

**Geophysical and Bioacoustic Investigations
in
Southwest Gulf of Mexico:
Gulf Probe VI Cruise Report**

J. D. Phillips - Chief Scientist

University of Texas Institute for Geophysics
Technical Report No.121

R. V. GYRE
Cruise GC-6
17 May-8 June 1992

31 August 1992

CRUISE REPORT

1

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Summary. A cooperative, marine geophysical/geological and mammal bioacoustic monitoring investigation was conducted in the western Gulf of Mexico by the University of Texas Institute for Geophysics (UTIG), Scripps Institution of Oceanography, (SIO), Centro de Investigacion Cientifica y Educacion Superior de Ensenada (CICESE) of Mexico and Texas A and M University (TAMU). The research was done aboard the Research Vessel GYRE (Cruise GC-6) of TAMU during the period 17 May-8 June 1992.

The ship departed and returned to Galveston, Texas with a brief intermediate stop at Port Isabel, Texas. The primary area of interest for the geophysical/ geological investigations was the Sigsbee abyssal plain near 24 N, 94 W (Figures 1 and 2, and Table 1). The bioacoustic work was done on the transit lines between Galveston/Port Isabel and the geophysical work area. Navigational control was provided by GPS (Magnavox models MX200 and 1107, Trimble model NavTrac) and Loran-C (Northstar model 6000) receivers. All navigation and underway geophysical data were digitally recorded using MacIntosh and IBM personal computer systems.

This report briefly describes the objectives and shipboard results for each of the investigations conducted aboard the cruise. A cruise log narrative is also provided (Appendix 1).

1. Heatflow. Previous widely-spaced, heatflow measurements in the western Gulf of Mexico basin appear to be anomalously low for its estimated crustal age (~160 my), even after corrections are applied to account for sediment radioactivity and sedimentation rate. Accordingly, closely-spaced thermal gradient and conductivity observations were made in the vicinity of Deep Sea Drilling Program (DSDP) sites 90 (23°47.80 N, 94° 46.09 W, Depth 3713m) and 91 (23° 46.40N, 93° 20.77 W, Depth 3763m) and along a 150 km transect between the sites (Figure 2 and Table 2), in an attempt to verify this apparent anomaly.

The digital recording, UTIG heat flow probe was used for these observations. This instrument provided fifty-nine (59) thermal gradient along 11 heat flow survey lines with forty (40) *in-situ* thermal conductivity measurements on 7 of the 11 survey lines. In addition, independent measurements of thermal conductivity were made on sediments from piston cores taken at the other four (4) heat flow probe survey lines as well as at five (5) other piston core sites to provide a total of forty-nine (49) conductivity measurements.

2. Piston Coring/3.5 Khz Shallow Penetration Seismic Profiling. Detailed 3.5 Khz seismic surveys were carried out to examine the most recent sediment depositional pattern and the sedimentation rate history near DSDP sites 90 and 91. These surveys were then used to locate seven (7) core stations along the heat flow survey transect between the DSDP sites (Figure 3, Table 3). In addition, two (2) piston core stations and 3.5 Khz profiles were made in the modern sediment wave field area, located immediately to the west-northwest of the heat flow survey area (Figure 3, Cores 2 and 9).

The latter work was done during the transits between the heat flow survey area and Port Isabel/Galveston, respectively, as time permitted. Also, the thermal conductivity of all nine (9) cores was measured aboard ship to verify the *in-situ* measurements made with the heat flow probe.

Seawater temperature was observed at twenty-seven (27) expendable bathythermographs (XBT) stations along the bioacoustic monitoring lines and in the geophysical survey area as well (Figure 5, Table 6). A separate report describing the XBT results is also available (Biggs, D. C., Texas A and M University, Technical Report, 92-04-T,1992).

6. Post-Cruise Research Responsibilities/Institution.

1. Heat Flow - S. Nagihara/SIO, J. Sclater/SIO
2. Piston-coring/3.5 Khz Profiling - W. Behrens/UTIG, A. Martin/CICESE
- 3a. Ocean Bottom Seismometers (OBS) - Y. Nakamura/UTIG, J. Garmany/UTIG
- 3b. Single Channel Seismic Reflection - K. Griffiths/UTIG, J. Phillips/UTIG
4. Magnetics/Gravity Profiling - J. Phillips/UTIG, K. Griffiths/UTIG, J. Garcia/CICESE
5. Bioacoustic Monitoring - J. Norris/TAMU, W. Evans/TAMU

7. Personnel.

Leg 1 (17 May-24 May)

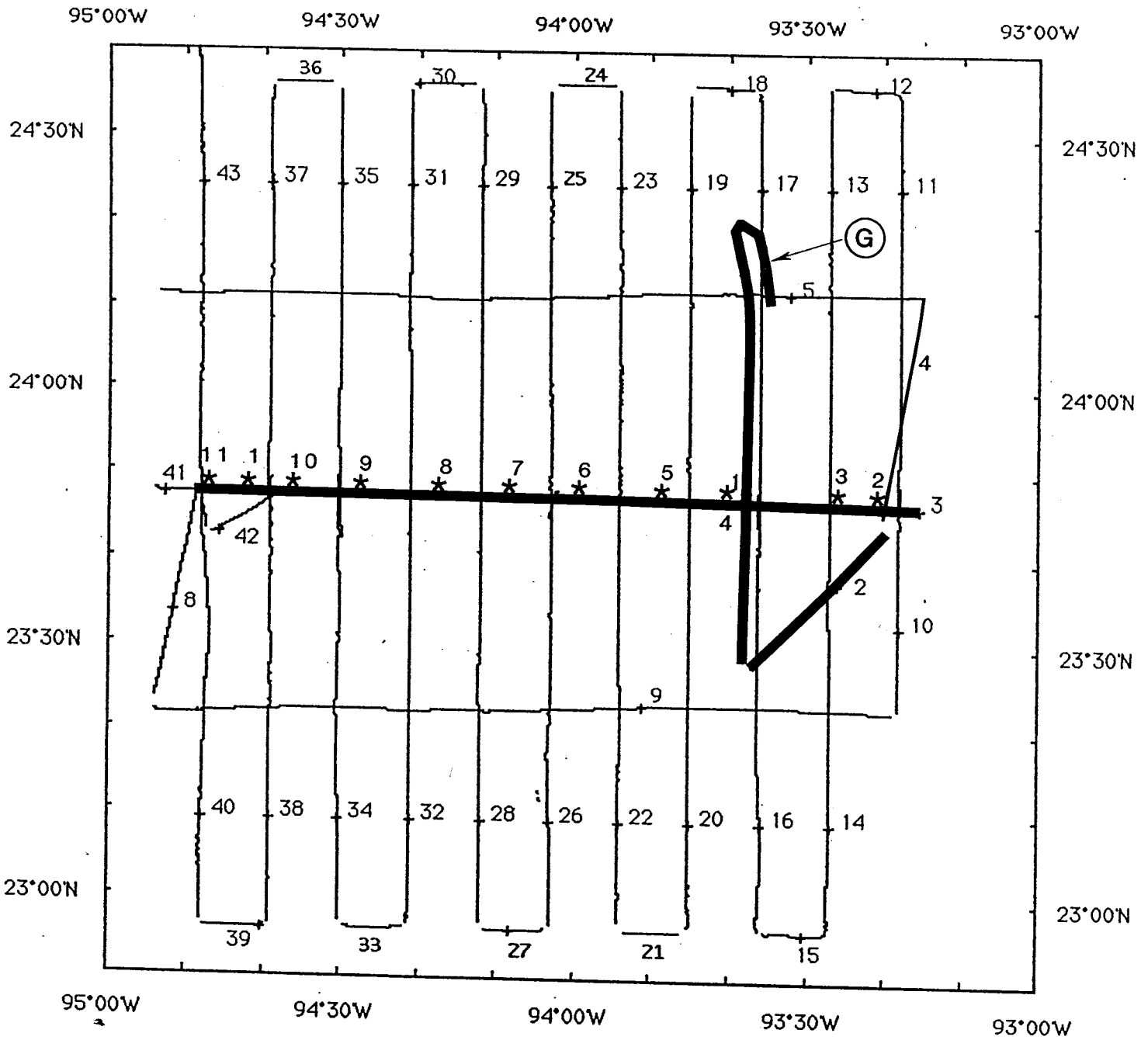
1. J. D. Phillips
2. Y. Nakamura
3. J. Garmany
4. M. Riedesel
5. W. Behrens
6. A. Roberts
7. K. Griffiths
8. Y. Hello
9. J. Norris TAMU
10. M. Duncan "
11. S. Leatherwood "
12. T. Jefferson "
13. W. Stevens "
14. D. Letzring GYRE
14. D. Barrows "
15. D. Rolf "
16. R. V. Pittman "
17. W. Green "
18. J. Garcia CICESE
19. G. Diaz "
20. R. Vazquez "
21. Darcy Brooks UTIG Student

Leg 2 (24 May-8 June)

- J. D. Phillips
- J. Sclater SIO
- L. Lawver
- S. Nagihara
- W. Behrens
- A. Roberts
- K. Griffiths
- D. Letzring GYRE
- D. Rolf "
- W. Green "
- R. V. Pittman "
- J. Garcia CICESE
- G. Diaz "
- R. Vazquez "
- Sally Zellers UTIG Student
- Sheryl Stouffer "
- Nick Hazel "
- Shannon D. Wilson "

8. Acknowledgements. Ship time for this cruise was sponsored by the US National Science Foundation (NSF) "Heat flow/basement depth relation for the ocean crust in the western Gulf of Mexico" (16 days allocated in support of grants OCE-9104100 to UTIG and OCE-9103341 to SIO); by The University of Texas Institute for Geophysics (3 days for student training & research) and the Texas Institute of Oceanography (3 days for the GULFCET bioacoustic work). NSF provided support for the GYRE shipboard technicians under grant OCE-9100233 to TAMU. The Vetlesen Foundation grant to the University of Texas Institute for Geophysics also provided financial support for this research. John Fett of LaCoste-Romberg kindly provided the shipboard gravimeter system.. The participation of CICESE scientists in the cruise was sponsored by Universidad Nacional Autonoma de Mexico (UNAM) and the NSF International Programs division.

Gulf Probe VI



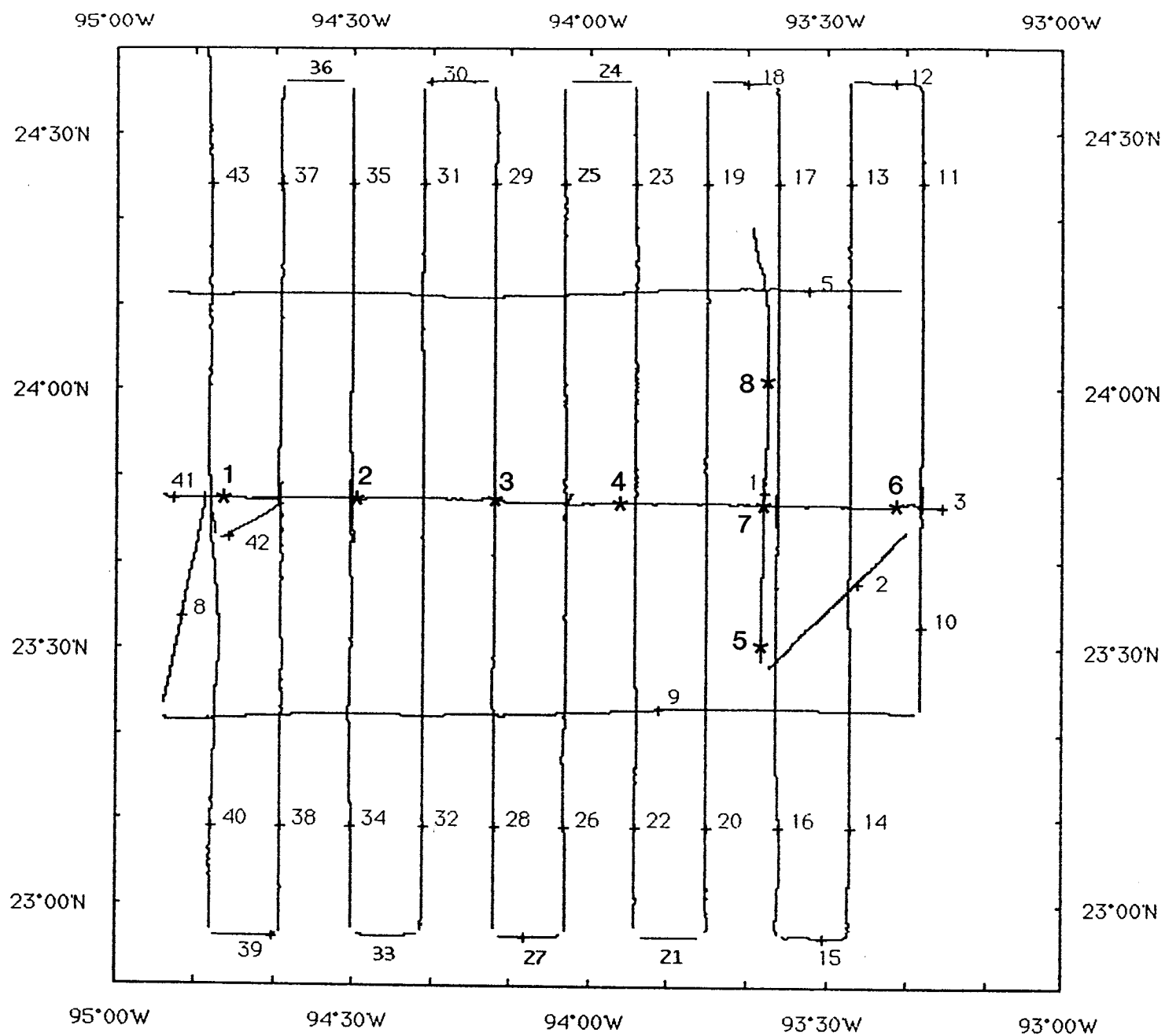
* HEAT FLOW PROBE STATION

— AIRGUN SHOOTING LINES

Projection: MERCATOR

Scale: 1: 1400000

Gulf Probe VI



* OBS STATIONS

Projection: MERCATOR
 Scale: 1: 1400000

Table 1

Gulf Probe 6 - Line/Time Definition											
Line No.	Description	Dir.	Day Start	Time Start	Day End	Time End	DATA TYPE				
							3.5	Mag	Grv	SCS	OBS
1	OBS Shooting line	N-S	21-May	05:15	21-May	15:59	x	x	x	x	x
2	OBS Shooting line	SW-NE	21-May	16:21	21-May	20:30	x	x	x	x	x
3	OBS Shooting line	E-W	21-May	22:00	22-May	18:49	x	x	x	x	x
	Core Station 1		23-May	15:00	23-May	18:00	x		x		
4	Transit to E-W North Tie		23-May	18:01	23-May	20:24	x	x	x		
5	North E-W tie line	E-W	23-May	20:25	24-May	05:00	x	x	x		
	Core Station 2		26-May	04:30	26-May	08:30	x		x		
	Core Station 3										
	Heat Flow Station 1.1		26-May	14:21	26-May	23:39	x		x		
8	Transit to South W-E Tie		26-May	23:40	27-May	02:00	x	x	x		
9	South W-E tie line	W-E	27-May	02:10	27-May	11:00	x	x	x		
10	Transit to site91	S-N	27-May	11:05	27-May	13:30	x	x	x		
	Core Station 4										
	Aborted Heat Flow		27-May	13:31	28-May	04:00	x		x		
	HF Pressure Case Tests										
11	Magnetic/Gravity	S-N	28-May	04:01	28-May	08:39	x	x	x		
12	Survey-North Loop	E-W	28-May	08:49	28-May	09:49	x	x	x		
13		N-S	28-May	10:00	28-May	15:51	x	x	x		
	Heat Flow Stations		28-May	15:52	29-May	00:19	x		x		
	2.1-2.4										
14	Magnetic/Gravity	N-S	29-May	00:20	29-May	05:38	x	x	x		
15	Survey-South Loop	E-W	29-May	05:40	29-May	06:27	x	x	x		
16		S-N	29-May	06:31	29-May	11:33	x	x	x		
	Heat Flow Stations		29-May	11:34	30-May	00:47					
	3.1-3.7										
17	Magnetic/Gravity	S-N	30-May	00:48	30-May	05:38	x	x	x		
18	Survey-North Loop	E-W	30-May	05:45	30-May	06:23	x	x	x		
19		N-S	30-May	06:32	30-May	12:15	x	x	x		
	Core Station 5										
	Heat Flow Stations		30-May	12:16	31-May	00:19					
	4.1-4.6										
20	Magnetic/Gravity	N-S	31-May	00:20	31-May	05:58	x	x	x		

Table 1

42	Survey-North Loop	NE-SW	6-Jun	23:20	7-Jun	00:05	x	x	x		
43		S-N	7-Jun	00:11	7-Jun	05:40	x	x	x		
Regional Transit Lines											
A	from Galveston		17-May	04:00	18-May	03:00	x	x	x		
B	from Galveston		18-May	03:00	18-May	20:00	x	x	x		
C	from Galveston		18-May	20:00	19-May	16:00	x	x	x		
D	from Galveston		19-May	16:00	20-May	06:30	x	x	x		
E	from Galveston		20-May	06:30	20-May	08:40	x	x	x		
F	OBS Deployment		20-May	09:00	20-May	15:00	x		x		
G	Shooting, no OBS		21-May	02:30	21-May	08:00	x	x	x	x	
H	OBS Recover		22-May	18:50	23-May	15:00	x		x		
6a	to Port Isabel		24-May	05:00	24-May	14:00	x	x	x		
6b	to Port Isabel		24-May	15:00	24-May	21:00	x	x	x		
7a	from Port Isabel		25-May	15:00	26-May	04:30	x	x	x		
7b	from Port Isabel		26-May	08:00	26-May	14:20	x	x	x		
I	to Galveston		7-Jun	05:41	8-Jun	09:00	x	x	x		

Table 2

Heat 5.1	31-May	1607	23° 45.092	93° 48.176	3741	enter
	31-May	1617	23° 45.160	93° 48.208	3741	pullout
Heat 5.2	31-May	1703	23° 45.541	93° 48.480	3741	enter
	31-May	1733	23° 45.775	93° 48.640	3741	pullout
Heat 5.3	31-May	1816	23° 46.088	93° 48.869	3741	enter
	31-May	1841	23° 46.303	93° 49.049	3741	pullout
Heat 5.4	31-May	1932	23° 46.680	93° 49.379	3741	enter
	31-May	1954	23° 46.878	93° 49.564	3741	pullout
Heat 5.5	31-May	2041	23° 47.236	93° 49.862	3741	enter
	31-May	2105	23° 47.508	93° 50.115	3741	pullout
Heat 5.6	31-May	2146	23° 47.795	93° 50.336	3741	enter
	31-May	2151	n/a	n/a	3741	No data,
Heat 6.1	1-Jun	1508	23° 42.577	93° 59.751	3743	enter
	1-Jun	1522	23° 42.736	93° 59.902	3743	pullout
Heat 6.2	1-Jun	1614	23° 43.135	94° 00.171	3743	enter
	1-Jun	1624	23° 43.281	94° 00.242	3743	pullout
Heat 6.3	1-Jun	1717	23° 43.558	94° 00.369	3743	enter
	1-Jun	1734	23° 43.706	94° 00.425	3743	pullout
Heat 6.4	1-Jun	2008	23° 47.114	94° 01.177	3741	enter
	1-Jun	2027	23° 47.263	94° 01.263	3741	pullout
Heat 6.5	1-Jun	2108	23° 47.518	94° 01.250	3741	enter
	1-Jun	2126	23° 47.554	94° 01.209	3741	pullout
Heat 6.6	1-Jun	2207	23° 47.693	94° 01.204	3741	enter
	1-Jun	2228	23° 47.758	94° 01.202	3741	pullout
Heat 7.1	2-Jun	1531	23° 44.695	94° 08.105	3743	enter
	2-Jun	1548	23° 44.858	94° 08.148	3743	pullout
Heat 7.2	2-Jun	1629	23° 45.184	94° 08.218	3743	enter
	2-Jun	1646	23° 45.359	94° 08.257	3743	pullout
Heat 7.3	2-Jun	1730	23° 45.624	94° 08.202	3743	enter
	2-Jun	1748	23° 45.732	94° 08.210	3743	pullout
Heat 7.4	2-Jun	1828	23° 45.972	94° 08.161	3743	enter
	2-Jun	1846	23° 46.035	94° 08.119	3743	pullout
Heat 7.5	2-Jun	1929	23° 46.423	94° 07.978	3743	enter
	2-Jun	1948	23° 46.467	94° 07.937	3743	pullout
Heat 7.5	2-Jun	2233	23° 47.077	94° 07.003	3743	enter
	2-Jun	2252	23° 47.076	94° 07.049	3743	pullout
Heat 8.1	3-Jun	1410	23° 44.761	94° 17.437	3743	enter
	3-Jun	1426	23° 44.917	94° 17.460	3743	pullout
Heat 8.2	3-Jun	1509	23° 45.150	94° 17.537	3743	enter
	3-Jun	1526	23° 45.254	94° 17.561	3743	pullout
Heat 8.3	3-Jun	1609	23° 45.500	94° 17.766	3743	enter
	3-Jun	1626	23° 45.627	94° 17.797	3743	pullout
Heat 8.4	3-Jun	1715	23° 46.058	94° 17.993	3743	enter
	3-Jun	1734	23° 46.168	94° 18.039	3743	pullout

TABLE 3 Piston Core Stations

Station	Date	Time	Lat	Long	Depth(cor)*	Comment	Length
CORE 1 (Site 91)	23-MAY	1554	23° 47.344	-93° 20.753	3753 m.	start trip	8.79 m.
	23-MAY	1720	23° 47.643	-93° 20.325	3753 m.		
CORE 2 (Wave Field)	26-MAY	0504	24° 38.54	-95° 26.65	3362 m.	start trip	7.50 m.
	26-MAY	0619	24° 38.603	-95° 24.516	3368 m.		
CORE 3 (Site 90)	26-MAY	1507	23° 47.53	-94° 46.059	3697 m.	start trip	6.44 m.
	26-MAY	1624	23° 47.625	-94° 46.098	3697 m.		
CORE 4	27-MAY	1652	23° 45.86	-93° 20.547	3753 m.	start trip	7.64 m.
	27-MAY	1751	23° 46.377	-93° 20.912	3753 m.		
CORE 5	30-MAY	1318	23° 46.369	-93° 40.882	3755 m.	start trip	4.60 m.
	30-MAY	1433	23° 46.58	-93° 40.39	3755 m.		
CORE 6	1-JUNE	2356	23° 46.819	-94° 00.904	3755 m.	start trip	4.36 m.
	2-JUNE	0057	23° 47.2271	-94° 00.9206	3755 m.		
CORE 7	3-JUNE	2130	23° 47.4453	-94° 17.9485	3755 m.	start trip	4.44 m.
	3 JUNE	2228	23° 47.7293	-94° 17.9013	3755 m.		
CORE 8	5-JUNE	1026	23°46.548'N	-94°35.167'	3753 m.	start trip	4.90 m.
	5-JUNE	1128	23°46.248'N	-94°35.950'	3753 m.		
CORE 9 (Wave Field)	6-JUNE	1938	23° 49.489	-94° 53.503	3643 m.	start trip	7.50 m.
	6-JUNE	2037	23° 49.440	-94° 54.163	3643 m.		

* Matthews' Tables (1939) correction applied (Zone 17). Add 3m for Transducer hull depth

TABLE 5
BIOACOUSTIC STREAMER DEPLOYMENT LOG

DATE (GMT)	TIME	MILES	SPEED	COMMENT	Line #
1300/17 May	29.0 hrs	190nm	6.6 kts	Dedicated	A,B
1804/18 May					
2000/18 May	20.3 hrs	130 nm	6.4 kts	Dedicated	C
1620/19 May					
1830/19 May	13.75 hrs	88nm	6.4 kts	Dedicated*	D,E
0815/20 May					
Subtotal	63.05 hrs	408 nm	6.5 kts		
0200/21 May	30.25 hrs	152.0 nm	5.0 kts	Shooting Fixed SOA 5.0 kts	G,1,2,3
0815/22 May					
1400/22 May	1.75 hrs	9.0 nm	5.0 kts	Shooting Fixed SOA 5.0 kts	3
1545/22 May					
Subtotal	32.00 hrs	161.0 nm	5.0 kts		
1545/22 May	2.25 hrs	22.5 nm	10.0	Transit	3
1800/22 May					
1845/23 May	24.25 hrs	242.5 nm	10.0 kts	Transit	4,5,6
1900/24 May					
Subtotal	26.50 hrs	265.0 nm	10.0 kts		
TOTAL	121.55 hrs	834.0 nm			

*Required a minimum Speed of Advance (SOA) = 6.0 kts

CRUISE LOG NARRATIVE

GYRE Cruise 92GC-6

Leg 1 17 May-24 May 1992
Leg 2 25May-8 June 199224° 49' , 95° 58'
23° 48' , 94° 46'18-May 0245 Change course @ 3°/min to 261°
0300 change reate of turn to 6°/min
0310 End of Turn
0440 GPS>LORANC
lat - 0.42 ±0.02; long - 0.25 ±0.02

1341 Change course @ 9°/min to 180

18-May 1400 Magnetometers off to switch sensors

1445 Port magnetometer on

1545 Magnetometers back to work

18-May 1500 GPS>LORANC
lat - 0.41±0.08; long - 0.19±0.04

1730 bring in streamer

1804 streamer on board,pulling in maggies

1809 port maggie coming in

1816 port mag in, starboard on way

1831 starboard mag on board

1839 airgun deployed and pressurized

1841 several test shots

1919 airgun retrieved

1928 airgun secured, redeploying port maggie

1936 begin slow turn to right

1945 starboard mag deployed + connected

1955 port mag on

2020 gps-loran c: lat 0.43; lon 0.16'

2230 Having to supply event marks on PDR for time when A delayed by B

2300 time marks present but partial when A only used. Generator has

drifted?

0052 Yes, generator drifts. Mark goes in analog input and may.

miss print enabling

0431 18° turn to next leg

0445 XBT #10

0540 GPS>LORANC: lat - 0.58±.13 long - 0.11±.03

1130 zero adjusted on red maggie. cal ~ ok.

1300 zero adjusted on red maggie. cal ~ ok.

200.0 6.9

18-May 1353:20 magnetometers off to switch connections

1356 maggies back on

1429 magnetometers off to work on the consol

1435 both maggies back on

1445 GPS>LORANC: lat - 0.70±.13 long - 0.5±.03

1551 XBT #11

1555 streamer starting in

Date 1992 Time(Z) COMMENTS Course Speed

GYRE CRUISE 92GC-6 Leg 1

Dr Joseph D. Phillips - Chief Scientist

17-May 0300 Depart TAMU Dock Pelican Island, Galveston, Texas

090.0 05.0

17-May 0330 Clear Bolivar Pass Breakwater

165.0 9

17-May 1300 Begin Underway Watch

Behrens,García Diaz on 4-8 Watch

17-May 1330 Slow to 4.0kt to deploy bioacoustic streamer

160.0 5

17-May 1346 Streamer out resume speed to 6-8kts

160.0 6

17-May 1400 change course C/C 185

185.0 8

17-May 1425 Sib Maggie deployed (Far 1575' Astern)

182.0 8

17-May 1500 Port Maggie deployed (Near 675' Astern)

182.0 8

Both maggies operating appear to be measuring 3-4

gamma gradient

3.5 Khz E/S running

17-May 1505 XBT 1

182.0 9.1

17-May 2100 change watch, Brooks & Riedesel to Garmany & Vazquez

2336 turn off maggies for noise check; out of synch now

17-May 2340 Both maggies back

181.0 6.3

18-May 0053 Bio Acoustic Way Points

27° 57' , 94° 10'

26° 17' , 94° 10'

26° 12' , 94° 47'

25° 50' , 95° 20'

25° 29' , 95° 19'

APPENDIX 1

22-May Long -94 12.449 23:46:37
 2348 Getting underway for OBS site 4 @ 10 kts

23-May 0130 on station waiting for OBS #4 (released 15min ago; due up in 50 min)

23-May 0150 Chief Scientist moves us to 1.5 mi SW of site

23-May 0230 OBS # 4 - Radio is not functional
 it will be located visually (No transmission is received)

23-May 0238 OBS #4 Secure at:
 Lat. 23° 46.853
 Long. 93° 55.168 (GPS)

0241 getting underway for OBS #5
 one steel strap broken, radios in the water
 not transmitting

23-May 0552 OBS #5 on surface

23-May 0612 OBS #5 attached to ship at:
 Lat. 23° 31.437
 Long. -93 37.950

0923 OBS #7 on board at:
 Lat. 23° 47.404
 Long. -93° 37.791

23-May 1153 OBS #8 on deck
 Lat. 24° 02.910
 Long. -93 38.199

Novatech beacon flooded

1155 Getting underway to OBS #6 7.8 kts 133°

1536 OBS #6 on deck
 Lat. 23° 47.094 (GPS)
 Long. -93° 20.856

1545 core over the side

1546 Trigger weight attached

1554 Core #1 started down
 Lat. 23° 47.344
 Long. 23°20.753

1600 Pinger on 51m above core head
 Core is 45 feet head-cutter

23-May 1601 Core going down
 1615 941m and going down
 1616 942m winch stopped Level wind broke!!
 1620 winch is working, going down
 1621 1000m depth
 1628 1500m depth
 1630 winch stopped at 1668 m
 1633 winch started again
 1638 2000 m water depth
 1644 winch stopped at 2400 m depth
 1650 started again at 2401 m depth
 1657 3000 m depth
 1703 3500 m slowing to 50 m/s
 1705 3600 m slowing to 20 m/s

APPENDIX 1

1717 3927 m, pinger at about 100m above sea floor

1720 3985m wire - pinger on sea floor
 TRIP!!! pinger left on bottom, wire clamp failed !!!

23-May 1726 3500 wire is coming up
 1729 3000m - core on way up
 1736 2000m
 1740 1500m
 1743 1000m
 1746 500m
 1748 200m
 1749 100m
 1810 Core on board at 18:10:30
 Confirmed that pinger was lost

1815 Underway - deploy magnetometers

1830 Magnetometers on line

1845 Steamer deployed

2023 Reached way point 2, starting to turn

23-May 0500 Turn to direct line to Port Isabel

24-May 1438 Circling back to whale sighting
 1457 Turning back to Port Isabel
 1510 Turn completed
 1931 Steamer secured on board
 2000 Magnetometers secured
 2200 Watch secured Gyre cruise 92g-6
 End of leg 1

24-May 2355 Secured at the dock- Port Isabel

BEGIN LEG2 GYRECRUISE GC-6

Dr. Joseph D. Phillips - Chief Scientist

25-May 0930L Leaving dock Port Isabel

25-May 0951L Coring site set at 24° 37.7N 95° 26.4' W

25-May 1016L Leaving jetties

25-May 1045L Starboard maggie deployed

25-May 1050L Port maggie deployed

25-May 1059L Maggies on and recording 1559Z = GMT = 1059L

25-May 1819 Change speed to 5 kts slowing due to engine overheating

25-May 1822 Return to 7.5 kts.

25-May 1830 Change speed to 5.7 kts.

25-May 1832 Return to 7.6 kts remain slow to solve engine problem

25-May 1842 Increase speed to 9.9 kts stabilized at10.6 kts

26-May 0328 Course change to 162° E

26-May 0415 maggies turned off. Port maggie starting on board.

26-May 0420 Slow to 6 kts

26-May 2137 Pinger aboard.
 26-May 2146 Probe aboard for check-out.
 26-May 2329 Changing cse. to 180°
 26-May 2340 Cse. 180° (Loran C) 11,1 knots.

27-May 0204 Change cse. to 090° E. 10.8 knots.
 27-May 1100 Changing course to 07N
 27-May 1109 Heading North towards site 91
 1335 maggies off
 1342 port maggie secured on board
 1354 starboard maggie secured on board
 1557 reduced speed to dead slow
 1401 on station for pressure testing of heat probe
 1412 heat flow probe in water - 1995 fms
 27-May 1422 1000m out
 1432 2000m out
 1441 3000m out
 1450 testing
 1500 begin recovery of probe
 27-May 1511 2000m to the surface
 1520 1000m to surface
 1524 500m to surface
 1528 100m to surface
 1531 probe at surface
 1537 probe secured on deck
 1544 heading S.W. to core station #4
 27-May 1630 Core Station #4
 1634 core at surface 1995 fms (3730m)
 1645 core begins descent
 1649 stop for pinger attachment (118m)
 1652 resume descent
 GPS: 23°45.86'N, 93°20.547'W
 Loran-C: 23°45.50'N, 93°20.32'W
 1659 500m out
 bottom profile signal went out
 Discovrd lost pinger on the sea floor
 27-May 1705 1000m out
 1713 1575m out
 1719 2000m out
 increased gain on PDR
 1724 2 sec crossing
 1725 2500m out
 1731 3000m out
 27-May 1734 1 sec crossing
 1737 3500m out
 1741 stop at 3700m
 1743 250m off bottom (from PDR)
 stopped at 215 m and changed rate
 1750 125m off the bottom
 1751 core triggered

GPS: 23°46.377'N, 93°20.912'W
 Loran-C: 23°46.12'N, 93°20.73'

27-May 1804 3000m out
 1814 2000m out
 1823 1000m out
 1829 300m out
 1832 Pinger at surface
 1839 Core at surface
 27-May ~1900 core secured
 1955 Probe above water surface.
 2000 Attaching pinger
 2004 pinger attached and going down
 3730 water depth
 GPS Loran
 23° 48.748 23° 48.43'
 93° 21.483 93° 21.26

2014 1000 meters out
 2023 Lost signal from instrument
 2036 1000 meters to go.
 2040 500 meters to go.
 2046 Pinger at surface.
 2053 Probe at surface.
 2144 Begin acceleration to unknown way point
 2149 Steam South at 155° to 23° 44 and 93° 18 at
 starting pt. of maggie survey line (7.6 knots)
 Heat flow pressure test and then start survey.
 27-May 2305 Slowing to test heat flow probe.

28-May Heat flow pressure casing lowered into water for
 testing.
 28-May 0115 3000 meters and stopping for five minutes.
 0120 Begin recovery of probe.
 28-May 0135 1000 meters to surface. Hold for five minutes.
 0140 Go down to 3500 meters.
 28-May 0245 3500 meters and holding for five minutes.
 0249 Begin recovery of probe.
 0258 3000 meters to surface.
 0305 2500 meters to surface.
 0316 1500 meters to surface.
 0321 1000 meters to surface.
 0322 casing on board and secured
 0334 Begin cse. 000°N to put out maggies. Spd. 5 knots.
 0344 Starboard maggie out.
 0358 Port maggie out.
 28-May 0402 Maggies turned on.
 28-May 0403 Increase speed to full power to reach waypoints
 i)24° 36' ii)24° 36'
 93°18' 93°27'
 then head due South to :
 23°42', 93°27'

28-May 2302 Slowing to begin heat flow probing.
 2310 Pinger failure- bring probe in.
 2330 Probe on surface
 2338 Probe on board, holding cse. until instruments are in lab.
 2340 Deploying maggies
 2345 c/c due West.
 2357 Reset maggie logger clock. (Port and starboard)
 2358 Maggies on.

29-May 0100 Waypoints:22°47', 93°27' turning West 270°
 22°56', 93°36' to
 23° 49', 93°36'

0540 c/c to 270°
 0544 XBT #23
 0624 c/c to 000°
 0650 c/c to 125°
 1205 Turn off magnetometers
 1220 Maggies on board.
 1251 Reaching the heat probe site.
 1300 Adrift NW 1 kts.
 1313 Probe in water
 GPS: 23° 42.991, 93°25.272
 Loran:23° 42.64, 93°25.07

1320 Pinger attached
 1328 4 Second crossing
 1329 1000 meters out
 1335 3 second crossing
 1339 2000 meters out
 1343 2 second crossing
 1349 3000 meters out
 1352 1 second crossing
 1357 3700 meters full stop.
 1358 Another 200 meters
 1400 3900 meters stop.
 1404 Going down.
 1405 Entering bottom
 GPS: 23° 43.116, 93° 25.759

1413 Heater pulse not coming on, come out of bottom five miles per miles.
 1424 Pull up 500 meters, drift for 5 to 10 minutes
 1432 3500 meters out
 1450 Heat flow station 3, penetration 2
 GPS: 23° 43.417, 93° 26.142

1458 Begin lowering probe.
 1459 Slowing
 1500 3850 meters out , go to 3900 meters
 1501 3900 meters full stop.
 GPS: 23° 430496, 93° 26.171

1506 Probe entering bottom at 3750 water depth.

29-May 1508 10 more meters out.
 1509 Stopping with 4050 meters out
 1513 Additional five meters.
 1516 Begin pull out.
 1520 Pull out. Go up to 3500 meters for 10-20 minutes of drifting.
 1523 Drift N/NW to nest station.
 1529 All stop 3500 meters
 1553 Penetration #3
 GPS: 23° 43.807, 93° 26.565

1557 3900 meters
 1601 Probe enters bottom
 1603 Stop, 4043 wire meter reading
 1606 Another five meters out
 1607 Begin pullout
 1614 Pullout complete
 GPS: 23°43.986, 93° 26.783

1614 Pull up to 3500 meters and drift to nest site.
 1622 Full stop at 3500 meters , drift.
 1651 Penetration #4
 GPS:23° 44.239, 93° 27.107
 Loran: 23° 43.90, 93° 26.88
 lowering to 3900 meters.
 1656 3900 meters, all stop
 1700 Going down.
 1701 4005 meters out when stopped.
 GPS: 23°44.322, 93°27.205
 Loran: 23°43.97, 93° 26.98
 Let out another 35 meters
 Let out another 5 meters.
 1708 Start up again.
 1711 Out of bottom.
 GPS: 23°44.419, 93°27.308
 Loran: 23°44.01, 93°27.04

1745 Lowered again.Penetration # 5
 GPS: 23°44.691, 93°27.514
 Loran:23° 44.47, 93°27.38
 1750 Stop above bottom.
 1754 Starting down again
 1755 Hit bottom
 GPS: 23°44.806, 93°27.622
 Loran: 23° 44.44, 93°27.40

1801 Let out 5 meters of wire
 1809 Probe pulled out
 GPS:23° 44.895, 93°27.725
 Loran 23°44.44, 93°27.40

1814 Pulling up and then steaming.
 1832 2000 meters out
 1842 All stop at 1000
 1849 Starting to steam at 312°

APPENDIX 1

30-May 1724 Dropped again
 1725 Probe entered
 GPS: 23° 45.655, 93° 40.129
 Loran: 23° 45.41, 93° 40.00
 bring up and stop at 3500 meters.
 Drifting.
 1815 Start down again.
 1820 3900 meters out, stopped above bottom.
 1824 Heading down
 1826 In the bottom
 GPS: 23° 45.906, 93° 40.269
 Loran: 23° 45.54, 93° 40.04
 1839 Out of bottom, bring up to 3500 meters.
 1915 On station and lowered.
 Loran: 23° 45.72, 93° 40.13
 1920 3900 meters and stopped
 1925 Going down.
 1926 In bottom,
 GPS: 23° 46.154, 93° 40.398
 Loran: 23° 45.76, 93° 40.19
 1934 Winch started in.
 1939 Out of bottom
 GPS: 23° 46.237, 93° 40.509
 Loran: 23° 45.88, 93° 40.28
 bring up to 3500 meters and drift.
 1948 All stop at 3500 meters.
 2014 On station, going down to 3900 meters.
 Loran: 23° 45.97, 93° 40.54
 2019 Stopped at 3900 meters.
 2024 Going down
 2026 In bottom
 GPS: 23° 46.414, 93° 40.796
 Loran: 23° 45.94, 93° 40.55
 2034 Bring it on up.
 2039 Pulled out
 GPS: 23° 46.459, 93° 40.929
 Loran: 23° 46.012, 93° 40.71
 Pulled up to 3500 meters and drift for 30 minutes.
 2048 All stop at 3500 meters.
 2114 Go down to 3900 meters
 2119 Time at stop above bottom, 3900 meters
 2123 Probe in and going down to the bottom.
 2124 Probe entered bottom.
 GPS: 23° 46.6446, 93° 41.3406
 Loran: 23° 46.36, 93° 41.16
 2132 Bring up the probe
 2136 Probe pulled out
 GPS: 23° 46.7083, 93° 41.4304
 Loran: 23° 46.36, 93° 41.24
 Pulled up to 3500 meters and drift for 30 minutes,

APPENDIX 1

2215 Take it down to 3500 meters to begin heatflow station #4 penetration #6
 2221 75 meters above sea floor
 2226 Probe entered bottom
 GPS: 23° 46.4247, 93° 41.9646
 Loran: 23° 46.065, 93° 41.81
 2235 Winch started in
 2237 Time on pullout
 GPS: 23° 46.9651, 93° 42.0625
 Loran: 23° 46.67, 93° 41.88
 2308 Changed bathymetry paper, last mark at 2245.
 2210 Changed paper in Loran printer.
 2355 Probe aboard, begin transit to nest survey line, (93° 45') at 6 kts.
 0000 31, May, 1992
 0001 Maggies are being deployed.
 0013 Maggies on.
 0020 On the survey, 180°, 9 kts.
 0030 Slow down to 6 kts. for engine oil change
 0040 Resuming speed.
 0200 Way points for the evening cruise.
 i) 22° 56', 93° 45'
 ii) 22° 56', 93° 54'
 iii) 23° 49', 93° 54' @ 0800.
 0414 slowed to change fuel filters on starboard main engine
 0420 resumed speed
 Cores: wire out vs. PDR depth.
 1. 211 7. 230
 2. 303 8. 243
 3. 210
 4. 220
 5. 229
 6. 232
 31-May 1154 Approaching waypoint.
 1156 Magnetometers off
 1158 Turning South to 180°
 1200 Recovering the maggies.
 1215 Maggies on board
 1222 Slowing.
 1230 Heading towards 23° 43.5, 93° 49.0
 1325 Arriving at heat probe station #5 23° 43.5 (lat) 93° 48.88 (long)
 1334 probe in water
 1335 attach pinger @100m of wire out
 1344 pulling pinger off
 1349 Probe on surface
 1351 Probe on board. Questionable pinger.
 1357 Holding station for probe repairs.
 1512 Probe in water

1-Jun
 i) 24° 36', -93° 54'
 ii) 24° 36', -93° 03'
 iii) 23° 42', -93° 03'
 0622 XBT 26 24° 36N, 93° 56W
 1306 Approaching final waypoint
 1323 Turn due East and head for 93° 58.5W
 1325 Turning off Maggies. Slow to 4 knots.
 1334 Port maggie on board.
 1343 Starboard maggie on board.
 1344 Steam two miles East to 93° 59'
 1354 Stop to dead stop and drifting to determine drift.
 1400 On station #6, fixing heat probe.
 GPS: 23° 41.65, 93° 59.07
 Loran: 23° 41.27, 93° 58.88
 1416 Probe in water for penetration #1
 1420 Pinger attached
 1421 Begin descent
 1429 4 second crossing
 1430 1000 meters of water out
 1436 3 second crossing
 1439 2000 meters out
 1444 2 second crossing
 1449 3000 meters out
 1452 1 second crossing
 1456 All stop, 3500 meters
 Go down to 3900 meters
 1501 Stop at 3900 meters.
 1506 Going down.
 1508 4029 m. or wire out. Hit!
 GPS: 23° 42.577, 93° 59.751
 Loran: 23° 42.19, 93° 59.51
 1510 Let 5 more meters out.
 1514 Heat pulse fired!
 1517 4131 meters of wire out.
 1519 Start up slowly
 1522 Pullout at 4094 meters of wire out.
 GPS:
 Loran:
 1525 Bring it up to 3500 meters
 1548 All stop at 3500 meters, drift for 5 minutes.
 1553 Penetration # 2
 Going down to 3900 meters.
 GPS: 23° 42.974, 94° 00.050
 Loran: 23° 42.58, 94° 59.86
 1554 Heat pulse fired.
 1609 3900 meters all stop for 5 minutes.
 1613 Full speed down.
 1614 Hit! 4025 meters of wire out
 Loran: 23° 42.72, 93° 59.97
 1615 Take to 4080 m. of wire out and stop.

1617 Let out 3-4 meters/minute.
 1619 Stop.
 1620 Heat pulse fires.
 1622 Let out five meters.
 1628 Start up slowly
 1637 Ot of bottom, bring up to 3500 meters.
 GPS: 23° 43.281, 94° 00.242
 Loran: 23° 42.89, 94° 00.05
 1657 All stop at 3500 meters.
 1700 Start down to 3900 meters for penetration #3
 1717 In bottom
 GPS:
 Loran:
 1723 Heater pulse fired!
 1729 Start up slowly
 1734 Out of bottom
 GPS: 23° 43.706, 94° 00.425
 1750 3000 meters bringing it up.
 1809 1000 meters out.
 1813 500 meters to go to pinger.
 1827 Probe at surface.
 1838 Steam to North@ 330° to lat. 23° 46'
 1846 c/c to 000°
 1915 Probe is lowered for penetration #4
 1921 Pinger attached and going down.
 1931 1000 meters out.
 1938 3 second crossing.
 1952 3500 meters out
 1956 EPC stopped recording water depth.
 2002 3900 meters out.
 2008 Probe hit bottom
 GPS:
 Loran:
 2014 Heat pulse fired!
 2027 Probe pullout
 GPS:
 Loran:
 2050 All stop at 3500 meters.
 2102 Stop above station, penetration #5
 2108 Probe entered bottom, 3740 m. of water.
 GPS: 23° 47.5175, 94° 1.2502
 Loran: 23° 47.014, 94° 1.02
 2114 Heater pulse turned on.
 2120 Winch started in.
 2126 Pullout from bottom
 GPS: 23° 47.5541, 94° 1.2094
 Loran: 23° 47.21, 94° 1.02
 2127 Pulling the probe up
 2142 Probe stopped at 3500 meters.
 2202 Stop above station, penetration #6

3-Jun	1230	Begin turn to East			
	1234	Maggies shut off.			
	1253	Maggies on board.			
3-Jun	1314	Steaming to line.			
	1319	PROBE in the water			
	1320	PROBE starting down			
	1323	pinger on and starting down			
	1338	3 second crossing.			
	1342	2000m out.			
	1346	2 sec. crossing.			
	1351	3000m out.			
	1354	1 sec. crossing			
	1357	Stop at 3500m			
	1359	Go down to 3900m.			
	1404	Stop at 3900m.			
3-Jun	1409	Full speed down.			
	1410	Bottom. 3983m out. 23° 44.76N, 94° 17. 437W			
	1416	Heat pulse fires.			
	1422	Start in slowly			
	1426	Pullout. 23° 44.917N, 94° 17.460. Up tp 3500m.			
	1447	All stp 3500. Go down to 3900.			
3-Jun	1503	All stop 3900.			
	1508	Full speed down.			
	1509	Bottom. 3997 out. 23° 45.150, 94° 17.537.			
	1515	Heat pulse fires. Let out 5 meters.			
	1521	Begin ascent.			
3-Jun	1526	Pullout. 23° 45. 254, 94° 17. 561. Up to 3500m.			
	1547	All stop 3500m. Go to 3900m. 23° 45.383N, 94° 17.659W			
3-Jun	1603	All stop 3900m.			
	1608	Full speed down.			
	1609	Hit! 4052m out. 23° 45.500, 94° 17.766.			
	1615	Fire!			
	1621	Begin up slowly.			
3-Jun	1626	Pullout. Up to 3500m. 23° 45.627 , 94° 17.797			
	1630	Steaming.			
	1649	Stop at 3500.			
	1650	Bring up to unknown depth.			
	1651	Stop. Go slowly down to 3900m.			
	1658	Arrive station #8, penetration #4.			
3-Jun	1710	Stopped at 3899m.			
	1715	Bring it down.			
	1715:55	Bottom. 23° 46.058N , 94° 17.993W			
	1722	Heater pukse fired.			
	1730	Bring it up.			
	1734	Pulling out of bottom. 23° 46.168 , 94° 18.039			
	1738	Underway to steam.			
	1755	All stop. Station 8, # 5. 23° 46.787 , 94° 18.861			
	1758	On way down.			
3-Jun	1813	All stop 3900m.			

	1817	Bring it up 100m and back down.			
	1822	All stop 3900m.			
	1827	On the way in.			
	1828:02	Bottom. Heater did not fire. 23° 46.596 , 94° 18.15			
	1838	On the way back up.			
	1840	Heater fired.			
	1851:39	Pulled out of bottom. 23° 46.693 , 94° 18.184			
	1858	Steaming.			
3-Jun	1916	Shipped stopped.			
3-Jun	1920	Shannon made delicious cheesecake			
	1929	All stop 3900m.			
	1933	Up 100m. Back 100m.			
	1941	Stop at 3900.			
	1946	On the way down.			
	1947	Bottom.			
	1953	Heater pulse fired.			
	2005	Out of the bottom.			
	2018	3000m out.			
	2029	2000m out.			
	2040	1000m out.			
	2044	500m to go. 400m to pinger.			
	2050	Heat probe at surface.			
	2055	Securing heat probe on deck.			
3-Jun	2130	Piston Core #7 going down. 23° 47.4453 94° 17.9485			
	2137	Pinger on. Going down. 103m (110m to bottom of core.) 23° 47.4964 , 94° 17. 9439			
	2147	1000m out.			
	2157	2000m out.			
	2216	3500m.			
	2222	3900m.			
	2228:40	Bottom!! 23° 47. 7293 , 94° 17.9013			
	2240	3000m . On the way up.			
	2252	2000m to go.			
	2302	1000m to recover core #7.			
	2307	500m.			
	2312	Pinger aboard.			
	2327	Piston core #7 on board			
		waypoint #1 : 23° 49N , 94° 21			
		waypoint #2: 22° 56N , 94° 21			
		waypoint #3: 22°56N , 94° 30W			
		waypoint #4: 23° 49N , 94° 30W			
3-Jun	2347	Maggies out.			
		Lobster being served on the sunset deck. (Hahl)			
4-Jun	0555	Turn to waypoint #4 0°			
4-Jun	1143	Maggies off.			
	1202	Both maggies are on board.			
	1258	Deploying heat probe.			
4-Jun	1303	Heat probe going down.			

APPENDIX 1

6-Jun	0250 begin turn from 180° to 270°		
	0300 turn completed		
	0340 c/c to 000°		
	0400 change completed		
	0933 turn of maggies		
	0935 c/c to 135°		
	0954 Maggies overboard		
	1030 on heat flow station 11 # 1		
	1039 probe in the water		
	1040 pinger in water		
	1048 1000m out		
	1058 2000m out		
	1108 3000m out		
	1125 probe entered bottom		
	GPS: 23° 45.233 94 44.578		
	1144 out of bottom	041.0	6.1
	GPS: 23° 45.1988N 94° 44.7377W		
	1204 lowered again		
	GPS: 23° 45.6609N 94° 44.8773W		
	1238 stopped at 3850m		
	1244 entered bottom		
	23° 45.766N 94° 45.184W		
	1250 heater pulse on		
	1304 pulled out		
	23° 45.811N 94° 54.289		
	1305 under way at 2 kts on 000°		
	1323 stop at 3450m then go to 3850m		
	1403 stop at 3850m of wire STA 11 #3		
	1409 full speed down		
	1410 penetrates bottom		
	gps: 23° 46.400N 94° 45.873W		
	1416 heater pulse fired		
	1422 start up slowly		
	1426 pulled out of bottom		
	begin steaming		
	1449 3450m out		
	1504 stop @ 3850m STA 11 #4		
	1507 stop steaming		
	1515 moving probe up and down to avoid heater pulse		
	1533 going down		
	1534 hit the bottom		
	GPS: 23° 47.051N 94° 46.468W		
	1540 Larry belches, heater pulse fires		
	1546 begin up slowly		
	1551 pull out @ GPS: 23° 47.032 94° 46.572		
	1623 stop above bottom at 3850m		
	1627 going down STA 11 #5		
	1628 hit bottom		
	GPS: 23° 46.999 94° 46.785		
	1635 heater pulse fired		
6-Jun		004.6	0.8

APPENDIX 1

5-Jun	1556 stop at 3894 m		
	1601 start down		
	1601 enter bottom		
	1608 heater pulse fired		
	1614 start up slowly		
	1619 pulled out		
	GPS: 23° 47.884N 94° 35.612W		
	1620 steam due south for 1/2 mile		
	c/c to 180°		
	1341 stopped at 3500m of wire		
	1357 stopped at 3894m		
	go up to 3800m		
	1708 go up to 3700m STA 10 #4		
	1711 go back down to 3900m		
	1713 heater pulse fired too soon in water		
	1719 stop at 3900m		
	1724 heat probe boom		
	GPS: 23° 47.362N 94° 36.002W		
	1730 heater pulse fired		
	1736 winch started in		
	1800 stopped at 3500 m STA 10 #5		
	23° 47.039N 94° 36.478W		
	1836 stop at 3900m		
	1842 in the bottom		
	GPS: 23° 47.039N 94° 36.478W		
	1853 bring it back out		
	1900 out of the bottom		
	GPS: 23° 47.150N 94° 36.578W		
	1922 stop at 3500 and then back down		
	1931 ship all stop		
	1939 up 100m then down 100 m STA 10 # 6		
	1948 Stop at 3900m above bottom		
	1953 in the bottom		
	GPS:		
	1959 heater pulse on		
	2009 out of the bottom		
	23° 47.038N 94° 37.191W		
	2013 bring it all the way up		
	batteries dead!!!		
	2045 1000m out		
	2059 pinger removed		
	2110 probe secured		
	2123 deploying magnetometers		
	2140 maggies turned on		
	2145 c/c to 180° South		
5-Jun		289.0	5
5-Jun		329.0	0.8
		318.0	0.8
5-Jun		304.0	0.3
		216.0	1.4
5-Jun		100.0	1.3
		072.0	0.1
5-Jun		306.4	7.5
		358.7	9.3

Way points for this tropical evening
 1) 22° 56N 94° 39W
 2) 22° 56N 94° 48W
 3) 23° 49N 94° 48W

APPENDIX 2

**Summary of OBS Experiment aboard R/V Gyre Cruise 92G-06,
Gulf Probe 6, Leg 1**

During this cruise, we deployed eight new UTIG OBS's along two intersecting lines and recorded 32 hours of continuous data on each of them. The total amount of data acquired is about 1.1 Giga bytes. In this supplement to the cruise report, we document certain pertinent technical information and performance of the instruments. [All times are given in local Central Daylight Time, which is 5 hours behind UTC.]

Seismic instruments: Upgraded UTIG OBS

Number of channels: 3 channels for 3-component geophone data for entire 32 hours, except the one for station 6, which was programmed to record 26 hours of 4-channel (3-component geophone and a hydrophone) data and 6 hours of single-channel (vertical geophone only) data.

Sensors: UTIG 3-component gimballed geophone assembly with Mark Products L15-B 4.5 Hz geophones for all stations; and for station 6 only, Benthos AQ-12 hydrophone

Sampling interval: 5.000 ms

Anti-aliasing filter: 30 Hz

Seismic signal source: 2000 cubic inch air-gun

Towing depth: 9 m (estimated)

Shot interval: 40 s

Deployment and recovery data

Station	1	2	3	4	5	6	7	8
OBS Chassis	92-5	92-6	92-7	92-8	92-9	90-2	92-10	92-11
Sphere	29034	23644	44398	29036	44568	32527	23640	31615
Deployment Time	May 20 05:02:03	May 20 06:53:43	May 20 08:46:54	May 20 10:52:17	May 20 13:27:46	May 20 16:16:11	May 20 18:03:00	May 20 19:47:45
Deployment Location	23°47.794N 94°46.097W	23°47.586N 94°29.009W	23°47.300N 94°11.974W	23°47.027N 93°54.890W	23°31.044N 93°38.175W	23°46.416N 93°20.723W	23°46.745N 93°37.626W	24°02.380N 93°37.467W
Water Depth	3686m	3749 m	3751 m	3755m	3753m	3757m	3757 m	3757 m
Release Time	May 22 12:00	May 22 14:45	May 22 17:30	May 22 20:15	May 23 00:00	May 23 09:15	May 23 02:45	May 23 05:30
Surfacing Time	13:00	15:43	18:28	21:13	00:52	10:12:30	04:09	06:26
Recovery Time	14:04:12	16:05:45	18:46:37	21:39:	01:12:36	10:37	04:23:44	06:53
Recovery Location	23°46.479N 94°46.479W	23°46.667N 94°29.471W	23°46.606N 94°12.449W	23°46.853N 93°55.168W	23°31.437N 93°37.950W	23°47.094N 93°20.856W	23°47.404N 93°37.791W	24°02.910N 93°38.199W
Water Depth	3686m	3753m	3755m	3758m	3757m	3758 m	3757 m	3758m

Deployment and recovery locations are from real-time monitor display of GPS navigation data from the bridge. Water depths have been converted from fathoms read off the echo sounder chartcorrected for 'Mathews' table' 3rd ed., 1980, and the ship's draft of 3 m added.

APPENDIX 3

Cruise Report
R/V Gyre
5/16-5/24/92

I. Goals of Cruise

The goal of this cruise was to conduct visual and acoustic observations of cetaceans in the western Gulf of Mexico as adjunct to the cetacean census estimates made for the GulfCet program. These observations were to replicate parts of the GulfCet census area and to extend our observations into Mexican waters south of the main GulfCet research area. These waters have historically been important areas for sperm whale sightings and may serve as seasonal locales where whales that are found off the mouth of the Mississippi congregate. Overall, these southwestern waters have rarely been surveyed by experienced marine mammal observers and this cruise represents one of our few opportunities to gain access to the area.

II. Personnel

A. Acoustics

1. Jeff Norris
2. Mike Duncan

B. Visual observers

1. Steve Leatherwood
2. Tom Jefferson
3. Bill Stevens

III. Cruise Chronology

A summary of this cruise is provided in table 1, with a cruise map provided in figure 1. The marine mammal observation components for this cruise comprised three segments.

A. First Segment: 5/17-5/19

After leaving Galveston at 22:05 on 5/16/94, we deployed the array upon arriving on station at the north end of GulfCet track #4 at 09:18 the next day, 5/17. We sailed south at 6 knots, replicating the census run done precisely a month before during the Long Horn cruise. While no animals were seen, we did record whistles. Upon reaching the end of track #4 at the 2000 m depth we turned west to follow that contour. On 5/18 we briefly halted recording, at 12:21, to test the seismic air gun. Recordings were begun again two hours later and we continued along the 2000 m isobath. We arrived at the end of this segment and retrieved the array at 10:50 on 5/19 having traversed 309 miles over 46:56 hours. We still had not seen any cetaceans, but we had made further recordings of whistles. Our overall impression of the seas were that they were extraordinarily sterile, with few sightings of fish or birds. According to the cruise plan, as described both in text

and on chart, this ended our contracted segment of the cruise. We then began heading east to continue with the physical oceanography components of the cruise.

B. Second Segment: 5/19-5/20

We redeployed the array 17 miles to the east of our last recording position at 13:54 on 5/19. We headed ESE for 75 miles at 5.7 knots for 13:13 hours, moving from the 2000 m contour to the deepest areas of the gulf, the Sigsbee Plain at 3700 m depth. During this transit we both saw and recorded rough-toothed dolphins (Steno bredanensis) and spinner dolphins (Stenella longirostris). Upon reaching Deep Sea Drilling Program (DSDP) site 90, we halted recording and retrieved the array at 03:07 on 5/20. This completed our recordings prior to the intensive physical oceanographic research. By this time we had recorded for a total of 60:09 hours over a distance of 384 miles.

C. Third Segment: 5/23-5/24

Upon completing the physical oceanography research we redeployed the array for the return cruise to Port Isabel at 13:58 on 5/23. However instead of heading directly back as planned we first headed directly north for approximately 25 miles, then directly east for about 110 miles after which we then headed directly to Port Isabel. These course deviations apparently allowed for further magnetic and/or gravitational field research. As we crossed the continental shelf, in approximately 820 m of water we made the first sighting in the Atlantic Ocean and the first recordings ever of Frazer's dolphin (Lagenodelphis hosei). Over 200 animals were observed, including several animals that bow rode on the vessel. We also later saw and recorded Tursiops. As we neared Port Isabel, we retrieved the array at 13:48 on 5/24, having recorded for slightly less than a day, covering 245 miles.

IV. Summary of Findings

During this cruise we uncovered valuable positive and negative data about marine mammal distributions in the Gulf. On the negative side we did not see many the cetaceans we had expected to see, particularly sperm whales and various stenellids. We are interested to know if there was no cold water gyre in the area, since the gulf appeared surprisingly empty, even of such commonly seen animals as flying fish and marine birds. On the positive side we had the first, third, and fourth sightings of three delphinid species. We even saw three humming birds crossing the gulf! We recorded 114 tapes over 629 miles of recording, including 15 acoustic contacts (see appended Taping Record), which can be compared to 126 acoustic contacts over 1240 miles during the Long Horn cruise. Overall, while this data set is meager, it represents valuable information that may allow us to piece together the distribution and abundance of marine mammals in the Gulf of Mexico.