

EN032- 21PISTON CORES, 1 KASTEN CORE, 2 BOXCORES, 4 GRAVITY CORES

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GRADUATE SCHOOL OF OCEANOGRAPHY
UNIVERSITY OF RHODE ISLAND
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CORE 2

CRUISE REPORT
R/V ENDEAVOR CRUISE EN32

OBJECTIVE: Climatic history of the northern Gulf of Mexico recorded in Late Quaternary marine sediments.

SCHEDULE: Depart Morehead City, N. C. 1700 EST 27 Jan. 1979
Arrive West Palm Beach, Fla. 0930 EST 16 Feb. 1979

FUNDING: NSF Grant No. OCE75-21262 (Kennett); 20 days at sea
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PURPOSE: Cruise EN32 included one principal project and two ancillary programs.

- 1) Piston cores were taken in the Orca Basin, the northwestern slope of the Gulf of Mexico, the Desoto Canyon and the northeasternmost Campeche Escarpment.
 - a) A dense, anaerobic brine is contained within the isolated Orca Basin. Cores were taken across the narrow transition zone at 2260 meters which marks the top of the brine. Cores taken beneath anaerobic waters are expected to be undisturbed by bioturbation and will provide high resolution records of latest Quaternary climatic events. The benthonic fauna in cores taken near the transition zone will be compared with that in cores taken at similar depths from an adjacent aerobic basin.
 - b) Cores from the northwest slope were selected using data from the Lamont core collection. Sites were chosen in regions of both high and low sedimentation rates for studies of Late Quaternary climate and paleoceanography.
 - c) Cores from the Desoto Canyon were taken to study in greater detail the history of the Laurentide meltwater event at the end of the last glaciation.
 - d) Cores from the Campeche Escarpment were selected using data collected on cruise TR149 and GS7603. Pliocene and Quaternary sections were cored to study the initiation and development of the modern Florida Current.

2) Hydrocasts were taken in the Orca Basin to sample waters above, below and within the transition zone at the top of the anaerobic brine. The water samples, taken in 1.2 liter Nansen bottles with 24 ml piggybacks, were analyzed for dissolved gases, temperature, salinity and nutrients in order to understand better the biological production of gases in anaerobic conditions and their biological consumption within the transition zone.

3) Gravity cores and box cores were taken in the Orca Basin, an adjacent basin and on the abyssal plain. Concentrations of isotopes produced since the beginning of the nuclear age will be analyzed in surface sediments to measure the depth of bioturbation in these differing benthic habitats.

RESULTS:

1) A total of 21 piston cores (Table 1) with trigger cores plus one kasten core (Table 2) were successfully recovered. The average piston core length was 32 feet; the total length of sediment recovered was 703 feet. A gross biostratigraphy determined from samples taken at five foot intervals in all piston cores indicates that most cores contain latest Quaternary sediments. However, those cores from the northeastern Campeche Escarpment contain Pliocene. Cores over 2000 nautical miles of high resolution sub-bottom profiles were recorded outlining the nature of sedimentary regions between core sites (Fig. 1).

2) A total of 25 samples were taken in 1.2 l Nansen bottles with 25 24 ml piggyback samplers. In addition one 5 l and one 30 l samples were taken in Wiskin bottles in order to measure volatile hydrocarbons (Table 3). Bottle depths ranged from 2400 m to 2060 m and some sampled the transition zone at 2260 meters at the top of the brine. Table 4 indicates which gases and nutrients were measured in each hydrocast.

3) Two box cores (Table 6) and four gravity cores (Table 5) totaling 31 feet of sediment were successfully recovered. Undisturbed top sediments appear to have been recovered in GC2, 4 and 5 and in both box cores.

The top four centimeters of the box cores will be analyzed for Pu-239, Pu-240, and Th-234. The gravity cores with undisturbed tops will be sliced into one centimeter thick sections and analyzed for Pb-210, Ra-226, Th-230, U-234, U-238, Th-232 and for Pa-231 in selected cores. Porosity and CaCO_3 content will be analyzed as well.

ACKNOWLEDGEMENTS:

Essential to the success of this cruise were the cooperation and performance of Captain H. Bennett and the crew of R/V ENDEAVOR and the expertise of Mr. Rodman Davies and Mr. Roger Roussell, marine technicians from the University of Rhode Island.

TABLE 1. PISTON CORE SITES

<u>Piston Core Number</u>	<u>Piston Core Length (Feet)</u>	<u>Trigger Core Length (Inches)</u>	<u>Water Depth (m)</u>	<u>Lat. (N)</u>	<u>Long. (W)</u>	<u>Region</u>
1	38.5	50	2415	26°54.6'	91°20.5'	Orca
2	31.2	51	2310	26°58.1'	91°17.0'	Orca
3	30.1	43	1620	27°00.1'	91°23.4'	Orca
4	24.5	54	2260	26°56.2'	91°21.3'	Orca
5	32.2	--	2240	26°59.5'	91°31.5'	Endeavor
6	33.0	--	2280	26°56.8'	91°21.0'	Orca
7	34.6	47	3150	25°58.9'	93°29.0'	NI
8	29.2	39	1655	26°24.6'	93°44.4'	NI
9	29.8	39	1405	26°58.3'	95°29.6'	NI
10	42.5	27	1352	26°50.8'	93°38.7'	NI
11	34.5	41	810	27°21.9'	92°56.4'	NI
12	28.1	44	1465	29°09.0'	92°16.4'	NI
13	32.5	26	1510	29°00.0'	87°50.6'	D
14	34.8	33	1162	29°08.6'	87°22.0'	D
15	24.0	36	750	29°10.1'	86°59.9'	D
16	30.0	--	990	28°24.1'	86°59.6'	D
17	27.4	31	2025	24°22.4'	86°34.8'	C
18	23.0	--	2930	24°33.5'	85°35.4'	C
19	30.8	39	1345	23°46.4'	86°21.5'	C
20	43.5	--	1135	23°14.5'	85°47.2'	C
21	2.0	37	678	24°59.5'	84°20.0'	F
Total	642.6	600				
Average	32.0	38				

TABLE 2. KASTEN CORE SITE

<u>Core No.</u>	<u>Core Length (ft.)</u>	<u>Water Depth (m)</u>	<u>Lat. (N)</u>	<u>Long. (W)</u>
KC1	10	1212	27°00.0'	91°30.4'

TABLE 3. HYDROCAST STATIONS

<u>Sta. No.</u>	<u>Bottle Type</u>	<u>Depth of Bottle (m)</u>	<u>Water Depth (m)</u>	<u>Lat. (N)</u>	<u>Long. (W)</u>
HC1	1.2 l Hansen & 24 ml piggybacks	2320	2430	26°54.0'	91°20.4'
	"	2340			
	"	2360			
	"	2380			
	"	2400			
HC2	1.2 l Hansen & 24 ml piggybacks	2060	2240	27°01.9'	91°16.5'
	"	2080			
	"	2120			
	"	2150			
	"	2210			
HC3	1.2 l Hansen & 24 ml piggybacks	2255	2375	26°55.7'	91°20.2'
HC3A	1.2 l Hansen & 24 ml piggybacks	2298			
	"	2308	2405	26°55.1'	91°20.4'
	"	2328			
	"	2348			
	"	2368			
	5 l Niskin	2378			
HC4	1.2 l Hansen & 24 ml piggybacks	2180	2350	26°56.0'	91°20.0'
	"	2210			
	"	2240			
	"	2270			
	"	2300			
	5 l Niskin	2320	2315	26°56.5'	91°20.4'
HC5	1.2 l Hansen	2158			
	"	2188			
	"	2218			
	"	2248			
	"	2278			
	30 l Niskin	2298			

TABLE 4. EN-32 HYDROCAST SAMPLES

Measurements Made on Samples Taken for Analysis of	HC 1	HC 2	HC 3	HC 3A	HC 4	HC 5
Temperature	x		x	x	x	x
Salinity	x		x	x	x	x
Nutrients (P, S, NO ₃ , NO ₂ , NH ₃)	x		x	x	x	x
Argon	x		x	x	x	
Nitrogen	x		x	x	x	
Methane	x		x	x	x	
Hydrogen Sulfide	x		x	x	x	x
Total CO ₂	x		x	x	x	x
Helium-3	x		x	x	x	x
Neon	x		x	x	x	x
Xenon	x		x	x	x	x
Krypton	x		x	x	x	x
Volatile Hydrocarbons*				x	x	

* deepest bottle only

TABLE 5. GRAVITY CORE SITES

<u>Core No.</u>	<u>Core Length (ft.)</u>	<u>Water Depth (m)</u>	<u>Lat. (N)</u>	<u>Long. (W)</u>
GC 1	8	2389	26°54.2'	91°20.2'
GC 2	8	2430	27°01.3'	91°16.6'
GC 3	0	2285	26°59.2'	91°17.9'
GC 4	6	2240	26°59.7'	91°31.3'
GC 5	9	2237	26°57.1'	91°20.9'

TABLE 6. BOX CORE SITES

<u>Core No.</u>	<u>Water Depth (m)</u>	<u>Lat. (N)</u>	<u>Long. (W)</u>
BC 1	2175	26°59.4'	91°32.0'
BC 2	3175	25°58.3'	93°22.7'

C R U I S E E N 3 2

