

PROCEEDINGS:
SECOND ANNUAL
GULF OF MEXICO
INFORMATION TRANSFER MEETING

Held April 30-May 1, 1981
New Orleans, LA

Sponsored by
Bureau of Land Management
Outer Continental Shelf Office
New Orleans, LA

Arrangements Handled by
Texas A&M University
Through the
Texas A&M Research Foundation
TAMRF-BLM Contract AA851-CT0-25

Department of Oceanography
Technical Report #81-5-T

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PREFACE

The first Gulf of Mexico Information Transfer Meeting was held May 12-13, 1980, for the purpose of providing a forum for exchange of current data and information generated through environmental studies in the Gulf of Mexico. Over 75 participants from industry, academia, and government attended that meeting. It was generally agreed that this meeting achieved the goals of providing information supportive of Gulf of Mexico lease sales 66 and 67, identifying future environmental study needs, and furnishing a forum for "scoping" as required by the Council of Environmental Quality (CEQ). Scoping is a formal process of gaining insight into what issues are important for generating Environmental Impact Statements and making environmental decisions.

The Second Annual Gulf of Mexico Information Transfer Meeting was planned to fulfill the same needs for exchange of current environmental information. Held April 30-May 1, 1981, the meeting was attended by 82 scientists and administrators from the public and private sector. These Proceedings are based on a transcript of the general session and abstracts provided by the speakers in each specialized session. Arrangements for both the 1980 and 1981 meetings were handled by Texas A&M University through the Texas A&M Research Foundation (Contracts AA551-CT8-35 and AA851-CT0-25), sponsored by the Outer Continental Shelf Office of the Bureau of Land Management, New Orleans, Louisiana.

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I. GENERAL SESSION (April 30, 1981)

Introduction

Dr. Robert Rogers, of the Bureau of Land Management (BLM) Outer Continental Shelf (OCS) Office, New Orleans, LA, called the opening session to order, welcoming the seventy-five participants (Table 1) and explaining the purpose of this Second Annual Information Transfer Meeting. The meeting brought together people from government, industry, and academia to exchange the most current environmental studies information available regarding the Gulf of Mexico. Participants were given an Information Kit explaining the Environmental Studies Program administered by the New Orleans OCS office. The kit included a current quarterly report, describing all the Gulf of Mexico and South Atlantic studies that are administered by the New Orleans office, as well as profiles of Gulf of Mexico studies (see Appendix A), and a current list of environmental studies reports now available through the National Technical Information Service (NTIS) (see Appendix B).

1981/82 Regional Studies Plans

Dr. Ed Wood, chief of the environmental studies staff at the New Orleans OCS office, displayed lists of Gulf of Mexico studies approved for funding in fiscal years 1981 and 1982 (see Tables 2 and 3). Of ten tentatively approved FY'81 studies, eight are renewals of active contracts. For FY'82, Dr. Wood indicated a 25% budgetary cut, which reduced the scope of most approved studies. Eight studies were approved for FY'82, of which all but one (Physical Oceanography) are continuations of previously funded contracts.

Lease Sales

Ed Richardson, Branch Chief of Sales and Support (BLM Operations Division) described Gulf of Mexico lease sales 72 and 74, scheduled for 1983. Thirty companies participated in the nomination process, nominating approximately 15.16 million acres (2744 blocks). Mobil Oil nominated 18.6% of the total, while the remainder were single nominations. Companies indicated four priority levels in these nominations.

From these nominations, BLM and the U.S. Geological Survey (USGS) recommended 1244 blocks, or approximately 6.7 million acres, to be divided equally into the two Gulf of Mexico lease sales 72 and 74. Nominations indicate growing interest in the Florida coastal areas, such as Charlotte Harbor. Richardson indicated that additional geophysical work is being done in that area.

TABLE 1
ATTENDANCE LIST
INFORMATION TRANSFER MEETING

GOVERNMENT AGENCIES.

BUREAU OF LAND MANAGEMENT

New Orleans Outer Continental Shelf Office

Bob Avent	Doug Elvers
Jerry Brashier	Lawrence R. Handley
Murray Brown	Charles Hill
Mike Burdette	Jesse L. Hunt, Jr.
Joe A. Christopher	Gail B. Rainey
Barney Congdon	Villere C. Regglo, Jr.
Richard Defenbaugh	Ed Richardson
Omar E. DeWald	Bob Rogers
	Ed Wood

Washington, D.C.

Jim Cimato
Mark J. Grussendorf
Richard H. Miller
Frances L. Sullivan

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Carlos G. Parra

NATIONAL MARINE FISHERIES SERVICE, GALVESTON, TEXAS

William B. Jackson

NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION

W. Lawrence Pugh, Washington, D.C.
Donald S. Day, OMPA, NSTL Station, MS
Glenn Hamilton, NDBO

U.S. FISH AND WILDLIFE SERVICE

Carolyn French, National Coastal Ecosystems Team,
Slidell, LA
Cherry Keller, National Coastal Ecosystems Team,
Slidell, LA
James B. Kirkwood, Atlanta, GA
Wiley Kitchens, National Coastal Ecosystems Team,
Slidell, LA
Robert Oja, Galveston, TX
Martha Young, National Coastal Ecosystems Team,
Slidell, LA

U.S. GEOLOGICAL SURVEY

Richard T. Bennett, Environmental Unit, Metairie, LA
Henry Berryhill, Corpus Christi, TX
T.J. Claffone, Environmental Unit, Metairie, LA
Leon H. Cousté, Jr., Environmental Unit, Metairie, LA
Les Dauterive, Environmental Unit, Metairie, LA
Debra Dretar, Metairie, LA
Charles Guice, Conservation Division, Metairie, LA
Darice Koder, Environmental Unit, Metairie, LA
Bob Kuzela, Metairie, LA
Harold Loyacano, Environmental Unit, Metairie, LA
Jack Rebman, Metairie, LA
Brent Smith, Environmental Unit, Metairie, LA

UNIVERSITIESTEXAS A&M UNIVERSITY, COLLEGE STATION, TX

Tom Bright
 Rezneat Darnell
 Charles Giammona
 Joseph U. LeBlanc
 David W. McGrail
 Richard Rezak

LOUISIANA STATE UNIVERSITY, BATON ROUGE, LA

Robert Allen, Center for Wetland Resources
 Wen-Ssn Chuang, Coastal Studies Institute
 Jean Pantell Sikora, Coastal Ecology Laboratory
 Walter Sikora, Coastal Ecology Laboratory
 William J. Wiseman, Jr., Coastal Studies Institute

MCNEESE STATE UNIVERSITY, LAKE CHARLES, LA

Dennis Casserly
 Gus Stacy

REPRESENTATIVES OF STATESSTATE OF FLORIDA

Debbie Blizzard, Governor's Office
 Barbara Henderson, Dept. of Veteran & Comm. Affairs
 Walter Kolb, Governor's Office, Planning & Budgeting
 Murice O. Rinkel, OCS Representative

STATE OF LOUISIANA

Virginia Van Sickle, Louisiana State Geological Survey

STATE OF TEXAS

Michael Dick, Dept. of Water Resources

CONSULTING FIRMS AND COMPANIES

Barry A. Vittor & Assoc., Mobile, AL
 Paul G. Johnson
 Barry A. Vittor

LGL Research Assoc., Bryan, TX
 Benny J. Gallaway
 George L. Lewbel

Coastal Environments, Inc., Baton Rouge, LA
 Sherwood M. Gagliano

New England Coastal Engineers, Bangor, ME
 Bryan Pearce

Cochrane & Assoc.
 Doug Cochrane
 Fred Styer

Restrepo & Assoc., El Paso, TX
 F. Charles Lamphear
 Carlos E. Restrepo
 Linda S. Restrepo

Conoco, Inc., Houston, TX
 John Wolfe

Shell Oil, Co., San Ramon, CA
 Fred Weiss

Continental Shelf Assoc., Tequesta, FL
 David Gettleson
 Russell E. Putt

TerEco Corp., College Station, TX
 Linda Pequegnat

Energy Resources Co., Cambridge, MA
 Paul D. Boehm
 Diana Pilson

Woodward-Clyde Consultants, Orange, CA
 Jan D. Rietman

TABLE 2
 FY'81 STUDIES FOR THE GOM OCS REGION
 NEW ORLEANS OCS OFFICE

N.O. #	TITLE	CLASS/POINTS
G 103	GOM Topographic Features Synthesis	A2B1-62
G 127	Reef Fish Study	A2B1-62
G 101	GOM & S. Atlantic Endangered Species	A2B1-62
G 104	Texas Barrier Island Characterization	A2B1-60
G 118	Geological Studies	A2B1-47
G 128	Southwest Florida Shelf Ecosystem	A2B1-42
G 130	Satellite Oceanography	A2B1-47
G 105	Northeast Gulf of Mexico Characterization	A3B1-50
G 126	Southwest Florida Coastal Characterization	A3B1-47

TABLE 3
 FY'82 STUDIES FOR THE GOM OCS REGION
 NEW ORLEANS OCS OFFICE
 (Tentative 3/4/81)

N.O. #	TITLE	CLASS/POINTS
G 205	NE GOM Coastal Characterization	A2B1-65
G 223	GOM Benthic Habitat Study	A2B1-62
G 214	GOM Physical Oceanography	A2B1-62
G 216	SW FL Coastal Characterization	A2B1-62
G 228	NE GOM Slope & Deep Sea Benthic Study	A2B1-62
G 203	GOM Topographic Features Synthesis	A2B1-62
G 201	GOM & S. Atlantic Endangered Species	A2B1-57
G 208	SW FL Shelf Ecosystem Study	A2B1-57

Environmental Assessment

Doug Elvers, Chief of the BLM Division of Environmental Assessment, reported on Environmental Impact Statement scheduling. Summarizing the effect of the new draft proposed five-year schedule (Figure 1), he indicated that Lease Sales 67-69 had not been delayed, but that Lease Sales 72-74 were put off about six months. The Draft Environmental Impact Statement on Lease Sales 67-69 has been distributed and was awaiting comments at the time of Elvers' presentation. In the comments already received on 67-69, most reviewers favored approval because of the need for new oil and gas. Elvers also indicated that a Regional Environmental Impact Statement is being coordinated with state and federal agencies through three coordinators: Jack Holt, Mary Bartz, and Jake Lehman. The visuals for this document were nearing completion at the time of the meeting.

Elvers also indicated that a new set of visuals on the Gulf of Mexico is being prepared and nearing completion. All but the geology visual are considerably different from the last set.

II. ABSTRACTS OF SPECIAL SESSIONS

April 30 - May 1, 1981

TOPOGRAPHIC FEATURES STUDY:
GEOLOGICAL STUDIES

Richard Rezak
Texas A&M University
College Station, TX

During the past year, we have gathered data at the East and West Flower Garden Banks, mapped MacNeil Bank, and worked up the data on Coffee Lump, Alderdice, Diaphus, Elvers, East Flower Garden, Fishnet, Geyer, Jakkula, and Rezak-Sidner Banks. A sediment distribution map has been prepared for the East Flower Garden Bank and for the general area of the East and West Flower Garden Banks. The distribution of sediments on these banks indicates that the nepheloid layer does not rise above the 85 m level.

A new sediment facies, the Molluscan Hash Facies, was discovered at the East Flower Garden Bank. This facies is a relict deposit and represents an ancient beach or offshore bar sand. It has been modified to a certain extent by recent deposits of terrigenous muds that have been admixed with it.

The most exciting discoveries during the past year have concerned the documentation of very recent movement of the sea bottom on and around salt domes. At last year's Information Transfer Meeting, I reported on the volume of salt being removed annually from the top of the East Flower Garden salt dome. Approximately 24,000 m³ of solid salt is being dissolved annually from the crest of the East Flower Garden dome, as calculated from the outflow of the brine lake on the southeast side of the East Flower Garden Bank.*

Evidence based upon coral growth rates indicates that the collapse could have begun in 1957, and the present brine lake could be the result of that collapse.

Cores taken from Montastrea cavernosa indicate that a decline in the growth rate occurred in 1957 (Hudson and Robbin, 1980) and continues to the present. In 1957, no exploration activity had taken place in the area. Hudson and Robbin were not able to explain the change in growth rate by any events that may have taken place. When the magnitude of salt dissolution and possible catastrophic collapse was described to Eugene Shinn (USGS), he stated that an increase in depth of 10 m would be enough to retard coral growth by the amount shown by Hudson and Robbin. Geyer, Fishnet, and Alderdice Banks also show evidence of very recent faulting and movement of the sea bottom.

*Since the May 1981 meeting, the figure on salt dissolution has been re-calculated at between 11,000 m³ and 22,000 m³.

This movement is not restricted to the crest of the bank but also may occur in the immediate area surrounding the bank, as shown on Fishnet and Alderdice Banks.

References

Hudson, H.J. and D.M. Robbin, 1980. Effects of drilling mud on the growth rate of the reef-building coral, Montastrea annularis. In Geyer, R.A., ed., Marine Environmental Pollution, Vol. 1, Hydrocarbons, 455-470.

TOPOGRAPHIC FEATURES STUDY:
RECONNAISSANCE AND MONITORING OF BIOTIC COMMUNITIES
OF HARD-BANKS IN THE NORTHWESTERN GULF OF MEXICO

Thomas Bright
Texas A&M University
College Station, TX

A management-oriented system of categorization and environmental ranking of hard-bottom biotic zones and banks on the Outer Continental Shelf of the northwestern Gulf of Mexico is shown in Table 4. Based on dominant benthic communities, seven biotic zones have been defined on 33 hard-banks in this area. The seven zones are also ranked by degree of reef-building activity, from greatest (category A) to least (category D).

High diversity coral reefs (20 to 35 m depth) occur on two banks (East and West Flower Gardens), with 18 species of hermatypic corals covering 50 to 60% of the hard bottom. Montastrea annularis dominates, growing at 7-8 mm/yr. Low diversity coral reefs dominated by Stephanocoenia michelini (growth rate approximately 6 mm/yr) occupy four banks between 35 and 52 m depth. The largest reef-building community is dominated by crustose coralline algae, which form nodules and encrust hard substratum on thirteen banks between 46 and 97 m depth. Turbid water envelops the lowermost portions of all the banks, possibly limiting the depth to which coralline algae populations predominate.

Biological monitoring at the East Flower Garden has involved measurements of population levels, growth, mortality, and recruitment of hermatypic corals. Encrusting growth rates for dominant Anthozoan corals on high diversity reefs at the East Flower Garden range from 0.4 to 0.7 mm/mo. Encrusting growth for the hydrocoral Millepora alcicornis is considerably higher (1.6 mm/mo). Mortality rates of 0.3 to 24.0 mm/mo lateral regression were measured for specific colonies of Anthozoan corals. The number of coral spat settling on recruitment plates at the East Flower Garden varied from 0.0 to 0.38 spat per cm² (average 0.04 spat per cm²).

TABLE 4
CATEGORIES AND ZONES OF HARD-BANKS IN THE GULF OF MEXICO

Categories	Zones
A - Maximum protection recommended	I <u>Diploria-Montastrea-Porites</u>
B - Protection strongly recommended	II <u>Madracis</u>
C - Protection recommended	III <u>Stephanocoenia</u>
D - Protection not recommended	IV <u>Algal-Sponge</u>
	V <u>Millepora-Sponge</u>
	VI <u>Antipatharian</u>
	VII <u>Nepheloid</u>

Bank	Category	Zone	Depth (m)	Bank	Category	Zone	Depth (m)
Adam (Big)	D	VII*	?	Flower Garden (West)	A	I	20-35
Adam (Small)	D	VII*	?		A	III	35-50
Alderdice	A	IV	55-67		A	IV	46-88
	C	Trans. ††	67-79		C	Trans. ††	88-89
Applebaum	C	VI	?	Geyer	A	IV	60-98
Aransas	C	VI	57-70		B	V	37-52
Baker	C	VI	56-70		C	Trans. ††	98-123
Baker (South)	C	VI	59-70	Hospital (North)	C	VI	58-70
Blackfish	D	VII*	?	Hospital Rock	C	VI	59-70
Bouma	A	IV	60-75	Jakkula	A	IV	59-90
	C	Trans. ††	75-84		C	Trans. ††	90-94
Bright	A	III	37	Mysterious	D	VII*	?
	A	IV	52-74	Parker	A	IV	60-82
	C	Trans. ††	74-?		C	Trans. ††	82-?
Claypile (2)**	B	V	40-45	Rezak-Sidner	A	IV	55-93
Coffee Lump	C	VI	62-68		C	Trans. ††	93-99
Diaphus †	C	VI	73-106	Sackett	C	VI	65-75
Dream	C	VI	62-70	Sonnier	B	V	18-52
Eivers	A	IV	60-97	Southern	C	VI	58-70
	C	Trans. ††	97-123	Stetson	B	V	20-52
Ewing	A	IV	56-72	18 Fathom	A	III	45-47
	C	VI	72-88		A	IV	45-82
Fishnet	C	Trans. ††	66-80		C	Trans. ††	82-?
Flower Garden (East)	A	I	20-35	28 Fathom	A	IV	66-92
	A	II	28-46		C	Trans. ††	92-108
	A	III	35-52	32 Fathom	C	VI	?
	A	IV	46-82				
	C	Trans. ††	82-86				

* Nepheloid zone probably envelops these banks entirely.

** Reef-building is poorly developed or arrested.

† Not adequately explored; shallowest portion of bank may harbor yet undetected reef-building populations.

†† Transition zone between Algal-Sponge Zone and deeper, turbid-water, lower bank zones. Comparable to an Antipatharian Zone.

TOPOGRAPHIC FEATURES STUDY:
PHYSICAL AND SEDIMENTOLOGICAL INVESTIGATIONS
AT THE FLOWER GARDEN BANKS

David McGrail,
Michael Carnes, and Doyle Horne
Texas A&M University
College Station, TX

We have been conducting investigations of sediment and current dynamics around the East and West Flower Garden Banks since 1977. At first, our observations were limited to STD and transmissivity, profiles. They now include over 72 hours of in situ bottom boundary layer experiments recorded on Super 8 mm color film and video tape; simultaneous profiles of salinity, temperature, transmissivity, and current velocity (some taken in a time series mode); and records from moored current meters which include velocity, temperature, and transmissivity.

We have now occupied 198 stations in a 12 x 27 mile rectangle surrounding the East and West Flower Garden Banks. At 125 of those stations the complete suite of measurements (salinity, temperature, transmissivity, and current velocity) were taken in profile. Nearly continuous records of currents around the banks have been obtained since January of 1979.

In March of 1980 we designed and built a new profiling data acquisition system. It was field tested in August and successfully used operationally in October of 1980. It consists of a sensor package (containing: power supply; depth sensor; temperature sensor; conductivity cell; LED transmissometer; electromagnetic current meter; bottom trip switch; and two 5-litre Niskin bottles), an A-frame with hero bucket, an electrically powered hydraulic winch, and a complete electronics lab van. The system is called PHISH, an acronym for Profiling Hardwired Instrumented Sensor for Hydrography. Data logging is accomplished by means of an interfaced microcomputer with 64 K bytes of internal memory turning off of a 2.5 megabyte floppy disk system. The peripherals on the microprocessor system include a 4-pen flat bed plotter, terminal with CRT, and a hardcopy printer/terminal. Twin microprocessor-based LORAN C receivers are also interfaced with the system to provide continuous navigational information both for ship position and ship drift calculations. A video slave monitor from the LORAN C unit is installed on the bridge of ships from which we operate so that we can control the navigation remotely.

Sampling of the various parameters is made simultaneously rather than sequentially so that all data are correlated by depth. A complete 100 m station can realistically be taken in 15 to 20 minutes, including the 5 minutes required for equilibration of the reversing thermometers. At our present combination of sampling rate/lowering speed we obtain two to three sets of data per metre. A bottom trip line with a magnetic closure switch simultaneously triggers the Niskin bottles and

sends a pulse to the computer so that the exact depth of the water samples for salinity and transmissivity calibration is known. Salinity calculated from the conductivity and temperature data agrees with calibration salinometer readings to within 0.01%, or one part in 10^5 .

The microprocessors and peripherals run off of a frequency and voltage stabilized power source to eliminate computer failure due to the vagaries of ship's power.

Back in the laboratory, the same microprocessor system used to log the data is used to edit, quality control, and plot the data in report quality without resorting to the expense of the University's Data Processing Center. We have designed an interface which does allow us to use the microcomputer as a smart terminal to the University's large scale computer for rapid transfer of station data to 9-track tape.

We have also interfaced a Universal tape cassette tape reader to the same microcomputer so that the tapes from the current meters can be read, preprocessed, and the data transported to the Data Processing Center for spectral analyses, filtering, and plotting. In addition, we have interfaced a back projected digitizing table to the system so that the dye emission movies from the boundary layer studies can be digitized and processed. Final stages of interfacing for a video digitizer are now being completed so that the video tapes can be similarly analyzed.

PHISH is undergoing modifications to speed data acquisition up to 4 sweeps per second, or about 24 sweeps per metre. This will be accomplished by digitizing the data in the underwater unit, multiplexing the data, and sending it up a single wire. We are also adding a pump to the conductivity cell to decrease sensor response time, and two orthogonal inclinometers to insure the accuracy of the current meter data.

Interpretations based on all of our new data are consistent with those previously reported. That is, the nepheloid layer is restricted to the bottom boundary layer around the banks; the currents diverge around the banks rather than flow over them; and the flow at the base of the banks is accelerated by convergence. The mean flow at 60 m depth on the open shelf adjacent to the banks is toward the east. It is modulated at several frequencies, the most energetic of which are the modulations at the diurnal and semidiurnal tidal frequencies. Lower frequency oscillations vary with the seasons. In the winter, low frequency oscillations are generated by the passage of "northers." These have periods of 3 to 5 days. It is not yet clear, but there appears to be some response to forcing at a 30-hour natural mode for the Gulf of Mexico when the waters are stratified. Flow near the bottom is directed offshore except for brief periods. It too is modulated at many frequencies.

Currents near the banks exhibit very strong topographic steering at all levels.

STUDY OF OIL AND GAS
ACTIVITIES ON REEF FISH POPULATIONS

David Gettleson and Russell Putt
Continental Shelf Associates, Inc.
Tequesta, Florida

This is a three-phased program with the overall goal of developing methods by which standing stocks of selected species of reef fishes can be quantitatively assessed near oilfield platforms and natural reefs in the northwestern Gulf of Mexico.

The objective of Phase I was to evaluate tentatively selected platform and reef study sites as to adequacy and appropriateness for study. Divers using underwater television and still photography surveyed 25 tentative sites, including 13 platforms and 12 hard bottom areas, from which suitable study sites were selected.

The objective of Phase II was to evaluate various types of gear and methods for efficacy in determining standing stocks of reef fishes at platforms and hard bottoms on the Outer Continental Shelf of the Gulf of Mexico. Equipment and methods evaluated included a remotely controlled vehicle (RCV-225), a remote time-lapse movie system, diver Super 8 cine transects, fish traps, and hook and line fishing. Equipment was evaluated at one platform and one natural hard bottom location. Equipment and methods judged most suitable were selected for use during Phase III.

The objective of Phase III was to quantitatively assess standing stocks of fish near selected offshore platforms and hard bottoms. Sampling procedures included using a remotely controlled vehicle (Perry Oceanographics Recon III-B) and time-lapse movie photography at near-surface, mid-water, and near-bottom locations at both platform and reef sites.

Water column measurements of salinity, temperature, dissolved oxygen, and transmissivity were made every five metres at each study site. Quantitative measurements of fish standing stocks were made at four petroleum platforms and two natural hard bottom sites. Analysis of videotape and Super 8 movie records has been completed, and final computer analysis and report preparation is presently underway.

As a contract modification, a photo reconnaissance of Phleger and Sweet Banks was performed to document the associated biota prior to the potential leasing of oil and gas tracts that contain the banks within their boundaries. A final report detailing the results of this reconnaissance was submitted to the BLM during August 1980. The hard bottom biota associated with the surveyed depths of 122 to 173 m on Phleger Bank included sponges, comatulid crinoids, paramuricid sea fans, spiral sea whips (Cirrihipathes sp.), and the roughtongue bass (Holanthias martinicensis). The surveyed area of Sweet Bank included Algal

Nodule-Sponge and Antipatharian Zones. The algal nodule substrate was observed in water depths of 75 to 80 m and the rock outcrops of the Antipatharian Zone from approximately 80 to 105 m. The fauna of the Algal Nodule-Sponge Zone included leafy algae, sponges, gorgonians, an antipatharian, holothuroids, and small tropical fish. The Antipatharian Zone was characterized by crinoids, antipatharian whips, alcyonarian sea fans, and roughtongue bass (Holanthias martinicensis).

IXTOC OIL SPILL DAMAGE ASSESSMENT STUDY

Paul Boehm
ERCO (Energy Resources Co., Inc.)
185 Alewife Brook Parkway
Cambridge, MA

George Lewbel
LGL Ecological Associates
1410 Cavitt Street
Bryan, TX

Background

Energy Resources Co., Inc. and our subcontractors, LGL Ecological Associates and Global Geochemistry, have been contracted by the Bureau of Land Management to conduct the IXTOC Oil Spill Damage Assessment study. Both oil from the IXTOC offshore well blowout and crude oil spilled from the BURMAH AGATE tanker collision impacted the Texas coastline in 1979 and 1980.

The blowout of the IXTOC oil well in the Bay of Campeche resulted in the largest documented spill in history. Approximately 140 million gallons of oil were released from the runaway well from June 3, 1979, to March 23, 1980. Of that amount, an estimated 3 million gallons impacted south Texas beaches, with an unknown quantity of oil in the waters of the northwest Gulf of Mexico over the biologically productive continental shelf.

The BURMAH AGATE oil tanker collided with the freighter, MIMOSA, in November 1979, five miles off of Galveston, Texas, and resulted in the spillage of several million gallons of crude oil into offshore waters. Approximately 150,000 barrels of the spilled oil burned in an ensuing fire.

The present study is designed to monitor hydrocarbon levels in the benthic environment and in benthic epifauna, in order to estimate potential impacts on population dynamics, and to determine the extent of IXTOC and BURMAH AGATE oil presence in the South Texas OCS area. An adequate data base for determining such an impact exists from the BLM South Texas OCS baseline information. Three years of seasonal data on benthic population parameters were gathered at offshore study sites in the impacted area prior to appearance of the IXTOC oil. Biological and chemical parameters from the pre-spill study of the area are being compared to the data collected after the spill.

Chemistry Program

Three methods were used to establish chemical fingerprints for identifying IXTOC and BURMAH AGATE oil. Two methods involve gas chromatograph (GC) analysis. The first involved plotting the gas chromatograph results of normal alkane relative abundances from C₁₀ to C₃₄. The GC traces of weathered oil samples are easily

assigned to one of three groups: IXTOC, BURMAH AGATE, and unrelated beach tars (see Figures 2-4). Gas chromatography using sulfur-specific detectors is the second GC fingerprinting method used to aid in identifying the source of a selected set of weathered oil/tars.

The third method proven useful in identifying the source of the oil samples is analysis of stable isotope ratios of hydrogen, carbon, and sulfur. This work is being done by Global Geochemistry. Oil and tar samples collected in the BURMAH AGATE region and those collected in the IXTOC region have similar $\delta^{13}\text{C}$ values. However, the $\delta^2\text{H}$ values are quite different and the two sources are easily differentiated from one another (Figure 5). This method offers a reliable way to establish the source of heavily degraded oils.

These three fingerprinting techniques will be used to identify the source of petroleum hydrocarbons in the sediment and shrimp samples which were collected during and after the spills.

ERCO used ultraviolet/fluorescence (UV/F) to screen all of the shrimp and sediment samples collected in 1979 and 1980 for petroleum hydrocarbon contamination. Those samples that are suspected to contain oil are being analyzed by GC and, in some cases, GC/MS, to quantify the various hydrocarbon components and to identify the source of petroleum contamination. A set of positively screened sediment samples is also being analyzed for stable isotope ratios ($\delta^{13}\text{C}$, $\delta^2\text{H}$) as another method of identifying the source of petroleum contamination. The UV/F data reveal possible hydrocarbon pollution in many offshore sediments. This finding is complicated, however, by the fact that the polynuclear aromatic hydrocarbon (PAH) distributions reflect mixed petrogenic and pyrogenic origins. Thus, use of GC and GC/MS to "pull out" the sources is essential. In the shrimp samples, the UV/F screen revealed sporadic incidence of possible petroleum pollution. Again, this is complicated because the major fluorescence band coincides with the two-ringed aromatic bands that have appeared in coastal shrimp previous to the spill, and also because shrimp are capable of metabolizing aromatic hydrocarbons. Because of these problems, the compound distribution in the saturated fraction will be relied on heavily to identify petroleum sources and concentrations in the sediment and shrimp tissue samples.

Biology Program

The biological program, being carried out by LGL Ecological Associates, is characterizing the macroinfauna of the Texas OCS region. The samples LGL is analyzing were collected during the spill and after the spill at stations which coincided with the ERCO chemistry samples and samples from the STOCS baseline study. LGL has identified 135 species comprising 3,348 individuals in samples collected from the 12 "priority stations" (those stations sampled in 1975, 1976, and 1977 during the STOCS study; by the regional response team mid-spill in

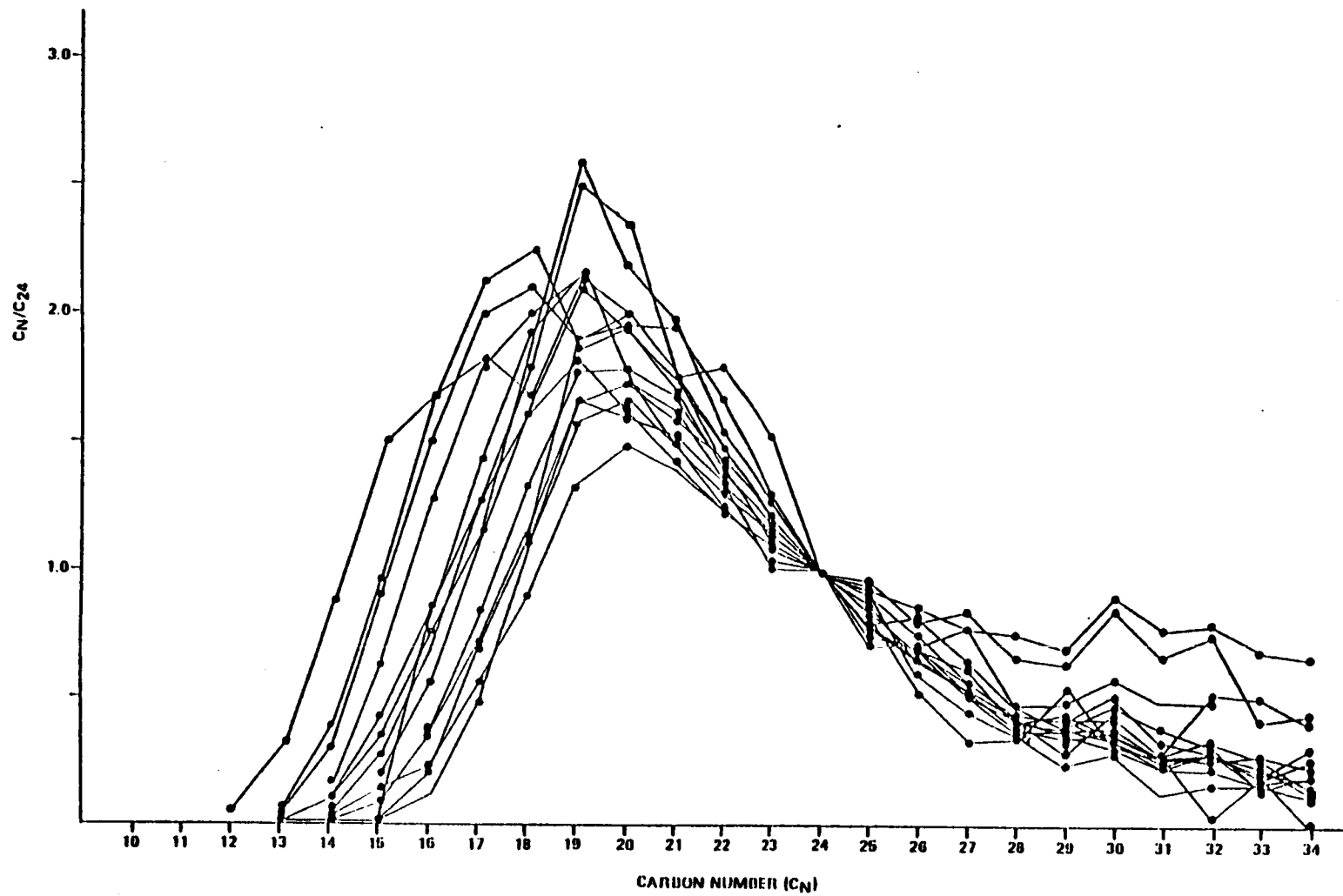


Figure 2. Carbon plots of IXTOC related oils/tar.

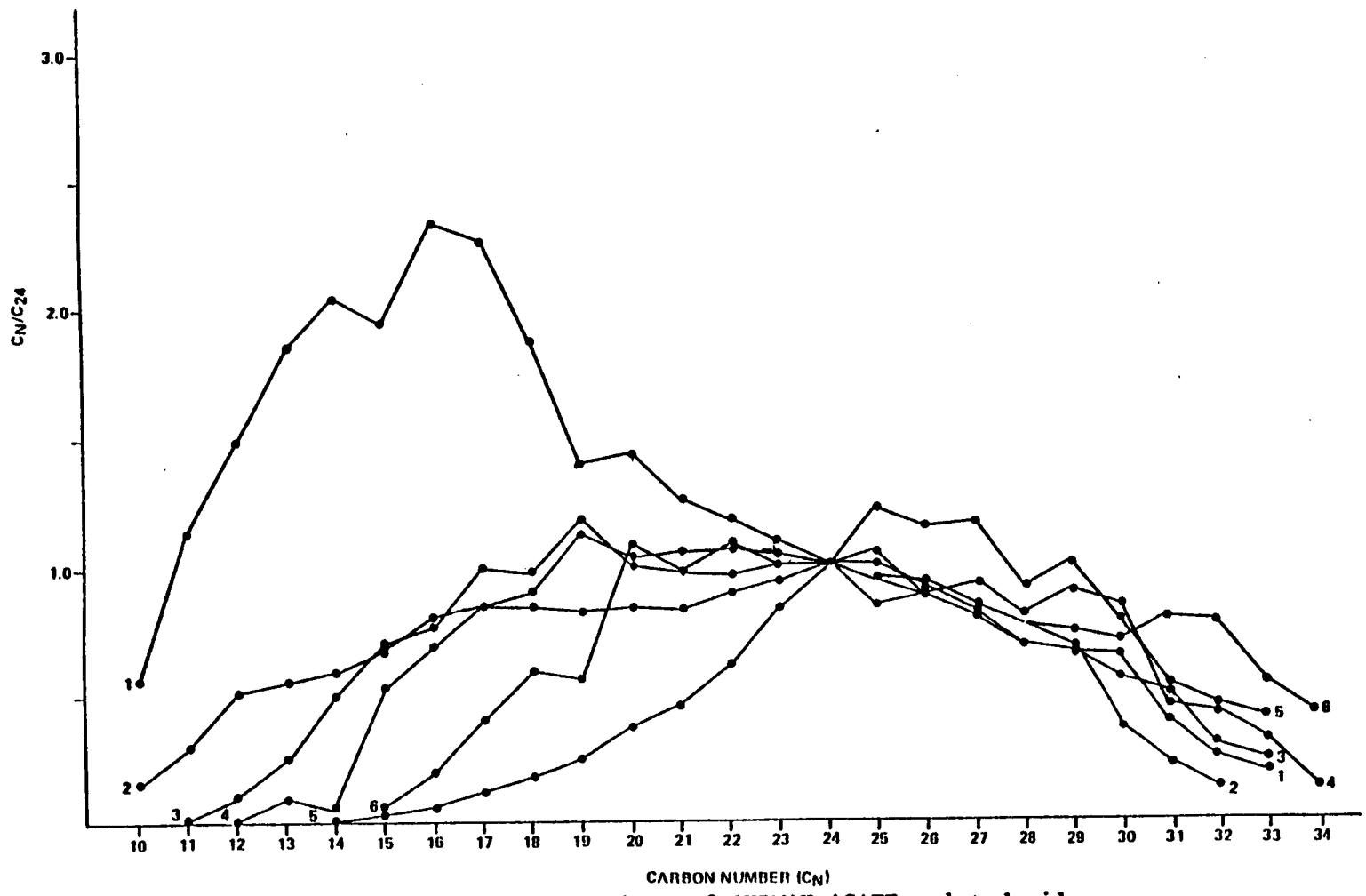


Figure 3. Carbon plots of BURMAH AGATE related oils.

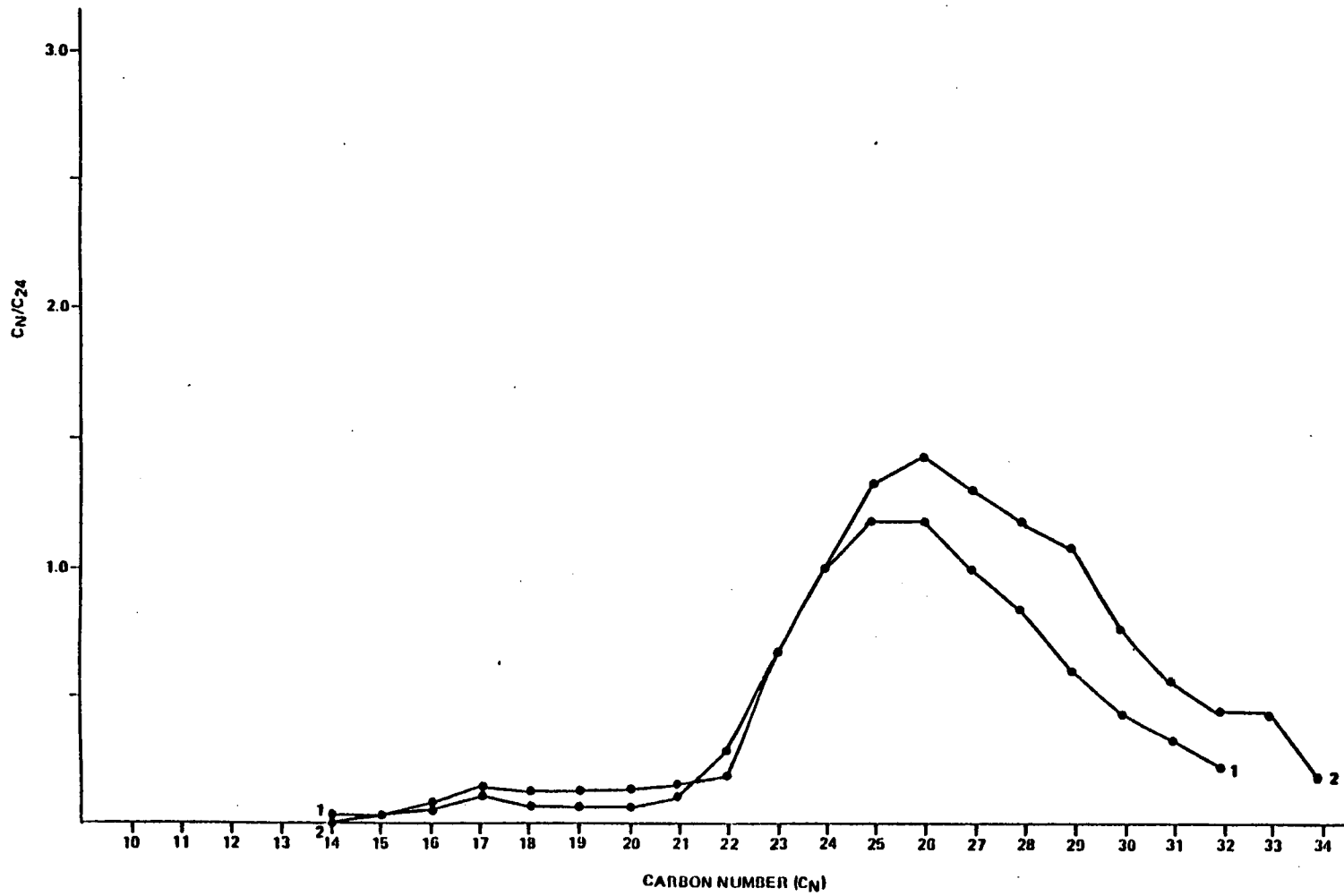


Figure 4. Carbon plots of non-spill related beach tars.

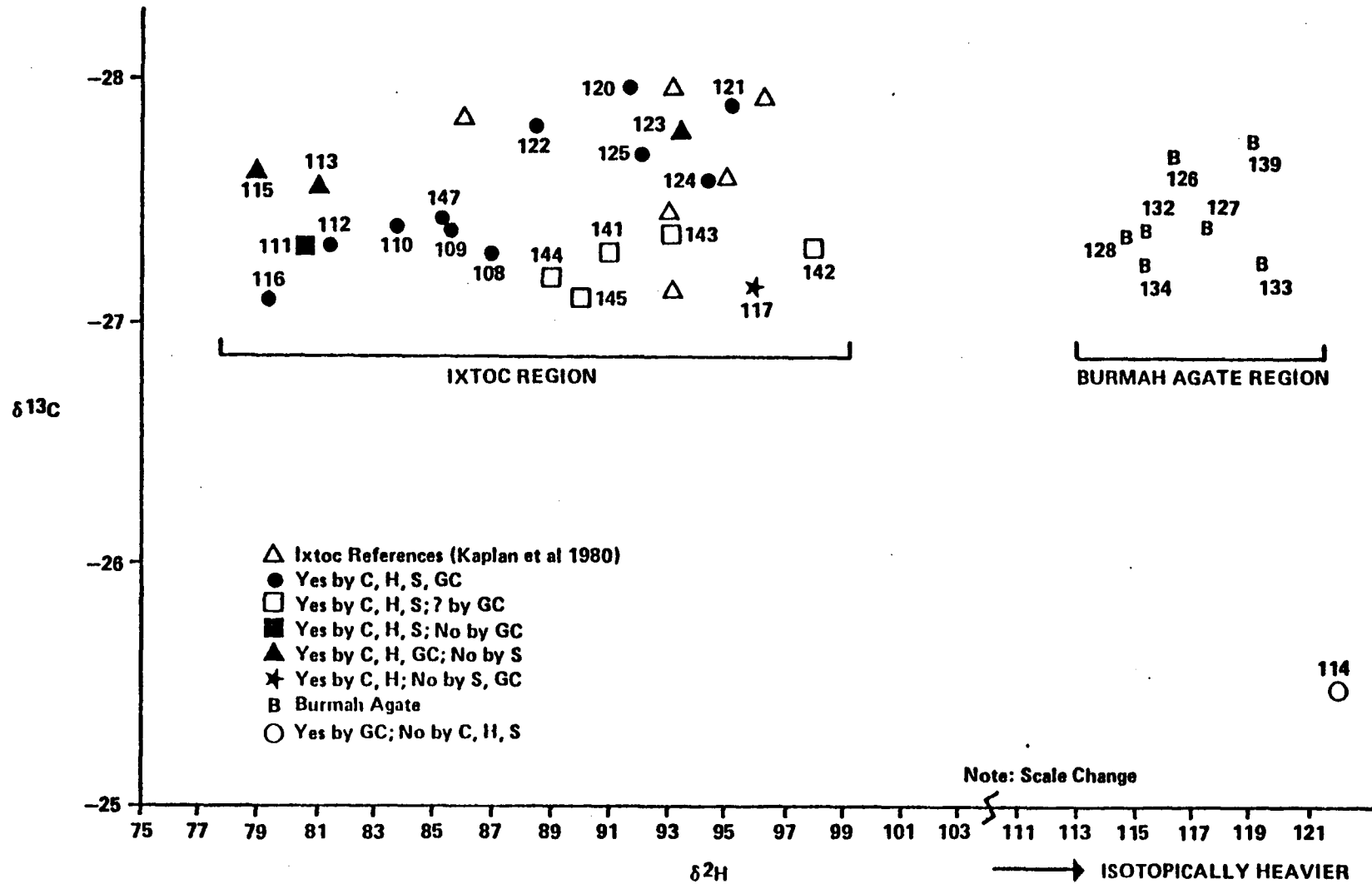


Figure 5. Cumulative stable isotope plot of saturated oil/tar fractions.

1979, and then again in December 1980 after the spill). LGL taxonomists have worked with the taxonomists from the STOCS program to ensure consistency in species identification. Preliminary statistical analyses are being performed to compare the STOCS pre-spill data base to the LGL mid- and post-spill data base. Significant decreases in numbers of individuals and species have been noted, but have not yet been linked to a causal mechanism.

The chemical and biological data will be synthesized to determine the effect that the input of oil to the Texas OCS area has had on the chemistry of the sediments and the population dynamics of the benthic infauna living in the impacted area.

For further information on this project, the final report, which is due November 1, 1981, will be available through the BLM OCS office, New Orleans, LA.

IXTOC I AND BURMAH AGATE ECONOMIC IMPACT STUDY

Carlos Restrepo
Restrepo & Associates
El Paso, TX

The IXTOC I Oil Spill Economic Impact Study is establishing information needed for prediction, assessment, and management of impacts on the economic, marine, and coastal environment of the OCS areas affected by oil spills. The study addresses major economic impacts on tourism, recreation, and commercial fishing in the area affected, and also analyzes the extent of federal and state cleanup activities.

From the preliminary information gathered and processed to date on the economic impact of the IXTOC I Oil Spill and the BURMAH AGATE sinking, the most salient conclusion that can be made, based on the data collected and analyzed to date, is that the impact period of analysis may prove too short to yield any definitive conclusions about the overall impact of the oil spills, particularly in the commercial fishing sector. Initial evidence from biological assessments indicates that there is no basis for associating declines in the landings of major species in 1979 with the effects of oil spills. The important areas (bays) were apparently sufficiently protected from the oil to prevent damage.

The economic impact of the oil spills on the Tourism and Recreation sectors can be quantified without major difficulties since the effect on these areas was more direct and time specific. However, due to the biological cycles affecting the Gulf fish species, it may not be clearly discernible whether the oil spills had a major direct impact on the Commercial Fishing sector.

The availability and the quality of the data on certain areas, such as employment data at the three-digit SIC code level for the period 1972-1977 for the State of Texas, has been sporadic and incomplete. In addition, Recreation and Tourism count data for the state parks and recreation areas have presented some interesting challenges.

Most of the data base and direct field research has been already accomplished as well as the preparation of the computerized regional input/output model. The next major phase of analysis for the study will involve the preparation of the computerized input/output projections that will determine the direct and indirect economic impacts of the oil spills on the Tourism, Recreation, and Commercial Fishing sectors. Once this phase of the study is completed, the research team will begin preparation of the final report for delivery to the Bureau of Land Management.

GEOLOGY STUDIES

Henry Berryhill, Jr.
U.S. Geological Survey
Corpus Christi, TX

In November, 1980, the Port Isabel 2° environmental geology atlas, one of three prepared for the South Texas OCS, was published. The six topical maps making up the atlas set include: water circulation and rates of sedimentation; trace metals content and texture of surficial bottom sediments; shallow subsurface sediments and biogeology; Post-Wisconsin sedimentation patterns and faulting; Paleogeography of the continental shelf during the last low stand of sea level; and structure of the continental terrace. Release of the Corpus Christi and Beeville atlases is expected during May 1981.*

Work on the continental shelf and upper continental slope off southwest Louisiana involved several categories of work:

1. Northern Garden Bank, southern Bouma Bank area - Interpretation of 5000 miles of high resolution seismic reflection profiles was completed and delivered to the BLM as a series of topical maps at a scale of 1:48,000. The data were then compiled as a series of topical maps at a scale of 1:250,000. Twelve topical maps at 1:250,000 for the northern half of the Garden Banks 2° map and the southern half of the Bouma Bank 2° map were delivered to the BLM in December 1980 on mylar for use as overlays. The topical maps include:
 - (1) Bathymetry
 - (2) Geologic Features Expressed Topographically at the Sea Floor
 - (3) Distribution of Shallow Gas in Sediments
 - (4) Relative Bottom Hardness Based on Acoustical Response
 - (5) Location of Faults
 - (6) Distribution of Buried Stream Channels
 - (7) Surficial and Shallow Deformation
 - (8) Location of Diapirs and Folds
 - (9) Depth to Diapirically Deformed Sediments
 - (10) Thickness of Seismic Stratigraphic Unit A (Late Holocene)
 - (11) Thickness of Seismic Stratigraphic Unit B (Early Holocene)
 - (12) Thickness of Seismic Stratigraphic Unit C (Late Pleistocene)

*Released in June 1981.

2. Northern Bouma Bank, Port Arthur 2° maps - During the period June to October, 1980, 8,200 miles of high resolution seismic reflection profiles spaced in a 3 x 3 mile grid were collected by subcontract to a geophysical service company for the northern half of the Bouma Banks 2° map and all of the submerged part of the Port Arthur 2° map.
3. Northern Bouma Bank, Port Arthur 2° maps - Interpretation is underway as follows:
 - (1) A first draft work map showing the locations of all shallow buried stream channels has been completed.
 - (2) Faults have been marked on the seismic profiles and are ready for transfer to maps.
 - (3) Diapirs have been plotted on a first draft work map.
 - (4) A first draft work map showing the distribution of seismic stratigraphic Unit A (Late Holocene) is two-thirds completed.
 - (5) Basal contacts for seismic stratigraphic units B and C have been marked on records for northern Bouma Banks area and are being digitized for plotting thickness maps.

RECREATIONAL FISHERIES INVESTIGATIONS

Villere Reggio
New Orleans Outer Continental Shelf Office
Bureau of Land Management, New Orleans, LA

A substantial recreational fishery has grown in tune with petroleum development in the Gulf of Mexico. BLM believes offshore oil and gas leasing and development has, and will continue to have, a major symbiotic relationship with offshore Gulf of Mexico recreational fishing.

In 1980, the Year of the Coast, the New Orleans OCS Office initiated a concerted, comprehensive effort to obtain a data base which will increase understanding of the scope and magnitude of this recreational phenomena and provide a foundation for future decisions by government and industry involved in development and management of ocean resources.. Several project initiatives are directed at these goals.

BLM has negotiated an Interagency Agreement with the National Marine Fisheries Service (NMFS) which will lead to estimates on the total number of Gulf of Mexico fishermen attracted to oil and gas platforms and their catch. Collateral recreational fishing associated with petroleum structures will be determined through the ongoing National Marine Recreational Fishery Statistics Survey for the Gulf of Mexico. From these data the relationship of Gulf of Mexico "rig fishing" and catch to all offshore fishing can be determined. Results of this survey should be available by early 1982.

With the cooperation and support of the offshore industry, BLM is collecting data on daily fishing activity in approximately 250 separate offshore locations associated with more than 400 oil and gas structures off the coast of Louisiana. Through this investigation they will be able to document the nature and extent of public use associated with petroleum platforms in the central Gulf of Mexico by individual recreational group and activity. These data will be correlated with variables such as offshore area, water depth, distance from shore, vessel size, target species, and weather, in order to determine how these conditions affect fishing patterns. Specific recreational groups being inventoried are private boats, charter boats, and SCUBA divers. The level of commercial hook and line fishing directly associated with petroleum structures will be an interesting by-product of this investigation. Results should be available in 1982.

MARINE ECOLOGICAL MAPPING PROJECT

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Texas A&M University
College Station, TX

The present project is designed to provide a clear understanding of the distribution patterns of critical benthic species, groups, and species assemblages of the continental shelf of the Gulf of Mexico from Brownsville, Texas to Key West, Florida. Areas of specific biological importance or sensitivity are to be identified, knowledge gaps determined, and recommendations for filling the knowledge gaps presented. Final products should include a series of maps and a narrative report displaying and describing the findings of the project.

In order to achieve the goals of the project it is necessary to locate and obtain all major data bases dealing with benthic collections on the shelf and to subject them to computer analysis. Seven major data bases exist. All but one have been obtained (Figure 6) and about half have been analyzed. The major outstanding data base is that of the National Marine Fisheries Service, and access to that has been promised.

For analytical purposes each data base is being treated separately. Within a given data base each gear type is analyzed individually, and fishes are treated separately from invertebrates. All data are being standardized to a common unit of effort. Within this context, the data are being analyzed by fishery statistical area; within each statistical area data are analyzed by depth. Where the data permit, seasonal aspects are being determined.

Although precise interpretation of distribution patterns must await further analysis, it is already clear that on an east-west basis there are three primary faunal assemblages.

1. Western zone (Texas shelf) - dominated by the longspine porgy with smaller percentages of Atlantic croaker, inshore lizardfish, silver seatrout, and wenchman.
2. Central zone (shelves of Louisiana, Mississippi, Alabama, and northern Florida) - dominated by the Atlantic croaker with smaller percentages of sea catfish, longspine porgy, silver seatrout, Atlantic cutlassfish, and blackfin searobin.
3. Eastern zone (peninsular Florida) - dominated by the dusky flounder with smaller percentages of fringed and planehead filefish, pancake batfish, barbfish, smoothhead scorpionfish, tomtate, and others.

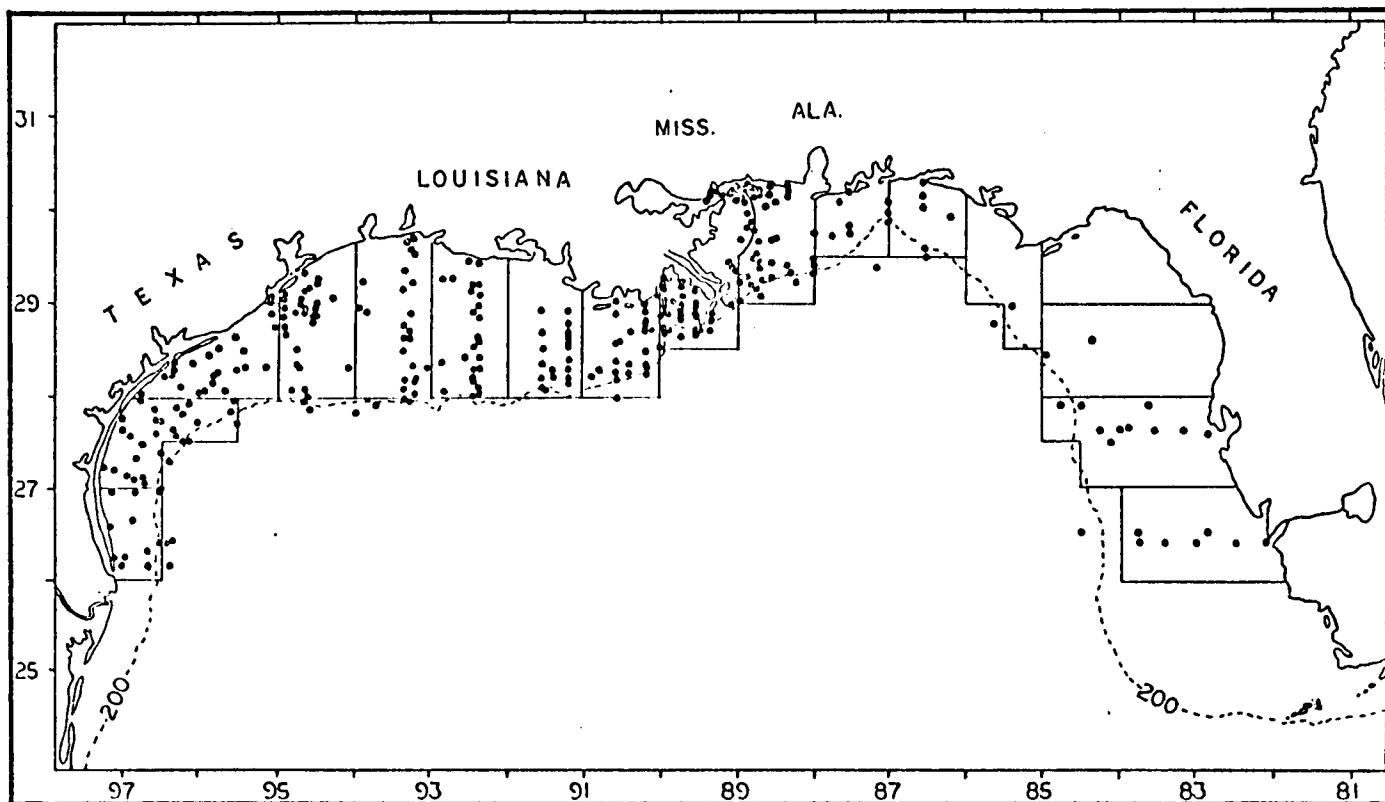


Figure 6. Data bases obtained for computer analysis of benthic collections on the Outer Continental Shelf.

The western and central assemblages differ largely in percent occurrence of species common to the two areas, but the eastern assemblage is largely unique. It is represented in the other two zones primarily in connection with topographic high reefs. Within each of the three zones the faunas are differentiated by depth and season.

By assembling and analyzing the existing major data bases, we have the potential for developing a real understanding of the distribution patterns of the shelf species. However, only a portion of this potential can be realized due to severe restrictions of time and funding. Hence, it is recommended that the project be funded for an additional year. This would permit incorporation of the NMFS data base and in-depth analysis of the total available information.

Recommendation for two additional studies seems warranted on the basis of the analyses to date. Real knowledge of faunal zonation of the shelf must rest, in part, upon information on the distribution of macro-infaunal species. Present knowledge of the macro-infaunal distribution patterns is sketchy, and this area should be investigated. A great many of the mobile species display 24-hour periodicity patterns which affect their susceptibility to capture. This bias in trawl samples must be studied and understood to provide a firmer basis for interpretation of their distribution patterns.

DEEP-SEA BIOLOGY

Linda Pequegnat
TerEco Corporation
College Station, TX

This project is studying the macroepibenthic vertebrate and invertebrate organisms living on the Outer Continental Shelf, continental slope, and abyssal plain of the Gulf of Mexico from DeSoto Canyon on the east to the area off Brownsville, Texas (Figure 7). It is based almost exclusively upon biological and physico-chemical data collected by Dr. Willis Pequegnat during the years 1964 to 1973. The principal emphasis is upon the communities that exist in the northern Gulf north of the 25th parallel and below depths of 1000 m. For the sake of ecological perspective, the study examines and compares communities that exist above depths of 1000 m, thus producing a synthesis of the 1976 and present studies. It also compares the results of communities found in the study area with those stations taken on the shelf, slope, and plain from Brownsville, Texas, south to the Gulf of Campeche. This study not only complements the previous report on deep Gulf communities prepared by TerEco for BLM in 1976, but also extends that report by detailing the species found at each station. Thus, approximately 192 stations will be analyzed, involving over 2300 samples, which contain about 500 species and between 150,000 and 200,000 individuals.

During the nearly three months since the project began on February 2, 1981, we have sorted, curated, and inventoried some 2300 samples of unidentified material from the study area. These were sorted into 30 taxonomic groups. Taxonomic specialists are now working on all but two groups (the Nemertea and Isopod crustaceans).

We have also drawn together and consolidated our data on previously identified material from the deep-sea stations involved in this study, creating two sets of data books: one based on species (listing all the station locations at which each species was taken) and the other based on station locations (listing all the species identified thus far from each station). These data books are set up so that new identifications coming in from the taxonomic specialists can be added to provide eventually a complete data profile by species and by station.

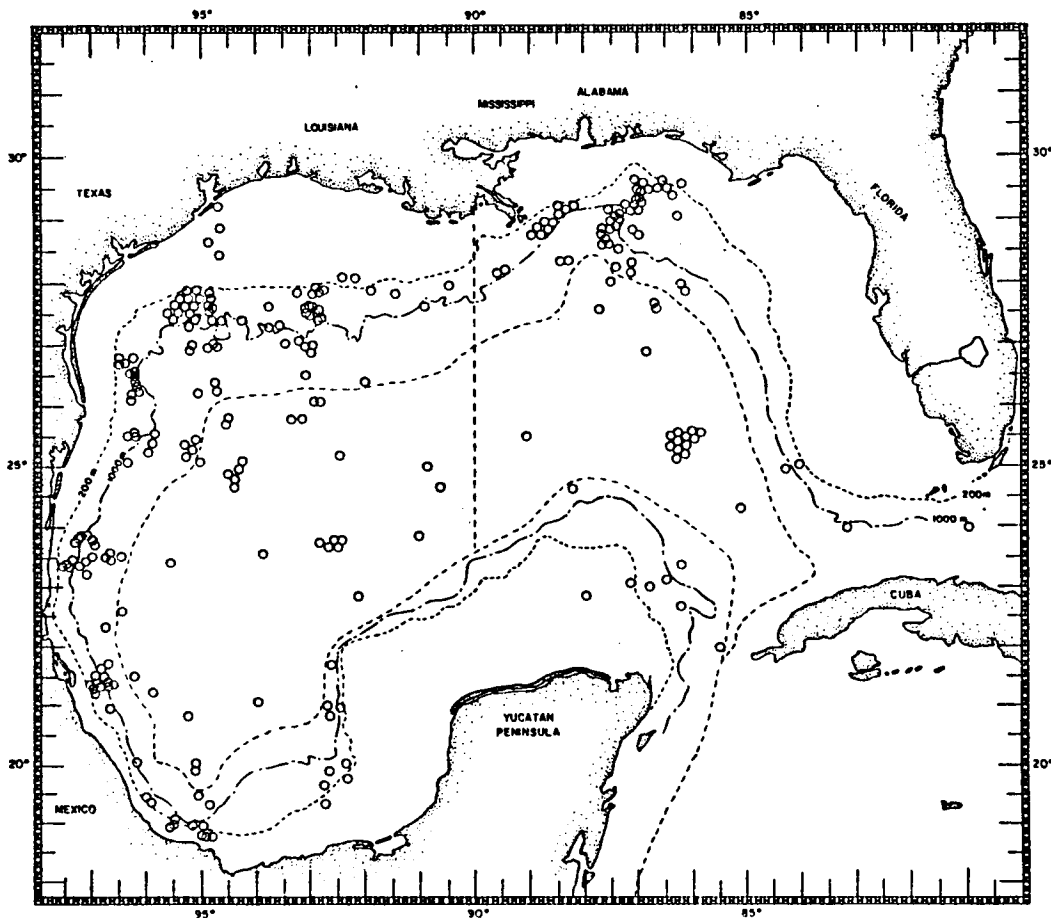


Figure 7. Map of Gulf of Mexico deep-sea benthic stations which are being analyzed for the study of macroepibenthic vertebrate and invertebrate organisms living on the OCS, continental slope, and abyssal plain from DeSota Canyon to the area off Brownsville, TX.

POLYCHAETE STUDY

Barry Vittor
Barry A. Vittor & Associates
Mobile, AL

The Bureau of Land Management has been involved since 1974 in extensive environmental baseline studies of the Outer Continental Shelf in consideration of oil lease sales and exploration activities in the Gulf of Mexico. A major component of this sampling effort has been characterization of the benthos through the quantification of benthic infaunal communities. In the two benchmark studies (MAFLA and South Texas) polychaetous annelids have been shown to comprise the majority of species and the greatest abundance of infaunal organisms. Polychaetes were instrumental in the delineation of community assemblages and their distribution and associations with physical parameters.

The importance of polychaetes as indicators of possible habitat changes has been stressed in both programs. This, however, requires repeatability in the taxonomic characterization of an area through accurate identification to the species level. Taxonomic literature for Gulf of Mexico polychaetes is inadequate to insure uniform identifications due to its diversity, general inaccessibility, and lack of applicability to the largely undescribed polychaete fauna of the Outer Continental Shelf. Repeatability is rendered still less attainable by difficulties in corroboration between laboratories and investigators identifying polychaetes. The present study is an attempt to alleviate this problem.

Our program will standardize identifications and taxonomic nomenclature of polychaetes for the Gulf of Mexico so that future monitoring can be based upon a common, comparable taxonomic work. This is being accomplished through the acquisition, reexamination, and verification of archived polychaete voucher specimens from three major BLM-OCS infaunal sampling programs in the Gulf: MAFLA, South Texas, and Central Gulf production platform monitoring programs. The principal product of this research effort will be a comprehensive series of keys and descriptions to the polychaetes of the Gulf of Mexico, with particular emphasis on soft-bottom species. The format for publication includes an introductory chapter describing the standardization process; terminology and techniques used in polychaete identification; and general information on the biology, ecology, and zoogeography of Gulf polychaetes. This is followed by a key to families, leading the reader to one of 38 family chapters contained in a series of bound volumes. Each family chapter will include an introduction describing distinctive characteristics of the family, followed by keys and descriptions to all genera and species represented in the BLM-OCS collections. Illustrations of diagnostic features will be provided for each species, along with a distributional map and a summary of depth and sediment type records based on occurrences in the BLM-OCS monitoring. This information has been made possible largely by the development and implementa-

tion of computer software to reduce and consolidate the various polychaete data bases into a compatible, usable format specifically for this project.

To date, 71% of the estimated 540 species to be included in this publication have been described and figured. Of these, approximately 54 species are newly reported from the northern Gulf of Mexico and 61 species, presumably new to science, are described. Although only 7 of the 38 family chapters have been completed (Table 5), they include the

TABLE 5
SUMMARY OF PROGRESS ON STANDARDIZATION OF
IDENTIFICATION OF BENTHIC POLYCHAETOUS ANNELIDS FROM
THE GULF OF MEXICO OCS

FAMILY CHAPTER	NUMBER SPECIES	NEW GULF RECORDS	NEW SPECIES	NUMBER MANUSCRIPT PP.
SPIONIDAE	40	4	4	110
PARAONIDAE	26	12	5	75
ORBINIIDAE	20	9	4	63
TEREBELLIDAE	38	9	14	114
SYLLIDAE	73	15	30	239
NEREIDAE	20	3	3	71
QUESTIDAE	<u>3</u>	<u>2</u>	<u>1</u>	<u>11</u>
	220	54	61	683

largest and most difficult to deal with, and represent 41% of the total species to be included and 683 pages of the anticipated 1200 page manuscript. These chapters are presently undergoing a review process which will assure their credibility with other recognized experts in the field of polychaete taxonomy. Several additional families are nearing completion, and will be followed by analysis of the large number of smaller families. The project is presently scheduled for completion in September 1981. However, additional work recommended to BLM may delay completion by several months.

Recommendations for additional work beyond the scope of the present BLM contract include: 1) consideration by BLM of adequate printing and distribution of the completed publication to insure its widespread availability to investigators in and around the Gulf of Mexico; 2) accession of a master voucher collection from the three BLM-OCS programs for deposit in the United States National Museum's archives; 3) incorporation of results from the taxonomic standardization program (i.e., species name changes, synonymies) into the MAFLA, South Texas, and Central Gulf data bases; 4) assimilation and incorporation of any ongoing (e.g., Southwest Florida and IXTOC) BLM funded infaunal

polychaete collections into the standardization process; and 5) the initiation of a taxonomic standardization program for other faunal groups shown to be important in the BLM-OCS monitoring programs (i.e., crustaceans, molluscs).

SOUTHWEST FLORIDA SHELF
ECOSYSTEMS STUDY

Jan Rietman
Woodward-Clyde Consultants
Orange, CA

The Southwest Florida Shelf Ecosystems Study is part of BLM's Outer Continental Shelf Environmental Studies Program. The primary goals of this program are to (1) obtain environmental data on the impacts of petroleum exploration and production activities on the OCS, and (2) provide relevant information to decision-makers in BLM's OCS Minerals Management Program.

The specific objectives of this study are:

1. To determine the potential impact of OCS oil and gas offshore activities on live bottom habitats and communities, which are integral components of the Southwest Florida Shelf Ecosystem.
2. To produce habitat maps that show the location and distribution of various bottom substrates.
3. To broadly classify the biological zonation across and along the shelf, projecting the percent of the area covered by live/reef bottoms and the amount covered by each type of live/reef bottom.

The technical studies program for this project was developed by BLM's New Orleans OCS Office. The major aspects of the program include: four data collection cruises (a geophysical survey of the sea floor, an underwater television and camera survey, and fall and spring biological sampling cruises); preparation of an atlas presenting the results of the geophysical and underwater television and camera observations; laboratory analyses of the biological, bottom sediment, and water column samples; and synthesis and interpretation of the data.

The field studies program began in September 1980 with the geophysical data collection cruise. Data from the first two cruises have been reduced, and the atlas has been prepared in draft form. Laboratory analyses of the data from the first biological sampling cruise (Oct/Nov 1980) is currently underway. Analysis of data from the second biological sampling cruise (April/May 1981) will begin immediately and continue concurrently with analysis of data from the first biological sampling cruise. The final report on the first year program is due to be submitted in December 1981.

Figure 8 summarizes the interpretation of the seafloor mapping programs. The geophysical data were collected along five transects (A to E, north to south) between the water depths of 40 and 200 metres. Each transect consisted of three parallel lines spaced approximately

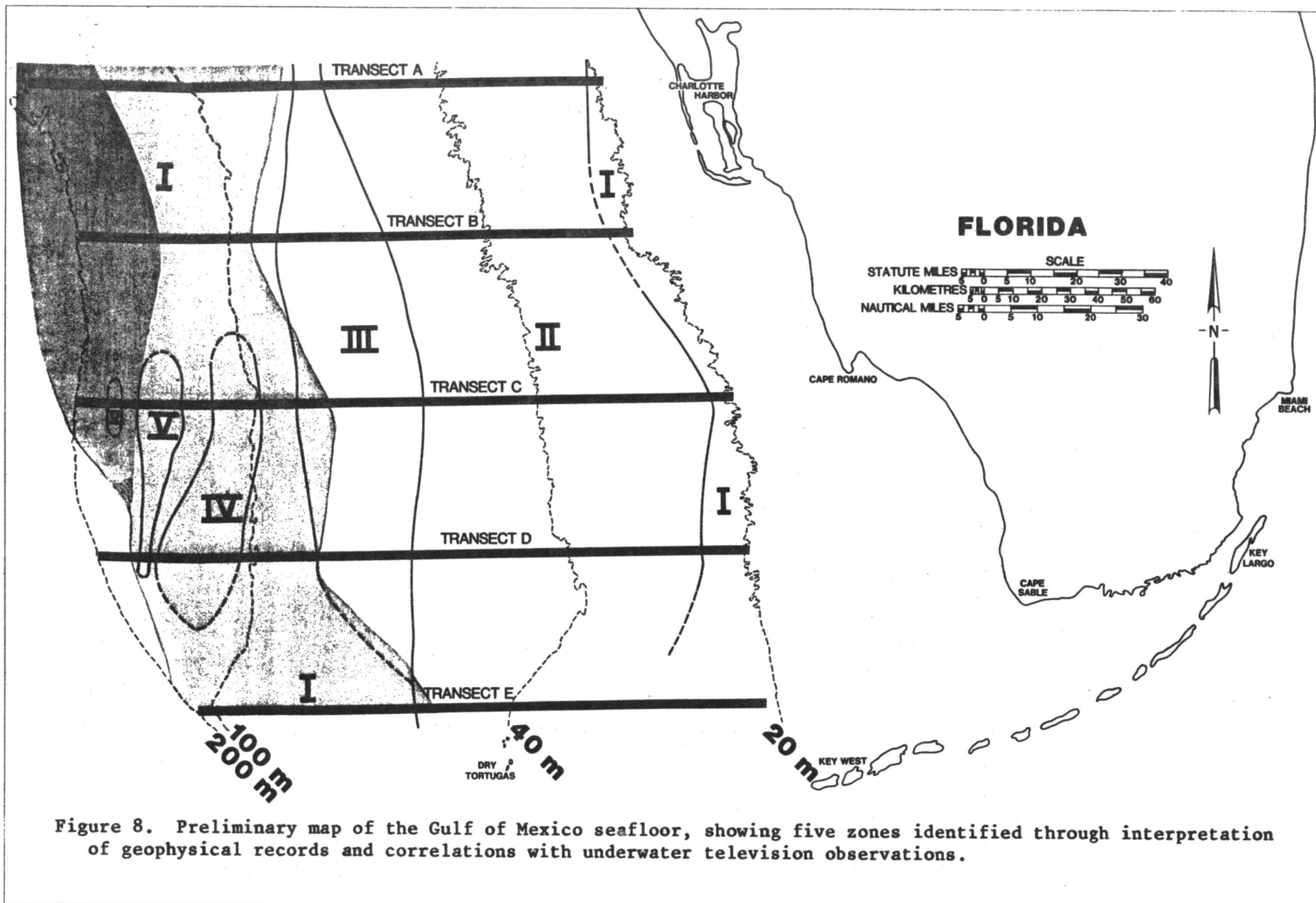


Figure 8. Preliminary map of the Gulf of Mexico seafloor, showing five zones identified through interpretation of geophysical records and correlations with underwater television observations.

1/2 mile apart. This program was designed to supplement data collected by the U.S. Geological Survey over selected lease blocks as part of their Geological Hazards Study Program. During the geophysical cruise, data were collected simultaneously from the following systems: Decca Hi-Fix and/or Pulse 8 Loran-C Navigation Systems; Raytheon DFS-600 Digital Survey Fathometer; EG&G SMS-960 Sea Floor Mapping System; and an EG&G UNIBOOM High Resolution Subbottom Profiler.

After a preliminary interpretation of the geophysical data was made on board ship, one line from each transect was selected for the ground truthing during the Underwater Television and Camera Survey cruise. This cruise began immediately upon completion of the geophysical data collection cruise. Surveying was conducted along the center line of each geophysical transect between the water depths of 20 and 100 metres. Sub Sea Systems Model SL-75 and HydroProducts TC-125 underwater television systems were used. Over 10,000 still photographs of the bottom were obtained with a Benthos Model 372 underwater camera.

A preliminary map of the seafloor is shown in Figure 8. It is based primarily on the interpretation of the geophysical records and preliminary correlations with the underwater television observations. This map reflects only the physical appearance of the seafloor, not the biological assemblages that are present. Five zones, and several sub zones have been identified.

- ZONE I:** Featureless Soft Bottom
A sand, silt, or mud bottom that generally appears featureless on the side-scan sonar records. The thickness of the sand cover over the first subbottom reflector varies from several metres to less than 0.3 m.
- ZONE II:** Soft Bottom with Striped Mottling
Alternating stripes of light and dark areas appear on the side-scan sonar records on all lines between water depths of 20 to 60 m. The mottling has a high contrast (except on Transect E) and appears to result from a cover of Caulerpa-like algae (dark zones) interspersed with sand (light zones).
- ZONE III:** Soft Bottom with Circular Mottling
Between water depths of 60 to 75 m (Transects A-D) the mottling pattern on the side-scan sonar records becomes subdued. The dark patterns have circular or curved boundaries. The TV logs indicate that the dark patches may be related to a unicellular algae or some type of epibrota interspersed with the light sand patches.
- ZONE IV:** Scattered Hard Bottom
Scattered hard bottom is seen only on Transects C and D in water depths of 100 to 150 m. It is interpreted as an area of buried reef(s) or bedrock with a locally thin sand cover. When no sand cover is present, little or no

measurable relief is shown on the depth sounder or subbottom profile records.

ZONE V: Outcrops

This zone is seen only on Transects C and D in the water depth range of 160 to 165 m. The local outcrop relief ranges from 1 to 5 m.

In addition to the general features that have resulted in the seafloor zonation described above, there are several categories of bottom features seen on the side-scan sonar that occur locally in the soft-bottom areas. Four of these features occur in significantly large areas to be mapped in the visuals atlas.

- (1) **Bedforms:** Areas of ripple marks or other subtle bottom patterns.
- (2) **Dark Blotches: (Shaded area)**
These areas are generally 10-20 m in diameter and occur in scattered groups or as an isolated signature. They are found on all transects in water depths of 70 to 165 m. They have tentatively been identified as clumps of epifauna algae or sponges.
- (3) **Pock Marks: (Shaded area)**
These features are 3-15 m in diameter. They appear as white shadows on the side-scan sonar records and are up to several metres deep. Locally, they are associated with turbid water and may have an algae cover. They are found primarily on Transects D and E in water depths of 40 to 200 m.
- (4) **Linear Marks:**
These are small (1-3 m) oriented marks on the seafloor found on Transect D at 150 m water depth. At present there is no television coverage in this area and the source is not identified.

Analysis of all data collected under this program is continuing. The preliminary zonation of the seafloor habitats will be refined, and probably revised, as the synthesis of the data continues. Planning for additional cruises is currently underway.

Underwater television and camera coverage of the 100 to 200 m water depth zones and summer and winter biological sampling cruises will be conducted over the next year. These data will be synthesized and incorporated into the results of the initial study.

SATELLITE OCEANOGRAPHY

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The radar altimeter aboard both GEOS-3 and Seasat provided direct measurements of the sea surface with an accuracy of ± 20 cm for one second averaging. This offers a direct way to measure the dynamic topography which until now could only be inferred from hydrographic data. The measurements made by a satellite altimeter may be expressed as:

$$h_a = h_s - h_g - \Delta h$$

where h_a is the satellite altitude measured by the altimeter, h_s is the satellite height above a reference spheroid determined from the satellite tracking data, h_g is the geoidal deviation from the spheroid due to gravitational anomalies, and Δh is the height deviation from the geoid due to dynamic processes in the ocean. These height deviations, when combined with those from many passes, yield average ocean topographies which can then be mapped.

The altimeters are instrumented with sample and hold gates which provide information about the shape and amplitude of the return waveform. This information can be used to determine a number of interesting and useful parameters including ocean surface wind speed and significant wave height.

Presently all Seasat data have been processed and more than half of GEOS-3 data have also been completed. A mean ocean topography map (Figure 9) was presented as well as some seasonal deviations from this mean. Figures 10 and 11 are histograms depicting the wind speed and significant wave height. A detailed progress report indicating the status of all this work was presented.

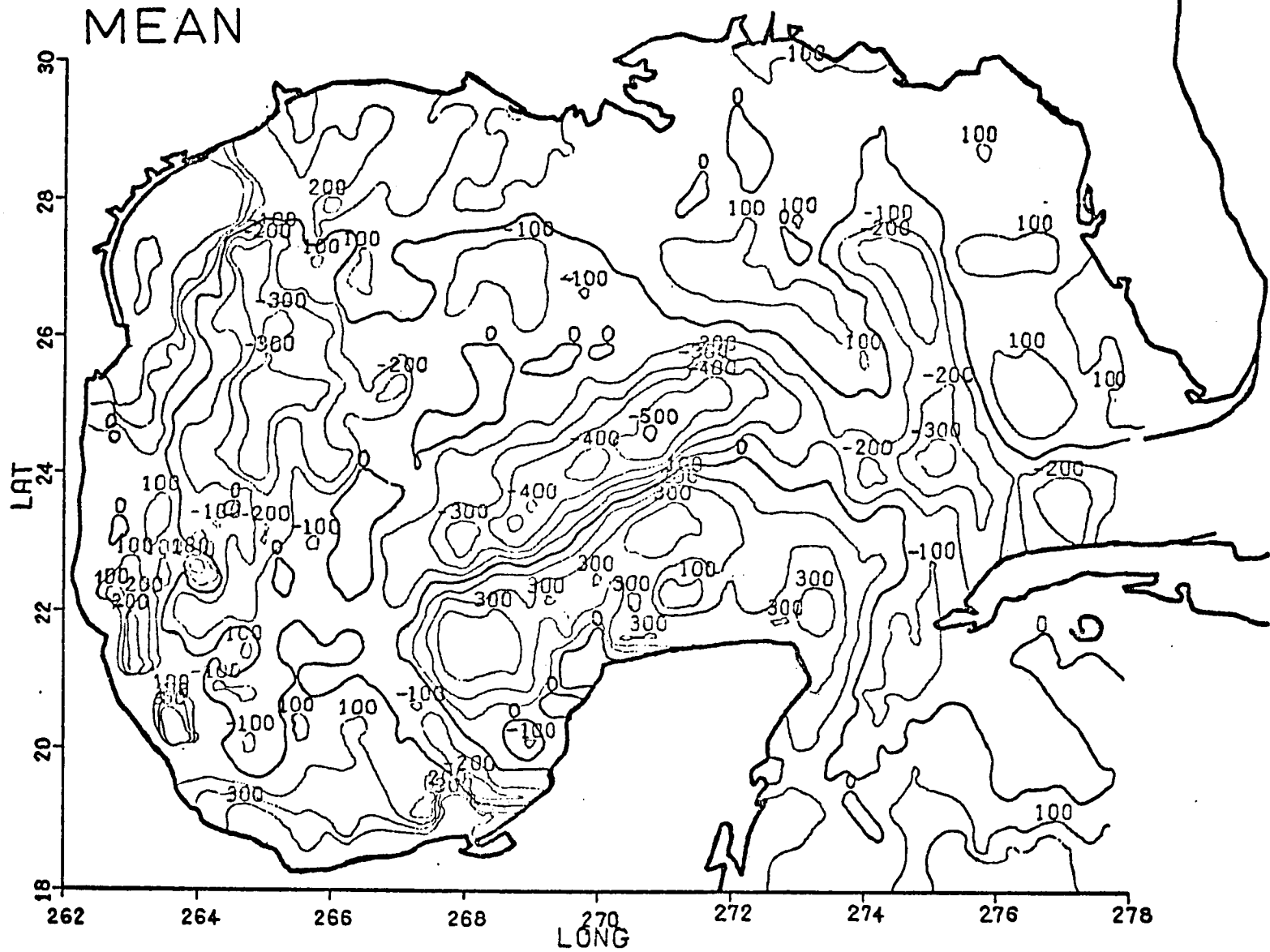


Figure 9. Mean sea surface topography of the Gulf of Mexico (in centimetres).

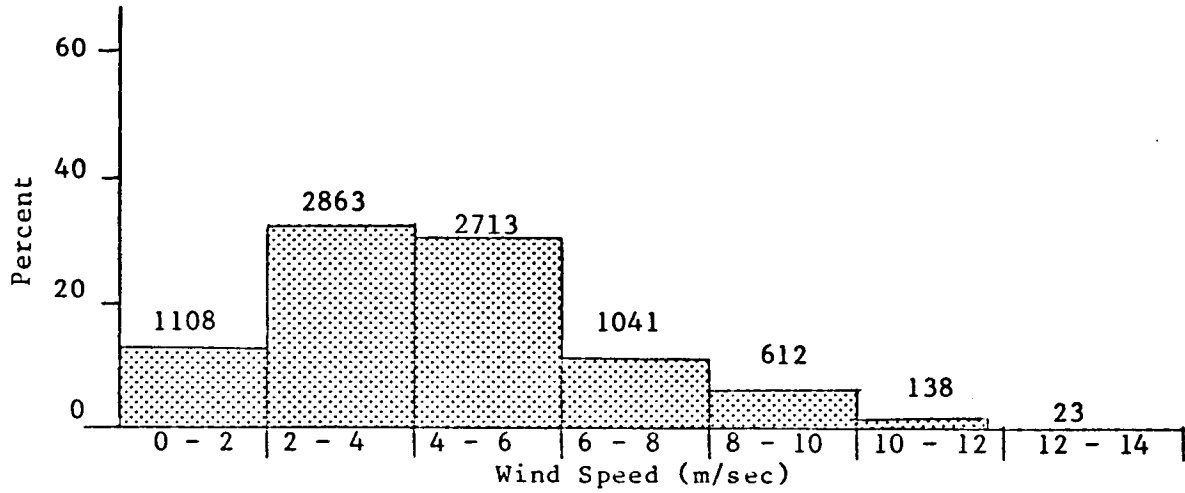


Figure 10. GEOS-3 data showing distribution of wind speed (metres per second) for the entire Gulf of Mexico; mean for summers 1975-78. $N = 8703$; mean = 5.07; sigma = 4.7.

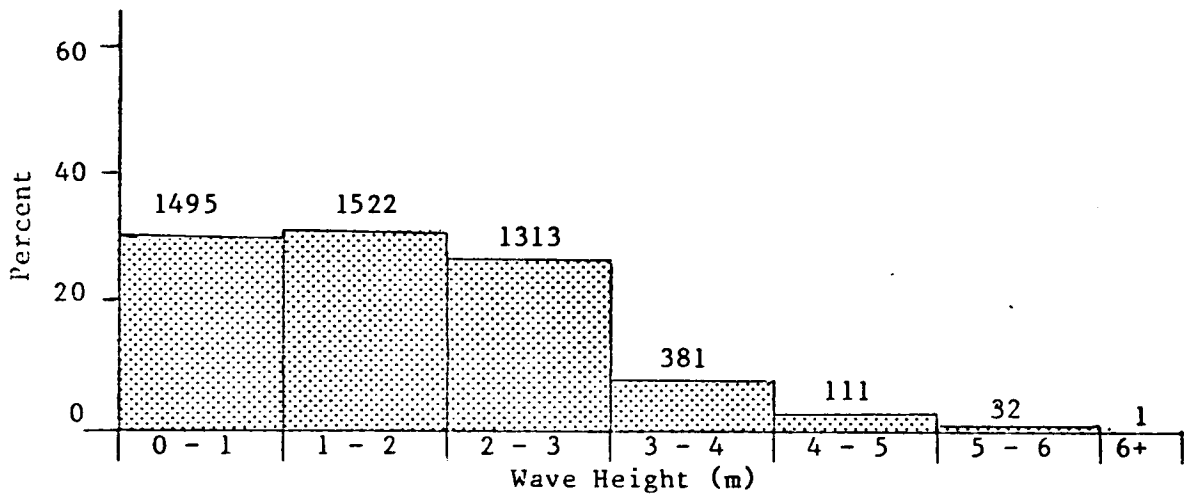


Figure 11. GEOS-3 data showing distribution of significant wave height in metres for the entire Gulf of Mexico; mean for winters 1975-78. $N = 4855$; mean = 1.60; sigma = 1.2.

SOUTHWEST FLORIDA SHELF CIRCULATION STUDY

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New England Coastal Engineers, Inc.
Bangor, ME

Existing and prospective energy-related development on the Western Florida Shelf poses potential negative impacts to other uses of the shelf and coastline. In order to investigate these potential negative impacts, the Bureau of Land Management has recently funded work involving application of a circulation model to the shelf (see Figure 12). The model is to provide information on: (1) surface current velocities for input into oil spill trajectory models; (2) mid-water circulation to predict dissolved and suspended matter transport; (3) near-bottom currents to predict long-term sediment transport and (4) the important driving mechanisms affecting the first three items above.

To adequately fulfill BLM's modeling needs, it is essential that a 3-dimensional circulation model be used. The model which is being applied uses the primitive equations (conservation of momentum). These equations are modified using two numerical techniques: a Galerkin technique in the vertical direction, and an explicit finite difference technique in horizontal space and time. The result is a much simplified set of equations which can be economically solved. A brief review of the model formulation is given (Figure 13 shows a preliminary Model Grid).

As part of the study, review of the existing data base in the region has been completed. The results of the review are summarized. Figure 14 shows a summary of available data and Figure 15 shows the locations of that data. Two studies provide current meter data for comparison to model results: one, a 1978 25-day study off Cedar Key, Florida in the northern region of the Gulf; the other, the 1973-74 Shelf Dynamics Experiment conducted along the shelf break south of Tampa. A typical comparison of winds and currents is shown in Figure 16.

Since the Florida shelf study has only recently begun, final modeling results are not presented. However, the problems of specifying the boundary conditions and verifying modeling results are discussed.

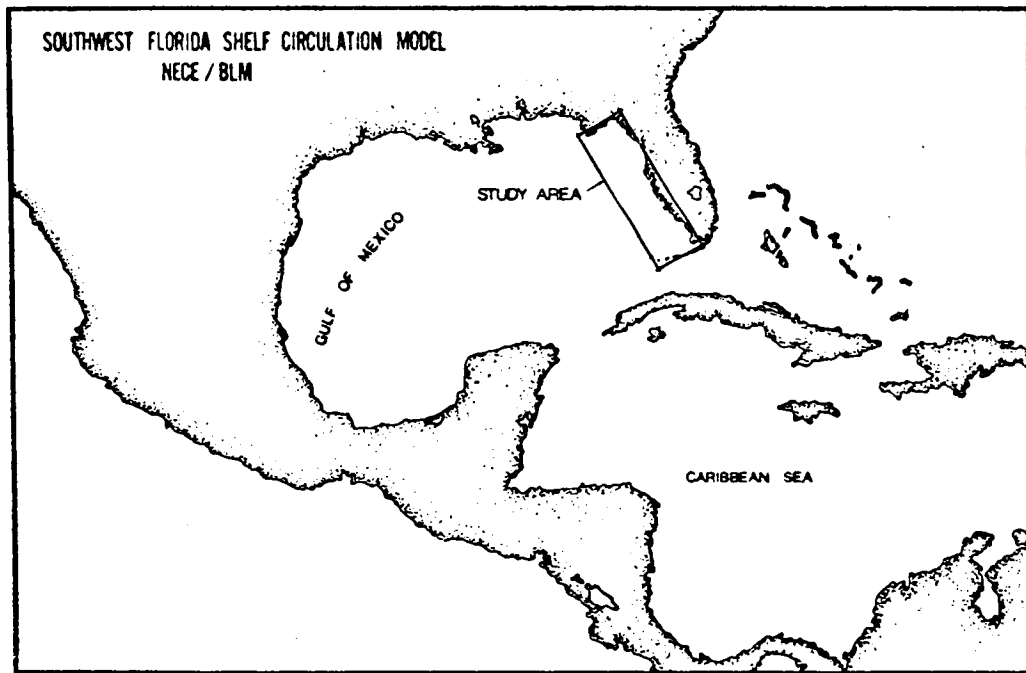


Figure 12. Study area, Southwest Florida Shelf Circulation Study.

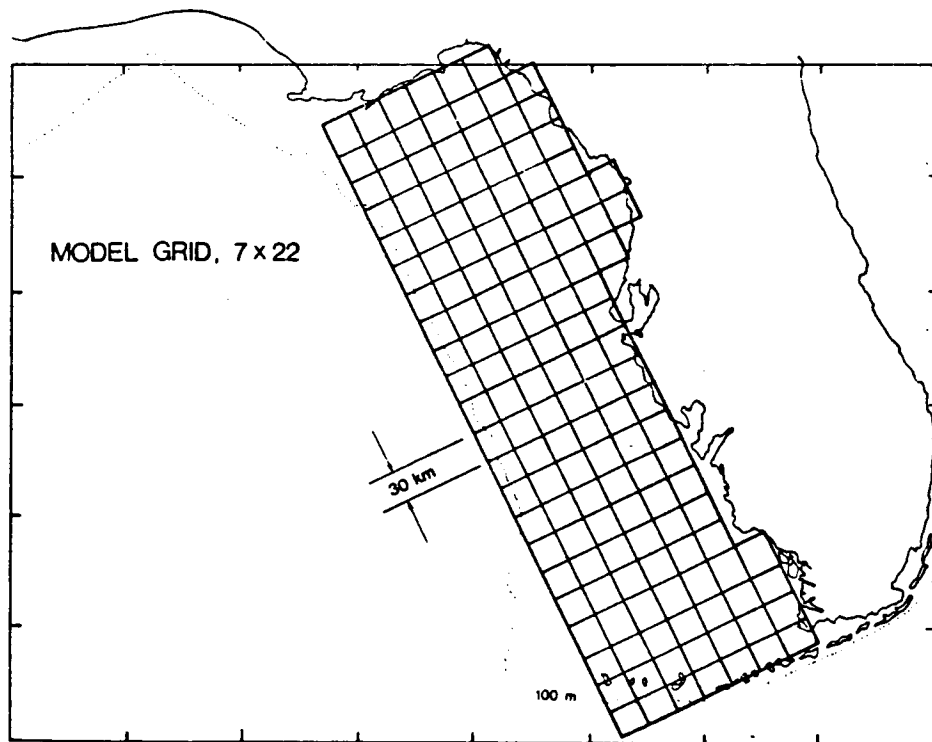


Figure 13. Preliminary circulation model grid for the study area shown in Figure 12.

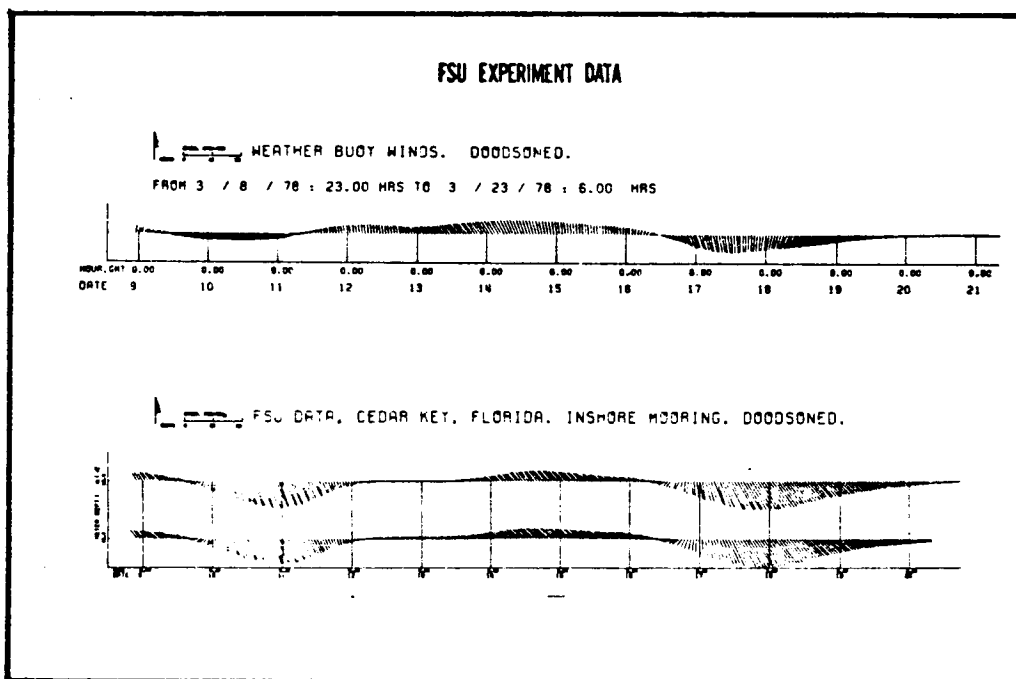


Figure 16. Typical comparison of winds and currents (from study off Cedar Key, Florida, 1978).

COASTAL ECOLOGICAL CHARACTERIZATIONS:
SOCIOECONOMIC STUDIES

Carolyn French
U.S. Fish and Wildlife Service
National Coastal Ecosystems Team
NASA-Slidell Computer Center
Slidell, LA

Project History

The National Coastal Ecosystems Team has worked with the Bureau of Land Management to implement ecological characterization studies for most of the nation's coastal regions. In this program, a series of socioeconomic studies has been designed to correlate with environmental studies, with final products representing a merger of socioeconomic and biological data. Although each of the studies contains socioeconomic components, socioeconomic studies have been done in more detail for the Gulf of Mexico than for other areas.

The socioeconomic study products include narrative reports, data appendices, and, in some cases, maps and map narratives. The topics studied include natural and socioeconomic processes, major uses of natural resources, impacts of human activities, explanations of causes and effects, and identification of data deficiencies. Synthesis papers are prepared on oil and gas activities, commercial fishing, recreation and tourism, transportation, industrial and residential development, agriculture, social and demographic characteristics, and--in recent studies--multiple-use conflicts and environmental issues and regulations.

Accomplishments

The first major socioeconomic study for the characterization program was the Mississippi Deltaic Plain Region (MDPR) study, which encompassed fourteen parishes in Louisiana and three counties in Mississippi. The habitat mapping study encompassed the same region.

For the MDPR study, maps and map narratives were prepared, showing pipelines, oil and gas data, transportation facilities, and conservation, preservation, and recreation facilities. Various map overlays may be used to analyze combined factors. The Map Narratives that accompany these maps provide tables of site specific information keyed to each map overlay. Both the Synthesis Papers volume and the Map Narratives volume contain extensive bibliographies for each topic studied.

Significant Findings

The scope of this effort is geared to the biological and cultural resources of the Gulf of Mexico. A major focus of the study is the

commercial activities that are related to natural resources. These activities are, primarily: (1) petroleum, sulfur, and related chemical industries, (2) commercial fishing, (3) waterborne commerce, (4) agriculture, and (5) commercial recreational activities.

Socioeconomic impacts of these activities in the Gulf environment include the discharge of wastes, habitat modification, and natural resource exploitation. The likelihood of impacts from petroleum production and refining is particularly great because of the scale of such enterprises in the MDPR region. Approximately 50% of total U.S. crude production was from Gulf coastal states in 1979. (Texas, Louisiana, and Mississippi were among the top ten producing states, with 32.3%, 15.7% and 1.3%, respectively.) A large share of the nation's refining capacity and chemical industries have concentrated in the Gulf area.

Applications of Socioeconomic and Characterization Studies

Characterization studies address the needs of the OCS leasing program by providing information for the prediction, assessment, and management of impacts on the human, marine, and coastal environments, as required by the OCS Lands Act of 1978. Our studies are directly applicable to the formulation of exploration and development plans, transportation management plans, and pipeline permit issuance.

The socioeconomic studies within the characterization program have provided information for the selection of sites for energy facilities in the coastal zone. Our maps and narratives have been used by the industry for the selection of pipeline corridors.

Socioeconomic studies provide information on port facilities and other onshore transportation networks. Data are gathered for specific ports on the kinds and amounts of freight handled in international, interstate, and intrastate commerce.

For the commercial fishing industry, data are gathered on catches (both quantity and value), status of the resource (healthy or under pressure), and factors affecting the industry (biological and economic). A primary concern of the Fish and Wildlife Service, of course, is environmental changes that could adversely affect fisheries.

For the recreation and tourism industries, there is an emphasis on the shorefront and offshore marine environments. This part of the socioeconomic studies is geared toward resource identification, economic value, participation, and economic dependence on the industry (i.e., identification of those areas whose economic viability is primarily dependent on recreation or tourism).

Demographic patterns are described in the socioeconomic synthesis papers. Population changes, density patterns, and shifts in distribution are described. For the Gulf coastal area, population changes for the last decade have been most dramatic in Texas and Florida.

Population shifts describe the decline of employment in agriculture and the increase in industry. Projections based on the 1980 Census are still coming out, but generally predict continued absolute growth and net in-migration, with stabilization of urban populations and continuing increases in suburban areas.

Socioeconomic studies are an integral part of the ecological characterization program, providing a basis for a holistic approach and for relating ecosystem responses to man-induced changes. The synopses of ecological data are correlated with socioeconomic information for the same geographic regions, biologically sensitive areas, and environmental conditions.

Conclusion

So far, we have fully met our stated objectives of (1) providing biological, physical, and socioeconomic information bases for decision-making purposes, and (2) identifying various components of coastal regions. Our socioeconomic studies have also produced several publications that have been well received. The MDPR and Texas products have been published and distributed. Studies for Alabama and Florida are in progress, and draft reports are promising.

COASTAL ECOLOGICAL CHARACTERIZATIONS:
HABITAT MAPPING AND ECOLOGICAL ATLAS, MISSISSIPPI DELTAIC PLAIN

Martha Young
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National Coastal Ecosystems Team
NASA-Slidell Computer Center
Slidell, LA

Introduction

In the Mississippi Deltaic Plain Region Ecological Characterization, the study area is defined as extending from Vermilion Bay, Louisiana to the Mississippi-Alabama state line. The inland boundary is the Coastal Zone Management boundary line in Louisiana and includes the three coastal counties in Mississippi.

Habitat Mapping

Habitat mapping for this study was carried out at 1:24,000 scale, to produce overlays for USGS 7.5 minute topographic maps. Our habitat maps are a monoscopic interpretation of color infrared photography, with each discrete polygon representing a habitat type visible on the film. The aerial photography was taken by EPA at a scale of 1:62,500. Our contractor worked closely with the National Wetland Inventory (NWI) on this project, using the same classification system which NWI is using to map all of the wetlands of the U.S., with some additions of special modifiers (e.g., to show land uses like oil and gas) and upland categories, which were appropriate for the purposes of the characterization study. Photography for 1978 was available and NWI 1974 habitat maps were used as collateral information.

Habitat mapping for the Louisiana-Mississippi study included historical mapping for the 1950s also. The 1950s maps provide a frame of reference to assess and measure changes in coastal conditions over the 20+ year time period. When the maps were completed, all individual polygons on the maps were measured by electronic planimeter and the areas were computed by hydrologic unit, by state, and by parish or county. Comparing 1950s with 1978 data clearly reveals where changes have occurred. The areal measurement data have been entered on the Slidell computer and are available to interested State agencies. The maps have been distributed to State and Federal agencies and are only recently available for general distribution.

Habitat maps will help to answer the following kinds of questions in the study area. (1) What habitats are found in a particular region that support valuable wildlife or commercial fishery resources? (2) Are some of these areas appropriate for acquisition as wildlife refuges? (3) How much of a parish/county is fresh marsh? (4) Is this marsh acreage the same or different from what it was in 1955? Coastal Louisiana is confronted with the problem of conspicuous loss of fresh

marsh due to the intrusion of salt water, subsidence, and development of marshland for agriculture.

For agencies responsible for permit recommendations, it is clear that permits cannot be denied or granted solely on the basis of such maps. An on-site inspection is necessary before specific decisions can be made. The habitat maps, however, are the closest thing to being there. They give information about inaccessible areas, and allow generalizations about areal extent to be made which otherwise would be impossible.

Ecological Atlas

In addition to the habitat mapping contract, the Mississippi Deltaic Plan Region Ecological Characterization includes a mapping project at 1:100,000 scale--the Ecological Atlas. This map scale was selected for consistency with the 1:100,000 scale program of the National Wetland Inventory and with ecological atlases in other characterization studies. The study area for the Atlas is covered by thirteen 1:100,000 scale quadrangles, each of which has six topic overlays of mapped information.

The Socioeconomic Features map shows: conservation, preservation and recreation areas including public and private boat launches and marinas; transportation networks--highways, waterways, airports; National Historic Register sites and archaeological sites (for which we have mapped generalized locations). In addition, this map shows activities with environmental consequences--point source discharges, landfills, industrial impoundments, oil spill prevention, control and countermeasures sites, power generating plants.

The second overlay is Oil and Gas Infrastructure and Mineral Resources. This map shows pipelines, production areas, and a variety of related facilities (e.g., fabrication yards, storage areas, refineries), as well as the locations of sulfur, salt, shell, sand and gravel, and clay deposits.

The Soils, Geologic/Geomorphic Features and Man-made Lands map is the third in the series. It includes soil types, geologic/geomorphic features (i.e., cheniers, active dunes, and mud lump areas), and man-made lands.

Climatology and Hydrology is the next topic in the Atlas. This topic displays yearly prevailing wind frequency, monthly fastest wind mile, monthly prevailing wind direction and speed shown as wind roses; extreme rainfall events and monthly average precipitation are displayed graphically for the period of record; hydrological features include stream discharge, water quality, ground water availability, and coastal current patterns.

The Active Coastal Processes map is an attempt to display, in graphic terms, the more dynamic aspects of the coastline of the study

area. Shoreline change has been estimated in terms of acres of coastline gained or lost over the 22-year period from 1955 to 1978. Areas of accretion, retreat, and shoreline stability are indicated. These measurements were made using the 1955 and 1978 1:24,000 scale habitat maps for the same study area. This map also shows wave energy, hurricane tidal flood surge for five major storms, water control structures (e.g., dams, levees, seawalls), and the extent of the various wetland vegetation types for 1949, 1968, and 1980.

Biological Resources is the last map in the Atlas. It shows public oystering grounds and private oyster leases, clam beds, natural fishing areas and artificial reefs, grassbeds, fish spawning habitats for marine and estuarine dependent species, loggerhead turtle nesting areas, seabird and shorebird colonies, wading bird rookeries, waterfowl concentrations areas, concentration areas for nutria and muskrat, and areas where endangered species are found (e.g., the Mississippi sandhill crane critical habitat, and the southern bald eagle). Generalized locations were mapped as "sensitive habitat" to protect individual eagle nests.

Inexpensive paper maps will be printed for distribution as soon as the base maps are completed. Each paper map will be a composite of the base, plus a topic overlay. The maps will be distributed singly or in sets of 78 maps, boxed to fit on a bookcase shelf. A few mylar atlases will be produced that will allow the user to combine topic overlays over a single base map (e.g., biological resources with oil and gas infrastructure).

A short volume of narratives accompanies the maps. The narratives serve to elaborate upon and clarify the mapped materials for the inexperienced map user and for the person who lacks familiarity with the study area. Probably more important, the narrative volume provides a comprehensive list of the sources of mapped information for each topic.

ENDANGERED SPECIES STUDIES PROGRAM

Cherry Keller
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National Coastal Ecosystems Team
NASA-Slidell Computer Center
Slidell, LA

Introduction

The major thrust of the Endangered Species Study Program is a one-year effort to investigate the distribution and abundance of marine mammals, birds, and turtles in OCS areas of the Gulf of Mexico and South Atlantic. The need for this study stems from the incredible void of information on these species and the fact that most are protected by either the Marine Mammal Protection Act or the Endangered Species Act.

Objectives

Objectives of the study are as follows:

1. Determine the spatial and temporal distribution of the marine mammal, bird, and turtle fauna of the study area.
2. Identify areas of special biological significance for feeding, migration, and maintenance of populations encountered.
3. Provide a basis for estimating abundance of individual species within the overall study area.
4. Amplify the understanding of poorly known species.
5. Formulate specific questions and investigative lines for subsequent research relevant to oil and gas development.
6. Investigate the effects of oil on marine turtle nesting beaches.

To accomplish these objectives, aerial surveys of four major study areas were conducted bimonthly, beginning in April 1980 and concluding in May 1981. Study areas are located off of Brownsville, TX; Marsh Island, LA; Naples, FL; and Merritt Island, FL; with intervening flight transects conducted to pursue other areas.

Results

Results have yet to be thoroughly analyzed, but the following highlights a few of the preliminary findings.

Sperm Whale Distribution

Some of the more exciting observations recorded during this study are the continued sightings of sperm whales (Physeter catadon) in the Gulf. The first observations of sperm whales occurred in August 1979 during the pilot study for this project. This was the first observation of live sperm whales in the Gulf since the turn of the century. Since then the current project has observed 35 sperm whales, with an additional 24 individuals seen from shipboard cruises off Texas and from a sport fishing vessel off Louisiana.

Most of the sightings have occurred off the Texas coast (14 sightings of 40 animals). Two sightings involving 18 animals occurred off Louisiana, and one animal was sighted off Florida. Observations include solitary animals, groups of adults, and adults with calves. Though sexing of whales from the air is not possible, sizes of these animals suggest that solitary animals are lone bulls and that adults with young are females or females with a few young males and calves. Again, based on size, calves were estimated to be from less than one year to two years old. Juveniles were observed in eight of seventeen groups.

Observations indicate there is a viable population of sperm whales in the Gulf of Mexico, occurring most frequently along continental shelf breaks off of Texas and Louisiana. Sightings from aerial surveys occur most frequently during summer and fall, but past records occur in every month of the year, leading some to the hypothesis that there is a resident Gulf population of sperm whales.

Sea Turtle Distribution

Preliminary findings on sea turtle distribution off the Atlantic Coast of Florida have also proven to be very interesting. Distribution of marine turtles away from nesting beaches is poorly known and the environmental variables which influence their distribution at sea have not been investigated in any detail.

During August flights off the Atlantic Coast of Florida, large concentrations of loggerhead turtles (Caretta caretta) were observed between the coast and the landward edge of the Gulf Stream. Transects were designed to survey the area specifically for turtle distribution in relation to the Gulf Stream. Distribution was found to be so consistently inland of the current that it suggests that turtles actively avoid the Gulf Stream.

Implications of this distribution for oil spill hazards are encouraging. Oil transported by the Gulf Stream would not be likely to impact or contact turtles in the area.

Effects of Oil on Marine Turtle Eggs

A separate investigation was also conducted to determine the effects of oil contamination on the development and survival of turtle embryos. Both field and laboratory studies were conducted to accomplish this.

Field experiments were conducted at Rancho Nuevo, Mexico, a major rookery for Kemp's Ridley Turtles (Lepidochelys kempi), which was oiled by the IXTOC oil spill in 1979. Oil first arrived in July and August of 1979. In April of 1980, oil was still present in some areas of the beach, and investigations were begun to try to determine the quantity of oil remaining and the effect of that oil on viability of turtle eggs.

Nine clutches of eggs were collected from nesting turtles for comparative incubation experiments. Half of each clutch was incubated in sand taken from areas of beach where turtles usually nest, and half in clean sand collected from the dune areas of the beach. Sand taken from areas where turtles usually nest had been exposed to the IXTOC oil, whereas dune sand had not. Incubation conditions of oiled and clean subgroups of each clutch were kept the same.

Results indicated no significant differences between survival, length of incubation, or any other aspect of viability between exposed and not-exposed sand groups. Hence, the conclusion of the field experiment was that turtles nesting on previously oiled beaches (where oil had weathered for one year) ran little risk of impact from oil. However, further study would be required to determine the extent of weathering required to remove the toxicity of oil.

Lab experiments were also conducted to determine the effects of varying amounts of oil. Tests were conducted at the University of Central Florida with eggs of loggerhead turtles (Caretta caretta). Five clutches were collected from Merritt Island. Ninety eggs were randomly selected from each clutch and divided into six subsamples of fifteen eggs each.

Samples were subjected to the following conditions:

- A. Control - no oil
- B. Light oil (.5 ml per egg mixed with sand at initiation of incubation) 7.5 ml oil/4 kg sand
- C. Medium oil (1.0 ml per egg) 15 ml oil/4 kg sand
- D. Heavy oil (2.0 ml/egg) 30 ml oil/4 kg sand

Results of experiments on quantity of oil indicate significant differences in the length of incubation, with medium and heavily oiled samples having longer incubation times than control samples. However, no significant differences were found with any of the other parameters measured.

This is an encouraging find for oil concentrations at these levels; however, these concentrations are at the lower end of the spectrum of possible oil concentrations that can be found on beaches. Additional work would be needed to determine effects of higher concentrations of oil with attempts at finding a potential threshold level where toxicity of the oil becomes a significant threat.

Effects of the time of oiling were also tested. Sample conditions for this analysis were as follows:

- A. Control (no oil)
- B. Quarter time (oil added for last quarter of incubation)
- C. Half time (oil added for last half of incubation)
- D. Full time (oil added at beginning of incubation).

The quantity of oil for samples B,C, and D was 30 ml oil/4 kg sand. Some of the parameters measured were: incubation time; number of hatchlings released; number of dead hatchlings; number of unhatched eggs; number of eggs with embryos; number of eggs near full term; number of embryos 21-60 mm in length; number of embryos 1-20 mm in length.

Effects of time of oiling indicated that eggs exposed to oil during the last quarter and last half of incubation required a longer time to incubate and significantly reduced the number of eggs hatched. Quarter and half time treatments had 61.3 and 74.7% unhatched eggs, respectively, compared to 9.3 and 10.7% unhatched eggs in control and full time samples. The implications of the data are that turtles are more vulnerable to oil during the latter portions of development and less susceptible early on.

These data have increased our knowledge of the effects of oil on turtle eggs by providing known effects of oil at particular concentrations, weathering stages (age), and at particular times of incubation. However, these are known points on a continuum of values, and additional work would be required to pinpoint threshold levels.

APPENDIX A

PROFILES OF GULF OF MEXICO STUDIES,
NEW ORLEANS OCS OFFICE

I. New Orleans OCS Office Study Profile

A. Study Title: NORTHERN GULF OF MEXICO TOPOGRAPHIC FEATURES STUDY,
FY 78

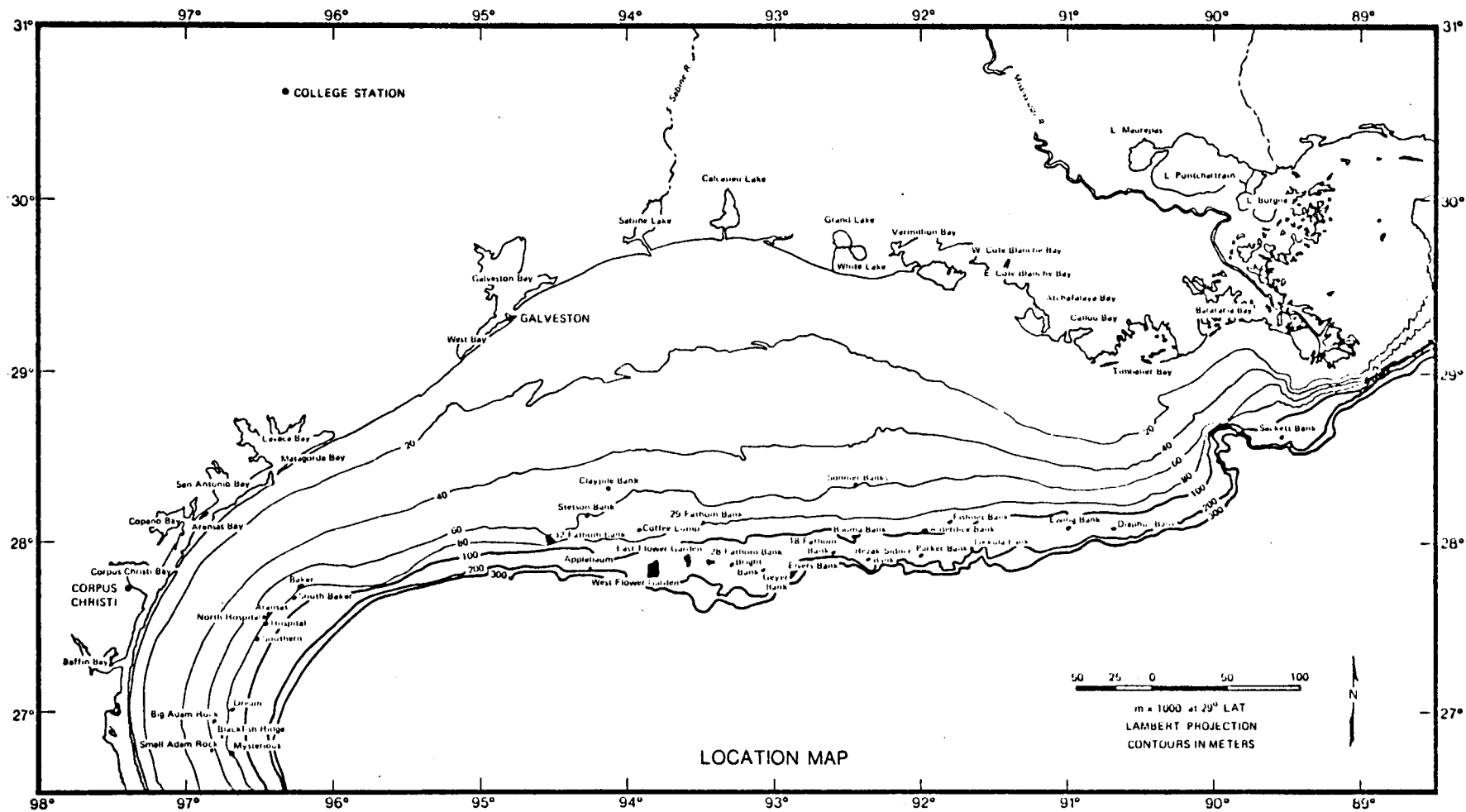
B. Basic Data: Contract No.: AA551-CT8-35
Contractor: Texas A&M University, College Station, Texas
Project Manager: Mr. Joseph U. LeBlanc
COAR: Dr. Robert Rogers
W.O. Coordinator: Dr. Mark Grussendorf
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$2,777,496

C. Study Objectives/Methodology:

The objectives of the study include:

1. Monitor the East and West Flower Gardens including geological studies, submersible reconnaissance, current meter arrays, and time lapse photography.
2. Study eight submarine banks including mapping submersible reconnaissance and geological and biological studies.
3. Study the Florida Middle Ground including mapping, submersible reconnaissance, geological and biological studies, and time event monitoring studies.

(Map on reverse)



Major topographical features on the Texas-Louisiana Outer Continental Shelf.

I. New Orleans OCS Office Study Profile

A. Study Title: NORTHERN GULF OF MEXICO TOPOGRAPHIC FEATURES STUDY, FY 80

B. Basic Data: Contract No.: AA551-CT0-25
Contractor: Texas A&M University
COAR: Dr. Robert Rogers
EAD Coordinator: Mr. Charles Hill
W.O. Coordinator: Dr. Mark Grussendorf
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$1,277,978
Program Manager: Dr. David W. McGrail

C. Study Objectives/Methodology:

The Northern Gulf of Mexico Topographic Features Study consists of an ongoing monitoring of the East Flower Garden. This effort will consist of submersible observations and sampling, epifauna plotless line transects, epifauna time-lapse photographic study, current monitoring, and geologic sampling.

Monitoring of the West Flower Garden will also be initiated following a similar approach as the East Flower Garden.

Supportive elements in these monitoring efforts include hydrocarbon distributions, net sediment transport, and current patterns.

Analysis and synthesis of bathymetric maps, side-scan sonar, and subbottom profiling of banks studied under previous contracts will be carried out.

(Map on reverse)

I. New Orleans OCS Office Study Profile

A. Study Title: GULF OF MEXICO OCS AREA STUDY OF EFFECTS OF OCS OIL AND GAS ACTIVITIES ON REEF FISH POPULATIONS

B. Basic Data: Contract No.: AA851-CT9-36
Contractor: Continental Shelf Associated, Inc.
Project Manager: Dr. David Gettleton
COAR: Dr. Robert Rogers
W.O. Coordinator: Dr. Mark Grussendorf
Contract Inspector: Mr. Jim Barkuloo (FWS)
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$395,822

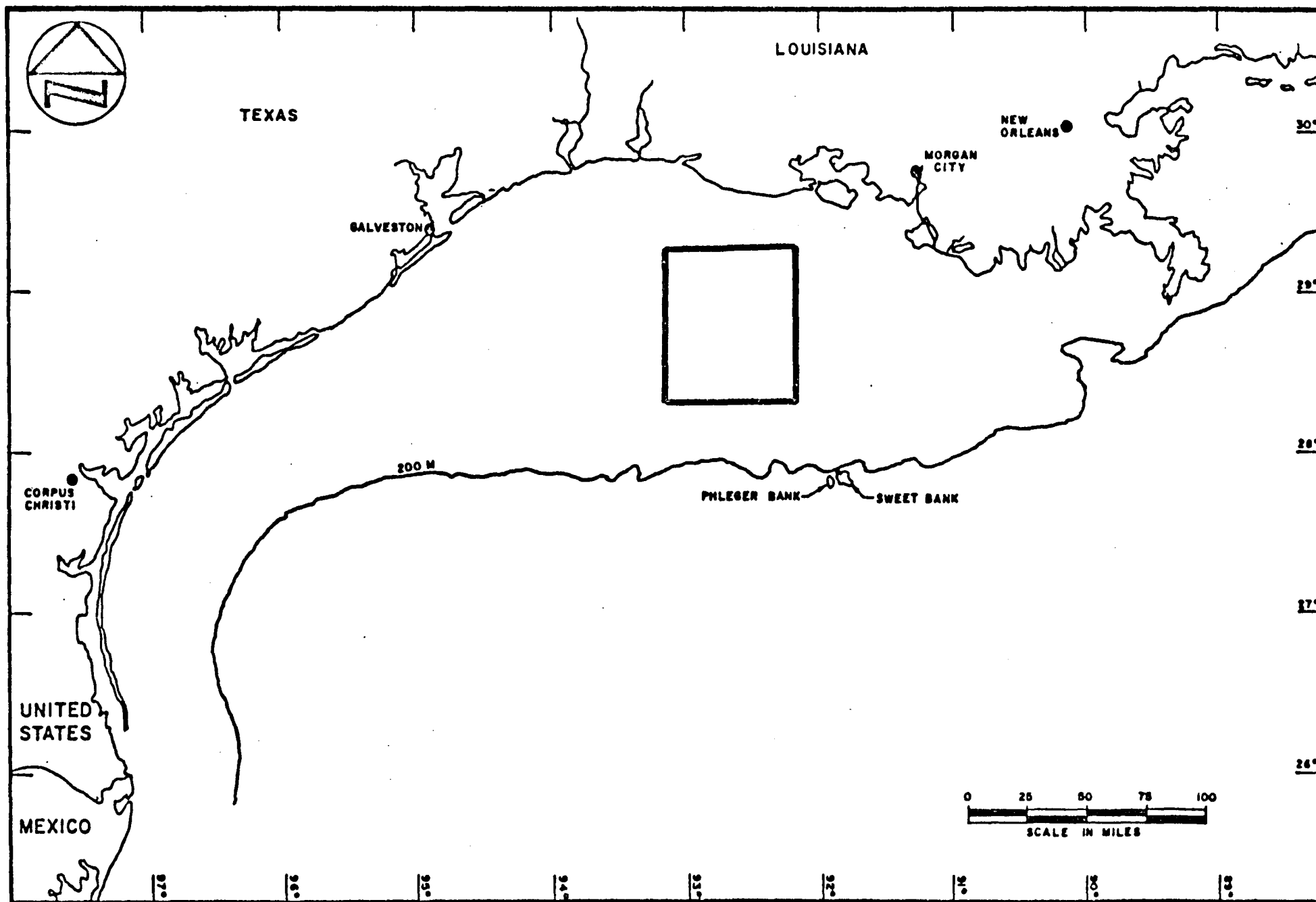
C. Study Objectives/Methodology:

The overall goal of this study is to quantify the effects of marine oil and gas activities on reef fishes in the northwestern Gulf of Mexico.

The specific objectives of the study include:

1. Comparisons of the standing stocks of selected reef fishes among the following types of habitats: (a) natural reefs distant from oilfield structures; (b) oilfield structure distant from natural reefs; and (c) oilfield structures proximate to natural reefs.
2. Develop sampling techniques and methodologies to achieve objective (1) which are equally applicable to deeper waters of the continental shelf.

(Map on reverse)



I. New Orleans OCS Office Study Profile:

A. Study Title: IXTOC OIL SPILL DAMAGE ASSESSMENT STUDY

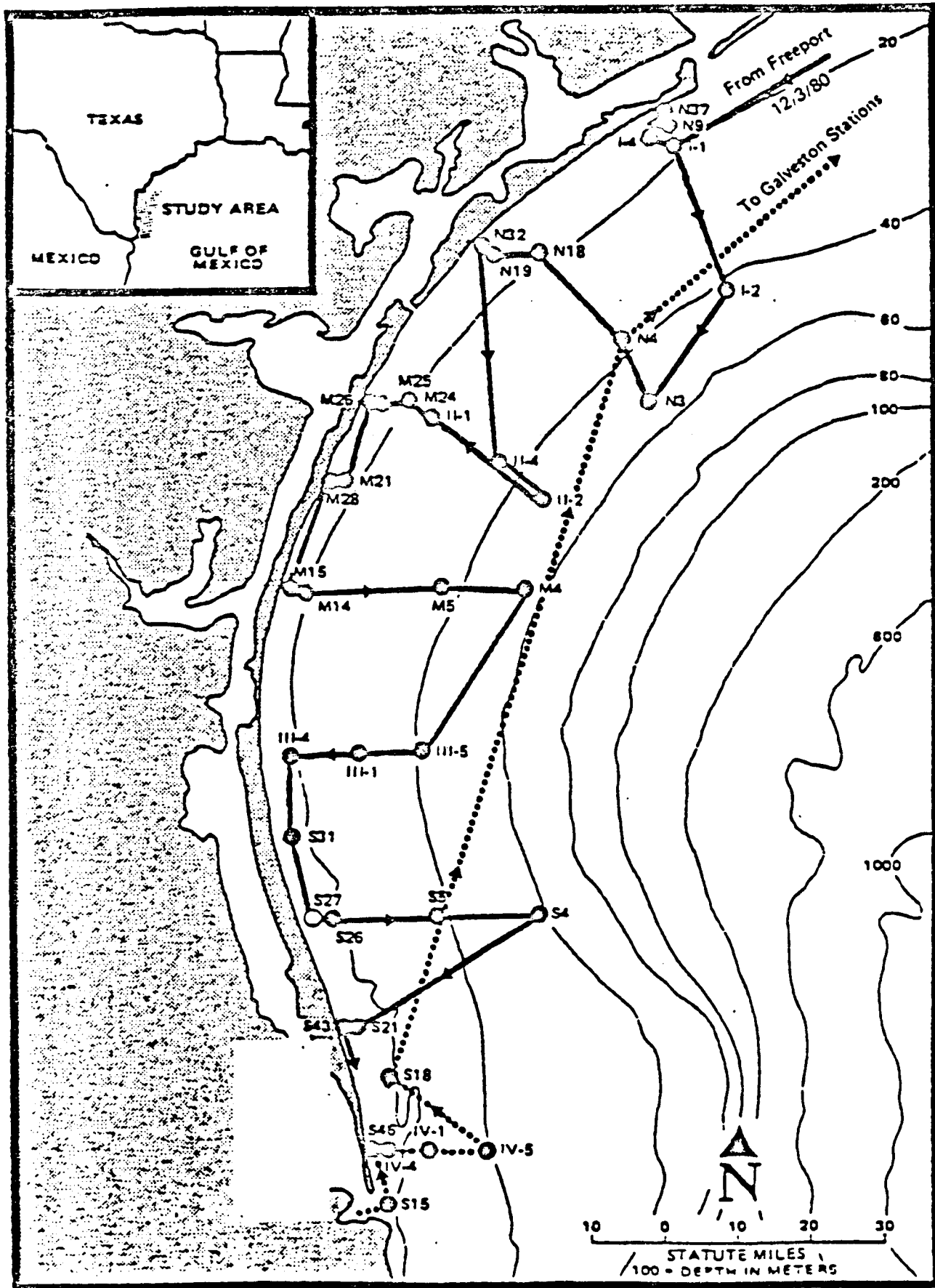
B. Basic Data: Contract Number: AA851-CTO-71
Contractor: Energy Resources Company (ERCO)
Project Manager: Dr. Paul Boehm
COAR: Dr. Murray Brown
EAD Coordinator: Ms. Gail Rainey
W.O. Coordinator: Mr. Jim Cimato
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$553,066

C. Study Objectives/Methodology:

The study has been designed to make use of an extensive sample set collected by the National Oceanic and Atmospheric Administration (NOAA) during the IXTOC spill event (summer and fall 1979) and a specially collected post-spill sample set to determine what effects might be reasonable and attributable to that event. Preexisting data from the BLM South Texas OCS study series will be used to establish baseline conditions for comparison.

The sample sets include sediment, infauna and trawl samples to be analyzed for hydrocarbons, as well as the usual physio-chemical and biological ecosystem parameters. Samples of tar and mousse will be analyzed to measure weathering effects and to establish identity of the oil observed.

(Map on reverse)



Actual Cruise Track, Ixtoc Oil Spill Assessment

I. New Orleans OCS Office Study Profile

A. Study Title: ECONOMIC IMPACTS OF OIL SPILLS ON THE TEXAS COASTS

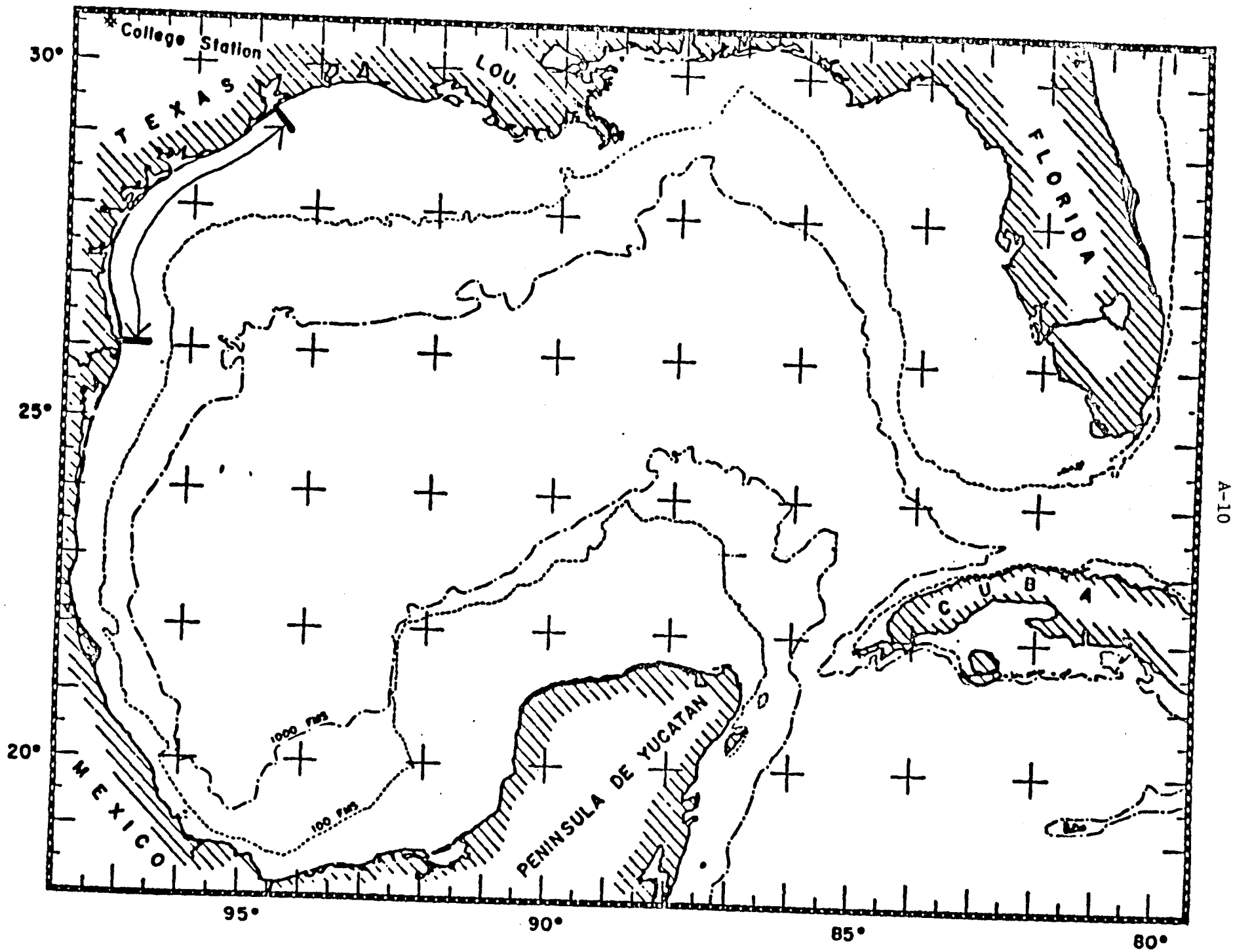
B. Basic Data: Contract No.: AA851-CT0-65
Contractor: Restrepo & Associates, El Paso, Texas
Project Manager: Dr. Carlos Restrepo
COAR; Dr. E. D. Wood
W.O. Coordinator: Dr. Tom Warren
Contract Inspectors: Ms. Sussan Bakke, Ms. Mary Bartz, and Mr. John Rodi
Funding Level: \$249,790

C. Study Objectives/Methodology:

A baseline assessment is to be made of the study area to include tourism, recreation, and commercial fishing. The baseline assessment shall encompass data on study area activity over recent years, as well as projections over a three to five year period. This assessment shall account for natural variations in the level of activity by including such variables as weather, gas shortages, major sporting events, oil seepage, etc., within the analysis.

Certain economic impacts of the IXTOC blowout and the BURMAH AGATE sinking shall be identified. These impacts shall be separately presented wherever possible. In cases where monetary impacts are not obtainable, quantification in other appropriate units or qualitative evaluations based on sound economic judgment shall be given. These impacts shall address primarily regional effects; however, the Contractor shall provide information or reasonable conclusions on the national importance of these effects, as well as the specific local areas which are decidedly affected.

(Map on reverse)



A-10

I. New Orleans OCS Office Study Profile

A. Study Title: GULF OF MEXICO GEOLOGICAL STUDIES, FY 79; FY 80

B. Basic Data: Contract Number: AA551-MU9-10; AA551-MUO-8
Contractor: U.S. Geological Survey
Project Managers: Mr. Henry Berryhill and Mr. Lou Garrison
COAR: Dr. Murray Brown
EAD Coordinator: Mr. Jesse Hunt
W.O. Coordinator: Dr. Mark Grussendorf
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$612,585; \$1,319,000

C. Study Objectives/Methodology:

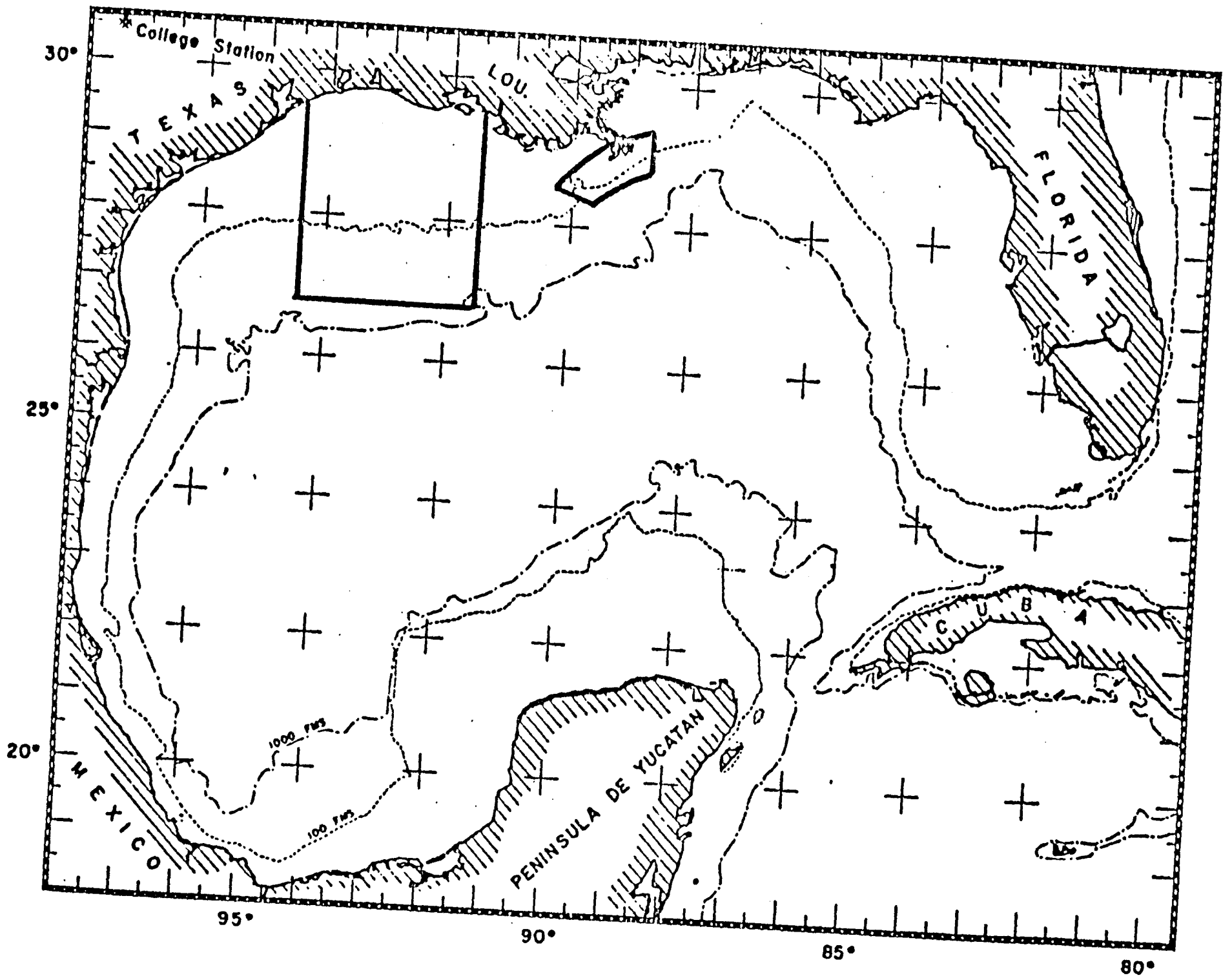
The objectives of the study include:

1. Interpret, in the broadest perspective, the geologic framework and geologic history of the area since late Pleistocene time.
2. Identify those geologic features that may be potentially hazardous to offshore exploration and development: faults, slumps, slides, and to the extent possible, gas seeps and areas of gas at shallow depths.

Mississippi Delta Project: An intensive geophysical and remote-sensing survey, with particular emphasis on the synthesis of side-scan sonar mosaics, of the area off the mouth of the Mississippi River. Rapid sedimentation in this area gives rise to sediment instability which can be triggered by natural events, such as storms, to give rise to slides and bottom collapse. Maps at a scale of 1:48,000 will be produced.

Pleistocene Trend Area Hazards Project: A compilation of specially obtained regional-scale seismic data and data from hazards surveys of individual blocks to derive maps of surficial and shallow buried hazards as well as benthic habitats. The multi-year effort will proceed from the shelf edge northward toward Calcasieu, Louisiana. Maps at a scale of 1:250,000 will be produced.

(Map on reverse)



I. New Orleans OCS Office Study Profile**A. Study Title:** GULF OF MEXICO GEOLOGY STUDY, FY 81

B. Basic Data: Contract No.: AA550-MUI-16
 Contractor: U.S. Geological Survey, Corpus Christi, Texas
 Project Manager: Dr. Arnold Bouma
 COAR: Dr. Murray Brown
 W.O. Coordinator: Dr. Mark Grussendorf
 Contracting Officer: Ms. Frances Sullivan
 Funding Level: \$1,057,198

C. Study Objectives/Methodology:Mass Movement of Sediments (Mississippi Delta Project)

In FY 79 the USGS, through research contract arrangements with Louisiana State University, began a long range project of mapping seafloor morphology and shallow geology in OCS areas on and around the Mississippi Delta. The first product of this effort, accomplished with assistance from the Bureau of Land Management, was BLM Open-File Report 80-01, a collection of maps and a 60-page text that portrayed in considerable detail the dynamic aspects of the metastable delta sediments.

The delta mapping program will be extended in FY 81 to adjacent areas where potentially unstable features have been found. New high-resolution seismic and side-scan sonar data will be collected between water depths of approximately 100 m and 300 m in an area that extends northeastward from the limits of present mapping (MUO 851-MUO-8) to a point south of the Mississippi/Alabama boundary. The data will be interpreted at Louisiana State University and used to extend the 1:48,000 series of BLM Open-File Report 80-01.

Hazards Mapping Off Mississippi Sound (Marine Geologic Atlas Series)

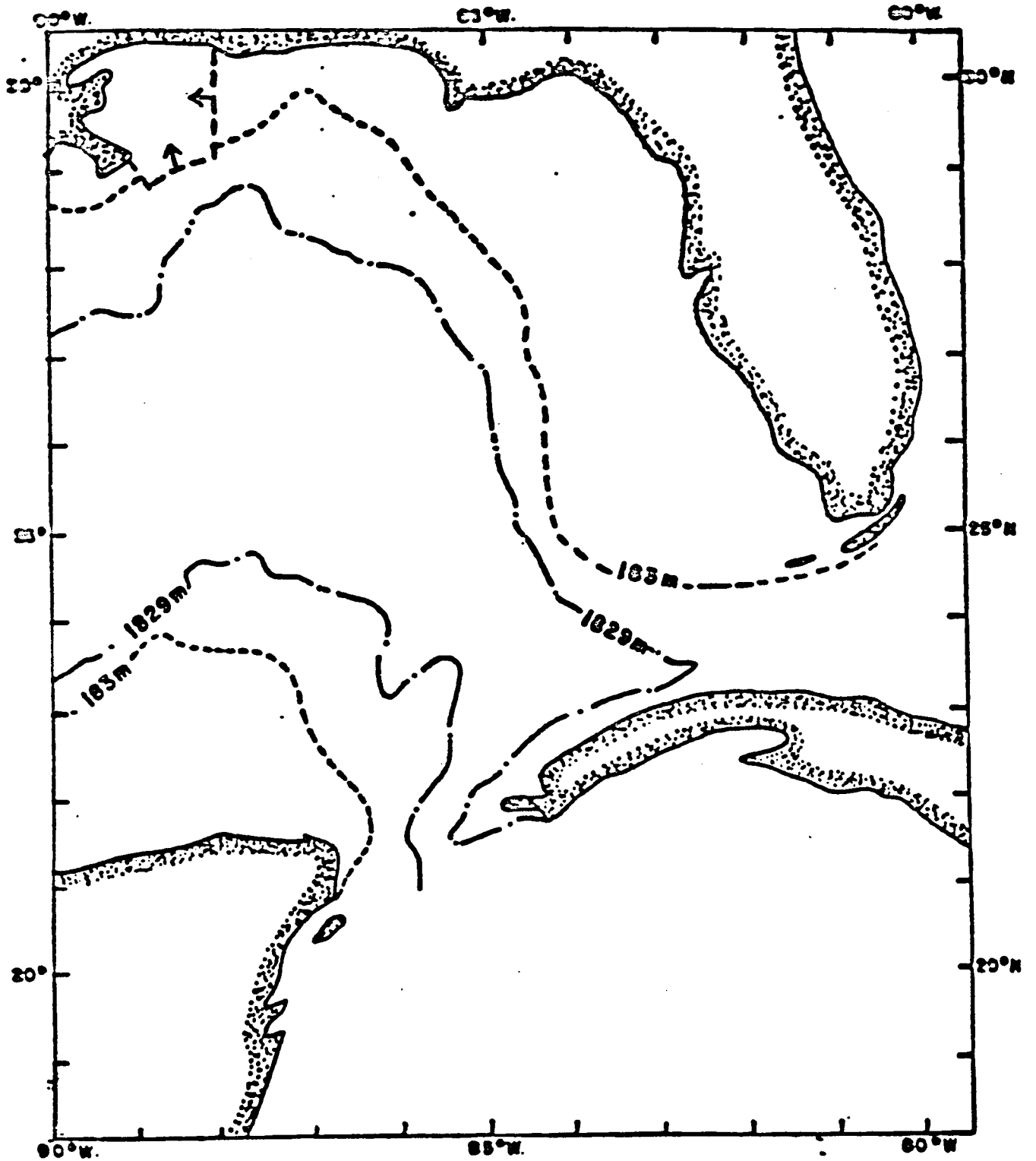
An interpretation of the geologic framework and geologic history of the OCS immediately east of the Mississippi River Delta since late Pleistocene time shall be compiled using existing data and new data. Included in the interpretation of these data shall be:

1. Identification of those geologic features that may be potentially hazardous to offshore exploration and development, such as faults, slumps, slides, gas seeps, and areas of gas accumulation at shallow sediment depth.
2. Synthesis of the geologic data in an integrated form for publication on standard projection—bathymetric base maps at scales of 1:250,000; these same data shall be provided as reproducible mylar maps at a scale of 1:100,000.

Pleistocene Trend/Calcasieu Hazards Mapping

The synthesis of data begun in 1929 will continue as described.

(Map on reverse)



I. New Orleans OCS Office Study Profile

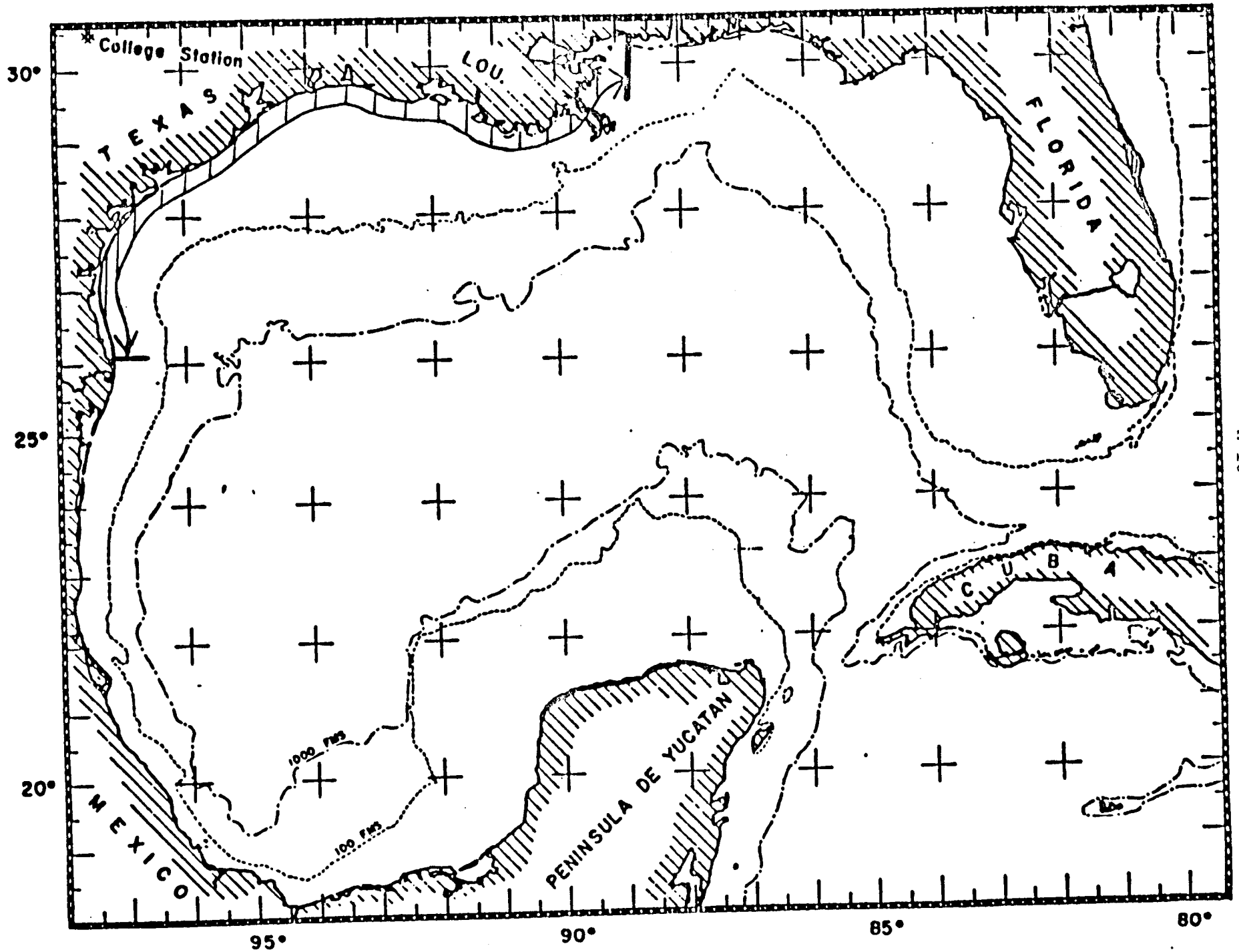
A. Study Title: RECREATIONAL FISHING AT OFFSHORE PLATFORMS STUDY,
FY 80-81

B. Basic Data: Contract No.: AA851-IA0-49
Contractor: National Marine Fisheries Service, NOAA
Project Manager: Dr. David Deuel
COAR: Dr. Robert Rogers
W.O. Coordinator: Mr. Tom Burke
Contract Inspector: Mr. Villere Reggio
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$40,000

C. Study Objectives/Methodology:

This interagency agreement with the National Marine Fisheries Service (NMFS) will lead to estimates on the total number of Gulf of Mexico fishermen attracted to oil and gas platforms and their catch. Collateral recreational fishing associated with petroleum structures will be determined through the ongoing National Marine Recreational Fishing Survey; therefore, the relationship of Gulf of Mexico "rig fishing" and catch to all offshore fishing can be determined. Results of this survey should be available in 1982.

(Map on reverse)



I. New Orleans OCS Office Study Profile

A. Study Title: GULF OF MEXICO ECOLOGICAL MAPPING PROJECT

B. Basic Data: Interagency Personnel Act Agreement No.: IPA-0-1
Principal Investigator: Dr. Rezneat M. Darnell, Texas A&M University
Project Manager: Dr. Richard Defenbaugh
Funding Level: Approximately \$60,000

C. Study Objectives/Methodology:

This study consists of identification, acquisition, and analysis of existing data on benthic fishes and invertebrates of the Gulf of Mexico to develop reliable information on the distribution of selected species, groups of species, and delineation of biologically sensitive areas. Dr. Darnell was hired through the New Orleans OCS Office for this project for full-time summer support during the summers of 1980 and 1981, with part-time support during the 1980-81 academic year. The project funding consists of \$20,000 for support (graduate student assistance, supplies, computer time, etc.) plus reimbursement to the University for Dr. Darnell's salary, travel, per diem, and benefits.

Dr. Darnell has identified the major pertinent data base for the Gulf and has initiated computerization and analysis of some of the smaller data bases. He hopes to complete computer analysis of all but the largest (NMFS) data base by May 1981, so that he may resume residence in the New Orleans OCS Office during the summer months for development of maps and a text report. At present, project completion is scheduled for August 1981.

I. New Orleans OCS Office Study Profile

A. Study Title: GULF OF MEXICO OCS DEEP SEA BIOLOGY STUDY

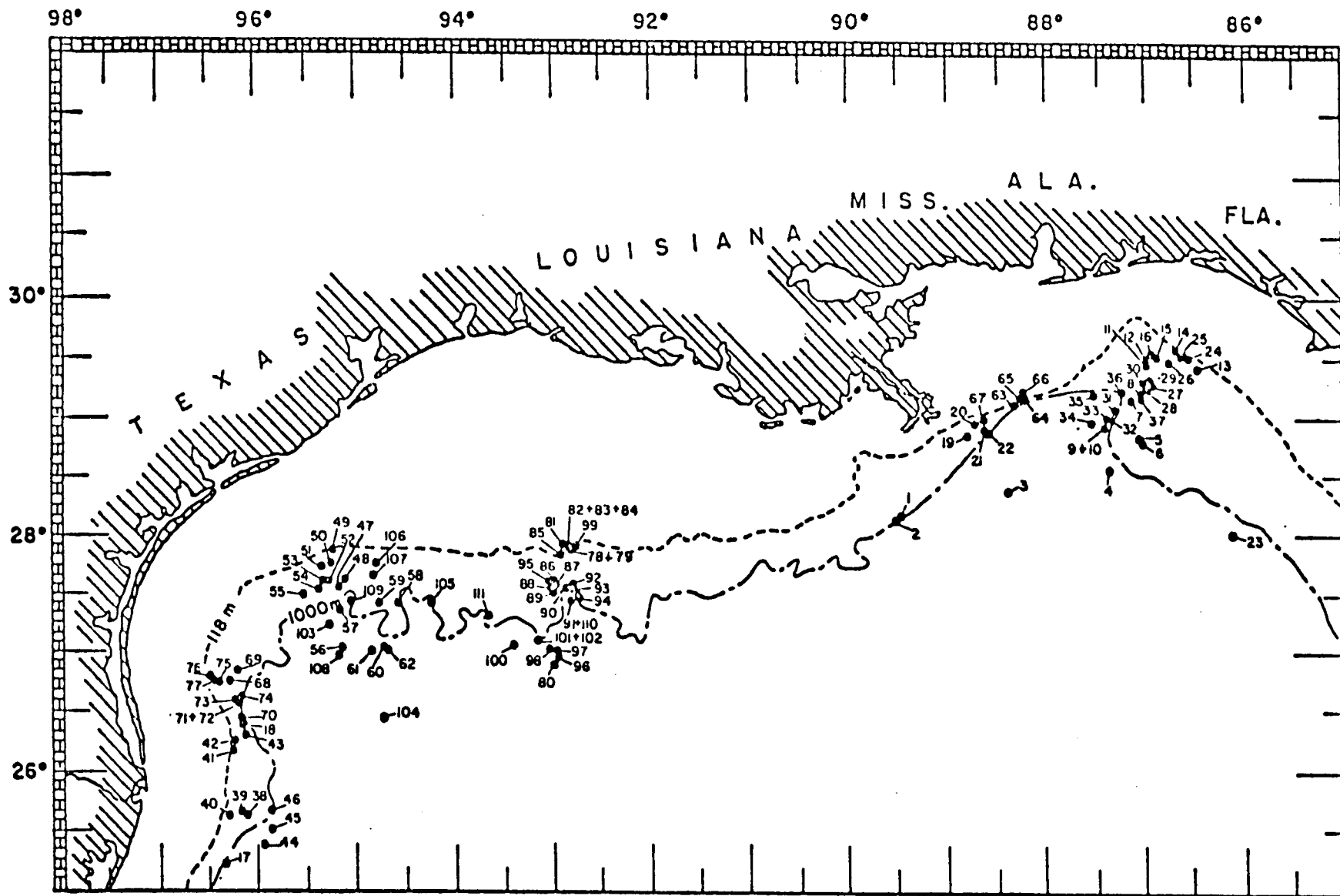
B. Basic Data: Contract No.: AA851-CT1-12
Contractor: TerEco Corporation
Project Manager: Dr. Willis Pequegnat
COAR: Dr. Robert Rogers
EAD Coordinator: Dr. Rick Defenbaugh
W.O. Coordinator: Dr. Mark Grussendorf
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$111,765

C. Study Objectives/Methodology:

This study is designed to investigate the macrocepibenthic vertebrate and invertebrate organisms living on the outer continental shelf, continental slope, and abyssal plain of the Gulf of Mexico. Information presentation will be based upon biological and physico-chemical data collected during the years 1964-1973. Although the principal emphasis will be on the communities existing in the northern Gulf north of the 25th parallel and below depths of 1,000 m, the study will, for the sake of ecological perspective, examine and compare communities that exist above 1,000 m, thus providing a synthesis of the 1976 and present studies.

The study area extends from the DeSoto Canyon on the east to the continental slope off Brownville, Texas.

(Map on reverse)



Map of study area with benthic stations plotted between the 118 m and 1000 m contours.

I. New Orleans OCS Office Study Profile

A. Study Title: GULF OF MEXICO OCS AREA POLYCHAETE STUDY

B. Basic Data: Contract No.: AA551-CT9-35
Contractor: Barry A. Vittor & Associates, Inc., Mobile, Alabama
Project Manager: Dr. Barry Vittor
COAR: Dr. Richard Defenbaugh
W.O. Coordinator: Dr. Mark Grussendorf
Contracting Officer: Mr. Carroll Day
Contract Specialist: Mrs. Linda DeRamus
Funding Level: \$145,020

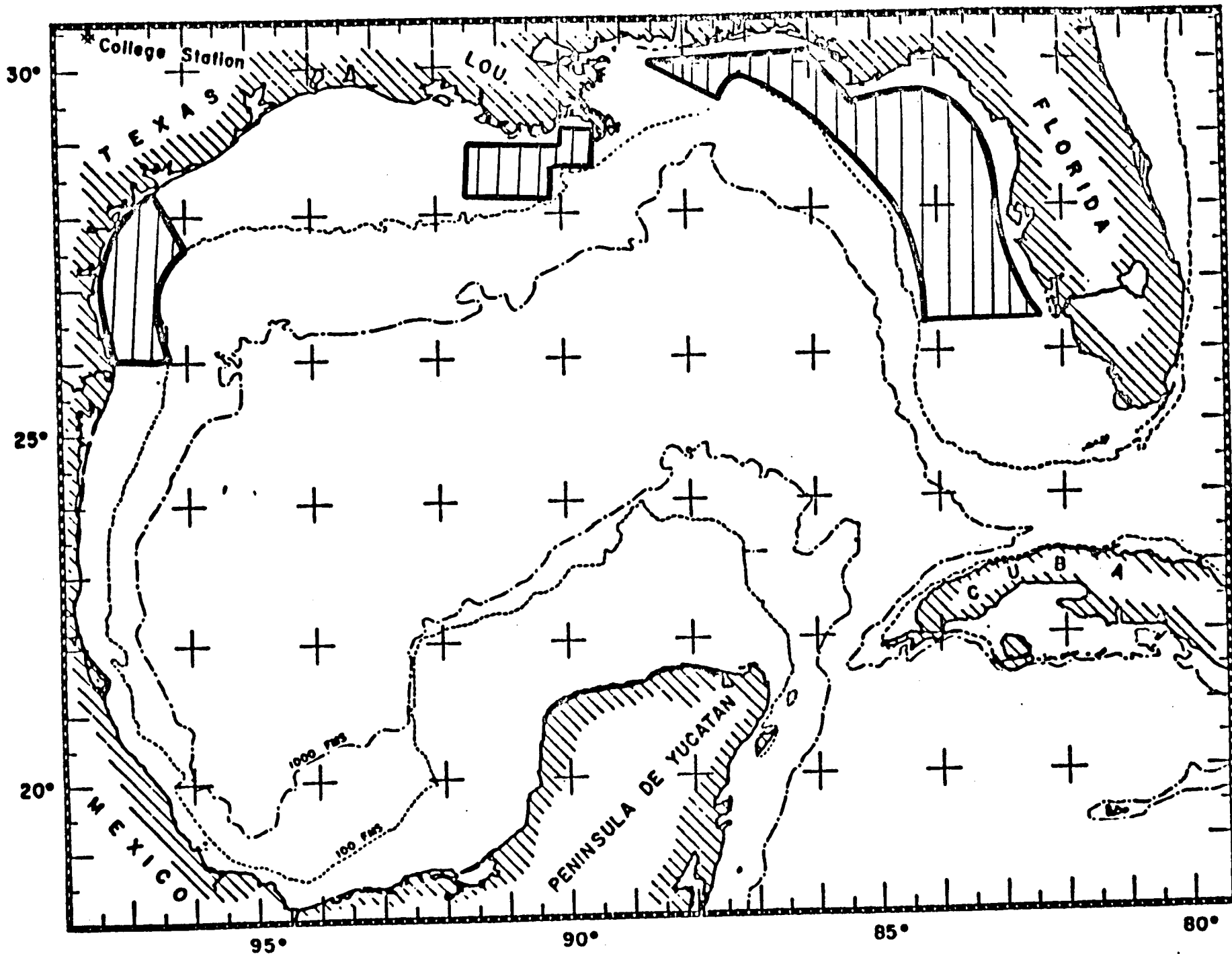
C. Study Objectives/Methodology:

BLM has collected a large number of samples of polychaetous annelids from various studies conducted in the Gulf of Mexico. Polychaetes have been shown to be sensitive indicators of environmental stress, and therefore will be of significant interest in monitoring lease areas and detecting degradation from oil spills. A standardized system of identification of polychaetes is essential for such comparisons to be made.

The objectives of the study include:

1. Conduct an analysis and synthesis of all species of polychaetous annelids which have been collected in the Gulf of Mexico in order to standardize identification of such polychaetes.
2. Develop a set of taxonomic keys which describe those species which have been collected in the Gulf and shall describe newly discovered polychaetes so that they may be identified to the same level.

(Map on reverse)



I. New Orleans OCS Office Study Profile

A. Study Title: SOUTHWEST FLORIDA SHELF ECOSYSTEMS STUDY, FY 80

B. Basic Data: Contract No.: AA851-CT0-50
Contractor: Woodward-Clyde Consultants, Orange, California
Project Manager: Dr. Keith B. MacDonald
COAR: Dr. Murray Brown
EAD Coordinator: Dr. Richard Defenbaugh
W.O. Coordinator: Dr. Thomas Ahlfeld
Contract Inspectors: Dr. Richard Defenbaugh, Mr. Jesse Hunt, and
Mr. Jim Barkuloo (USFWS)
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$1,022,946

C. Study Objectives/Methodology:

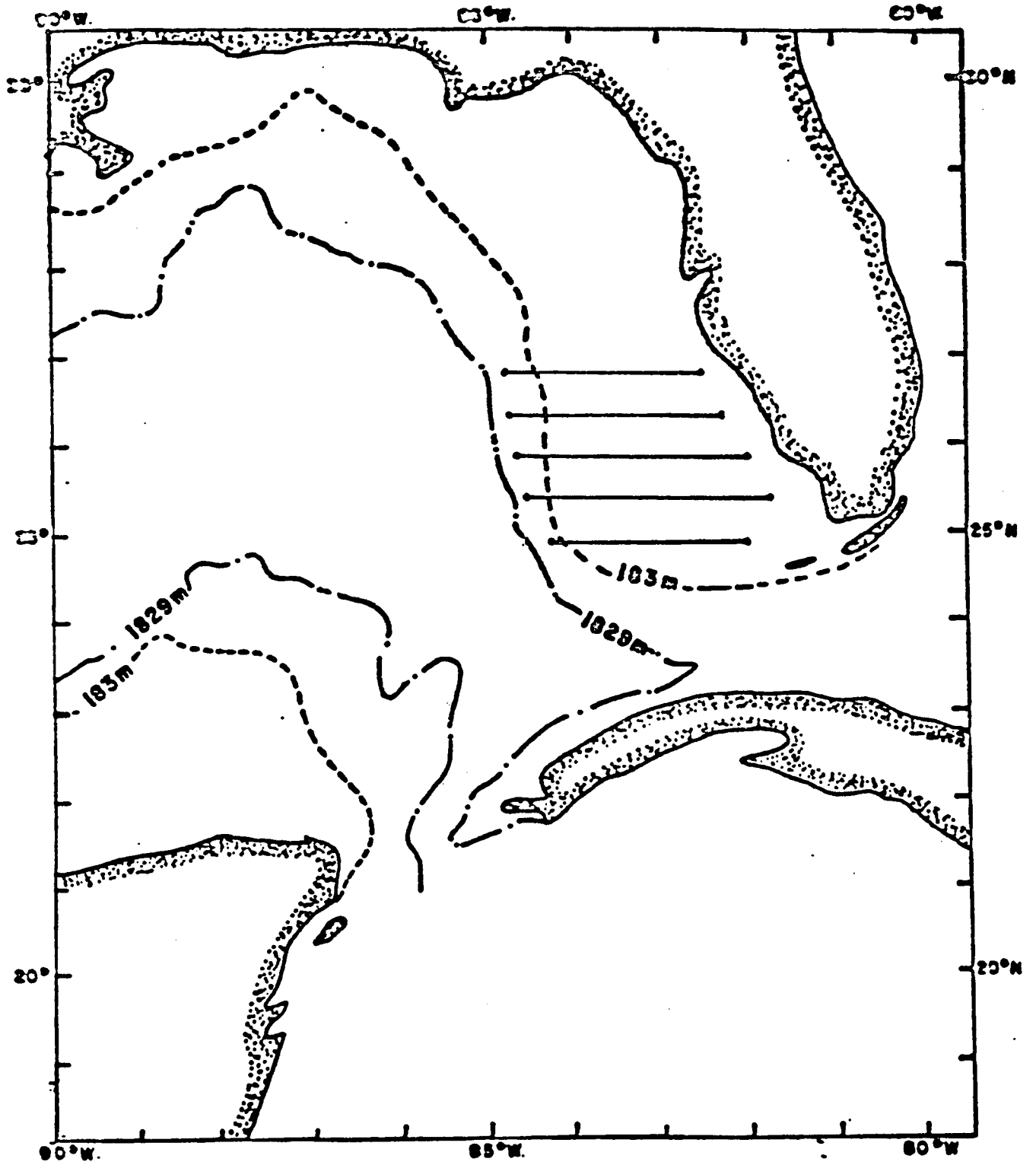
The objectives of the study are threefold:

1. Determine the potential impact of OCS oil and gas offshore activities on live bottom habitats and communities which are integral components of the shelf ecosystem.
2. Produce habitat maps that show the location and distribution of various bottom substrates (several widely spaced transects will be explored across the shelf).
3. Broadly classify the biological zonation across and along the shelf, projecting the percent of the area covered by live/reef bottom.

The study area is on the southwest Florida shelf in the area between latitudes 24°50'N to 27°00'N (in a south-north direction) and in depths between 20-200 m (east-west direction).

The main objective of the study is to provide an ecosystem description of the southwest Florida shelf. Geophysical and remote sensing identifications of habitats will be ground-truthed by television and photographic observations. This work will be followed by two seasons of benthic sampling to describe the macrofauna and chemistry. Benthic samples will be taken on sand/mud bottoms and from live reef bottoms. The results of the study will help BLM decision-makers to determine the effects (if any) of oil and gas activity on this ecosystem and to make determinations concerning the appropriateness of biological lease stipulations.

(Map on reverse)



I. *New Orleans OCS Study Profile*

A. *Study Title:* SOUTHWEST FLORIDA SHELF ECOSYSTEMS STUDY, FY 81

B. *Basic Data:* In preparation

C. *Study Objectives/Methodology:*

The FY 81 (Year-2) effort is described in the 1981 Regional Studies Plan as a continuation of the seasonal sampling, an extension of the remote sensing coverage into deeper waters, and a new north-south transect. This procurement has been initiated and will be negotiated with the present Contractor in May/June 1981.

I. *New Orleans OCS Office Study Profile*

A. *Study Title:* GULF OF MEXICO SATELLITE OCEANOGRAPHY STUDY, FY 80

B. *Basic Data:* Interagency Agreement No.: AA851-IAO-11
Agency: National Aeronautics and Space Administration
Wallops Flight Center
Project Manager: Dr. Norden Huang
COAR: Dr. E.D. Wood
W.O. Coordinator: Dr. David Amstutz
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$169,000

C. *Study Objectives/Methodology:*

The radar altimeter aboard both GEOS-3 and Seasat provided direct measurements of the sea surface with an accuracy of ± 20 cm for one second averaging. This offers a direct way to measure the dynamic topography which until now could only be inferred from hydrographic data. The measurements made by a satellite altimeter may be expressed as:

$$h_a = h_s - h_g - \Delta h$$

where h_a is the satellite altitude measured by the altimeter, h_s is the satellite height above a reference spheroid determined from the satellite tracking data, h_g is the geoidal deviation from the spheroid due to gravitational anomalies, and Δh is the height deviation from the geoid due to dynamic processes in the ocean. These height deviations, when combined with those from many passes, yield average ocean topographies which can then be mapped.

The altimeters are instrumented with sample and hold gates which provide information about the shape and amplitude of the return waveform. This information can be used to determine a number of interesting and useful parameters, including ocean surface wind speed, significant wave height, significant slope, and phase speed.

Incremental funding: A Year-2 effort is under negotiation to complete tasks begun under this agreement.

I. New Orleans OCS Office Profile

A. Study Title: SOUTHWEST FLORIDA SHELF CIRCULATION MODEL STUDY, FY 80

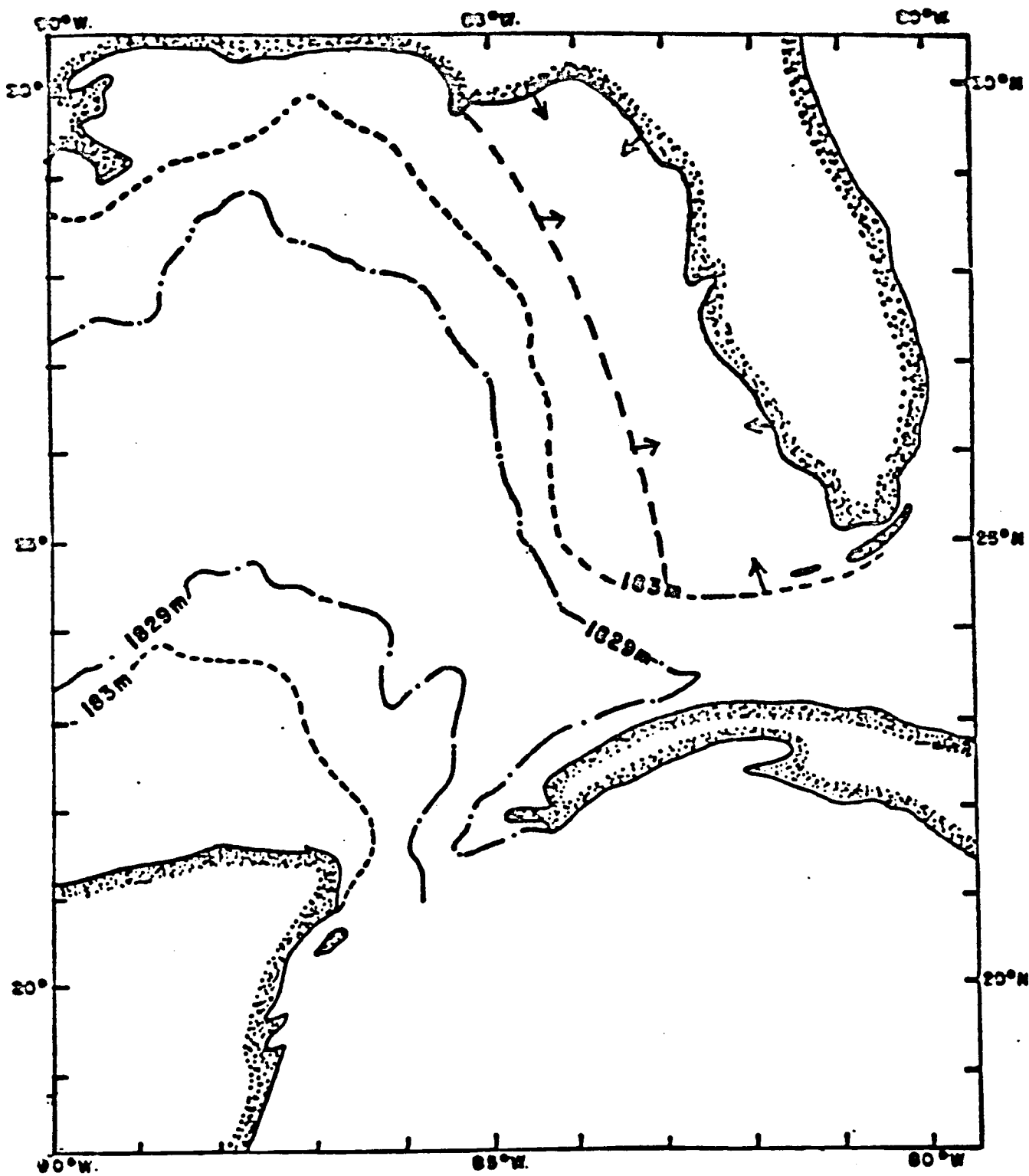
B. Basic Data: Contract No.: AA851-CTO-72
Contractor: New England Coastal Engineers, Bangor, Maine
Project Manager: Mr. Bryan Pierce
COAR: Dr. E.D. Wood
W.O. Coordinator: Dr. David Amstutz
Contracting Officer: Mr. Carroll Day
Funding Level: \$223,455

C. Study Objectives/Methodology:

The statement of work calls for application of a computerized three-dimensional, time-dependent circulation model of the southwest Florida shelf between the Florida Keys and the panhandle near Apalachicola, and from the shoreline to approximately the 100 m isobath.

The Contractor has completed a data search and is incorporating the data base into the circulation model of the west Florida shelf. Plans are being made for a physical oceanography workshop to be held in New Orleans in the spring of 1981 to discuss specific data needs to better define the circulation of the Gulf of Mexico. The model results will be compatible with the input format of the USGS oil spill risk assessment model.

(Map on reverse)



I. New Orleans OCS Office Study Profile

A. Study Title: MISSISSIPPI DELTAIC PLAIN ECOLOGICAL CHARACTERIZATION, FY 79-81

B. Basic Data: Contract No.: AA551-MU8-28
Contractor: U.S. Fish and Wildlife Service
Project Manager: Dr. James B. Johnston
COAR: Dr. Robert Rogers
W.O. Coordinator: Dr. Mark Grussendorf
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$394,750

C. Study Objectives/Methodology:

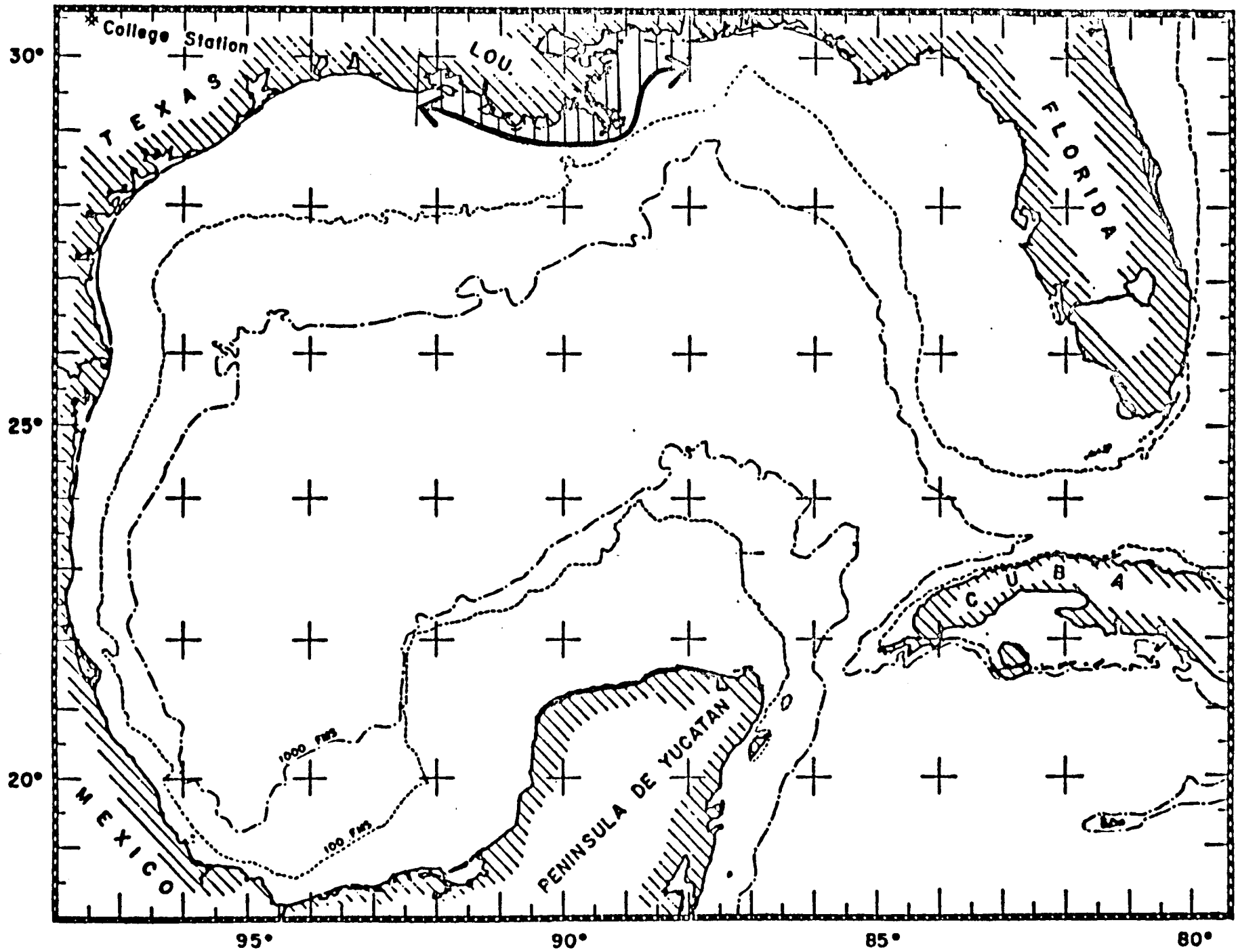
Generally, an ecological characterization is a structured synthesis of existing information and data in a manner which identifies functional relationships of natural processes and components of a regional ecosystem.

More specifically, this characterization is designed to develop and synthesize an information base which reflects an ecosystem-level understanding for the Mississippi Deltaic Plain Region emphasizing OCS oil and gas, transportation, and fishing and hunting activities.

This objective will be fulfilled by performing the following four tasks:

1. **Planning Model** - The planning model will provide the framework for synthesizing information and data for the narrative report and ecosystem model.
2. **Habitat Mapping** - The habitat mapping task will provide necessary data on habitat changes within the region and be a vital section of the ecological atlas.
3. **Collection of Environmental Information and Data** - This collection will provide the information base for completing the ecosystem model, ecological atlas, and narrative report.
4. **Compilation of Socioeconomic Data, Historic and Present** - This compilation will provide the information base for completing the ecosystem model, ecological atlas, and narrative report.

(Map on reverse)



I. New Orleans OCS Office Study Profile

A. Study Title: TEXAS BARRIER ISLANDS ECOLOGICAL CHARACTERIZATION STUDY, FY 79-81

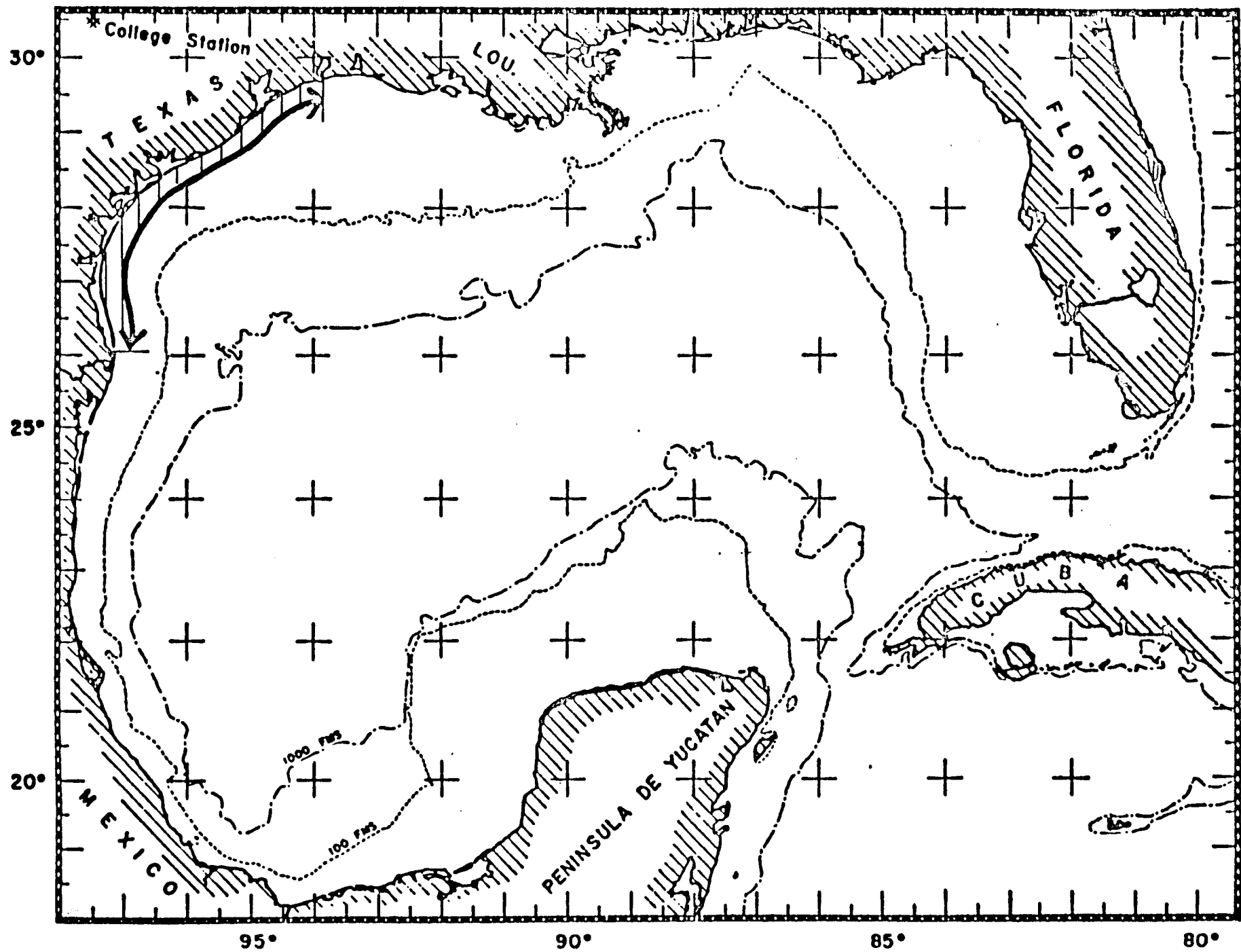
B. Basic Data: Memorandum of Understanding No.: AA551-MU9-14
Contractor: U.S. Fish and Wildlife Service
Project Manager, Dr. James B. Johnston
COAR: Dr. Robert Rogers
W.O. Coordinator: Dr. Mark Grussendorf
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$606,000

C. Study Objectives/Methodology:

The objectives of the study include:

1. Assemble, review, and synthesize existing biological, physical and socioeconomic information for the Texas Barrier Island Ecosystem;
2. Identify and describe subsystems and their communities within the Texas Barrier Island Ecosystem;
3. Identify and describe physical and biological processes that relate to components of the Texas Barrier Island Ecosystem;
4. Relate ecosystem responses to natural and man-induced changes; and
5. Identify major information deficiencies and research priorities needed for greater understanding of the Texas Barrier Island Ecosystem.

(Map on reverse)



I. New Orleans OCS Office Study Profile

A. Study Title: NORTHEASTERN GULF OF MEXICO COASTAL CHARACTERIZATION, FY 80

B. Basic Data: Contract No.: AA851-MU0-20
Contractor: U.S. Fish and Wildlife Service
Project Manager: Dr. James B. Johnston
COAR: Dr. Robert Rogers
W.O. Coordinator: Mr. Tom Burke
Contracting Officer: Ms. Frances Sullivan
Funding Level: \$360,000

C. Study Objectives/Methodology:

The ecological characterization of the Alabama and northern Florida coastal zone is designed to compile and analyze existing information and data identifying functional relationships of natural processes and components of the regional ecosystems. Four tasks have been initiated in FY 80 and continue through FY 81 – environmental literature search and preparation of synthesis papers, mapping of biological resources, preparation of socioeconomic synthesis papers, and preparation of habitat maps.

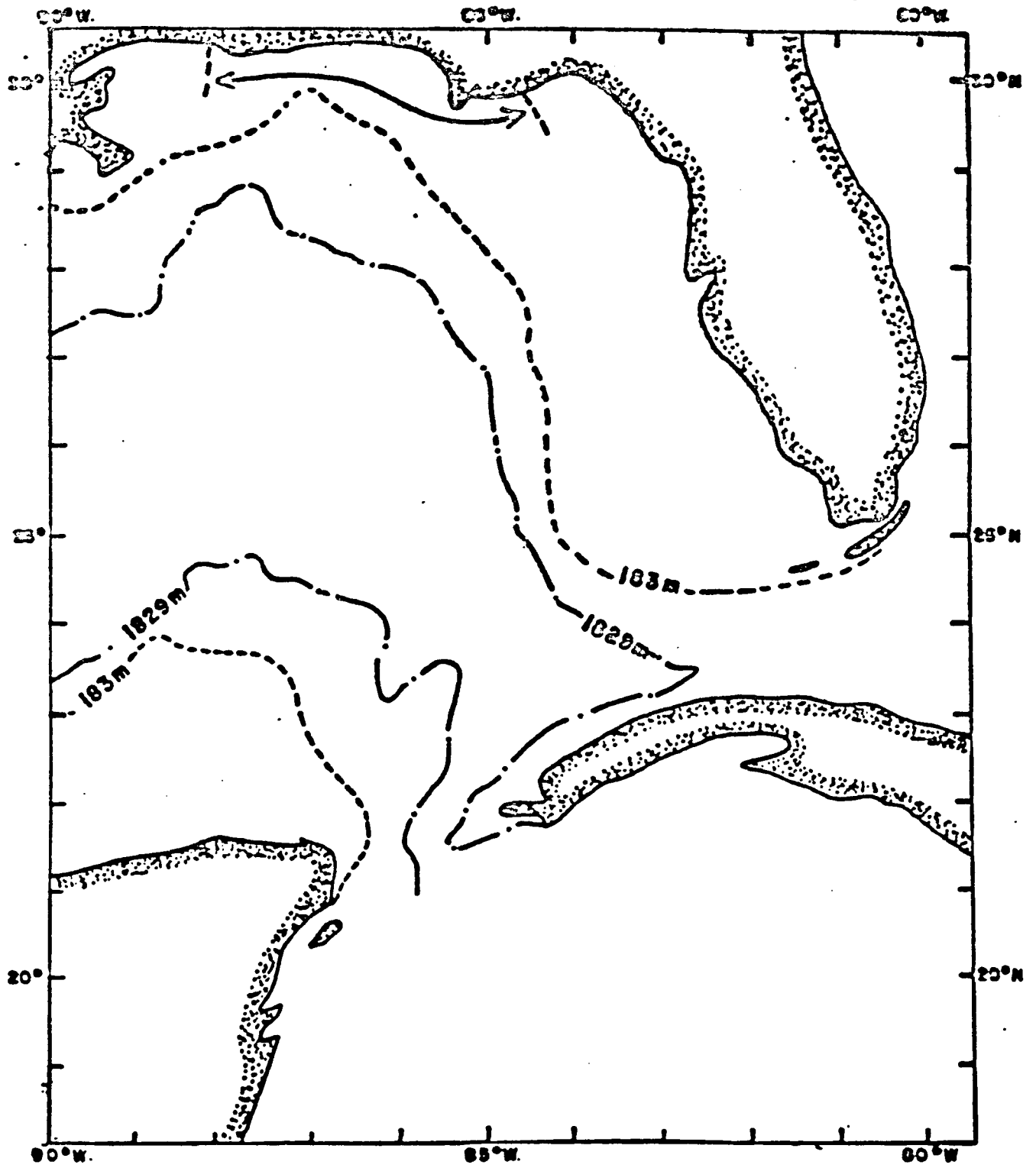
In Alabama, historical habitat mapping, synthesis and annotated bibliography, and socioeconomic compilation have begun under a cooperative agreement with the State of Alabama.

In the northeastern Gulf coastal area the environmental literature search and synthesis has begun under a cooperative agreement with the Florida Department of Environmental Regulation.

The socioeconomic compilation will be carried out through a contract with Nanex, Inc. This study will cover both the northeastern Gulf and southwest Florida study area. The study profile for the Southwest Florida Shelf Coastal Ecological Characterization study (AA851-MU0-48) also summarizes the general program and expected products from this study.

Incremental Funding: A Year-2 effort has been negotiated to continue tasks begun under this memorandum. The funding level is \$200,000.

(Map on reverse)



I. New Orleans OCS Office Study Profile

A. Study Title: SOUTHWEST FLORIDA SHELF COASTAL ECOLOGICAL CHARACTERIZATION STUDY, FY 80

B. Basic Data: Contract No.: AA841-MU0-48
 Contractor: U.S. Fish and Wildlife Service
 COAR: Dr. Robert Rogers
 W.O. Coordinator: Mr. Tom Burke
 Contract Inspector: Ms. Gail Rainey
 Contracting Officer: Ms. Frances Sullivan
 Funding Level: \$390,973

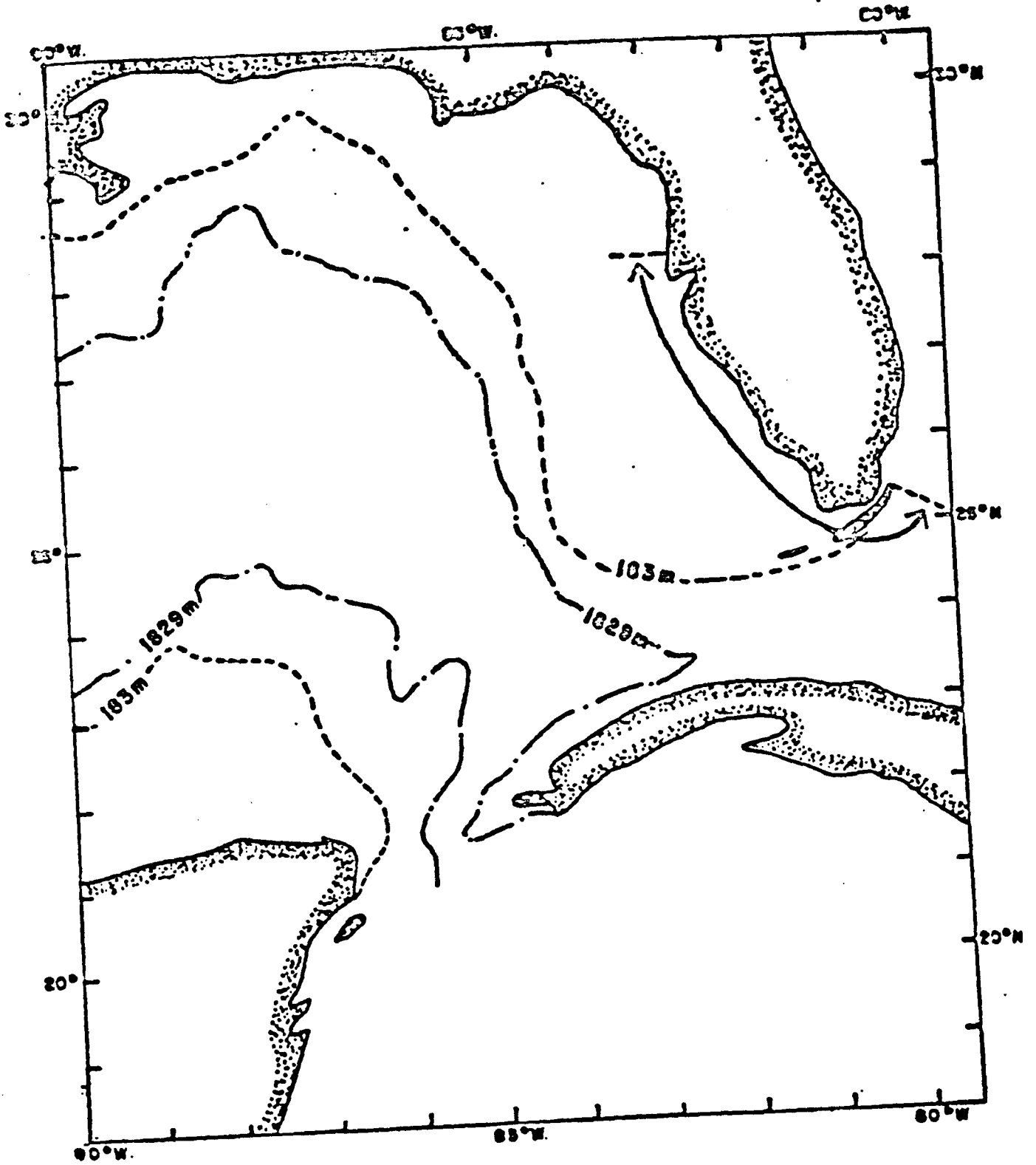
C. Study Objectives/Methodology:

In response to a need for an integrated overview on coastal ecosystems, the U.S. Fish and Wildlife Service's Coastal Ecosystem Project within the Biological Services Program started a series of studies in 1976 called "coastal ecological characterizations." These studies compile existing available information utilizing a holistic approach that identifies functional relationships among natural processes and components of coastal ecosystems. An ecological characterization study is designed primarily to identify research needs to integrate environmental and socio-economic information in a form useful for planning, impact assessment, and analysis. A characterization study is a tool that will enable decisionmakers to address problems, including planning for urban and industrial developments, determining corridors for pipelines, siting of onshore and offshore facilities for OCS oil and gas activities, and determining priorities for future research.

The products from a characterization study are an ecological atlas, ecosystem models, a narrative report, and all information base or data source appendix. The atlas is a series of maps and diagrams that depict biological resources, including habitats, factors of potential impact (including land-use practices, socioeconomic activities, and environmental perturbations), and ecological processes within the study area. The ecosystem models delineate structural components, functional processes, and their integral relationships to physical-chemical processes characteristic of the region. The narrative report contains descriptions of the study area, emphasizing natural socioeconomic interrelationships, major uses of natural resources, and changes resulting from human activities. The information base or data source appendix includes a record of all references, copies of reprints and unpublished information and data acquired, a report on the location, and a description of unpublished data not acquired.

Incremental Funding: A Year-2 effort has been negotiated to continue tasks begun under this memorandum. The funding level is \$250,000.

(Map on reverse)



I. New Orleans OCS Office Study Profile

A. Study Title: PILOT STUDY OF THE SEASONAL DISTRIBUTION AND ABUNDANCE OF MARINE BIRDS, MAMMALS, AND TURTLES IN THE OCS REGIONS OF THE GULF OF MEXICO FY 79

B. Basic Data: Contract No.: AA551-MU9-18
 Contractor: U.S. Fish and Wildlife Service
 Project Manager: Dr. James B. Johnston
 COAR: Dr. Robert Rogers
 EAD Coordinator: Mr. Jacob Lehman
 W.O. Coordinator: Dr. Thomas Ahlfeld
 Contract Inspector (FWS): Mr. Jim Barkuloo
 Contracting Officer: Mr. Carroll Day
 Funding Level: \$245,673

C. Study Objectives/Methodology:

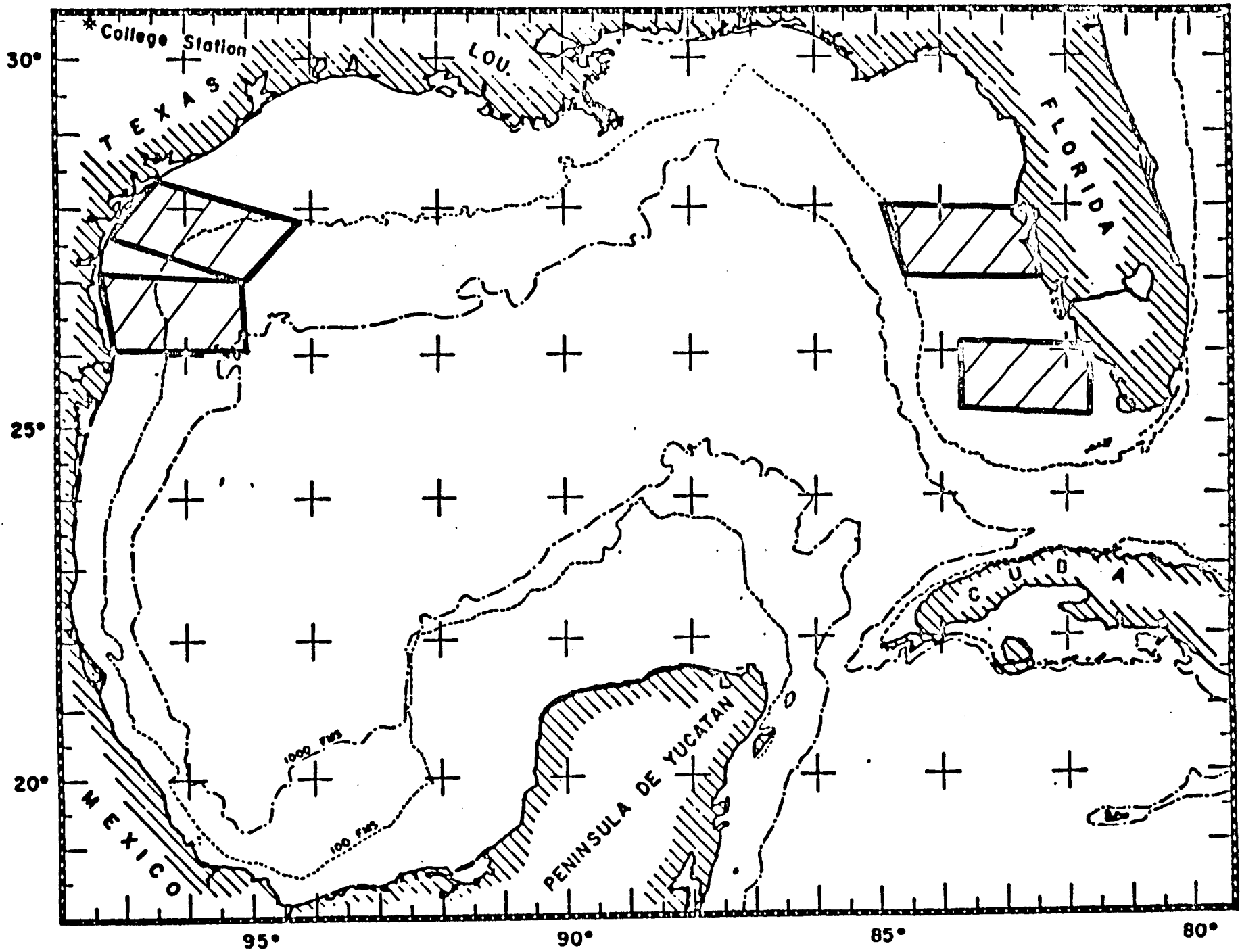
To make effective management decisions relative to oil and gas exploration and production on the OCS, BLM requires information on the distribution and abundance of organisms that are potentially affected or vulnerable to activities in the OCS area. Thirty-two species of marine mammals protected by the Marine Mammal Protection Act, including six endangered species, occur within the Gulf of Mexico and South Atlantic OCS areas. However, even the most basic aspects of their biology within the area are poorly understood because of the lack of thorough studies involving systematic and modern sampling regimes. Similarly, five species of marine turtles are present, including four that are considered endangered within the area. Since the Gulf of Mexico and South Atlantic waters are the warmest waters contiguous with the U.S., they contain the most significant sea turtle populations within national limits and border on all significant nesting beaches in the U.S., with the exception of Hawaii.

The birds of this area include several endangered species in coastal areas, but also include key pelagic species. The abundance of these important oceanic migrants reflects biological productivity and ecological relationships which may not be accurately measured by human investigative techniques; thus, oceanic birds are an important data source.

As a consequence of the orderly development of energy resources in OCS areas, comprehensive data are needed for birds, marine mammals, and turtles in marine and coastal areas. A multidisciplinary approach allows the efficient and expedient data collection. The purpose of this study is to initially increase the understanding of marine mammals, birds, and turtles in the Gulf of Mexico and South Atlantic OCS areas to subsequently gather specific information needed for the evaluation of effects of OCS development and evaluation of management policies compatible with national priorities and needs. Particular emphasis is given to those species considered to be endangered and to those having any other status likely to be influenced by energy development and exploitation of the waters of the continental shelf.

This study is designed to directly address the need for data on distribution, abundance, and ecology of the major vertebrate groups of concern. The study design includes sampling a broad spectrum of bathymetric extremes. This is because marine organisms are highly mobile, and the paucity of existing information prevents determination of definite ecological limits for many of these species at present. Consequently, for certain species, investigation of the bathymetric profile is preferable to the study of specific habitats. Bathymetric scope is as important as geographic scope.

(Map on reverse)



A-37

I. New Orleans OCS Office Profile Study

A. Study Title: GULF OF MEXICO AND SOUTH ATLANTIC OCS STUDY ON THE DISTRIBUTION AND ABUNDANCE OF ENDANGERED AND VULNERABLE MAMMALS, BIRDS, AND TURTLES, FY 80

B. Basic Data: Contract No.: AA851-MUO-21
Contractor: U.S. Fish and Wildlife Service
Project Manager: Mr. Larry Shanks
COAR: Dr. Robert Rogers
EAD Coordinator: Mr. Jacob Lehman
W.O. Coordinator: Dr. Thomas Ahlfeld
Contract Inspector (FWS): Mr. Jim Barkuloo
Contracting Officer: Mr. Carroll Day
Funding Level: \$494,870

C. Study Objectives/Methodology:

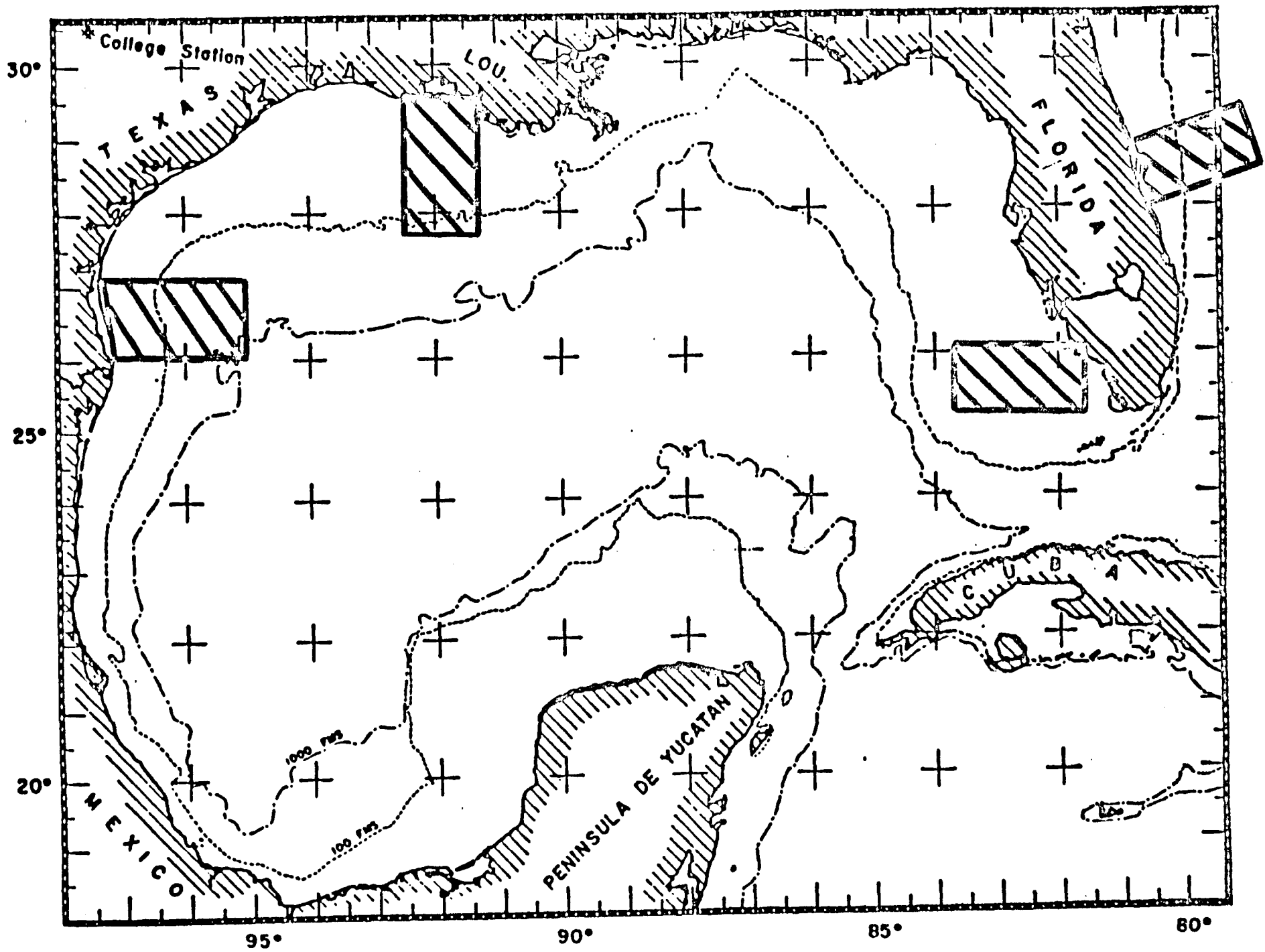
Field surveys under this study continue with the following objectives:

1. Determine and confirm which species of marine mammals, birds, and turtles inhabit or migrate through the OCS areas of the Gulf of Mexico and South Atlantic.
2. Investigate temporal and spatial distribution of these species and the patterns of movement associated with such distribution.
3. Identify, delineate, and describe any areas of special biological significance for feeding, migration, and maintenance of the populations encountered.
4. Provide a basis for estimating relative abundance of individual species within the study area.
5. Amplify the understanding of population structure and basic ecology of poorly known species of populations where possible.
6. Formulate specific questions and investigate lines for subsequent research relevant to effects of oil and gas development and other research priorities in OCS.

The contract was modified to provide funds to study how oiled sands affect the reproductive success of the Kemp's ridley turtle.

Incremental Funding: Additional funding for following year's efforts is planned. A FY 81 program has been negotiated.

(Map on reverse)



I. New Orleans OCS Office Study Profile

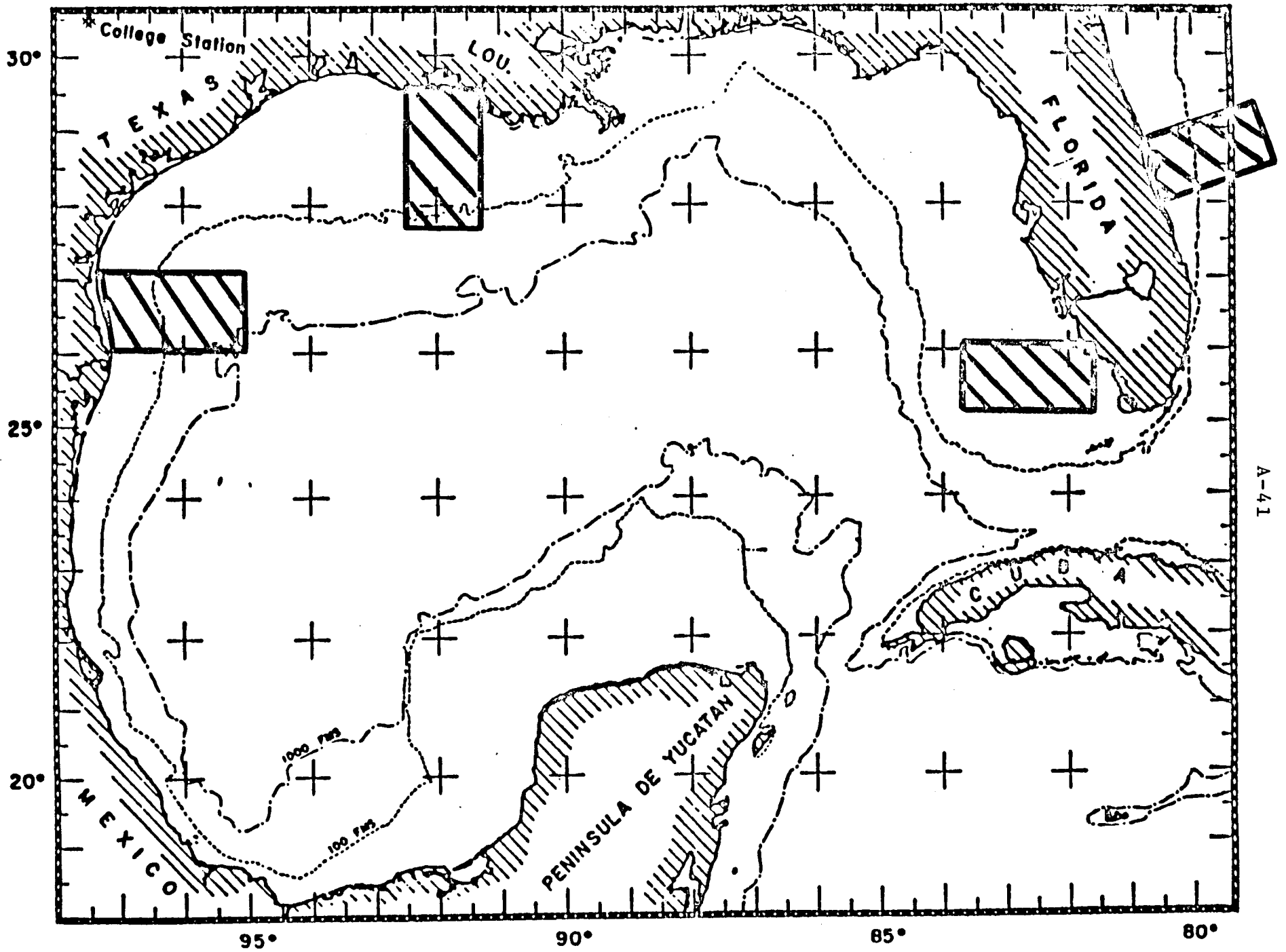
A. Study Title: GULF OF MEXICO AND SOUTH ATLANTIC OCS ENDANGERED SPECIES, MAMMALS, BIRDS, AND TURTLES STUDIES, FY 81

B. Basic Data: Contract No.: AA851-IAI-24
Contractor: U.S. Fish and Wildlife Service
Project Manager: Dr. James B. Johnston
COAR: Dr. Robert Rogers
EAD Coordinator: Mr. Jacob Lehman
W.O. Coordinator: Mr. Thomas Burke
Contract Inspector (FWS): Mr. Jim Barkuloo
Contracting Officer: Mr. Carroll Day
Funding Level: \$500,000

C. Study Objectives/Methodology:

This study provides for the extension of aerial surveys from FY 80 into FY 81 for a full year. This continuation should provide valuable information in the determination of seasonal trends in distribution and abundance of these animals. Aerial surveys in FY 81 will be limited to four systematic subunits in the vicinity of Brownsville, Texas; Marsh Island, Louisiana; Naples, Florida; and Merritt Island, Florida. Intervening areas will also be sampled but less intensively. The distribution of manatees will not be surveyed in this year's study.

(Map on reverse)



A-41

I. New Orleans OCS Office Study Profile

A. Study Title: SOUTH ATLANTIC AND GULF OF MEXICO MARINE BIRDS LITERATURE SYNTHESIS AND ANALYSIS, FY'78

B. Basic Data: Contract No.: AA551-MU8-12
Contractor: U.S. Fish and Wildlife Service
Project Managers: Mr. Larry Shanks and Ms. Cherry Keller
COAR: Dr. Robert Rogers
W.O. Coordinator: Dr. Mark Grussendorf
Contract Inspector: Mr. Jacob Lehman
Contracting Officer: Mr. Carroll Day
Funding Level: \$190,000

C. Study Objectives/Methodology:

The Fish and Wildlife Service shall synthesize and analyze information about marine birds occurring on the Gulf of Mexico and South Atlantic OCS lease areas.

This synthesis and analysis shall assess the likelihood of marine birds occurring in or being attracted to hazards associated with exploration and development in the OCS areas. The synthesis and analysis shall address which species are high-risk species, which species have migratory or feeding habits that increase their vulnerability, which part of the year and the length of time such species might be vulnerable to hazards, and which mitigation action may be employed to offset losses.

The synthesis and analysis shall relate the general topics of distribution, ecology, population dynamics, and feeding to the impact of oil and gas development. This information shall be organized by species and OCS lease areas.

The final report will contain a synthesis and analysis of the following topics to the extent that the information base permits. If no, or inadequate, information is available, this will be stated.

1. Distribution, abundance, seasonality, and movement of each species of marine bird occurring in the study area.
2. Food habits of marine birds while occurring in the study areas.
3. Species perspective that relates distribution and abundance in the study area to the species total distribution and abundance.
4. Review, assessment, and evaluation of impact of OCS-related perturbations, disturbances, displacement, and hazards on the marine birds occurring in the study area.
5. Identification, description, and evaluation of techniques to minimize or eliminate marine bird exposure to catastrophic and chronic perturbations, disturbances, displacements, and hazards associated with OCS deployment.
6. Information essential to complete the information base.

I. New Orleans OCS Office Study Profile

A. Study Title: CENTRAL GULF OF MEXICO PLATFORM STUDY

B. Basic Data: Contract No.: AA551-CT8-17
 Contractor: Southwest Research Institute, San Antonio, Texas
 Project Manager: Dr. C. A. Bedinger
 COAR: Dr. Richard Defenbaugh
 W.O. Coordinator: Dr. Mark Grussendorf
 Contract Inspector: Mr. James Barkuloo, FWS, Panama City, Florida
 Contracting Officer: Mr. Jerome Rourke
 Funding Level: \$2,186,738

C. Study Objectives/Methodology:

The overall purpose of the study was to ascertain the long-term regional impacts of intensive oil and gas production in the central Gulf of Mexico. This was approached by studying a variety of physical, chemical, and biological parameters at stations 100, 500, 1,000, and 2,000 meters distant from selected production platforms and at "control" sites in the study area. The four "primary platforms" and the four "control sites" were sampled during each of three seasons, while sixteen "secondary platforms" were sampled only once. Platforms were selected to represent various water depths, sediment regimes, oil and/or gas production histories, degrees of utilization by fishermen, etc.

The specific study objectives were:

1. Determination of the distribution and concentration of petroleum hydrocarbons, selected trace metals, and well drilling related substances in surficial sediments and tissues of commercially and/or ecologically important benthic and demersal species.
2. Examination of the microbial hydrocarbon degradation and nutrient cycling processes and related nutrient chemistry in surficial sediments.
3. Comparison of benthic communities, with emphasis on selected "indicators," in the immediate vicinity of platforms with those at control sites.
4. Examination of the distribution with depth in sediments of petroleum hydrocarbons, selected trace metals, and well drilling related substances (i.e., to provide some measure of persistence).
5. Investigation of the biofouling communities and "artificial reef" effect associated with selected platforms representing a variety of production types and durations.

(Map on reverse)

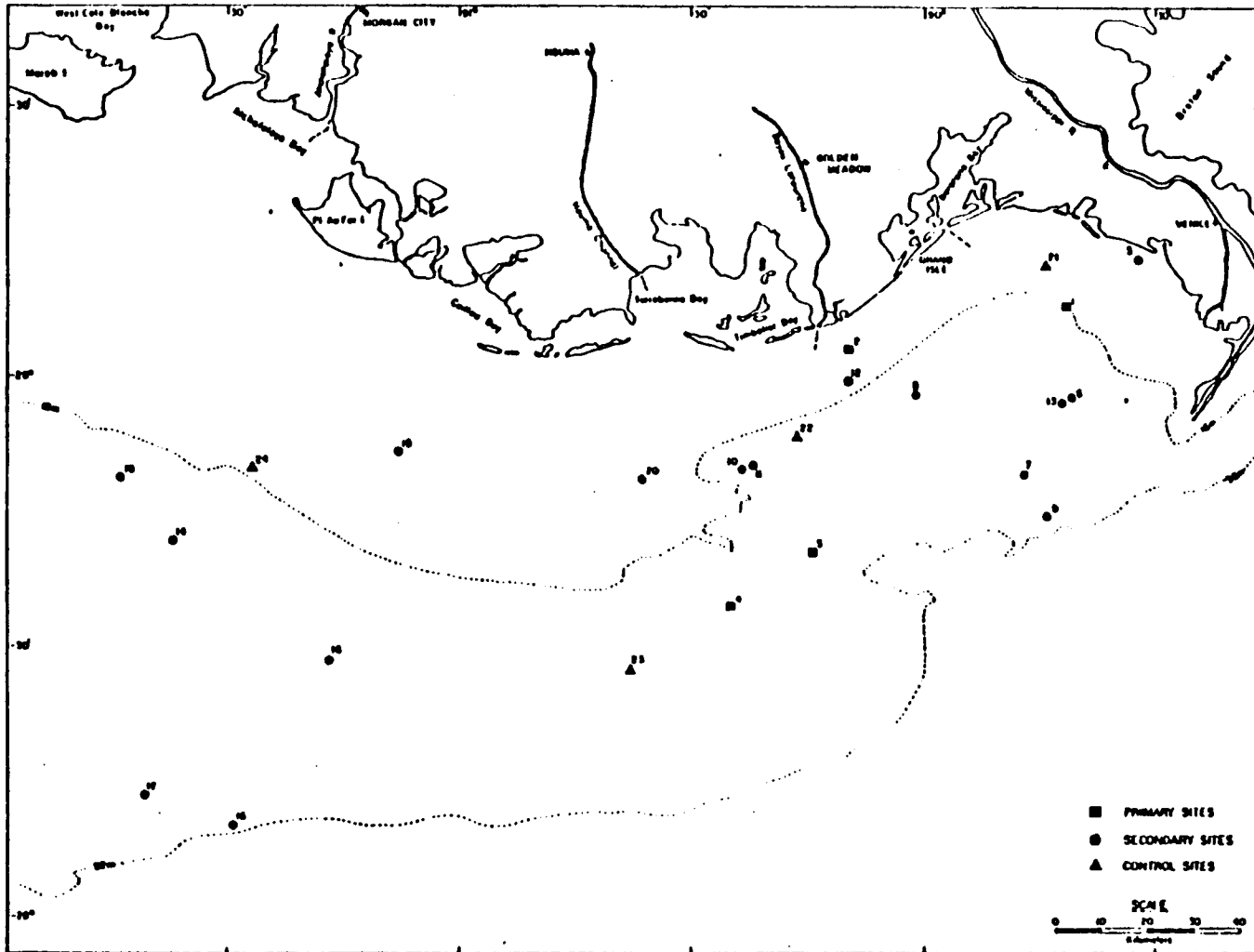


FIG. 13. The study area showing platform and control site designations.

APPENDIX B

CURRENT LIST OF ENVIRONMENTAL STUDIES AVAILABLE THROUGH
NATIONAL TECHNICAL INFORMATION SERVICE

UPDATED March 17, 1981

**Listing and Status of BLM Environmental
Studies Reports Administered by the
New Orleans OCS Office**

StatusDocument

- | | |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Available only
thru NTIS | 1974. A Socio-economic Environmental Baseline Summary for the South Atlantic Region between Cape Hatteras, North Carolina, and Cape Canaveral, Florida. Final report to BLM under CEQ Contract EQ4AC007; prep. by Virginia Institute of Marine Science. 5 volumes. |
| #PB80-216187 | I. Physical Oceanography. xvi + 247 pp. |
| #PB80-216286 | II. Climatology. xiv + 211 pp. |
| #PB80-216278 | III. Chemical and Biological Oceanography. xxxvii + 772 pp. |
| #PB81-110371 | IV. Geological Oceanography. xiv + 200 pp. |
| #PB81-127680 | V. Socio-economic Inventory. xiv + 199 pp. + appendix (78 pp. + 12 maps). |
| Available only
thru NTIS | 1975. Environmental and Socio-economic Baseline on the Gulf of Mexico Coastal Zone and Outer Continental Shelf. Final report to BLM, Contract 08550-CT3-10; prep. by Environmental Consultants, Inc. 3 volumes. |
| #PB80-202831 | 1. Supplemental Bibliography on Environmental Processes and Conditions in the Gulf of Mexico region. iv + 778 pp. |
| #PB80-202849 | 2. Current and Recent Research on Environmental Processes and Conditions in the Gulf of Mexico region. iv + 525 pp. |
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#PB80-166036 | 1976. A Biological and Geological Reconnaissance of Selected Topographical Features on the Texas Continental shelf. Final report to BLM, Contract 08550-CT5-4; prep. by T. J. Bright, R. Rezak, et al., Texas A&M University. xxi + 337 pp., illus. |

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<p>Available only thru NTIS #PB80-195043</p>	<p>1976. Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings. Final Rept. to BLM, Contract AA550-CT6-5; prep. by Research Triangle Institute. vi + 283 pp.</p>
<p>Available only thru NTIS #PB80-201684</p>	<p>1976. Ecological Aspects of the Upper Continental Slope of the Gulf of Mexico. Final rept. to BLM, Contract 08550-CT4-12; prep. by W. E. Pequegnat, et al., TerEco Corp. ix + 360 pp., illus. (This contract was administered by the Washington Office, Branch of Environmental Studies, and is included in the list only because of the regional nature of the final report.)</p>
<p>Available only thru NTIS #PB-251-341/AS</p>	<p>1976. Environmental Studies; South Texas Outer Continental Shelf, 1975; Geology. Final rept. to BLM Contract 08550-MU5-20; prep. by H. L. Berryhill, et al., U.S. Geological Survey. xxiv + 335 pp., 115 figs.</p>
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<p>Limited supply; no charge. PB81-127698</p>	<p>1977. Environmental Studies, South Texas Outer Continental Shelf, Rig Monitoring Program. Final report to BLM, Contract AA550-CT6-17; prep. by R. D. Grover, et al., University of Texas, Texas A&M University and U.S. Geological Survey. xiii + 455 pp.</p>
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- I. Executive Summary; prep. by Texas Instruments, Inc., Contract AA550-CT7-2. 6 pp.
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Limited supply; no charge.	1980. Proceedings: Gulf of Mexico Information Transfer Meeting. Final Report to BLM, Contract AA551-CT8-35; prep. by Texas A&M University. iv + 65 pp.



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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.



The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.