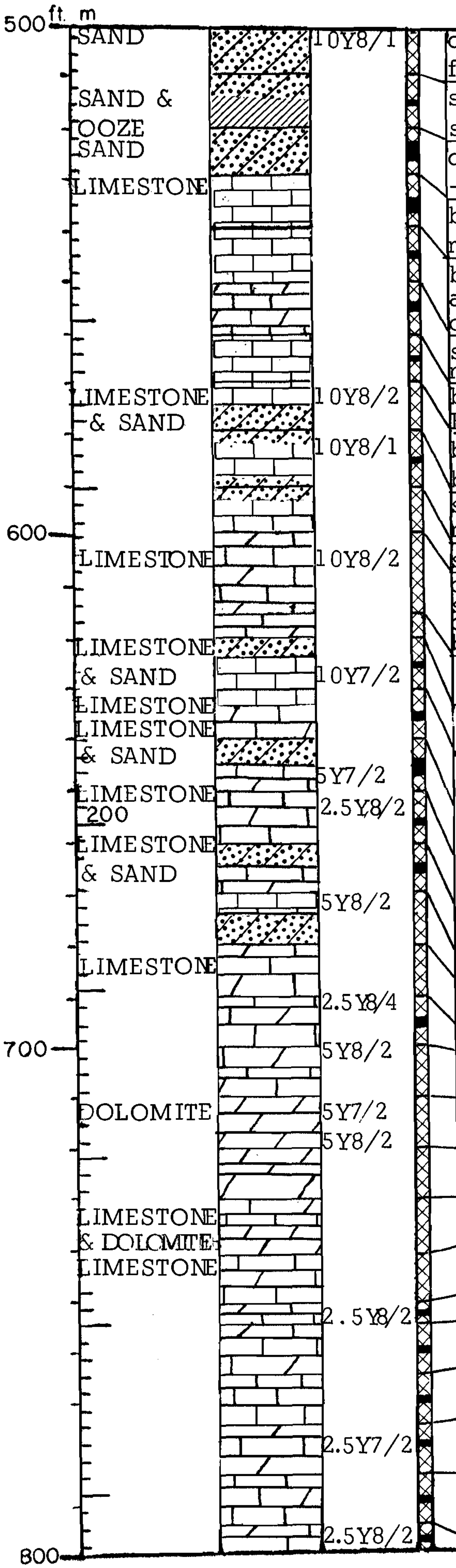
calcarenitic, slty, brkn plcy shl frags, Bryo; intbd calc ooze; H_2S od

biogenic, calcarenitic, grainstone; por, due to sol of plcy shl

biogenic, calcarenitic, packstone, slty; sl H_2S od; mtx-abu

calcarenitic, biogenic, grainstone; F, Bryo and plcy shl frags

NO CORE RECOVERED



calcarenitic, biogenic, f to md grn, uncons, F-fld; fn grn glauc

sd-calcarenitic w/fn mtx; fn frn glauc ooze-calc, sl H_2S od

calcarenitic; v fn grn, dolic, sl H S od; F-cm;glauc -tr

biogenic, calcarenitic, packstone, crs sh to f sd rng; mtx-abu; F-cm; glauc-tr

biogenic, calcarenitic, packstone, sl H_2S od; F-cm and a few are replaced by glauc; calc ooze at base of core

same w/mtx; F-abu as frags of lrg F; ls is as brkn rx frags, dolic

biogenic, calcarenitic packstone-as brkn rx frags; H_2S od; lrg F-abu; glauc repl of a few F

biogenic, calcarenitic packstone to grainstone-as brkn rx frags; fri; F-abu

same; fri ls frag at top of core; lrg F-abu; r/glauc rep of F

same; pr recovery

dolic, hd, biogenic, calcarenitic grainstone to packstone, md to crs grn, por, msy; voids-20%, as casts of plcys; glauc-abu; middle-upper Eocene-boundary at 182.9m

grainstone, dolic, por, hd, ds; pyr-tr; glauc-tr; pore space where fossils have been dissolved

grainstone to packstone, md grn, biogenic, fri; sd-calcarenitic, slty to grv , biogenic, pt cptd

packstone, calcarenitic, biogenic, dolic, hd; dolic - as yl intstl xls and biogenic frags; vug;asph specs

same as before; dolic; glauc - tr; carb-sca grns sd- calcarenitic, md grn, slty, carb(?), biogenic

grainstone, calcarenitic, biogenic, dolic; intbd w/sd of ls rx frags

ls-same as above, md grn, slty, sd-calcarenitic, biogenic, md grn, w srt to pry srt

same ls and sd as before

grainstone, calcarenitic, biogenic, fn to crs grn, w srt, dolic, msv; voids-abu; F-cm to abu;dolic cem

same as before; grns are F, coral, Alg, shl frags

grainstone, calcarenitic biogenic, md to crs grn, dolic, firm; s/sd-md grn, calcarenitic, biogenic slty

crpxl, msv to mot, hd; voids where shls leached; coral impressions

crpxl to fn xln, hd ds; leached shl voids; coral impressions

dol-same as before; ls-grainstone, calcarenitic, v fn grn, biogenic, dolic

grainstone, calcarenitic, biogenic, fn to md grn, mod srt, dolic, msv, voids 10%; dol-brn xln cem

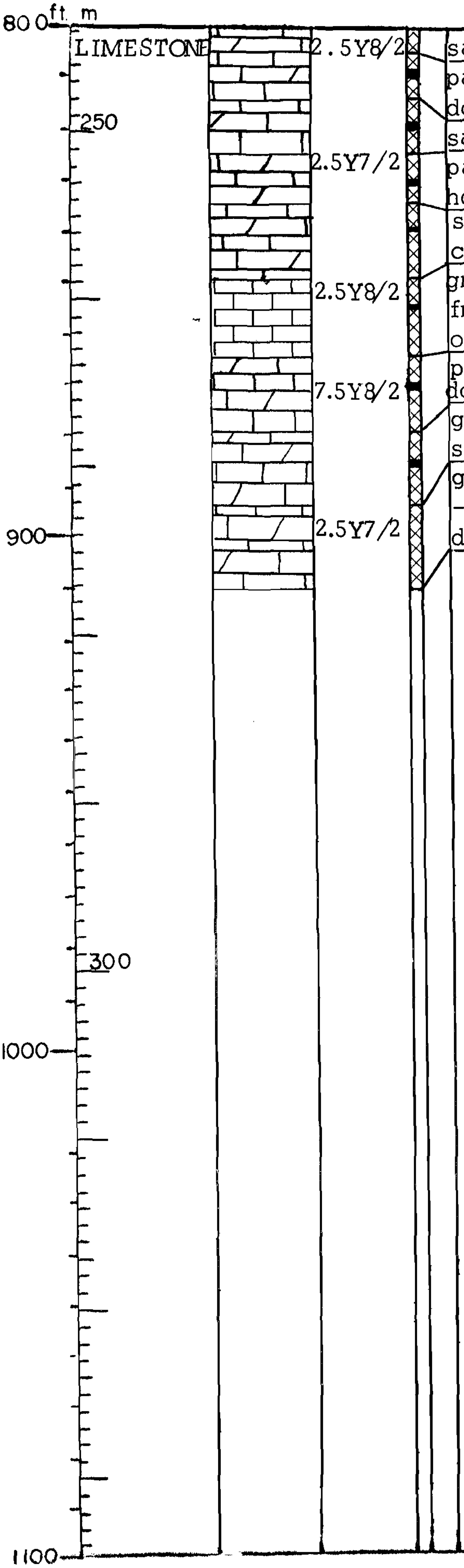
same as before, asph specs

grainstone, calcarenitic, biogenic, dolic to non-dolic, firm to fri; voids-0-20%; dol-intstl;carb-tr

same as before; cal-fn yl xln cem; F-cm; coral and Bry - abu; brkn shl frags and Alg-abu

grainston, calcarenitic, biogenic; dol-cem or as isolated rhombs in packstone mtx; carb-sca flks

same as above; dol-yl intstl patches; f-abu grainstone to packstone, dolic; F-cm; asph specs



same as before

packstone, calcarenitic, biogenic, fn to v fn grn, dolic; leaf and stem impressions; lmn stn; F-cm

same as before; hd; F-cm; plcy shl frags - cm

packstone, calcarenitic, biogenic, dolic, v fn grn, hd, ds

same as before, fn to md grn, msv; fn xln dol and cal; carb - cm, sca

grainstone to packstone, calcarenitic, biogenic, v fn to v crs grn, msv, por; void 20-30%; framework of F, plcy shl frags, Bry

packstone to grainstone, calcarenitic biogenic, dolic, por, msv to fnt bdng; F. abu; void - 20-25%

grainstone, calcarenitic, biogenic, md to v crs grn, slty, dolic, msv, por, firm; void - 25%; F - abu

grainstone, calcarenitic, biogenic, dolic, por; void -5 to 25%; lrg F- abu; intbd por and nonpor layers; dol -fr xl intstl

END OF CORE AT 277.4 m

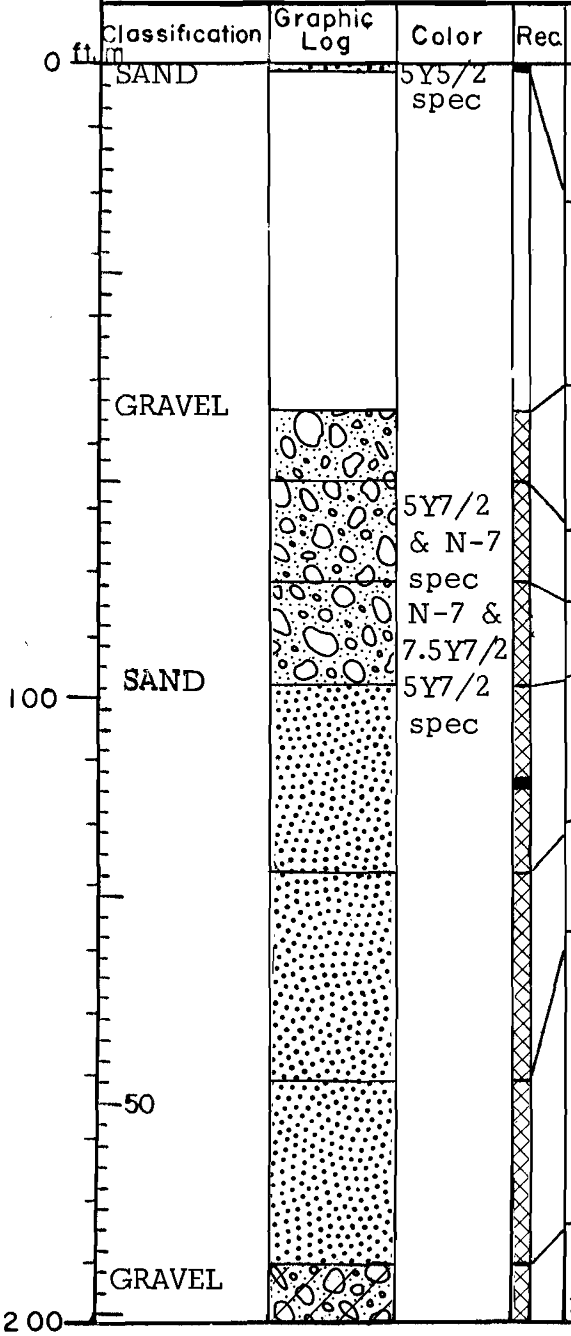
PRELIMINARY JOIDES *CORE LOG*-HOLE 2

AREA: Outer part of continental shelf east of Jacksonville, Florida

LAT. 30° 21' N
30° 20' N
LONG. 80° 20' W
80° 20' W
DATE 4/18-21 and
5/10-11, 1965

LOGGER(S) Schlee, Frothingham, Manheim
DEPTH 42, 46 m

REMARKS: Hole redrilled twice; the second time it was deepened from 173.4 m to 320.2 m
Composit section



Description

crs grn, mod srt, qtzs, shly uncons; qtz-md to crs-grn, sbang to sbrd, clr, to iron oxide stn, v abu; skl carbonate-abu, F, plcy shl frags; pel or ool-cm, gy to blk; glauc-tr

pebs and shl frags (4-20 mm) and rx frags; shl frags-plcy brkn, dull; rx frags-ss, qtzs md grn calc cem; ls-calcarenite, grainstone, dk gy (N-6), phos

pebs of rx frags (10-40 mm)- ss, crs to v crs grn, qtzs, shly; calc cem; rnd qtz and shl frags

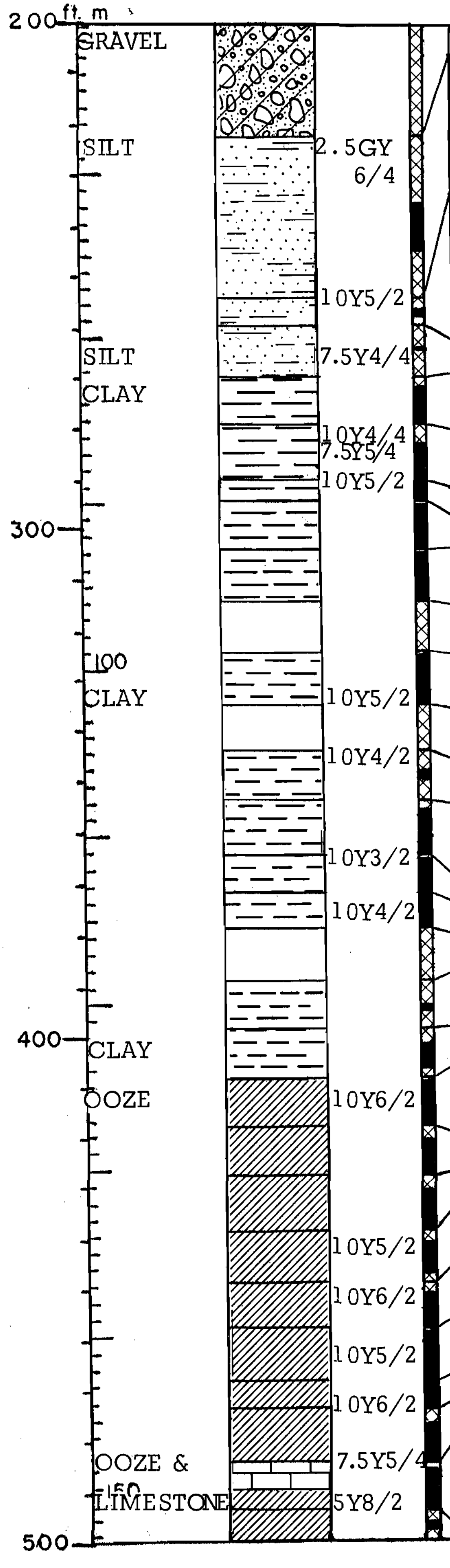
pebs (10-40 mm) of shl frags-abu; and ss-fld, md grn, w srt, qtzs, shly

crs to v crs grn, mod srt, sbang to sbrd, qtzs, calc, uncons; qtz-v abu, md to v crs grn, clr; shl frags-abu plcy, md grn to grnl; rx frags-scr; pel-scr

similar to previous interval; post Miocene-Miocene boundary at 48.8 m

v crs grn, fn sd to fn grv, pry srt, uncons; qtz-v abu, v crs grn, sbang to sbrd; skl carbonate-abu, plcy shl, F, Bry, gstr shl frags; rx frags and pel-abu, qtzs calc ss and dk gy pel

calcirudaceous (4-16 mm); shl frags-abu, plcy brkn fresh, w srt; rx frags-fld, ss, calc qtzs, fn to md grn



as on the previous page

sdy, mod srt, qtzs, calc, msv to fnt mot, uncons; F- cm; s/qtz sd; glauc-tr, strn H_2S od

sdy, qtzs, calc, phos, msv to fnt mot, plas to uncons; F-cm to abu; qtz-cm, v fn grn; strn H_2S od; phos - dk gy crpxl pebs; upper Miocene-lower Miocene boundary at 79.2m

sdy (v fn grn), calc, msv to fnt mot, cptd

slty, calc, sl phos, msv to fnt mot and lamd cptd; qtz-tr; F-cm; oily od

slty , calc, phos, msv to mot, cptd, oily od; phos-sca grnl and pebs, dk gy; sd-tr

slty, msv to fnt mot, plas to pt cptd

same as before; phos-cm as sca dk grns

slty, calc, phos, msv to indst lam, plas to cptd; F-scr to cm; phos cm as sca grns (sd to peb) pol

NO CORE RECOVERED- slty cl and phos peb in catcher

slty, msv to fnt lamd, plas to pt cptd; F-sca to abu

NO CORE RECOVERED-catcher plugged by ss and shl frags

slty, msv to lamd, cptd; F-scr; phos-scr, as blk pol grns

slty, phos, mot to msv (pt cptd to crumbly); phos-blk sbrd grns, 12 mm or less in size, abu in upper 2 feet; scr at base

slty, msv to indst lamd, pt cptd

same as before; phos, plas

NO CORE RECOVERED

slty, phos, msv to lamd, plas to pt cptd; lower Miocene -Oligocene, boundary at 121.3m

calc, msv to fnt bd, pt cptd to crumbly; phos-tr

slty to cly, calc, phos, fnt bd and mot, plas to pt cptd.

slty, calc, msv, plas to crumbly; qtz-as slt, cm

sl slty, strn calc, msv, sl plas to crumbly

sl slty, v calc, msv to fnt mot, plas to crumbly

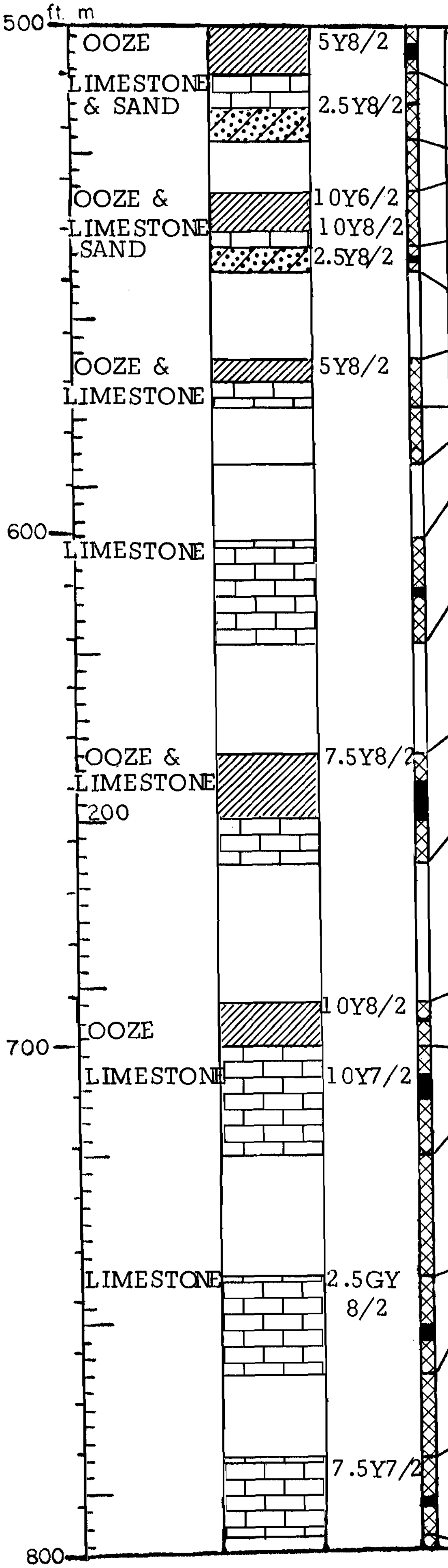
same as above; msv to fnt lam; phos-tr

slty, v calc, msv to fnt lamd, plas to cptd

same as before; cptd, fnt mot and lamd

sl slty, v calc, msv to fnt lamd, sl plas

calc, cly, impure msv to mot to fnt lamd, cptd, oily od; F-abu; phos-tr ls-packstone, glauc, msv, hd to firm; Oligocene-Upper Eocene boundary at 149.4 m



biogenic, calcilutaceous, sdy to cly, msv, uncons to cptd; F-abu; pel-abu; glauc-cm

ls-packstone, vfn to md grn, msv, hd, sd-slty, calcarenitic, fn to md grn, mtx-abu

NO CORE RECOVERED

cly, calc, uncons
ls-biogenic, calcarenite, md-to crs grn, firm

biogenic, calcarenitic, F, msv, uncons to firm ls lumps glauc-scr, slty, v fn grn, mod srt

INTERVAL NOT CORED

calcilutaceous, slty, glauc, msv, cptd, sl oily od
ls-packstone, slty, glauc, F, msv, firm

NO CORE RECOVERED - shl frags and'ss rx frags

INTERVAL NOT CORED

packstone to wackestone, slty mtx, glauc, msv, firm to cptd, oily od; sca shl and F frags.

INTERVAL NOT CORED

biogenic, calcilutaceous, sdy, msv, uncons to cptd and plas; F-abu; ls-as firm sca lumps of packstone in crs slt rng

INTERVAL NOT CORED

calcilutaceous, slty w/sdy admixture, msv, uncons to pt cptd, H_2S od

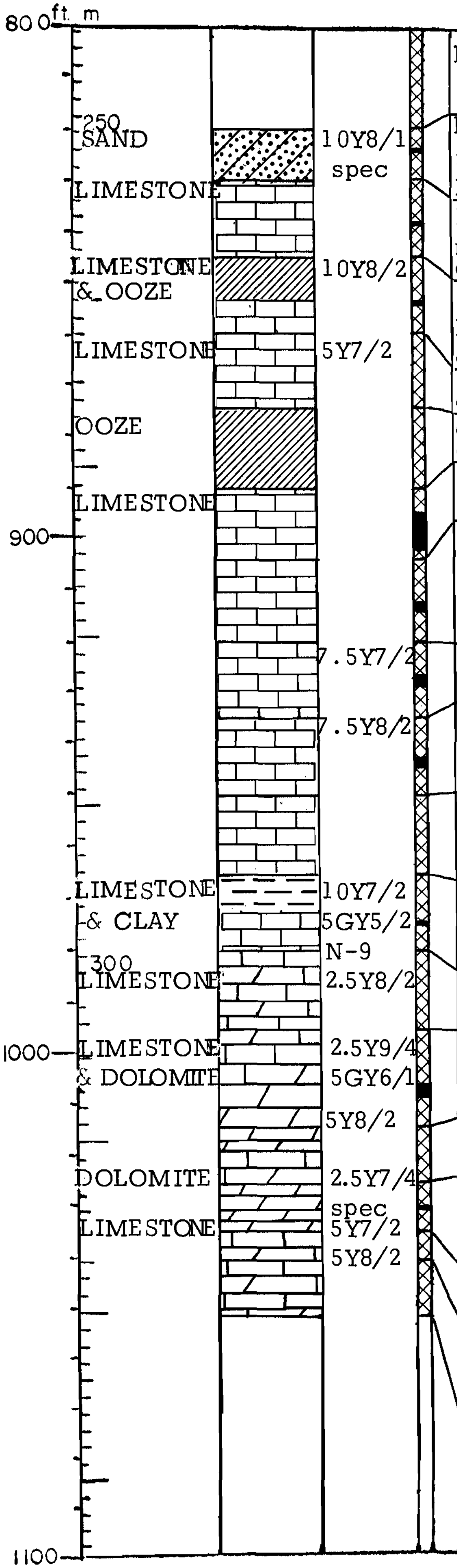
biogenic, wackestone, slty, msv, firm to cptd; F-cm; mainly as brkn rx frags up to 16 mm

NO CORE RECOVERED

biogenic, packstone in crs slt rng, glauc, msv, firm to pt cptd; glauc-v fn grn-md grn, tr to cm

NO CORE RECOVERED

biogenic packstone to wackestone, slty to cly, msv, firm to pt cptd, sl H_2S od; glauc-tr, v fn grn; pyr-cncr



NO CORE RECOVERED

biogenic, calcarenitic, slty, mot, pt cptd to fri; mtx- 30-40%; shl frags-brkn (up to 8 mm); pel; Ech; glauc-tr

biogenic, calcarenite, md grn (frags up to 10 mm), mod to pry srt, glauc, carb, msv, firm to hd, oily od; carb-blk oily flk; Alg; shl-brkn plcy frags; mtx

biogenic, slty packstone, glauc, msv to fntly lam, F-abu; Alg
ooze-slty, calc, msv

biogenic, calcarenitic, packstone, v fn grn sd to crs slt, mod srt, msv, hd to firm; glauc (?)

cly, biogenic, calcilutaceous, slty, msv, mic crumbly to plas; ls lmps

biogenic, slty packstone, msv, firm to cptd, sl H_2S od; glauc-lmps of v fn grn agrs

biogenic, sdy to slty packstone, glauc, msv, firm; glauc-scr, as sm cluster agrs

biogenic, calcarenitic, packstone, crs slt rng, msv firm to pt cptd; F-cm; sca glauc, mod srt

biogenic, calcarenitic, grainstone to packstone, fn sd to crs slt rng, msv, firm to cptd; glauc clusters, tr; carb-sca blk flk

biogenic, calcarenitic, grainstone to packstone, v fn grn, w srt, msv, por, firm to pt cptd; glauc-tr, agr clumps; calc frags-Alg

ls-md grn, biogenic, calcarenitic, grainstone, glau
cl-cal, glauc, plas to crumbly; glauc-v abu, md grn Upper Eocene-Middle Eocene boundary at 298.8 m

fn gr biogenic, calcarenitic, grainstone, w srt, dolic, msv, hd, vug; dol-intstl cem; sca glauc-tr

biogenic, calcarenitic, grainstone, dolic, por, msv. hd; carb
dol-calc, msv, glauc, hd

biogenic, calcarenite, fn to crs grn, w srt, dolic, msv, hd; F-cm; pel-abu

biogenic, calcarenitic, md grn, w srt, por, msv, hd; dol-intstl yl fn xls and as filling of bioclastic frags

biogenic, calcarenitic, grainstone, md to fn grn, dolic

biogenic, calcarenitic, grainstone, dolic, msv, por to solid, hd; voids-up to 30%; F; cor and Alg deb; shl frags

END OF CORE AT 320.2 m

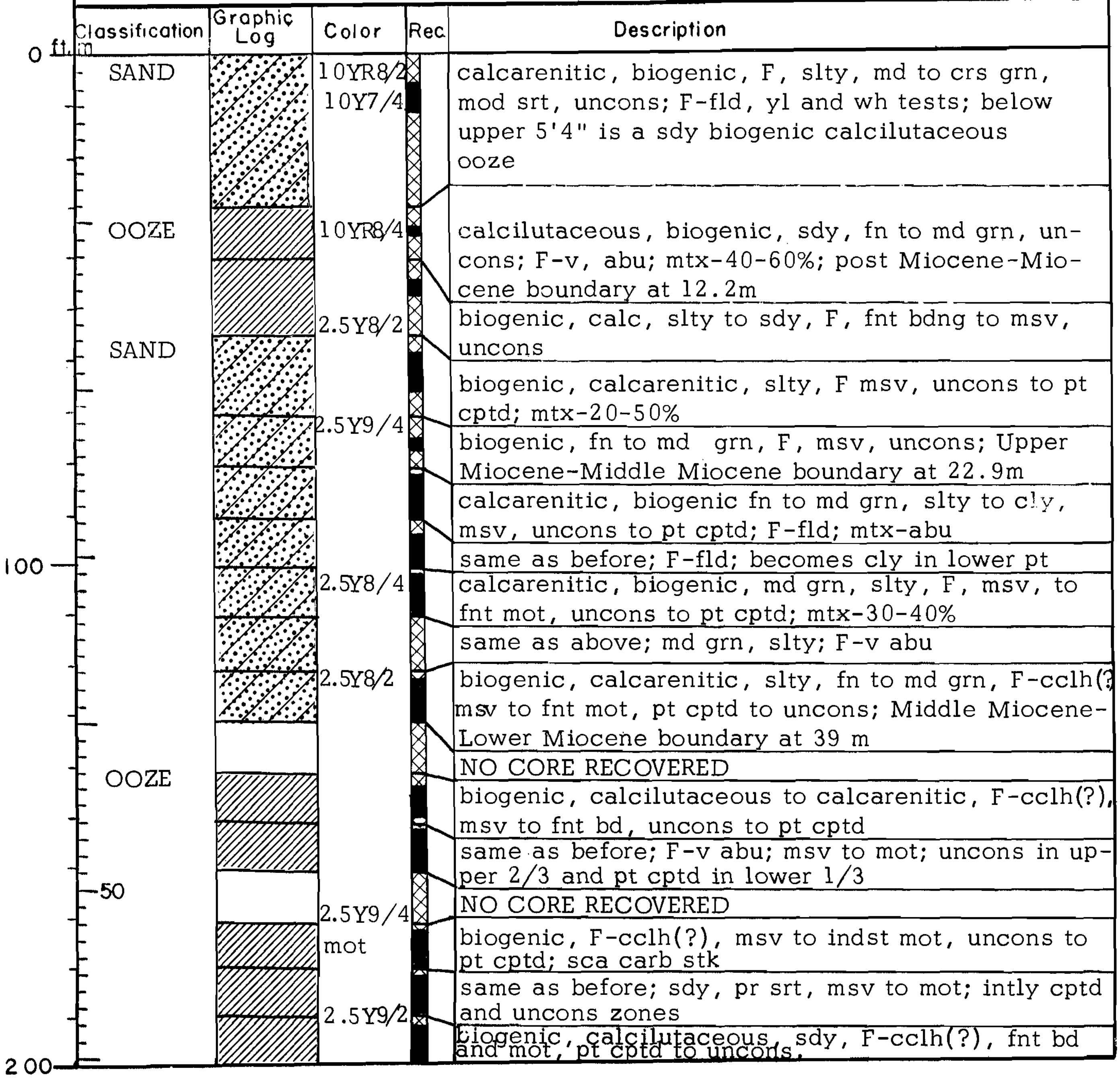
PRELIMINARY JOIDES *CORE LOG*-HOLE 3

AREA: Eastern edge of the Blake Plateau east of Cape Kennedy, Fla.

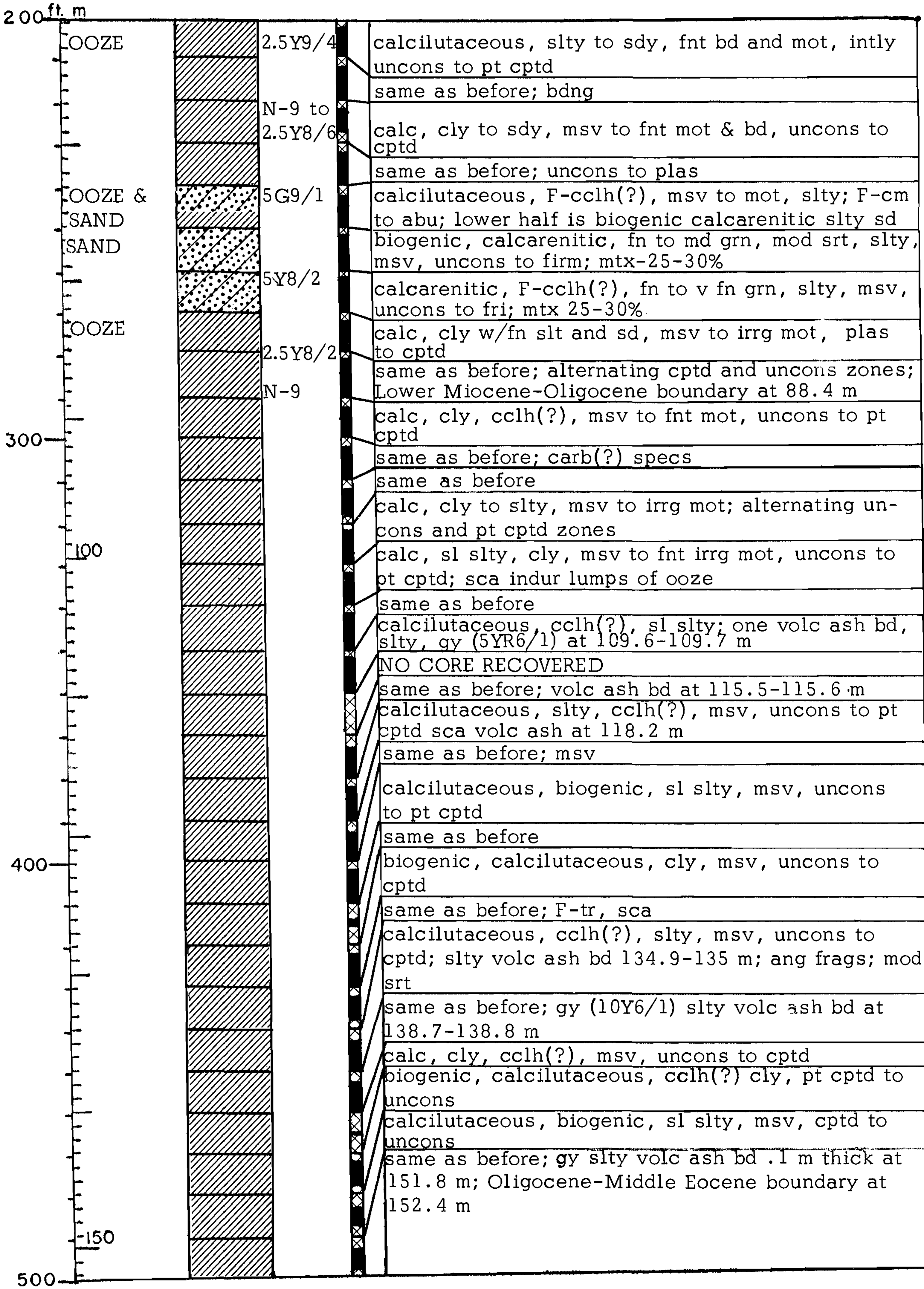
LAT. 28° 30'N **LONG.** 77° 31'W **DATE** 5/3-5/5, 1965

LOGGER(S) Schlee, Frothingham, and Shuter **DEPTH** 1032 m

REMARKS:



Classification	Graphic Log	Color	Rec	Description
SAND		10YR8/2 10Y7/4		calcarenitic, biogenic, F, slty, md to crs grn, mod srt, uncons; F-fld, yl and wh tests; below upper 5'4" is a sdy biogenic calcilutaceous ooze
OOZE		10YR8/4		calcilutaceous, biogenic, sdy, fn to md grn, uncons; F-v, abu; mtx-40-60%; post Miocene-Miocene boundary at 12.2m
SAND		2.5Y8/2		biogenic, calc, slty to sdy, F, fnt bdng to msv, uncons
				biogenic, calcarenitic, slty, F msv, uncons to pt cptd; mtx-20-50%
		2.5Y9/4		biogenic, fn to md grn, F, msv, uncons; Upper Miocene-Middle Miocene boundary at 22.9m
				calcarenitic, biogenic fn to md grn, slty to cly, msv, uncons to pt cptd; F-fld; mtx-abu
				same as before; F-fld; becomes cly in lower pt
		2.5Y8/4		calcarenitic, biogenic, md grn, slty, F, msv, to fnt mot, uncons to pt cptd; mtx-30-40%
				same as above; md grn, slty; F-v abu
		2.5Y8/2		biogenic, calcarenitic, slty, fn to md grn, F-cclh(?) msv to fnt mot, pt cptd to uncons; Middle Miocene-Lower Miocene boundary at 39 m
				NO CORE RECOVERED
OOZE				biogenic, calcilutaceous to calcarenitic, F-cclh(?), msv to fnt bd, uncons to pt cptd
				same as before; F-v abu; msv to mot; uncons in upper 2/3 and pt cptd in lower 1/3
				NO CORE RECOVERED
		2.5Y9/4 mot		biogenic, F-cclh(?), msv to indst mot, uncons to pt cptd; sca carb stk
		2.5Y9/2		same as before; sdy, pr srt, msv to mot; intly cptd and uncons zones
				biogenic, calcilutaceous, sdy, F-cclh(?), fnt bd and mot, pt cptd to uncons.



calcilutaceous, slty to sdy, fnt bd and mot, intly uncons to pt cptd

same as before; bdng

calc, cly to sdy, msv to fnt mot & bd, uncons to cptd

same as before; uncons to plas

calcilutaceous, F-cclh(?), msv to mot, slty; F-cm to abu; lower half is biogenic calcarenitic slty sd

biogenic, calcarenitic, fn to md grn, mod srt, slty, msv, uncons to firm; mtx-25-30%

calcarenitic, F-cclh(?), fn to v fn grn, slty, msv, uncons to fri; mtx 25-30%

calc, cly w/fn slt and sd, msv to irrg mot, plas to cptd

same as before; alternating cptd and uncons zones; Lower Miocene-Oligocene boundary at 88.4 m

calc, cly, cclh(?), msv to fnt mot, uncons to pt cptd

same as before; carb(?) specs

same as before

calc, cly to slty, msv to irrg mot; alternating uncons and pt cptd zones

calc, sl slty, cly, msv to fnt irrg mot, uncons to pt cptd; sca indur lumps of ooze

same as before

calcilutaceous, cclh(?), sl slty; one volc ash bd, slty, gy (5YR6/1) at 109.6-109.7 m

NO CORE RECOVERED

same as before; volc ash bd at 115.5-115.6 m

calcilutaceous, slty, cclh(?), msv, uncons to pt cptd sca volc ash at 118.2 m

same as before; msv

calcilutaceous, biogenic, sl slty, msv, uncons to pt cptd

same as before

biogenic, calcilutaceous, cly, msv, uncons to cptd

same as before; F-tr, sca

calcilutaceous, cclh(?), slty, msv, uncons to cptd; slty volc ash bd 134.9-135 m; ang frags; mod srt

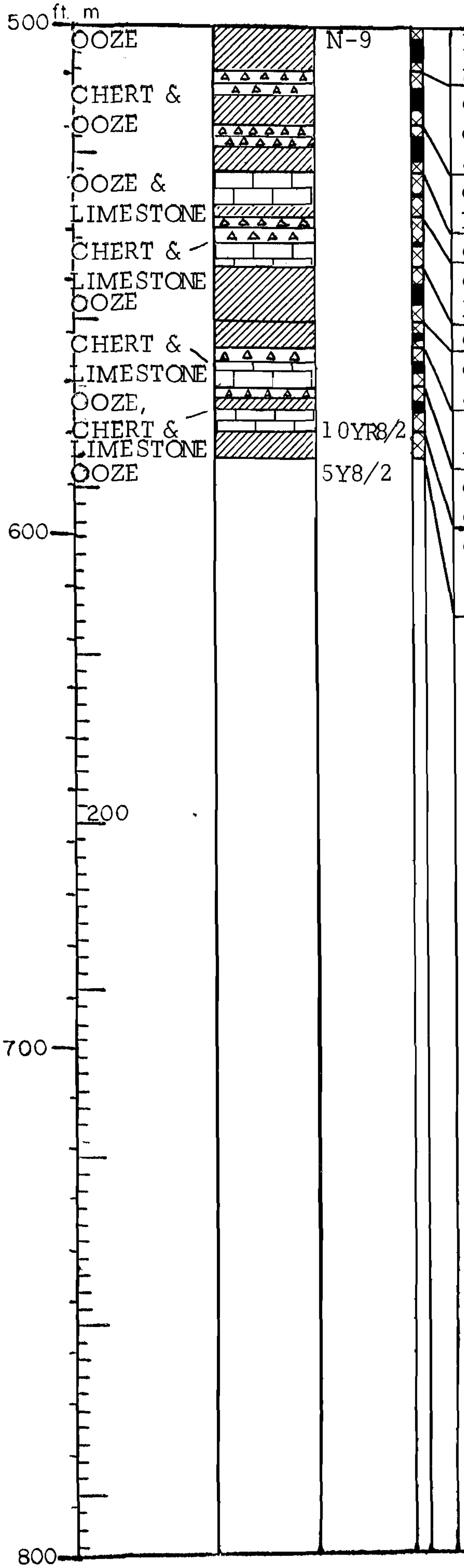
same as before; gy (10Y6/1) slty volc ash bd at 138.7-138.8 m

calc, cly, cclh(?), msv, uncons to cptd

biogenic, calcilutaceous, cclh(?) cly, pt cptd to uncons

calcilutaceous, biogenic, sl slty, msv, cptd to uncons

same as before; gy slty volc ash bd .1 m thick at 151.8 m; Oligocene-Middle Eocene boundary at 152.4 m



biogenic, calc, cly, sl slty, cclh(?), msv to fnt mot, uncons to pt cptd

ooze-same as before; cht-wh, to v lt gy (5Y7/2) crpxl brkn frags up to 25 mm, ang; thn volc ash bd at 157.4 m

calc, sl slty, msv, firm to uncons cht-as brkn frags; Lower Eocene-Middle Eocene boundary at 161.5 m

calc, slty, msv, pt cptd to cptd or lumpy

cht-gy (5Y6/2) crpxl; as angular brkn frags ls-calcilutite, mot, clay, cptd to firm

calcilutaceous, slty, msv, uncons to pt cptd

ooze - same as before; gy (10R5/1) slty, msv, volc ash bd at .1 m thick in middle of interval

intbd cht and calcilutite, v fn grn, por, msv, firm to cptd; cht encloses irrg mass of ls

calcilutaceous, slty, cclh(?), msv, cptd to firm cht-gy (5Y6/2) brkn angular frags; ls-calcilutite

calcilutaceous, impure, slty, msv

END OF CORE AT 178.3 m

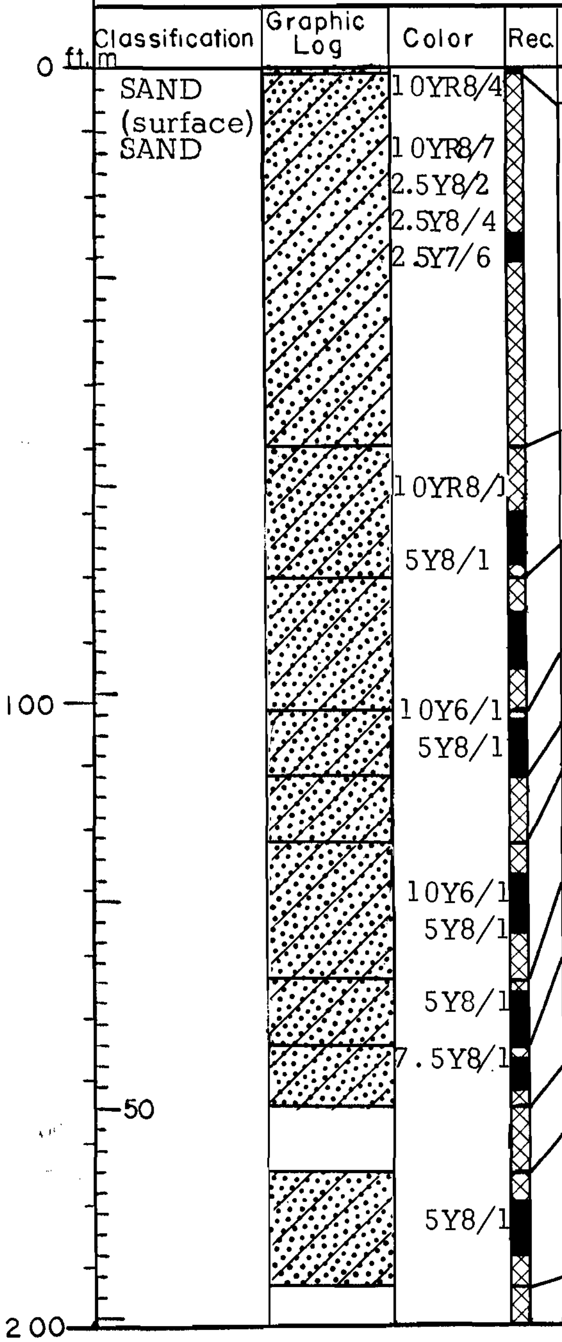
PRELIMINARY JOIDES *CORE LOG*-HOLE 4

AREA: North outer part of the Blake Plateau, east of Georgia

LAT. 31° 02' N LONG. 77° 43' W DATE May 13-15, 1965

LOGGER(S) Schlee, Frothingham, Emery and Wait DEPTH 892 m

REMARKS: Second redrill of hole



Description

biogenic, calcarenitic, F, Pt, msv, uncons

biogenic, calcarenitic, md to crs grn, w srt, F, Pt, msv to color banded; color changes due to variation in color of slty mtx; otolith-scr; post Miocene-Lower Miocene boundary at 18.3 m

biogenic, calcarenitic fn to md grn, mod srt, msv to fnt mot, uncons; calc mtx in slt-cl rng, abu; F - fld; s/F stn yl

biogenic calcarenitic, slty, fn grn, mod to pr srt, F, fnt mot, uncons; sca calcarenitic packstone rx frags; glauc-tr

biogenic calcarenitic slty, fn to v fn grn, mod to pr srt, F, msv w/sca lam, uncons; dk mnrls-scr

biogenic, calcarenitic, F, uncons

biogenic, calcarenitic, slty, fn grn, mod to pr srt, F, msv, uncons; mtx-20%; .1 m gy sdy, calc, clay layer in middle of core.

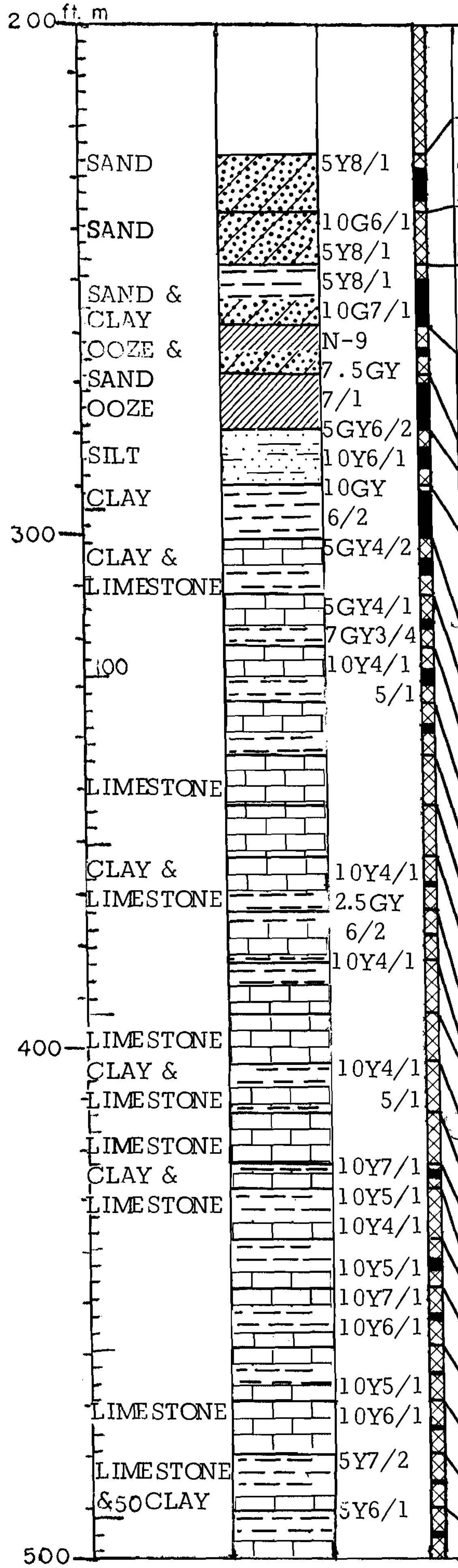
biogenic calcarenitic, fn to v fn grn, slty, F, msv, uncons; mtx up to 20%; F-fld; glauc-tr; dk mnrls-tr

biogenic, calcarenitic, fn grn, slty, F, msv, uncons; mtx - 20-30%; glauc-tr; sca lmps of calcarenitic ls

NO CORE RECOVERED

biogenic calcarenitic, slty, fn grn, pr to mod srt, F, msv to fnt bd, uncons; F- fld; mtx - 20%; sca pods of cl; Lower Miocene-Oligocene boundary at 53.3 m

NO CORE RECOVERED



NO CORE RECOVERED

biogenic calcarenitic, slty, fn grn, F, msv, uncons; calc mtx - 20%; dk mnrls - scr; F-fld; sca lmps of calcarenitic ls

sd - biogenic calcarenitic, v fn gr, F, msv, pt cptd; sm frag of cly, non calc, msv, cptd; mudstone

intbd sd - calcarenitic biogenic, F, v fn to fn grn, slty, msv, pt cptd and cl - one bd 8 cm thick at 76.9 m, slty, non calc, msv; sca gy cl pods

ooze-calc, slty, msv, uncons; mtx-fld; glauc-tr
sd-biogenic, calcarenitic, fn to md grn, F, slty, pt cptd Oligocene-Lower Eocene boundary at 82 m

calc, slty, msv, uncons; glauc-scr; sca warped lam

cly, calc, lamd to fnt bd, uncons; one thn sltst bd half way down core; sharp color change in upper pt

calc, slty, irrg stk mot, uncons; sca t-b of cptd calc mudstone; Lower Eocene-Paleocene boundary at 88.4 m

cl-slty, sl calc, mot to dst bd or lamd; ls-sil, calcilutite-wackestone, glauc, msv to bd, hd

cl-slty, sl calc, fnt mot, uncons to plas
ls-sil packstone in crs slt rng; as brkn frags; glauc

cl-slty, sl calc, fnt lamd, plas; s/cly slt ls-sil, msv, as brkn frags

intbd slt and cl bd 2-4 cm thick; F rich, v calc; ls-sil packstone in crs slt rng; indst x-lamd

sil, packstone in slt rng, glauc, msv to fnt lamd, concoidal fracture, hd

same as before; F-fld; glauc-tr; indst bd, hd; only a few frags

cl-sl calc, slty, msv, pt cptd
ls-sil, wackestone, slty, msv, hd

cl-slty, calc, msv, cptd; intbd w/ ls-sil packstone in crs to md slt, fnt mot

same as before; fnt bd; glauc-tr

impure, sil, slty, wackestone, msv to indst lamd, hd to firm; only a few frags recovered

cl-slty, calc, msv, pt cptd
ls-sil wackestone to packstone in crs slt rng, hd

sil slty packstone, impure, msv to fnt bd hd; concoidal fracture, in crs slt range

calc, msv, plas to cptd cl
sil msv hd lithographic ls - wackestone; glauc-tr

same intbd cl and sil ls; glauc-tr; only a few frags

cl-sl slty, mot, plas
ls-wackestone to carbonate mudstone, sil, msv, hd

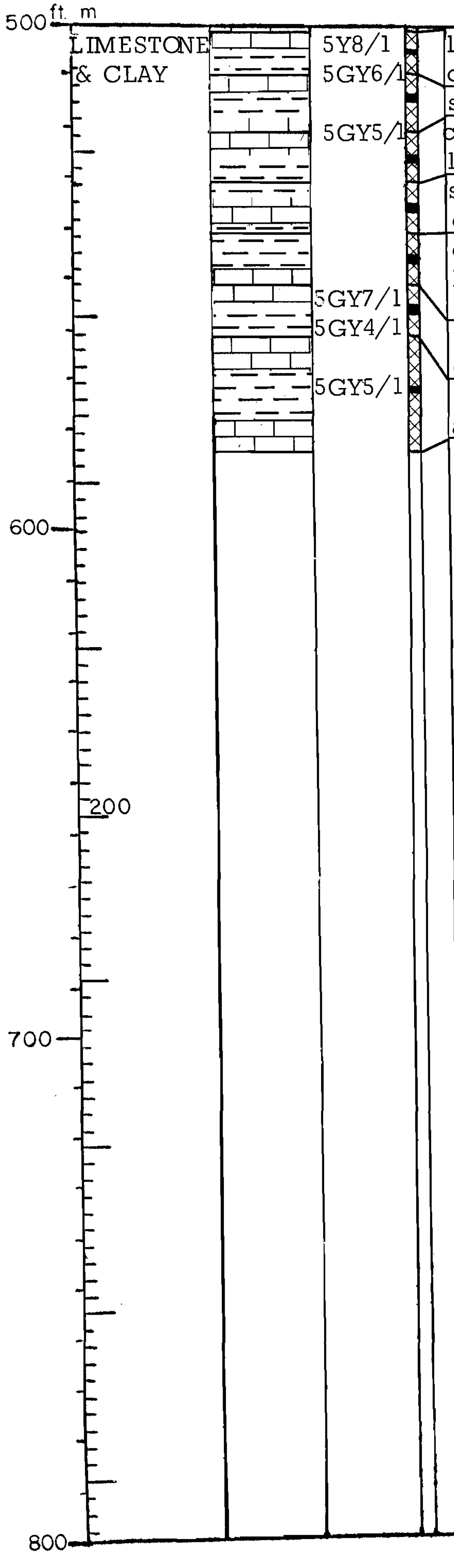
same intbd, calc, plast, mot, cl and sil, hd, lithographic, impure ls

cl-sl calc, sl slty, plas and intbd w/ls-wackestone sil, slty, firm to cptd

sil, wackestone, mot to msv hd; F-cm ; pyrite-tr, in seams

cl-calc, slty, plas
ls-wackestone, sil, slty, mot, hd; glauc-tr; pyr-tr

same sil ls and calc cl as before



ls-sil wackestone, fnt lamd, hd; sca F

cl-calc, sl slty, fnt mot, plas

same intbd sil ls and calc msv cl as before

cl-slty, calc, msv, cptd; in fn slt rng

ls-sil wackestone; dsct carb lam to mot; pyr-tr

same sil msv, hd, wackestone intbd w/calc msv pt cptd cl

cl-sl slty, calc, msv, cptd; grades to impure ls

ls - sil wackestone, impure, mot, hd; concoidal fract

same as before; sca frags of crumbly impure ls in cl; sharp color change near bottom of core

same intbd sil hd, concoidally fract ls w/sca F, and calc msv, pt cptd cl w/frags of ls

END OF CORE AT 178.3 m

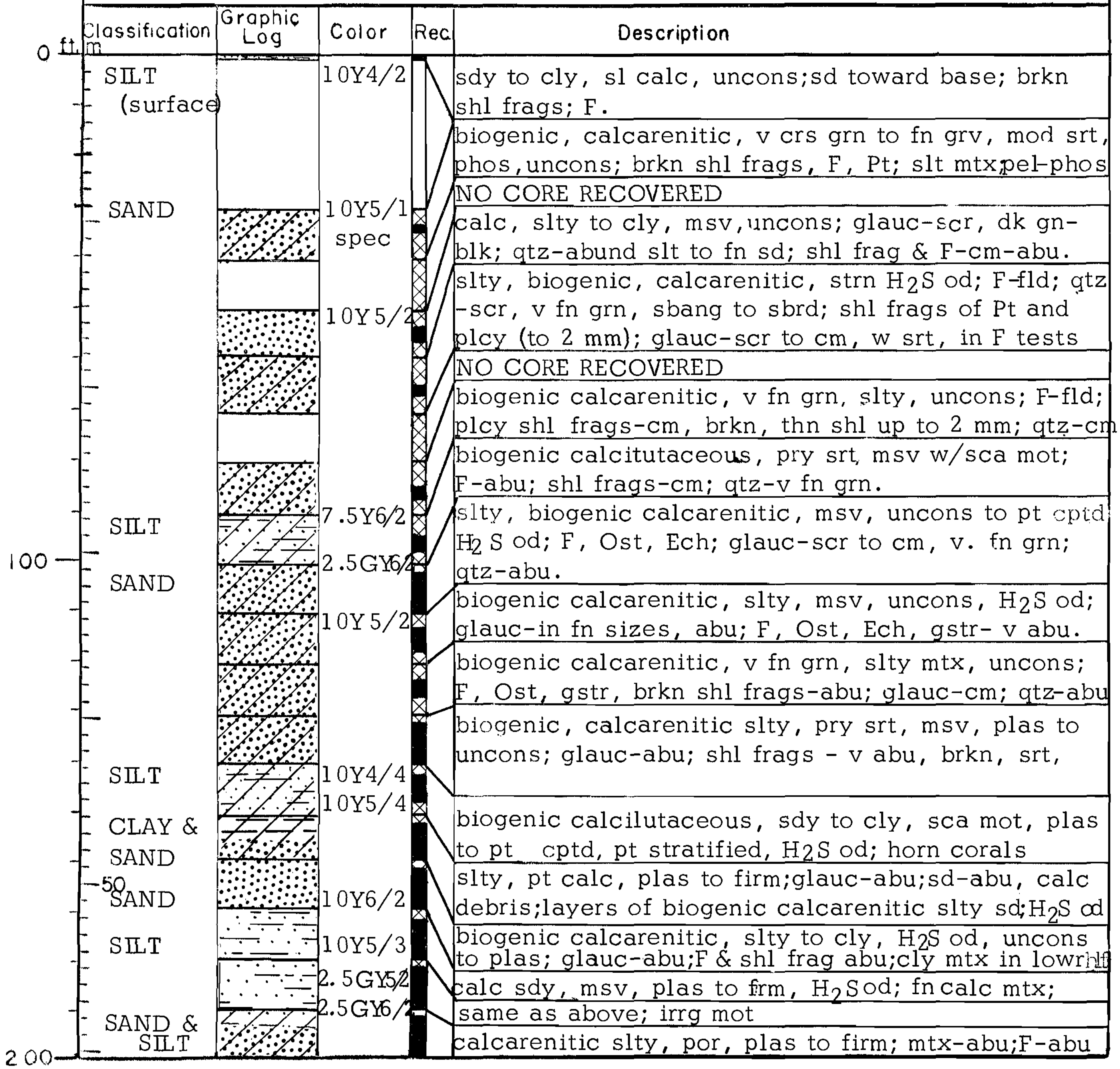
PRELIMINARY JOIDES *CORE LOG*-HOLE 5

AREA: Upper part of the Florida-Hatteras Continental Slope east of Jacksonville, Florida.

LAT. 30° 23' N **LONG.** 80° 08' W **DATE** 4/-22-26/65

LOGGER(S) Schlee, Manheim, Wait, Shuter **DEPTH** 190 m.

REMARKS: Redrilled three times to achieve depth of 244.8 m.



sdy to cly, sl calc, uncons;sd toward base; brkn shl frags; F.

biogenic, calcarenitic, v crs grn to fn grv, mod srt, phos,uncons; brkn shl frags, F, Pt; slt mtx;pel-phos

NO CORE RECOVERED

calc, slty to cly, msv,uncons; glauc-scr, dk gn-blk; qtz-abund slt to fn sd; shl frag & F-cm-abu.

slty, biogenic, calcarenitic, strn H_2S od; F-fld; qtz -scr, v fn grn, sbang to sbrd; shl frags of Pt and plcy (to 2 mm); glauc-scr to cm, w srt, in F tests

NO CORE RECOVERED

biogenic calcarenitic, v fn grn, slty, uncons; F-fld; plcy shl frags-cm, brkn, thn shl up to 2 mm; qtz-cm

biogenic calcitutaceous, pry srt, msv w/sca mot; F-abu; shl frags-cm; qtz-v fn grn.

slty, biogenic calcarenitic, msv, uncons to pt cptd H_2S od; F, Ost, Ech; glauc-scr to cm, v. fn grn; qtz-abu.

biogenic calcarenitic, slty, msv, uncons, H_2S od; glauc-in fn sizes, abu; F, Ost, Ech, gstr- v abu.

biogenic calcarenitic, v fn grn, slty mtx, uncons; F, Ost, gstr, brkn shl frags-abu; glauc-cm; qtz-abu

biogenic, calcarenitic slty, pry srt, msv, plas to uncons; glauc-abu; shl frags - v abu, brkn, srt,

biogenic calcilutaceous, sdy to cly, sca mot, plas to pt cptd, pt stratified, H_2S od; horn corals

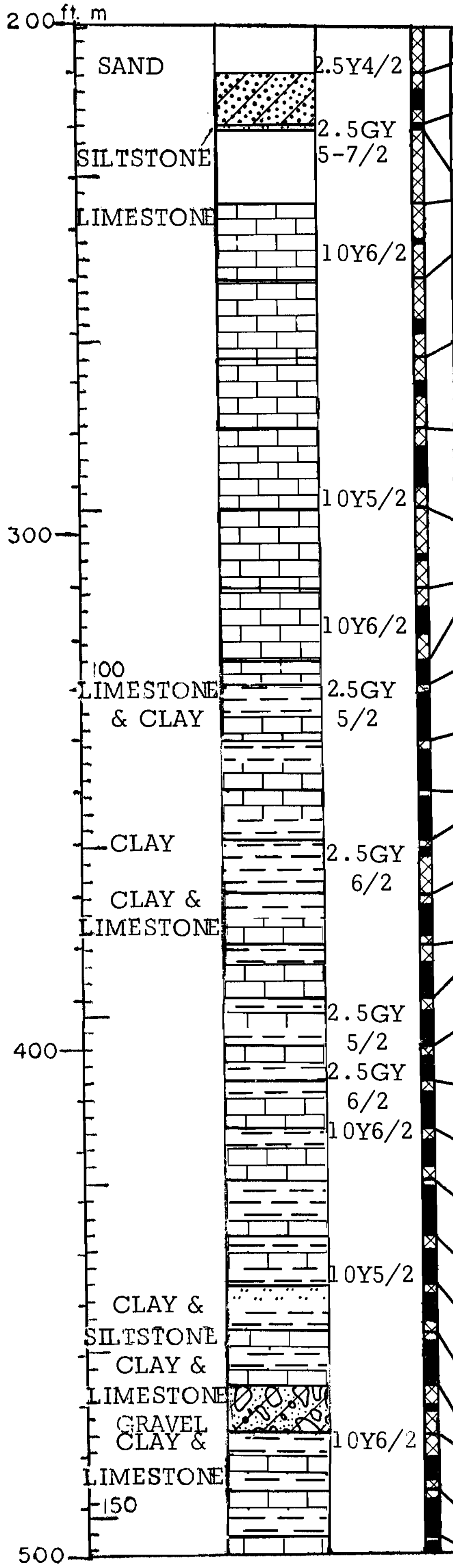
slty, pt calc, plas to firm;glauc-abu;sd-abu, calc debris;layers of biogenic calcarenitic slty sd;H_2S od

biogenic calcarenitic, slty to cly, H_2S od, uncons to plas; glauc-abu;F & shl frag abu;cly mtx in lowrhlf

calc sdy, msv, plas to frm, H_2Sod; fn calc mtx;

same as above; irrg mot

calcarenitic slty, por, plas to firm; mtx-abu;F-abu



NO CORE RECOVERED

biogenic, calcarenitic, v fn grn, slty, mod srt, msv to irrg mot, uncons to pt cptd; mtx-v abu

slty, impure, phos, calc, t-b to lam, hd, post Miocene-Oligocene boundary at 67.1 m.

NO CORE RECOVERED

impure calcilutaceous, slty, packstone, indst flaser bdng; F- cm; sca plcy shl imp up to 6 mm long

top 5" is a calcirudite of plcy shl frags (30%) in an indur mtx slty calcarenite; remainder is a wackestone in slt rng, indst lam. impure.

Calcilutaceous, impure, slty, wackestone, lam to irrg mot, firm; lamd in upper 2/3 of core and mot in lower 1/3; dk mnrls - scr

calcilutaceous wackestone, slty, lamd to irrg mot, cptd to hd; dk mnrls-scr; glauc-tr; lam are sca and dstb

impure, calcilutaceous slty wackestone, lam to mot; burrowed carb ptngs at base of core

Same as before; pt cpted to hd; H_2S od strn

impure calcilutite-wackestone, slty. msv w/sca bk lam, firm to hd, H_2S od strn

ls calcilutite as above. as dst bd
cl - calc, slty to cly, fnt mot, plas; sca bk lam

intbd slty calcilutite, msv, hd to firm and cl, slty, calc, fnt mot to dsct lamd, plas to cptd

same intbd calcilutite and slty cl

mainly slty, calc plas, fnt mot cl except for upper 13 cm of core which is a slty hd to firm calcilutite

intbd ls - calcilutite, wackestone, firm to cptd and cl - calc, slty, plas; tk to t-b

same as before, tk to t-b, fnt mot

intbd slty calc cl and msv firm to cptd calcilutite; tk to t-b

same intbd calcilutite-wackestone and slty plas msv cl

same as before; cl fnt lamd and borders on being a calc ooze

intbd calcilutite, fn to md slt max size, fnt mot and cl, slty, calc; sca plcy shl frags up to 1 cm

cl-calc, slty, fnt mot, plas, H_2S od strn ls-wackestone to carbonate mudstone, firm to cptd

intbd calc plast slty cl and slty msv impure calcilutite w/oily od

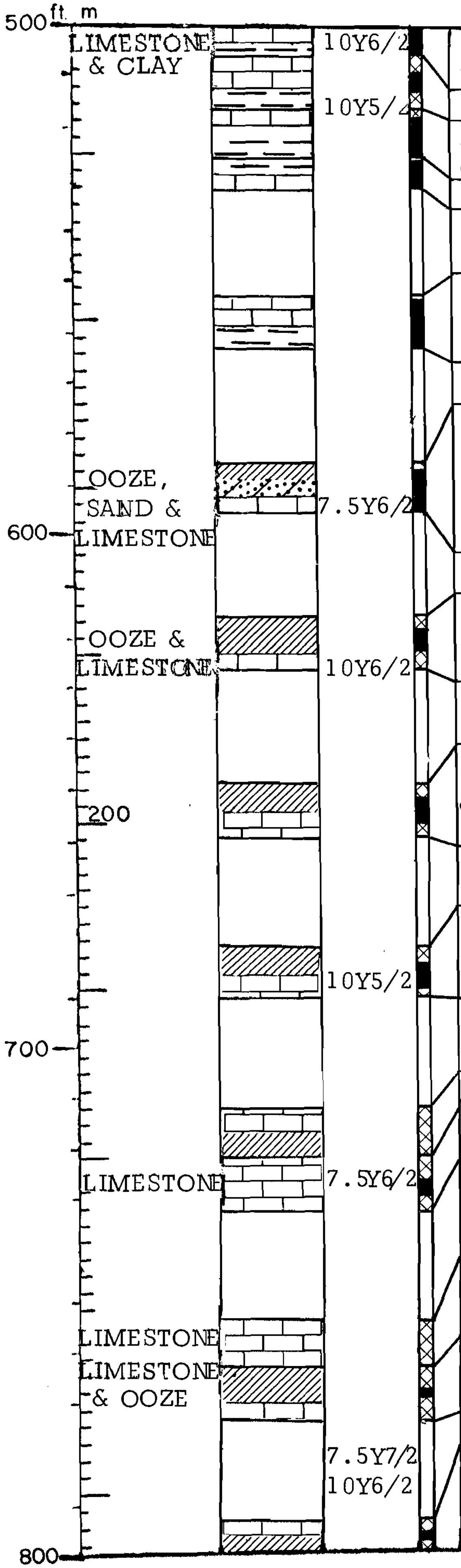
sltst-calc, cly, msv, crumbly to firm
cl - slty, calc, plas, fnt mot, intbd w/sltst

intbd slty calc, msv to fnt mot plas cl and calcilutaceous slty mot, firm to cptd wackestone

brkn shl frags and sltst rx frags - probably slump

intbd msv to fnt bd slty firm wackestone and fnt mot calc, slty cl; sca brkn plcy shl frags up to 20 mm

same as above; dk mnrls-scr; H_2S od strn; msv



intbd calcilutite-wackestone, slty, fnt lamd, firm to cptd and cl, sl slty, calc, plas, H_2S strn

same as before; cl borders on being a calc ooze

ls - impure slty wackestone; dsct lam and bd; fnt oily od, cl - slty, calc plas, fnt mot

same impure calcilutite and fnt mot calc cl

INTERVAL NOT CORED

intbd cl, calc, slty, plas to pt cptd and ls, calcilutite-wackestone, slty, dsct lamd, firm to cptd; sca qtz; H_2S od strn

INTERVAL NOT CORED

intbd calc ooze and calcilutaceous ls down to 179.3 m where there is a marked color change; below is sd, biogenic, calcarenitic, slty impure, msv, pt cptd, intbd w/ls, calcilutite, msv to fnt lamd, firm, wackestone

INTERVAL NOT CORED

ls-impure calcilutaceous slty to sdy wackestone, msv to fnt lamd, firm to cptd; ooze-calc, fnt irrg mot, plas to crumbly

INTERVAL NOT CORED

intbd ooze-slty calc, msv to fnt bd, plas to pt cptd <u>and</u> ls-slty calcilutite, packstone to wackestone, msv; Holothurian spines

INTERVAL NOT CORED

same as before, intbd calc slty ooze and msv firm to cptd ls-calcilutite, packstone; abu mtx; irrg fracture

INTERVAL NOT CORED

same as before; 5 cm sample in core catcher

calcilutaceous wackestone in slt rng; mtx-40%; msv firm to cptd, impure; glauc-tr

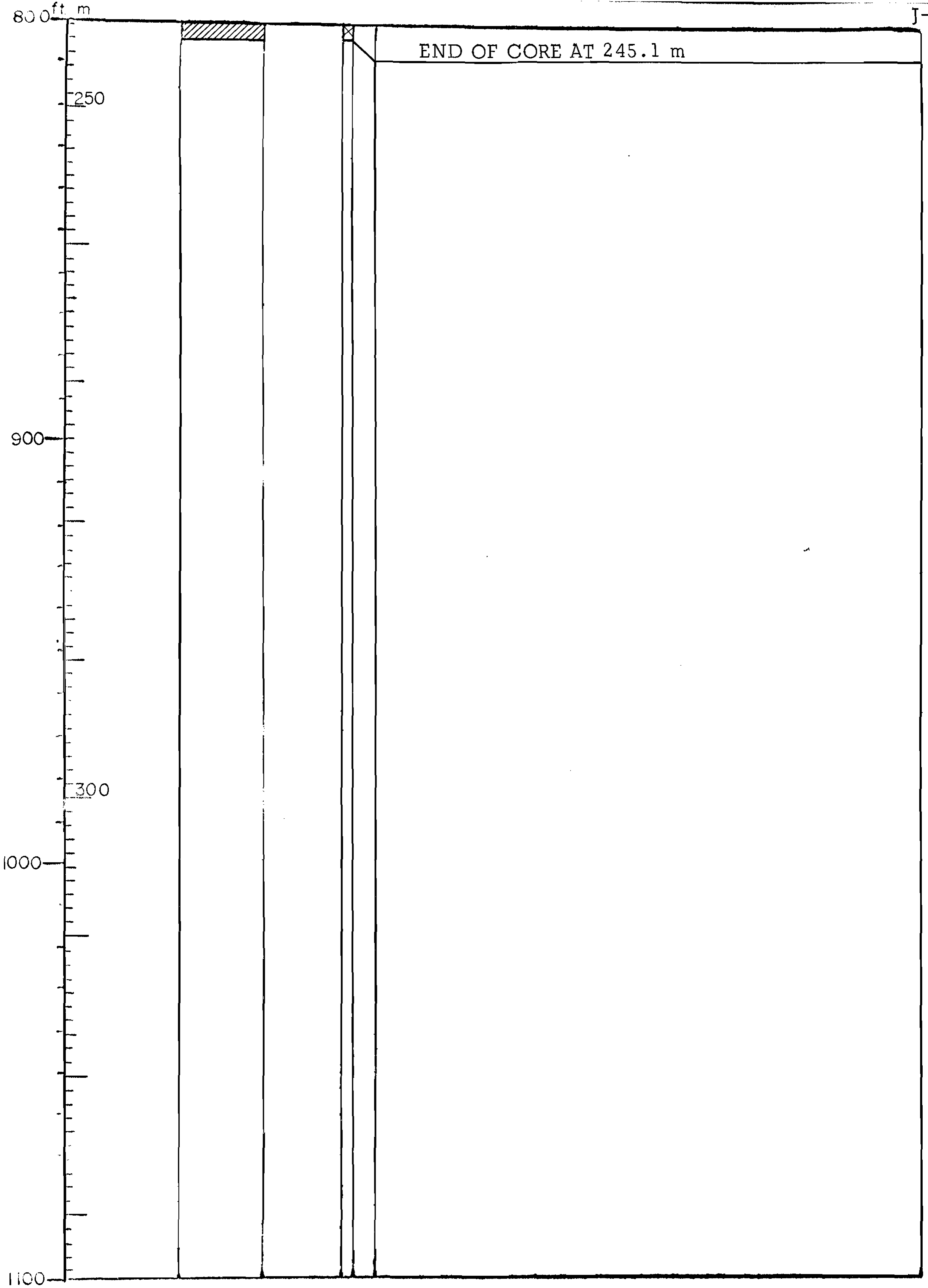
INTERVAL NOT CORED

2.5 cm core of ls-wackestone to carbonate mudstne, slty, msv, hd; Oligocene-Upper Eocene boundary 229.2m.

ooze-cly calc, msv, plas to pt cptd, H_2S strn
ls-calcilutite in slt rng, wackestone, msv, firm to hrd

INTERVAL NOT CORED

ls- calcilutaceous, slty, firm
ooze-calc, impure, msv, plas to crumbly, H_2S od str


ft. m
800
250
900
300
1000
1100
END OF CORE AT 245.1 m

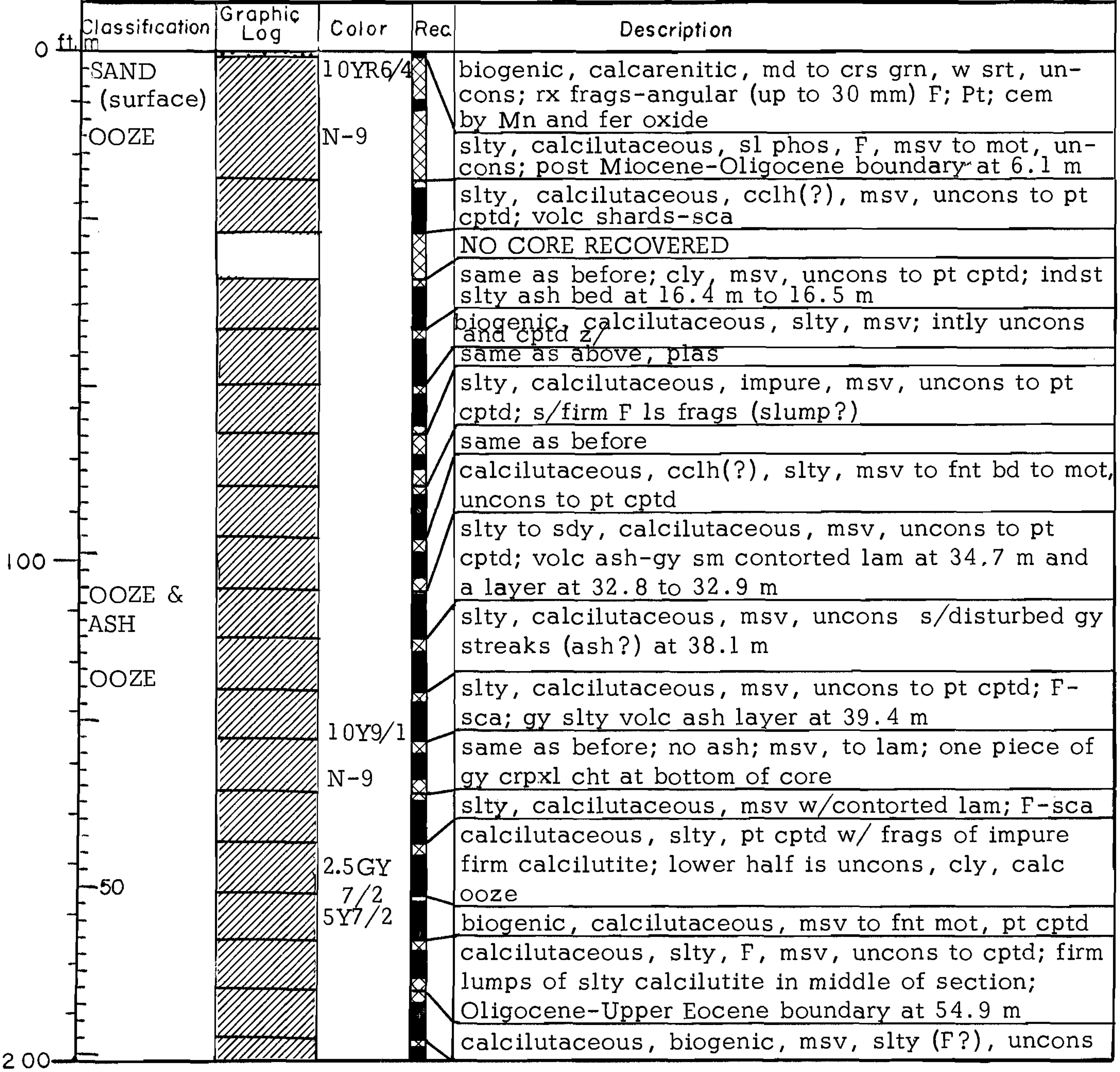
PRELIMINARY JOIDES *CORE LOG*-HOLE 6

AREA: Inner(west) part of Blake Plateau at base of Florida-Hatteras Slope, east of Jacksonville

LAT. 30° 05' N LONG. 79° 15'W DATE May 7, 1965

LOGGER(S) Frothingham, Schlee DEPTH 805 m

REMARKS:



biogenic, calcarenitic, md to crs grn, w srt, uncons; rx frags-angular (up to 30 mm) F; Pt; cem by Mn and fer oxide

slty, calcilutaceous, sl phos, F, msv to mot, uncons; post Miocene-Oligocene boundary at 6.1 m

slty, calcilutaceous, cclh(?), msv, uncons to pt cptd; volc shards-sca

NO CORE RECOVERED

same as before; cly, msv, uncons to pt cptd; indst slty ash bed at 16.4 m to 16.5 m

biogenic, calcilutaceous, slty, msv; intly uncons and cptd z/

same as above, plas

slty, calcilutaceous, impure, msv, uncons to pt cptd; s/firm F ls frags (slump?)

same as before

calcilutaceous, cclh(?), slty, msv to fnt bd to mot, uncons to pt cptd

slty to sdy, calcilutaceous, msv, uncons to pt cptd; volc ash-gy sm contorted lam at 34.7 m and a layer at 32.8 to 32.9 m

slty, calcilutaceous, msv, uncons s/disturbed gy streaks (ash?) at 38.1 m

slty, calcilutaceous, msv, uncons to pt cptd; F-sca; gy slty volc ash layer at 39.4 m

same as before; no ash; msv, to lam; one piece of gy crpxl cht at bottom of core

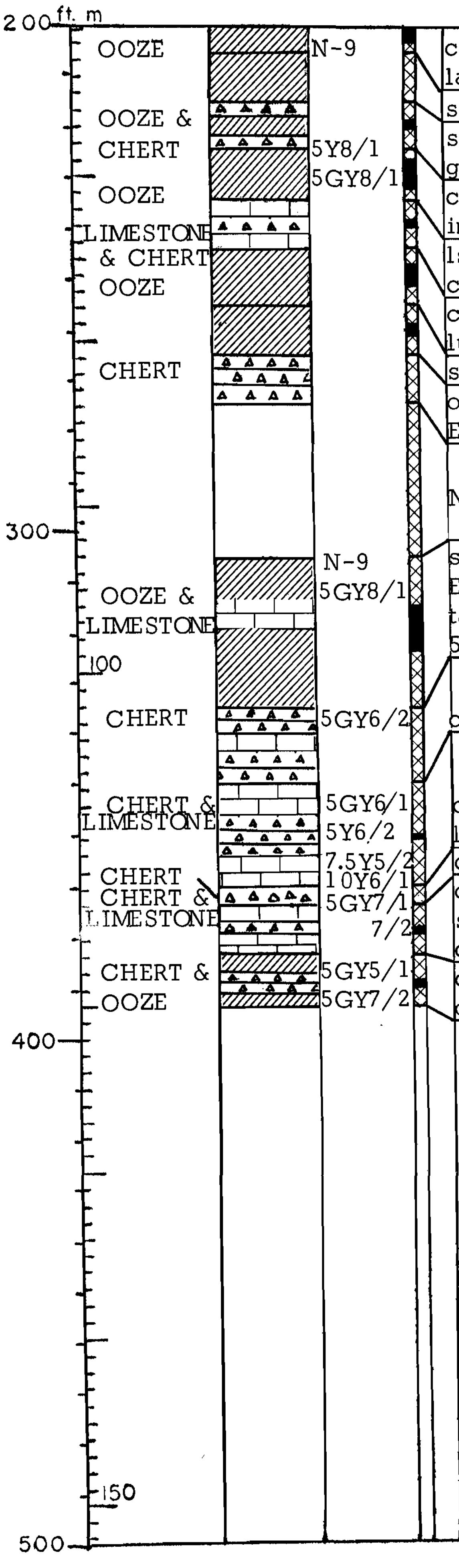
slty, calcilutaceous, msv w/contorted lam; F-sca

calcilutaceous, slty, pt cptd w/ frags of impure firm calcilutite; lower half is uncons, cly, calc ooze

biogenic, calcilutaceous, msv to fnt mot, pt cptd

calcilutaceous, slty, F, msv, uncons to cptd; firm lumps of slty calcilutite in middle of section; Oligocene-Upper Eocene boundary at 54.9 m

calcilutaceous, biogenic, msv, slty (F?), uncons



calcilutaceous, biogenic, cly to slty, msv to fnt lam, uncons to cptd; calc lmps

same as before

slty, calcilutaceous, msv to mot, uncons; cht-v lt gy, crpxl, msv, hd, w/inclusions of ls in it

calcilutaceous, biogenic, cly, msv to indst lam, impure

ls-biogenic, calcilutite, msv, firm to pt cptd cht-as brkn frags (up to 30 mm), crpxl, mot

calcilutaceous, cly, msv to indst lam; thin calcilutite layer in middle

same as before; plas to cptd, w/sm frags of cht

one piece of crpxl hd cht w/faint banding; Upper-Eocene-Middle Eocene boundary at 83.8 m

NO CORE RECOVERED

slty, calc, F, msv, uncons; Middle Eocene-Lower Eocene boundary at 97.5 m; below is slty; calcilutaceous, msv, pt cptd ooze w/firm calcilutite bd 5 cm thick; s/ angular hd cht frags at base

crpxl msv, mot, hd; sharp irrg ct w/ls

crpxl streaky hd, ang frags w/patches of sil firm ls in cht

crpxl hd, fnt lamd, mot and solid

cht-crpxl, mot, hd, ds, and intbd w/calcilutite, sil, cly, msv, cptd to firm; Lower Eocene-Paleocene boundary at 116.7 m

cht-hd, crpxl

ooze-calc, cly, msv, cptd

END OF CORE AT 119.7 m